

affected environment



NATURAL ENVIRONMENT

PHYSIOGRAPHY AND GEOLOGY

The Denali area is dominated by Mount McKinley and an east-west trending line of towering mountains known as the Alaska Range. The Alaska Range forms the northernmost portion of the Pacific Mountain System, and it is one of the great mountain uplifts in North America, rising above 500- to 2,000-foot-elevation lowlands to the pinnacle of Mount McKinley at 20,320 feet.

A series of two and sometimes three parallel rugged and glaciated mountain ridges compose the Alaska Range. In the vicinity of Mount McKinley, numerous peaks stand at elevations of 10,000 to 13,000 feet. Mount Foraker, 14½ miles southwest of McKinley, is the second highest peak, attaining an altitude of 17,400 feet. Nearby Mount Hunter, third highest, is 14,573 feet. The range is perpetually snowclad above approximately 7,000 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 and 45 miles in length. These include the Kahiltna (the largest), Ruth Eldridge, Tokositna, and Yentna. The largest glacier on the north side is the 34-mile-long Muldrow.

The northern foothills of the Alaska Range consist of a series of east-trending ridges, starting with the Kantishna Hills and running eastward. Summit altitudes range generally between 2,000 and 4,500 feet. The foothills vary from 3 to 7 miles in width and from 5 to 20 miles in length. They are separated by broad flat valleys of glacial origin which range from 2 to 10 miles in width. Beyond the northern foothills lies a broad region of lowlands drained by the Tanana and the Kuskokwim rivers.

The foothills that line the southern edge of the Alaska Range are generally quite steep and are cut through by large south-flowing glaciers. Southeast of the Alaska Range, across Broad Pass, are the Talkeetna Mountains. Curry Ridge, which lies along the western edge of these mountains, trends in a northeasterly direction, parallel to and between the Chulitna and Susitna rivers. It is a gently rounded ridge marked by past glacial activity, and it is generally 3,000 feet in elevation.

To the south of the Alaska Range and west of the Talkeetna Mountains, the broad Susitna River lowlands stretch out in a north-south direction. Both the Susitna and the Yentna rivers drain this area where elevations are less than 500 feet.

In terms of geology, the Denali area is one of the most interesting and important in North America. It encompasses a region of diverse igneous, metamorphic, and sedimentary rocks ranging in age from Recent to units which may be as old as Precambrian. Wahrhaftig (Geological Survey 1965)

describes the internal structure of the Alaska Range as a synclinal complex with Cretaceous rocks in its center and Paleozoic rocks on its flanks. Longitudinal faults, the principal one being the Denali fault, trend approximately parallel to the trend of the range. Fault traces are marked by linear valleys, low passes, scarps, and sag ponds. The Denali fault system is a major zone of fracturing which represents one of the most fundamental geologic features on the continent.

South-central Alaska is one of the most seismically active areas in North America. This region is part of a larger seismically active arc which follows the coastline of the North Pacific and is known generally as the Ring of Fire. The seismic activity is caused by the collision of two tectonic plates. The Pacific plate is colliding with the continental plate along the northern Pacific coastline. Numerous small faults which are part of the Denali fault complex occur on the south side of the Alaska Range. While these small faults themselves may not cause major earthquake activity, activity in other areas could trigger subsidiary movements within the area. In general, the potential for significant damage as a result of earthquakes decreases from Anchorage toward the interior.

Metamorphic rocks, which include schist, underlie much of the northern foothill ridges and appear as isolated hills jutting above the unconsolidated deposits in the Tanana-Kuskokwim lowlands. A Tertiary rock sequence known as the Cantwell formation contains abundant volcanic rocks. The upper portion of the Cantwell formation is predominantly volcanic flows and tuffs. A thick conglomerate cover near the top of the Tertiary rock section forms ridges where dips are steeper than 20 degrees and broad dissected plateaus where the conglomerate is flat-lying.

Rocks in the central and southern portions of the park are characterized by a sequence of predominantly dark gray argillite, slate, graywacke, and a few intervals of limestone.

Tertiary sedimentary and volcanic rocks occupy lowlands north of the range and also form east-west trending ridges along the northern flank of the mountains. Much of the present topography within the region probably resulted from erosion and removal of the relatively weaker Tertiary rocks.

Granitic plutons (igneous rocks) support groups of high mountains that have glacier-carved canyons and cirque headwalls rising almost vertically to heights of 5,000 feet. The most rugged and scenically striking landforms in the region are eroded granitic rocks. Notable examples include Mount McKinley, Mount Foraker, the Cathedral Spires, and the Great Gorge of the Ruth Glacier. The granitic rocks to the south of the fault system are composed of quartz monzonite and granite between 55 and 60 millions years old, whereas rocks to the north of the system are chiefly granodiorite 38 million years old.

Four periods of glaciation are recognized in the Denali region. 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.

South of the Alaska Range, the Cook Inlet-Susitna lowlands are covered by ground moraines, drumlin fields, eskers, and glacial outwash plains. Nearer to the mountains are broad flat valleys with sides that show a glacial trim line. A few small rock-floored lakes occur throughout this area. The largest is Chelatna Lake, which is 7 miles long. Bedrock beneath the lowlands is mainly poorly consolidated Tertiary rocks which are flat-lying or only slightly deformed. Mesozoic metamorphic and granitic rocks occur as isolated mountains near the center of the lowland.

MINERAL RESOURCES AND MINING

The complex sequence of tectonic, volcanic, and metamorphic activities that has influenced the Denali region provides significant possibilities for mineral deposits. While not enough is known to link the geology of the area with specific levels of mineralization, recent studies have revealed the occurrence of mineral resources within portions of the 1980 park boundaries (NPS 1981 and 1983a).

Regional metal mining and prospecting during the early part of this century were dominated by placer gold mining. Other metals were mined in association with gold to a limited extent in the Kantishna area. From the early 1970s to present time, a renewed interest in placer mining has been evidenced within the region, particularly within the Kantishna mining district. This area encompasses an elongated 40-mile, northeast-trending mineralized belt known for silver and gold polysulfide crosscutting veins, placer gold deposits, and also antimony and base metal lodes. According to the probabilistic resource assessment method, the average aggregate value of recoverable minerals for all deposit types in the Kantishna Hills is estimated to be \$781 million (ADNR, DGGS 1983, Salisbury and Dietz 1983). Important mineral deposits are gold, silver, antimony, lead, and zinc.

The Dunkle Mine township on the east side of the park is part of the Chulitna-Yentna mining district, which is a significant base and precious metal province to the south of the Alaska Range. Metals from the area include copper, arsenic, gold, silver, tin, molybdenum, lead, and zinc. No metal production has occurred in the Dunkle Mine township to date, although the nearby Golden Zone Mine has produced gold, copper, and silver. The abandoned Dunkle Mine, which is within the Dunkle Mine township, produced 64,000 tons of coal from underground mining operations during the period from 1940 until 1954. Coal reserves of up to eight million tons are estimated in the Costello, Colorado, and Camp creek basins.

North of the Alaska Range the park boundary encompasses the westernmost portion of the Nenana coal field. Production began in the Healy area in 1920 and today the Usibelli Mine produces over 700,000 tons annually. The Healy area and points farther to the east overlie the major segments of the coal field. Coal was once mined on a small scale near Riley Creek to supply park facilities.

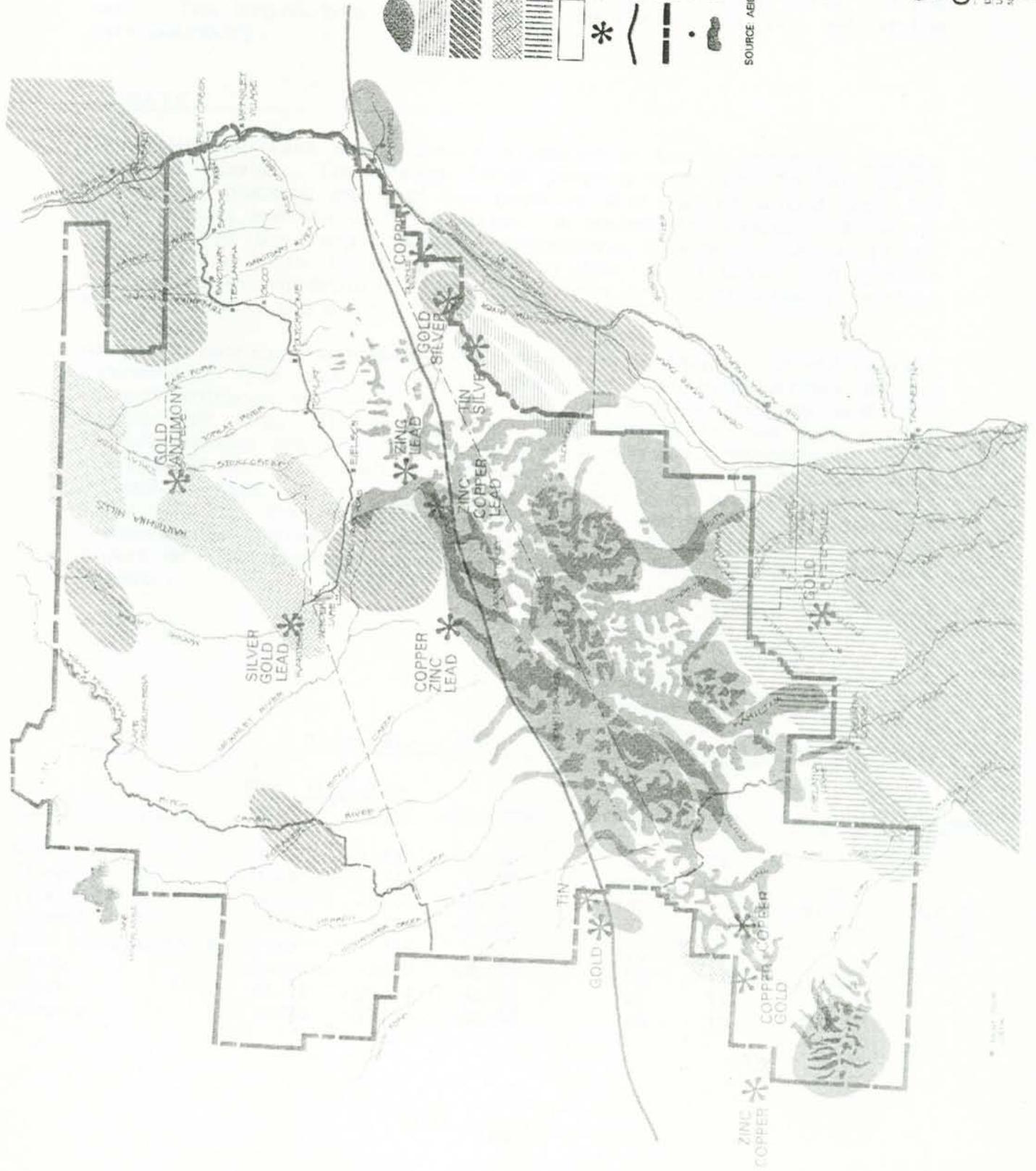
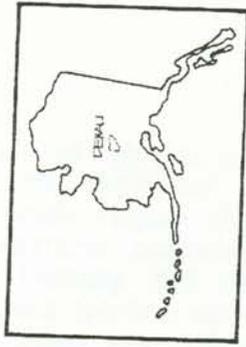
No production of oil or gas has occurred within the park, although several outlying areas contain sedimentary basins and have, in the past, been identified as possible petroleum provinces. Nonmetallic materials including sand, gravel, limestone, perlite, clay, haydite, shale, and argillite occur throughout the region, but the only extraction has been for gravel, which was mined during the construction of the railroad and highway. Deposits of limestone suitable for making cement occur near Cantwell both in and out of the park. Clay, shale, and argillite (components of insulating mineral wool) occur in the Windy Creek/Cantwell area.

HYDROLOGY

Flowing from all major glaciers within the park are large braided streams whose waters are milky with glacial silt. Below various glaciers these rivers cut intermingling channels, sometimes extending over two miles wide. The most important rivers that have their headwaters in this portion of the Alaska Range are the Foraker, McKinley, Toklat, Teklanika, Savage, Chulitna, Kahiltna, and Yentna. Clear streams occur sporadically throughout the area, oftentimes as tributaries to major glacial streams or rivers. The sources of these streams are primarily snowmelt and precipitation.

Mean annual runoff is from 1 to 2 cubic feet per second per square mile in the lower elevations of the park. Suspended sediment concentrations vary from 500 to 2,000 milligrams per liter for glacial streams and are considerably less for nonglacial streams. Most of the sediment load is carried during the summer months, and very little is carried during the winter. Except in the Kantishna Hills, nearly all surface water is potable, although iron is sometimes present in undesirable quantities. However, boiling of surface water is necessary due to the presence of Giardia. Summer flooding is common on the major streams.

Water for the various developed areas along the park road is generally taken from surface sources, but the park is gradually shifting to groundwater (well) sources to meet current standards. Five wells were drilled in 1981 in the vicinities of the Wonder Lake, Igloo, Sanctuary, and Savage River campgrounds and the Wonder Lake ranger station. Wells have generally been successful only in the unfrozen alluvium associated with glacial rivers. Attempts to obtain deep groundwater at the park headquarters and at the Riley Creek/hotel area have been unsuccessful because permafrost inhibits the subsurface flow of water. Thus, surface water and shallow groundwater sources will probably continue to provide primary water supplies to developed areas within the park.



- PLUTONIC ROCK
- VOLCANIC ROCK
- CONTINENTAL-MARGINAL MARINE-COAL BEARING SEDIMENTARY ROCK
- MIXED VOLCANIC, SEDIMENTARY, MARINE ENVIRONMENT
- HYDROTHERMAL DEPOSITS
- UNDIFFERENTIATED TERRANE
- DEPOSITS
- DENALI FAULT
- DENALI NATIONAL PARK AND PRESERVE BOUNDARY
- AIRSTRIIP
- GLACIER

SOURCE: ABCD MINERAL TERRANES OF ALASKA 1979



GEOLOGY

Denali National Park and Preserve
 United States Department of the Interior
 National Park Service
 211 2002A
 10/19/84

Because of glacial gouging and moraine formation, many large, deep lakes would be expected in glaciated country such as this. However, within the Denali region there are only two such lakes. Wonder Lake is within the western boundary of former Mount McKinley National Park and is approximately 2.5 miles long. Chelatna Lake is found just outside the expanded park's southern boundary and is 7 miles in length. Numerous small lakes are found scattered throughout the northwest portion of the park. The largest lake in this area is Lake Minchumina, just outside the park boundary.

CLIMATE

Denali National Park and Preserve is located in two of the major climatic zones of Alaska. The Alaska Range plays a major role in influencing climate by blocking much of the moisture that sweeps inland from the Pacific Ocean and the Gulf of Alaska. A continental climate is formed to the north of the range, while a transitional climate is formed to the south. The north is characterized by less precipitation and greater fluctuations in temperature (hotter in summer and much colder in winter) than the area to the south.

Annual temperature extremes may range from 90 degrees to -52 degrees Fahrenheit. The mean maximum temperatures at headquarters at the eastern entrance to the park are 12.8 degrees for January and 65.9 degrees for July. The mean minimum temperatures for the same months at this location are -5.2 degrees and 43.8 degrees, respectively. The average 24-hour temperature spread during the summer months, June through August, is only 22 degrees. Wider daily temperature ranges occur during the winter months, with a record of 63 degrees. Temperatures decrease with increases in elevation. Chill factors in excess of -148 degrees have been experienced on the Mount McKinley summit.

Table 6: Climatological Data

<u>Location</u>	<u>Temperature (°F)</u>			<u>Precipitation (in.)</u>		<u>Wind (knots)</u>	
	<u>Mean High/Low</u> <u>Summer</u>	<u>Winter</u>	<u>Extreme</u>	<u>Snow</u>	<u>Total</u>	<u>Average</u>	<u>Extreme</u>
Willow	40/70	-10/33	-55/90	--	24	--	--
Skwenta	44/69	-4/40	-50/90	119	29	--	--
Talkeetna	44/68	0/40	-48/91	102	29	N 3.7	NE 33
Summit	40/60	-5/30	-45/89	119	20	NE 8.4	E 42
Park headquarters	41/64	-1/18	--	76	15	--	55
Healy	44/66	-3/26	-46/90	66	17	SE	--
Clear	45/71	-28/14	-42/96	61	13	--	--
Nenana	43/70	-17/12	-69/98	48	12	E 5.3	--

Precipitation is greater on the south side of the Alaska Range than on the north side. Precipitation is greater in summer than in winter for the entire region. Rainfall occurs on an average of 21 days during June, July, and August at the Denali and Lake Minchumina recording stations, on 45 days at Summit, and on 36 days at Talkeetna. The average annual precipitation at park headquarters is slightly in excess of 15 inches; snowfall there is 75.7 inches.

At higher elevations in the Alaska Range the total precipitation exceeds 80 inches in some locations and snowfall exceeds 400 inches. Normal snowpack throughout the region averages between 20 and 40 inches. Sudden showers and thunderstorms occasionally develop to the north of the Alaska Range. Flash floods occur throughout the region.

Calm days are the rule in summer. Turbulance is more characteristic of fall and winter. The maximum wind velocity recorded at headquarters is 60 miles per hour, but winds of this magnitude are rare. Winds in excess of 100 miles per hour are not uncommon on Mount McKinley's summit.

Mount McKinley's visibility (and frequent invisibility) depends on the weather. North-trending winds commonly pile up clouds on the mountain's south flank and then surround it. Because of its sheer immensity and height, the mountain mass tends to generate its own weather and cloud formation, even on days that may otherwise be clear. Many visitors to the area go away disappointed, having never glimpsed the mountain itself. A rough visibility index indicates that during the three summer months the peak is totally obscured about 30 days, visible 4 hours or less about 30 days, and visible more than 4 hours another 30 days. It is a rarity when the peak is visible all or most of any one day. It seems that the peak is hidden well over half of the time, and it is often hidden for many successive days.

Weather is also an important factor in other forms of visitor use. The peak visitor season is between June and mid-September. Cross-country hiking may not be practical until early June, and snow may close the park road by mid-September. Winters are extremely cold, particularly north of the Alaska Range, although snow depths there rarely exceed 3 feet. Greater snow depths and somewhat milder winter temperatures to the south of the range are more conducive to a broader range of winter visitor use. Spring provides the best opportunity for cross-country skiing, snowshoeing, and dogmushing. During the summer up to 18 hours of sunlight supply ample opportunity to enjoy the park, although mosquitoes (most abundant in June and July) are a constant annoyance. Early fall is one of the best seasons to visit Denali because there is a better chance of fair weather, the landscape is brilliant with color, and the animals begin to show their winter coats.

SOILS

Soil types within the area vary as a result of parent material, topography, and vegetative cover. Soils in the park can be generally classified as mountain and tundra soils, bog soils, and forest soils. Mountain or tundra soils form directly from bedrock and the slow accumulation of organic matter. The sparseness of these soils is attributable to cold weather extremes and steepness of slopes. Bog soils, or histosols, consist of clay and glacial moraine and are poorly drained. This causes, over time, the accumulation of plant material and often peat layers. Forested areas within the park typically have soils of sandy and silty clay with humus layers supporting mosses and lichens.

Permafrost (perennially frozen ground) is intermittently present throughout the lowlands north of the Alaska Range and is continuous at higher elevations both north and south of the range. Detailed studies of the extent of permafrost in lowland areas to the south of the range have not been made, but wells, roadcuts, and other past development within the region have encountered permafrost at varying depths beneath the surface. Exact permafrost thicknesses have not been documented, but thicknesses of up to 100 feet have been recorded near the eastern entrance to the park.

Permafrost essentially consists of soil, rock, or other earth materials at a temperature of 32 degrees Fahrenheit or colder for two or more consecutive years. A delicate heat balance exists between the permafrost and the active layer above it. Thus, changes in the vegetative mat, snow, or other characteristics of the upper layer can significantly alter the thermal regime with resultant changes at ground level. For example, removal of vegetation increases the release of heat from the ground in the winter and prevents heat absorption into the ground in summer, and this can cause the melting of permafrost. In addition, an increase in solifluction, or soil movement, is possible. These phenomena can cause heaving, sagging, soil slumping, and erosion at the surface during successive periods of freeze and thaw in the active layer. The result 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

Vegetation within the park is similar to that found throughout the interior of Alaska. The five major vegetation associations within the park and preserve are low brush-bog, bottomland spruce-poplar forest, upland spruce-hardwood forest, moist tundra, and alpine tundra.

Bogs are found within the river drainages and around the permanent water bodies, often in association with black spruce. A broad lowland area of bogs extends south and east of Lake Minchumina, along old river terraces, outwash plains, and sloughs.

Interspersed within this lowland area, on relatively stable soils farther back from the drainages, lie areas of bottomland spruce-poplar forest. This plant association is dominated by white spruce and Alaska paper birch, often in association with an understory of balsam poplar, willow, and alder. Mosses, horsetails, and a variety of flowering plants are common groundcover.

The tree line within the park is approximately 2,000 feet, except within protected river valleys where it may extend to 3,000 feet. Between the bottomland spruce-hardwood forest and tree line is an area of upland spruce-hardwood forest. It is composed of white and black spruce, paper birch, balsam poplar, quaking aspen, larch, and willow. Species composition is uniform over large areas, but certain species are locally dominant. Paper birch, a major constituent of most interior Alaska forested lands, is not abundant in the region but forms significant stands in the northernmost portions of the park. Quaking aspen occurs principally on well-drained uplands in small scattered stands mixed with white spruce. Dense stands of white spruce are found principally along the banks of large rivers. Balsam poplar, an early invader of floodplains, is mainly restricted to gravelly riverbottom sites. Black spruce covers large areas in the northern part of the park. A variety of other species occur in association with the upland forest. These can include little tree willow, flatleaf willow, resin birch, American green alder, thinleaf alder, Alaska rose, bush cinquefoil, red currant, and shrubs such as cranberry, blueberry, and lingonberry. Mosses and lichens are abundant on the forest floor.

At higher elevations (usually above 2,000 feet) the spruce-hardwood association gives way to a dwarf shrub and moist tundra association. This association, which occurs extensively along the foothills of the vast Alaska Range, usually forms a complete groundcover dominated by dwarf birch and willow. Blueberry, Labrador tea, bearberry, alpine azalea, and crowberry are common in this moist tundra zone. In addition, grasses and sedges are oftentimes found in nearly continuous stands in the wetter areas.

Alpine tundra, low-growing mats composed of herbaceous and shrubby plants, grows where a thin soil mantle is present with frequent outcrops of bare rock. It includes mat and cushion tundra, tussock tundra, and dwarf shrub vegetation associations. Species composition varies from almost continuous cottongrass tussocks with a sparse growth of sedges and dwarf shrubs, to stands where dwarf shrubs dominate. Often found in the alpine tundra are mountain avens, bearberry, crowberry, ground willows, alpine azalea, and lingonberry. On the highest and rockiest areas, below the zone of barren rock and ice, lichens are found in abundance. Lichens are slow-growing plants which are highly sensitive to any disturbance.



-  BOTTOMLAND SPRUCE-POPLAR FOREST
-  SPRUCE HARDWOOD FOREST
-  LOW BRUSH BOG
-  TUSsock TUNDRA
-  ALPINE TUNDRA AND BARREN GROUND
-  DENALI NATIONAL PARK AND PRESERVE BOUNDARY
-  AIRSTRIP
-  GLACIER

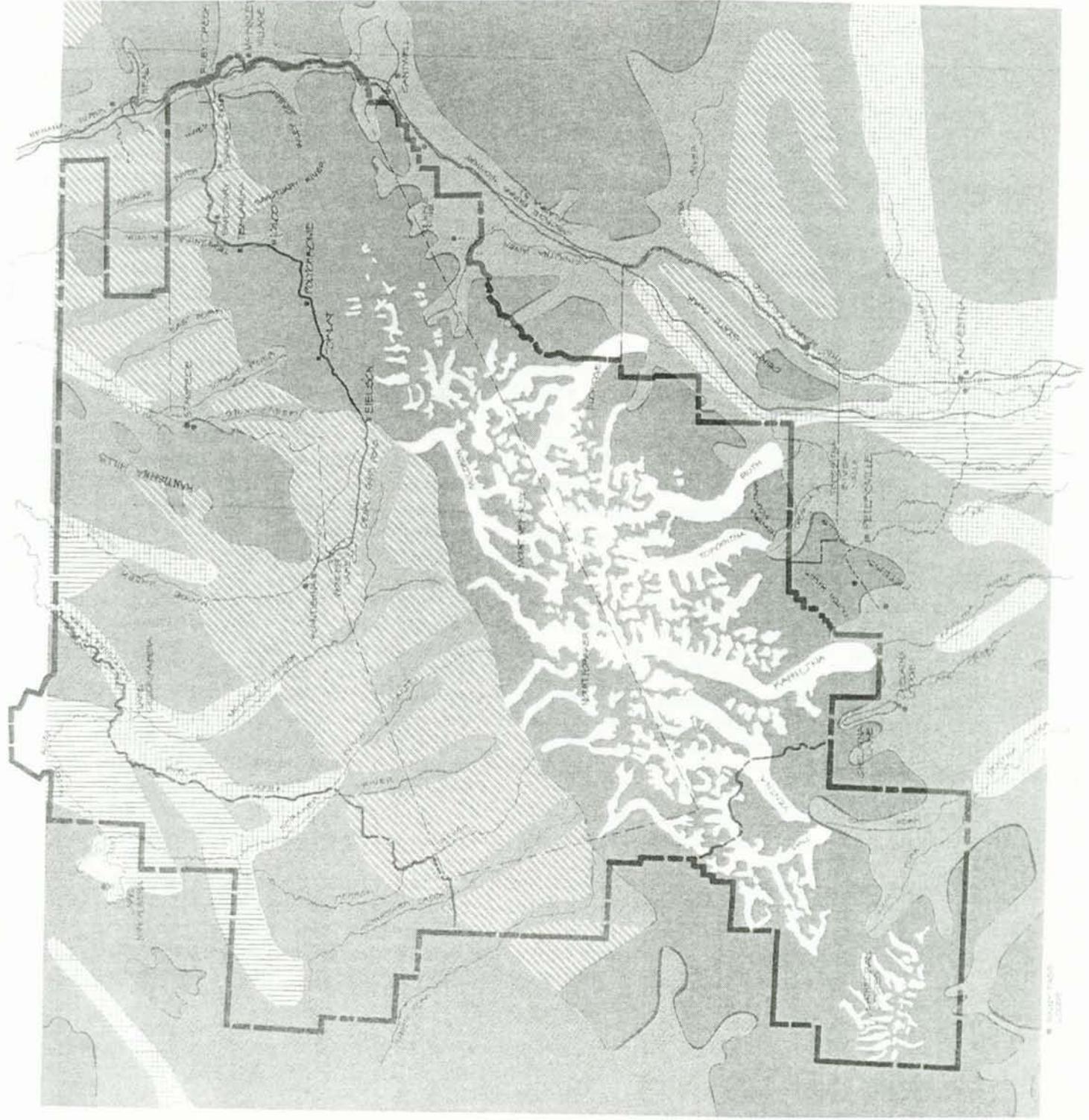
SOURCE SELKREG, LIDA, ALASKA REGIONAL
PROFILE VOLUME IV, YUKON REGION



VEGETATION

Denali National Park and Preserve
United States Department of the Interior
Fish and Wildlife Service

DOI/USFS/04
FWS/04-04



In general, the extensive glacier and drainage system, the greater precipitation levels, and the varied physiographic features to the south of the Alaska Range support a somewhat more varied and diverse range of plant associations than what are found on the north side of the range.

Two plant species reported to occur within or near the park and preserve have been cited as potentially eligible for the list of threatened or endangered species. These are Taraxacum carneocoloratum and Smelowskia borealis var. villosa, both reported to occur along dry ridgelines at high elevations (see appendix M).

WILDLIFE

The park hosts a wide variety and abundance of wildlife. Prominent large mammal species include moose, Dall sheep, grizzly bear, wolf, and caribou. These large mammals occur within the park in greater concentrations north of the Alaska Range than south of the range. Greater habitat variety and less permanent snow and ice on the north side may be responsible for these differences in concentrations. Other smaller mammal species are beaver, red fox, hoary marmot, coyote, collared pika, arctic ground squirrel, red squirrel, snowshoe hare, lynx, otter, porcupine, marten, wolverine, weasel, several mice, lemming, and vole.

Moose are abundant the year around within and near the numerous drainages throughout the park. Moose are particularly 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 supports approximately 300 moose (Troyer 1979). They browse primarily on willow, dwarf birch, and alder. Sedges, horsetails, and other plants are also eaten in the spring. Moose are unpredictable in behavior and can be dangerous if casually approached by visitors. This is particularly true of rutting males and females with young.

Caribou are migrating herd animals which utilize varying habitats for wintering, calving (late May to early June), summer range, and rutting (September and October). Such plants as willow, dwarf birch, and lichens constitute much of the caribou diet. The Denali caribou herd ranks 13th in size of the 22 Alaskan herds. Because of its accessibility it is also the most frequently viewed and photographed. This herd, which was determined to consist of 20,000 to 30,000 animals from 1900 to the early 1940s, has declined dramatically in numbers since that time. Today, the population appears to number approximately 2,600 animals. The reasons for the decline are speculative and may include emigration, habitat quality, predation, hunting, and herd condition.

An area south of the crest of the Alaska Range, south of the town of Cantwell and between the middle and west forks of the Chulitna River, is a prime calving and post-calving ground for caribou. From 1975 to 1980 this area received significantly more use than other calving areas north of the range. Since 1980 the northern calving areas have been more

significant. The critical use period for the Cantwell calving ground is from about May 1 through July 20. After calving, the herd moves to the north side of the Alaska Range, passing through Polychrome Flats as early as July. Movements then follow a traditional migration route west and north to summer and winter ranges. When the herd calves north of the Alaska Range, most cows still travel to the Cantwell area approximately the first week in June and migrate back to the north from early to mid July. The significance of the southern area as a post-calving destination is not understood.

Both grizzly and black bears inhabit the area, which provides abundant food including various berries, roots, sedges, and grasses. Salmon is also taken during spawning times in a few areas. Grizzly bears utilize high alpine areas for denning and are dormant from October until April.

Wolves exist in and out of the park on both sides of the Alaska Range. They, along with bears, occupy the top of the predator/prey pyramid in Denali's large mammal ecosystem. Wolves travel in packs and prey upon moose, caribou, Dall sheep, and small mammals. The young are born in dens excavated into hillsides.

Wolverines are relatively abundant within central Alaska, although they never occur in great abundance compared to other furbearers. The wolverine is a member of the weasel family and feeds on everything from carrion to berries in all major vegetation associations. The lynx, Alaska's only native cat, inhabits the lowland forests and wetlands. It preys largely upon snowshoe hares, and cycles in the hare population directly affect the lynx population.

Denali's birdlife includes a variety of migratory waterfowl. Nonmigratory birds include chickadee, raven, magpie, woodpecker, ptarmigan, and owls. Trumpeter swans, formerly listed as endangered species, frequent floodplain meadows and small ponds.

Fish species include several salmon (king, coho, chum,), arctic char, Dolly Varden, whitefish, burbot, northern pike, sheefish, and grayling.

The only amphibian known to inhabit the area is the wood frog. Insects, including mosquitoes and various biting gnats, are prevalent in muskegs, drainages, and at lower elevations where winds are reduced by topography and vegetation. On higher hills and knolls in more exposed areas, winds tend to disperse insects.

In general the wildlife to the south of the Alaska Range is less visible than the wildlife along the park road corridor to the north. The existing park road follows a broad tundra valley north of the range and traces portions of a traditional caribou migration route. The dominant low mat vegetation and steep rock cliffs flanking segments of the route facilitate the viewing of large mammals (primarily caribou, Dall sheep, and grizzly bear) at great distances.

MCKINLEY MASSIF

LOFTY REALM OF ROCKS AND ICE
"THE ROOF OF THE CONTINENT"
• EXPEDITION CLIMBING AND MOUNTAINEERING
• SCENIC OVERFLIGHTS

FRONT RANGE MOUNTAINS

RUGGED PEAKS AND RIDGES WHICH SERVE AS PLATFORMS FOR VIEWS OF THE MCKINLEY MASSIF. TRANSITION ZONE BETWEEN RICH LOWLAND HABITATS AND LIFELESS HIGH ALTITUDE MOUNTAIN LANDSCAPE OF THE MCKINLEY MASSIF
• MOUNTAINEERING, HIKING, AND BACK-COUNTRY CAMPING SUPPORTED BY A SYSTEM OF TRAILS
• AIR ACCESS TO SELECTED VIEWPOINTS, TRAILHEADS, AND PRIMITIVE CAMPSITES

RUTH GLACIER

NATURAL CORRIDOR THROUGH AN IMMENSE GLACIALLY SCULPTED LANDSCAPE CULMINATING IN THE GREAT GORGE AND SHELTON AMPHITHEATER
• AIR TOURS WITH THE OPPORTUNITY TO LAND ON AND WALK ABOUT THE GLACIER
• GLACIER INTERPRETATION AND DEPARTURE POINT AT ALDER CREEK FOR HIKING, DOG SLED TRIPS, AND ACCESS TO PRIMITIVE CAMPSITES

BYERS LAKE

SERENE, EASILY ACCESSIBLE LAKE SET IN A LUSH FOREST ENVIRONMENT
• CAMPING, PICKNICKING, HIKING, AND HORN-MOTORIZED BOATING SUPPORTED BY STATE PARK FACILITIES

CHULITNA RIVER VALLEY

AN EXPANSIVE VALLEY OF RIVERS, PONDS, AND FORESTS ENCLOSED BY THE TOKOSHIA MOUNTAINS AND CURRY RIDGE
• VIEWING OF MOOSE, SWANS, AND OTHER WILDLIFE
• RIVER RAFTING, CROSS-COUNTRY SKIING, AND DOG SLED TRIPS
• WILDERNESS OVERNIGHT STAYS IN PRIMITIVE CABINS

PETERS HILLS

REMOTE, ROLLING TUNDRA HIGHLANDS WITH CLASSIC FRAMED VIEWS OF MOUNT MCKINLEY
• HIKING, BACKCOUNTRY CAMPING, AND CROSS-COUNTRY SKIING AWAY FROM THE MAINSTREAM OF TOURIST ACTIVITY

SOUTH CURRY RIDGE

BEST VANTAGE POINT FOR SIMULTANEOUSLY EXPERIENCING THE IMMENSE SCALE AND GRANDUR OF THE ALASKA RANGE WITHIN DENALI NATIONAL PARK AND THE RICH DETAILS OF A TUNDRA ENVIRONMENT WITHIN DENALI STATE PARK
• ORIENTATION AND INTERPRETATION AT A MAJOR VISITOR CENTER
• OVERNIGHT STAYS AT A FULL-SERVICE LODGE ORIENTED TO VIEWS OF THE ALASKA RANGE AND THE CHULITNA RIVER VALLEY
• STAGING FOR AIR ACCESS INTO THE MOUNTAINS AND THE RUTH GLACIER
• HIKING, PICKNICKING, CAMPING, LATER, PRIMITIVE WALKS, AND WINTER SPORTS
• ACCESS FROM THE HODGWAY AND THE ALASKA RAILROAD

GEORGE PARKS HIGHWAY

THE ROAD TO THE SOUTH SIDE OF DENALI: A FORESTED CORRIDOR, OFFERING GLIMPSES OF MOUNT MCKINLEY
• INFORMATION AND ORIENTATION
• PICKNICKING, SCENIC VIEWING
• PUTTING AND TAKE-OUT FOR CHULITNA RIVER TRIPS
• STAGING FOR HIKING AND BACK-COUNTRY CAMPING
• COMMERCIAL VISITOR SERVICES

SOUTH SIDE LANDSCAPE FEATURES
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Most areas to the south of the range are not expansive and open and thus do not afford a comparable viewing experience. Instead, wildlife viewing on the south side occurs within more enclosed spaces, as for example, sighting a moose in a small pond within a lowland forest area. Other species readily observable, particularly along drainages, are bear, beaver, and numerous small mammals. Wolf, wolverine, and coyote are wary of humans and are not often seen. Waterfowl, including trumpeter swans, are found in ponds and wetter areas. While access remains a major obstacle for most south-side fishing, the potential is greater than in rivers and streams which intersect the park road.

No threatened or endangered wildlife species are known to inhabit or migrate through the park and preserve. Grizzlies, wolves, and the golden and bald eagles are not considered threatened or endangered in Alaska (see appendix M).

CULTURAL ENVIRONMENT

The Denali region has fostered a rich prehistory and history of human occupation. However, the exact extent of human activity is not yet fully known, given the awesome dimensions of Mount McKinley and its flanks of lesser mountains, foothills, glacial canyons, and river valleys. Further archeological surveys and academic studies are needed to develop a comprehensive picture of human activity in the Denali region.

ARCHEOLOGY AND ETHNOGRAPHY

In very early times, 10,000 to 20,000 years ago, the northern sector of the park was on the margin of the Beringian steppe, where Pleistocene megafauna could support big game hunters of Siberian origin. Representations of this earliest culture are found in the early man site just outside the park boundary at Dry Creek, west of Healy. There, artifactual remains have been determined to be older than 10,500 BP, thus constituting one of the more important archeological discoveries in Alaska. The significance of this site has drawn considerable archeological attention to the area. A large stone spear point was recently found in the west end of the park, indicating the potential for an equivalent site to be found and dated within the park.

Prehistorically, the land comprising Denali National Park and Preserve was sparsely populated, reflecting the low biological productivity of the land and the geography of this border region between Pacific systems and the interior. Large game animals--the principal food source--were widely scattered, and thus, occupation was on an intermittent seasonal basis. Concentrating on obtaining the necessities of life, the inhabitants were likely migratory, seasonally following and intercepting herds of big game, especially caribou.

These bands left scanty remains at their temporary camps and game lookout points in the form of lithic scatterings. Thus, archeologists have been unable to determine the specific Alaska cultural tradition they represent. The archeological evidence gathered to date suggests representations of the American Paleoarctic tradition (Denali complex), the Northern Archaic tradition (possibly the Arctic Small Tool tradition), and prehistoric and historic Athapascans. The most definitive archeological remains, located within the Teklanika archeological district, are considered type sites for the Denali complex of the American Paleoarctic tradition, representing a people who preyed upon herds of grazing mammals in Beringia during the early Holocene.

More recently, Athapaskan groups exploited this region, centering upon the Susitna, Tanana, and Kuskokwim river systems. At the time of European contact, three major Alaska native groups occupied the area: the Tanaina and Tanana Indians and the Ingalik. A mixing of Eskimo and Athapaskan cultures may have taken place in the upper Kuskokwim River drainage before Russian exploration.

Native villages within the Denali region are known to have existed at McGrath, Telida, Nikolai, Lake Minchumina, and along the Tanana River and its tributaries. Another village may have been situated 50 miles southeast of Cantwell.

To these natives living in the region two centuries ago, the majestic snow covered peak towering above all others was known by various names--Denali, Trolike, Tenada, Trelaka--all meaning the great or high mountain. The foreigners drawn to the area in search of wealth (from furs to be harvested or minerals to be prospected) were not aware or apparently not interested in the great size of the mountains of the interior Alaska Range. It was not until 1896, spurred by a minor gold rush in the area, that prospector William Dickey arrived and drew public attention to the lofty peak, estimating its height at 20,000 feet. He named the mountain McKinley after William McKinley, presidential candidate and fellow proponent of the gold standard. Thus, Mount McKinley was recognized as the "summit of North America."

HISTORY

The first sighting of Mount McKinley by nonnatives occurred in 1794 when George Vancouver saw "distant stupendous mountains" from the Knik Arm of Cook Inlet.

Russian explorer-traders were the first nonnatives to visit the Mount McKinley region. Vassili Malakoff of the Russian American Company ascended the Susitna River in the early 1800s in search of furs and reached the area now comprising Denali State Park. Russians also came up the Kuskokwim River, setting up a few trading posts along its banks. Their initial ascendancy of the upper Kuskokwim took place in 1830, and arrival in the McKinley region occurred around 1842. The upper Kuskokwim was not attractive to the Russians, and so the trading posts were soon abandoned.

Despite the early European observations and tentative explorations, the Denali region remained virtually unknown to modern explorers until the late 19th century.

Alaska was purchased by the United States in 1867, but government-backed exploration of the area did not occur until 1898, when George Eldridge, geologist, and Robert Muldrow, topographer, of the United States Geological Survey approached Mount McKinley from the south to measure its elevation. Twenty-five years later the general route taken by Eldridge and Muldrow was followed during construction of the Alaska Railroad. Also in 1898 Sargent William Yanert crossed the Alaska Range through Broad Pass, making him the first white man to set foot in what is today Denali National Park and Preserve.

Another USGS party, headed by Alfred H. Brooks, set out in 1902 to survey the geology of the McKinley massif. This party circled nearly the entire base of the mountain and was the first to visit the local native tribes and to set foot on McKinley's lower slopes.

One year later, in 1903, Judge James Wickersham and party attempted the first ascent up Mount McKinley. The attempt was unsuccessful, reaching only 8,000 feet before turning back. At least 11 more expeditions would fall short of the summit before it was finally reached by the Stuck-Karstens expedition in 1913.

In 1905 placer gold was discovered on Moose Creek and in the Kantishna Hills, luring thousands of miners to the north side of McKinley. After a frenzied summer of prospecting, most miners moved onto other areas, while the handful of lucky miners who had struck pay dirt remained.

In 1915 construction was underway on a railroad which would connect Seward with Fairbanks. Construction camps sprang up along the line with the advance of the project. Train depots and roadhouses arose along the railway and small settlements developed at the train stops.

The metal prospecting and related geological and travel route surveys brought the mountain and its varied wildlife to public attention. Widely publicized mountaineering expeditions and naturalist Charles Sheldon's early movements to protect the animals of the Denali wilderness led to national park designation in 1917. The boundary included the top and north side of the McKinley massif as well as the northern flank of the Alaska Range. Automobile access within the park was provided in 1938, upon the completion of the McKinley National Park road. Visitors then brought their cars via the railroad. Almost 20 years later, in 1957, the Denali Highway connected the park road to the Richardson Highway and the rest of the Alaska road system. With the completion of the George Parks Highway in 1972, travel time from Anchorage and Fairbanks was greatly reduced, and in anticipation of greatly increased visitor use, the National Park Service instituted a free shuttle bus service along the park road and prohibited most private vehicle travel.

SIGNIFICANT CULTURAL RESOURCES

There are approximately 100 known cultural sites and structural units or complexes located within Denali National Park and Preserve. Though this may constitute only a fraction of what actually exists within the park, these cultural resources illustrate most major elements of the region's prehistory and history, representing themes from early man to modern Euro-American occupation.

Many cultural sites relate to prehistoric occupation of migratory big game hunters who used the area on an intermittent seasonal basis possibly as early as 10,000 years ago. Two sites, Teklanika East (HEA-001) and Teklanika West (HEA-002), comprise the Teklanika archeological district, which is listed on the National Register of Historic Places. The significance of this district is its archetypal site representation of the Denali complex of the Paleoarctic tradition--a people who preyed upon herds of grazing mammals in the Beringia during the early Holocene.

Two additional prehistoric sites containing lithic remains of early hunters have been determined potentially eligible for nomination to the National Register of Historic Places. Alaska heritage resource site MMK-028 is located on a hilltop near the confluence of Willow Creek and Moose Creek. MMK-027 is situated on a hill west of Rainy Creek.

Of additional archeological significance is an early man site at Dry Creek, located just outside the park boundaries. Listed on the National Register of Historic Places, this site has produced the earliest evidence of culture in the Denali region, and its proximity to the park suggests such prehistoric site potential therein.

Other sites relating to prehistoric use of Denali have been identified in the vicinity of the park road corridor on the Savage and Sanctuary rivers, along the upper reaches of the Susitna and Nenana river valleys, and at Telida, Minchumina, and Stephan lakes. The scanty remains of these brief encampments do not lend themselves to precise classification within a specific Alaska cultural tradition, and their overall significance is yet unclear.

Many of the significant historic structures relate to two distinct but often interrelated themes: mining and subsistence hunting and trapping. The majority of these surviving structures, which date between 1905 and 1935, are located in the Kantishna mining district. Based on a recent field study of this area, the National Park Service and the Alaska state historic preservation officer have determined the following structures are potentially eligible for the National Register of Historic Places:

- Kantishna roadhouse (unknown)
- Fanny Quigley residence (unknown)
- Busia's cabin (1920s)
- Banjo Mill (1936)
- Upper Caribou Creek (1920s)
- Glacier City (1905-06)
- Stampede Mine (1936-41)

The first four sites are privately owned.

The administrative history of the park is represented by two complexes of structures which are in the process of being nominated to the National Register of Historic Places. The park headquarters area is comprised of several buildings, including the park headquarters (1935), the east district ranger office (1928), the warehouse (1932), the dog kennels (1929), and the interpretive building (1928).

Other historic structures potentially eligible for inclusion in the National Register of Historic Places are the patrol cabins in the interior of the park dating from 1924 to 1939.

EXISTING VISITOR USE

The large visitation statistics at Denali National Park and Preserve are a reflection of the park complex's strategic location between Anchorage and Fairbanks, its long history in the national park system, and its easy access. Visitors can arrive at Denali via private vehicle, tour bus, railroad, or aircraft. A landing strip at Riley Creek accommodates small planes.

Currently, almost all visitor facilities are confined to the 88.5-mile-long park road corridor and near the park entrance along the George Parks Highway. The National Park Service operates seven campgrounds with a combined total of 225 campsites. Other overnight accommodations are provided inside the boundary by privately operated lodges and a concessioner-operated hotel. Camp Denali and the North Face Lodge, both privately owned, are located near the end of the park road in Kantishna. Camp Denali offers cabin accommodations for approximately 43 people, while the North Face Lodge has 15 motel-style rooms. Recently, the Kantishna Roadhouse has reopened for use and provides several rental cabins. Denali National Park Hotel (formerly McKinley Park Station Hotel), near the entrance to the park, offers a variety of accommodations with a capacity of 120 double rooms and 21 single rooms. Several additional commercial operations near the park entrance and adjacent to the park boundary provide lodging, camping, and associated visitor services for tourists to Denali.

The activities of visitors reflect the available access corridors and facilities. The majority of visitor use occurs along the park road corridor between Riley Creek and Wonder Lake. A shuttle bus system operates during the peak visitor use season. This transportation system performs two principal functions. It provides an opportunity for visitors to experience the park (primarily viewing wildlife and Mount McKinley) and it also provides access into the park's interior for backcountry users. In addition to the NPS park shuttle bus system, the concessioner offers wildlife tours along the park road, and the three lodges in Kantishna provide transportation from the park entrance to their facilities.

Visitor travel along the road corridor is by necessity controlled, and only those with camping permits or special use permits are allowed access in private vehicles. Even with the transportation systems and other controls to minimize wildlife disturbance, traffic volume along the road doubled between 1971 and 1979.

Visitation to Denali has grown remarkably since the area was established as a national park (see table 7). The extraordinary increase that occurred in 1972 was the result of the completion of the George Parks Highway and the ease of access it provided between Anchorage, Fairbanks, and the park. The past decade has witnessed continued growth in visitation, with recorded use almost quadrupling from 1972 to 1983.

Table 7: Annual Visitation, 1922-1984

<u>Year</u>	<u>Total Recreation Visits</u>
1922	7
1932	400
1942	5
1952	7,300
1962	16,600
1972	88,615
1973	137,418
1974	161,427
1975	160,600
1976	157,612
1977	170,031
1978	222,993
1979	251,105
1980	216,341
1981	256,593
1982	321,868
1983	346,082
1984	394,426
1985	432,542

Visitation to Denali is highly seasonal, with 93 percent of the total annual use occurring during the months of June, July, August, and September (see table 8).

Table 8: Seasonal Use Patterns, 1985

<u>Month</u>	<u>Total Recreational Visits</u>
January	166
February	161
March	346
April	661
May	10,993
June	94,794
July	144,598
August	122,482
September	55,241
October	1,854
November	788
December	458
Total	432,542