



CHAPTER 3: AFFECTED ENVIRONMENT

INTRODUCTION

This section describes the existing environment and the current conditions of important resources and values of Denali National Park and Preserve that would be affected by any of the five alternatives in the plan. Topics examined include physical resources (air, water, soils), vegetation and wetlands, fish, wildlife, natural sounds, wilderness, subsistence, cultural resources, socioeconomics, visitor use, and park management.

OVERVIEW: GEOGRAPHY AND CLIMATE

Denali National Park and Preserve is dominated by three physiographic provinces in central Alaska: the Alaska Range, Northern Foothills of the Alaska Range, and the Tanana-Kuskokwim Lowlands, while small portions of the park extend into the Cook Inlet-Susitna Lowlands, the Broad Pass Depression, and the Kuskokwim Mountains. The Alaska Range forms the northernmost portion of the Pacific Mountain System, and is one of the great mountain uplifts in North America, rising to the pinnacle of Mount McKinley at 20,320 feet. Mount Foraker is the second highest peak, rising to 17,400 feet, while nearby Mount Hunter, third highest, is 14,573 feet high. In addition, numerous peaks in the vicinity of Mount McKinley stand at elevations of 10,000-13,000 feet. The lower southern slopes of the Alaska Range are generally steep between the glaciers and contain spectacular lower elevation walls, spires, and peaks of their own. Examples include the granitic spires of the Tokosha Range between the lower ends of the Tokositna and Ruth glaciers, and the towering granitic walls on the west side of Cripple Creek. Because of the rugged relief, extensive glaciers, and dramatic scenery, the Alaska Range region has been the area of most interest to park visitors.

The northern foothills of the Alaska Range consist of a series of east-west trending ridges, starting with the Kantishna Hills and running eastward. Summit altitudes generally range between 2,000 to 4,500 feet. The foothills vary from 3 to 7 miles in width and from 5 to 20 miles in length (Wahrhaftig 1965). They are separated by broad flat valleys of glacial origin, which range from 2 to 10 miles in width. The Tanana-Kuskokwim Lowlands to the north of the foothills form a broad region of flat to gently rolling lowlands drained by the Tanana and the Kuskokwim rivers. There are more than 10,000 mapped lakes within the park and preserve boundaries, most of them in the northwestern park additions and preserve.

Another prominent feature of the geology of the area is extensive glaciation in the Alaska Range. The range is perpetually snowclad above approximately 7,500 feet on the north and 6,000 feet on the south. Glaciers are numerous and tend to be larger and longer on the south side of the range than on the north. The larger glaciers range between 35 to 45 miles in length and include the Kahiltna (the largest), Ruth, Eldridge, Tokositna, Yentna, and the Muldrow. On the north side of the Alaska Range beyond the existing glaciers, morainal and glacial outwash deposits extend into the foothills belt and cover large areas of bedrock. Except for some valleys, the foothills section was never glaciated.

Denali National Park and Preserve straddles two of the four major climatic zones of Alaska –the transitional maritime zone south of the Alaska Range and the continental zone in the interior north of the range. The Alaska Range exerts a major influence on the climate of the interior by blocking much of the moisture that sweeps inland from the Gulf of Alaska. Therefore, the north side of the park and preserve is characterized by less precipitation and greater fluctuations in temperature (hotter in summer and colder in winter) than the south side.

Weather is an important factor in other forms of visitor use. Cross-country hiking often is not practical until early June, and snow commonly closes the park road in mid-September. Winters are cold, particularly north of the Alaska Range where temperatures at Park Headquarters have reached -52°F. Average maximum temperature for January is 13°F, minimum is -5°F. Deeper snow and milder temperatures south of the range encourage a broader range of winter visitor use over a longer period. The period from late February to early April generally provides the best opportunities for cross-country skiing, snowshoeing, dog mushing, and snowmobiling. During summer, up to 20 hours of daylight provide many opportunities to enjoy the park, and temperatures have been as high as 90°F. The average maximum temperature for July is 66°F, minimum 44°F.

Precipitation at Park Headquarters averages about 15 inches annually, including an average snowfall of 76 inches annually. At higher elevations in the Alaska Range, however, the total precipitation exceeds 80 inches in some locations, and snowfall exceeds 400 inches. Precipitation in summer exceeds that in winter and is greater on the south side of the Alaska Range than on the north side. Rainfall occurs on an average of 21 days during June, July, and August at the McKinley Park and Lake Minchumina recording stations, 45 days at Summit, and 36 days at Talkeetna. Sudden showers and thunderstorms occur occasionally and flash floods can occur throughout the region.

PHYSICAL RESOURCES

Air Quality and Visibility

Air quality in the park and preserve is very good to excellent, with the notable exception of haze and smoke from wildfires in summer and, on a local basis, “fugitive” dust from the park road. The park and preserve are managed to achieve the highest attainable air quality levels and visibility standards, consistent with the applicable provisions of the Clean Air Act (42 USC 7401 et seq.) and mandates specified by ANILCA and the NPS Organic Act.

The exceptional air quality and lack of nearby city lights provide conditions for outstanding daytime panoramic views and winter night sky visibility (the long days of summer render stars invisible from May to August). Mount McKinley is the dominant landscape feature of the region. On a clear day the mountain can be seen from both Anchorage and Fairbanks at distances of 150 miles or more.

The 1977 amendments to the Clean Air Act designated the original Mount McKinley National Park as a Class I airshed, which requires the prevention of significant deterioration of air quality over baseline conditions. That classification was extended to cover the 1980 ANILCA additions to the park and preserve. Denali National Park and Preserve is the only national park unit in Alaska that is designated as a mandatory Class I airshed. The primary values to be protected under the Clean Air Act are human health and the secondary values include a variety of air quality-related values (AQRV), such as visibility and scenic, cultural, biological, and recreational resources. Protection of visibility is also a high priority under both Alaska regulations and national “regional haze” regulations issued by the EPA in June 1999.

The CAA also established National Ambient Air Quality Standards (NAAQS) for six priority pollutants (sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and fine particulate matter) to protect public health and the environment. No exceedances of NAAQS have been documented within Denali National Park and Preserve. Air quality data have been collected at a sampling station at Park Headquarters since 1980, and south of the Alaska Range near Trapper Creek since 1998. The park participates in four national sampling programs: the National Atmospheric Deposition Program/National Trends Network (NADP/NTN), which monitors acid precipitation; the NPS ozone monitoring program; the Interagency Monitoring of Protected Visual Environments (IMPROVE) program, which monitors aerosols; and the Clean Air Status and Trends Network (CASTNet), which measures dry deposition of particles and gases.

Water Quality

The surface waters of Denali National Park and Preserve generally appear to be of good quality, with indications of some impacts from human activities. Potential sources of contaminants are principally associated with mining claims; or glacial streams that drain high-altitude mountainous areas and carry high sediment loads (NPS 1995c). Most surface waters in the backcountry receive little recreational use because of difficult access, challenging boating conditions, or lack of fisheries. The surface waters probably receiving heaviest recreational use are the Nenana River, Moose Creek (in the Kantishna area), Horseshoe and Triple Lakes (in the frontcountry near Park Headquarters), and Wonder Lake (in the frontcountry near the road to Kantishna). In recent years, the Nenana River has supported an estimated 30,000-35,000 visitors each summer on commercial rafting tours. However, no water quality impairments attributable to use impacts have been detected in the Nenana River or on Moose Creek (NPS, unpublished data [Edwards and Tranel 1995]). Although they have not been measured recently, no use-related water quality impacts are expected at current use levels in the three frontcountry lakes (NPS 1996).

Streams and rivers can be grouped by type on the basis of the three main factors that affect water quality in the Denali National Park and Preserve: source (glacial or clear water), geology (marine sedimentary, primarily north side of the Alaska Range, or granitic, primarily south side of the Alaska Range), and mining impacts (placer mined or not mined) (Edwards and Tranel 1998). The primary effect of glacial water inputs is to increase suspended sediment and turbidity. Some of the effects of placer mining on water quality in the past have included increased suspended sediment levels and turbidity, depressed pH levels, and increased water temperatures. However,

there has been minimal mining activity in the park since 1985 and recent monitoring in the Kantishna area found few differences between mined and unmined streams, suggesting substantial recovery of water quality (Edwards and Tranel 1998).

Except in the Kantishna Hills, nearly all-surface water is potable, although iron is sometimes present in undesirable quantities. However, boiling or otherwise treating surface water is advised due to the presence of *Giardia*.

Soils

Soils within the park vary according to climate, parent material, topography, and vegetative cover and can be classified into four broad soil orders, the Entisols, Histosols, Inceptisols, and Spodosols (Rieger et al. 1979, <http://www.ak.nrcs.usda.gov>). The Entisols are relatively young soils that show little or no evidence of weathering. In Denali National Park and Preserve, they commonly are associated with outwash plains, upland areas adjacent to rivers where eolian deposition of silt and sand is frequent, recently exposed glacial moraines, and on steep, unstable areas.

Histosols are made up completely or in large part by organic material that has accumulated under wet conditions in depressions or other low areas. Histosols are uncommon and typically are associated with moraine depressions, thermokarst depressions in permafrost areas in the Tanana-Kuskokwim Lowlands.

Inceptisols have undergone relatively minor modification of the soil parent material by soil-forming processes. These soils are common in the Tanana-Kuskokwim Lowland and the northern foothills of the Alaska Range. These soils are found on both well-drained upland areas and in wet lowland areas associated with permafrost.

Spodosols are well-developed soils in which soil materials have been leached from the upper part of the soil and deposited at greater depth. Spodosols are common in the lower foothills on the south side of the Alaska Range and upland areas in the Cook Inlet-Susitna Lowlands because of the relatively high precipitation in that region.

Finally, there also is rugged mountainous land comprised of poorly weathered bedrock and glaciers where soils have not developed due to absence of fine-grained material. This land type is extensive in the Alaska Range region.

Permafrost, where ground temperatures are below 32°F for at least two years, occurs in most areas of Denali National Park and Preserve. Permafrost is discontinuous (50–90% of area), relatively warm (30–32°F), and of low ice content (0–10% excess ice) in the Tanana-Kuskokwim Lowlands, northern foothills, and the Alaska Range (Ferrians 1965, Ferrians et al. 1969, Brown et al. 1997). There are, however, some isolated areas of permafrost with moderate ice contents in the Tanana-Kuskokwim Lowlands, which makes the terrain more susceptible to thermokarst. In these areas, permafrost typically is found in wet, low-lying areas with fine-grained soils, on steep north facing slopes and at high elevations. Permafrost occurs sporadically (10-50% of

area) in the Cook Inlet-Susitna Lowlands. Exact permafrost thicknesses have not been documented, but thicknesses of up to 100 feet have been recorded near the eastern entrance to the park.

Thermokarst terrain caused by melting of the permafrost and subsequent subsidence of the ground surface is common because permafrost temperatures are relatively warm, (Osterkamp and Romanovsky 1999, Jorgenson et al. 2001). Fires are common disturbances that initiate thermokarst (Vioreck 1973). Permafrost also is sensitive to human disturbance (Brown and Grave 1979). The extent of thermokarst depends on soil texture, ice content, air and soil temperatures, and degree of disturbance. Thermokarst can be highly detrimental to buried cables and utility lines, paved surfaces, roadbed foundations, buildings, and other developments.

Permafrost also poses problems for the disposal of liquid and solid waste. Decay rates in frozen ground are extremely slow. Frozen ground is also impermeable to subsurface flow of fluids because ice fills all rock or soil pore spaces.

VEGETATION

The vegetation of Denali National Park and Preserve is a mosaic of taiga and tundra ecosystems controlled by the interaction of climate, topography, substrate, and site history. These determining factors vary considerably across the landscape of the park. Thus we find a diversity of plant communities and vegetation types in the park that vary across all spatial scales, ranging from patterns caused by micro-topography within individual sites to patterns on the scale of the landscape that are driven by differences in regional climatic factors. The major vegetation zones found in the park are described below.

Denali is located between 62 and 64 degrees north latitude. This area of the earth's surface lies within the taiga, or northern boreal forest biome. As such, Denali is predominantly forested below elevations of about 763 meters (2,500 feet), although local treeline varies with topography and location. Above treeline, we find two other vegetation zones: subalpine and alpine.

Lowlands/ Forested zone: Black spruce forest and woodland occupies areas underlain by permafrost, mostly north of the Alaska Range crest. The cold soil temperatures and impeded drainage found in these sites result in relatively low annual productivity and slow growth. Common understory shrubs in these areas include Alder (*Alnus crispa*), Dwarf birch (*Betula glandulosa*), Labrador tea (*Ledum groenlandicum*), Shrub cinquefoil (*Potentilla fruticosa*), several species of willow (including *Salix arbusculoides*, *Salix glauca*, and *Salix planifolia* ssp. *pulchra*) and blueberry (*Vaccinium uliginosum*). Black spruce stands burn periodically, and trees of more than 100 years of age are uncommon (Vioreck et al. 1992). Black spruce is a fire-adapted species, with serotinous cones that generally require fire for seed dispersal.

River corridors and upland areas with better drainage support more productive forest types than sites with permafrost, because of higher soil temperatures and increased nutrient availability. White spruce (*Picea glauca*) forest occupies uplands, sometimes mixed with paper birch (*Betula*

papyrifera) on hillsides. Birch occupies early successional sites in relatively moist facies while aspen (*Populus tremuloides*) is locally abundant in very dry or more xeric early successional sites. Common shrubs in upland Spruce-Birch forests are dwarf birch (*B. glandulosa*), rose (*Rosa acicularis*), willows (including *Salix bebbiana*) high-bush cranberry (*Viburnum edule*). Common mosses in the understory of spruce forest are *Hylocomium splendens* and *Pleurozium schreberi*. White spruce also requires a mineral seed bed for establishment, so that recruitment of trees is generally tied to disturbance events, which is most frequently fire (particularly north of the Alaska Range).

Dry and open sites in the forested zone of the park often have high cover of kinnikinnik (*Arctostaphylos uva-ursi*) and soapberry (*Shepherdia canadensis*). In southerly aspects, spruce forest is gradually replaced by aspen woodland with increasing slope. Aspen forest is characteristic of warm, relatively steep slopes in the interior, and is much less common on the south side of the Alaska Range, where balsam poplar more commonly occupies warmer slope facies within the forest.

The very warmest and driest sites within the forest zone in the interior are occupied by dry meadow and steppe-like vegetation dominated by grasses such as *Calamagrostis purpurascens* and *Poa glauca*, sagebrush (*Artemisia* spp.) scattered shrubs of juniper (*Juniperus communis*) and a variety of herbaceous perennials of the genera *Arabis*, *Erigeron*, *Pulsatilla*, and *Solidago*. Equivalent slope facies to the south of the Alaska Range are more likely to support lush graminoid-forb meadows dominated by Nootka lupine (*Lupinus nootkatensis*) geranium (*G. erianthum*) cow parsnip (*Heracleum lanatum*), and *Carex* species, as a result of moister growing conditions and historical factors.

Terraces along the major rivers support colonial herbs in newly abandoned channels grading into thickets of alder (*Alnus crispa*) and willow (*Salix* spp.). Older surfaces support mature balsam poplar forest (*Populus balsamifera*) grading into closed white spruce (*Picea glauca*) forest. Black spruce, and mixed black and white spruce forest occupy areas where permafrost has developed and drainage is impeded.

Interspersed within the forested zone on both sides of the Alaska Range in Denali are numerous wetland and riparian areas dominated by herbaceous taxa, including sedges, rushes, grasses, forbs, and mosses. Wetlands in this area are often topographically controlled and occupy topographic depressions, thaw features, and sites with impeded drainage. Numerous ponds and wetlands dot large areas underlain by glacial till of Wisconsin age and represent relicts of kettlehole ponds formed as glacial ice retreated with strong climatic warming through the Holocene. Beaver (*Castor canadensis*) also have a considerable influence on the distribution of wetlands through the impounding of streams, particularly in the forested lowlands of the Yentna, Susitna, Kantishna, and Kuskokwim river basins.

Subalpine zone: In the subalpine zone, roughly 2,500-4,000 feet in elevation, scrub vegetation dominated by dwarf birch (*Betula glandulosa*), alder (*Alnus crispa*), and willow (*Salix* spp.) alternates with open spruce woodland and meadow sites depending on drainage, topography, and site history. As the upper elevational limit of trees is approached, spruce woodland becomes

more open with a higher relative cover of tundra shrubs such as blueberry (*Vaccinium uliginosum*), dwarf birch, rhododendron (*R. lapponicum*), and willow (*Salix* spp.). Common graminoid species in the shrub zone are *Arctagrostis latifolia*, *Carex bigelowii*, *Carex podocarpa*, *Carex scirpoidea*, *Festuca altaica*, and *Poa arctica*. Common forbs in this zone are arctic wormwood (*Artemisia arctica*), lupine (*Lupinus arcticus*), parrya (*Parrya nudicaulis*), coltsfoot (*Petasites* spp.), wintergreen (*Pyrola* spp.), groundsels (*Senecio atropurpureus* and *S. lugens*), and goldenrod (*Solidago multiradiata*). Dwarf shrub species that are important in this vegetation are bearberry (*Arctostaphylos alpina* and *A. rubra*), mountain avens (*Dryas* spp.), crowberry (*Empetrum nigrum*), and netted willow (*Salix reticulata*).

The subalpine zone south of the Alaska Range crest, particularly in the Kahiltna and Yentna River drainages, is dominated by dense thickets of alder (*Alnus* spp.), devil's club (*Echinopanax horridum*), and other shrubs of more coastal distribution. The vegetation in these areas is considerably denser than equivalent sites north of the Alaska Range.

Alpine Zone: The alpine zone occupies elevations above about 3,500 feet. The alpine vegetation of the park is tundra, most often dominated by dwarf shrubs of the families rose (Rosaceae) and heath (Ericaceae), as well as graminoids and forbs. Due to the large amount of geomorphic activity and the relatively young age of many of the surfaces in the alpine, many slopes are essentially barren, supporting only a few scattered cushion plants. The upper limit of plant growth is about 7,500 feet, above which is an area of permanent snowcover.

Alpine tundra is variable within the park, depending on site characteristics and geographic location. In well-drained sites too dry or rocky to support dwarf birch, alpine tundra occurs above about 2,800 feet; in more favorable sites it occurs above the elevational limit of the shrub-tundra zone, which varies between approximately 3,500 and 4,000 feet. The most important class of vascular plant species of alpine tundra in the park are dwarf shrubs of the rose (Rosaceae), heath (Ericaceae), and willow (Salicaceae) families. The dominant plant species that occur in alpine tundra include mountain avens (*Dryas alaskensis*, *D. integrifolia*, and *D. octopetala*), bearberry (*Arctostaphylos alpina* and *A. rubra*), cassiope (*C. tetragona*), crowberry (*Empetrum nigrum*), and dwarf willows (*Salix arctica*, *S. polaris*, *S. reticulata*).

Snowbed areas and north-facing slopes in the alpine zone are characterized by high cover of heath species (principally *Cassiope tetragona*), Alaska mountain avens (*Dryas alaskensis*), polar willow (*Salix polaris*) and netted willow (*Salix reticulata*). These cool, moist sites support a characteristic assemblage of common forbs including *Antennaria monocephala*, spring beauty (*Claytonia sarmentosa*), mountain sorrel (*Oxyria digyna*), and buttercups (*Ranunculus eschscholtzii*, *R. nivalis* and *R. pygmaeus*). Club moss (*Huperzia selago*) and the grasses *Hierochloe alpina* and *Trisetum spicatum* are also common in snowbed sites. In rivulet areas, and more gravelly and disturbed snowbed sites, several saxifrages (*Saxifraga calycina*, *S. nelsoniana*, *S. nivalis*, *S. oppositifolia*, *S. rivularis*, *Boykinia richardsonii*) are very common throughout the park, particularly in high elevations. The distribution of these spatially-limited snowbed communities on the landscape is controlled by late lying snow, which is determined by local topography and wind patterns that redistribute the snowpack. Accumulation zones in the lee of exposed slopes, and topographic depressions are areas commonly associated with snowbed plant communities.

Dwarf scrub-sedge alpine tundra associations occupy mesic topographic positions in the park. These associations occur in more insulated sites than snowbeds and north-facing heath tundra. Dominant taxa can include the dwarf shrubs *Arctostaphylos alpina* and *A. rubra*, *Dryas octopetala*, *Empetrum nigrum*, *Salix arctica* and *S. reticulata* and the sedges *Carex bigelowii*, *C. microcheata*, and *C. scirpoidea*. Forbs common in mesic alpine tundra throughout the Park include mouse-ear chickweed (*Cerastium beeringianum*), *Minuartia arctica*, *Pedicularis capitata* and *P. lanata*, cinquefoil (*Potentilla hyparctica* and *P. uniflora*), spotted saxifrage (*S. bronchialis*), and moss campion (*Silene acaulis*). The grasses *Festuca brachyphylla*, *Hierochloa alpina*, *Poa arctica*, *Poa glauca*, and *Trisetum spicatum* are also common and are codominant in some associations. Dwarf-scrub-lichen tundra occurs on windswept ridges, sometimes with relatively sparse vascular plant cover of *Dryas* spp. and graminoids and abundant lichen of the genera *Cetraria*, *Cladonia*, and *Stereocaulon*.

Dry sites from the subalpine to alpine zone support a range of plant communities from discontinuous graminoid-forb associations to continuous *Dryas*-graminoid-forb tundra depending on slope, aspect, substrate, and slope morphology. Common vascular plant species in xeric alpine associations include mountain avens (*Dryas octopetala*), snow draba (*Draba nivalis*), *Minuartia arctica*, *M. obtusiloba*, and cinquefoil (*Potentilla nivea* and *P. uniflora*). Graminoid species common in dry alpine sites include *Calamagrostis purpurascens*, *C. rupestris*, northern fescue (*Festuca brachyphylla*), and *Kobresia myosuroides*.

Xeric alpine plant communities in the park harbor numerous endemic plant species. Endemic species that occur in dry sites throughout alpine areas of the park include *Astragalus nutzotinensis*, *Saxifraga reflexa*, and *Senecio ogoturukensis*. A number of uncommon arctic-alpine xerophytes occur in the northern section of the park. These include *Douglasia gormanii*, *Erysimum pallasii*, *Phlox sibirica* ssp., *richardsonii*, *Smelowskia calycina*, and *Synthyris borealis*.

Disturbance: The vegetation types most sensitive to disturbance are alpine tundra communities (Racine and Johnson 1988, Emers et al. 1995). The alpine tundra communities are particularly vulnerable because of the steep terrain commonly associated with these communities and thin soil that supports the vegetation mat. Disruption of the mat can lead to erosion of the thin soil, and the steep terrain exacerbates this process.

Vegetation surveys are an important component of the Long-Term Ecological Monitoring program. Sampling sites occur on plots throughout the park and preserve.

Wetlands

Wetland resources vary in type and distribution in Denali. Wetlands comprise less than approximately 15 percent of the total landscape within the alpine mountains regions in the park to over 80 percent on hills, plains, and flood plains in the northern boreal lowlands. The three essential characteristics of wetlands include hydrophytic vegetation, hydric soils, and hydrology. Hydric soils include soils that formed under conditions of saturation, flooding, or ponding for periods long enough during the growing season to support the growth and reproduction of

hydrophytic vegetation. The Soil Survey of Denali provides a description of hydric soils and major vegetation communities found within the park and thus provides a good resource for determining the extent and types of wetlands.

Within the high alpine mountains, hills, and plains regions of the park, wetlands are of limited extent or “sporadic” (less than 15%) across the landscape and “occasional” (15 to 49%) on low alpine mountains, hills and plains. In the high alpine mountains, wetlands are restricted to snowbed swales and flood plains in narrow valleys. Snowbed swales include areas beneath or directly down slope from snow drifts and saturated conditions exist primarily during spring. Soils consist of a thin layer of organic rich loess over gravelly till and colluvium with relatively low permeability. Vegetation consists of a mosaic of alder (*Alnus* spp) or willow (*Salix* spp.) scrub communities, and sedge (*Carex* spp.)-herbaceous meadow types. Wetlands on low mountains and glacial plains include saturated soils over permafrost. Saturated conditions result from the perching of water over an impermeable permafrost table that commonly occurs within a meter of the surface. Permafrost wetlands within the mountains have predominantly ericaceous-sedge (*Carex* spp.) scrub communities. Flood plain wetlands within the mountainous regions have water tables that fluctuate and often pond in response to changes in discharge associated with the riverine system. Vegetation is typically willow (*Salix* spp.), scrub, and sedge (*Carex* spp.) wet meadow types. Soils are formed in a thin layer of loamy alluvium underlain by sandy and gravelly alluvium.

At lower elevations, wetlands underlain by permafrost and characterized by stunted spruce woodlands referred to as “taiga” dominate the uplands. These wetlands are the single most extensive wetland type identified in Denali Park and often comprise from 50 to 100 percent of the landscape. Soils consist of a thick organic mat 20 or more centimeters thick over saturated loamy loess and alluvium, with permafrost at depths less than a meter.

Other noteworthy wetlands include the wet sedge (*Carex* spp.) meadow and sedge-sphagnum (*Sphagnum* spp.) bog wetlands found interspersed among permafrost wetlands and the many lakes of the northwestern part of Denali near Minchumina Lake. This wetland type is also common in uplands of the Susitna Valley portion of the park. Soils of the wet meadows and bogs consist of thick organic mats of sedge and sphagnum peat with layers often occurring as floating mats around lakes and ponds. A unique wetland type is found along the lower reaches of the Kantishna River north of Chilchikabena Lake where groundwater discharges at the surface, providing a unique wetland community of tufted bulrush (*Trichophorum cespitosum*) meadow. Soils consist of an organic mat over gravelly alluvium.

Other wetlands of minor extent in Denali, though of regional significance, include forested riparian wetlands with white spruce (*Picea glauca*)-willow (*Salix* spp.) forest or mixed white spruce-tamarack (*Larix* spp.) forest. Both of these types have soils with loamy alluvial mantles over sandy and gravelly alluvium and both have saturated conditions due to local groundwater discharge from the water table associated with the riparian system. Wet mixed paper birch (*Betula Neoalaskensis*)-white spruce (*Picea glauca*) forest and alder (*Alnus* spp.) scrub wetlands are identified along mountain slopes of the south side of the Alaska Range in Denali. These wetlands consist of a loamy volcanic ash mantle over glacial till and glacio-fluvial deposits. The

relatively high precipitation on the south side of the Alaska Range in combination with low permeability subsoil characteristics contributes to the saturated conditions in these soils.

Threatened and Endangered Species

No threatened or endangered plants are known to occur in Denali National Park and Preserve, but one plant species is considered a federal species of concern (former Candidate 2 species): a composite (*Taraxacum carneocoloratum*), the pink dandelion, which is found on alpine slopes and coarse, well-drained substrates. This species has been found in this general region of the Alaska Range (Murray and Lipkin 1987), and has been documented in the north side of the park and preserve in gravelly areas and scree slopes (Carl Roland, pers. comm.). The Alaska Natural Heritage Program also maintains a list of regionally sensitive plants (S1–S3) and surveys for these plant species are currently underway, with 47 species already documented within the park and preserve (Carl Roland, pers. comm.).

WILDLIFE

Birds

Denali National Park and Preserve supports a cosmopolitan avian fauna. All of the major groups of birds (waterfowl, raptors, grouse, shorebirds, near-passerines, and passerines) found in Interior Alaska are found in Denali. As of August 2001, 164 species were documented in Denali (C. McIntyre, pers. comm.). Of these, at least 106 species breed in Denali, including at least 25 resident species. The rich avifauna is supported by a diversity of habitats in Denali. The distribution of avian species in Denali is a function of habitat and elevation; however, studies of avifaunal communities are just beginning in Denali. In most cases, the available information is limited to presence and few data are available on relative abundance of species and habitat relationships. Except for approximately 25 resident species, most birds are migratory and occur in Denali only during the breeding season (April to October). Migratory species include those wintering in North, Central and South America, Southeast Asia, Africa, and the southern Pacific Ocean.

Passerines

Since 1992, the Denali Long-term Ecological Monitoring Program has supported studies to examine population trends of selected passerine species within Denali's frontcountry. The Alaska Bird Observatory (ABO) uses a survey-based monitoring approach, point counts, to determine population trends in selected species of passerines. The Institute for Bird Population studies uses a demographic-based monitoring approach, constant effort mist netting, to determine survival and productivity in selected species of passerines. These studies provide information on the relative abundance, survivorship, productivity, and habitat relationships of the most common passerines primarily in spruce-dominated forests in Denali's front country. In 1998, ABO and the Denali Institute initiated a migratory bird banding station along Moose Creek on Camp Denali property in the Kantishna Hills (Benson 1999). This study provides information on the timing and diversity of migration in the Moose Creek area.

Few surveys for passerines have been conducted in the Denali backcountry. However, in 2001 Denali staff initiated passerine surveys in several backcountry areas and is designing a Denali-wide sampling plan for passerines and other land birds (McIntyre and Roland 2002).

Waterfowl

Park-wide waterfowl surveys are conducted in coordination with the U.S. Fish and Wildlife Service. Except for a few species, waterfowl distribution on the south side is limited to the wetlands, lakes, and ponds along the southern park boundary. Lands south of the park boundary contain more waterfowl habitat. The Minchumina basin, in the northwestern portion of Denali, supports the highest densities of breeding waterfowl in Denali (McIntyre 2002). Of the 20 species of migratory waterfowl that breed in Denali, trumpeter swans, harlequin ducks, and Tule greater white-fronted geese are of particular interest on a nationwide basis. Additional species of interest included those used by subsistence users and those particularly sensitive to human disturbance.

Breeding and staging trumpeter swans occur on the south side of the Alaska Range, particularly in the Yenta and Tokositna drainages, and in the Minchumina basin on the north side of the Alaska Range (McIntyre 2002). However, there is limited swan habitat within the boundaries of Denali on the south side of the Alaska Range. In 2000, a park-wide trumpeter swan survey was completed by the USFWS (McIntyre 2002). While results from these surveys show that the wetlands and waterways from the Yenta River drainage east to the Ruth River drainage contain large numbers of breeding swans, the highest concentrations of swans were observed in the Minchumina basin. In September 2000, observations were also made of large flocks of staging swans in the Chulitna River area, especially between the Tokositna drainage and West Fork of the Chulitna River (Bryant, pers. comm.). Currently, Denali staff is conducting surveys for staging swans and developing habitat models for trumpeter swans on the south side of the Alaska Range (McIntyre 2002).

The Tule greater white-fronted goose, a subspecies of the greater white-fronted goose, is considered “at risk” by the International Waterfowl Research Bureau, although it is not listed federally or by the state. They nest at very low densities from the Yenta River drainage to the Tokositna River drainage within and adjacent to Denali’s boundaries (Ely et al. 1994).

In autumn, tens of thousands of Sandhill cranes, Canada geese, greater white-fronted geese, trumpeter and tundra swans, and other waterfowl migrate through the area, especially along the north side of the Alaska Range, the Wonder Lake and eastern Kantishna Hills area, and the northern additions. Many of these species also use wetlands and tundra areas for feeding and resting during migration. Trumpeter and tundra swans regularly use lakes and ponds in Denali during migration periods. In spring, migratory waterfowl are often forced to congregate in relatively small areas of open water. For instance, flocks of white-winged scoters numbering in the hundreds often stage at the south end of Wonder Lake in spring.

Raptors

Most raptor surveys in Denali have been limited to the mountainous regions and waterways within and adjacent to Denali. Raptors are well represented in the avifauna of Denali, including eagles (bald and golden), falcons (gyrfalcons and peregrines), merlins and kestrels, accipiters (northern goshawk and sharp-shinned hawk), northern harriers, and owls (great gray, short-eared, northern hawk, boreal, great horned, and snowy). Until recently, most quantitative data on raptor abundance, distribution, and habitat preferences in Denali were restricted to studies on the north side of the park on a few species: golden eagles (McIntyre and Adams 1999; on-going studies), gyrfalcons, (McIntyre, unpublished data), merlins (Wilbor 1996), and northern hawk owls (Kertell 1986).

In 2000, Denali staff initiated a three-year study to quantify cliff-nesting raptor habitat and bald eagle habitat on the south side of the Alaska Range (McIntyre 2002). Denali staff is also developing habitat models to predict the occurrence of golden eagles throughout Denali and habitat models to predict occurrence of cliff nesting raptors and bald eagles on the south side of the Alaska Range (McIntyre 2002). Golden eagles and gyrfalcons occur in the mountainous regions of the park, with the highest densities in the northeastern portion of Denali. Bald eagles are numerous at lower elevations on the south side of the Alaska Range (McIntyre, unpublished

data); the highest concentrations occur on lands adjacent to Denali. Surveys in 2001 found over 25 occupied bald eagle nesting areas in the Yenta, Kahiltna, Tokositna, Ruth, and Chulitna drainages (McIntyre, unpublished data).

Known species of owls that breed in Denali include short-eared owl, great gray owl, great horned owl, northern hawk owl, and boreal owl. Great-gray owls and northern hawk owls occur at very low densities. Short-eared owls are the most common owl species breeding in the area and great-horned owl and boreal owls are the most common resident species in Denali (McIntyre, pers. comm.)

Alaska Department of Fish and Game staff reports an increasing number of ospreys observed south of Denali, with at least one pair nesting in the Trapper Creek area. Farther to the south at least three pairs were present in the Willow Creek area (ADFG 1996b). Osprey are occasionally seen in the Wonder Lake area, and abundance and distribution of this species is probably greater than currently reported based on the abundance of suitable habitat in the southern and western portions of Denali and increases in their breeding populations statewide. However, ospreys were not located during bald eagle surveys on the south side of the Alaska Range in 2001 (McIntyre, unpublished data).

Other species

Ruffed and spruce grouse, and all three species of ptarmigan (willow, rock, and white-tailed), are residents in Denali. Woodpeckers are also well represented in Denali. All woodpeckers are resident, except for the yellow-shafted flicker. Kingfishers and American dippers occur in riparian areas. Shorebirds are represented by species nesting in sub-alpine and alpine habitats (whimbrel, upland sandpiper, surfbird, semipalmated plover) and wetland and riparian areas (yellowlegs, common snipe, solitary sandpiper, wandering tattler). Denali provides important summer breeding grounds for two species that winter at sea, arctic tern and long-tailed jaeger. The numerous lakes and ponds at lower elevations provide important breeding habitats for the arctic tern and long-tailed jaegers breed in subalpine and alpine areas of Denali.

The Boreal Partners in Flight Working Group (PIF) identified 19 bird species as “priority species” for Central Alaska, which includes Denali. The PIF system ranks each species of North American breeding birds based upon seven measures of conservation vulnerability. All but three of these species (sharp-tailed Grouse, Townsend’s warbler, and Smith’s longspur) occur in Denali. The Smith’s longspur occurs infrequently in the Wonder Lake area and is expected to occur on the south side. Suitable habitats for sharp-tailed grouse and Townsend’s Warblers (mature white-spruce forests) are limited in Denali; however, Townsend’s warblers are seen occasionally.

Threatened and Endangered Species

Currently, no bird species occur in Denali National Park and Preserve that are listed as threatened or endangered under the Endangered Species Act (USFWS 1999). The American peregrine falcon (*Falco peregrinus anatum*) was delisted in August 1999 (*Federal Register* 64: 46542-46558). Nesting peregrine falcons are relatively rare in Denali, but two pairs have been found nesting on the north side near the Toklat River and near Chilchuckabena Lake (McIntyre,

pers. comm.). No nest sites have been documented in the south side of the park. Foraging and transient birds may occur in that area, however; and peregrines are considered rare in Denali State Park (ADNR 1989).

Some wildlife species formerly were listed by the U.S. Fish and Wildlife Service as category 2 candidate species for possible future listing under the Endangered Species Act. These candidate species were redesignated as “species of concern,” which provides no protection under the Endangered Species Act. Under NPS policy, however, such taxa are treated as threatened or endangered until additional data on their population sizes and distributions show otherwise. Federal species of concern that occur in Denali National Park and Preserve include two bird species, the harlequin duck and olive-sided flycatcher.

Harlequin ducks occur in fast-moving clear streams and rivers in the Alaska Range, including Denali National Park and Preserve. Although population surveys have not been conducted in the park, Moose Creek in the Kantishna area and other clear water streams probably support breeding harlequin ducks.

In Alaska, olive-sided flycatchers nest in open coniferous forests with bog ponds and marshy streams, and in woodland/dwarf forest, usually in black spruce trees located near the drainages (Gabrielson and Lincoln 1959). This species has been recorded annually on point counts and Breeding Bird Surveys on the north and south sides of the Alaska Range. It has been found breeding on the north side near Moose Creek (Benson 1999); they are an uncommon summer visitor to the state park (ADNR 1989).

In addition to federal species of concern, the State of Alaska maintains a list of “species of special concern,” which includes American peregrine falcon, olive-sided flycatcher, gray-cheeked thrush, Townsend’s warbler, and blackpoll warbler (ADFG 1996). Except for Townsend’s warbler, all of these bird species occur within the park and preserve boundaries in suitable habitats, although little is known about population abundance or distribution.

Mammals

Moose

Moose are abundant throughout the year within and near the numerous drainages in Denali National Park and Preserve. Moose concentrations vary seasonally and, during winter, correlate with snow depth and timing (ADFG 1992b). Most calving takes place from late May through June. During calving, cows tend to seek areas within their home range that provide low predator densities (islands in rivers) or improved visibility (open muskeg areas) (ADFG 1996b). Post-calving moose generally move to higher elevations. Fall rutting and post-rutting concentrations occur in subalpine habitats, with moose moving down from these areas in winter as snow depths increase (ADFG 1992a). Riparian willow stands provide a large part of winter forage and upland coniferous forests provide thermal cover and shallower snow depths (ADNR 1991).

Moose inhabit the entire vegetated planning area in the park except the highest tundra communities. The area from the Park Headquarters to the Savage River supports a relatively

high density of moose for Interior Alaska. During early autumn, large rutting congregations occur between mile 6 and mile 15 of the park road. Fall rutting congregations can reach sizes of 50 or more moose, and it may be possible to witness bulls sparring to determine dominance. On the north side of the Alaska Range in Denali National Park and Preserve, the overall population of moose has remained relatively constant since 1986 (Meier 1987, Meier et al. 1991). However, the moose population along the road corridor, at least from Headquarters to Teklanika, has declined by about half since the early 1970s (Burson et al. 2000), as has the number of moose sighted from the park road (Burson et al. 2000). Autumn density estimates in various regions of the park have ranged from $0.1-1.4\text{ moose/mi}^2$ (Meier 1987, Meier et al. 1991), with overall autumn densities of $0.4-0.5\text{ moose/mi}^2$ (Meier 1987).

Prior to the 1990s moose were abundant within the broad drainages on the south side of the Alaska Range, particularly within the Tokositna, Ruth, and upper Yentna drainages. The Yentna drainage alone supported approximately 300 moose (Troyer 1979). During a 1996 survey, park staff observed only 202 moose within the Yentna River drainage within the Preserve boundary (ADFG 1996a). Since that survey ADF&G reports a 50% or greater decline in moose numbers throughout the southern slope of the Alaska Range, likely due to deep snow winters and increasing predator numbers (ADFG 1996b).

Concentrations of moose are often seen mid and late winter in the Windy Creek area above Cantwell and where Ohio Creek emerges from the mountains (NPS unpublished data). Important moose concentrations within the south side region (primarily outside the national park boundary) include the Sunflower basin (next to Chelatna Lake), the Kahiltna Flats, the Petersville Road, Moose Creek, Bear Creek, Peters Creek, Little Peters Hills, Peters and Dutch Hills, the Tokositna River valley sides and bottom, the south end of Curry Ridge, upper Troublesome Creek, and Twenty Mile Creek (ADFG 1984a; ADFG 1995a). The upper Tokositna River valley was identified by the state as important winter range (ADNR 1989). Rangers also reported high numbers of moose in this area in the winter. This concentration of moose is especially the case on the south side of the Tokosha Range where a flyover counted 88 moose in a $2-3\text{ mi}^2$ area (this area is known as “Moose Meadows” to pilots who lead scenic flights out of Talkeetna) (NPS 1995). High numbers of moose also wintered in the Little Peters Hills and Petersville area where the riparian zones of Moose, Kroto, and Peters Creeks provide critical habitat for winter survival (ADNR 1991). Mean density of moose during late winter (late March) ranged from 0.7 to 3.2 moose/mi^2 on the south side (ADFG 1990b). A large rutting concentration roughly coincides with caribou calving grounds in the higher country north of Broad Pass between Windy Creek and the Bull River (ADNR 1985; ADFG 1985a). The drainages in the area of the old Dunkle Mine – the upper Bull River, Costello and Cantwell creeks, and the West Fork of the Chulitna – are identified as prime early-winter moose range (NPS 1984a; ADNR 1985). Critical winter range also includes the Kahiltna Glacier moraines and west of Little Peters Hills.

Caribou

Caribou are migratory herd animals that use varying habitats for wintering, calving (late May to early June), summer range, and rutting (September and October). Caribou are common along the park road and may be observed throughout the summer. Caribou are usually visible during early morning and evening while they are foraging, or during midday while bedded. Caribou are

relentlessly harassed by insects during warm days in summer, when they commonly bed on snow fields or windy ridgetops to avoid insects. Most visitors observe caribou in open areas above treeline. Caribou are a popular game animal and are generally hunted south of Denali National Park and Preserve in the late summer and early fall, although in some areas, the hunting season extends through late winter (March).

The Denali caribou herd currently numbers approximately 2,000 caribou and ranges over approximately 3,900 mi², including most of Denali National Park and Preserve north of the Alaska Range, and areas south of the range and east of Mount McKinley. Historically, the Denali herd may have exceeded 20,000 animals from the turn of the century to the early 1940s (Murie 1944). The herd declined to about 10,000 caribou in the mid-1940s and maintained that size until the mid-1960s. Along with many other Alaskan caribou herds, the Denali herd again declined after the mid-1960s reaching a low of about 1,000 caribou in 1975 (Troyer 1977). This latter decline resulted from poor recruitment and lowered adult survival during a period of relatively severe winters (Adams et al. 1989).

After 1975, the Denali herd sustained annual growth of about 7% per year during a period of favorable winter weather, reaching a peak size of about 3,200 caribou in 1990 (Adams and Mech 1995c). With heavy snowfalls during winters of 1988-89 to 1993-94, the herd again declined to its current size. Researchers have conducted intensive studies on the dynamics of the Denali Herd since 1984 (Adams et al. 1995a,b; Adams and Mech 1995c; Adams 1996; Adams and Dale 1998b). They found high losses of calves to predation are an important factor in limiting the growth of this caribou population.

The Denali herd has been known to use three areas where cow caribou drop their calves – Cantwell on the south side and Wonder Lake and Stampede on the north side of the Alaska Range. Historically, 10–90% of the herd crossed to the Cantwell calving grounds each year for calving or immediately after calving. In the past these calving grounds may have been the most significant in terms of the percentage of the herd using them and of overall calf survival (NPS 1982; Kline et al 1983.; Kline and Boertje 1984). Now, however, studies indicate the Cantwell grounds have recently been used less extensively for calving by the Denali herd than the two northern areas (NPS 1989b). For the last decade, approximately half of the cows in the Denali herd have calved in the foothills of Mount McKinley from the Muldrow Glacier to the Straightaway Glacier. The other half of the cows do not congregate on calving grounds but disperse throughout the range of the herd (Adams et al. 1995b). The proportion of cows on the calving grounds increases in years with low spring snowpacks and decreases when the mountains are blanketed in snow.

Following calving, caribou predominantly move to higher mountainous areas greater than 5,000 feet in elevation for the first half of the summer. These high altitude areas provide relief from insect harassment as well as nutritious, newly growing forage (Boertje 1985). By mid-summer, when insect harassment is reduced by cooler temperatures and increased rainfall, caribou disperse widely throughout the mountains and foothills of the park to forage.

With the onset of the breeding season in mid-September, caribou aggregate into rutting herds. These rutting groups can be found from the foothills of Mount McKinley, north through the Upper Moose Creek drainages and into the Toklat, East Fork, and Sushana River drainages. In general, rutting occurs farther to the north and at lower elevations with increased autumn snowfall.

Since 1986 caribou have predominantly wintered on the tussock flats north of the Outer Range and the associated foothills. The Broad Pass area also is used as winter range by the Denali herd because of good habitat and because the hill tops are wind-blown and cleared of snow. Often some caribou winter in the forested and treeline areas from Eagle Gorge on the McKinley River west to the Foraker River. In years of high winter snowfall, caribou are restricted to wind-blown alpine ridges of the Outer Range, Kantishna Hills, and the Stampede Hills.

When moving between the north and south sides of the Alaska Range, most caribou move from the Sanctuary River over a pass to the upper West Fork of Windy Creek. About 90% of the caribou migrating to the south side were estimated to use this pass in the late 1970s. From Windy Creek they move through Foggy Pass to Cantwell Creek and beyond to the Bull River. Crossing of the range also occurs between the Sanctuary River and Windy Creek itself, from the East Fork of the Toklat to the Bull River, and over Anderson Pass. Historical movements occurred in the 1920s and 1930s from Riley Creek to the main fork of Windy Creek. Recent field observations indicate that caribou movement occurs over nearly all negotiable passes between the Toklat and Sanctuary Rivers.

In addition to caribou from the Denali herd, small numbers of caribou from the Nelchina herd venture into Denali National Park and Preserve in the Broad Pass and Yanert Valley areas. The Nelchina herd, which reached about 45,500 animals in the early 1990s (ADFG 1993a), has recently declined to about 30,000 animals. The Rainy Pass herd ranges into the southwest corner of the Preserve in the upper reaches of the Kichatna River drainage and in the Simpson Pass area (ADFG 1996a). The Rainy Pass herd was estimated by Masteller et al. (1997) at 1,500–2,000 animals following a summer survey conducted by both ADFG and park staff during 1996. The Tonzona herd ranges into the northwestern portion of the southwest preserve.

Dall Sheep

The mountainous terrain throughout most of Denali National Park and Preserve provides habitat for Dall sheep except for the south slopes of the range, which are prone to deep winter snow that excludes sheep. Sheep migrate annually between the Alaska Range and the Outer Range (Dalle-Molle, J. and Van Horn, J. 1991).

Sheep are gregarious and are usually observed in groups of 10 or more. Rams are in bachelor groups during most of the year and only join the ewe-lamb groups during the breeding season in November. The park road travels along several nursery areas on mountains near Toklat and Polychrome Pass where it is common to observe ewes with lambs. The white coloration of Dall sheep makes them visible from great distances.

During 1996 park staff along with ADF&G surveyed the portion of the park and preserve and adjacent mountains south and west of McKinley River and documented 1,055 sheep (Masteller et al. 1997). The highest densities were found in the West Fork of the Yentna River.

Bears

Both brown (grizzly) and black bears inhabit Denali National Park and Preserve, where habitats provide abundant foods, as well as denning areas. Brown bears inhabit open tundra throughout the park, which facilitates their observation from great distances by backcountry hikers and park visitors from the road system. In contrast, black bears inhabit forested areas and are more difficult to see.

Brown Bear:

Brown bears range throughout the park and preserve, but generally prefer high-elevation tall shrub, low shrub, and alpine tundra communities. Bears are omnivorous, opportunistic feeders and move to areas when foods become seasonally available. Roots, sedges, early herbaceous plants, and overwintered berries constitute the bulk of their diet after they emerge from dens in late April (Stelmock 1981). Denali brown bears prefer peavine (*Hedysarum alpinum americanum*) roots, which grow on low slopes and valleys (Murie 1981). They also prey on moose and caribou calves. By mid-summer, brown bears turn from digging to grazing and feed on grasses and sedges growing on upper hillsides. In late July, brown bears turn to a diet of berries, especially soapberries (*Shepherdia canadensis*), that grow on floodplain gravel bars. This diet is supplemented by ground squirrels and, where available, salmon. They return to eating roots in the fall.

Brown bear densities are poorly known for most of Denali, but recent work on the south side of the park indicates that densities there vary from 0.03–0.10 bears per square mile (ADFG 1990a, ADFG 1993f; ADFG 1996b). Dean (1987) estimated grizzly bear density for the 1,000 mi² area from Riley Creek to the Muldrow from the AK range to just north of the Outer Range. The density estimate for all bears expanded for estimated sighting efficiency was 1 bear for every 12 mi²-all bears. Keay (1995) estimated bear density in a 660 mi² study area from the Muldrow glacier west to the Herron River. Density estimate for all bears was 1 bear per 10.4 mi².

Black Bears

Little is known about the density of black bears in Denali. In the Susitna River area, southeast of the park, black bear densities reach about 0.2 bears per square mile (Miller et al. 1987). Overall concentrations of black bears on the south side are thought to be decreasing (ADFG 1995a). In contrast to brown bears, black bears prefer upland forest and floodplain forest communities below 2,000 feet in elevation (ADFG 1978a).

Black bears are known to be present in relatively large numbers in the lowland forests of the Chulitna, Ruth, and Tokositna Rivers; however, their home ranges often extend out of these forests well up into the open tundra vegetation classes of the higher foothills (NPS 1995c). During spring 2000 bear surveys, ADFG staff noted high spring concentrations of black bears on south facing slopes of the Hidden River, Coffee River, Tokositna River, and the Chelatna Lake area (ADFG 1995a).

Black bears den in all types of habitats in holes, brush piles, or simply under a blanket of snow (Smith et al. 1994). After emerging from their den in the spring, black bears seek new plant growth. They are opportunistic feeders and readily eat whatever food they encounter, including carrion. Salmon, where available, may be substituted for herbaceous vegetation. Berries are an important part of their diet in late summer and early autumn. Black bears are considered bolder than brown bears and have a high potential to be adversely affected by human activity (NPS 1990).

Gray Wolf

Wolves have been studied intensively in Denali north of the Alaska Range since 1986 (Mech et al. 1998). During that time, the estimated late-winter population of wolves in the park and preserve has varied from 60 in 1986 to 135 in 1990. In late winter 1998, approximately 80 wolves appeared in Denali (L. Adams, personal communication). In contrast, little effort to document population status and trend has been conducted on the south slope of Denali. However, during an investigation of the presence of dog-biting louse in the Lower Susitna River-Yentna River drainage in 1998 and during recent moose surveys, staff from ADFG identified a minimum of five packs using Denali National Park and Preserve lands between Ruth Glacier and Kitchatna River (ADFG 1996b).

The size of the park's wolf population is primarily dependent on the abundance and vulnerability of ungulate prey species. During periods of low winter snowfall, when prey are in particularly good nutritional condition, wolf numbers tend to be low because of low pup production and survival and high dispersal and mortality of older wolves (Adams and Mech 1995c, Mech et al. 1998). When winters are severe, making prey more vulnerable, the wolf population can quickly increase by higher pup production and reduced dispersal of young adults. For example, the park's known wolf population more than doubled during 1987-1990 when winter snowfalls were particularly severe.

Wolves occur throughout all areas of the park that support ungulate prey (i.e., areas less than 6,000 feet elevation). The wolf population is comprised of territorial packs that can include from 2-30 individual wolves (Mech et al. 1998). Wolf packs are usually comprised of a breeding pair, the pups of the year, and possibly a few young wolves from previous litters. Although a single litter produced by one female in the pack each year is the rule, up to three litters per pack have been documented in Denali (Meier et al. 1995).

During much of the year, wolves travel nomadically throughout their territory in search of vulnerable prey, and occasionally make forays into adjacent territories. In Denali, marked overlap occurs among annual pack territories, probably resulting from shifts in territory boundaries throughout the year and movements of wolves in response to migratory prey, particularly caribou (Mech et al. 1998).

From May to September, movements of wolves in a pack radiate from a central point, where the young pups remain because they are too small to travel with the adults. Pups are born in dens during mid-May where they usually remain for the first several weeks. Den sites have been located throughout the park. Some dens are used repeatedly, while others are used only rarely.

Although wolves most commonly use underground dens, these dens are not required to rear young pups successfully (Mech 1993). As the summer progresses, pups may remain at a den site or they may be moved to an area away from the den, called a rendezvous site. Regardless, the adults continue to hunt from this central location throughout the remainder of the summer. By about mid-September, pups are large enough to travel with the adults and the pack resumes its winter nomadism (Mech et al. 1998). The seasonal habitat selection of wolves is largely dictated by habitat use patterns of their prey during the various seasons (Mech et al. 1995). Park management closes the areas immediately around active den sites during the season the dens are in use.

Smaller Carnivores, Rodents, Lagomorphs, and Insectivores

Although much of the emphasis on Denali's wildlife focuses on larger mammals, Denali supports a large suite of smaller carnivores (coyote, red fox, lynx, river otter, wolverine, marten, ermine, least weasel and mink), rodents (hoary marmot, arctic ground squirrel, red squirrel, northern flying squirrel, beaver, voles, brown lemming, and porcupine), two lagomorphs (snowshoe hare and collared pika), insectivores (shrews), and at least one species of bat (little brown bat). These species inhabit a variety of habitats across Denali and form integral links in Denali's food web. Many of the furbearers, beavers, and snowshoe hare are important resources for subsistence users in Denali. Many of the rodents are prey sources for many larger omnivores and carnivores. For instance, beavers are one of the primary alternate prey animals for wolves in summer, especially in Denali's western half (Mech et al. 1998); grizzly bears may prey heavily on voles when they are available; and golden eagles depend heavily on snowshoe hare and arctic ground squirrel during the breeding season. Many herbivores, including snowshoe hare and arctic ground squirrel, are important forces in browsing and dispersing vegetation across the landscape.

Red fox are common throughout the park and are very conspicuous along the Denali park road. Coyote occur but are not common. Lynx occur at relatively low densities and depend heavily on snowshoe hare as a prey source. River otter and wolverine occur at relatively low densities. Marten, ermine, least weasel, and mink occur across the park; however little is documented about their abundance. Hoary marmots are usually found in family groups in loosely formed colonies in subalpine and alpine areas, often in proximity to talus slopes and boulder fields. Marmots are obligate hibernators and spend nearly eight months of the year in hibernation. Flying squirrels and red squirrels are usually found in spruce dominated forests, although densities of flying squirrels are low.

One of the most common and most conspicuous smaller mammals in Denali is the arctic ground squirrel. These open-country squirrels inhabit many different vegetation communities in Denali, but are usually found in areas where they can build burrows that are protected from flooding. Arctic ground squirrels are obligate hibernators and spend nearly seven months hibernating in their burrows.

Another common herbivore in Denali is the snowshoe hare. Snowshoe hare inhabit forested regions of Denali, but they often occur outside forested areas in years when their populations are high. Populations of snowshoe hare in Denali fluctuate on 8- to 11- year cycles.

Collared pika live in subalpine and alpine areas and are active year round. They depend on seeds and grass collected throughout the short summer season to survive throughout the year. Beavers and muskrat live in areas dominated by ponds, lakes, and streams. Beavers play a major role in diverting water and creating small to large ponds.

Voles, shrews, and lemmings occur in abundance across the park in a diversity of habitats, but are rarely seen because of their size, habits, and habitats. Populations exhibit tremendous fluctuations between years. These animals are active year round and during winter they live under the snow. They form the prey base for many of Denali's carnivorous and omnivorous animals. NPS researchers are beginning to better understand the population dynamics of small mammals through intensive research funded through Denali's Long-Term Ecological Monitoring program.

One species of bat, the little brown bat, has been recorded in Denali. Its distribution and abundance are unknown.

Threatened and Endangered Species

There are no threatened or endangered mammal species at Denali, but the lynx is a "species of concern" under the Endangered Species Act. Low densities of lynx occur in forest communities in the northern areas of the park. Little is known about lynx on the south side of the park, although indications of lynx have been found in the southern development zone of Denali State Park (ADNR 1995a). In general, the potential for high lynx densities on the south side is thought to be low due to low hare densities during cyclic peaks (ADFG 1995a).

Amphibians

One species of amphibian, the wood frog, occurs in Denali. The wood frog spends its life in the woodlands and vegetated wetlands across Alaska and occur in Denali at lower elevations (Travis 2000). The wood frog hibernates through the winter in shallow depressions in the upper layer of the previous year's dead vegetation

Fish

All five species of Pacific salmon and at least six other species of freshwater fish commonly harvested for subsistence and sport inhabit streams and lakes in various portions of Denali National Park and Preserve. In addition, four species of nongame fish inhabit park waters: blackfish, longnose sucker, slimy sculpin, and Arctic lamprey. The five species of salmon, Dolly Varden, several species of whitefish, and lamprey, are anadromous species that migrate from salt water to fresh water to spawn. Depending on the species, juveniles remain in freshwater rearing habitats for varying periods before migrating to salt water. Resident species, such as grayling, sheefish, rainbow and lake trout, blackfish, suckers, and sculpins, live in freshwater habitats year-round, although some undertake extensive seasonal migrations. Waters used by anadromous species receive high levels of protection because of the value of these species for subsistence, commercial, and sport harvest. Under Alaska Statute Title 41 regulations, the Alaska Department of Natural Resources administers a permit system to regulate human activities that may affect anadromous fish habitat and the free passage of resident species.

The glacial character of many of Denali's rivers precludes the development of significant fisheries because of the high turbidity and sediment loads in glacial meltwater, which significantly reduce habitat quality for spawning and feeding. Arctic grayling, the most common resident species of gamefish in park waters, inhabit many streams throughout the park and preserve. Because grayling prefer clear, cold, gravel-bottomed streams, however, they do not tolerate the silt-laden flows of glacial rivers during the summer months. Arctic grayling spawn early in the summer, from mid-May to June. Rainbow trout spawn in the spring, mainly between mid-April and late June. Other resident species spawn at different times of the year: northern pike in early spring (coinciding with spring break-up); lake trout in September and October; whitefish and ciscos in late September and October; and burbot from December through February.

Salmon and other anadromous species use freshwater habitats for migration, spawning, and rearing of young. Spawning seasons differ among species (ADFG 1984a), and there are often multiple spawning runs of salmon in some drainages. Coho salmon generally spawn from midsummer to early winter at the head of riffle areas in narrow side channels and tributaries of mainstream rivers. Pink salmon usually enter natal streams from late June to September. Sockeye salmon spawn during the summer and fall from July to October (sometimes as late as December), primarily in streams connected to lakes and along lake shorelines. Chinook salmon spawn from July to early September. Most chum salmon spawn in August and September. Dolly Varden char spawn between the end of July and the beginning of December, with most occurring in September and October. The amount of time spent in freshwater habitats by juveniles of the anadromous species is highly variable, depending on the species; some migrate downstream from spawning areas within a few months of hatching, whereas others may spend several years in freshwater before migrating to the ocean.

On the south side of the park and preserve, Peters Creek and its major tributaries are rated the seventh most important waterway system in the Susitna Basin by the Alaska Department of Fish and Game (ADNR 1985). Chelatna Lake contains important salmon spawning habitat (ADNR 1991). The Susitna River and its tributaries support the largest stock of king salmon in the Cook Inlet drainage, which is thought to be the fourth largest stock in Alaska. The Susitna River also supports the largest coho salmon stock in northern Cook Inlet (ADFG 1994b). Fishing is generally permitted throughout the south side; however, the Tokositna River drainage and Byers Creek are closed to Chinook salmon fishing.

NATURAL SOUNDSCAPES

NPS Management Policies define natural soundscapes as follows:

Natural soundscapes exist in the absence of human-caused sound. The natural soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive, and can be transmitted through air, water, or solid materials.

Natural sounds are intrinsic elements of the environment that are often associated with parks and park purposes. They are inherent components of “the scenery and the natural and historic objects and wild life” protected by the NPS Organic Act. NPS Management Policies and Director’s Order #47 also make it clear that the National Park Service is obligated to protect and restore natural soundscapes as it would any other natural resource of the parks (NPS 2001; NPS 2000e). As was reported to the U.S. Congress in the “Report on the Effects of Aircraft Overflights on the National Park System,” a system-wide survey of park visitors revealed that nearly as many visitors come to national parks to enjoy the natural soundscape (91 percent) as come to view the scenery (93 percent) (NPS 1995b).

Characterizing soundscapes at Denali is an ongoing process. Researchers use sound level meters and digital media storage devices both to record sound level measurements in decibels (dB) and to collect digital sound recordings. Decibel levels are generally described using an A-weighted scale (dBA) to better approximate human hearing sensitivities. The digital sound recordings are important because the National Park Service can determine the percent of time that particular sounds are audible and identify the source of those sounds. The sound recording stations have been used at 11 locations and more are planned.

The natural soundscape of Denali National Park and Preserve varies depending on the acoustical attributes of the location. The size of Denali makes it difficult to briefly summarize the soundscape. Season, animal life, vegetation, climatic conditions, topography, and proximity to water all influence the production and propagation of sounds. Despite this inherent complexity, it is helpful to simplify the park into three acoustical zones (those areas with similar soundscapes): alpine (rock, glacier, and snow), sub-alpine, and scrub/forest zones. The natural soundscape in each of these three zones relies on the interplay of sound generation and attenuation.

Park staff recently collected high quality dB and audibility data in each of the three main acoustical zones in the park (Burson, unpublished data). Generalizing from a subsample of these 10,524 hours, 480 days, and 1,250,251,000 dB points, the following paragraphs will describe our current understanding of the soundscape of the park. Several sound sources are common to the three zones including natural sounds of wind, snowfall and rain, flowing water, thunder, migrating birds (e.g., Sandhill Cranes, geese, swans) and ravens.

In addition to natural sounds, there are significant human-generated sounds such as aircraft and surface vehicles that are intrusions upon the natural soundscape. Because of the wilderness character of the Denali backcountry, many of the human-made sounds qualify as noise under the definition provided by Director’s Order #47, which reads, “noise is generally defined as an unwanted or undesired sound, often unpleasant in quality, intensity or repetition.” Noise may often be the byproduct of desirable activities or machines, but it still requires management to protect park resources. In each of the three zones, noise intrusions on the natural soundscape are also characterized.

Alpine acoustical zone: Wind is the most common natural sound heard, but avalanches, flowing water, glacier movements, occasional mammals (caribou, sheep, and grizzly bears) and several species of birds (ravens and passerines) are frequently audible. Intruding on the natural

soundscape are the frequent high-altitude overflights of commercial jetliner traffic, lower altitude propeller general aviation, flightseeing, and air taxi traffic. Sounds originating from the ground near foci of human activity (Don Sheldon Amphitheater, Eldridge Glacier, Little Switzerland, and at base camp on the Kahiltna Glacier) include human-generated sounds from voices, traveling, and camping activity. Winter soundscapes differ by having fewer animal and propeller planes sounds, and no flowing water. Sound often carries long distances in this zone because of the lack of sound attenuation from vegetation (Rossing et al. 2002). Sound reflection and echoes are common from vertical faces of rock and ice. Fresh snow absorbs sounds well and therefore diminishes sound propagation, but loses this absorptive property upon compaction and metamorphosis.

Data collected about 100 meters from a glacier landing zone in the Don Sheldon Amphitheater during the summer of 2002 documented dBA levels from the low 20s when there was no wind or human sound to levels near 100 dBA during airplane takeoffs. Because decibels are logarithmic and a 10-dBA increase is a doubling of loudness, 100 dBA is 512 times the perceived loudness of 20 dBA. This area is a popular scenic flight and glacier landing site and thus, on clear summer days, many air tour flights are audible and loud. Five-second digital recordings (samples) were made every five minutes 24 hours/day. During one week in May, the mean number of samples/day with propeller planes audible was 67, in June the mean was 59 samples/day (including 3 days of poor flying conditions), and in July the mean was 73 samples/day. Four days had over 100 propeller samples (130 max.). Most good-weather days had aircraft audible over 50% (max. 80%) of the samples during the period between 8 a.m. and 8 p.m. Jets and helicopters were often also audible. Human voices associated with glacier landings and camping were audible in 51% of the samples in May, 25% in June, and 13% in July. Unlike aircraft sounds, these human sounds are generally audible only in the local area of activity, but occurred late into the night. The expected sound level range of the natural soundscape is from the high teens during quiet winter days to near 90 dBA from nearby large avalanches and infrequent distant thunderstorms. Wind was audible in 0–33% (avg. 11%) of the daily samples. Avalanches were audible much less frequently, from 0–9/day (0–3% of the daily samples). Loud aircraft sounds during the day likely drowned out normally audible wind, avalanche, and human voice sounds.

Sub-alpine acoustical zone: The sub-alpine acoustical zone in Denali is vegetated by low plants. Though the natural soundscape is dominated by wind, during non-winter months, flowing water and a diversity of birds, insects and mammals are often audible. The relative absence of sheer cliffs of rock and ice reduce reflection and echoes in this zone. Low vegetation absorbs sound propagation but is offset by wide-open spaces that allow long distance travel from distant sound sources. In this zone, flowing water is developing into larger streams and having a greater influence on the nearby soundscape. In addition to natural sounds, human-generated noise is more diverse and widespread than in the alpine zone. Jet, propeller, and helicopter aircraft are often audible, as well as road and rail traffic near these corridors. Human voices are audible near backpacking routes and other travel and recreation corridors. Other than the higher diversity of human-generated sounds, during the winter the soundscape in this zone becomes similar to the alpine zone.

Sound data was collected from April 2001 through August 2002 at a 3,000-foot elevation in the Dunkle Hills south of Cantwell on the south side of the Alaska Range. The equipment documented many wind events in addition to bird and mammal sounds during the non-winter months. Wind was audible most days; some days wind could be heard in almost in every sample. Flying insects were abundant and audible in early and mid-summer. Arctic ground squirrels were often audible along with ravens, ptarmigan, and other passerines. This site was 8 miles from the Parks Highway and the Alaska Railroad tracks, yet vehicle sounds originating from these corridors were clearly audible, especially during the winter when the highly absorptive vegetation was covered by snow and sound propagation was enhanced. Snowmachine use was audible during many days during the winter and spring, especially during weekend days. No flowing water or rustling leaves elevated the sound level. Sound levels could be very quiet; dBA in the high teens were not uncommon. This level approaches the noise floor limit of the sound equipment.

Scrub/forest acoustical zone: The dominant tree species in the scrub/forest acoustical zone in Denali is spruce on the north side of the Alaska Range and a mixture of deciduous and conifers on the south side. Willow, birch, aspen, and alder also grow to heights that play a large role in attenuating sounds. The natural soundscape is less dominated by wind in this zone due to the presence of trees and scrub that block and reduce the speed of wind. Compared to the other two zones, animal sounds are more frequently audible. A greater diversity of birds, insects, and mammals occupy this scrub/forest zone than the other two acoustical zones. With the exception of aircraft sounds, audible sounds are usually generated by nearby sources rather than carried from far distances. Red squirrel chatter replaces the sub-alpine zone's arctic ground squirrel whistles and woodland birds such as thrushes and warblers replace tundra bird species. Streams have become rivers in this zone, which then dominate the acoustics in the riparian areas. Human-generated sounds originate from developed areas of the front-country and from travel corridors near roads and railways. Aircraft are often heard overhead throughout this zone. Again, the distinction between the natural soundscapes of the acoustical zones becomes blurred during the winter months when flowing water sounds either have stopped or are muffled by snowcover and animal sounds are reduced in diversity and number. The remaining difference between the three zones in winter is mainly determined by human-generated sounds.

Sound data collected near the toe of the Tokositna Glacier and at Wonder Lake during July and August 2001 are examples from the scrub/forest acoustical zone but also demonstrate intra-zone variability. The soundscape of the Tokositna Glacier site is dominated by river sounds. The sound level of this site rarely dipped below 40 dBA due to the flowing water. Even river sounds were not constant, however. There was a distinctive rise and fall of river sound level depending on time of day, wind direction, and amount of recent rainfall. At this riparian site, distant or quieter sounds that would be audible away from the river were "drowned" out by the river sound, although nearby birds and mammals were audible. On days without low clouds or rain, frequent aircraft sounds were audible. Most of these were single-engine propeller planes likely on scenic air-tours from Talkeetna to the Alaska Range. The sound levels on a typical sunny spring/summer day followed a predictable pattern. The Leq (average sound level) was steady about 43 dBA (from river sounds) until about 9 a.m. and then increased 4-10 dBA for the next 12 hours and dropped again after 9 p.m. These increases were mostly driven by aircraft overflights.

The sound data collection site about 1 km from Wonder Lake was far removed from flowing water and the sound level often approached the equipment noise floor in the high teens dBA. Many bird and animal vocalizations were audible due to the low ambient sound level. Road traffic from the Park Road (about 2 km) and the campground spur road (1 km) was frequently audible as was propeller plane traffic likely coming from the airstrip at Kantishna. For illustrative purposes, on a day in mid-August 2001 light rain started about 2 p.m. and continued for the rest of the day. Bird vocalizations were audible on 63 (23%) of the daily digital recording samples, 4 with insects (1%), 100 with rain (35%), 29 with wind (10%), 67 with road vehicles (23%), and 18 with propeller planes (6%). The day began with a sound level about 20 dBA (Leq) and at 4 a.m. climbed to about 30 dBA by 9 a.m., but dropped and stayed in the mid 20s dBA by 4 p.m. for the rest of the day. Levels below 30 dBA are very quiet. The maximum sound level (Lmax) (as continuously measured) peaked at 65 dBA during the 11 a.m. hour, but during most of the daylight hours the Lmax was in the 40s dBA and at night 30 dBA or below. These Lmax document that although propeller planes were often heard, sound levels are much quieter below overflights than below low-level flights and landings and take-offs.

Sound data was also collected and analyzed for the Stampede Airstrip, which is near the historic Stampede Mine. Motorized sounds were audible on average 4 times per day and audible on average 0–8% of each hour. Natural ambient sound levels depended mostly on wind. When no wind was present natural sound levels were near the noise floor of the instruments used, approximately 21 dBA. Wind was constant throughout the seasons, especially during summer, and caused natural ambient sound levels to range around 30 dBA with occasional gusts that would raise the level up to 40 dBA. Three seasons were captured and analyzed for the site; spring, summer, and fall. Spring days consisted of nearly 24 hours of wind and abundant bird-song (audible 20–30% of a day) with occasional squirrel vocalizations. Natural ambient levels ranged from 23-28 dBA. A typical summer day consisted of nearly 24 hours of wind and bird-song (audible 80–100% of a day) with occasional squirrel vocalizations and insect sounds. Natural ambient levels ranged from 25-35 dBA. Fall days contained much less bird song (audible 0–10% of a day) and contained occasional squirrel vocalizations. Natural ambient levels on fall days ranged from 25-30 dBA.

Other Studies

In addition to the information gained from the automated sound monitoring stations described above, there are two more important sources of information about the extent of human noise intrusions on the natural soundscape of the Denali backcountry.

Backcountry Ranger Observational Data

Backcountry rangers made systematic observations of motorized noise intrusions during the summer seasons of 1999 and 2000 in the backcountry of the Old Park (Morgan and Van Horn, 2001). Data were collected from June 12-September 5, 1999 and again from May 28-September 5, 2000 within the Denali Wilderness. Rangers were instructed to listen for aircraft throughout as much of the patrol day as possible, including periods of time when they were around their camp. The patrols recorded the overall time of the sample period that they (the rangers were usually in pairs) actively listened for aircraft. While the sampling was opportunistic and

statistically non-random, it did parallel the times and locations that park visitors traveled through the backcountry.

Within the overall sample period, the observers recorded the start and stop times of audible aircraft noise. This period of time, which could include overlapping noise from several successive aircraft, was labeled an “overflight event.” The observers recorded the number and type of aircraft for each overflight event. They also rated the intensity of the noise for each overflight event. The rating for each overflight event was based on the peak noise level that occurred during the event. Key statistics included the following.

- There was an average of 19.5 overflight events (25 aircraft) per patrol, an average of 9.1 overflight events (11.7 aircraft) per day, and an average of 1.4 events (1.8 aircraft) per hour.
- The average duration of overflight events per day of sampling was 32.1 minutes.
- An average sampling day lasted 6.6 hours.
- The average duration of overflight events per hour of sampling was 4.8 minutes.
- The average duration of a single overflight event was 3.4 minutes.

Maximums noted included:

- Eight overflights in an hour that lasted for nearly 30% of that hour
- Thirty-one overflight events (51 separate aircraft) in a day
- Aircraft noise audible for 30% of the time during an afternoon hike

The patrol rangers rated sound level on a three-part scale as follows:

- 1 – Faint, barely audible, aircraft might be only heard and difficult to locate visually.
- 2 – Clearly audible above normal background noise with no difficulty.
- 3 – Distracting for conversation, completely dominates soundscape drowning out even loud sounds of nature such as wind or sounds of water.

Table 4-2: Number of Overflight Events by Intensity Rating.

Intensity Rating	Number of Events	Percentage of Total
1	660	43.4
2	695	45.7
3	160	10.5

Backcountry Visitor Survey

A Survey of Overnight Backcountry Visitors to Denali National Park and Preserve conducted in 2000 (Swanson, et al. 2002) asked questions of respondents about the number of aircraft encountered while hiking in the backcountry. Because the universe of survey respondents was limited to visitors who obtained a permit for overnight camping during summer months, the response primarily reflects conditions in the backcountry of the Old Park.

Out of 190 hiking parties surveyed, the average of the average number of aircraft seen per day of the trip was 4.87. The average numbers of aircraft seen or heard per day as a percentage of hiking parties were as follows:

Table 4-3: Average Number Of Aircraft Seen Per Trip Day By Percent Of Hiking Parties

Average Number of Aircraft Seen Per Trip Day	Percent of Hiking Parties*
10 or more	11.1%
6 to 9.99	21.7%
3 to 5.99	33.6%
1 to 2.99	22.1%
less than 1	11.5%
*Survey response included 190 hiking parties. The number indicated reflects the percent of the total that experienced the average number of aircraft per day in the left hand column.	

WILDERNESS

The Wilderness Act of 1964 (P.L. 88-577) describes wilderness as an area “untrammeled by man...retaining its primeval character and influence, without permanent improvements or human habitation... [with] outstanding opportunities for solitude or a primitive and unconfined type of recreation.” Most of the land within the boundaries of Denali National Park and Preserve meets the above criteria, offering superlative opportunities for wilderness recreation in an environment where human influences are minimal.

However, the association of Denali with wilderness began before the advent of the Wilderness Act, and before the passage of the 1980 Alaska National Interest Lands Conservation Act, which formally associated portions of the park with the legal designation of wilderness. In fact, the recognition and protection of Denali’s wilderness resource values stretches back to the earliest period of the park’s history, creating a lengthy legacy of wilderness management. The legal framework and national policy direction for Denali’s wilderness management mandate is addressed in Chapter 1. This section describes the historic decisions and vision that created Denali’s existing wilderness management policy.

Wildlife and Wilderness

At Denali, the protection of wildlife and an intact ecosystem is integral to the present day management philosophy regarding wilderness. Charles Sheldon, Denali’s “founding father,” first called attention to the importance of wildlife for Denali’s wilderness character in his diaries of 1906-1908, published in 1932 under the title *The Wilderness of Denali* (Sheldon 1930). Sheldon and many others who spoke for Denali’s establishment clearly had in mind the protection of wildlife as well as the wilderness setting they inhabited; the two values were linked and

complementary. The concern for wildlife became a concern for ecosystem protection in later decades, particularly through the work of wildlife researcher Adolph Murie. Murie's authoritative research eventually brought an end to predator control at Denali and established a general policy of avoiding management manipulation of wildlife or ecosystems. Murie's work also established the basis for incorporating the northern additions into the park in 1980, to more completely protect the habitat of major mammal species found in the park.

Development and Wilderness

A second thread of early wilderness protection at Denali was comprised of decisions to minimize or avoid facility development and to strive for the highest possible standard for maintaining a primitive, wilderness landscape throughout the park. Debates over development at then-Mount McKinley National Park were first played out during the NPS Mission 66 program, which advanced many proposals for development in the park interior including hotels, road upgrades, trail and hut systems, and other visitor facilities. The ultimate rejection of most of the proposed facilities and the cessation of road upgrades established a clear direction for the national park – that the undeveloped wilderness character of the park was extremely important and should be preserved.

These decisions were reinforced by the implementation of the bus system to address increased visitation associated with the opening of the George Parks Highway in 1972 and the 1973 Master Plan, requiring visitors to change their usual means of access (private automobile) in order to preserve wildlife viewing experiences and the primitive character of the Denali road. The philosophy was extended to the park backcountry in the 1976 Backcountry Management Plan (NPS 1976), which affirmed a policy of a “trail-less” backcountry, and the 1986 General Management Plan (NPS 1986) which indicated the park would maintain a “no formal trails” policy in the designated wilderness and extend that policy to the northern additions wherever possible.

Backcountry Visitor Use

A third thread in the protection of the park's wilderness character emerged in the management of visitor use in the backcountry that incorporated the concepts of dispersed use and use limits. Use limits for the backcountry were established in 1974 as a response to increased interest in backcountry hiking as well as easier access to Alaska and the Denali area. A system of backcountry units was delineated and quotas were set for each unit. The 1976 Backcountry Management Plan affirmed the desirability of the unit system for dispersing use, maintaining opportunities for solitude, preventing trail and campsite formation, and minimizing wildlife disturbance. The plan also noted the utility of the unit system for maintaining freedom of movement and opportunities for self-discovery as well as limiting the consciousness of regulation for visitors in the backcountry.

In 1977 a study by the University of Washington Cooperative Parks Study Unit was conducted to determine visitor opinions about the permit system, compliance with the system, support for other regulations such as wildlife closures, levels of use that created the feeling of crowding, day

use activities, and many other basic visitor use statistics that were need to evaluate the effectiveness and assumptions of the 1976 plan. It was found that the expectations for solitude were not met for the majority of users if they encountered more than two parties per day. In 1978 the average number of parties seen per day was one. Therefore, the expectations of visitors for solitude were being met. Based on this information, use limits could have been increased somewhat above the 1976 plan levels while still meeting the management objective for crowding. Some increases were made in 1982, and overall backcountry visitation was higher than in 1978. The permit system was overwhelmingly supported as were the wildlife closures. The majority of users did not support the further development of trails, designated campsites, toilets, and other backcountry facilities typical of other wilderness areas in the Lower 48. The level of impact in the backcountry in 1978 met visitor expectations for an exceptional wilderness experience.

The 1986 General Management Plan reaffirmed the strategy set forth in 1976 and indicated that areas outside the Old Park could be incorporated into the backcountry unit and quota system as necessary.

Spectrum of Opportunity and Non-Degradation

Advocates of wilderness protection during the Mission 66 debate noted that the wilderness qualities of then-Mount McKinley National Park were much greater than those in other parks, and argued that management should seek to preserve this unique character rather than develop the national park like those in other states. The 1976 Backcountry Management Plan noted that the remoteness of the park backcountry; the absence of typical signs of human presence such as trails, bridges, and established campsites; the existence of native wildlife populations in a largely natural condition; and the opportunity for a high degree of solitude were all “extremely rare and easily degraded resources.” The plan direction was to sustain these resources and continue distinguishing the Mount McKinley backcountry from that of other parks in the system.

For Denali, these plans provided the genesis of management practice that favored maintaining Denali to provide a unique park experience and backcountry experience within a spectrum of opportunities afforded throughout the national park system. This evolution at Denali coincided with a national debate over the Eastern Wilderness Act of 1975 during which great concern was expressed that designated wilderness in some of the eastern areas of the U.S., which barely met the basic requirement of the 1964 Wilderness Act, would degrade other areas in the West that were of a higher quality. What clearly emerged from this debate was that the minimum requirements for wilderness designation are a limit, not a goal.

As a result of these debates, the principle of nondegradation has been incorporated into wilderness management (Hendee et al. 1978). As applied to wilderness, this nondegradation principle recognizes variation in the level of naturalness and solitude available in individual wildernesses. The objective is to prevent further degradation of current naturalness and solitude in each wilderness and to restore substandard settings to minimum levels, rather than letting all areas in the National Wilderness Preservation System deteriorate to a minimum standard.

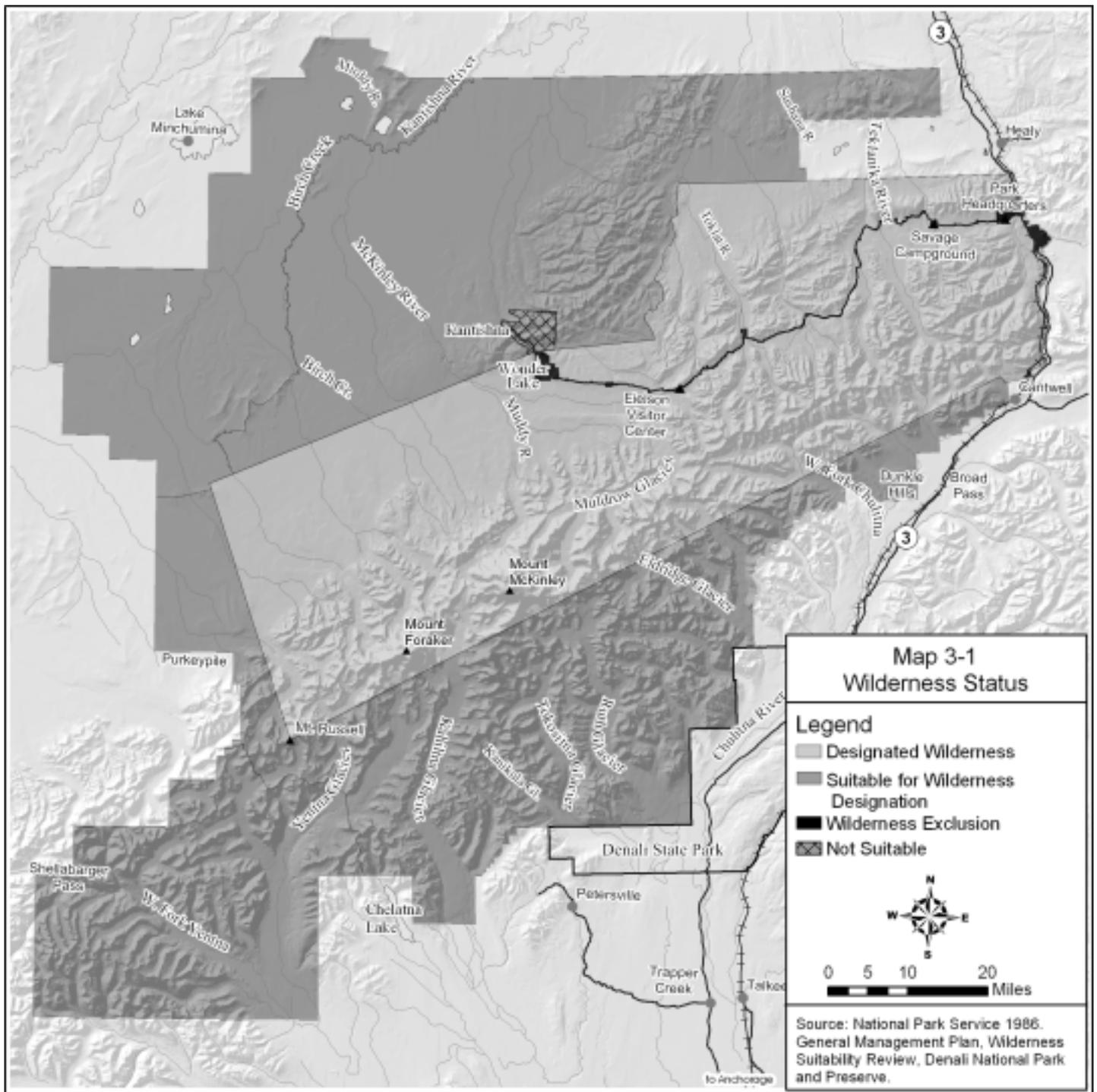
Alaska National Interest Lands Conservation Act (ANILCA)

The passage of ANILCA in 1980 tripled the size of Mount McKinley National Park and recognized the wilderness resource values of the original park and the additions. Section 701 designated 99% of the former Mount McKinley National Park (2.126 million acres) as the Denali Wilderness to be managed under the provisions of the Wilderness Act. Sections 101 and 202 of ANILCA mandated the preservation of wilderness resource values and wilderness recreational activities in the additions, along with related values such as wildlife, wildlife habitat, and undisturbed ecosystems.

Because of the traditional uses and means of access, relatively few roads, great travel distances, areas of vast size, and often severe weather conditions common to most national park system units in Alaska, ANILCA made special provisions for certain types of access and uses in Alaska wilderness that are generally not permitted in wilderness in the lower 48 states. Under reasonable regulations to protect natural and other values, ANILCA specifically allows the use of snowmachines, motorboats, airplanes, and various modes of nonmotorized surface transportation for traditional activities, and for travel to and from villages and home sites.

Wilderness Suitability and Proposal

Section 1317(a) of ANILCA required the Secretary of Interior to conduct a wilderness suitability review for the park additions and preserve, which was included in the 1986 *General Management Plan*. The review concluded that approximately 3.73 million additional acres of the nondesignated lands in the park and preserve were suitable for wilderness designation. An area within the Kantishna Hills was determined to be unsuitable for designation as wilderness because of persistent disturbance caused by past mining activity, although since that determination all mining has ceased, many private inholdings have been acquired, and much of this land has been restored, so these lands now share similar values as the rest of the park additions. Various alternatives for additional wilderness designation were subsequently evaluated in an Environmental Impact Statement (NPS 1988) to assist in fulfilling ANILCA 1317(b), which required the President to recommend wilderness designations to Congress in accordance with the process outlined in sections 3(c) and 3(d) of the Wilderness Act. Of the 3.73 million acres of suitable lands, the preferred alternative proposed 2.25 million acres to be recommended for wilderness designation. However, the Secretary of the Interior did not forward the recommendation to the President, so the process prescribed by ANILCA 1317(b) and the Wilderness Act 3(c) and 3(d) was not completed. Pending action by the Secretary of the Interior, President, and Congress, the wilderness values of the recommended lands will continue to be preserved under NPS policy. (See Map 3-1).



SUBSISTENCE

The Alaska National Interest Lands Conservation Act provides the opportunity for local, rural residents engaged in a subsistence way of life to continue that lifestyle on federal public lands. Accordingly, Congress provided for traditional subsistence uses by local rural residents within the ANILCA additions to Denali National Park and Preserve, with the area within the former boundaries of Mount McKinley National Park not open to subsistence uses. Many Native and non-native local rural residents engage in, and depend upon, resources from the park and preserve for personal consumption, cultural identity, and maintenance of a subsistence way of life.

The Alaska National Interest Lands Conservation Act recognizes the significance of traditional Native and non-Native subsistence use as a cultural value and a vital piece of America's heritage. ANILCA also recognizes the importance of maintaining unimpaired ecosystems and natural and healthy populations of fish and wildlife to ensure the continued opportunity for traditional subsistence use. This view does not separate people from the landscape, but rather maintains the continuum of people's vital connection and relationships with the land. Striking a balance between the physical and social-cultural needs for subsistence requires close working relationships between park managers and subsistence users.

To achieve this complex synthesis of protection and use, Congress felt it was important to include input from those who have a personal knowledge of traditional subsistence activities and resources on federal lands. For national parks and monuments, ANILCA directed subsistence resource commissions be established to advise the Park Superintendent, Secretary of the Interior, and the Governor of Alaska on subsistence programs for those areas (Section 808). These commissions provide a key element on NPS management by providing a direct link between subsistence users and NPS superintendents and resource managers. Since the early 1980s, the Denali Subsistence Resource Commission and park staff have been discussing and developing a subsistence management program specific to Denali National Park and Preserve.

The National Park Service determines eligible subsistence users of park lands by the use of subsistence resident zone communities and individual's subsistence use permits. The communities of Cantwell, Lake Minchumina, Nikolai, and Telida are identified as subsistence resident zone communities containing significant concentrations of residents who have customarily and traditionally used park lands for subsistence purposes. By virtue of their residence, local rural residents of these communities are eligible to pursue subsistence activities in the new park subject to federal subsistence management regulations. Individuals not residing in one of Denali's subsistence resident zones communities, who have a personal or family history of using the park lands for subsistence, are authorized use by issuance of a subsistence use permit. The National Park Service has issued approximately fifteen subsistence use permits to families from Tanana, Nenana, Healy, McKinley Village, and the Broad Pass area.

To be eligible to harvest subsistence fish and wildlife in Denali National Park and Preserve under federal subsistence regulations, one must be a "local rural resident" (36 CFR 13.41) and comply with Federal subsistence harvest requirements. This includes a "positive" customary and

traditional use determination for the intended species and area to take fish and wildlife (50 CFR Part 100). Federal and State of Alaska regulations allow residents and non-residents to harvest fish and wildlife in Denali National Park and Preserve (ANILCA 13.13 and 36 CFR Part 100). ANILCA provides a preference for local rural residents over other consumptive users should a shortage of subsistence resources occur and allocation of harvest becomes necessary.

The National Park Service and the Denali Subsistence Resource Commission participate in the Federal Subsistence Management Program at both the park and regional levels. With the federal government's assumption of managing federal subsistence hunting and trapping on Federal Public Lands in 1990, park staff and the Denali Subsistence Resource Commission have been actively involved with the Southcentral, Eastern and Western Interior Regional Subsistence Advisory Councils and the Federal Subsistence Board. Portions of Denali National Park and Preserve are included within these three Regional Advisory Council's geographic boundaries. The Federal Subsistence Board is advised and informed by 10 Regional Advisory Councils. These Regional Advisory Councils represent specific geographic areas of Alaska and serve as public forums to provide recommendations on regulatory proposals, policies, management plans, and other issues related to subsistence management on Federal lands. The Councils, in turn, actively seek direct input and recommendations from Subsistence Resource Commissions on park-specific subsistence issues and federal fish and wildlife regulatory proposals.

Subsistence activities are diverse with hunting usually occurring in the fall and winter months. Fishing is concentrated during the summer and fall, and trapping efforts occur in the mid-to-late winter months when snow cover is adequate for travel and fur is prime. Berry picking and use of plant greens occur in the summer and fall months. Timber harvest typically occurs in the winter when frozen rivers, lakes, and snowcover make access and transportation more efficient. The different means and methods of subsistence access and the seasonal timing of their use are critical for acquiring resources and are as diverse as the resources being sought. Common methods of access include hiking, skiing, snowshoeing, dog sled teams, horses, snowmachines, motorboats or canoes, and in some cases such as near Cantwell and in the Kantishna Hills, the use of off road vehicles. There is no known use of airplanes by local rural subsistence users to access preserve lands for the taking of subsistence fish or wildlife.

Based upon 2000 U.S. Census Bureau data for Denali's resident zone communities there are approximately 357 local rural residents eligible to engage in subsistence use activities within Denali National Park and Preserve, excluding the 15 families not in a residence zone. A comparative review of census data between 1980 and 2000 indicates that the Cantwell resident zone community is experiencing consistent population growth, while Nikolai and Lake Minchumina's population grew from 1980 to 1990 but then stabilized, and Telida's population is consistently declining. For social, political, economic, or regulatory reasons, not all members of these communities are active subsistence users. Since 1980, the overall populations for most communities surrounding Denali has increased, but the relative number of subsistence users actively involved in subsistence activities at Denali has remained about the same as in the past.

Subsistence community use profile studies were conducted for Cantwell and Nikolai in the early 1980s (Stratton and Georgette, 1984; Stokes, 1984). Cantwell's subsistence harvest assessment

data was updated in a 2000 study, and Nikolai's harvest assessment was updated in 2003. Initial harvest assessment surveys were conducted for Telida in 2000 and Lake Minchumina in 2003. These studies indicate a dependence primarily upon moose, caribou, salmon, hare, rock and willow ptarmigan, spruce grouse, ducks and geese, and a few species of freshwater fish. Less frequently used large mammals include black bear, brown bear, and Dall sheep. Freshwater fish include burbot, dolly varden, grayling, lake trout, northern pike, rainbow trout and whitefish. Important fur animals include marten, mink, red fox, wolf, lynx, weasel, wolverine, land otter, beaver, muskrat, and coyote.

Denali National Park and Preserve lands are responsible for only a portion of the estimated community subsistence harvests reported by these communities since a significant portion of the areas used by these communities for subsistence are beyond the park and preserve boundaries. The most recent summary data from Cantwell's Community Harvest Assessment indicates a total harvest of wild resources of 27,599 pounds usable weight, or an average household harvest of 293 pounds, with a per capita harvest of 135 pounds. Moose made up the largest harvest component of the community's resource harvest as measured by edible weight (12,368 pounds; 44.8 percent of all resources). Households harvested on average 131 pounds of moose, or 60 pounds per capita. Caribou was second at 3,698 pounds, or 39 pounds per capita, and sockeye salmon was third at 3,084 pounds or 33 pounds per capita. Other resources with a mean household harvest of 10 pounds or more were berries (15 pounds), king salmon (11 pounds), and hare (10 pounds). In summary, the current research found that the harvest and use of wild resources played a significant role in the socioeconomic system of Cantwell and that these results were not that different from those reported by Stratton and Geoette in 1984 (Simeone 2000).

Cantwell is a road- and railroad-accessible community with greater employment and economic opportunities than Denali's other remote subsistence resident zone communities. However, cash wages and subsistence activities form a mixed economy in all of Denali's subsistence communities. Subsistence activities are dynamic, varying in intensity and scope depending on the seasonal availability of wildlife, fish, plants, and the availability of wage earning work. Changes in socio-economic conditions, such as fur prices, and availability of seasonal jobs, greatly influence the reliance on, and ability to engage in traditional subsistence hunting, gathering, fishing, and trapping activities.

Subsistence harvests also may vary considerably from year to year due to such factors as weather, migration patterns, natural cyclic population fluctuations, or from political and regulatory factors. Although the magnitude of subsistence use was probably much greater historically than it is now in Denali, the seasonal rounds and use and relative importance of certain species are still similar today. Ever-changing environmental and political conditions, as well as seasonal fluctuations of many resources, continue to make flexibility and adaptability key components to a successful subsistence lifestyle.

The National Park Service is engaged in a variety of subsistence-related activities beyond the harvest of fish and wildlife. These include timber cutting and use, shelters and cabins, trapping and trapline management, eligibility and resident zones, access, acquisition of user data, and

resolution of user conflicts and possible closures, and undertaking research on fish, wildlife, subsistence uses, and local traditional knowledge. As identified in Denali's 1986 General Management Plan subsistence section, the park has – in cooperation with the Denali Subsistence Resource Commission, Federal Regional Advisory Councils, State of Alaska, Local Advisory Committees, and the public – prepared a Subsistence Management Plan intended to address major topics related to subsistence management. Comments from other federal agencies and Native groups with park-related resource management concerns were solicited. After consultation and review, the Subsistence Management Plan was approved by the Park Superintendent and Denali Subsistence Resource Commission in 2000 (NPS 2000i).

The Subsistence Management Plan is a dynamic document that is amended to respond to new information and approved Subsistence Resource Commission subsistence program recommendations. Significant revisions to the Denali Subsistence Management Plan or formal subsistence hunting program recommendations made by the Denali Subsistence Resource Commission are available for public review and comment prior to final action. Park staff and the Denali Subsistence Resource Commission hold public meetings at least twice annually to review federal fishing, hunting and trapping regulatory proposals, and to discuss resource and subsistence issues.

The continuation of traditional subsistence activities depends directly on the availability of healthy and diverse wildlife, plant, and fish populations. The natural diversity and abundance of resources important to subsistence activities is, in turn, directly dependent upon intact and healthy ecosystems. The systems and the subtle interplay of natural processes, including subsistence use, must be carefully protected. In order to protect these resources and social values, the traditional ecological knowledge of Native people and other long-term residents must be integrated with the technical scientific approach to park management.

CULTURAL RESOURCES

Denali National Park and Preserve is home to a host of cultural resources that date back to the earliest period of human settlement of North America. Many of these resources are from prehistoric time periods – archeological investigations conducted within and immediately adjacent to the park strongly suggest that sites dating from the Paleoarctic tradition (11,000 years before present) through the Protohistoric period (200 years before present) exist within the park.

In historical times, the 1905 gold discoveries in the Kantishna Hills to the west of the park brought large numbers of prospectors and miners to the area and settlements such as Diamond, Glacier City, and Kantishna (Eureka) developed in support of the mining activities. As the population of Interior Alaska grew, development of transportation systems became essential. Construction of the Alaska Railroad (1915-1923) connected the southern coast of Alaska to the Interior city of Fairbanks, skirting the eastern boundary of the new Mount McKinley National Park, established in 1917. The first visitors arrived by train and headed into the park by pack train (later bus and auto), to spend a few days at Savage River Tourist Camp. The park road, constructed between 1922 and 1938, eventually connected the Kantishna Mining District to the

railroad at McKinley Park Station and provided tourists a second destination camp near the site of the present-day Eielson Visitor Center at Mile 66. The completion of the park hotel in 1939 served as the catalyst for eventually closing both the Savage River Camp and the camp at Eielson.

Over the years, Mount McKinley National Park grew as boundary changes added more land and resources to the park. In an effort to provide more wildlife protection and conservation, the park boundaries were expanded in 1922, 1932, and 1980 (the 1980 expansion was accompanied by the name change to Denali National Park and Preserve). These extensions also added important natural features such as Wonder Lake and the south slopes of the Alaska Range and added significant cultural resources associated with McKinley Park Station, the Kantishna Mining District, and trapping and subsistence use areas to the northwest of the original park.

Throughout the park there are 257 known cultural sites and complexes representing Denali's rich cultural history. Because cultural resource inventories have been limited to date, this number most likely represents a fraction of the total sites contained in the park. Known resources include archeological and historic sites associated with Athabaskan Native culture, mining activity, trapping and subsistence use, mountaineering, conservation, transportation, and park administration.

Archeological Resources

The Teklanika Archeological District is the only archeology site in the park listed on the National Register of Historic Places. This site was excavated in the 1960s with additional work conducted in the 1970s and again in 1992. The site is located near the road corridor in the Old Park.

Other known archeological resources consist of lithic scatters and a few isolated points. The majority of these sites are located in the western area of the Old Park and Kantishna. None has been evaluated for National Register significance (NPS ASMIS, NPS 1990a)

Ethnographic Resources

Ethnographic resources are traditional sites, structures, objects, landscapes, natural resources, and other material features associated with cultural systems or ways of life. Many ethnographic resources have been identified in Denali in various publications, including Haynes et al. 2001, Schneider et al. 1984, Gudgel-Holmes 1991, and Kari 2000. However, no systematic work has been completed to define the significance of any of these resources.

Cultural Landscapes

Four Cultural Landscapes have been identified in Denali. The Headquarters Historic District is the only one listed on the National Register of Historic Places and is not in the backcountry. The other three cultural landscapes have not been inventoried, boundaries defined, or significance determined (NPS CLAIMS).

Historic Structures

In the backcountry of Denali the historic structures consist mainly of isolated patrol cabins, trapping cabins, and resources related to mining in the Kantishna and Dunkle Hills areas. The patrol cabins are listed on the National Register of Historic Places and many of the historic resources relating to mining in Kantishna have been determined eligible for listing on the National Register. The resources in the Dunkle Hills area were determined ineligible for the National Register. With increasing visitor use a potential exists for increased pressure on the historic resources and their associated archeological deposits. (NPS LCS, Brown et al. 1982, Saleeby 2000).

SOCIOECONOMICS

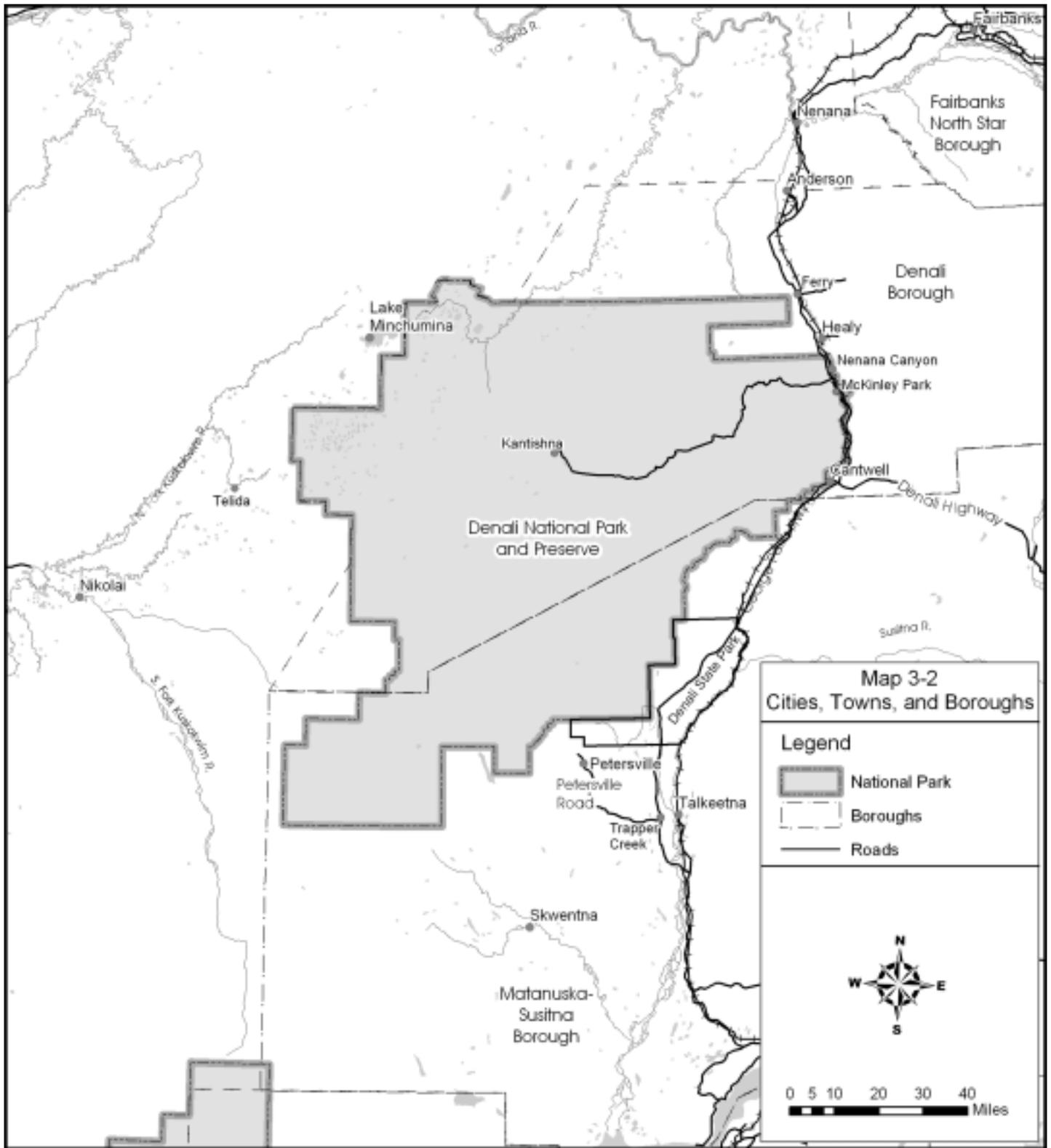
It is possible for Alaska visitors and residents to see Mount McKinley from both Anchorage and Fairbanks, and it is the area between these cities where the presence of Denali National Park and Preserve has an impact on the local population and economy. The rural communities in the Denali Borough and northern Matanuska-Susitna Borough are most affected because they are very near the national park, their economies are much smaller and less diverse than the Fairbanks North-Star Borough or the Municipality of Anchorage, and a significant portion of their economy is already linked to park-oriented tourism. Additionally, there are communities that are not within organized boroughs to the north and west of Denali that have connections to the park. Each of the boroughs and the small communities is described below according to the history, demographics, economy and employment, and economic characteristics of the population. Only the boroughs and one of the small communities are incorporated, so the “Census Designated Place” is used for census information.

Community Histories

Denali Borough

The Denali Borough was incorporated on December 7, 1990 as a home-rule borough. The borough provides limited services to its residents including planning, education, and administration. The borough encompasses 12,780 square miles (8,179,200 acres) and encompasses the majority of Denali National Park and Preserve (Map 3-2 – Cities, Towns, and Boroughs). The borough is largely rural, with most lands undeveloped and used for dispersed recreational and subsistence activities.

The earliest inhabitants of the lands forming the Denali Borough were nomadic Natives who subsisted on fishing, trapping, and hunting. Mining opportunities brought the first non-Natives into the area. Camps were established at Hoseanna Creek (now known as Lignite Creek) near Healy prior to 1902. Construction of the Alaska Railroad in the 1920s brought additional settlers to the area. The establishment of the Clear Missile Early Warning Station (U.S. Air Force) near Anderson, the Usibelli Coal Mine near Healy, and tourism associated with the park and preserve has brought growth and development to the area.



- Cantwell

Cantwell is located in the Denali Borough just north of the Matanuska-Susitna/Denali Borough boundary near the intersection of the George Parks and Denali Highways (Map 3-2– Cities, Towns, and Boroughs). The community lies on the Alaska Railroad. It can be accessed year-round from the Parks Highway by a 2.5-mile spur road. During the summer, the 135-mile gravel Denali Highway links Cantwell with Paxson to the east.

Cantwell began as a construction camp for the Alaska Railroad in 1917 and later was made a flag stop on the 1922 Alaska Railroad Timetable. It served as a supply and transportation center for nearby mining camps. Several Ahtna native families moved to Cantwell in the 1940s to work on the railroad; in the 2000 census about 23% of the population were identified as Alaska native.

Through funding by the borough, the community provides limited services including the Cantwell School (part of the Denali Borough School District), a library, emergency medical services, and a volunteer fire department. When surveyed by the Denali Borough in 1993, 55.9% of the Cantwell respondents were opposed to the borough encouraging tourism development in the immediate area. A similar percentage of respondents were in favor of some development depending upon the circumstances. The survey yielded 34 responses from a total of 121 mailed survey instruments, a low response rate of 28.1% (NPS 1997).

- McKinley Park

McKinley Park is located along the Parks Highway near the entrance to Denali (Map 3-2 – Cities, Towns, and Boroughs). The community offers a community association and fire hall to its residents. McKinley Park has developed around National Park Service employment at the entrance to Denali and the associated tourism-related industries and services.

- Kantishna

Kantishna, also known as Eureka after the nearby stream, was established as a gold mining camp in 1905, two years after Judge James Wickersham discovered gold in the Kantishna Hills. There remain a few patented and unpatented mining properties, although future mining activity is very unlikely. The area now is primarily developed as a seasonal tourist destination and has no year-round residents.

Kantishna is the site of four major lodges: Denali Backcountry Lodge, Kantishna Roadhouse, Camp Denali, and North Face Lodge. The latter two are owned and operated by the same company. Additional seasonal residents include National Park Service personnel nearby at Wonder Lake and a few other private inholders. Because Kantishna is seasonally occupied, there is no census information for the community in the sections below.

- Nenana Canyon

The name “Nenana Canyon” has only recently come into popular currency to describe the highway business district just north of the park entrance. The area was originally staked as three

Trade and Manufacturing sites around the time of Parks Highway construction. Over the ensuing 30 years it developed first as a mixed residential and commercial district before transitioning into the major commercial services area for the national park. Now there are few permanent residents in Nenana Canyon and the community is almost deserted in winter except for hotel property caretakers. During the summer, however, it is the largest single community in the borough with a population of hotel guests and seasonal workers. In 2004, there were almost 1,600 guest rooms, cabins, and RV sites, and occupancy was close to 100% for most of the summer visitor season. Because Nenana Canyon is seasonally occupied, there is no census information about the population in the sections below.

- Healy

Healy is located approximately 12 miles north of the entrance to Denali National Park and Preserve (Map 3-2 – Cities, Towns, and Boroughs). The community of Healy began as a mining camp in 1905, transitioning in the 1920s to a coal-mining town that was located at the confluence of Healy Creek and the Nenana River. The Usibelli Coal Mine further developed the community with its establishment in 1943. Since the construction of the Parks Highway, the commercial center of town has moved away from the river and railroad to the junction of the Parks Highway and the Healy Spur Road. The Tri-Valley subdivision, built on leased land belonging to the Alaska Railroad, comprises the central residential area. Other residents live in subdivisions at Otto Lake, along Dry Creek, and in a state subdivision along the Stampede Road. Through funding from the borough, the community provides basic services, including the Tri-Valley School (part of the Denali Borough School District), a library, and a volunteer fire department.

- Ferry

Ferry is a community of scattered residences that straddles the Nenana River at the site of an Alaska Railroad trestle. It appeared in the Alaska Railroad timetable in 1922 as a flag stop, and in a 1919 Seattle Chamber of Commerce promotional folder about farming in Alaska. The west side of the community is accessible from a spur road from the Parks Highway, but homes on the east side of the river can only be reached by off-road vehicle or by walking across the railroad trestle. Residents find employment in the national park or in Fairbanks.

- Anderson

Several homesteaders settled along the Nenana River near Lost Slough in the mid-1950s. Shortly thereafter, the U.S. Air Force selected a site nearby for construction of the 9-square-mile Clear Air Force Station, which was completed in 1961. Arthur Anderson, one of the homesteaders, subdivided his 80-acre homestead into quarter-acre lots and placed them on the market in 1959. Most of them were purchased by civilian workers from Clear, and the homestead became the nucleus of a new community.

Anderson incorporated as a second-class city in 1962, and is the only incorporated city in the Denali Borough. Anderson has a school, library, and volunteer fire department.

Matanuska-Susitna Borough (“Mat-Su” Borough)

The Matanuska-Susitna Borough was incorporated in 1964 as a second-class borough. The borough is located just north of 61° N latitude and to the south of the Denali Borough (Map 3-2 – Cities, Towns, and Boroughs). It encompasses 24,694 square miles of land (15,804,160 acres) and 539 square miles of water (344,960 acres). The borough includes the southern third of Denali National Park and Preserve. While still largely rural, the borough is more developed than Denali Borough.

The earliest inhabitants of the lands forming the Matanuska-Susitna Borough were nomadic Natives who subsisted by fishing, trapping, and hunting. Mining for gold and coal plus the construction of the Alaska Railroad had established a local, non-Native population in the area by 1920. Homesteaders seeking agricultural lands settled the Matanuska Valley in the 1930s. Further growth in the area was spurred by the construction of a statewide road system and the locally rich farmlands.

The Matanuska-Susitna Borough has 23 recognized community councils. The borough provides basic areawide and non-areawide services to its residents. Areawide services include planning and zoning, education, administration, parks and recreation, ambulance service, ports, harbors and wharves, transportation systems, air pollution control, daycare facilities, and historic preservation functions. Non-areawide services include solid waste, libraries, limited health and social service, septic tank waste disposal, natural gas and electrical local improvement districts, animal control, and water pollution control. The borough is a Certified Local Government, an official partner in the nationwide historic preservation program under the National Historic Preservation Act.

Borough communities particularly affected by activities at Denali National Park and Preserve include Talkeetna, Trapper Creek, and Petersville.

- Talkeetna

Talkeetna is located at the confluence of the Chulitna, Susitna, and Talkeetna Rivers, approximately 120 miles north of Anchorage (Map 3-2 – Cities, Towns, and Boroughs). The community is located along the Alaska Railroad and is accessible by a 14-mile spur road from the Parks Highway. The spur road is open year-round.

Talkeetna was originally the site of a Tanaina Indian village. Talkeetna was established as a supply station for miners and mining camps in 1896. A gold rush, the establishment of a riverboat steamer station in 1910, and the siting of the Alaska Engineering Commission in 1915 increased development of the community. The community declined in size after the Alaska Railroad was completed and the planning and construction workforce left. The decline was reversed over time with the Civil Aeronautics Authority (predecessor to the current Federal Aviation Administration) building the Talkeetna airport in 1941, the construction of the spur road linking the community to the George Parks Highway in 1965, and the establishment of the community as the most common departure point for mountaineering expeditions in the Alaska Range.

- Trapper Creek

Trapper Creek is located at the intersection of the Parks Highway and Petersville Road, approximately 115 miles north of Anchorage (Map 3-2 – Cities, Towns, and Boroughs). Most businesses in the community are located near the intersection of Petersville Road and the highway. Kroto Creek and the Petersville area bound Trapper Creek to the west.

Miners built the Petersville Road in the 1920s. Homesteading in the Trapper Creek area began in 1948, though few homesteaders remained long after arriving. The completion of the Parks Highway as far as Trapper Creek in 1967 fueled further growth in the area.

- Petersville

The Petersville settlement is approximately 200 square miles (128,000 acres) located along the Petersville Road, beginning at approximately 12 miles west of its intersection with the George Parks Highway and extending to the end of the road (Map 3-2 – Cities, Towns, and Boroughs). The area is bounded on the east by Kroto Creek and includes Petersville and Peters Creek.

Non-Natives first settled the Petersville area in the early 1900s after gold was discovered in the upper tributaries of Peters Creek. A freighting trail was developed between the numerous mining operations and Peters Creek. Mining activities in the area went through a series of declines due to World War II, increased operating costs and fixed gold pricing in the 1960s. Each decline was followed by resurgence. Most recently, increased tourism led to increased growth in the area, which has become a popular destination for winter sports enthusiasts, primarily snowmachiners.

Non-Borough Communities

- Lake Minchumina

This community is located on the northwestern shore of Lake Minchumina, approximately 5 miles northwest of the Denali National Park and Preserve boundary (also the Denali Borough boundary). The community is not incorporated and has no connection to the statewide road system. A 4,200-foot state-owned gravel airstrip is located in the community.

Lake Minchumina is historically a Native Athabaskan area, although its population is now primarily Caucasian. A post office was established in 1930. The community now supports a small village, a lodge, and a store. Many of the residents run dog teams for transportation and most practice a subsistence lifestyle (DCED 2000).

- Nikolai

Nikolai is located approximately 65 miles west of Denali National Park and Preserve (Map 3-2 – Cities, Towns, and Boroughs), and is incorporated as a second-class city. The city has no road connection but is accessible via air (2,350-foot gravel airstrip) or water (Kuskokwim River).

Nikolai is historically an Athabascan Indian village that has been relocated at least twice since 1880. Nikolai has been at its current location since 1918. The community now supports a post office and school. The city school is part of the Iditarod Area Schools. Most of its residents practice a subsistence lifestyle.

- Telida

The community of Telida is located approximately 15 miles west of the park boundary (Map 3-2 – Cities, Towns, and Boroughs). The community is not incorporated and is primarily accessible via air (2,270-foot airstrip). Telida is historically an Athabascan Indian village that has been relocated three times since the 1890s. Telida has been at its current location since 1916. The community's residents practice a subsistence lifestyle.

Demographics

The population of the Denali region is growing, albeit very unevenly. The Matanuska-Susitna Borough and the communities of Talkeetna and Trapper Creek show particularly vigorous growth, particularly when compared to the more moderate growth of the large cities of Anchorage and Fairbanks (see Table 3-1: Population Distribution in the Denali National Park and Preserve Region). The Mat-Su Borough is known as the fastest growing area in the state (Fried 2000).

Population growth in the Denali Borough is much slower and lags the state, although some communities such as Cantwell and Healy show growth rates comparable to those in Mat-Su. However, Anderson, Ferry, and McKinley Park are losing population. The Bush communities of Lake Minchumina and Nikolai have relatively stable, small populations. Telida has shrunk to two residents (Hollis Twitchell, personal comm.).

Table 3-1: Population Distribution in the Denali National Park and Preserve Region, 2000

Geographical Area	Population			Annualized Growth Rate	
	1980	1990	2000	% per year 1990-2000	Relative Growth Rate
State of Alaska	401,851	550,043	626,932	1.3	Moderate
Denali Borough	na ^a	1,764	1,893	0.7	Low
Anderson City	517	628	367	-5.2	Negative
Cantwell CDP	89	147	222	4.2	High
Ferry CDP	na	56	29	-6.4	Negative
Healy CDP	334	586 ^b	1,000	5.5	High
McKinley Park CDP	60	171	142	-1.8	Negative
Matanuska-Susitna Borough	17,816	39,683	59,322	4.1	High
Petersville CDP	na	na	27	na	
Talkeetna CDP	264	250	772	na ^c	High
Trapper Creek CDP	na	296	423	3.6	High
Lake Minchumina CDP	22	32	32	0.0	Stable
Nikolai city	91	109	100	-0.4	Negative
Telida	33	11	3	-12.2	Negative
Municipality of Anchorage	174,431	226,338	260,283	1.4	Moderate
Fairbanks-North Star Borough	53,983	77,720	82,840	0.6	Low

^a Denali Borough was incorporated on December 7, 1990

^b 1990 population figure for Healy CDP includes Lignite CDP, which was reported separately only in that year

^c The Talkeetna CDP was enlarged in 2000 so population numbers are not directly comparable to 1990 figures

CDP = Census Designated Place

na = not available

Source: U.S. Census Bureau, 1980, 1990, and 2000 Census of Population & Housing

Economy and Employment

The region surrounding Denali National Park and Preserve supports a remarkable diversity of economic activity, only a portion of which is dependent upon the national park. The Air Force, mining, labor export, tourism unrelated to Denali, retail, and services make up a large portion of the economic mix. In addition, in many of the communities, non-market activities such as gardening and subsistence hunting, fishing, and gathering make up a significant portion of the economic activity, along with activities that do not fit well within standard economic reporting—systems such as trapping, and the manufacture and sale of arts and crafts. This is particularly true for communities in the Bush that have no road access, but is also relevant to rural communities on the road system such as Talkeetna, Trapper Creek, and Cantwell.

Denali Borough and Its Communities

The Denali Borough has a diverse economy for a rural community. Major sources of employment include Clear Air Force Station near Anderson, the Usibelli Coal Mine and an associated Golden Valley Electric Association (GVEA) a coal-fired power plant in Healy, Denali National Park and Preserve, and tourism businesses that depend upon visitation to the national park. While all four are substantial contributors to the borough's economy, growth is largely driven by the national park. Table 3-2 shows the number of employees in each industrial sector in 2000, while Table 3-3 lists the top 10 employers in the borough.

Table 3-2: Denali Borough Wage and Salary Employment by Industry, Annual Average 1991 and 2000

	1991	% of Total	2000	% of Total
Total Employment	762	100.0%	1,810	100.0%
Mining	112	14.7%	132	7.3%
Construction	11	1.4%	15	0.8%
Trans., Communication, Utilities	68	8.9%	607	33.5%
Trade	253	33.2%	397	21.9%
Finance, Insurance, Real Estate	2	0.3%	10	0.6%
Services, total	163	21.4%	318	17.6%
Hotels	121	15.9%	259	14.3%
Government, total	153	20.1%	331	18.3%
Federal	111	14.6%	198	10.9%
State	29	3.8%	20	1.1%
Local	13	1.7%	113	6.2%

Source: Fried and Windisch-Cole, 2001

Federal employment and contracts associated with the Clear Air Force Station are the most important source of employment and income in the community of Anderson. Clear Air Force Station is a radar surveillance site that tracks missile movement and space objects. Employment at the station consists of military personnel, civilian Department of Defense employees, and the employees of service contractors (Arctec Services being the largest – see chart below). The Air Force is in the process of turning the station over to the Air National Guard.

Federal employees are also one of the underpinnings of employment in the central part of the borough through the National Park Service – particularly the Healy and McKinley Park areas. The National Park Service also hires a significant number of seasonal employees from both the local community and elsewhere.

The tourism industry is the driving force behind employment growth in the borough, although the growth is scattered among several different economic sectors. Hotels, restaurants, transport services, retail shops, gas stations, and guide services are among the many services available for people coming to visit the national park. To illustrate the growth, in 1980 the National Park Service counted just 133 hotel rooms near the park’s entrance. By 2004, there were 1,900 rooms, 346 cabins, and 587 RV spaces, excluding campsites and RV sites within the park (Denali Borough, pers. comm.). Half of the top 10 employers in the borough in 2000 were in the tourism industry.

The Usibelli Coal Mine is the largest employer in the borough that is not associated with the federal government or related industries. Founded in 1943, Usibelli became the state’s single producer of coal in 1981. In recent years, the mine produced on average 1.5 million tons of coal per year, a rate that fluctuated little from 1985 to early 2002. For these years, half of the coal was consumed by local electric generation facilities from Healy north to Fairbanks and half exported to South Korea. However, the Korean contract has recently become smaller and less reliable.

The Healy Clean Coal Project, a new 50-megawatt power plant constructed between 1995 and 1997 by the Alaska Industrial Development and Export Authority with the assistance of federal grants, would consume 300,000 tons of coal annually if it were operating. However, after its initial test period the Golden Valley Electrical Association refused to take over operation of the facility as per its contract with AIDEA, claiming the experimental clean coal technology proved too expensive and unreliable during its test period. The plant has been idle since completion of the test period, awaiting potential modifications, a full retrofit to conventional coal-burning technology, or another operator.

Employment in the Denali Borough is strongly seasonal because of the importance of the tourism industry within the borough’s economy compared to the other industries. By conservative estimates, the population of the area at least triples during the summer season, which is roughly mid-May to mid-September (Fried and Windisch-Cole 2001). The fluctuation in the jobless rate is one indicator of this seasonality; in 2000 the rate peaked at 17.7% in January and then declined to just 3.1% in July. Even more telling is workforce residency. In 1999, 39 percent of the private sector wage and salary workforce in the borough were nonresidents of the state. Another 42 percent resided somewhere else in Alaska. That means that during the summer, non-resident private-sector workers outnumber the local workers 4 to 1. (Fried and Windisch-Cole 2001) One entire community in the borough – the Nenana Canyon business area just outside the park boundary along the Parks Highway – is inhabited by thousands of employees and visitors any given night of the summer, but is closed up entirely from October through April.

Despite the seasonality of tourism, its impact is felt year-round in two ways. First, many local residents work in tourism during the summer, but spend their earnings throughout the year. Second, the borough government depends on bed taxes for approximately 86% of its revenue, much of which is used to fund the borough school district (Fried and Windisch-Cole 2001). For the latter reason, communities throughout the borough are strongly concerned about national park visitation even if they do not benefit directly from tourism and other park-related employment.

Table 3-3: Top Employers in the Denali Borough in 2000

Rank	Employer	Employment
1	ARAMARK Leisure Services	285
2	Arctec Services (contractor to Clear Air Force Station)	208
3	National Park Service	133
4	Alaska Hotel Properties	132
5	Usibelli Coal Mine	119
6	Denali Borough School District	83
7	U.S. Department of Defense	56
8	Golden Valley Electrical Association	44
9	Royal Highway Tours	32
10	Denali Bluffs Hotel	26
10	Denali National Park Wilderness Centers	26

Source: Fried and Windisch-Cole, 2001

The Matanuska-Susitna Borough and Its Northern Communities

Historically, mining and agriculture were the economic activities that brought people to the Mat-Su Borough. In fact, the borough is still the state’s largest agriculture producer. However, in the context of a rapidly growing population agriculture has become relatively unimportant, amount to \$9 million in production in 1998 (Fried 2000). Now, the rapid population increase in the Matanuska-Susitna Borough is directly linked to export of labor, particularly to Anchorage. In 1990, the census estimated that 28% of borough residents could be working in Anchorage; in 2003, the estimate was 35.4% with an additional 11.5% of borough residents commuting to work in the oil industry on the North Slope or elsewhere in the state. The comparative affordability of housing is one of the primary factors attracting residents to the Mat-Su Valley (Fried 2003).

Because labor is the borough’s major export, it is unsurprising that services and retail dominate employment within the boundaries of the borough itself. Expansion in these sectors over the last decade means that more income is retained in the borough rather than going to Anchorage and elsewhere. Construction and the finance-insurance-real estate sectors have also prospered from residential and commercial construction. Table 3-4 shows wage and salary employment for the Matanuska-Susitna Borough for 1991 and 2001.

Table 3-4: Matanuska-Susitna Borough Wage and Salary Employment, 1991 and 2001

	1991	% of Total	2001	% of Total
Total Employment	7,878	100.00%	12,874	100.00%
Mining	162	2.10%	34	0.26%
Construction	397	5.00%	1,317	10.23%
Manufacturing	95	1.20%	149	1.16%
Trans., Communication, Utilities	784	10.00%	874	6.79%
Trade, total	2,012	25.50%	3,553	27.60%
Wholesale Trade	133	1.70%	156	1.21%
Retail Trade	1,879	23.90%	3,397	26.39%
Finance, Insurance, Real Estate	195	2.50%	312	2.42%
Services	1,540	19.50%	3,364	26.13%
Government, total	2,640	33.50%	3,140	24.39%
Federal	107	1.40%	163	1.27%
State	810	10.30%	896	6.96%
Local	1,723	21.90%	2,081	16.16%
Misc./Unclassified	53	0.70%	129	1.00%

Source: Fried, 2003

The tourism industry is also strong in the Matanuska-Susitna Borough, although its character differs from the rest of the state. The visitor industry in Mat-Su caters in large part to Alaskans and others who have recreational property in the borough. According to the 2000 census, 19.2% of the housing in the borough is recreational or seasonal, and hundreds of new cabins are added each year. The owners of these recreational properties buy services and pay property taxes.

While Denali-bound visitors spend some money for food and gas on the way through the borough, only the northern communities of Trapper Creek and particularly Talkeetna are tied directly to the park economically. For several decades, Talkeetna has been the gateway to Denali for mountaineers who fly from the town airstrip into the Alaska Range to climb Mount McKinley or adventure on other peaks or glaciers. Although this type of visitor traffic has had considerable effect on Talkeetna's character, the number of people entering the park this way has always been relatively minor (see below under Visitor Activities). However, other visitors come to the town to enjoy the mountain views, take flight-seeing trips over the park, listen to stories of mountaineers and bush pilots, and experience life in a small Alaska town. This kind of tourism is growing dramatically with an increase in interest in "South Denali." In 1992, the Talkeetna Visitor Impact Assessment estimated that 40,000 visitors came to Talkeetna over the course of a year. For 2001, Christopher Beck & Associates estimated 110,000 visitors came to Talkeetna (Beck, 2002).

The opening of two large new lodges serving the package tour industry has driven much of the tourism growth in Talkeetna and nearby northern Mat-Su communities. The Mount McKinley Princess Lodge opened 20 miles north of Trapper Creek in 1997. The Cook Inlet Region, Inc. opened its Talkeetna Alaskan Lodge in 1998 and within a year began working on plans to double its size. Proximity to and views of Mount McKinley, accessibility from road and rail, a diversity of attractions, and available land have made this area a magnet for the rapidly expanding package tourism industry (Talkeetna Community Tourism Plan – Issues and Needs Workbook, March, 2002). These two lodges are now two of the largest employers in the borough (see Table 3-5).

It is important to note that not all tourism in the northern Mat-Su is Denali-related. Sport fishing, hunting, snowmachining, and other non-park tourism have been important at least as long as park-related visitation, and still provide a substantial part of tourism activity.

Table 3-5: Top Employers in the Matanuska-Susitna Borough, 2001

Rank	Employer	1999 Average Annual Employment
1	Mat-Su Borough Schools	1,650
2	Valley Hospital	467
3	Wal-Mart	341
4	Safeway	335
5	Fred Meyer Stores	283
6	Matanuska-Susitna Borough	237
7	Matanuska Telephone Association	231
8	University of Alaska	159
9	Alaska Department of Corrections	150
10	Ma-Su Services for Children and Adults	137
11	Advanced Concepts (Job Corps)	131
12	Nye Frontier Ford	123
13	Alaska Department of Administration	120
14	Mat-Su Community Counseling Center	109
15	Sears Roebuck	104
16	Matanuska Electric Association	100
17	New Horizons Telecom	98
18	McDonalds	97
19	Wolverine Supply	93
20	Alaska Dep't of Health & Social Services	92
21	Mount McKinley Princess	92
22	Bailey's Furniture	90
23	City of Wasilla	80
24	Tony Chevrolet	80
25	GCI Communications	79
26	Spenard Builders Supply	74
27	Talkeetna Lodge*	70
28	Alaska Department of Natural Resources	69
29	Fishers Fuel	64
30	K&G Enterprises	64

Source: Fried, 2003

Lake Minchumina, Nikolai, and Telida

The economies of Lake Minchumina, Nikolai, and Telida are rooted in subsistence, with hunting, gathering, and gardening providing much of what residents need. Residents depend on cash income that is linked to federal and state programs, the local school district, and seasonal construction work (Simeone and Haynes 2001). Trapping and handicrafts also provide cash income for some residents. At Lake Minchumina, there is a small lodge that is partially-dependent on park-related visitation, including winter visitation as the lodge has a concession to take sled dog tours into the park and preserve.

Economic Characteristics

Denali Borough residents tend to be wealthier than the state as a whole, with median household income and per capita income above the level of the state as a whole for the borough and most of its communities. The Matanuska-Susitna Borough has a very similar median household income and per capita income to the state, but for northern communities more strongly tied to the park the income is substantially lower than the borough and the state. The percentage of the workforce that is unemployed is significantly higher across most of the Denali-area communities than the state as a whole, perhaps because of the seasonality of work (note that Healy has less unemployment than the state, along with an economy more closely related to coal mining than to tourism). The poverty rate of families is slightly higher than the state average through most of the communities, although Anderson and Ferry have more than double the statewide rate and Trapper Creek and Nikolai have extremely high rates of poverty – 27.6% and 21.1% respectively (see Table 3-6: Selected Economic Characteristics).

Table 3-6: Selected Economic Characteristics, 2000

Geographical Area	Median Household Income	Per Capita Income	Unemployment (%)	Families below poverty level (%)
State of Alaska	51,571	22,600	9.0	6.7
Denali Borough	53,654	25,251	11.6	5.7
Anderson City	58,750	23,837	10.2	15.6
Cantwell CDP	43,750	22,615	11.0	0.0
Ferry CDP	38,750	18,323	60.9	16.7
Healy CDP	60,000	28,225	8.8	2.5
McKinley Park CDP	53,750	27,255	14.7	8.6
Matanuska-Susitna Borough	51,221	21,105	10.3	7.8
Petersville CDP	43,750	43,000	50.0	0.0
Talkeetna CDP	38,289	23,695	14.4	7.2
Trapper Creek CDP	27,031	18,247	8.1	27.6
Lake Minchumina CDP	36,250	26,780	--	--
Nikolai city	15,000	11,029	37.9	21.1
Telida	--	--	--	--
Municipality of Anchorage	55,546	25,287	6.8	5.1
Fairbanks-North Star Borough	49,076	21,553	9.1	5.5

Source: U.S. Census of Population and Housing, U.S. Bureau of the Census, 2000

VISITOR USE AND EXPERIENCE

This analysis of visitor use is organized into four categories: general visitation, backcountry activities, access, and facilities. General visitation describes the primary users of Denali National Park and Preserve. The backcountry activities section provides an overview of the types of recreational activities occurring within the boundaries of the park and preserve. Access describes the various means by which visitors reach Denali and travel into the park. The facilities discussion describes the park infrastructure that supports and facilitates visitor access to recreational activities in the backcountry.

General Visitation

Denali National Park and Preserve has the most visitation of any national park in Alaska. This has been attributed to its location between Anchorage and Fairbanks, ease of access by both rail and road, the fame of its resources, and its relatively long history in the national park system. Visitation grew rapidly during the 1990s, when the number of recreation visits peaked in 1999 at 386,867— an increase of 13% in four years. Visitation rates then stagnated or declined through the early years of the current decade before a resurgence and record visitation in 2004. Table 3-7 shows the trend in recreational visits since 1996.

Table 3-7: Recreational Visits for Denali National Park and Preserve, 1996–2004

Year	Recreation Visits ¹	% Change from previous year
1996	341,385	
1997	354,278	4.1
1998	372,519	5.1
1999	386,867	4.7
2000	363,983	-5.9
2001	360,192	-1.0
2002	353,560	-1.8
2003	359,841	1.8
2004	404,236	12.3

¹ Number of people entering the park and preserve during any part of the day

Source: NPS Visitation Database. The number of visits for 2002 was adjusted to correct errors using original statistics at park Headquarters.

Although Denali National Park and Preserve is open year-round, nearly all visitor use of the park and preserve occurs during the short summer season (late May through early September). Only about 2% of visitation occurs outside this time period, and over 80% generally occurs within three months: June, July, and August (See Table 3-8).

Table 3-8: Monthly Visitation for Denali National Park and Preserve, 2003-2004.

Month	2003		2004	
	# Visitors	% of Total	# Visitors	% of Total
January	979	0.3%	313	0.1%
February	524	0.1%	392	0.1%
March	751	0.2%	1,441	0.4%
April	2,985	0.8%	3,087	0.8%
May	27,260	7.6%	30,132	7.5%
June	88,471	24.6%	100,127	24.8%
July	104,686	29.1%	116,601	28.8%
August	97,821	27.2%	108,097	26.7%
September	34,639	9.6%	39,969	9.9%
October	889	0.3%	2,525	0.6%
November	374	0.1%	1,059	0.3%
December	462	0.1%	493	0.1%
Total for Year	359,841	100.0%	404,236	100%

Source: NPS Visitation Database.

Denali National Park and Preserve is a destination park with national and international appeal. Denali provides a variety of unique opportunities and experiences for visitors, including opportunities to view Mount McKinley and wildlife throughout the park and preserve. According to a 1995 survey, 90% of the visitors were from out-of-state. Included in that figure were a significant number of international visitors – 12%, according to the same survey. During the off-season (October through April), the majority of visitor use is by Alaska residents.

The average length of stay for visitors to Denali National Park and Preserve varies according to the mode of transportation used to access the park and preserve. For visitors arriving by private vehicle, the average length of stay is estimated to be about two hours. The National Park Service estimates that visitors arriving by commercial motor coach or bus will spend an average of eight hours in the park and preserve. Passengers of the Alaska Railroad spend an estimated 18 hours within the boundaries of the park and preserve.

Length of stay can be divided into those visitors who spend fewer than 24 hours in the park (day use) and those who spend more (overnight stays). Day-use visitors may spend only a few hours in the entrance area and along the unrestricted first 15 miles of the park road. Other day-use visitors may take a bus that travels beyond the Savage River either as part of a 6-7 hour narrated wildlife and wilderness tour or as a passenger on the park's Visitor Transportation System which offers the potential for day-hiking, picnicking, or sightseeing in addition to wildlife viewing.

For visitors spending one or more nights at Denali, there are accommodations both inside and outside of the park. Inside the park, overnight use within the national park is documented in Table 3-9. An overnight stay is one visitor spending one night in the park for recreational purposes and is counted separately from a recreational visit. Despite such variables as the closure of the park hotel and campground expansion, overnight stays have remained stable, looking at the period as a whole. Overnight stays can be divided into four categories:

concessioner lodging, NPS standard campgrounds, NPS group campgrounds, and NPS backcountry use. Most relevant to this backcountry plan are the numbers on overnight backcountry use, which have oscillated dramatically in the last 16 years, peaking in the mid 1990s at a level 22% higher than the most recent year.

The Denali Park Hotel closed after the 2001 season, so now camping is the only opportunity that the National Park Service offers for staying inside the park. Most visitors stay at hotels in adjacent communities. There are four lodges that provide overnight accommodations on privately-owned inholdings in Kantishna at the western end of the 92-mile park road, and a remote lodge on a privately-owned inholding along the Tokositna River on the south side of Denali.

Table 3-9: Overnight Stays at Denali National Park and Preserve, 1985-2004

Year	Number Overnight Stays ¹				Total Overnight Stays
	Concessioner Lodging ²	NPS Campgrounds	NPS Group Campground	NPS Backcountry	
1985	28,020	67,963	3,001	26,029	125,013
1986	29,752	67,071	2,693	27,999	127,515
1987	23,780	65,649	2,086	28,962	120,477
1988	22,101	77,500	1,191	29,460	130,252
1989	23,429	63,789	1,637	34,113	122,968
1990	24,459	56,329	1,534	35,918	118,240
1991	24,311	62,539	2,683	29,798	119,331
1992	27,452	73,066	2,831	38,262	114,159
1993	25,683	63,957	2,034	33,010	124,684
1994	23,942	63,082	2,592	41,455	131,071
1995	24,459	65,105	1,807	39,500	130,871
1996	23,586	59,871	2,240	37,188	122,885
1997	22,223	65,999	2,019	39,224	129,465
1998	18,330	64,438	962	37,504	122,150
1999	19,912	66,722	1,349	35,826	123,809
2000	19,095	67,431	1,883	32,579	121,107
2001	19,106	42,830	1,457	35,306	98,699
2002		26,309	455	36,212	62,976
2003		62,570	801	34,127	97,498
2004		85,752	3,309	34,016	123,077

¹Person-nights

²The concessioner lodging was the Denali Park Hotel, which closed after the 2001 season.

Source: NPS Visitation Database.

Backcountry Activities

There are both guided and unguided visitor activities in the Denali backcountry. Some activities, such as flightseeing and horseback riding, are generally – although never exclusively – done through a commercial service while others, such as hiking, climbing, skiing, and camping, are more commonly done independently. Visitors are also able to participate in a variety of educational programs offered by the National Park Service, Murie Science and Learning Center, and other educational partners. With the exception of overnight camping in the Old Park and portions of the Kantishna Hills and climbing on Mount McKinley and Mount Foraker, most independent travel does not require a permit from the National Park Service, so there is little data available on the amount of visitor activity. Commercial operators are required to report on their use of the park.

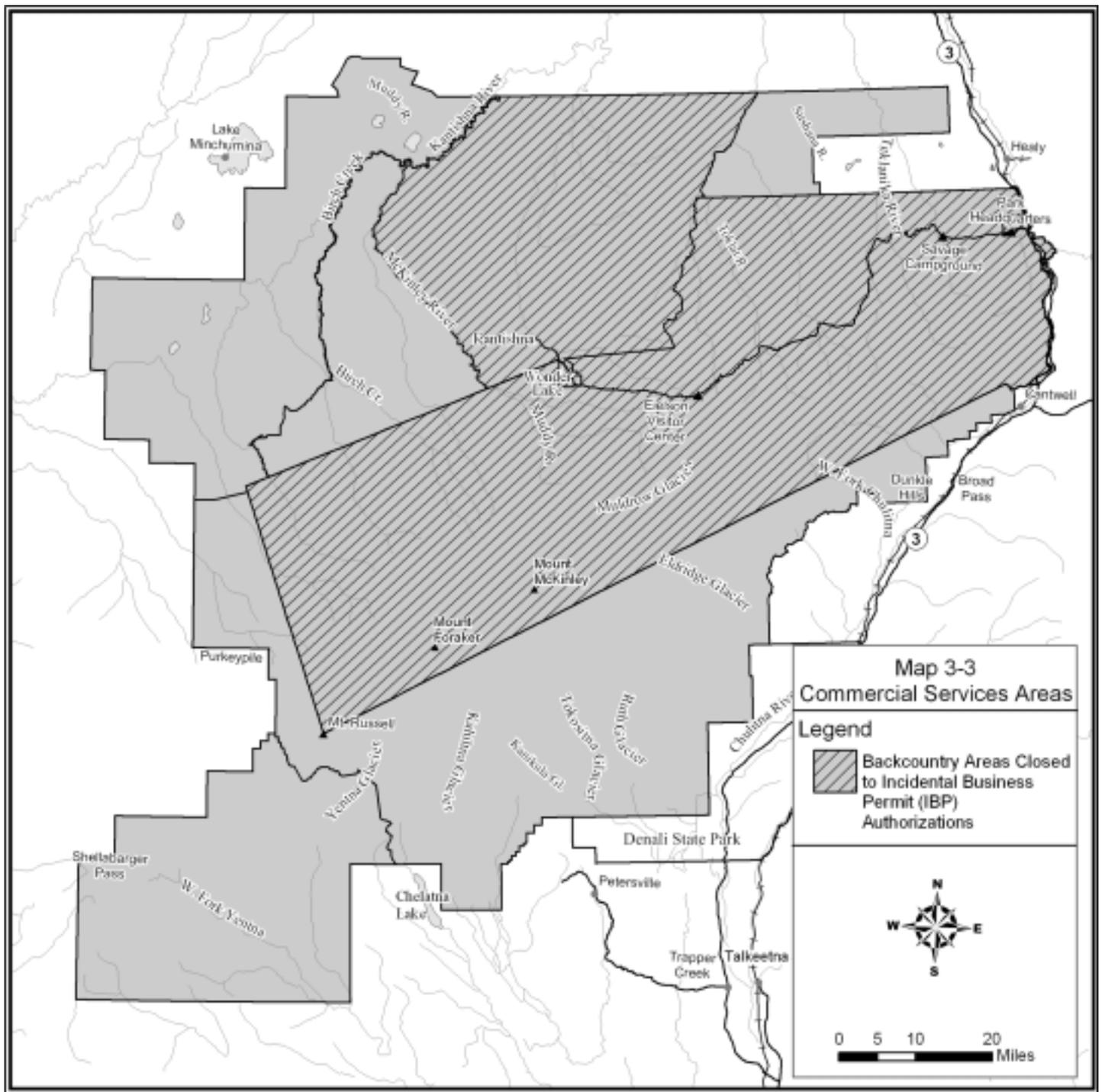
Commercial operators authorized to offer their services to park visitors must obtain either a concessions contract or an incidental business permit. Twenty-three companies had National Park Service concessions contracts and thirty-two had incidental business permits to operate in Denali National Park and Preserve during 2004; the number fluctuates from year to year.

Concessions contracts are awarded to successful bidders on prospectuses issued by the National Park Service for activities and services which the NPS has determined should be offered to visitors (see Chapter 1). Only a limited number of contracts are awarded. Presently, backcountry activities authorized by concession contract include:

- Guided hiking in the Old Park and Kantishna
- Guided climbing on Mount McKinley
- Air taxi and scenic tour landing service on glaciers in the southern park additions
- Air taxi and scenic tour service in Kantishna
- Guided sport hunting
- Winter dog sled tours
- Freight hauling by dog team in the Old Park

Incidental business permits are issued to businesses providing appropriate services where there are no fixed commercial facilities in the park, the commercial activity originates and terminates outside the park, no money changes hands on park lands, and no commercial solicitation occurs on park lands. Permits are generally available for a specified set of authorized activities within a specified area. Map 3-3 shows areas that are open to backcountry activities authorized through incidental business permits. The backcountry activities that may be authorized through an IBP are the following:

- Air Taxi Operator
- Big Game transport
- Mountaineering
- Day hiking
- Backpacking or overnight camping
- Winter backcountry trips (guided overnight camping in winter snow conditions).



All operators are subject to the requirements of National Park Service commercial visitor services guidelines, and operating plans required of concessions contract holders.

For some activities, the distinction between “activity” and “access” is indistinct, such as for air tours or horseback riding. For that reason, some topic headings occur in both the access and backcountry activities sections.

Day Hiking

Hiking is one of the most common visitor activities in Denali, whether a short stroll along trails in the entrance area or a grueling multi-day, off-trail backpacking adventure. The term “day hike” encompasses any hike that does not include camping overnight (the latter will be referred to as “backpacking”). There is little data about the extent of day hiking in the park. Most day hikers either use the entrance area trails or take a bus into the park and start their hikes from anywhere along the park road. As a result, except for the few trails in the park (see “Facilities” below), independent day-hiking is widely dispersed.

Guided day-hiking is primarily offered by the lodges in Kantishna for their clients, and tends to have a more concentrated use pattern. All lodges take guided parties to the Moose Creek and the Skyline Drive areas. Those hiking up Moose Creek generally use the former mining access route that follows the creek. Groups hiking in the Skyline Drive area usually hike up or down the Friday Creek drainage to Wickersham Dome and back down to Kantishna. Some groups are shuttled up Skyline Drive to start at higher locations, and then hike back. The Kantishna lodges are able to bring their clients into the Wonder Lake area for guided hikes, including use of the McKinley Bar Trail. One Kantishna lodge operator has pre-ANILCA historic rights to lead guided hikes in the Old Park and brings clients by van as far east as Highway Pass.

About one party per day visits each hiking area with group sizes averaging 12 to 17 people. Duration of the guided hikes varies from 2 to 6 hours. The lodges coordinate group hikes so that usually no more than one group visits a hiking area at any one time. The annual average number of people participating in guided hiking in the Kantishna area between 1995 and 1998 was 6,043 people.

A company that offers big-wheeled truck tours along a state right-of-way in the Dunkle Hills area also provides a limited number of guided hikes for its clients.

Except for the historic operator, there is no commercial guided hiking available in the Old Park. There are educational programs – in particular the NPS Discovery Hikes – that provide opportunities for those who want to join a group or feel they need assistance. Guided groups that visit the Old Park by bus or in the entrance area may be accompanied by their guides, but their guides may not guide or engage in activities with their clients even if the company has a contract or IBP for guiding elsewhere in the park and preserve.

Backpacking

Backpacking primarily occurs in the Old Park where shuttle buses are used for drop-offs and pick-ups along the park road corridor. Backcountry permits are required, at no charge, for

overnight stays in 42 of the designated backcountry units, as detailed in Appendix D. For the north side of the park during 2001, there were 11,532 user nights: 2,296 backcountry permits were issued to 4,752 people, resulting in an average of 2.07 people and 2.38 nights per permit (Joe Van Horn, pers. comm.).

Permits for backpacking are available at the Wilderness Access Center (WAC) during summer and at the Murie Science and Learning Center during winter months. Reservations are not required for the permit and are issued only one day in advance. Many areas of the park also require the use of bear-resistant food containers (BRFC), which are distributed with the backcountry permit and must be returned at the end of the trip; the units where BRFCs are required are also detailed in Appendix D.

Registration for other areas of the park was voluntary in 1999 and 2000 and was strongly recommended in 2001, particularly for overnight users entering the park on the south side of the Alaska Range. In 1999, 328 backcountry users voluntarily registered; 426 registered in 2000; and 684 registered in 2001.

Visitors are encouraged to practice Leave No Trace skills and ethics during their time in the backcountry. These include planning ahead, camping and traveling on durable surfaces, packing out all garbage, properly disposing of human waste, and not disturbing vegetation, wildlife, or cultural sites.

2000 Backpacker Survey

A survey of overnight backcountry visitors who obtained permits from the backcountry desk at the Visitor (now Wilderness) Access Center was conducted in 2000 (Swanson et al. 2002).

Results indicated the following:

- 81% of visitors reported camping within sight or sound of no other parties. Backcountry users interacted with an average of 0.65 hiking parties per day.
- 73% felt they saw about the right number of hiking parties, while 25% would have preferred to see fewer hiking parties.
- 94% agree with the present objective that backpackers should be able to camp out of sight or sound of other parties.
- 75% of respondents to the survey were satisfied or very satisfied with the experience in obtaining a backcountry permit.
- 87% oppose or strongly oppose the National Park Service's allowing unlimited use in the backcountry.
- 97% support or strongly support the National Park Service's permanently closing areas to protect wildlife habitat.
- 96% support or strongly support requiring all overnight hiking parties to obtain a backcountry permit.
- 95% rated overall satisfaction with their backcountry trip as good or very good (Swanson et al. 2003).

The average total number of aircraft seen per day by survey respondents was 4.9.

- 76% of respondents said they would prefer to not see or hear any aircraft during their visit.

- 48% of respondents in the control condition who saw or heard aircraft were annoyed by those aircraft.

Lawson and Manning (2001) evaluated the choices overnight wilderness visitors in Denali National Park make when faced with hypothetical tradeoffs among the conditions of social, resource, and management attributes of the wilderness portion of the park. Their results implied that, in general, Denali overnight wilderness visitors would prefer to forgo some freedom from management to improve opportunities to experience solitude. The study also concluded that:

... management actions that provide Denali overnight wilderness visitors with places to camp that have no more than some signs of human use will make substantial positive contributions to the quality of their wilderness experiences. Camping conditions characterized by sites with extensive signs of human use greatly detract from the quality of visitors' wilderness experience in Denali. Further, Denali overnight visitors place relatively high importance on having limited contact with other groups while hiking and camping. Denali overnight wilderness visitors would prefer a wilderness setting that emphasizes solitude through relatively restrictive management actions over a more congested wilderness setting with limited management restrictions by a margin of three to one (Lawson and Manning 2001).

There is a limited amount of guided backpacking in the park additions. No guided overnight backpacking is authorized in the Old Park or areas closed to IBPs.

Bicycling

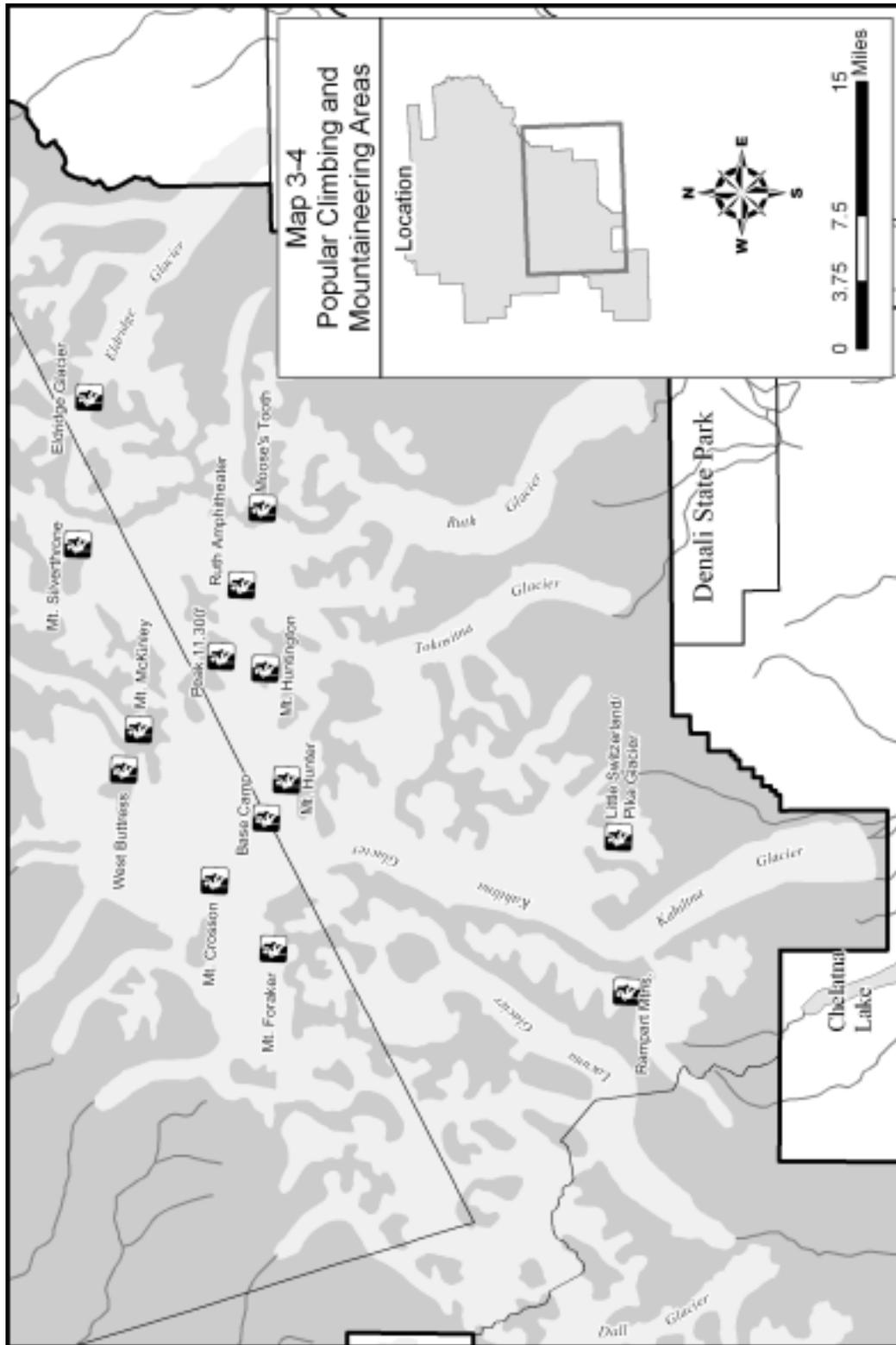
Very little bicycling occurs in Denali except on the park road. The little backcountry cycling that occurs is in the Kantishna Hills area on former mining access routes such as Moose Creek and Skyline. VTS camper buses can transport bicycles to any point along the park road. Three of the Kantishna operations provide mountain bikes and associated equipment, such as helmets, water bottles, and fanny packs, for overnight guests. Bicycling activity recorded by the lodges ranged from 92 to 169 people between 1996 and 1998, representing an annual average of 125 people, although much of this activity occurred on the park road and not in the backcountry. NPS rangers counted 432 bicycle riders in the Wonder Lake area in 1997 (NPS 1999c, NPS 2000d).

Climbing and Mountaineering

Climbing and mountaineering are prominent recreational activities in Denali National Park and Preserve. Each year approximately 2,000 people participate in independent and guided expeditions on peaks in the Alaska Range in the park. Various glaciers in the park and preserve are also used for skiing, ice climbing, rock climbing and alpine recreation courses. (See Map 3-4, Popular Climbing and Mountaineering Areas.)

- Mountaineering Logistics

The climbing season for Mount McKinley and the other peaks in the Alaska Range typically lasts from late April through the end of July. Severe winter weather with high winds typifies the



start of the season. Snow conditions on the glaciers, where air taxi services land, deteriorate as summer progresses (after July). Weather and mountain conditions limit climbing during the rest of the year, although a few ascents are attempted in other seasons (Jones and Stokes 2000).

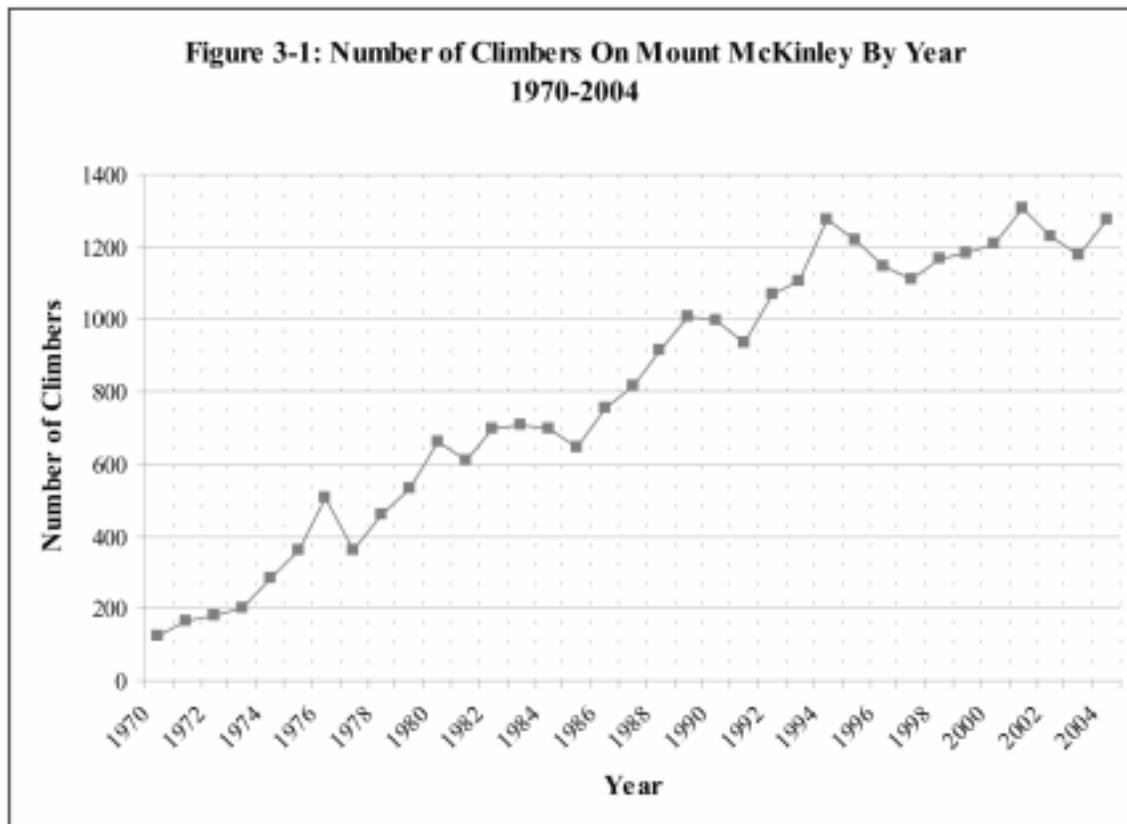
Most mountaineering expeditions and climbers use the town of Talkeetna, located on the south side of the Alaska Range, as a staging area before entering the park or preserve. Air taxi services are available to transport equipment and supplies to glacier landing areas near desired peaks. For routes that involve a north side approach, mountaineers may use dog sled freight hauling services to cache equipment and supplies during winter for the upcoming climbing season (see below under Caches). Although foot access to the Alaska Range in Denali National Park and Preserve is possible, the difficulty of the terrain and distance from roads to prime mountaineering areas present a significant challenge (Jones and Stokes 2000).

Since 1995, mountaineers attempting ascents on Mount McKinley or Mount Foraker have been required to register with the National Park Service 60 days before their expedition start date. The registration and fee process were instituted in response to an increase in the total number of mountaineers and an increase in search and rescue activity in 1992. Climbers and mountaineers are not restricted based on experience levels or other subjective factors. Anyone who legally registers is entitled to a permit.

Before entering the park or preserve, registered mountaineers are required to sign in at the Talkeetna Ranger Station, where they receive a briefing by NPS rangers on current route information, safety, environmental concerns, and waste disposal methods. On returning to Talkeetna, mountaineers must sign back in at the ranger station. Registration is voluntary for ascents on all other peaks in Denali National Park and Preserve.

- Mount McKinley

Mount McKinley is significant to the worldwide mountaineering community. Numerous peaks in the Alaska Range are climbed each year, but none has the appeal and drawing power of Mount McKinley, the highest peak (20,320 feet) on the North American continent. Compared to other peaks that are international destinations, accessing Mount McKinley is relatively easy and logistically simple using air transport. The mountain offers significant challenges with glacier travel, severe temperatures, and extreme environmental conditions. The number of mountaineers attempting the peak has increased substantially in the last three decades, from 124 in 1970 to 1,275 in 2004, with a peak of 1,305 in 2001 (see Figure 3-1).



The south summit is the highest point on Mount McKinley and, therefore, is the goal for most mountaineers. The most popular route to the south summit is the West Buttress. More than 90% of all successful ascents of Mount McKinley are attained via this route. Because the expeditions are lengthy, typically lasting 2-3 weeks, a relatively small number of mountaineers accounts for a lot of user nights and associated impacts, averaging 17 user nights per climber on the West Buttress. Despite the lengthy investment of time by most expeditions, success rates still hover in the 50% range.

Table 3-10: Denali National Park & Preserve Registered Mountaineering Activities on Mount McKinley, 2000–2004

	Expeditions	Climbers		User Nights
	#	#	% Summiting	
West Buttress (including Muldrow traverse)				
2000	287	1,083	53%	18,367
2001	300	1,154	61%	19,471
2002	284	1,111	53%	18,233
2003	269	1,005	60%	16,703
2004	290	1,176	54%	19,126
Other Routes				
2000	44	122	43%	2,309
2001	58	151	46%	2,860
2002	44	121	48%	2,391
2003	56	174	49%	3,088
2004	33	99	28%	1,689
Total McKinley				
2000	331	1,205	52%	20,676
2001	358	1,305	59%	22,331
2002	328	1,232	53%	20,624
2003	325	1,179	58%	19,791
2004	323	1,275	52%	20,815

Source: Denali National Park and Preserve Climber Database

- Mount Foraker and Other Mountaineering Destinations

Mount Foraker (17,400 feet) is the second highest mountain in the Alaska Range and the sixth highest in North America. It is accessed by the Kahiltna Glacier, which is also the starting point for West Buttress climbs on Mount McKinley. Mount Foraker is the only other mountain that requires registration by mountaineers and climbers.

Besides Mount McKinley and Mount Foraker, attempted ascents on peaks within the Alaska Range and the boundaries of the park and preserve include: Mount Hunter (14,573 feet.), Mount Silverthron (13,220 feet.), Mount Huntington (12,240 feet.), Mount Crosson (12,800 feet.), Peak 11,300', and Moose's Tooth (10,335 feet.) (NPS 2000d and f). Because registration is voluntary unless mountaineers are ascending Mount McKinley or Mount Foraker, or if their travel includes the Old Park, data is likely incomplete. However, table 3-18 still shows a rapid increase in visitor use of Alaska Range destinations.

Table 3-11: Number of Climbers and Mountaineers Registering for Backcountry Use Besides Mount McKinley 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	Average
Mount Foraker*	27	11	22	52	40	36	34	16	30
Mount Crosson	26	5	12	42	46	0	12	2	18
Mount Hunter	55	37	52	59	39	35	26	21	41
Mount Huntington	7	8	13	20	14	19	14	30	16
Mooses Tooth	30	24	14	23	52	47	77	53	40
Peak 11,300	2	2	4	4	19	9	10	25	9
Silverthrone	0	0	0	5	3	4	0	0	2
Other Destinations	107	104	146	199	361	442	363	367	261
Total Mountaineering Use except McKinley	254	191	263	404	574	592	536	514	417

* Mount Foraker is the only one of these peaks where registration is required. Numbers for other destinations are based on voluntary registrations.

Source: Denali National Park and Preserve Climber Database

Popular glacier destinations have seen substantial growth over the past decade. Registered visitor nights on the Ruth Glacier increased from 1,262 in 1990 to 1,672 in 2000, before retreating to 1,435 in 2004. On the Pika Glacier user nights climbed from 68 in 1990 to 550 in 2004 (NPS Climber Database).

Visitors flown to the Ruth Amphitheater often trek or ski on the Ruth Glacier or in the Great Gorge area and have numerous opportunities for moderate to difficult mountaineering. Since 1976, visitors have also been able to purchase overnight lodging at the privately-owned Don Sheldon Mountain House, a six-sided cabin located near the Ruth Amphitheater Airstrip.

- Guided Mountaineering

Part of the total mountaineering activity includes guided mountaineering. In 2004, there were six National Park Service permitted mountaineering concessioners that could offer expeditions on Mount McKinley and other peaks in the Old Park. Additionally, 13 businesses had Incidental Business Permits to climb peaks outside the Old Park.

Table 3-12 summarizes data for Mount McKinley submitted by permitted mountaineering concessioners to the NPS. The amount of guided activity on peaks and glaciers besides Mount McKinley (Table 3-13) has risen rapidly from an average of 96 climbers per season during 1997-1999 to an average of 242 climbers per season during 2000-2004.

Table 3-12: Guided Mountaineering by Concessioners on Mount McKinley, 2000-2004

	Expeditions	Climbers		User Nights
	#	#	% Summiting	
West Buttress (including Muldrow traverse)				
2000	33	288	55%	5,330
2001	36	322	69%	5,668
2002	40	338	48%	5,656
2003	34	305	67%	5,432
2004	49	400	57%	6,572
Annual Avg	38	331	59%	5,732
Other Routes				
2000	2	21	71%	553
2001	1	7	100%	112
2002	2	20	15%	543
2003	5	33	76%	764
2004	1	3	100%	39
Annual Avg	2	17	72%	402
Total McKinley				
2000	35	309	56%	5,883
2001	37	329	69%	5,780
2002	42	358	63%	6,199
2003	39	338	77%	6,196
2004	50	403	57%	6,611
Annual Avg	41	347	64%	6,134

Source: Denali National Park and Preserve Climber Database

Table 3-13: Guided Mountaineering for Destinations besides Mount McKinley and Mount Foraker, 1997-2004

	# Expeditions	# Climbers	User Nights
Eldridge Glacier			
1997	1	12	120
1998	1	8	88
1999	8	59	494
2000	5	43	370
2001	4	15	120
2002	7	48	393
2003	3	16	134
2004	3	14	85
Kahiltna Glacier			
1997	2	10	85
1998	0	0	0
1999	1	13	117
2000	16	117	921
2001	17	146	1,245
2002	12	84	476
2003	18	100	622
2004	22	107	670
Little Switzerland			
1997	4	43	580
1998	5	49	666
1999	0	0	0
2000	7	55	448
2001	6	36	294
2002	6	35	524
2003	3	23	226
2004	3	18	90
Ruth Glacier			
1997	4	29	174
1998	4	29	181
1999	3	20	240
2000	8	43	290
2001	10	62	329
2002	14	53	263
2003	12	66	377
2004	12	55	282

Other Peaks & Glaciers			
1997	0	0	0
1998	1	15	330
1999	0	0	0
2000	2	11	61
2001	1	12	132
2002	1	6	54
2003	1	2	11
2004	12	44	288
Total Peaks & Glaciers Other Than McKinley			
1997	11	94	959
1998	11	101	1,265
1999	12	92	851
2000	38	269	2,090
2001	38	271	2,120
2002	40	226	1,710
2003	37	207	1,370
2004	52	238	1,415

Source: Denali National Park and Preserve Climber Database

In addition to guided ascents on the various peaks of the Alaska Range within the boundaries of Denali National Park and Preserve, guide services also offer alpine recreation courses. Classes are typically conducted on the Brooks, Eldridge, Kahiltna, and Ruth Glaciers. Courses on the Brooks Glacier generally last between 23 and 25 days. Courses on the Kahiltna, Ruth, and Eldridge Glaciers typically are 12 days long (NPS 2000d).

- Human Waste Disposal

Human waste disposal is one of the most visible problems on Mount McKinley. Most climbers use pit latrines where provided and, where latrines are not available, biodegradable bags filled with human waste are tossed into crevasses. As snowpack and glaciers move, the area where pit latrines have been dug will become exposed. The high camps, particularly the ones at 16,000 feet and 17,200 feet, are littered with feces that freeze and remain exposed due to high winds that prevent snow from accumulating. Also, 27,000 user days per year account for many plastic bags that could some day become exposed in an icefall or at the toe of a glacier (NPS 1998).

In 2000, NPS staff assisted a plastic manufacturer with the design of the “Clean Mountain Can” (CMC). These two-gallon plastic cans come with biodegradable bags and are used as portable toilets for expeditions. Once used, climbers deposit the cans at Kahiltna Base Camp where the NPS transports them off the mountain via aircraft. A sewage disposal company discharges the waste in an approved landfill, cleans the containers, and returns them to the Talkeetna Ranger Station.

- Trash Disposal

At the 14,200-foot camp alone, approximately 700 pounds of abandoned caches and trash were recovered in 1997. In 1999, the end-of-season clean-up yielded six abandoned caches and an additional 150 pounds of trash on the route between base camp and the 11,200-foot camp. In 2000, there was a 20% non-compliance rate for returning fuel cans (NPS 2000g). The *Trash on Denali Summary Report for the 2000 Climbing Season* found that more than 37,000 pounds of food and potential trash are hauled onto Denali each year by climbing expeditions. In discussions with 136 individuals, 76 (56%) stated they saw garbage on Mount McKinley.

- Caches

Caches that support climbing and mountaineering activities are allowed in the park additions and preserve subject to the rules provided at 36 CFR 13.22. They are particularly important for expeditions attempting the northern climbing routes on Mount McKinley. The National Park Service authorizes a concessioner to deliver the caches by dog team. Typically, freight hauling occurs during February and March, and the concessionaire remains in the park for between 7 and 44 days while shuttling freight from the Kantishna airstrip to the cache sites near McGonagall Pass. The weight of freight being transported averages around 4,000 pounds (Jones and Stokes 2000).

- Visitor Experience

Experiences of mountaineering in Denali National Park and Preserve are, for the most part, highly satisfactory. Besides accidents or illness, high air traffic volumes and associated noise detract from the mountaineering experience for some climbers. Guides may possibly notice more noise from air traffic than visitors may because they have been in the park and preserve enough years to notice the increase (Jones and Stokes 2000). Also detracting from a quality experience is the evidence of human waste on the mountain (NPS 2000f). When climbs are not successful, wands and food caches are often left on the mountain.

Sport Hunting

The Alaska Board of Game regulates hunting and establishes harvest levels and season lengths for preserve lands in Denali. Hunting regulations are published annually. The Board of Game meets regularly and changes state hunting regulations as necessary, based on comments and proposals from the public, local fish and game advisory committees, and the National Park Service. The National Park Service will also submit comments on proposals that affect game management units encompassing land areas managed by the agency.

Animals subject to hunting on preserve lands are:

- moose
- Dall sheep
- black bears
- grizzly bears

- wolves
- wolverine
- spruce grouse
- ruffed grouse
- willow ptarmigan
- rock ptarmigan
- white-tailed ptarmigan
- snowshoe hare
- fur animals (coyote, red fox, lynx, and squirrel)

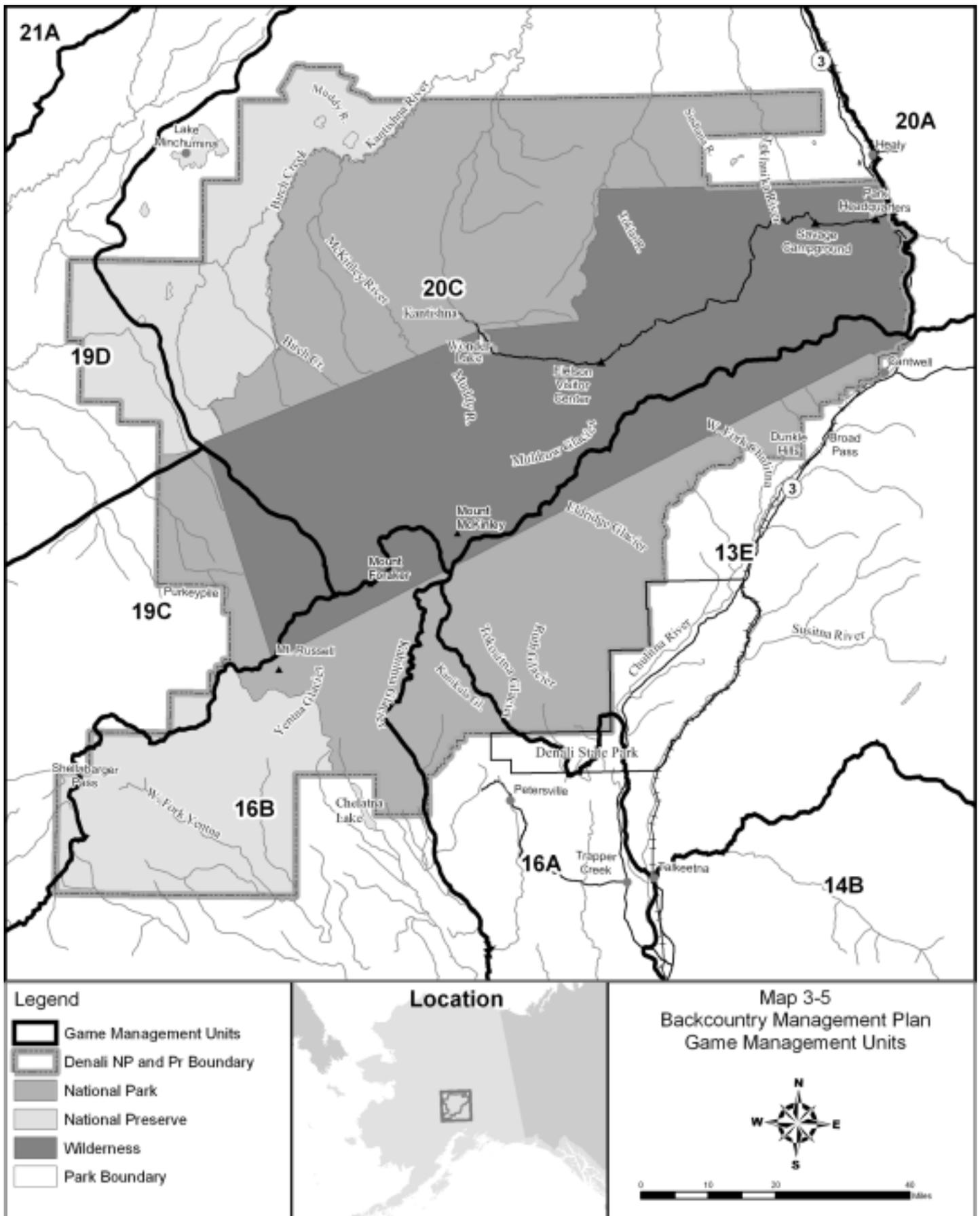
Most of these species are harvested under both subsistence and general hunting regulations. When wildlife resources are limited and not able to sustain both subsistence and sport harvest, ANILCA provides a preference for eligible subsistence users. The hunting seasons vary, depending on the open season for the game being hunted, but are typically during spring (late March through April) for bears and autumn (mid-August through early October) for Dall sheep, moose, and caribou (Jones and Stokes 2000).

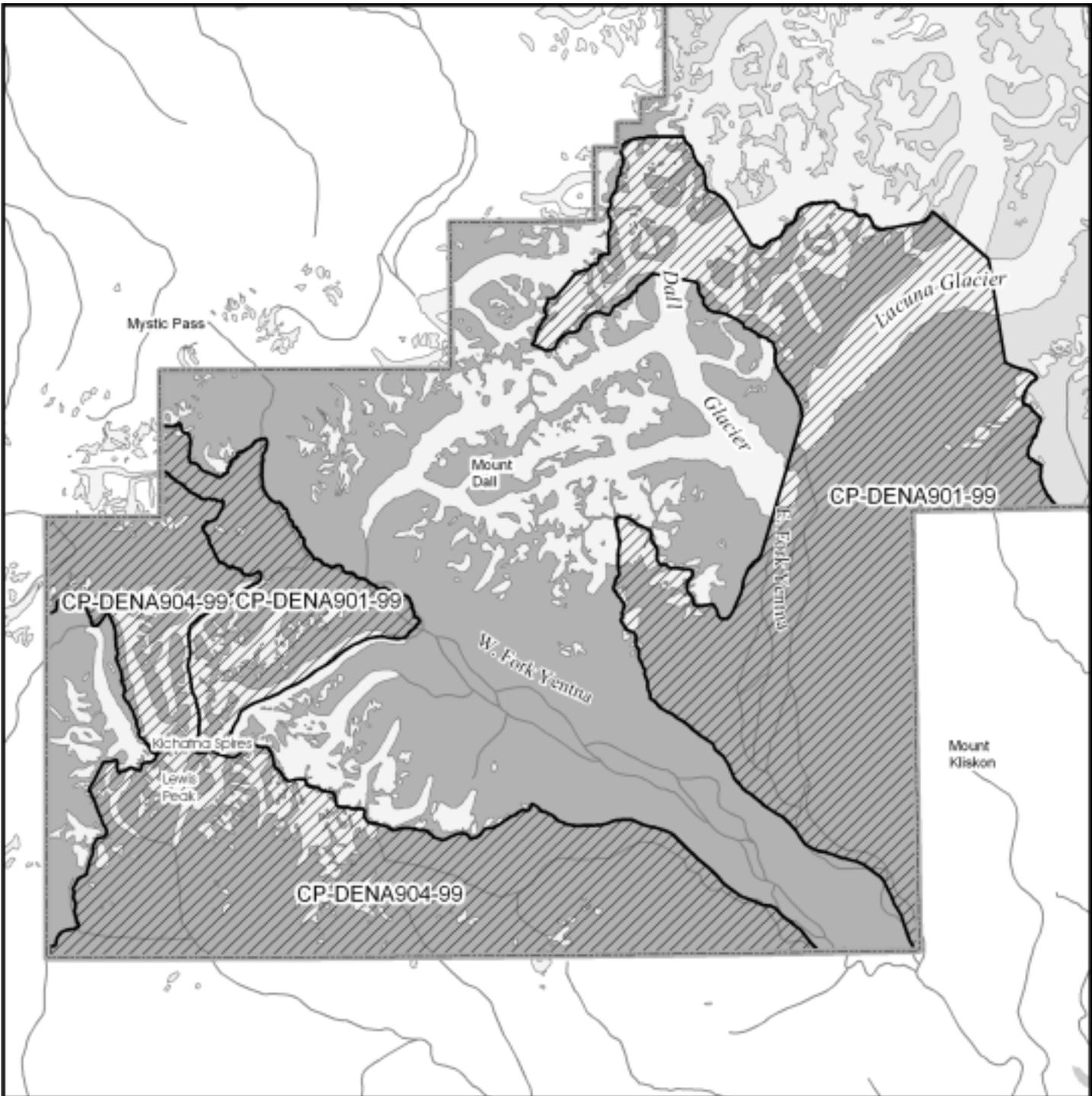
The state of Alaska is divided into 26 game management units (GMUs). Hunting and trapping regulations, harvest reporting requirements, and game management practices are designed specifically to each GMU. GMUs are further divided into subunits and uniform coding units (UCUs) that represent major drainages. See Map 3-5 for a map of GMUs and UCUs that fall within the boundaries of Denali National Park and Preserve.

- Guided Hunting

There is no authorized guiding in the northwest preserve. In the southwest preserve unit of Denali, where much of the hunting activity is guided, two operators are authorized to provide sport hunting guide services. Each guide service is assigned a specific guide area. In 1989, three hunting areas were established and three permits were issued. In 1991, one permit was revoked because of a hunting violation and the area once authorized by this third permit has been divided and assigned to the two existing permits. Authorized guide areas are the East Fork Yentna area and the Kichatna Mountains area. The annual number of clients is limited to 13 for the East Fork Yentna and 7 for the Kichatna Mountains (see Map 3-6: Hunting Guide Areas).

Guided hunts are for legally hunted species as defined in state regulations, unless further restricted by permit or other closures. In addition to state harvest reporting requirements, these guides are required to report hunting and harvest activities directly to the park. Table 3-14 shows the number of trips, number of clients and the number of animals taken from preserve lands.





Legend

-  Guided Hunting Areas
-  Glaciers
-  National Park
-  National Preserve

Location



**Map 3-6
Hunting Guide Areas**



Table 3-14: Guided Hunting Statistics, 1990-2004

Year	# Trips	# Clients	# Animals Taken
1990	11	12	(no record)
1991	4	5	(no record)
1992	8	8	(no record)
1993	1	1	3
1994	10	10	3
1995	10	10	2
1996	8	9	1
1997	5	5	1
1998	3	3	1
1999	1	1	1
2000	(no trips)	--	--
2001	(no trips)	--	--
2002	(no trips)	--	--
2003	(no trips)	--	--
2004	(no trips)	--	--

Guided hunting on preserve lands occurs for a variety of game, including brown and grizzly bear, caribou, moose, and Dall sheep. Many expeditions also include fishing for salmon, grayling, rainbow trout, and Dolly Varden char. Guided hunting expeditions are typically backpack hunts, though canvas-walled tent base camps are used. One guide service has used packhorses occasionally. Hunting and fishing licenses and tags are required, though the guide services typically aid their guests in obtaining them.

Caches of food and gear are allowed for hunting activities in the southwest preserve. They must be transported and stored in a manner that will minimally affect the resource, and they must be removed within one year. Caches must be stored in a manner that wildlife is unable to access the contents per 35 CFR 13.22. Caches must be identified by party or expedition name, along with the dates they are intended for use. Food and gear are frequently cached for sheep hunters in parts of the southwest preserve, including Mystic Pass, Shellabarger Pass, and the Upper Yentna Airstrip.

Sport Fishing

While not many streams or lakes in Denali National Park and Preserve are prime sport fishing areas, there are fishing opportunities throughout the park and preserve. In the Kantishna area, Moose Creek and Wonder Lake offer opportunities for Arctic grayling and lake trout fishing. NPS employees estimate that recreational fishing on Moose Creek upstream of North Face Lodge is minimal, about one person or less per day, or fewer than 90 fishing days per year. About 10 to 15 fishers use Moose Creek below North Face Lodge each day of the season, or about 900 fishing days per season. No catch data are available. State of Alaska fishing licenses can be purchased in Kantishna, and some of the lodges have gear available for use by their guests (NPS 1999c). Fishing licenses are not required in the Old Park.

Anecdotal information indicates that sport fisheries use in the Moose Creek drainage and Wonder Lake by Kantishna lodge guests and other park visitors is increasing. Lake trout found in low-productivity, high-altitude, Alaska lakes, such as Wonder Lake, are generally very slow growing and prone to over harvest from even limited fishing pressure. All of these areas are within easy access to visitors as they are located along the Denali Park road corridor. Other popular fishing areas include the Triple Lakes, accessible from the Parks Highway near McKinley Village, and Caribou Creek, a tributary of the Savage River.

Recreational fishing activity in other areas of the park and preserve is not well known. However, fishing is popular on the south side of the Alaska Range near the park boundary. The numerous surface waters provide habitat for the migration, spawning, and rearing of a variety of fish species, such as salmon, rainbow trout, Arctic grayling, northern pike, burbot, and whitefish.

Winter Recreation

Denali National Park and Preserve offers many opportunities for winter recreation, although the park presently offers few facilities to support winter use. The park road is generally not plowed past park headquarters at Mile 3 from October through March, and skiers, dog mushers, skijorers, and snowshoers regularly use it for recreation throughout the winter. NPS staff and dog teams put in an unmarked winter trail from park headquarters to Wonder Lake that is used by adventurous, long-distance winter travelers. Other use along the trails and creek beds of the park entrance area is also common. It is the south slope of the Alaska Range, however, that often provides the most reliable snow for winter recreational opportunities for visitors.

Winter use in the park entrance area has been increasing in recent years. NPS dog sled patrols encountered 55 visitors along the road between November 1, 1999, and March 15, 2000. During the winter months of 2003-2004, NPS kennels staff encountered 134 visitors in the park, an estimated 121 (90%) of which were along the road or Aufeis Trail within 5 miles of Headquarters. In addition, 248 visitors were contacted at the kennel between October 1, 2003 and April 1, 2004 (Fortier, pers. comm.).

- Dog Mushing

Dog mushing is a winter activity that occurs throughout Denali National Park and Preserve and is perhaps Denali's most emblematic backcountry activity because of the long and colorful history of ranger dog-team patrols in the park. There is perhaps more private dog mushing on the south side of the Alaska Range than the north, although the significant distance between park boundaries and accessible winter staging areas limits the amount of activity that occurs on national park land; most occurs on adjacent state or other lands (NPS 1997).

NPS-permitted concessioners operate passenger services on the north side of the Alaska Range. In 1998, new concession contracts were awarded to three businesses for operating dog sled passenger services within the boundaries of the park and preserve. One concessioner offered day trips only, while the other two offered overnight trips. After the winter of 2000-2001, the day-trip concessioner ceased operations in the park. The typical season for dog mushing in Denali

National Park and Preserve is between December and April, with March being the busiest month. During that period, snow conditions are best for dog mushing (Jones and Stokes 2000).

Day trips were generally between 4 and 6 hours, while overnight trips presently last from 2 to 7 days. Dog mushing trips into the park and preserve range from 2 to 5 guests per trip, with 1-2 guides. Concessioners operate between 2 and 15 trips per year. In the winter of 2003-2004, 8 overnight trips took 16 people on passenger dog sled tours in Denali National Park and Preserve (NPS concessions data). The number of trips and the number of clients have gradually been increasing since the concessioners started business.

NPS-permitted concessioners sometimes use trails leading from the Stampede Road or the park headquarters west along the park road to the lower Toklat River and Wonder Lake areas. The dog sled operations often use snowmachines outside the Old Park for laying trails.

For visitors participating in guided passenger dog mushing, experiences can be highly satisfactory. The solitude, quiet, and historic Alaska means of transportation are often unique experiences for visitors to Denali (Jones and Stokes 2000).

Educational Programs

A number of educational programs for park visitors are offered in the Denali backcountry. Although many concession-guided activities are also educational, these programs are distinguished as having education as a primary purpose and being offered by the Murie Science and Learning Center, non-profit organizations operating in the park under a cooperative agreement, accredited institutions, or the National Park Service itself.

The National Park Service offers Discovery Hikes daily, roughly between mid-June and the end of August. These hikes are designed to provide natural history interpretation and to teach visitors how to hike safely and without damaging resources in Denali's backcountry. Visitors catch a designated bus at the visitor center and meet a ranger at a specified location on the park road to begin the hike. There is a limit of 15 visitors allowed on each hike, and visitors must sign up in advance to participate. To avoid overusing an area and causing social trail formation, Discovery Hikes are only allowed two times per year in any one location, except on gravel riverbeds or similar durable ground. In 1996, 124 hikes were offered with a total number of 1,212 participants. In 2003, 163 hikes were offered and 1,764 visitors participated.

Access

Like much of Alaska, the remote location of Denali National Park and Preserve has meant that the availability of access to the park has been the most important determining factor for the level of and type of visitor use, both in the backcountry and the frontcountry. The availability of surface transportation both to and into the park developed slowly through the twentieth century, and direct, all-weather access to the park entrance was not available until the fall of 1971. Much of the park remains accessible primarily by air transport.

The transportation systems and access considerations described briefly below are treated in more depth in the *General Management Plan* (NPS 1986), the *Alternative Transportation Modes Feasibility Study, Volume II* (NPS 1994a) and the *Entrance Area and Road Corridor Development Concept Plan and Environmental Impact Statement* (NPS 1997a). In addition, an entrance area transportation planning effort is underway.

Access to the park and preserve lands was redefined by the Alaska National Interest Lands Conservation Act of 1980. ANILCA Title VIII guarantees access for subsistence activities via traditionally-employed means of access, and Title XI guarantees access for traditional activities and travel to and from villages and homesites.

Surface Transportation

- Railroad and Highways

The Alaska Railroad was the first mode of mechanized transportation to the original Mount McKinley National Park after the park was established in 1917. The railroad was completed in 1922, and that year there were seven visitors to the park. The railroad passes through the Alaska Range via Broad Pass and the Nenana River canyon along the eastern edge of the Old Park. Until the Denali Highway was completed in 1957, the railroad was the only easy means of access to the park. Automobiles were carried on flat cars for use on the park road before 1957.

The park was linked to the statewide road system in 1957 with completion of the Denali Highway, a 135-mile gravel road extending northwest from Paxson on the Richardson Highway to Cantwell, near the Parks Highway and south of the park entrance. Road access to the park via this route involved a long, circuitous drive from Anchorage via the Glenn and Richardson Highways or from Fairbanks and Valdez via the Richardson Highway. Road access did encourage more visits, however, and by 1962 the park was receiving more than 16,000 visits annually (NPS 1997).

Access to the park improved further in the fall of 1971 with the completion of the George Parks Highway. The highway linked Alaska's two major population centers, Anchorage and Fairbanks. It provided a more direct route for buses and private vehicles to travel between the two cities. The highway follows the eastern edge of the park and enters it for a 7-mile section near the park's main entrance, which is approximately 240 miles north of Anchorage and 120 miles south of Fairbanks. Visitation to the park and preserve increased dramatically from that point forward – a record 88,615 recreational visits in 1972 alone (NPS 1997). Many visitors arrive by this route, either by commercial bus, rental vehicle, or their own vehicle. However, in recent years the proportion of visitors using the railroad, particularly those on packaged commercial tours, has been increasing.

Table 3-15: Visitor Arrivals by Transportation Mode, 1995, Denali National Park and Preserve – Entrance Area

Transportation Mode	Numbers
Automobile	373,569
Railroad	128,221
Bus *	28,832
Air	5,053

**Estimated*

- Park Road

The 92-mile park road, completed to Kantishna in 1938, serves as the major access route to the interior of the Old Park and the existing backcountry units, as well as to the historical mining district at Kantishna. The road was designed as a low speed route for wildlife viewing. Restriction on use of the park road began in 1972 after the completion of the George Parks Highway. The first 15 miles of the road are paved and open to all traffic. Beyond Mile 15, the road is gravel and travel is restricted to tour and shuttle buses, vehicles used to access private inholdings (including businesses in Kantishna), administrative traffic, campers driving to Teklanika Campground (minimum 3-night stay), limited numbers of professional photographers, and occasional specially permitted uses.

The NPS initiated the shuttle bus service to provide visitor transportation into the interior of the park while minimizing wildlife disturbance. The Visitor Transportation System (VTS) is intended to promote a leisurely park experience, with visitors getting off the bus to explore an area and then return on a later bus. Most visitors tend to remain aboard a bus until it reaches the Eielson Visitor Center, the primary destination in the park interior.

There is also a seasonal limit of 10,512 vehicles allowed to travel the restricted part of the park road during the core visitor use period (Saturday before Memorial Day to the Thursday after Labor Day) established by the 1986 *General Management Plan* and codified in NPS regulations that were published in the *Federal Register* in June 2000 (36 CFR 13.63(d)(2)). The quota is allocated between tour buses, shuttle buses, private vehicles, and administrative traffic. The restrictions and quotas are in place to protect both wildlife viewing opportunities and the wilderness character of the road itself.

For overnight campers, there are designated shuttle buses called “camper buses” that provide transportation to campgrounds or starting points for an overnight backcountry expedition. These buses have fewer seats than standard shuttle buses so there is room to store backpacks and other camping gear. Individuals must have either a backcountry permit or a campground permit to obtain a ticket for a camper bus.

Except for daily bus limits, no limits have been established for road use during the two shoulder seasons (before and after the core visitor use period) when private vehicles and tour buses are permitted to drive as far as the Teklanika rest stop (mile 30), if weather and road conditions allow. In September, after the shuttle bus system ceases operation, a lottery system offers the public an opportunity to drive their private vehicles on the park road. During the second weekend after Labor Day (Friday-Monday), up to 1,600 lottery winners (400 per day) are permitted to drive their vehicles as far as Kantishna. Although there is no restriction on vehicle use of the paved road section, NPS traffic statistics indicate that this use is also increasing steadily from spring through fall with as many as 500 vehicles per day driving to the Savage River Bridge during peak season.

Other Surface Access

In addition to vehicular access by way of the park road, highway, or railroad, a variety of other modes of surface transportation is used for access into the park and preserve and its backcountry, including snowmobiles, motorboats, pack animals, and dog teams. ANILCA specifically allows these modes of access for some activities, although all of them are subject to regulation to protect resource values.

Non-motorized access into the backcountry portions of the park and preserve principally consists of hiking into designated backcountry units in the Old Park and northern additions from the park road. Less use is made of the backcountry on the south side of the park by hikers (the notable exception being climbers attempting Mount McKinley and surrounding peaks) because of the greater difficulty and expense of access. This access typically relies on some form of motorized transport, usually an airplane, to reach the point from which the visitors hike, mush, or ski. A small number of winter backcountry visitors ski into the park from the highway and railroad corridor.

- Snowmachines

In terms of the number of park visitors using off-road surface transportation, snowmachines (snowmobiles) top the list. Before 1980, Mount McKinley National Park was closed to snowmobile use. The passage of ANILCA in 1980 authorized snowmachine use throughout the entirety of Denali National Park and Preserve for “traditional activities.” However, ANILCA did not define which activities are included in “traditional activities.”

On June 19, 2000, final special regulations for Denali National Park and Preserve were published in the *Federal Register* (65 FR 37863). The regulation established a definition of “traditional activity” that applied only to the former Mount McKinley National Park area of Denali National Park and Preserve. The rule also determined that before the enactment of ANILCA, no traditional activities took place for which snowmachines may now be used. In addition, the rule implements the June 2000 Statement of Finding, *Permanent Closure of the Former Mt. McKinley National Park Area of Denali National Park and Preserve to the Use of Snowmachines (Snowmobiles)* (NPS 2000) and determines that any snowmachine use in the Old

Park would be detrimental to the resource values of the area. The preamble to the regulation provided that the NPS intends to define traditional activities and apply such definitions to other park areas, including the remainder of Denali in subsequent processes, such as future rulemakings to implement backcountry management plans. The preamble noted that the use of the Old Park might be distinct as compared to the additions created by ANILCA because of the different administrative history.

Winter access to the park additions and preserve by snowmachines is allowed for traditional activities, provided sufficient snow cover is present to protect vegetation and soils. ANILCA also allows access to homesites and between-village travel (for example, between Minchumina and Telida). Most snowmachine users who enter the park and preserve do so from the Parks Highway on the south side of the Alaska Range (See Map 3-7). Denali National Park and Preserve is presently not open to snowmachine access for uses other than traditional activities (36 CFR 2.18).

- Off-road Vehicles (ORVs)

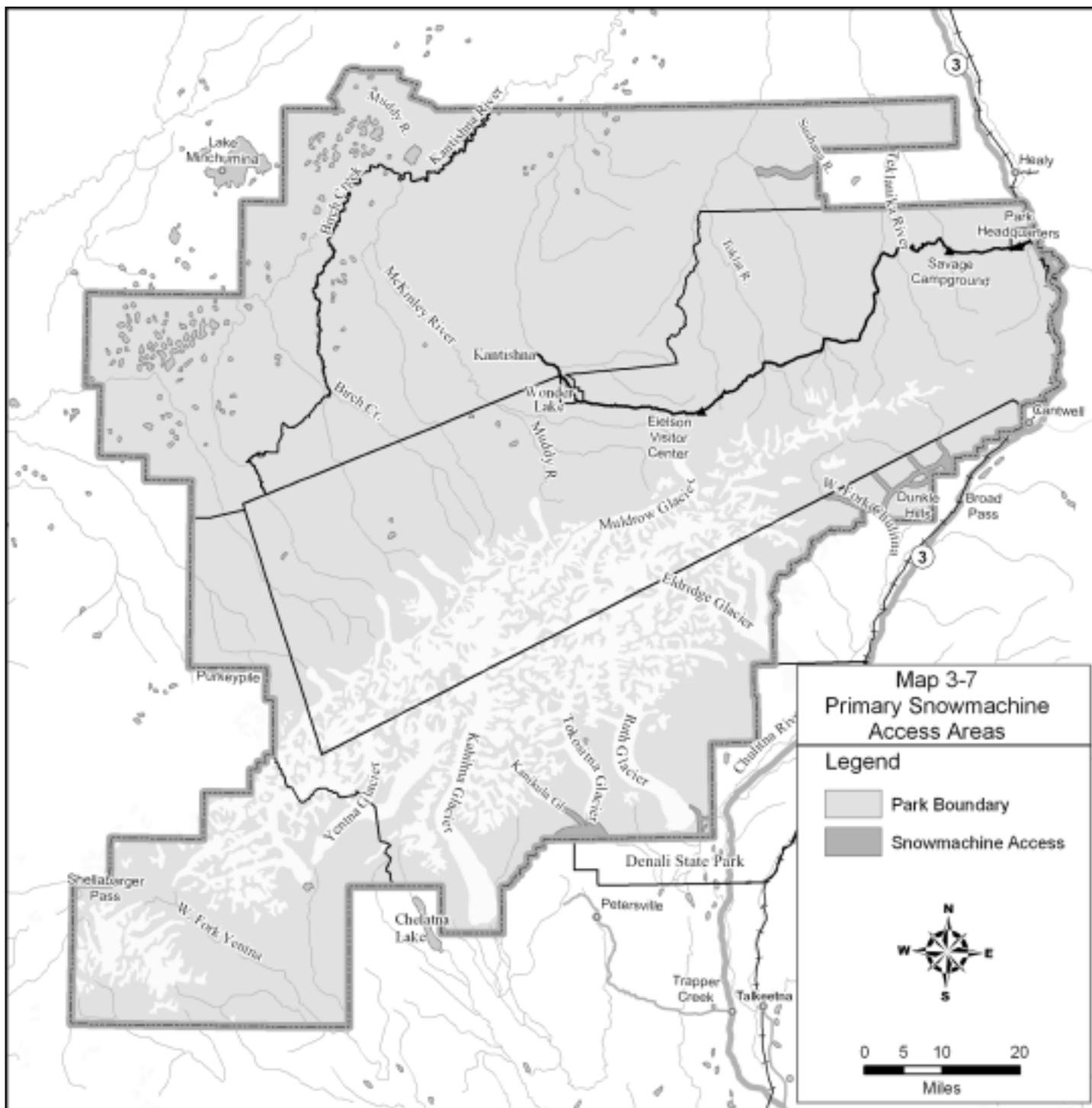
The use of ORVs in the backcountry is prohibited throughout the national park and preserve consistent with existing regulations. The only exceptions are for specific permitted access to some inholdings in the Kantishna Hills to meet the requirement of ANILCA 1110(b) and subsistence access on constructed mining access routes in the Kantishna Hills. There is also access along the state right-of-way in the Dunkle Hills. In addition, NPS is evaluating ORV use on two short sections of trail in the Cantwell area for subsistence purposes, but no determination has yet been made and these trail sections are presently not open to ORV use.

One commercial business transports visitors along a state right-of-way to locations in park additions in the Dunkle Hills, about 60 miles south of the park entrance. Visitors ride in a 14,000-pound (7-ton) truck with 64-inch tires and a very low gear ratio. The vehicle makes a 30-mile roundtrip tour along a former mining access route and provides drop-offs and pick-ups for day hikers and mountain bikers, but not for overnight use.

A 2003 report on ORV use in Alaska Region national park units noted that there are 10 ORV routes in Denali National Park and Preserve (NPS 2003). These routes are a mixture of the routes used for inholder access in Kantishna, the state right-of-way, the sections of trail near Cantwell that are being considered for subsistence use, and trespass trails that are a current concern for enforcement.

- Motorboats

Limited use of motorboats for access occurs in some parts of the park and preserve, particularly along the Tokositna River in the southern additions and the Muddy and Kantishna Rivers in the northern additions.



- Pack Animals

Horses and other pack animals are allowed for access to subsistence and traditional activities in the park additions and preserve. They are allowed for other uses subject to permit conditions. One hunting outfitter with a history of packhorse use that predated ANILCA is allowed to continue that use in the southwestern preserve unit. Between 1970 and 1980, a concessionaire was permitted to offer freight hauling services to McGonagall Pass and for pleasure trips. However, significant vegetation damage occurred. When the concessionaire reapplied for the permit in 1980, the park could not complete a Finding of No Significant Impact in an Environmental Assessment and concluded an Environmental Impact Statement would be required. The concessionaire chose not to continue the permit application. The only other commercial use of horses allowed in the park and preserve is for lodge-based trail rides in the Kantishna vicinity.

- Sled Dogs

There is a history of dog mushing in the park, and ranger patrols still rely on sled dogs for transportation in the Old Park wilderness. Several concessioners offer winter trips of varying length by dog sled, primarily on the north side of the park. Day trips by dog sled are common during the winter between the entrance area and Savage River.

- Future Access

Improved access on the southern side of the Alaska Range is likely to occur in the near future as part of the proposal for a new visitor center in the Petersville area that was evaluated in the *South Side Development Concept Plan EIS* (NPS 1997). That proposed project – currently the subject of a continuing cooperative planning effort by the NPS, State of Alaska, and the Matanuska-Susitna Borough – would provide a new means of access for visitors to the south side of the park and preserve.

Potential future access in the northeastern portion of the park has been discussed under the concept of a proposed North Access route, which would consist of a road or rail link to Kantishna from the Healy area (NPS 1997). That proposal, which would involve a significant new means of access into the park, would require a separate EIS and is not considered reasonably foreseeable at this time.

- Access Easements and Right-of Ways

Access to park lands includes Alaska Native Claims Settlement Act (ANCSA) Section 17(b) public access easements. These easements are intended to provide connecting access for public lands or waters across native corporation land conveyed by ANCSA. The National Park Service at Denali is responsible for managing three 17(b) easements:

1. The former cat-trail (EIN 7a C5, DI. L) from near the Cantwell Airstrip to the park boundary (it is 25 feet wide and allows travel by foot, dogsleds, animals, snowmachine, two- and three-wheeled vehicles, and small all-terrain vehicles);

2. A 5-mile easement (EIN 21C5) from near the junction of Highpower Creek and Swift Fork River to the preserve boundary (it is 25 feet wide and allows travel by foot, dogsleds, animals, snowmachine, two- and three-wheeled vehicles, and small all-terrain vehicles); and
3. A one-acre overnight camping site (EIN 4 D1) on an unnamed lake north of the Muddy River.

For the Cantwell-area 17(b) easement, there is no identified public access on the Cantwell side; legal access is blocked by several parcels of private property north of the Alaska Railroad crossing. It appears that this obstacle was known at the time the easement was reserved, but access was never resolved. Members of the local community and landowners are increasingly concerned about park visitors crossing private land to reach the easement (see Map 2-7).

The State of Alaska has asserted R.S. 2477 right-of-ways across Denali National Park and Preserve; these were listed in the 1986 *General Management Plan* (NPS 1986). The validity and limitations of any R.S. 2477 rights-of-way asserted by the State of Alaska across Denali National Park and Preserve lands would be determined on a case-by-case basis.

There is an existing state right-of-way along a former mining road that extends into the Dunkle Hills.

Air Transportation

Airplanes provide the principal means of access to most of the park and preserve. The more remote southern side and much of the northern and western portions of the 1980 additions can only be reached by air or long, difficult overland travel.

A large volume of air taxi and scenic tour traffic originates from Talkeetna, and the traffic is growing rapidly. While the number of airport advisories given at the airport remained relatively flat from 1991 to 1996, from 1996 through 2001 the number of advisories rose 44%, from 13,619 to 20,046. The Alaska Department of Transportation and Public Facilities is planning to upgrade the airport in a phased program of improvements (NPS 1997). Other flights originate from the McKinley Park Airstrip in the park entrance area, Healy, Kantishna, and even more distant points such as Anchorage and Fairbanks. Most developed airstrips in the park and preserve were originally constructed to support mining operations, especially in the Kantishna Hills and Peters Hills.

- Landings

The National Park Service has regulatory authority over aircraft landings within the management boundaries of Denali National Park and Preserve. Commercial airplane landings require a permit, with private airplane landings allowed by regulation (43 Code of Federal Regulations). Helicopter landings are not allowed anywhere in the park or preserve except for administrative purposes and emergencies.

Backcountry Landing Areas. While the only maintained landing strips in the park and preserve are the McKinley Airstrip at the park entrance and the Kantishna airstrip at the west end of the park road, there are formerly-constructed airstrips and other undeveloped areas, such as gravel bars on braided rivers and dry ridgetops, that provided suitable landing sites for small aircraft equipped with large tundra tires. Ski-equipped airplanes can land throughout much of the park and preserve during the winter and on glaciers during the summer when snow conditions allow. Relatively few private airplanes land in the backcountry of the park and preserve because of weather, topography, glacier and snow conditions, the low number of adequate landing strips, and the need for special equipment and pilot proficiency for landing everywhere but on the maintained landing strips.

Designated backcountry landing strips may be maintained as needed with non-motorized hand tools by people using the areas. Any other maintenance requires a permit from the superintendent. Outside of the designated landing area, no alteration of vegetation or terrain is authorized for landings and takeoffs except in emergencies (NPS 1986).

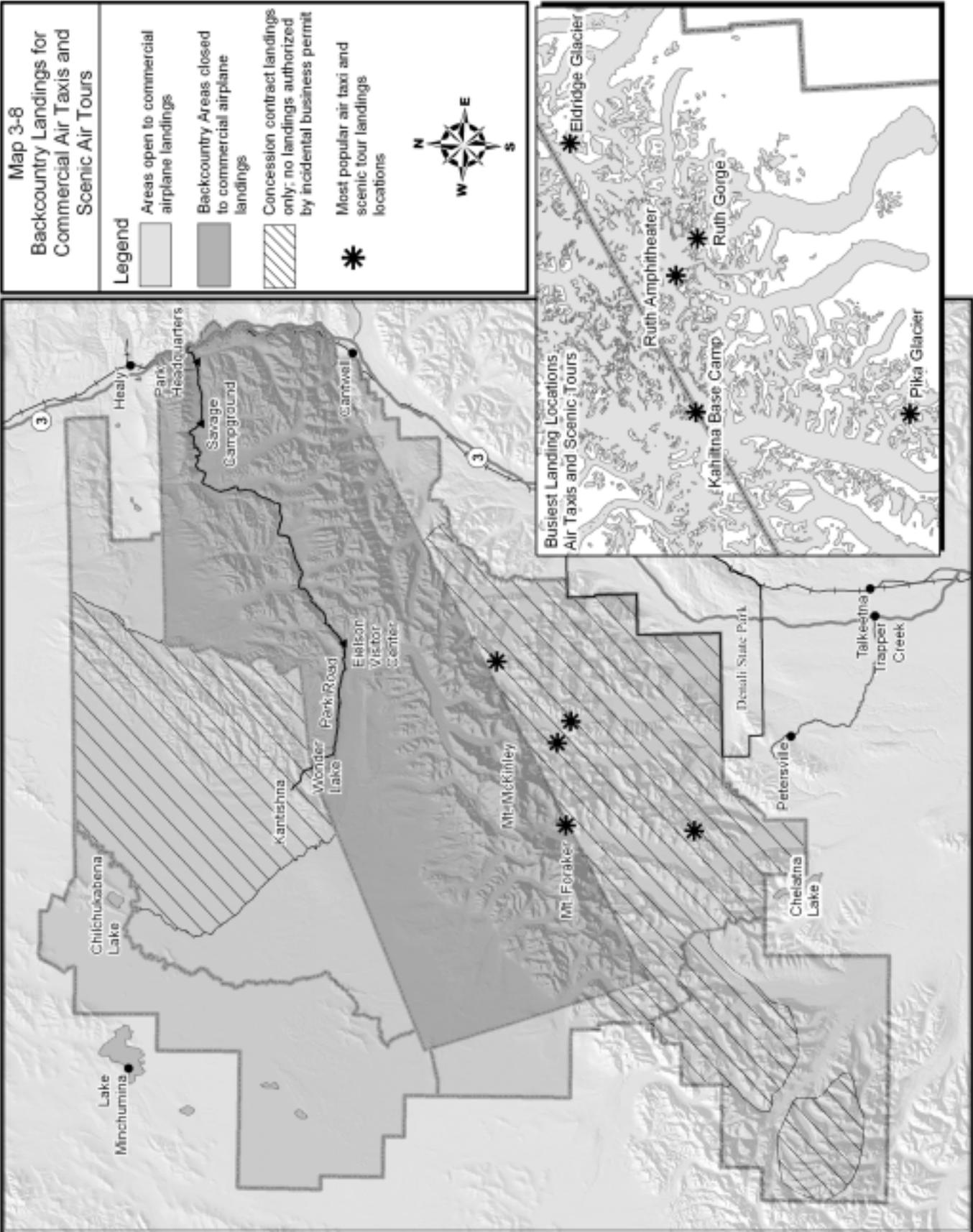
General Aviation. The airspace over the park and preserve is unrestricted for general aviation (non-commercial) pilots. While air traffic is generally lighter in the winter, use occurs year-round. Most pilots land for a few hours or spend one night on the ground.

Commercial Services: Air Taxi and Scenic Air Tour Landings. Much of the aircraft activity in the park and preserve is generated by businesses that provide air taxi and scenic air tour services to visitors wanting to access or see the remote parts of Denali. An *air taxi* is a commercial flight in which visitors and/or their equipment are taken to a location and left or picked up. A *scenic tour* (flightseeing) is a flight in which passengers remain with their aircraft for the entire trip, although authorized concessioners may offer their passengers the opportunity to land briefly on a glacier as part of the tour. There are six businesses with concession contracts authorized to land on glaciers in the southern park additions and 14 holders of incidental business permits (IBPs) to land elsewhere within the IBP area (see Map 3-8: Backcountry Landing Areas for Commercial Air Taxis and Scenic Air Tours). No commercial landings are permitted in the backcountry of the Old Park. The IBP holders make few landings in the park; in fact, many of them do not land at all.

Air taxi services transport visitors for a variety of backcountry recreational uses, including mountaineering, hunting, fishing, boating (kayaking and rafting), hiking, and camping. Mountaineering constitutes the majority of the air taxi trips for the services operating within the park and preserve; mountaineers are landed on glaciers on the south side of the Alaska Range to begin their expeditions.

The same companies that provide air taxi services make scenic tour landings, and they land in the same areas as air taxi flights. However, scenic tour flights concentrate their landings in just a few locations, with the Ruth Glacier as the primary landing area.

Air taxi flights and air scenic tours vary in duration. Because of the nature of the service provided, air taxi flights vary in length depending on drop-off/pick-up location, air traffic, and



weather. The length of time between drop-off and pick-up also varies depending upon the recreational activity and volume of business being handled by the service. For mountaineers, the duration is typically between drop-off and pick-up is typically between 15 and 25 days (Jones and Stokes 2000). The duration of scenic tours depend on the flight path, weather conditions, and if glacier landings are included. Flights typically range between one and two hours, with most of that time over the park. Glacier landings are short-term – typically 15-30 minutes – allowing enough time to step out of the airplane, walk around, and take a few photographs (Jones and Stokes 2000).

Table 3-16 shows the number of commercial air taxi and scenic tour landings on glaciers and the number of passengers from 1999 through 2004. The number of flights with landings increased rapidly up through 2001 before declining and stabilizing at about 3,000 per year, still reflecting an 11% increase over the six-year period. However, passenger volume has continued to increase reflecting the use of larger planes and greater capacity utilization on the part of the operators generally. The number of passengers landing on glaciers has increased 38% from 1999 through 2004. Air access now accounts for a substantial number of backcountry visitors, both those participating in extended expeditions and short duration visits.

Table 3-16: Total Flights with Landings and Passengers by Year, 1999-2004

Year	Air Taxi Flights		Scenic Tour Flights		Total	
	Flights	Passengers*	Flights	Passengers	Flights	Passengers
1999	935	2,914	1,666	6,517	2,601	9,431
2000	999	3,422	2,118	8,266	3,117	11,688
2001	1,088	3,875	2,284	9,436	3,372	13,311
2002	978	3,665	2,028	8,380	3,006	12,045
2003	977	3,669	2,024	9,817	3,001	13,486
2004	874	3,419	2,006	9,578	2,880	12,997

* Air taxi passengers are counted both when they are dropped and picked up, so many are double-counted.

Source: NPS Concessions Data

The number of air taxi landings peak in May and June, and most occur at Kahiltna Base Camp. There is significant traffic to other locations that attract climbers and mountaineers, particularly the Ruth Glacier Amphitheater. The Pika and Eldridge Glaciers have also seen substantial numbers of landings over the period 1999-2004. By contrast, the peak months for scenic tour landings is June and July, and almost all of the traffic lands in the Ruth Amphitheater. Base Camp may receive between 100 and 200 scenic tour landings a year, the Pika Glacier has had two seasons where it received about 170 landings, and the Eldridge Glacier saw 565 scenic air tour landings in 2004.

Table 3-17: Busiest Landing Locations, Air Taxis and Scenic Tours

Landing Location	Total Reported Landings 1999-2004		
	Air Taxi	Scenic Tour	Total
Ruth Amphitheater	1,064	9,815	10,879
Kahiltna Base Camp	4,276	659	4,935
Eldridge Glacier	123	737	860
Pika Glacier (Little Switzerland)	323	444	767
Ruth Gorge	128	40	168

Source: NPS Concessions Data

The Ruth Amphitheater is by far the busiest landing location in the park – during June there is usually an average of 20-30 landings per day, and there have been up to 62 landings in a single day. By comparison, peak season average for landings at Kahiltna Base Camp – the next busiest landing location – is usually between 12 and 13 landings per day and only rarely are there more than 40 landings in a single day. (See Table 3-18)

Table 3-18: Average, Maximum, and Total Concession Airplane Landings, Kahiltna Base Camp and Ruth Amphitheater

		Kahiltna Base Camp					Ruth Amphitheater				
		1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
Average Daily Landings	May	10.5	11.2	13.1	14.0	12.3	9.2	10.9	10.6	14.0	8.0
	June	13.0	11.0	12.0	9.1	12.4	23.8	25.2	35.4	23.3	17.5
	July	1.9	1.8	2.5	1.9	1.5	11.8	14.9	13.1	16.2	18.8
	August	0.0	0.4	3.5	0.1	0.0	0.0	7.0	6.1	4.1	13.5
Maximum Daily Landings	May	38	31	51	28	36	24	31	27	31	38
	June	43	23	24	30	35	42	51	55	61	57
	July	11	11	20	13	9	47	49	47	49	62
	August	0	5	21	1	0	0	29	28	19	35
Number Days with 20+ Landings		9	6	14	11	10	36	39	39	42	36
Total Landings		805	802	995	790	854	1,422	1,924	2,107	1,929	2,036

Source: NPS Concessions Data

Concern has been expressed about air safety at current levels of flight activity, particularly in the Ruth Amphitheater on the south side of the Alaska Range near Mount McKinley. In the past, air taxi and flightseeing services operating out of Talkeetna have voluntarily met with each other and the National Park Service to improve safety in Denali National Park and Preserve. Specific radio frequencies have been designated for safety in all aircraft flying throughout the park and preserve, with reporting of aircraft location occurring on a regular basis. The Federal Aviation Administration, NPS, and air tour operators have cooperatively developed a Denali flight advisory map showing geographic reporting points, Common Traffic Advisory Frequencies, and geographic-based in-flight communication frequencies.

- **Overflights**

The National Park Service does not have control over fixed-wing airplane or helicopter flights in the air space above Denali National Park and Preserve, since air space is regulated by the Federal Aviation Administration (FAA). The FAA has complete regulatory authority over airspace classification and use within the territorial limits of the United States.

All aircraft are requested to maintain a minimum altitude of at least 2,000 feet above ground surface within the park boundaries. FAA Advisory Circular 91-36C (“VFR Flight near Noise-Sensitive Area”) defines the surface as the highest terrain within 2,000 feet laterally of the route or uppermost rim of a canyon or valley. More-specific guidelines are in effect in other parts of Alaska. Togiak National Wildlife Refuge has been identified as a “Wildlife Sensitive Zone,” where pilots are requested to fly above 2,000 AGL (above ground level) from April 1 through October 1 because of heavy concentrations of migratory waterfowl, sea birds, and marine mammals. Except in an emergency, the landing of aircraft is restricted to lakes, streams, and other bodies of water on the refuge and adjacent established village airstrips that are available. In the Walrus Islands State Game Sanctuary, pilots are advised to maintain a minimum altitude of 5,000 feet above ground level within a three-mile radius of Round Island (U.S. Department of Transportation 2000a). At the Kupreanof Peninsula Area, pilots are advised to fly above 1,000 feet within two nautical miles of Kupreanof Wilderness Retreat from March 1 through June 30.

Scenic Air Tours. Approximately 36 aviation companies based along the George Parks Highway corridor from Anchorage to Fairbanks advertise air tours in portions of the park and preserve. Air tours can be either by helicopter or airplane, although helicopters are not permitted to land. They occur throughout the park, but the majority of flights are concentrated on the south side of the Alaska Range, centered on Mount McKinley. The majority of the tours follow a flight path along the Kahiltna, Tokositna, and Ruth Glaciers, possibly circling Mount McKinley or Mount Foraker, depending on flight duration (Jones and Stokes 2000). Flights leaving from the park entrance generally follow the spine of the Alaska Range to Mount McKinley (R.D. Rosso, pers. comm). In recent years, specialty tours have developed, such as Lear jet tours and a 1940’s-themed DC-3 tour.

One flightseeing concession is based in Kantishna and serves primarily guests of the lodges. The concession operator is presently allowed to take 290 flightseeing trips from the Kantishna airstrip and 150 flights between the Kantishna airstrip and the McKinley Park airstrip at the park entrance.

General Aviation. The airspace over the park and preserve is unrestricted for general aviation pilots. A 2000-01 Alaskan Aviations Safety Foundation survey found the following areas to be most popular for general aviation (non-commercial use):

- Kantishna and McKinley Airstrip to Healy
- Most north and east parts of the park
- Broad Pass
- East and West Forks of the Yentna River

- Foraker River
- Herron River
- Windy Pass via Cantwell
- Toklat and Sushana Rivers
- Petersville
- North boundary
- Mount McKinley, Mount Hunter, and Mount Foraker

Commercial Overflights. In addition to the air tour companies, commercial aircraft en route between destinations often fly over the park. The Federal Aviation Administration has established high and low altitude IFR (instrument flight rules) routes that pass over and near the park. Traffic between Anchorage and Fairbanks uses the IFR routes alongside and over the park's eastern boundary. When conditions permit, commercial flights may request a "McKinley Tour" and be permitted to fly more directly over the park. The Kahiltna Pass between Mount Foraker and Mount McKinley is a popular route for commercial traffic during favorable weather conditions and good visibility. By regulation this "McKinley Tour" traffic must remain above 23,000 feet.

Military Overflights. The Air Force's Susitna Military Operating Area (MOA) lies partly over the southern park and preserve. The "floor" is set at 10,000 feet above mean sea level (MSL) or 5,000 feet AGL, whichever is higher. Overflights can occur between 7 a.m. and 10 p.m. (Captain Gary L. Rolf, pers. comm.). The military conducts an average of 3 flights per day (primarily by F-15s) in the Susitna MOA and an average of 8-12 flights per day (U.S. Department of Defense 1995).

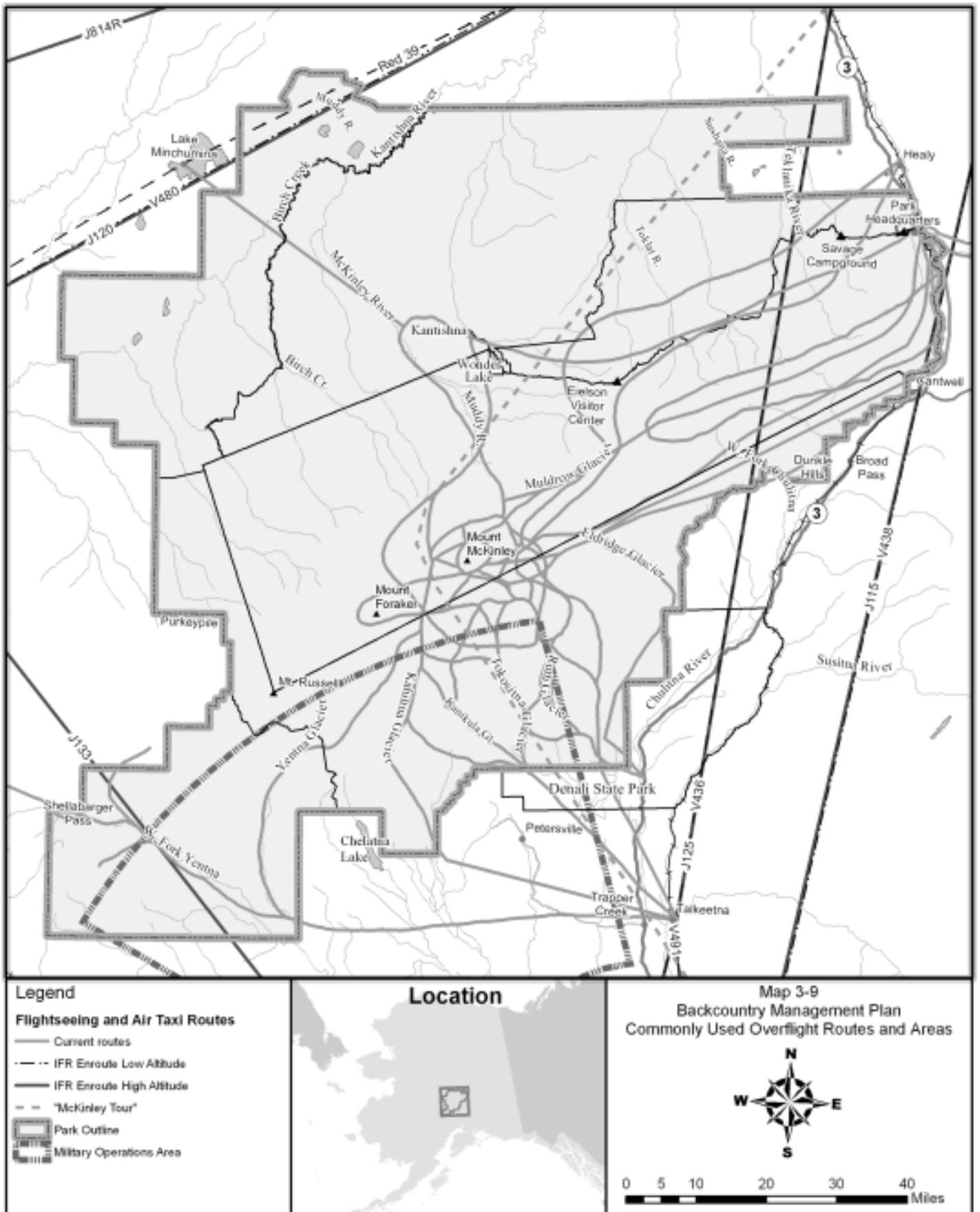
Map 3-9 depicts common flight routes and areas over Denali National Park and Preserve.

Backcountry Facilities

Relative to its size, Denali National Park and Preserve has very few facilities. There are no maintained trails, designated campsites, or public use cabins in the backcountry. The majority of facilities in Denali National Park and Preserve are located near the park entrance and along the 92-mile park road (Map 3-2: Cities, Towns, and Boroughs), aside from a ranger station in Talkeetna. The park entrance is located at the intersection of the George Parks Highway and the park road. Many of the park facilities are designed to support the park's visitor transportation and tour bus system that operates during the peak visitor use season between May and September.

Information Facilities

Backcountry information, overnight camping permits, and camper bus tickets are available during the summer at the park Wilderness Access Center (formerly called the "Visitor Access Center"). During winter months, information and permits are available at the Murie Science and Learning Center. Information and registration for mountaineers and other backcountry users is available year-round at the Talkeetna Ranger Station.



An important role of the information facilities is to provide a mandatory safety and resource protection orientation. For overnight backpackers, this orientation covers such topics as minimum impact camping, bear encounters, and river crossing technique. For mountaineers, the orientation covers topics such as waste and trash disposal, route logistics, and climbing safety.

The 1997 *South Side DCP and EIS* called for a visitor center to be constructed in an alpine saddle between the Peters and Dutch Hills in Denali State Park overlooking the Tokositna River and Glacier. The *DCP* also indicated that additional visitor information facilities could be built along the Parks Highway on the south side of the Alaska Range. An implementation plan presently in preparation is considering alternatives for either option.

Shelters and Cabins

Denali has no backcountry public use cabins or other shelters. The 1997 *South Side DCP and EIS* calls for building up to six public use cabins on state land in cooperation with Alaska State Parks in the Tokositna and Chelatna Lake areas.

Campsites

Denali has no designated campsites in the backcountry. There are six frontcountry campgrounds along the park road corridor offering varying levels of amenities and access. Backcountry trips can be seamlessly coupled with stays at the park campgrounds. The 1997 *South Side DCP and EIS* calls for the development of five primitive campsites at Chelatna Lake.

Park Road

During summer months, the 92-mile park road is Denali's primary frontcountry transportation facility and outside the scope of this plan. However, during winter months the park road has traditionally been left unplowed past Park Headquarters at mile 3, effectively becoming a part of the park backcountry. The first few miles from Headquarters to treeline become an important trail for skiers, snowshoers, and dog mushers on day-trips or beginning a longer expedition. There is a transition period usually beginning in late March when road crews begin plowing the road in preparation for the summer season. As conditions allow, the road is then opened to vehicle traffic as far as the Teklanika Rest Area at mile 30.

Trails

The backcountry of Denali National Park and Preserve has few maintained trails, the result of a management philosophy articulated in the 1986 General Management Plan for the Wilderness and the northern additions. The "trail-less" management philosophy promotes exploration, self-reliance and solitude in the backcountry.

Existing maintained trails in the Old Park generally either date to a period prior to the opening of the Parks Highway or were recently constructed to address specific resource management concerns. The trails are located in a few specific areas where visitor use is concentrated along the park road. Many of the trails are short and do not extend more than a quarter mile from the park road. Others are longer and several cross the wilderness boundary. These trails and their lengths are shown in Table 3-19.

Table 3-19: Trails

Trail	Distance (miles)	Distance (feet)	Width	Type
Blueberry Hill	0.2	1,056	2	unpaved hand
Eielson Alpine	0.8	4,118	1.5	unpaved hand
Eielson Tundra Loop	0.4	1,954	4	crush stone
Eielson tundra spur	0.2	950	4	crush stone
Gorge Creek	0.2	1,056	1.5	unpaved hand
Horseshoe Lake	0.8	3,975	6	crush stone
Jonesville	0.4	2,186	4	crush stone
McKinley Bar	2.2	11,563	2	unpaved hand
Mount Healy Overlook	2.2	11,838	2.5	unpaved hand
Polychrome	0.5	2,746	5	crush stone
Primrose	0.2	792	7	crush stone
Roadside	2.2	11,828	5	crush stone
Rock Creek	2.4	12,425	3	crush stone
Savage Cabin	0.3	1,531	8	crush stone
Savage River	1.7	8,870	2	unpaved hand
Savage River Bar	0.2	1,162	5	unpaved hand
Spring dog/ski trail	4.3	22,440	8	unpaved hand
Taiga	1.5	8,089	3	unpaved hand
Triple Lakes	7.6	39,970	2	unpaved hand
Total Length	28.1	148,548		

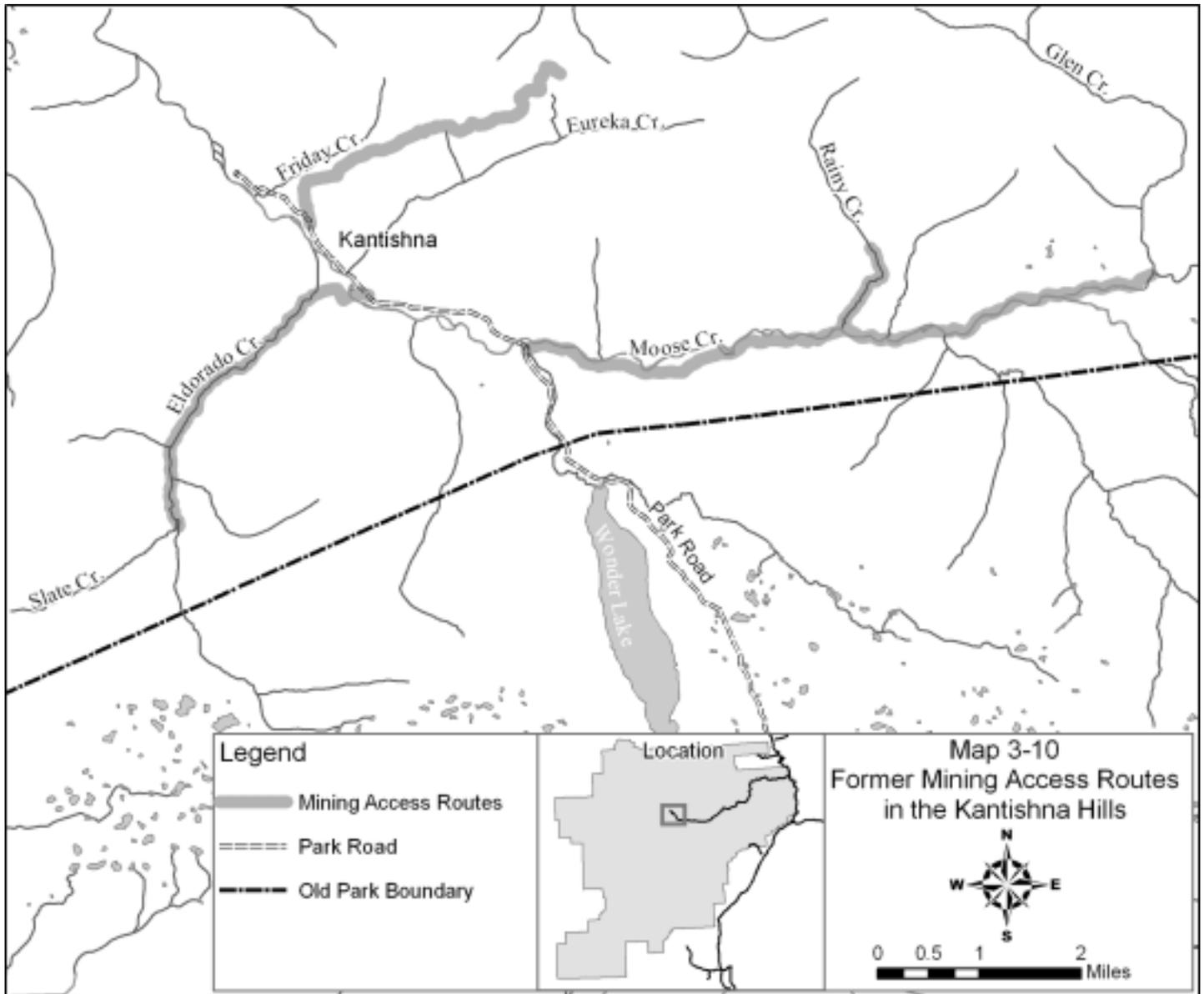
In addition, the 1997 *Entrance Area and Road Corridor DCP and EIS* and the 1997 *South Side DCP and EIS* authorized several trails that have not yet been constructed. These include:

- Foot trail along the Nenana River from McKinley village to the park entrance area
- A trail to the top of the ridge above Savage River that extends to the Savage River Campground
- A system of short hiking/interpretive trails in the Tokositna area in conjunction with the new visitor facility
- A hiking trail through the brush at Chelatna Lake, leading to the alpine terrain in Denali National Park and Preserve
- A trailhead with unspecified trails in the Broad Pass/Dunkle Hills area from the state right-of-way along the West Fork of the Chulitna River

Finally, there are formerly constructed mining access routes that serve as informal and unmaintained trails in several places, particularly in the Kantishna Hills. The most visible and utilized of these trails are the following (see Map 3-10):

- Moose Creek, extending upstream from the park road to former mining claims as far east as Glen Creek
- Skyline, extending from the park road to a ridgeline in the Kantishna Hills
- Eldorado Creek

The Kantishna Hills also has a large network of social trails that have developed both historically and relatively recently. Several of these trails have had some maintenance provided by the users, either miners or lodge operators depending on the era and the location.



Visitor Safety

While there are inherent risks in backcountry use, several decades of park management experience in Denali demonstrates the value of education to the safety of park visitors. The park has seen considerable benefits from educating backcountry visitors about hazards and proper behavior prior to trips. A good example is the instruction given on how to avoid bear encounters and prevent the habituation of bears to human food. The educational message is delivered at the backcountry desk at the main park visitor center, and it is required as a condition of obtaining a backcountry permit in the park. Along with bear-resistant food and garbage storage, education is one of the most significant parts of Denali’s bear-human conflict management program. This program was successful in reducing the number of backcountry incidents between bears and people at Denali from 26 in 1982 – when Denali had more such backcountry incidents than any

national park in the country – to 3 in 1987, which was the first year that bears obtained no human food in the park (Dalle-Molle and Van Horn, 1989).¹ Altogether, visitor education greatly enhanced visitor safety in the backcountry.

Excellent success has also been reported from the increased level of information provided to climbers on Mount McKinley and Mount Foraker. Information provided during the advanced reservation process and at the Talkeetna Ranger Station prior to climbers traveling to the mountain has had a significant impact in reducing climber injuries and fatalities (NPS 2000f). Mountaineering rangers believe the present educational and rescue services could accommodate up to 1,500 climbers on Mount McKinley (Daryl Miller, South District Ranger, pers. comm.).

¹ Methodology for collecting information on bear-human encounters and incidents changed in the 1990s, so recent reported figures are now higher than in the 1980s but the numbers are not comparable.

PARK MANAGEMENT AND OPERATIONS

The Denali National Park and Preserve backcountry is currently managed according to the 1986 *General Management Plan* and the 1998 *Resource Management Plan*. The 1976 Backcountry Management Plan for the former Mount McKinley National Park also provides some specific direction that was not changed by the General Management Plan. An updated backcountry management plan was drafted in 1983 but was not finalized. Summer backcountry operations for the Old Park have evolved to meet visitor and resource protection needs, and several changes have been made in recent years in the south district mainly affecting mountaineering operations.

Current backcountry management activities and responsible divisions include:

Ranger Division:	Operations, including mountaineering Wilderness management
Division of Research and Resource Protection:	Research and resource management
Cultural Resources and Subsistence Management Team:	Cultural resources management Subsistence management
Concessions Division:	Commercial activities
Planning and Compliance Team:	Long-term planning and compliance for projects and studies
Maintenance Division:	Construction and maintenance of facilities such as trails, cabins, and bridges

Backcountry Operations

The rangers and volunteers working at the backcountry desk in Denali National Park and Preserve follow a standard set of operating procedures in order to assist and educate visitors who are seeking a wilderness experience and access into the backcountry. The backcountry desk staff issues overnight camping permits where they are required (see appendix D), which are available for free but must be issued in person at the Wilderness Access Center or, in the winter, at the Murie Science and Learning Center. No reservations are accepted and permits can be issued no sooner than one day in advance. However, just as important as issuing the permit is the opportunity for backcountry staff to give visitors critical safety and resource protection information.

At the backcountry desk, visitors are informed of the careful planning necessary for a successful trip. To receive a backcountry permit, visitors must watch a 25-minute video, which gives information on bear safety, minimum impact camping, river crossings, safety and emergencies, wildlife ethics, and pre-trip preparations. Along with the backcountry permit, a Bear Resistant Food Container (BRFC) is issued to the campers to ensure that they follow correct food storage procedures. The BRFC must be returned to the visitor center at the end of the backcountry trip.

The organizational structure and personnel requirements for park operations and the backcountry desk are as follows:

- 1 Chief Ranger
- 1 Wilderness Program Coordinator

Backcountry Desk Staff

- 1 Seasonal Supervisor
- 5 Seasonal employees

Along with issuing permits, backcountry rangers patrol the backcountry. A patrol is an assignment to range across a particular area of the park for specific purposes or objectives. Reasons for a patrol may be to increase orientation and knowledge of the park, initiate visitor contacts to provide assistance and education on wilderness ethics and park regulations, document resource damage and human impact, prevent violations in the park rules and regulations, study wildlife, and effect search and rescue. All patrols are documented with a detailed patrol report.

The south side of the Alaska Range, particularly the town of Talkeetna, is the staging area for most mountaineering expeditions on Mount McKinley and other peaks in the Alaska Range. Since 1995, all expeditions attempting ascents on Mount McKinley or Mount Foraker have been required to preregister with the NPS and pay \$25 per person (of the total \$200 per person registration fee) 60 days prior to the expedition. Upon arriving in Talkeetna, prior to being transported into the park and preserve, all mountaineers are required to sign in at the Talkeetna Ranger Station, provide an expedition itinerary, pay the remainder of the fee, and receive a briefing by NPS rangers on safety, environmental concerns, and waste disposal methods. Upon returning to Talkeetna, climbers must sign back in at the ranger station. Registration is voluntary for ascents on all other peaks within the park and to the backcountry accessible from the south (NPS 2000c). Many backcountry users use the resource library at the Talkeetna Mountaineering Center to inquire about current resource and weather conditions before heading into the backcountry. However, registration is sporadic, so use data are limited for areas where registration is not required.

The registration and fee process was established as the number of climbers and those needing rescue increased, thus requiring greater NPS staff management and increasing costs. The National Park Service currently maintains ranger camps at Mount McKinley's base camp, at the 7,200-foot level, and at the 14,200-foot level. These camps are staffed from the end of April through early July. The air-taxi concessions have personnel at the 7,200 foot base camp to coordinate flights in and out of the base camp for the duration of the climbing season. The NPS mountaineering rangers, along with climbing volunteers, staff the 7,200-foot and the 14,200-foot camps.

Staffing at the Talkeetna Mountaineering Center consists of:

- 4 Permanent full time employees
- 4 Permanent subject-to-furlough employees, typically Feb-Sept.
- 5 Seasonal employees (3 mountaineering rangers, 2 visitor use assistants)
- 1 Permanent detailed helicopter manager

Backcountry Management During Winter

Backcountry permits are required in winter in the same portions of the park as in the summer. In winter, this permit allows campers to build fires if they obtain firewood only from down and dead timber. Dog mushers are encouraged to camp several hundred yards from patrol cabins to help disperse impacts from concentrated use.

Rangers conduct winter patrols by dog sled. Outside the designated wilderness, snowmachines are also used. Rangers estimate visitor snowmachine use and wilderness boundary violations, establish an agency presence, make wildlife observations, and monitor aircraft overflights.

To enhance education and enjoyment of the park, the National Park Service has worked with partner organizations since 2001 to host “Winterfest,” a special event offering a variety of dog mushing workshops, skijoring clinics, interpretive ski tours, telemark clinics, and mammal tracking clinics. The event has been very successful and has become a local tradition.

During winter the park road is typically maintained for driving to mile 3. Beyond that point, park maintenance staff packs snow out to mile 7 in order to allow for equipment to prevent the buildup of ice on the road between miles 4 and 7, but a surface suitable for skiing and mushing is retained.

Closures

Approximately 32,100 acres in the old park are currently identified as critical wildlife habitat, where human presence is not compatible with wildlife activity (Jon Paynter, pers. comm.). These areas are closed to all uses, except for special projects conducted by researchers and park staff. Throughout the year, temporary or emergency closures are often designated to protect the resource and to enhance visitor safety. In the past, areas have been closed to protect moose rut sites; to protect visitors from activity around recent kill sites; or to protect visitors from unsafe conditions such as an aggressive bear, avalanche danger, fire, or flooding.

Emergency closures, which last no longer than 30 days, are usually initiated by a field ranger or wildlife technician. Temporary closures, which can last up to 12 months, are usually recommended by the resource management specialist or division chief. If a need for an emergency closure is identified, the communications center is notified, signs are posted to mark the closure boundary, and a written report is sent to the chief ranger. If a need for a temporary closure is identified, the initiating party writes a brief justification and location for the proposed closure. If the superintendent concurs, the signed report is forwarded to the communications center for dissemination and the area is posted as closed.

The decision to designate a closure is be guided by factors such as public health and safety, protection of natural or cultural resources, aid to scientific research (for example, to use as a control against areas with human impacts), subsistence, implementation of management responsibilities, equitable allocation and use of facilities, and the avoidance of conflict among visitor use activities (36 CFR 1.5 (a), 13.30(b)). Except in emergency situations, the superintendent prepares a written determination justifying the establishment or termination of a closure. This determination is available to the public upon request (36 CFR 1.5(c)).

Current closure information is distributed to the backcountry desk, park headquarters, law enforcement rangers, the superintendent's office, wildlife biologist, interpretation division, shuttle bus dispatcher, the concessions bus systems, and Kantishna businesses. It is also announced on the park's morning report. Emergency closures are opened after the area has been deemed safe, and temporary closures are opened upon the recommendation of the appropriate resource management employee. Closures in the old park are usually in effect only during the time the park road is open (typically from April through September). Once the road is closed for the season, the closures are removed.

Facilities

There are several administrative cabins in the Denali backcountry. Many of these are historic structures listed on the National Register of Historic Places. They are primarily located near the boundaries of the Old Park and in the Kantishna Hills, and are used during both summer and winter months to support NPS backcountry patrols including winter dog sled patrols.

Communications facilities in Denali National Park and Preserve include a radio station at Park Headquarters and relay stations at the Savage check station, Toklat road camp, Eielson Visitor Center, and the Wonder Lake ranger station. There are seven permanent repeaters: Wickersham Dome, Thorofare, Savage, Mount Healy, Cantwell, Tokosha, and Bald Mountain. In 1999 Denali Park Resorts began sharing the Mount Healy and Thorofare sites with the National Park Service (Diane Brown, pers. comm.). Occasionally, temporary or emergency repeaters are installed in the spring to service search and rescue operations around Mount McKinley (Chuck Holm, pers. comm.). Although there has been little pressure from private telecommunications companies to construct facilities in the park, use of cellular phones, laptop computers, and other forms of communications technology is increasing. As users demand wider coverage, private companies may want to build structures inside park boundaries.

Scientific Information

Given the clear preservation intent of Congress, and faced with a growing concern about the impacts of increasing visitor use and other activities, the National Park Service is continuously expanding its resource management program. The intent of the resource management program is to understand the natural forces that shape Denali's environment and to avoid or eliminate activities that significantly interfere with natural processes. Resource management plans are prepared to describe the scientific research, surveys, and management activities that will be conducted in each national park system unit. Information obtained from research described in

the resource management plan is used by park managers to better understand the unit's cultural and natural resources and is used in making resource-related decisions and funding requests.

The park's current research and resource preservation program is generally organized around the following categories:

Resource Inventory – Identify and develop understanding of the resources and processes that are essential to the park.

Monitoring – Establish and monitor baseline measurements of the resource conditions and processes so impacts can be detected before they cause damage and to provide a standard against which management performance can be measured.

Research – Identify and conduct quantitative investigations to answer questions about park resources and processes.

Mitigation, Interpretation, Protection – Implement various mitigation, interpretation, and protection actions to resolve resource related problems.

Prediction – Institute a system for predicting potential threats to natural or cultural resources early enough before their occurrence. Therefore, budgeting and programming are done to accomplish research and/or management actions to prevent or mitigate these threats. Information derived from inventory, research, and monitoring efforts is useful in forecasting the possible threats.

Administrative Programs and Planning – Identify all planning and administrative actions necessary to support a well developed resource preservation program.

Administrative Use of Aircraft and Airstrips

The park currently operates two small fixed-wing airplanes and routinely contracts for helicopter and fixed-wing services. The fixed wings are flown regularly on a year-round basis. Contract helicopter services are used primarily during the climbing season and the summer visitor season. Missions flown by these aircraft include boundary and hunting patrols; wildlife surveys and radio tracking; snow surveys; search and rescue; wildfire monitoring; hazardous waste and debris removal; point to point transportation of scientists, park rangers, maintenance personnel, smoke jumpers, and their equipment and supplies; and staff orientation. Frequently these flights are below 2000 feet and often involve highly specialized types of missions such as aerial wildlife capture.

Military helicopters and fixed-wing aircraft are routinely used during search and rescue missions. Military aircraft are also used each year to insert and extract a ranger station on Mount McKinley at 14,200 feet. Under the terms of a memorandum of understanding, military aircraft are permitted to practice limited landings and takeoffs at high altitudes for search and rescue operations.

Administrative use of aircraft is controlled by the U.S. Department of Interior Office of Aircraft Services (OAS). The OAS sets policies and procedures, with additional detail contained in park policies and the park's aviation management plan. These policies deal primarily with administrative concerns and do not provide much guidance on frequency of flights, avoidance of sensitive areas or time periods, or other issues that are related to visitor use and resource preservation. The park's Aviation Use Plan identifies the areas around Park Headquarters and Kantishna as noise-sensitive areas and recommends pilots avoid flying directly over lodges and other housing facilities and discourages landing at Wonder Lake.

Minimum Requirement

Section 4c of the 1964 Wilderness Act acknowledges that even though there are certain activities that are prohibited in order to protect wilderness there are also necessary exceptions in order to meet the minimum requirements for the administration of the area as wilderness. Therefore, a two-step process is used:

- 1) Determine whether or not the proposed management action is needed and necessary for the purpose of wilderness, and does not pose a threat to wilderness resources and character.
- 2) Determine the techniques and type of equipment needed to ensure that impact to wilderness resources and values is minimized.

The minimum requirement concept is used when making all decisions concerning management of wilderness, including administrative practices, proposed special uses, scientific activities and equipment use in wilderness. When the minimum requirement is determined, the potential disruption of wilderness character and the physical resource is considered and given more weight than economic efficiency and convenience. If a compromise of wilderness resource or character is unavoidable, only those actions that preserve wilderness character and/or have localized, short-term adverse impacts will be acceptable (NPS 2001).

