environmental overview and analysis of mining effects

september 1981

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ENVIRONMENTAL OVERVIEW and ANALYSIS OF MINING EFFECTS

DENALI NATIONAL PARK AND PRESERVE

ALASKA

Denver Service Center
National Park Service
United States Department of the Interior

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PURPOSE OF THE STUDY

The information contained in this Environmental Overview and Analysis of Mining Effects is intended to assist the National Park Service and other interested agencies and individuals in adequately assessing the effects of existing and future mining activities in Denali National Park and Preserve and to expedite the processing of proposed mining plans of operations.

This document is divided into three sections (Kantishna Hills, Chulitna, and Other Located Claims) correlating with the areas where mining claims and operations are concentrated.

For the purposes of this document, it has been assumed that all mining activities in the Kantishna Hills study area are being conducted on existing valid and/or patented claims.

Most of the existing mining operations in Kantishna Hills, for which supplemental claim information and plans of operations have been received, have been granted temporary operating authority subject to certain stipulations and additional information requirements. However, it must be emphasized that any subsequent validity determinations on unpatented claims may reveal, among other things, that they are not legally located or that they do not contain economic mineral deposits. At such time, the validity of the claims may be contested by the secretary of the interior for the purpose of having them declared null and void, precluding further mining activity if any has occurred. Proposals for renewed operations are currently undergoing review.

The Chulitna area includes the study areas of West Fork and Tokositna. There are currently no major mining operations in these areas of the park, and no major mining activity is anticipated in the future. Some survey work and exploration has been conducted in the Chulitna area but little, if any, extraction has occurred. If mining operations should occur in the future, the effects on the natural resources are expected to be similar to those described for the Kantishna Hills study area. In some instances, environmental concerns for Chulitna that would be highly important should mining occur on a given claim have been addressed in the description of the area, where applicable.

Currently, there are a total of 593 claims totaling approximately 12,620 acres in Denali National Park and Preserve. The Kantishna Hills study area has 34 patented and 92 unpatented lode claims covering approximately 2,520 acres and 201 placer claims covering approximately 4,780 acres recorded with the Bureau of Land Management. Chulitna has 195 unpatented lode claims covering approximately 3,900 acres and 21 placer claims totaling approximately 420 acres. In addition, there are 50 lode claims totaling approximately 1,000 acres within the former Mount McKinley National Park boundary.

BACKGROUND

LEGISLATIVE HISTORY

Denali National Park and Preserve was originally established pursuant to 39 Stat. 938 in 1917 as Mount McKinley National Park. (Legislation in 1922 and 1932 enlarged the park boundary to 1,939,493 acres.) Concerning mining and mineral rights, the 1917 legislation stipulated that existing valid claims and entry and location rights could not be affected by park designation and that existing mineral land laws, in particular the Mining Law of 1872, would continue to apply to all lands within the boundary.

In 1931 the secretary of the interior was granted authority to prescribe regulations for the surface use of lands in Mount McKinley provided that no one was denied entrance to the park for prospecting and mining purposes (46 Stat. 1043). The 1932 legislation enlarging the park boundary also restated the rights of individuals to "full use and enjoyment" of valid claims, locations, and entries under existing mining laws (47 Stat. 68). These provisions remained in effect until the Mining in Parks Act of 1976 (PL 94-429), which closed the park to any further mineral entry and location under the Mining Law of 1872 and placed a four-year moratorium on surface disturbance for mineral exploration and development on existing valid claims. This act also required that the secretary of the interior determine the validity of any unpatented claims within the park boundary and that he submit to Congress recommendations as to whether any valid or patented claims should be acquired by the federal government. PL 94-429 required that all unpatented claims within the park boundary be recorded with the secretary of the interior by September 1977. Any claim not recorded by that time was to be presumed abandoned and declared null and void. (Claims within the former Mount McKinley National Park boundary that were properly recorded with the park superintendent as of September 1977 are addressed in the "Other Located Claims" section in this document.)

On December 1, 1978, the president of the United States, acting under the authority granted him in the Antiquities Act of 1906, proclaimed 3,890,000 acres of land surrounding Mount McKinley National Park as Denali National Monument. Although the proclamation supported and complemented the original enabling legislation, a major purpose of the monument was to protect all of the southern slope of Mount McKinley, the highest peak in North America, previously partially excluded from the boundary. The proclamation also called for preservation of the geologically unique Cathedral Spires, several of the largest glaciers in the state of Alaska, and areas of significant habitat for the McKinley caribou herd and important populations of grizzly bear, wolf, wolverine, and salmon. The monument was also established subject to valid existing mineral rights, including mining activities on existing recorded and patented claims. However, pursuant to the Mining in Parks Act of 1976, no further locations of mining claims within the monument were to be permitted.

On December 2, 1980, the president signed into law the Alaska National Interest Lands Conservation Act (PL 96-487). Section 202 of the act expanded Mount McKinley National Park, established Denali National Preserve, and redesignated the park and preserve together as Denali National Park and Preserve. The act revised the previous park boundary to encompass approximately 5,696,000 acres. The new park additions and designated preserves were to be managed to protect the entire Mount McKinley massif, the additional scenic mountain peaks, and habitat for all important populations of fish and wildlife. Subject to valid existing rights, section 206 of the 1980 act withdrew all federal lands within units of the National Park System from mineral entry and location under the mining laws and from disposition under the mineral leasing laws. (All the above legislative references can be found in appendix A.)

MINING REGULATIONS AND COMPLIANCE

After all unpatented claims were recorded for the former Mount McKinley National Park, field investigations by the National Park Service were completed on each claim group, and complaints challenging the validity of all claims were issued. Administrative and legal action is currently at different stages on each claim group. No mining activity is allowed on a claim during this adjudication period.

Pursuant to section 314 of the Federal Land Policy and Management Act of 1976 (see appendix A), as implemented by regulations found in 43 CFR subpart 3833, procedures were established for recording the number and location of unpatented mining claims. In the park expansion area and preserve, mining claims were recorded with the Bureau of Land Management by October 11, 1979, as required, and are in various stages of investigation or adjudication for validity. Further, all owners of properly located unpatented lode or placer mining claims, mill sites, or tunnel sites on federal land are required to either show evidence of performing annual assessment work related to the claim or file a notice of intention to hold the claim with the appropriate office of the Bureau of Land Management before December 31 of each calendar year.

Assessment work is annual labor or improvements required by the Mining Law of 1872 on unpatented claims for the purpose of developing those claims. Such work includes, but is not limited to, geological, geochemical, and geophysical surveying; roadwork; tunneling, surface cuts, pit, or trench excavations; or core drilling that tends to develop the mineral deposit. The intent of assessment work is to encourage development of minerals and to preclude speculative holding of claims (USDA, FS 1977). The work should contribute to the development or extraction of an established ore deposit and is not be used for exploratory type work, or work spent in search of an ore deposit (Maley 1979). Such action on an unpatented claim in the park requires issuance of a permit pursuant to 36 CFR 9.5.

A notice of intention to hold is in the form of a letter setting forth certain claim information and signed by a claim owner, owners, or an

agent. Filing of this document instead of an affadavit of assessment work is required on unpatented claims in the park and other units of the National Park System when mining operations are not approved for development, extraction, or patent requirements in order to reduce environmental disruption on claims that later may be found invalid.

The Mining in Parks Act of 1976 (16 USC, Sec. 21-54) precipitated promulgation of regulations (36 CFR 9A) in 1977 for the National Park Service to control all mining activities on patented or valid unpatented mining claims in all NPS areas. These regulations enable the National Park Service to prevent or minimize potential damage to the environment and other resource values through control of mining activities.

Typically, these NPS regulations require the mining operator to submit a proposed plan of operations to the National Park Service for evaluation. If the proposed mining activities are in accordance with the regulations, afford adequate protection of park resources, and do not compromise the purposes for which the park was established, operating authority may be granted.

In some instances, an exhaustive site specific analysis may be necessary for adequate evaluation of a proposed plan of operation. While that is beyond the scope of this document, the material contained in this report should supply an information base for adequately evaluating the majority of proposed plans and preparing the necessary environmental analyses.

Emergency regulations were promulgated on February 27, 1979, to amend the requirements of 36 CFR 9 (9.9 (b), (4), and (5)). These regulations require the operator on an unpatented claim in Alaska to submit a supplemental claim information statement detailing the nature of the known deposit to be mined; describing the quantity, quality, and previous production of the deposit; and listing the proposed operation with a timetable for each phase, including completion. This information enables appropriate NPS mining personnel to make tentative assumptions of claim validity and to grant temporary operating authority under special stipulations on a case-by-case basis. To date, most operations in NPS units have been handled in this manner. In the future, as the new NPS areas and the regional office in Alaska become adequately staffed, the process will probably revert to the manner in which plans of operations and environmental analysis are handled in other NPS units that have existing mining operations.

Finally, in a recent solicitor's opinion and in regulations (36 CFR 13.15) published June 17, 1981, it was noted that section 9.3 36 CFR 9A, which requires issuance of an access permit to mining claims, does not apply in Alaska park areas because its requirement for an approved plan of operations could interfere with the "adequate and feasible access" provisions to valid claims granted in section 1110 (b) of the Alaska National Interest Lands Conservation Act. However, sections 9.9 and 9.10 still independently require an approved plan of operation prior to conducting mining activities in the park. (All the above NPS and BLM mining regulations can be found in appendix B.)

KANTISHNA HILLS

INTRODUCTION

The Kantishna mining district is generally defined on the south by the crest of the Alaska Range including Mount McKinley, on the north by the Tanana River, on the east by the Toklat River, and on the west by the Herron River and Lake Minchumina. In a broad sense, the Kantishna region includes the entire Kantishna River basin and part of the Nenana River basin (USDI, GS 1919b). However, the focus of this section of the report is on the southwest portion of the area, near Wonder Lake, north of the former boundary of Mount McKinley National Park, in a group of mountains (less than 5,000 feet in elevation) known as the Kantishna Hills (see Region map). The greatest concentration of mining activity in the park is currently located in this 180,000-acre area.

Road access to the Kantishna Hills area has been primarily via the existing Denali park road since its completion in the 1930s. It is assumed that such access will continue under the existing NPS administrative requirements. Transportation of all heavy mining equipment on the road is currently restricted (between 10:00 p.m. and 7:00 a.m.). Existing airstrips in the Glen Creek and Caribou Creek basins and at Kantishna are primarily utilized for transportation of personnel.

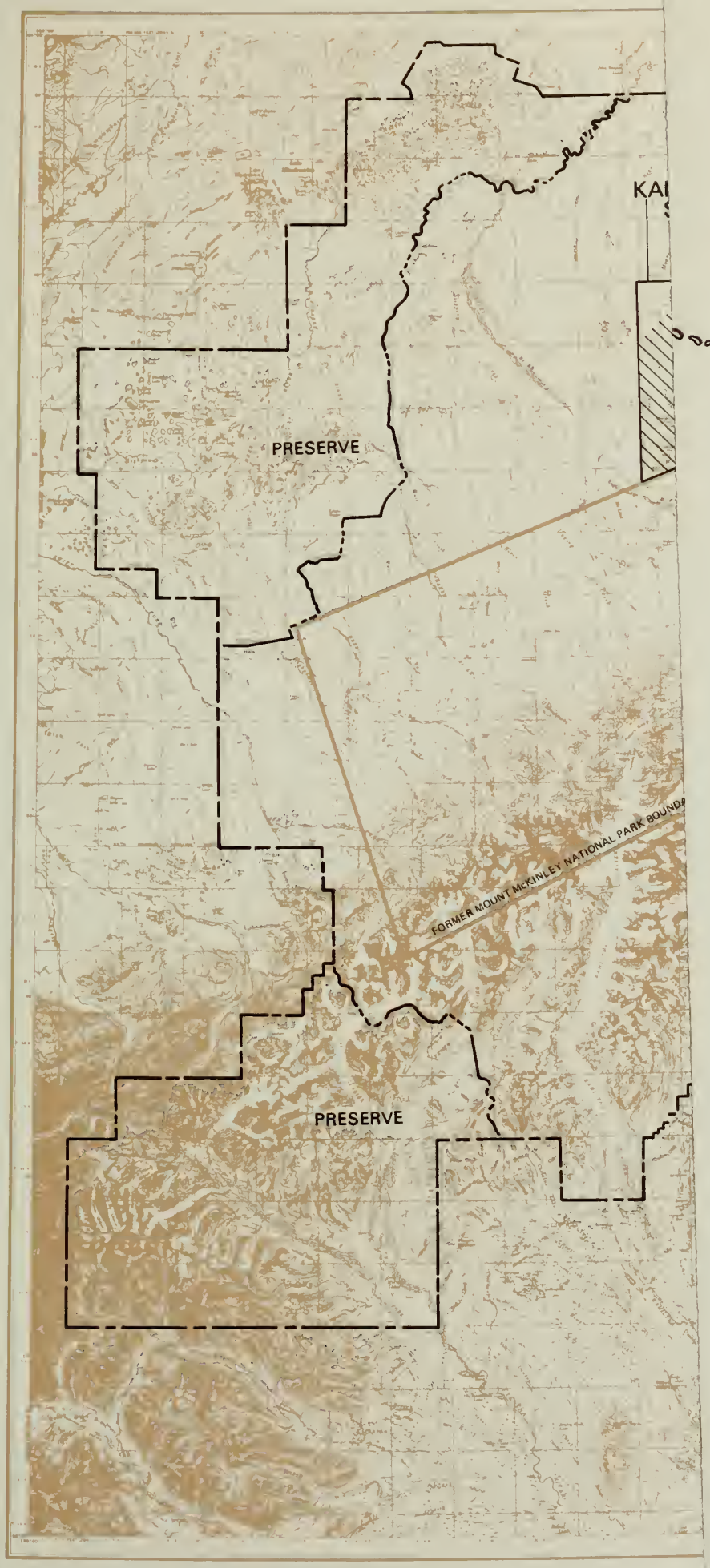
On April 30, 1965, the Bureau of Land Management withdrew an area of land in Kantishna Hills to establish it as a protective area, precluding further appropriation under the public land laws including mining laws (see appendix C). Many placer and lode claims within this withdrawal area were located after 1965 and were declared null and void by the Bureau of Land Management. Responding to an appeal of the BLM decision (IBLA 80-787), a January 12, 1981, ruling by the Interior Board of Land Appeals affirmed the null and void determination of all or part of approximately 30 placer claims within the withdrawal area (see appendix D and the Placer and Lode Claims maps for Kantishna Hills in the accompanying map pocket). In addition, there are several more placer claims and many unpatented lode claims within the boundary that were entirely or partially located subsequently to the withdrawal. As a result, it is probable that many of the placer and lode claims within Kantishna Hills will be precluded from mining activities in the future.

The land and mining claims that are associated with the Stampede mine in Kantishna, northeast of the Kantishna Hills study area addressed in this document, are not included in this analysis because of the existence of a memorandum of understanding between the University of Alaska and the National Park Service dated December 31, 1979. The memorandum ensures protection of resources in the region of the mine, since the area will be principally used by the university, with particular concern for park resource values.

Mineral interests that were formally privately owned were deeded to the university on December 31, 1979. Any mining-related research or education activity by the university will proceed only with a plan of operations approved by the National Park Service and will be directly related to programs and study courses and research sponsored by the university.

MINING CLAIM STATUS

The Kantishna Hills study area contains 190 recorded placer claims and 11 unrecorded placer claims, covering approximately 4,780 acres. There are 34 patented and 92 unpatented lode claims, totaling approximately 2,520 acres. Table 1 details the status of mining activities in the Kantishna Hills study area for the 1980 mining season. Where possible, information is also presented for potential future operations. Appendix E contains claim status information and additional data on 1980 operations. This information was mostly derived from proposed mining plans submitted to the National Park Service and field work conducted in the area from July through September 1980.



DENALI NATIONAL PARK AND PRESERVE BOUNDARY

PL 96-487 KANTISHNA HILLS/ DUNKLE MINE STUDY AREA

NORTH

0 5 10 15 MILES

0 5 10 15 KILOMETERS

REGION

KANTISHNA HILLS / CHULITNA
DENALI NATIONAL PARK AND PRESERVE

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

184	20,000A
DSC	AUG 81

KANTISHNA HILLS
STUDY AREA

FORMER MOUNT McKINLEY NATIONAL PARK BOUNDARY

PARKS HIGHWAY

PRESERVE

DENALI PARK ROAD

CHULITNA
STUDY AREA
(WEST FORK)

FORMER MOUNT McKINLEY NATIONAL PARK BOUNDARY

PARKS HIGHWAY

PRESERVE

CHULITNA
STUDY AREAS
(TOKOSITNA)

DENALI NATIONAL PARK
AND PRESERVE BOUNDARY

PL 96-487 KANTISHNA HILLS/
DUNKLE MINE STUDY AREA

NORTH

0 5 10 15 MILES

0 5 10 15 KILOMETERS

REGION

KANTISHNA HILLS / CHULITNA
DENALI NATIONAL PARK AND PRESERVE

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

184 | 20,000A
DSC | AUG 81

Table 1: Mining Claim Operation Status
Kantishna Hills

	Active Operations (1980)				Potential Future Operations			
Creek Basin	No. of Operations	Placer Claim Name	No. of Operations	Lode Claim Name	No. of Operations	Placer Claim Name	No. of Operations	Lode Claim Name
Willow	0		0		1	Willow #1-#8	0	
Spruce	1	Spruce #1-#8	0		1-2	Spruce #1-#8	0	
Glen	3	Gold King #1-#15 (2 operations) Glen Creek 1-11	1	Silver King #16-#18	2	Gold King #1-#15 (2 operations)	1-3	Silver King #16-#18
Rainy	1	Rainey #1-#8	0		1	Rainey #1-#8	0	
Eureka	2	Discovery #1-#3 Eureka 1-7	1	Eureka	2	Discovery 1-3 Eureka 1-7	8	Silver Pick, Silver Pick #2, Banjo, Lucky Strike, Keystone, Pennsylvania, Eureka
Eldorado/Slate	1	Liberty #15-#18	0		1-2	Liberty Claims	2	Antimony #1-#4 Slate Creek
Friday	3	Discovery Claim Alder #1-#4 (2 operations)	1	Red Top Lode (Kantishna Mines, Ltd new mill)	2-3	Discovery Claim Alder #1-#4 (2 operations)	2	Red Top Lode, Red #1
Moose	1	Moose Creek #2	0		2-3	Bueno, Moose Creek #2, Liberty Claims Taybo #3&#4	1	Whistler
Glacier	0		1	Flat Creek Lode 1-6	3	Schmuck #1-#3, Red Hat #1-#3, Glacier Creek Association Claims 1-6	1	Flat Creek Lode 1-6
Caribou	0		0		1	Lee Bench Howtay Assoc., Caribou Howtay Assoc., Howtay Assoc.	1	Last Chance 1-6
Subtotals	12		4		16-26		16-19	
		Total 16				Total 32-45		

MINING HISTORY

The interior of Alaska was the scene of a continuing gold rush from the 1880s through the turn of the century. Partly because of the extensive mining activity, a number of government expeditions explored the Kantishna River basin and the central Alaska Range. In 1903, gold was discovered in the stream gravels of Chitsia Creek in the extreme northern portion of the Kantishna Hills, and in 1904 prospecting for gold was begun in the foothills of the central Alaska Range. That same year, prospecting occurred in the Toklat River basin and the following year in Crooked Creek, a tributary of the Toklat that has its headwaters in Kantishna Hills. (For a more detailed description of the mining history, see Bundtzen 1978.)

In 1904, placer gold was discovered on Glacier and Eureka creeks, which started a stampede to Kantishna in 1905. With the stampede and further discovery of gold on Friday Creek, small towns sprang up throughout the area, and claims were staked on practically every creek and intervening ridge in Kantishna Hills. Because it was located near active pay streaks, the village of Kantishna (then named Eureka) served as a summer mining camp.

In 1906, as the rich gold discoveries on Friday, Glen, Rainy, Moose, Caribou, Stampede, Crooked, and Little Moose creeks were found to be limited in economic deposits, numerous miners left--leaving only an estimated 35 to 50 miners in the area.

With the discovery of galena and stibnite in sluice boxes between 1904 and 1905, lode mining became quite profitable because of the high prices being paid for antimony during the Russo-Japanese War. Lead, zinc, silver, gold, and copper veins were found on Quigley Ridge, and from 1907 to 1909 numerous hardrock discoveries were made in the Glen Creek area. In 1916, approximately 125 tons of high-grade antimony ore were mined from a deposit on Slate Creek. By 1919, mineral veins containing sulfides of antimony, lead, silver, arsenic, zinc, copper, and gold had been located along a 35-mile stretch from Slate Creek to Stampede Creek. From 1919 to 1924, high-grade ores of silver and gold and by-product lead and zinc were produced from the Quigley Ridge area, and it was suggested that Kantishna Hills could become a major silver producer for Alaska. Unfortunately for the miners of that period, the silver ores were expensive to develop because of serious transportation problems. Ore was not considered economic if it contained less than 100 ounces of silver per ton. In 1922, an apparent exhaustion of high-grade lead-silver ores caused a decline in early lode-mining activities. Placer mining was also on the decrease at this time, and by 1925 only 13 miners were recovering gold from their placer operations in Kantishna.

In 1931, the Banjo mine on Quigley Ridge became the largest hardrock gold producer in the Kantishna mining area. Early in the 1930s, because of an increase in the price of gold, the gold-mining industry began expanding, and construction of the present Denali park road (from the present Denali park station to Kantishna) eased the previous

transportation problems. The Red Top Mining Company was formed in 1935, and in 1938 a mill, assay shop, bunkhouses, blacksmith shop, and other structures served by a road and airstrip were constructed to facilitate the mining of the large commercial grade ore contained in the Banjo vein. The Banjo mine ceased operations during World War II, never to resume.

During the late 1930s, a successful dredge placer-mining operation began on Caribou Creek. This operation left tailings piles at various localities in the upper Caribou Creek valley that are still visible today.

A golden era for the Kantishna area occurred during the late 1930s and early 1940s but was terminated during World War II by Franklin Roosevelt, when he issued the order to shut down gold mines because gold extraction was not considered essential to the war effort. During 1940, Kantishna produced an all-time high of 7,000 ounces of gold from lode and placer operations.

Kantishna was also a major antimony district in Alaska, with the Stampede mine being the largest producer. The antimony deposit on Slate Creek (Antimony #1-#4 Slate Creek) has undergone development for the last 25 years, and the Last Chance lode claim on Caribou Creek has produced ore for the last 10 years. A stibnite-quartz vein on Eureka Creek also produced antimony during the early 1900s.

During the 1950s and 1960s, mining in Kantishna consisted of limited ore shipments from Slate Creek, Stampede Creek, and a few small-scale placer operations.

In 1973, a 35-ton-per-day flotation mill at the Red Top mine was constructed and processed 120 tons of silver ore that was shipped to British Columbia. At about the same time, high antimony prices resulted in ore production from the deposits in Slate, Stampede, and Last Chance creeks.

From the 1970s until the present time, placer mining, although sporadic, has increased with the rising price of gold. Mechanized placer operations utilizing bulldozers, front-end loaders, trommels, and shakers work gravels that were either mined in the past or were inaccessible at that time. During 1975, approximately nine placer-mining operations involving about 30 miners yielded at least 1,000 ounces of gold from Caribou, Glacier, Yellow, Eureka, Friday, Eldorado, Spruce, and Glen creeks. A summary of the 1980 mining activity in the Kantishna Hills is presented in appendix E.

Historic production of metallics from Kantishna Hills totals an estimated 55,000 ounces of gold, 265,000 ounces of silver, 5 million pounds of antimony (44 percent of Alaska's total production), and 1.5 million pounds of combined lead and zinc. (Refer to appendix F for detailed information on claim types and operations.)

THE ENVIRONMENT

NATURAL ENVIRONMENT

Hydrology/Water Quality

The Kantishna Hills study area is located in the Kantishna River basin, a 6,770-square-mile watershed tributary to the Tanana River. From the northwest slope of the hills, streams flow generally northerly across a wet, gently sloping alluvial plain to the Kantishna River, with Moose Creek and Bearpaw River the two main streams draining the area. Streams draining the east side of the hills flow into the Toklat River, which joins the Kantishna River further north and east.

The Kantishna River is primarily fed by streams originating from glaciers in the Alaska Range, including the McKinley and Toklat rivers that border the study area. Streams entering the system from Kantishna Hills, however, are fed by clear waters derived from rain, snowmelt, and subsurface aquifers. By virtue of the area's isolation from glacier drainage, the Kantishna Hills is an important clear-water source for the region.

Alaska's extreme northern climate controls the hydrologic cycle in the study area to the extent that annual flow patterns show little variation. High water supplied by runoff from regular summer rains and snowmelt occurs between May and September. Floods occur at almost anytime during the summer but have the greatest possibility during May or June when heavy spring rain combines with snowmelt. In addition, incomplete thawing of the soil may impede infiltration and increase runoff during this period. Localized flooding occurs regularly during spring breakup when ice jams form and burst abruptly, releasing great volumes of water and broken ice.

Floods are fairly common occurrences in the Kantishna Hills because of steep terrain and frequent summer rains. Floodwaters scour stream channels and carry heavy loads of silt downstream; in the process, the floodwaters are continually building and altering the extensive gravel bars of the larger streams.

During winter, stream discharge is at its lowest. Streams freeze on the surface but continue to flow at greatly reduced rates beneath the ice and via subchannel discharge. At this time, streams are also fed by groundwater from higher ground. Because there is no recharge from the frozen surface, minimum flow is reached in March or April as the groundwater supply is depleted.

Changes in the volume of streamflow or the impedance of drainage by frozen areas downstream at times cause water to flow under pressure beneath the ice in some areas. When it breaks to the surface, layered masses (called icings) are formed. Icings are common features on stream surfaces and banks in winter and can pose a considerable travel hazard.

All but one of the streams in the Kantishna Hills that have mining operations in their basins are tributary to the Bearpaw River, which flows west from the Kantishna Hills then north to the Kantishna River. However, Stampede Creek, location of the dormant Stampede mine, drains into the Toklat River.

No streamflow gauges have been established in this study area. However, from information on other streams in the region, estimated discharge for streams in the study area, using average flows per square mile of drainage, is possible. Average discharges and maximum discharges (measured in cubic feet per second (cfs)) for streams of the study area are shown in table 2.

Table 2: Estimated Stream Discharge
Kantishna Hills

Creek Basin	Drainage Area (sq. mi.)	Average Annual Discharge (cfs*)	Average Maximum Flow (cfs**)
Willow	2.9	4.3	58
Spruce	3.1	4.6	62
Glen	5.4	8.1	108
Rainy	2.9	4.3	58
Eureka	5.1	7.6	102
Eldorado	11.7	17.6	234
Friday	1.6	2.4	32
Moose	196.3	294.4	3,926
Glacier	32.6	48.9	652
Caribou	40.2	60.3	804

Note: Moose Creek data include Willow, Spruce, Glen, Rainy, Eureka, Eldorado, and Friday creeks.

*Factor used is 1.5 cfs/sq. mi. (Selkregg 1974).
**Factor used is 20 cfs/sq. mi. (Selkregg 1974; USDI, GS 1977).

Discharge estimates in table 2 are supplemented in table 3 by instantaneous discharge values measured in the field during 1979 and 1980. These discharge rates are probably representative of average peak month (July-August) discharges, which is why they are higher than the average annual values noted in table 2.

Table 3: Measured Instantaneous Stream Discharge
Kantishna Hills

Creek Basin	Location	Date Measured	Discharge (cfs)	Discharge per Square Mile (cfs)
Glen	Confluence with Moose	9-1-79	10*	1.8
Eureka	Confluence with Moose	7-22-80	37	7.2
Eldorado	Confluence with Moose	7-22-80	47	4.0
Friday	Denali park road bridge	7-23-80	5.6	3.5
Moose	Denali park road bridge	7-21-80	507	4.0

*Estimate from National Park Service 1979.

Under natural conditions, surface waters of the Kantishna Hills are of good or excellent quality. Small streams from steep well-drained valleys are clear, fast-flowing, and well-oxygenated. There is little adjacent bogland or moist tundra in such areas; consequently, these streams receive less organic sediment and acids than the large meandering low-elevation waterways of the same region.

Chemical water quality data specifically from streams of the study area are not available. Thus, comparisons and extrapolations have to be made using data from streams of the McKinley region that have been tested. Three representative analyses are shown in table 4.

Table 4: Chemical Analyses of Selected Streams
Tanana River Basin

	Nenana River (Healy*)	Teklanika**	Cantwell Creek (Summit**)
Calcium	36	32%	43%
Magnesium	10	10%	5%
Sodium potassium	8.2	5%	4%
Bicarbonate	102	32%	43%
Sulfate	51	20%	5%
Chloride	5	0	0
Iron	0	-	-
Total hardness	131	-	-
TDS	169	$<$250 mg/l	$<$250 mg/l

*All values are milligrams per liter (mg/l).
**Values are percentages of total dissolved solids (TDS) (Selkregg 1974).

Regional surface waters typically contain TDS ranging from about 50 to 500 mg/l, with most streams having less than 250 mg/l (Selkregg 1974). Small nonglacial streams have the lowest TDS levels. During winter, the concentration of TDS is usually highest because the discharge originates from groundwater seepage. Almost all of the surface waters sampled in the region are hard waters of the calcium bicarbonate type, although higher sulfate and magnesium contents exist in streams draining the Alaska Range than in other waters of the Tanana River basin (Selkregg 1974). However, neither ion has been noted in excessive concentrations.

Rivers flowing from the Alaska Range are usually glacier-fed and contain large amounts of sediment scoured from bedrock by the ice. This material, which has not been exposed to weathering and is light-colored, is responsible for the milky color of glacial rivers. Suspended sediment loads in such streams range from 500 to 2,000 mg/l. Nonglacial streams in lower elevations, such as those draining the Kantishna Hills, typically contain suspended sediments in the 5- to 50-mg/l range. These sediments originate from bank and bed erosion. Normal sediment loads are highest in the larger streams, such as Moose Creek, and increase following rainstorms when the waters commonly become opaque with brown silt. The most widely used field measure of suspended substances is turbidity, measured in nephelometer turbidity units (NTU). Turbidity is a measure of the clarity of a water sample and does not correlate directly with sediment concentration. An indirect relationship exists, however, in that greater sediment loads usually result in less light being transmitted through the water. The maximum level of industrial-caused turbidity permitted in Alaskan natural freshwaters is 25 NTU above the background level.

Water samples taken at middepth in midchannel were obtained from various streams in the Kantishna Hills area during July 1980 and measured for turbidity using a Hach laboratory turbidimeter (model 2100A). Prior to measurement, each sample was shaken to resuspend the silt that had settled. The sample was then allowed to resettle one to ten minutes until a stable reading was obtained. Samples with high turbidity were diluted up to 100 times until stable readings were obtained at the 40 NTU level or less.

Normal turbidity of streams in the study area, as presented in table 5, ranges from 0.3 NTU to 3.6 NTU, the latter value obtained in Moose Creek, which was hazily transparent and green in color. Water with turbidity levels less than 1 NTU is clear in appearance.

Groundwater availability is limited in northern and central Alaska by permafrost. The surface layer, which thaws during the summer and freezes in winter, is called the active layer. This layer is subject to various physical perturbations during the course of a year and is the source of major engineering problems in arctic regions. The Kantishna Hills area is located in a zone of discontinuous permafrost, where frozen and unfrozen ground is common, their distributions depending on local drainage, topography, or the persistence of permafrost formed during the Pleistocene period. Drainage and surface insulation are the primary determinants of local permafrost depth and distribution. It is usually closest to the surface where thick peat insulates the ground and lies at a

Table 5: Streamwater Turbidity*
Kantishna Hills

Stream	Location	Date	Turbidity (NTU)	Comments
Moose North Fork	Above Spruce Creek	7-16-80	0.6	No mining has taken place above sample point
Moose North Fork	Above Glen Creek	7-16-80	1.3	Upstream vehicle crossings recently used
Moose	Denali park road bridge	7-16-80	14	Upstream operations active
Moose	Denali park road bridge	7-21-80	3.6	Running clear; probably contains residual mine silt scoured from bottom
Moose	Denali park road bridge	7-22-80	4.2	Same condition as above
Moose	Denali park road bridge	7-23-80	19	Upstream operations active; silt recently arrived at sample point
Moose	Above Bearpaw River	8-2-80	29	Moose Creek turbid entire length; opaque
Bearpaw	Above Moose Creek	8-2-80	1.6	Translucent, light tea color
Bearpaw	Below Moose Creek	8-2-80	10	Cloudy tan color
Eureka	Confluence with Moose	7-22-80	260	Active mining upstream
Glen	Confluence with Moose	7-16-80	460	3 active placer mines upstream
Effluent from Moose Creek operation	Moose Creek at Kantishna	7-23-80	80	Heavy clay load; operations active
Eldorado	25 yards from confluence with Moose	7-22-80	1	No mining upstream; clear and translucent
Friday	Confluence with Moose	7-23-80	0.3	Two suction dredges working upstream

* Turbidity readings are from single samples usually taken midday.

greater depth or is absent under lakes, streams, gravel bars, or exposed rock. Deep snow further insulates the ground during winter, helping to prevent ground freezing in mountain soils.

Groundwater circulates in thawed zones above and below permafrost, or vertically between frost lenses wherever local conditions favor unfrozen ground. In the Kantishna Hills area, permafrost is probably most common on north slopes, beneath gently sloping benches along rivers, and on broad interfluves. It is probably present only at great depth on well-drained slopes or in streambeds. Thick layers of silt, usually found on low slopes and benches, are usually frozen below 4 to 5 feet.

Aquifers are present beneath streams and alluvial fans and are common below drainages on slopes. On benches, good aquifers commonly lie beneath a permafrost layer, which is a body of soil or other deposit that is continuously at subfreezing temperatures for two or more years. Total aquifer capacity in Kantishna Hills is probably great because of deep permeable outwash and alluvial deposits in the valleys.

In a good alluvial aquifer, 10 to 100 gallons per minute (gpm) would be a typical well yield (Selkregg 1974). Bedrock aquifiers yield only up to 10 gpm. The Kantishna Hills area is in a generalized area where less than 10 gpm would be available.

Low infiltration rates caused by silt or clay mantles, permafrost, or frozen surface during snowmelt limit groundwater recharge in certain areas. The lower Moose Creek valley, and possibly the Bearpaw River channel contains a thick layer of clay at about 8 to 12 feet below the surface of the channel. This layer, known locally as "false bedrock," is composed of a very fine-grained gray clay and silt derived largely from schist and provides an effective seal against infiltration. Water tends to flow down-drainage along the surface of the clay pan. This subsurface flow persists during winter.

Most other localities are highly permeable to bedrock. A portion of many streams commonly sinks beneath the surface upon reaching the alluvial fan and flows as circulating groundwater.

Groundwater quality in the region is generally good and suitable for most uses. Data from elsewhere in the Tanana River basin suggest TDS of 100 to 300 mg/l, although one mineral spring near Kantishna discharges water with 2,000 mg/l TDS. Chemical constituents vary but local groundwaters there are likely to be hard, with high levels of calcium, magnesium, sulfate, and bicarbonate (Selkregg 1974).

Geology/Soils

The Kantishna Hills area is a range of low mountains, with a comparatively well-weathered aspect and rounded contours located along the north boundary of the former Mount McKinley National Park. This range is a well-defined landform bounded by the Toklat River and

Clearwater Fork on the east and south and the McKinley and Bearpaw rivers to the west and north. The hills rise 2,000 to 3,000 feet above the Kantishna River lowlands to a high point of 4,987 at Kankone Peak.

The southern Kantishna Hills area is primarily composed of the ancient Birch Creek schist, a formation widespread in northern Alaska derived from Precambrian marine sediments and seabed volcanic deposits. The original materials have been strongly metamorphosed, folded, faulted, uplifted, and shaped by weather and erosion into the present formation.

The Birch Creek schist is a highly fissile mica-quartz schist. The formation contains igneous intrusives in the form of small stocks and dikes that postdate regional metamorphism. The formation is cut by many veins and stringers of quartz formed parallel to the foliation of the schist. Fissure veins of quartz, common in shear zones and probably genetically related to the igneous intrusives, cut across the foliation of the schist. These veins are frequently mineralized, a condition especially evident where they outcrop in shear zones within the older rocks. Localized mineralization occurs where the cross-cutting veins intersect, and such sites have yielded most of the high-grade ore bodies that have been mined (Alaska Division of Geological and Geophysical Surveys 1976).

The Kantishna Hills study area does not currently contain glaciers or permanent snowfields. However, during the maximum advance of Muldrow Glacier during the Wisconsin glaciation, a branch of the glacier filled Moose Creek to some point below Eureka and Eldorado creeks. Tongues of ice from this central mass extended into the lower reaches of Eldorado and Eureka valleys and probably those of the other creeks along the way. During the same period, small ice tongues probably formed in the upper creek basins as well. Glacier and Caribou creeks also contain evidence of glaciation in the form of benches. Following the retreat of the glaciers, the streams reworked their channels, and extensive deposits of outwash and stream gravels were laid down in Moose Creek and other large streams of the area. Windblown silt deposited on slopes and washed into drainages is an important component of these unconsolidated gravels.

The gold recovered in early years from placer mines in the Kantishna Hills was often coarse-textured when found in the upper stream canyons. Based on this and other evidence, the source of gold in the area is thought to be the gold-bearing fissure veins of quartz exposed in outcrops of schist above the streams. Gold in Moose Creek was probably largely contributed by its tributaries, and the most successful Moose Creek placer claims have been those situated close below the mouths of the gold-producing tributaries.

Gold has been found throughout the gravel profile in the area, but it has been mostly concentrated just above schist bedrock in the higher streams or in deposits lying on the false bedrock of fine silt and sand in Moose Creek. Other minerals recovered in sluices along with the gold included garnet, silver, antimony, lead, copper, and galena. Minor amounts of gem-grade rhodonite have also been reported (see the Placer Claims maps in the map pocket of this document for the location of placer claims).

The most important lode claims in the Kantishna Hills study area have been silver-lead-zinc deposits and antimony found in quartz fissure veins in schist. Gold-bearing lode deposits have been located but developed to a much lesser extent. Several of the silver and antimony lodes have yielded high-grade ores, although development of these deposits has been severely hampered by low prices and high transportation costs. Ores taken from Kantishna Hills have included a variety of associated minerals, such as galena, pyrargyrite, sphalerite, arsenopyrite, pyrite, marcasite, cassiterite, chalcopyrite, melanterite, sulfur, scheelite, scorodite, siderite, malachite, and others (see the patented and unpatented Lode Claims maps for Kantishna Hills in the map pocket of this document for the location of recorded lode claims).

The Kantishna Hills area may contain mineral resources in undiscovered deposits, as well as additional reserves in many of the poorly delineated known deposits. The silver and antimony potentials of Kantishna in the past have been referred to as the highest in the state of Alaska. The area is generally rated very high potential for metallic mineral production in the form of silver-lead-zinc ores and gold-silver ores, as well as antimony. More recently, the Alaska Department of Geological and Geophysical Surveys (1976) concluded from extensive mineralogical survey of the area that the potential for mineral development "lies in 1) continued small-scale placer gold production, 2) small-to-moderate-sized base and precious metal lode producers, 3) tungsten mining, and 4) continued sporadic production of antimony from known and undeveloped vein deposits."

Soil characteristics of the Kantishna Hills are only generally known from exploratory surveys. The Soil Conservation Service (1979) classified soils of the study area as pergelic cryaquepts, a very gravelly and hilly to steep association. The low rolling foothills along lower Moose, Caribou, and Glacier creeks have a loamy rolling association of histic pergelic cryaquept soils. These classifications are descriptive categories of the SCS standard soil taxonomic system. Both soil types have undergone only minor modification from parent material by soil-forming processes (inceptisols). Cryaquepts and cold wet inceptisols are the most extensive soils in the state.

Pergelic cryaquepts contain permafrost and a modest surface organic layer. The depth of summer thaw is greater and period of water saturation shorter than many other Alaskan soils. They are frequently formed on alluvial plains, moraines, or outcrops of coarse substrate. The profile is commonly gravelly throughout, often with a mixture of silty material.

Histic pergelic cryaquepts have thick accumulations of organic matter on the surface derived from tundra vegetation. Permafrost is normally found at shallow depths. The active layer is continually water-saturated during summer, and soil creep may be common. This soil type is formed in alluvium or loess.

Both soil classes have severe limitations for road construction, location of structures, and offroad traffic. These soils are not suited for agriculture.

Kantishna soils contain large amounts of micaceous sand and silt weathered from the parent schist. It is this material that gives stream sediments in the area their characteristic iridescent appearance.

Except for the glacial and alluvial deposits in stream basins, soils are generally thin because of slow weathering and relatively young age. The cold climate of the area retards organic decomposition and this, together with limited permeability, accounts for the low level of incorporation of organic material into the soil.

Although erosion is an active process on exposed material, solifluction is probably of greater importance in moving weathered material downslope. Solifluction is distinguished from erosion as downslope movement of soil masses instead of soil in water suspension. The process of solifluction is begun when unconsolidated material on slopes over permafrost or bedrock gradually builds up weight from accumulating organic matter and wind-borne silt. When saturated during summer thaw, such soil masses become unstable and slide, flow, or creep downslope. This process may be aided by subsurface water moving down along bedrock in the spring, reducing the resistance to flow of the soil mass.

Climate

The Kantishna Hills study area is in the continental climatic zone of interior Alaska. The terrain has a major influence on local climate; the Alaska Range blocks air mass movements that result in lower wind speeds and reduced amounts of precipitation on the leeward side. The continental climate zone is an area of light precipitation and extreme temperatures during both summer and winter in contrast to the heavier precipitation, cooler summers, warmer winters, and stronger surface winds of the maritime zone. Because of the high latitudes, the days are long in the summer but short and cold in the winter.

Locally, the climate of the Kantishna Hills is not as continental as the climate of a more inland location such as Fairbanks. Thus, the summers are cooler in the study area because of the greater maritime influence and a higher elevation. According to weather data collected at the Wonder Lake ranger station, the mean annual temperature is approximately 24°F. January is the coldest month, with an average monthly mean temperature of -22°F. July, the warmest month, has an average monthly temperature of 52.7°F. Precipitation averages 20.3 inches annually, half of it occurring from June through September. August is the wettest month with a monthly mean precipitation of over 3 inches. Snow accumulations range from 20 to 60 inches in forested areas (Viereck 1965).

Vegetation

Plant communities of the Kantishna Hills study area are distributed in a general pattern directly related to topography, with local variations in the

pattern based on such factors as substrate type, the existence and depth of permafrost, and disturbance history. The area's elevation range of about 1,500 feet to nearly 5,000 feet includes timberline for the area.

There are five major vegetation types in the Kantishna Hills area: upland spruce-hardwood forest on certain slopes, bottomland spruce-hardwood forest in drainages, shrubland on slopes and in drainages above timberline, moist tundra on mesic benches and interfluves, and alpine tundra at the highest elevations. Each of these types includes geomorphological variants that, for the purposes of this discussion, will not be detailed here; additional information on the plant communities of this area of Alaska may be found in United States Department of Agriculture, Forest Service (1980) and Neiland and Viereck (1977).

Upland spruce-hardwood forests are an upland form of the extensive boreal forest, or taiga, zone of North America and Eurasia. The dominant tree is usually white spruce, accompanied by paper birch and alder in various combinations. Aspen may be a common associate on southern slopes. In some localities, usually less well drained, black spruce stands or white and black spruce mixtures occur. In the Kantishna Hills area, spruce stands tend to be open, with a vigorous mixture of the deciduous species mentioned above, plus willow, resin birch, Alaska rose, bush cinquefoil, red currant, and decumbent shrubs such as crowberry, blueberry, lingonberry, and others. Open patches with dwarf arctic birch are common. Lichens and mosses are abundant on the forest floor, which is generally covered with a thick mat of vegetation. Epiphytic lichens are also common. Herbaceous plants are not especially prominent in this community because of the heavy cover of shrubs and moss, but a variety of wildflowers occur wherever open space is available around rocks, patches of bare soil, or similar spots.

Upland spruce-hardwood forests in the area is present up to about 3,000 feet on south-facing slopes and along the flanks of some of the lower drainages to about 2,000 feet, especially on the east faces. It does not occur above 1,500 feet on northerly aspects. This forest covers a relatively small portion of the study area.

Bottomland spruce-hardwood forests grow in and along drainages of the study area from 1,500 to 2,500 feet but are absent from narrow drainages with steep gradients, probably because of unfavorable soil conditions. Bottomland spruce-hardwood forest is found in the study area mainly along Moose Creek and lower Spruce, Rainy, and Eldorado creeks. It also occurs on many of the smaller side drainages, especially those facing south. This plant community type is dominated by open stands of white spruce, with a thick undergrowth of balsam poplar, willow, and alder. Black spruce is uncommon in these riparian woodlands of Kantishna Hills, but occurs on some of the larger forested benches adjacent to Moose Creek and above the mouths of its tributaries. The bottomland vegetation is strongly zoned spatially (and in successional sequence) with respect to the stream channels. Along the banks, where flooding maintains the substrate in a sort of perpetual instability, willow and alder form thickets of variable density, depending on frequency of flooding. Fireweed is very common on silty and rocky soil along thicket margins. Willow and alder stands are relatively open on coarse gravel bars along Moose Creek

where flooding is more frequent. Fireweed, horsetail, milk vetch, composites, and occasionally mosses and lichens are common in the open spaces. Other common plants of these open riparian shrub stands include mountain avens, oxytrope, and bearberry. On more stable soil, farther back from stream channels, balsam poplar persists with grasses that are more common in the understory. On well-stabilized alluvium poplar and spruce mixtures dominate, giving the bottomland forest its characteristic appearance. The soil beneath spruce-poplar stands is usually well covered with moss, horsetail, lichens, and a variety of flowering plants. In the upper parts of the drainages, which are above timberline, spruce is absent, and a shrubby community of willow, alder, and poplar dominates. This vegetation is included in the shrubland classification.

Shrubland varies in structure and composition according to drainage and microclimate and is frequently divided into several categories. The following discussion, however, will treat only the plant communities dominated by shrubs over 2 feet tall as shrubland.

Shrub communities of alder, willow, dwarf, or resin birch, singularly or in combination, occur near timberline and in the upper reaches of drainages. A low, open shrub type dominated by dwarf birch and several willows is widespread on drier hillsides of Kantishna. Blueberry, labrador tea, spirea, and dogwood are common associates. Lichens, prostrate ericaceous shrubs, and mosses provide ground cover, but the thick mossy mats of moist tundra are absent. Shrubland is prominent along Glen, Friday, Glacier, and Caribou creeks.

Tundra is a treeless vegetation community of cold climates and comes in a variety of forms. Moist tundra and alpine tundra are the two major classifications.

Moist tundra, dominated by dwarf birch and low ericaceous shrubs, is abundant on slopes and benches throughout the study area. A thick understory of mosses, lichens, and prostrate shrubs provide complete soil cover. Usually, the shrub canopy is fairly open, with a height of 2 feet or less. Blueberry, crowberry, labrador tea, lingonberry, bearberry, spirea, and cassiope are abundant in this community, as are dogwood and several species of ground willows. Sedges and sphagnum are common in the wetter areas. Permafrost often develops near the surface under the insulating mat of plants.

Alpine tundra occurs at the highest elevations throughout the Kantishna Hills, usually above 3,000 feet. Because of a harsh exposed environment and thin soil, patches of bare rock and soil are frequent. Lichens comprise a much greater percentage of ground cover than in the other communities. Mosses are abundant but do not form the thick continuous mats found in shrub tundra. Dwarf birch and other erect shrubs are scattered in protected areas or are absent. Mountain avens, bearberry, ground willows, alpine azalea, crowberry, cassiope, lingonberry, and diapensia are usually abundant in alpine tundra.

A summary of the vegetation types dominating the basins of the Kantishna Hills study area that are likely to be exposed to mining activity is presented in table 6. Field sampling was not used to identify communities present in each drainage. Instead, observations made by the study team during on-the-ground visits or overflights were recorded. The common and scientific names of prominent plant species in the study area are also presented in table 7.

Table 6: Vegetation Types*
Kantishna Hills

Creek Basin	Upland Spruce-Hardwood Forest	Bottomland Spruce-Hardwood Forest	Shrubland	Moist Tundra	Alpine Tundra
Spruce		+	+		
Glen			+	+	
Rainy	+	+	+	+	
Eureka			+	+	+
Eldorado	+	+	+	+	
Friday			+	+	
Moose		+	+		
Glacier		+	+	+	
Caribou		+	+	+	

Note: Willow Creek is absent from this table because it was not directly observed.
* "+" indicates where a community is present.

Table 7: Plant Species
Kantishna Hills

Common Name	Scientific Name
White spruce	Picea glauca
Black spruce	Picea mariana
Paper birch	Betula papyrifera
Alder	Alnus crispa
Willow	Salix alaxensis
	S. arctica
	S. lanata
	S. glauca
	S. bebbiana
	S. planifolia
Ground willow	Salix reticulata
	S. polaris
	S. rotundifolia
	S. arctica
Resin birch	Betula glandulosa
Dwarf arctic birch	Betula nana
Alaska rose	Rosa acicularis
Bush cinquefoil	Potentilla fruticosa
Red currant	Ribes triste
Crowberry	Empetrum nigrum
Blueberry	Vaccinium uliginosum
Lingonberry	Vaccinium vitis-idaea
Balsam poplar	Populus balsamifera
Fireweed	Epilobium angustifolium
	E. latifolium
Horsetail	Equisetum arvense
	E. scirpoides
Milk vetch	Astragalus sp.
Composites	Species of Compositae
Buffaloberry	Shepherdia canadensis
Spirea	Spiraea douglasii
Labrador tea	Ledum groenlandicum
	L. decumbens
Dogwood	Cornus canadensis
	C. stolonifera
Sedge	Carex sp.
Twinflower	Linnaea borealis
Lupine	Lupinus
Cassiope	Cassiope sp.
Mountain avens	Dryas sp.
Bearberry	Arctostaphylos uva-ursi
Alpine azalea	Loiseleuria procumbens
Diapensia	Diapensia lapponicum
Anemone	Anemone sp.
Common mosses	Polytrichum sp.
	Hylocomium splendens
	Sphagnum sp.
Lichen flora	Cladonia, Peltigera,
	Cetraria; Parmelia,
	Rhizocarpon; Umbilicaria
	Festuca rubra, Poa alpina,
	Festuca altaica

Four rare plant species collected near the Alaska Range in habitats similar to those in the Kantishna Hills have been proposed for federally threatened or endangered status. None of these plants, however, have officially been listed in the Federal Register. Table 8 summarizes pertinent information about the four species.

Table 8: Proposed Threatened or Endangered Plants*
Denali National Park and Preserve

Species	Proposed Status	Collection Locale**	Habitat
Papaver alboroseum	T	Upper Kuskokwim	Well-drained alpine areas
Smelowskia borealis var. villosa	T	Sable Pass, Denali park	Calcareous scree; high altitude
Smelowskia pyriformis	E	Upper Kuskokwim	Calcareous scree
Taraxacum carneocoloratum	T	Stony Pass, Denali park	Alpine slopes; well-drained substrate

*Bureau of Land Management 1980.
**Only localities near the study area appear in this table. The three threatened plants are known from other areas as well.

Wildlife

A rich diversity of wildlife species inhabit the Kantishna Hills study area. Based upon previously published wildlife resource information, reports from persons knowledgeable of the area and field observations by the study team, at least 31 species of mammals, 83 species of birds, 17 species of fishes, and 1 species of amphibian either inhabit or may exist in the study area and its immediate surroundings (see table 9). The major habitat types are identical to vegetation types. These include alpine tundra, moist tundra, shrubland, upland spruce-hardwood forest, and bottomland spruce-hardwood forest (Selkregg 1974).

Mammals. Ungulates, such as the moose and barren ground caribou, and large carnivores, such as the wolf and grizzly bear, are wide-ranging animals that inhabit all five vegetation communities in the Kantishna Hills study area.

Table 9: Wildlife Species in Kantishna Hills

Mammals	Habitat Type*				
	Bottomland Spruce-Hardwood Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland
Moose - *Alces alces*	x	x	x	x	x
**Barren ground caribou - *Rangifer tarandus*		x	x	x	
Coyote - *Canis latrans*	x	x			x
Wolf - *Canis lupus*	x	x	x	x	x
Wolverine - *Gulo luscus*	x	x	x	x	x
Lynx - *Lynx canadensis*	x	x			x
Marten - *Martes americana*	x	x			
Short-tailed weasel - *Mustela erminea*	x	x	x	x	x
Least weasel - *Mustela rixosa*		x		x	x
Black bear - *Ursus americanus*	x	x	x		x
**Grizzly bear - *Ursus arctos*	x	x	x	x	x
Red fox - *Vulpes fulva*	x	x		x	x
**Beaver - *Castor canadensis*					
**Arctic ground squirrel - *Citellus parryi*			x	x	
Red-backed vole - *Clethrionomys rutilus*	x	x			
Porcupine - *Erethizon dorsatum*	x	x			
Northern flying squirrel - *Glaucomys sabrinus*	x	x			
Brown lemming - *Lemmus trimucronatus*				x	
Hoary marmot - *Marmota caligata*			x		
Alaska vole - *Microtus miurus*					
Tundra vole - *Microtus oeconomus*				x	
Chestnut-cheeked vole - *Microtus xanthognathus*		x			
Meadow vole - *Microtus pennsylvanicus*					
Muskrat - *Ondatra zibethicus*					

*When present, an "x" indicates the habitat type(s) in which a terrestrial species is usually prominent. Other birds and small mammals may also be present in a given habitat type (Selkregg 1974).

**Indicates fauna observed by the study team in Kantishna Hills during July-August 1980.

	Habitat Type*				
	Bottomland Spruce-Hardwood Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland
Mammals					
**Red squirrel - Tamiasciuris hudsonicus	×	×			
**Snowshoe hare - Lepus americanus	×	×			×
Collared pika - Ochotona collaris			×		
Masked shrew - Sorex cinereus	×	×		×	×
Dusky shrew - Sorex obscurus	×	×			
Little brown myotis - Myotis lucifugus	×	×			
Birds					
Mallard - Anas platyrhynchos				×	
**Pintail - Anas acuta				×	
Green-winged teal - Anas carolinensis				×	
American widgeon - Mareca americana				×	
Northern shoveler - Spatula clypeata				×	
Canada goose - Branta canadensis				×	
Greater scaup - Aythya marila				×	
**Lesser scaup - Aythya affinia				×	
**Common goldeneye - Bucephala clangula	×	×			
Barrow's goldeneye - Bucephala islandica	×	×			
Bufflehead - Bucephala albeola	×	×			
Oldsquaw - Clangula hyemalis				×	
Harlequin - Histrionicus histrionicus		×			
**Surf scoter - Melanitta perspicillata					
Whistling swan - Olor columbianus				×	
Red-breasted merganser - Mergus serrator				×	
American golden plover - Pluvialis dominica			×		
**Mew gull - Larus canusi				×	
Arctic tern - Sterna paradisaea				×	
Northern phalarope - Lobipes lobatus				×	
Spotted sandpiper - Actitus macularia	×				
Western sandpiper - Ereunetes mauri				×	

Birds	Habitat Type*				
	Bottomland Spruce-Hardwood Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland
Long-tailed jaeger - *Stercorarius longicaudus*				x	
Belted kingfisher - *Megaceryle alcyon*	x				
Goshawk - *Accipiter gentilis*	x	x			
Sharp-shinned hawk - *Accipiter striatus*	x	x			x
Rough-legged hawk - *Buteo lagopus*		x	x		x
**Golden eagle - *Aquila chrysaetos*					x
Bald eagle - *Haliaeetus leucocephalus*					
**Marsh hawk - *Circus cyaneus*			x		x
Gyrfalcon - *Falco rusticolus*			x		
Spruce grouse - *Canachites canadensis*	x	x			
Ruffed grouse - *Bonasa umbellus*	x				
**Willow ptarmigan - *Lagopus lagopus*		x		x	x
Rock ptarmigan - *Lagopus mutus*			x	x	
White-tailed ptarmigan - *Lagopus leucurus*					
**Common loon - *Gavia immer*					
Horned lark - *Eremophilia alpetris*					
Bohemian waxwing - *Bombycilla garrula*					x
**Gray jay - *Perisoreus canadensis*	x	x			
**Common raven - *Corvus corax*	x	x	x	x	x
Pine grosbeak - *Pinicola enucleator*	x	x			
Gray-crowned rosy finch - *Leucosticte tephrocotis*			x		
Common redpoll - *Acanthis flammea*		x			x
Hoary redpoll - *Acanthis hornemanni*		x			x
White-winged crossbill - *Loxia leucoptera*	x	x			
**Savannah sparrow - *Passerculus sandwichensis*			x	x	
Slate-colored junco - *Junco hyemalis*	x	x			
**Tree sparrow - *Spizella arborea*					x
**White-crowned sparrow - *Zonotrichia leucophryus*	x	x			x
Golden-crowned sparrow - *Zonotrichia atricapilla*			x		x
Fox sparrow - *Pusserella iliaca*					x
Lapland longspur - *Calcarius lapponicus*			x	x	
Snow bunting - *Plectrophenax nivalis*			x	x	

	Habitat Type*				
	Bottomland Spruce-Hardwood Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland
Tree swallow - *Iridoprocne bicolor*		×			
Bank swallow - *Riparia riparia*		×	×		×
Barn swallow - *Hirundo rustica*		×	×		×
**Cliff swallow - *Petrochelidon pyrrhonota*		×	×		×
Rusty blackbird - *Euphagus carolinus*					×
Northern shrike - *Lanius excubitor*		×			×
Water pipit - *Anthus spinoletta*			×		
Black-capped chickadee - *Parus atricapillus*	×	×			
**Boreal chickadee - *Parus hudsonicus*	×	×			
Orange-crowned warbler - *Vermivora celata*	×				
Yellow warbler - *Dendroica petechia*					×
**Myrtle warbler - *Dendroica coronata*	×	×			
Blackpoll warbler - *Dendroica striata*		×			
**Wilson's warbler - *Wilsonia pusilla*					×
Northern waterthrush - *Seirus noveboracensis*		×			×
**American robin - *Turdus migratorius*	×	×			
Mountain bluebird - *Sialia currucoides*		×			
Varied thrush - *Ixoreus naevius*	×	×			
Hermit thrush - *Hylocichla guttata*	×	×			
Swainson's thrush - *Hylocichla usulata*	×	×			
Gray-cheeked thrush - *Hylocichla minima*		×			×
**Say's phoebe - *Sayornis saya*					
**Traill's flycatcher - *Empidonax traillii*					
Hairy woodpecker - *Dendrocopus villosus*	×	×			
**Great horned owl - *Bubo virginianus*	×	×			
Snowy owl - *Nyctea scandiaca*				×	
Hawk owl - *Surnia ulula*	×				
Great gray owl - *Strix nebulosa*					
Short-eared owl - *Asio flammeus*				×	

Moose are present throughout the study area, with the exception of the highest peaks, and are most commonly associated with willow brush and wooded areas. Moose browse extensively on willow, dwarf birch, and aspen during the fall and winter; in the spring, they graze on a variety of plants, such as sedges and horsetails. The summer diet consists of willow, birch, alder, and aspen (ADFG 1978e). Moose are relatively more adaptable than other wildlife species, because they can exist on transitional vegetation types that develop after fires or disturbances by man. The breeding season for moose begins in early September and continues into October. Calving occurs during late May and early June; most calves are born in swampy muskeg areas. An area west of the Kantishna Hills and immediately east of Lake Minchumina is known to attract moose for feeding and calving during the spring and summer. Moose also congregate in that area during the winter (ADFG 1973).

Caribou are nomadic animals, ranging over vast areas of terrain and a variety of habitats in fulfilling their needs for calving grounds, summer range, rutting/fall range, and wintering grounds. Calving occurs during late May or early June; rutting activities occur in September and October. The caribou diet includes a wide variety of plants, such as willow, dwarf birch, and lichens. Lichens are an important constituent of their winter diet. The population of the McKinley caribou herd, estimated at 20,000 to 30,000 animals in 1941, had declined to about 1,500 animals as of 1973 (USDI, NPS 1980c).

In the winter of 1979, the wintering range for the McKinley caribou herd included the southern end of the Kantishna Hills. Scattered calving occurred in an area approximately 1,500 square miles in size that also included the southern end. However, most of the herd followed the traditional migration route generally along the Denali park road and across the Alaska Range to the Cantwell calving grounds, where a majority of the calving took place. After the calving season, the herd returned to the north side of the Alaska Range, arriving at Polychrome Flats as early as July. From there, movements took place along the traditional migration route to that season's rutting grounds in the upper Moose Creek area. Caribou movements in the Kantishna area have been reported by residents along Moose Creek in recent years.

Wolves are wide-ranging, highly adaptable animals that can exist in a variety of habitats. Their known distribution in Alaska includes the entire study area and its immediate surroundings (ADFG 1973). Wolves are carnivorous animals that travel in closely knit packs and prey upon large mammals such as moose and caribou. Other prey species include smaller mammals and ptarmigan. Two packs are known in the region, the Savage River pack and the Toklat River pack. The Toklat pack ranges over approximately 1,000 square miles and was estimated to consist of at least 18 animals as of 1970. Wolves have been observed at other locations, such as Wonder Lake, Slippery Creek, and Lake Minchumina; however, their movements in these areas have not been studied (USDI, NPS 1975). Within the study area, one wolf was observed in the vicinity of the Kantishna airstrip during the summer of 1980. It is not known whether such occurrences indicate that the Toklat pack is expanding its territory or whether it represents temporary movements of individual pack members.

Grizzly bears are also present throughout the entire study area and have been observed on numerous occasions in Kantishna Hills. Grizzlies occur in a variety of habitats, primarily in tundra and forested areas along streams. Their foraging movements take them over mountain slopes and into valley bottoms. Grizzly bears are omnivorous; diet items include roots, grasses, sedges, berries, ground squirrels, and carrion. They are also known to kill caribou and moose calves on occasion. No denning sites have been identified within the study area; it is suspected that denning occurs east of the study area in suitable sites along both sides of the Toklat River from the Chitsia Mountain area south to the Stampede landing strip. In addition, the Toklat River and its immediate surroundings, from the headwaters to the confluence with the Clearwater Fork, are known to have higher densities of grizzlies relative to normal densities in that type of habitat (ADFG 1973). A large grizzly was observed in the area of Moose and Jumbo creeks on July 28, 1980; on the following day, a guest at Camp Denali while jogging about 2 miles north of the camp observed what may have been the same bear. In August 1980, the study team observed a sow grizzly with cubs in the Caribou Creek basin between Last Chance and Crevice creeks.

Black bears are also present in the study area. Although they prefer forested areas in valley bottoms and along streams, they also occur in other habitats (USDI, NPS 1975).

Other mammals that either inhabit or may exist in the study area and its immediate surroundings include the coyote, red fox, marten, least weasel, short-tailed weasel, mink, porcupine, snowshoe hare, and hoary marmot. Arctic ground squirrel, red squirrel, northern flying squirrel, lynx, collared pika, mice, lemmings, and voles are other small mammals (ADFG 1978c).

Wolverine also occur in all five of the habitat types in the study area. Wolverine are considered to be a wilderness species, because they are relatively sensitive to human disturbances of their habitat. Food items are mammals, berries, and carrion.

Birds. The region surrounding the Kantishna Hills study area (the floodplains of the Yukon, Tanana, and Kuskokwim rivers) is among the most productive of Alaska's waterfowl habitats (Selkregg 1974). However, the study area does not contain a significant amount of waterfowl nesting habitat. This critical habitat occurs west of the study area, where the topography is gentler and where there are lakes, ponds, and meandering streams (ADFG 1973).

Within the former boundary of Mount McKinley National Park, more than 130 species of birds have been identified; most of them are migratory (USDI, NPS 1976). To date a detailed study of bird life occurring in the Kantishna Hills study area has not been undertaken (refer to table 9 for additional information).

Willow ptarmigan have the greatest distribution of the ptarmigan species occurring in Alaska and prefer wetter habitats than those preferred by white-tailed or rock ptarmigan. Breeding habitat is close to timberline,

usually at elevations between 2,000 and 2,800 feet, in the fringes of coniferous forests, along streams, and in riparian shrub communities. Breeding activities begin in April, with the establishment and defense of breeding territories by males. After choosing mates, the females breed and lay their first eggs by late May or early June. The eggs begin hatching in late June or early July. Willows are the primary food source for willow ptarmigan; they forage primarily on leaves in the summer and twigs and catkins in the winter.

Although the endangered arctic peregrine falcon is present in Alaska, no nesting sites are known in the study area.

Reptiles and Amphibians. The cold climate of the Kantishna Hills and the surrounding region is a limiting factor for reptiles, and no species are known to occur here. One amphibian, the wood frog (*Rana sylvatica*), is present and occurs in the marshy areas near Wonder Lake. It is likely that the wood frog occurs in other similar habitats in the study area as well (USDI, NPS 1975).

Fishes. Compared to other parts of Alaska, fish species are relatively sparse in the study area. The aquatic environments consist primarily of clear, swift-flowing, and rock- and gravel-bottomed streams originating in the Kantishna Hills and flowing into larger streams, such as Moose Creek and Bearpaw River. The Yukon, Tanana, and Kantishna rivers are major anadromous fish streams (Selkregg 1974). King salmon (*Oncorhynchus tshawytscha*), chum salmon (*Oncorhynchus keta*), and coho salmon (*Oncorhynchus kisutch*) occur in Moose Creek, and king and chum salmon occur in the Bearpaw River (USDI, NPS 1975). Chum salmon are known to spawn in Moose Creek in the vicinity of Diamond and upstream approximately 5 to 7 miles. Another spawning area, used by king and chum salmon, is known to exist in the Bearpaw River from Diamond upstream to its confluence with Glacier Creek and possibly up Glacier Creek approximately 1 mile (ADFG 1978a). Salmon fry were reported by a local resident in Moose Creek at a point west of Glacier in early April 1973. Other fish species that are believed to occur or may exist in the study area and its immediate surroundings include arctic grayling (*Thymallus arcticus*), burbot (*Lota lota*), lake trout (*Salvelinus namaycush*), northern pike (*Esox lucius*), Dolly Varden (*Salvelinus malma*), arctic char (*Salvelinus alpinus*), sheefish (*Stenodus leucichthys*), broad whitefish (*Coregonus nasus*), humpback whitefish (*Coregonus pidschian*), round whitefish (*Prosopium cylindraceum*), least cisco (*Coregonus sardinella*), lake chub (*Couesius plumbeus*), longnose sucker (*Catostomus catostomus*), and slimy sculpin (*Cottus cognatus*) (ADFG 1978c; Morrow 1980).

Historically, the streams of the Kantishna area have supported indigenous populations of arctic grayling, which provided excellent opportunities for sportfishing. Today, these populations appear to be noticeably reduced, but viable spawning populations are still believed to occur within the study area. Grayling are reported to occur in Moose, Spruce, and Eldorado creeks; however, specific spawning areas have not been identified or documented. Grayling normally prefer cold, clear, and unpolluted rivers and gravel-bottomed streams.

Grayling spawn in the spring immediately after ice breakup. Prior to upstream spawning runs, the adults congregate at the mouths of clear-flowing tributaries during April, arriving from overwintering sites that include larger rivers and deep lakes, as well as areas near the mouths of tributary streams. Upstream spawning runs may even occur in channels formed in the ice by surface runoff. Spawning streams may be only 1½ to 2 feet wide. Spawning occurs from mid-May to June, most commonly over sandy gravelly substrates. No gravel nest is constructed. Territories are established by the males during spawning, and spawning movements create a slight depression over which the eggs are laid.

Depending on the water temperature, eggs normally require 11 to 23 days to hatch. The young are not restricted to the spawning streams and will begin moving into other areas as they develop; by the eighth day after hatching, they are actively feeding. After spawning, adults move away from the spawning areas and into pools for the summer. In general, summer habitats are usually located farther upstream from the spawning areas. To ensure better access to food, grayling will establish and defend territories within the pools. Aquatic and terrestrial insects constitute a majority of their diet, and they are primarily middepth and surface feeders. Downstream migrations occur in mid-September as environmental conditions begin to deteriorate with the coming of winter, with grayling moving out of the smaller tributaries to winter in deeper waters. Grayling are an important sport fish in Alaska; recreational harvests represent the major consumptive use (ADFG 1978b; Morrow 1980).

King salmon, being anadromous, ascend freshwater streams to spawn. Many streams have two well-defined spawning runs, which occur in the spring and fall in the south portion of their range. In the Yukon River, a single run occurs and may take place over a period of several months. King salmon enter the Yukon River in June; by late July, they have traveled as far as the Canadian border. In general, king salmon that migrate the farthest enter freshwater earlier. Within the Yukon drainage, king salmon spawn from July to early September and, perhaps, later in other portions of their range, particularly in the south. Female king salmon construct redds in gravel stream bottoms. In interior Alaska, the eggs may require 12 weeks or more to hatch. After hatching, the alevin remain in the gravel for two to three weeks and emerge after absorbing the yolk sac. The free-swimming fry thrive in cool, clear streams and remain in freshwater for as long as two years. However, most king salmon fry leave freshwater after their first year. While in freshwater, the young prey on aquatic and terrestrial insects and other invertebrates (Morrow 1980).

Chum salmon are considered to be fall spawners. Most spawning activities occur in September and October. Within the Yukon River, two distinct spawning runs occur in summer and fall. Summer chums spawn in lower Yukon tributaries, located for the most part downstream from the Koyukuk River. Fall chum enter the Yukon River in late June or July and go as far as the Yukon's headwaters. Chum salmon spawn in gravel-bottomed streambeds in which redds are constructed. It is not known exactly when the eggs hatch in interior Alaska; hatching is believed to occur under ice cover. The alevin remain in the gravel for 60 to 90 days after hatching to absorb their yolk sacs. After emerging from the gravel, young chum salmon

begin migrating to the sea. Whether or not the young feed during their seaward migrations depends on how much distance must be covered (Morrow 1980).

Coho salmon may ascend freshwater streams at any time from midsummer to winter to spawn. In general, earlier runs occur in the northern portion of their natural range. Within the Tanana River drainage, essentially all spawning occurs in north-flowing streams, which drain the north slope of the Alaska Range. Eggs are laid in redds constructed by the female; egg development normally requires six or seven weeks. After hatching, the alevin remain in the gravel for two or three weeks or more and emerge after absorbing the yolk sacs. At this stage, the fry are free-swimming and begin feeding immediately; a majority of their diet consists of terrestrial insects. Young coho salmon usually spend the first year of their life in freshwater prior to migrating to the sea (Morrow 1980).

CULTURAL RESOURCES

The following is not intended to be a comprehensive discussion of the history and prehistory of the Kantishna Hills but rather focuses on the areas primarily related to existing mining claims.

Historic Resources

The Kantishna Hills area is a historic mining district, where rich gravels have supported mining on a near continuous basis since 1905. The scale of operations has varied according to market prices and the development of new transportation routes.

An observer of the Moose Creek drainage in 1925 witnessed a highly mechanized operation in which "an elaborate system of five giants or monitors, stripping unthawed gravels into a long line of sluice boxes. For this project a 12,000-foot-long ditch, six feet wide and two feet deep, was built from Wonder Lake . . .to the mine site" (Bundtzen 1978). Part of this historic ditch lies in an active streambed that drains Wonder Lake; the other section now supports a rich growth of willows, nourished by rainwater that collects in the man-made depression. The growth forms a distinct pattern against the tundra hillside and is easily traced along the western side of the road.

A similar hydraulic project was underway on upper Caribou Creek, where "the pipeline alone weighed seventy-seven tons, all hauled in on horse-drawn sleds. A five-man crew cleared 70,000 square feet of gravel six to eight feet deep, but failed to show a commercial return" (Bundtzen 1978). The remains of this operation can still be seen. Three or four lengths of pipe, two horse-drawn wagons bearing the initials of the Alaska Engineering Company, and two frame structures are located at a site on upper Caribou Creek. The foundation of a third structure is also visible.

The Kantishna Hills mining area has gone through periods of growth and decline--at times, highly mechanized, and at other times, barely active. The most inactive period was during World War II, when a federal order shut down mining because it was determined to be a nonessential wartime activity. At this time, the Banjo mine was closed, never to reopen (Bundtzen 1978), but the mill at the mine still stands as testimony to this earlier period. It contains valuable historic mining equipment, still in place, demonstrating the arrangement and function of the structure.

Prospecting in the old days was labor intensive, as was the first mining operations. The number of operations tended to multiply as word of the strikes got out. Then the problems of transportation and supply had to be worked out. When an area "proved up," it attracted the attention of investors and corporations. Kantishna Hills shared in this tradition, owing its origin as a mining area to the attention created by James Wickersham who filed mining claims in Kantishna Hills. He was on his way back from a trip to climb Mount McKinley, and as he notes, was more interested in the mountain than gold. Nevertheless, the sketch map that accompanied his claim caused considerable attention. "It was immediately copied by numerous prospectors and the next year a horde of these hardy men explored every creek in this height of land for gold, and actually located rich placer diggings on our Webb [Moose] Creek, across which we had carelessly passed with our eyes fixed on the crest of Denali. It became the center of the rich Kantishna Mining District" (Wickersham 1938). All that remains to show Wickersham's involvement is a mountain that bears his name, Wickersham Dome.

The real work of the mining district was done by people such as Joe and Fannie Quigley who developed some of the richest claims. Joe Quigley had come over the Chilkoot Pass in 1891, and Fannie was a dance hall girl in Dawson and a cook during the mining stampedes. She finally made her way to the Kantishna Hills rush were she met and married Joe (Bundtzen 1978). Quigley Ridge is named after them, and the mines along the ridge are associated with their activities. A house on Friday Creek, near the airstrip, is known as Fannie's Old Place.

Today, the Denali park road permits miners to transport heavy equipment and supplies to operations in Kantishna Hills. Before the road, the route to Kantishna was more difficult. Summer access was usually via the Kantishna River and its tributaries. Steamers transported people and supplies to Roosevelt on the Kantishna River and to Diamond on the Bearpaw River. The trail then went overland to Glacier City, at the mouth of Glacier Creek, and then on to Kantishna Hills (USDI, GS 1919b; ADNR 1979). Shallow water prohibited boat transportation above Diamond except for the very shallow draft vessals that drew no more than 2 feet of water (Sheldon 1930). Diamond was the head of navigation, and Glacier was along both the Diamond and Roosevelt trails. Winter travel from Fairbanks was typically by dog team. One route went down the Tanana River to the Nenana River, up the Nenana to the foothills, then west to Knight's roadhouse on the Toklat, up the Toklat and Clearwater Fork to Myrtle Creek, over to Spruce Creek, and down to Moose Creek (USDI, GS 1918).

Before the Denali park road was constructed, the Kantishna mining district was supported by this system of trails and waterways. The towns and

roadhouses were built to cater to the miner's needs. Although this system received heavy use for only a limited number of years, it is significant to an understanding of how the area developed, how the miners solved the problems of transportation, and how the miners viewed the park road. Bundtzen (1978) explained this system as follows:

> Unfortunately for the silver miners of the 1920's the Kantishna district had serious transportation problems and the silver ores were expensive to develop. After being sacked they were transported in late winter to Glacier City from Eureka [Kantishna]. From there the ores were hauled by horse-drawn sleds over a twenty-two-mile-long corduroy wagon road to Roosevelt, where they awaited spring break up. Then a steamer barged the ores down the Kantishna River to the Tanana River, eventually reaching Saint Michael, at the mouth of the Yukon River. The ore shipment finally made it to Tacoma Washington by way of ocean steamer. The cost of transporting ore from mine to smelter was $75 a ton--an uneconomic trip unless the silver assay was at least 100 ounces a ton; silver was worth $1 an ounce in 1920. Lower grade ores today remain on the dumps. Upon completion of the Alaska railroad in 1923, mining supplies were brought into the district along a winter sled road from Kobe at railhead [near the present Nenana River bridge crossing on the Parks highway at Rex], west across the northern edge of the foothills to Diamond. From there a trail eventually made its way to Glacier and Eureka Cities.

Glacier, Diamond, and Roosevelt, although important to an understanding of the Kantishna Hills mining area and how it developed, are located outside the area of present mining activity.

Harder to document and integrate into an understanding of the history of existing mining claims are the remains of two cabins on Spruce Creek, a diesel shovel and dragline bucket on Glacier Creek, and the wagons and cabins on upper Caribou Creek. They were probably small-scale operations and tend to be identified with individuals. The stories behind these places, structures, and objects must await local interpretation as this information is often not available from written sources.

Archeological Resources

The first archeological surveys in the vicinity of the Kantishna Hills region were conducted by the National Park Service in 1963 and 1964, but these surveys were limited to areas within the former Mount McKinley National Park boundary. An obsidian scraper in the vicinity of Wonder Lake was noted, but crews found no evidence of cultural material in a brief reconnaissance of upper Moose Creek. An NPS archeological reconnaissance of the Wonder Lake area resulted in the discovery of an

obsidian flake on a moraine at the south end of the lake and a historic mining site along the west shore of the lake. No other cultural remains were recorded.

Two prehistoric sites, one on lower Rainy Creek and the other near the confluence of Willow Creek and the North Fork of Moose Creek were documented in a brief reconnaissance in September 1980. Both sites appear to be game lookouts and flaking stations for stone tool production. The Rainy Creek site is located on Rainey claims 3 and 4. The Willow Creek site is in the vicinity of Willow Creek claims 2 and 3.

In terms of the regional picture, significant archeological sites are known from Lake Minchumina (Holmes 1972, 1976, 1977a, 1977b, and 1978) and from northern areas of Denali National Park and Preserve (Holmes 1974 and 1975 a and b; Plaskett 1976). The results of the work completed to date suggest that sites in excess of 10,000 years in age might be expected to exist in the study area, as well as more recent sites associated with Athabaskan and, quite possibly, Eskimo groups.

The remains of towns and mining operations associated with the Kantishna Hills gold rush of the early 1900s may provide for fruitful archeological investigation into behavioral elements of this period. Other remains may also exist that can contribute to an understanding of early exploration and exploitation of the area. Intensive surveys of the cultural resources of the Kantishna Hills mining district are needed before positive statements can be made about the cultural resource values present.

Because of their relative scarcity, any sites discovered in the region will command a high degree of significance. Site specific surveys are needed in any undisturbed areas before mining activities are allowed. Table 10 outlines archeological site potential by creek basin within the Kantishna Hills. Significance of any specific site varies primarily with the number of known sites in a region and with the site's nature and character. The fewer the sites, the more significant a site will be. It is known that prehistoric archeological sites exist in the Kantishna Hills area. Overall, the potential of the area does not appear to be great, but significant sites will likely be identified.

RECREATION AND AESTHETIC QUALITIES

The study area has excellent potential for a wide variety of recreational opportunities that include hiking, camping, backpacking, nature photography, wildlife observation, and sportfishing. Currently, sportfishing opportunites are reduced by stream sedimentation associated with the uncontrolled release of process waters from mining operations. The Wonder Lake area is a major destination for park visitors; it also serves as a staging area for backpackers, as well as mountaineering expeditions to the Alaska Range and Mount McKinley.

Camp Denali, a private wilderness resort, is located approximately 3 miles north of the Wonder Lake ranger station. It has overnight

accommodations and provides environmental education. The North Face Lodge, located near Moose Creek and the Denali park road, offers overnight accommodations primarily to tour groups.

Scenic features of special interest to visitors include wildlife, Mount McKinley, and other mountains of the Alaska Range. Vegetation communities, which range from forested bottomlands to alpine tundra, enhance the scenic qualities of the study area, particularly in the fall when greens are transformed into brilliant shades of yellow, orange, and red. The study area contains excellent vantage points for viewing Mount McKinley and the mountains of the Alaska Range; examples include 3,774-foot Brooker Mountain and 3,246-foot Busia Mountain, both separated by Eldorado Creek Canyon. The study area also contains numerous clear-flowing freshwater streams, which is of significance in a region where glacial streams are common.

The Denali park road is paved to the Savage River bridge; movements of private vehicles beyond that point require a special permit. Shuttle buses are the primary mode of transportation to and from points in the park, such as the Wonder Lake campground and the Riley Creek visitor center at the east entrance.

Table 10: Archeological Potential
Kantishna Hills

Creek Basin	Level of Investigation	Site Potential*
Willow	Brief reconnaissance (known site)	3
Spruce	Helicopter overflight	2
Glen	Helicopter overflight	1
Rainy	Brief reconnaissance (known site)	3
Moose (upper) (lower)	Brief reconnaissance Helicopter overflight	2
Eureka	Reconnaissance lower Eureka Creek only	1
Eldorado/Slate	Helicopter overflight	1
Friday	Not visited	-
Glacier	Helicopter overflight and ground reconnaissance (2); inconclusive results	1
Caribou	Helicopter overflight and ground reconnaissance; historic sites present	1-2

*Key: Probability for cultural resources
1 low
2 low to medium
3 medium
4 medium to high
5 high

ENVIRONMENTAL EFFECTS OF MINING

EFFECTS ON NATURAL ENVIRONMENT

Hydrology/Water Quality

The most noticeable effect of placer mining on water resources is the introduction of sediment into clear streams. Because of the dominance of glacial drainage in the hydrologic systems in Denali National Park and Preserve, most streams are naturally turbid. This gives greater significance to the presence of clear-water streams like those found in the Kantishna Hills, which are important for wildlife, recreation, aesthetic qualities, and as a source of drinking water.

Large streams flowing from glaciers in the Tanana system typically contain 500 to 2,000 mg/l of suspended sediment, making them opaque and muddy in appearance. Normally clear streams subjected to placer mining without sediment control can contain several thousand mg/l of suspended sediment (Selkregg 1974). This level of sedimentation renders the water undesirable for most other purposes until the sediment has settled from suspension.

Sediment from placer mining enters surface waters primarily in two ways. First, stream waters used to wash gold-bearing gravels become silt-laden during the process before being discharged by the washing plant. If the system is uncontrolled, this water reenters the stream directly and contaminates downstream flow. This sediment discharge is considered a "point" source of pollution according to state and federal regulations. Second, overburden piles, tailings, cleared areas, and access roads may be subjected to erosion during rainstorms, contributing additional sediment to nearby streams. This is a "nonpoint" source of sediment and usually contributes less sediment than the uncontrolled washing plant. However, natural erosion during periods of heavy rainfall and high runoff can also contribute, temporarily, high levels of sediment to streams.

The steepness of the streambed gradient, volume of process water discharged, and amount of gravel washed primarily determine how much sediment will be discharged. Sedimentation or other mining-related contamination of natural waters spreads far beyond the stream and valley initially affected. For example, it was observed by the study team that natural waters affected by placer-mining operations in Glen Creek impacted the water quality of the lower Bearpaw River, almost 50 miles downstream.

The major creeks in the study area, on which mining was taking place during the 1980 season, were observed to be turbid the majority of operating hours. During one sampling period Glen Creek was about 770 times more turbid than unaffected water from Moose Creek above its confluence with Spruce Creek. In 1980, some operators were using settling ponds, but in several cases where mining was being conducted

the terrain within the stream canyon was so steep and the channel width so narrow that conditions were not conducive to proper pond construction immediately below the washing plant operation. In narrow canyons where settling ponds have been built, usually the entire stream has been run through the settling ponds. During heavy rains, water volumes become too great and wash out the dams.

Another effect of placer mining is the potential for increased ore-related heavy metals in stream waters (EPA 1976). The metals are associated with nondissolved inorganic minerals in the suspended sediment itself. Under certain conditions effluent from placer-mining operations could contain sufficient concentrations of heavy metals to exceed federal and state standards. Arsenic in particular is known to be a potential problem in the area (EPA 1980).

Physical impacts on stream channels include the diversion of a stream from its original channel. This delays development of a stable channel and alters flow patterns.

Roads, work areas, and other ancillary mine facilities can divert or block surface flows. Compacted surfaces block subsurface flows, redirecting flows parallel to the blockage. These factors also increase erosion from cleared surfaces, further increasing sediment loads in receiving waterways and runoff, which in turn increase the possibility of flooding.

When booming operations are conducted, physical impacts on the stream channel can be more severe. The sudden release of water causes downstream floods of turbid water that scour the channel bottom, severely disrupts flow patterns, leads to increased bank erosion, and subsequently damages or destroys riparian vegetation. Booming also severely damages fish habitat.

Once sediments are suspended in solution during the washing process, energy supplied by movement of water is required to keep them there. Whenever the velocity of the water decreases, as it does at the base of slopes or stream junctions, the heaviest particles drop out of suspension, covering the stream bottom with silt. Sediments may also build up on the insides of stream curves or wherever there is a change of pitch in the stream channel. The beds of silt-laden streams in Kantishna contain a layer of silt along most of their length. Streams in the same area that have no mining operations present have clean stream bottoms, which serve as important habitat for aquatic life.

Bottom siltation is a relatively long-term impact of placer mining. Long after cessation of mining, the streams will continue to pick up sediment from the bottom deposits during periods of high water. Silt particles in streams scour the streambed and can severely affect or destroy bottom-dwelling aquatic life. An approximation of the time required for natural flushing of the silt can be made from the fact that the streambed of Caribou Creek, last mined on a large-scale about 35 years ago, is now relatively free of bottom silt (Bundtzen 1978).

Adverse effects on water quality may occur during mining operations, when substances such as fuels, oils, and camp wastes are allowed to

enter streams. Such substances may be toxic or impart undesirable odors and tastes to the water, making it temporarily unfit for certain uses. It is plausible that sewage from mining camps could leak into streams through porous stream gravels, bacteriologically contaminating the water.

The principal hydrologic impact of lode mining is siltation of streams, but to a much lesser degree than placer mining. Silt from small-scale lode mining operations usually originates from unstabilized mine spoil piles, runoff from roads, or cleared working areas (such as open cuts) when such areas are exposed to runoff.

Effects of lode mining on water quality can also include the seepage of sewage from mining camps into ground and surface waters and spillage of toxic substances into streams. The potential for these effects is less than with placer mining, because lode-mining operations are most often located away from streams. In the vicinity of mills, surfactants, foaming agents, or other reagents may enter streams if high water should wash out or overrun wastewater-holding ponds.

Acid mine drainage is probably the most significant potential water quality impact of lode mining. It occurs when sulfate minerals are exposed to water and oxygen and left in a location where seepage and runoff from the mineral waste can reach natural waters. Mine waste usually contains many finely divided mineral particles with surfaces newly exposed to weathering. Oxygen and water combine with the sulfides in the waste to form various mineral salts and sulfuric acid. Water flowing or seeping through the mine and spoils carries these materials into the surrounding hydrologic system. Streams and groundwater are often acidified by this process and may also receive quantities of heavy metals in biologically available form. The highest incidence of acid mine drainage is usually during peak runoff, when acids and salts building up at their source are suddenly flushed into streams. It occurs mainly in runoff or seepage from lode mine tailings piles, mill waste, and mine shafts and is not associated with placer mining.

A sample of water draining the Slate Creek antimony mine was analyzed for heavy metals in 1979. The results are compared with state and federal water quality standards in table 11. Arsenic, cadmium, iron, and mercury are present in Slate Creek in concentrations in excess of certain standards. Arsenic appears to be present at levels dangerous to human health, as well as aquatic organisms. Bioassays on sensitive aquatic species present in Kantishna waters would be necessary to fully predict potential effects. From the known ore composition in the area, high concentrations of lead, zinc, silver, antimony, arsenic, iron, and copper can be expected in waters draining other Kantishna lode mines.

Hazardous metal concentrations in natural water are eventually reduced by dilution and by reaction with base substances to form insoluble compounds. Dilution and chemical reaction usually limit toxic metal levels to the vicinity of the creek receiving acid mine drainage except where large volumes of toxic drainage are involved. A complete analysis of waters draining the Slate Creek antimony mine and other mines would be necessary to accurately evaluate water quality effects.

Table 11: Analysis of Heavy Metals, Slate Creek Kantishna Hills

Metal	Slate Creek Mine[1] Discharge Concentration (mg/l)	Alaska[2] Numerical Drinking Water Standard I	EPA Numerical Water[3] Quality Criteria: Freshwater Aquatic Life II	EPA Numerical Water[3] Quality Criteria: Drinking Water III
Antimony	0.56		.02 LC50[4]	-----
Arsenic	0.81*(I,III)	.01 mg/l	.01 LC50	50 ug/l
Cadmium	0.004*(II)		1.2 ug/l[5]	10 ug/l
Chromium	Not measured		.01 ug/l	50 ug/l
Copper	0.05	1 mg/l	.01 LC50	1 mg/l
Iron	31*(I,II,III)	0.3 mg/l	1.0 mg/l	0.3 mg/l
Lead	0.005		.01 LC50	50 ug/l
Mercury	0.0001*(II)		.05 ug/l	2 ug/l
Selenium	0.002		.01 LC50	10 ug/l
Silver	Not measured		.01 LC50	50 ug/l
Zinc	1.4	5.0 mg/l	.01 LC50	5 mg/l

Note: mg/l equals milligrams per liter and ug/l equals micrograms per liter.

*The column number of the standard exceeded is in parentheses.

[1]USDI, NPS 1979.

[2]As shown in Golden et al. 1979.

[3]EPA 1976.

[4]Read: .02 times 96-hour LC50 for sensitive species.

[5]For cladocerans and salmonids in hard water.

Geology/Soils

Placer mining in Kantishna annually results in the washing of thousands of cubic yards of streambed deposits derived from unsorted till, outwash, stream alluvium, and windblown silt. Much of the silt in this material is separated from the coarse rock during placer mining and carried downstream with the mine effluent, leaving behind sands, gravel, and rock stacked in waste piles. A large amount of soil material is made unsuitable as plant habitat in this way. The piles of coarse rock left on the surface by the stackers will not revegetate until wind- and flood-borne silt accumulates sufficiently for plant growth.

Lode mining causes geologic materials never before exposed to weathering to be brought to the surface. Weathering of minerals in the newly exposed material can result in acid drainage as previously explained. If milling is part of the mining operation, additional waste is generated. Leachates and runoff from mine and mill tailings often negatively affect surrounding soils. Certain salts may precipitate out of solution, coating the bottom surface of a drainage and making it less suitable (or toxic) to bottom-dwelling organisms. Existing soil nutrients may also be leached away by reactive mine effluents. The soil volume involved in such chemical changes is usually fairly small near small mines, such as those at Kantishna.

The area of productive soil covered by waste rock can be quite large near lode mines, especially when a large amount of excavation is required to reach an ore deposit or when numerous exploration cuts have been made.

Probably the most important impact on soil resulting from placer and lode mining is the induced instability of soil wherever a stable surface or subsurface is disrupted. Constructing access roads, airstrips, or other facilities undermines upslope soils in some areas, causing slumping, soil creep, or other mass movement. This greatly widens the disturbed area. Depositing spoil piles on slopes can also cause slope failure. The added weight of spoil piles deposited on steep slopes may cause the soil mass beneath to slide downhill, especially when the soil becomes saturated in the spring. This latter impact may be significant where lode mines are developed on steep mountain slopes.

When vegetated surfaces are stripped of plant cover in Alaska, the underlying soil, particularly permafrost areas, is usually vulnerable to erosion when thawed. This is especially true in the Kantishna Hills area, where many slopes are steep and the high rainfall season coincides with the time of mining activity. Most upland soils of Kantishna are poorly developed and thin, further contributing to low infiltration rates and the rapid accumulation of runoff during storms, resulting in a high rate of erosion. This effect is significant because it takes so long for a new soil to develop in this area once the old soil is washed away.

Access road construction results in major soil impacts for these same reasons. Runoff flows rapidly across road surfaces and frequently creates rills and gullies downslope. Where roads are improperly located,

washouts and failure of cut-and-fill slopes may occur, widening the disturbed area.

Where permafrost is exposed by clearing or the overlying tundra is damaged, the thermal balance of the frozen soil is changed, usually resulting in a thaw of the upper permafrost layer down to a new thermal equilibrium depth. Such thawing can result in depression of the disturbed surface. The depressed areas will collect water from the surrounding tundra during summer thaw. In the case of wheel ruts running downslope, the result is erosion along the ruts and loss of soil load-bearing capacity. Unless bedrock is close to the surface, a new track often has to be established, consequently spreading the damage over a wider area.

Lode mining can result in subsidence when tunnels are constructed in shallow unconsolidated rock. The highly fractured and brittle Birch Creek schist of Kantishna Hills readily caves and could under certain circumstances lead to subsidence. However, to date, little subsidence has been noticed because most underground operations are small.

An impact common to both types of mining is compaction, which occurs on roads and wherever heavy machinery frequently moves over the soil. Compaction deteriorates soil structure, reducing infiltration, increasing runoff and erosion, and rendering the soil less suitable for plant growth.

Vegetation

The most significant effect of placer mining on vegetation is the clearing of plant cover and associated loss of stability in the substrate.

Clearing of vegetation is necessary for access to mining operations. Access roads can require from 1.5 to 2.5 acres per mile--depending on slope gradient, assuming about a 13-foot width for the road and adding a 10 percent factor for cuts and fills--and often involve considerably more areal disturbance than the mine itself. Airstrips, mining camps, equipment staging areas, and storage areas for equipment and materials are associated facilities requiring cleared ground. Most of these facilities are located on the claims, but some have been constructed away from the claims affecting additional land.

Placer mining disrupts large portions of streambeds in the Kantishna study area each year. An approximation of acreage disturbed is not possible because of the fluctuating numbers of annual operations and their varying efficiencies. Placer mining does not materially change the rock and soil of a streambed, it simply relocates them. In this sense, mining is not unlike natural processes that move stream gravel, such as glaciers and floods, except that mining separates sand and silt from coarse material and usually leaves sorted gravel in unnatural piles. The potential for natural revegetation of abandoned placer mines is fairly high where the recontouring of mined gravels is performed and enough fine material is intermixed to provide a root medium. Under these conditions,

natural revegetation could readily take place along placer-mined streambeds. The process of natural revegetation is discussed in more detail in the "Mitigating Measures" section.

Because no data are available regarding exact areas of disturbance to be associated with existing and future lode-mining operations, it is possible such activities in Kantishna Hills could potentially disturb the total acreage encompassed by lode claims. Typically, less than the full acreage of any given claim is involved in mining, but construction of access roads and other miscellaneous disturbances add to the area affected. The effects of vegetation removal will be essentially the same as for placer mining, except that lode mines are more likely to occur in upland spruce, shrubland, and alpine tundra and are less likely to affect bottomland vegetation. Alpine tundra disturbed by such operations will take much longer to recover than the bottomland communities disrupted by placer mining.

An additional impact of lode mining is the possibility of acid and heavy metals drainage from tailings piles and ponds. This may affect adjacent vegetation physiologically, as heavy metals building up in plant tissues have been known to reach toxic levels. The probability of this happening should be low because most mine drainage flows directly into watercourses.

Both types of mining result in higher silt loads in local streams. The moving silt scours the bottom and any other obstacle in the water so that aquatic microflora are damaged and/or prevented from developing. This removes the food supply for certain stream fauna and interrupts biotic food webs in silted streams. Highly turbid waters fail to transmit sufficient light for photosynthesis, eliminating or reducing planktonic plant life and benthic algae.

Any disturbance of natural systems may result in the introduction of nonnative species into the area. When habitat is suitable, such species sometimes become established and are often able to exclude native species by outcompeting them. The harsh Alaskan environment is suited to fewer kinds of nonnative plants than most locales, but there is a definite possibility of certain annual grasses and other herbaceous species becoming established on disturbed ground.

Although no threatened or endangered plants have been collected in Kantishna, four species found in high-altitude habitats in nearby mountains could occur (see table 8). It is very unlikely that the two species found on calcareous (limestone) scree would be affected by mining because such screes are not common in the Kantishna study area, and mining activities are rarely conducted on scree. The two plant species occurring on well-drained alpine slopes could be affected by lode mining if the plants do exist in the study area. A survey of alpine slopes in the vicinity of claims would be necessary to determine whether these plants occur and to protect them from being adversely affected.

The vegetation of individual creek basins has not been mapped or evaluated on an areal basis. However, table 6 summarizes the observed dominant vegetation types in each creek basin of the study area that has or may have mining activity.

Wildlife

In Alaska, the mining season coincides with the period of greatest biological productivity in streams--from ice breakup in the spring to winter freeze-over. Thus, there is considerable potential that placer-mining activities could have adverse effects on the reproduction, growth, and survival of aquatic species.

Sedimentation of streambeds can cause fish egg mortality, as silt particles become attached to the eggs and clog spaces between the gravel substrate. Specifically, this impedes the exchange of oxygen and metabolic waste products between the eggs and water. For salmon, the substrate permeability and subsurface water velocity are important factors in maintaining adequate intragravel concentrations of oxygen in spawning beds, or redds (EPA 1976). Laboratory tests with coho and chum salmon eggs indicate that reduced or less-than-optimal oxygen concentrations can cause egg mortality or result in smaller and weaker fry having reduced chances of survival. Lowered oxygen levels during the early stages of development may delay hatching or result in deformities. In the latter stages of development, lowered availability of oxygen may induce premature hatching. Siltation of spawning beds after hatching may also affect emergence of fry by trapping them in the gravel (USDA, FS 1979).

Turbidity can interfere with the migration patterns and natural movements of fish spawning and feeding (USDA, FS 1979). It can also impair the feeding activities of sight feeders, such as the grayling. Excessive turbidity levels can cause mortality by clogging gill filaments with silt particles, which impedes aeration of the blood (Smith 1974). Other potential effects of turbidity include reduced growth rates, lowered disease resistance and mortality from destruction of specific fish habitat (EPA 1976). Young fish often use tributaries for shelter during floods, but excessive turbidity levels can render the tributaries unsuitable for this purpose.

Suspended sediments and turbidity reduce light penetration in streams, which lowers primary productivity of aquatic plants and decreases availability of natural fish foods. Siltation further reduces the abundance of foods available to fish by smothering aquatic invertebrates.

The hydraulic removal of overburden can be particularly disruptive because it drastically increases sediment loads and turbidity levels downstream. Mechanically stripped and stored overburden can erode and cause stream sedimentation. Frozen overburden, which thaws during stripping, can also result in downstream sedimentation.

Erosion of topsoils or the removal of overburden can increase organic matter in streams. As organic matter accumulates and is decomposed by microorganisms, dissolved oxygen levels can be significantly reduced in downstream waters and hinder the survival of other aquatic organisms such as stream-spawning fish.

Altered streamflow regimes resulting from placer operations can adversely affect the survival of fish eggs and organisms that live in the streambed.

Booming dams and sluicing operations can also act as barriers to fish spawning, migration, or feeding activities.

When the bottoms of stream channels are scoured from placer operations, aquatic plants and bottom-dwelling organisms immediately downstream are destroyed. Fish habitat and spawning areas may also be similarly affected.

Sedimentation resulting from mining operations can alter streamflow characteristics. For example, stream depths can be decreased and stream widths increased, reducing the quality of fish habitat. If riffle areas are eliminated or disturbed, the availability of natural fish foods is decreased. In addition to sedimentation, the operation of earth-moving equipment in stream channels (e.g., during removal of overburden) can also cause physical disturbances to fish habitat. Fish-spawning areas can be destroyed, as can the shallow margins of streams that serve as fish-rearing areas. The destruction of pools in streams reduces available summer habitat for the adult grayling.

The destruction or removal of riparian vegetation in association with mining activities reduces available cover for fish and natural fish foods. Under natural conditions, terrestrial insects resting or feeding on riparian vegetation are frequently blown into the water where they become prey for fish.

The use of suction dredges in the vicinity of fish-spawning areas, particularly during critical stages in the life cycles of fish, may cause adverse effects on spawning activities or fish egg mortality.

Because roads expose bare soil to erosion, improperly placed access roads are sources of additional stream sediments during floods and heavy rains. There is also potential for damage to stream channels by heavy equipment using access roads.

Although the adverse impacts of sedimentation on aquatic organisms have been previously documented, some controversy exists at the present time between the mining and natural science community, with respect to the relative effects of mining activities on stream life in a region where glacial streams are common. The region's clear-flowing, or nonglacial, streams are naturally exposed to sedimentation during spring thaw and periods of heavy rains and high runoff. Because of this, it is thought that sedimentation and turbidity resulting from mining operations have had little adverse effect on fish. However, during natural episodes of high runoff and spring breakup, most of this material is discharged from the system within a short time. Therefore, the impacts of naturally caused stream sedimentation are relatively minor compared to sedimentation resulting from mining operations. Conversely, a stream may receive high sediment loads daily during the mining season; this allows for accumulation of sediments in the streambed and causes frequent, persistent levels of high turbidity. In Kantishna Hills, additional research is needed to determine how long a stream environment requires for natural rehabilitation from sedimentation and turbidity resulting from mining activities and whether biological productivity can return to the levels that existed prior to the initiation of mining.

The impacts of placer mining on terrestrial wildlife species are associated with the removal of overburden, construction and use of access roads, and the use of heavy earth-moving and other mining-related equipment.

Overburden removal and heavy machinery also destroy wildlife habitat. For example, the destruction of riparian vegetation can reduce available willow ptarmigan breeding habitat. Wildlife habitat disturbances displace resident populations of small mammals, temporarily increasing their population densities in adjoining areas. As this happens, the natural carrying capacity of adjoining habitats is exceeded, and the abundance of small mammals ultimately decreases. Changes in the abundance of small mammals, because of their position in the food chain, adversely affect higher order predators.

The construction of airstrips and access roads to mining claims also destroys wildlife habitat. Caribou are known to use the southern end of the Kantishna Hills for winter habitat. Construction of additional access facilities there resulting in destruction of lichens will reduce available winter food sources for caribou.

The removal of riparian vegetation also destroys moose-browsing habitat. Moose browse on willow, aspen, and birch during the summer, fall, and winter. However, unlike other wildlife (such as caribou), moose do not depend on climax vegetation for survival and can thrive on plant species that revegetate disturbed sites (ADFG 1973).

Increased noise levels generated by equipment and generators at mining operations and equipment on access roads can disrupt the natural movements of large mammals in the area.

It is not likely that placer-mining operations will interfere with the flight patterns of migratory birds. It is also unlikely that mining operations will have significant impacts on waterfowl nesting, because it occurs primarily in the lakes, ponds, and lowland areas west of the study area.

Scattered caribou calving occurred in the study area in 1979. It is not known whether mining operations and associated noise levels will reduce the area's potential as a calving site in the future.

It is not known whether mining activities, either placer or lode, are adversely impacting Arctic peregrine falcons, as no nesting sites are known in the study area.

The potential impacts of lode mining on aquatic life include acid mine drainage and pollution of aquatic habitat by heavy metals. The closer the stream is to the mining operation, the greater the potential for disturbance. Acid mine drainage can lower the pH level of receiving streams. In general, pH levels ranging from 6.5 to 9.0 appear to be suitable for maintaining the viability of freshwater fish populations and food organisms such as bottom-dwelling invertebrates (EPA 1976). Water quality monitoring of the streams in Kantishna Hills would be required to determine whether pH levels fall below 6.5, either as a result of mining or by natural causes.

It is possible that lode-mining operations can disrupt natural movements and migration patterns of wildlife. Impacts on wildlife resulting from use and construction of access roads, equipment, noise, and the removal of vegetation are similar to those described for placer mining.

EFFECTS ON CULTURAL RESOURCES

Placer-mining operations and associated activities pose an immediate threat to any archeological or historic site in the area of the mining claim and often in areas outside the claim.

Placer-mining operations on low-lying stream-based deposits will probably not affect significant archeological sites in the Kantishna region; however, stream terraces, stream banks, stream confluences, knolls, and other landform features in the vicinity of stream channels have a higher potential for the presence of archeological sites. Prehistoric and historic sites or materials are likely to be found in association with these landforms. These features should be surveyed for archeological resources when mining operations or related activities are proposed in the vicinity.

Bulldozing, backhoe excavating, and blasting are the most obvious and immediate causes of potential site destruction or disturbance to cultural resources (see table 12). Any activity that alters the spatial relationship of artifacts or the setting of the artifacts in the ground alters site context and effectively destroys a site's interpretive value.

Impacts from road building occur in two ways. Building an access road can destroy a site during construction, but it also provides access to sites that would otherwise be difficult to reach. This increases the chances that materials at the site would be collected or potted. The heritage of the Kantishna Hills mining district comprises more than the historic mining period. It includes the prehistoric period as well.

Other less apparent sources of site disturbance include destruction of the vegetative cover, which can lead to severe site erosion by wind, water, thawing of permafrost, and the contamination of organic remains through chemical or petroleum agents, thereby removing the opportunity to date these remains by radiocarbon analysis.

Table 12: Potential Effects on Cultural Resources
Kantishna Hills

Source	Effects
Mining construction	
Excavation (trenching, drilling, blasting)	Obliteration of all or part of a site Exposure of a buried site
Roads	Strata disruption
Material source borrow areas	Changes in artifact preservation
Water diversion channels	Destruction of artifacts
Staging areas	Loss of context for artifactual material
Camps	Alterations in erosional patterns resulting in site destruction, loss of context of materials
Human activity	Increased potential for the discovery, disturbance, and looting of sites
Emergency environmental clean-up procedures due to flooding, petroleum spills, etc.	Chemical contamination of artifacts or other materials making them useless for radiocarbon determinations
Abandonment procedures (stabilization-reclamation activities, revegetation, contouring)	If undisturbed areas of ground are involved, the effects listed under construction apply

Note: A positive result of mining activity is that it may lead to the discovery and scientific consideration of additional sites.

EFFECTS ON RECREATION AND AESTHETIC QUALITIES

Mining activities generally reduce the quality of scenic views and vistas, diminish wilderness values, and disrupt opportunities for solitude. Surface disturbances associated with mining (such as the removal and stockpiling of overburden) and destruction of vegetation adversely affect the area's natural setting and diminish appreciation of the area by recreationists. Aesthetic qualities and recreation are also impacted by the presence of heavy machinery, vehicles, trailers, housing, equipment, and supplies in the vicinity of mining camps.

Blasting, generators, pumps, and heavy equipment disrupt solitude and the appreciation of being in a natural environment, in addition to being safety hazards to recreationists. Noise from these sources also diminishes opportunities for viewing wildlife that tend to avoid areas where operations are ongoing.

Construction and use of access roads affect aesthetic qualities, solitude, and opportunities for enjoying wildlife. Highly turbid streams diminish opportunities for sportfishing as grayling are sight feeders and are not likely to feed in turbid streams.

Patented claim holders can restrict recreationists from using existing roads leading to public lands by exercising valid existing rights.

Mining operations may attract interested recreationists who can pose a nuisance to individuals conducting operations.

EFFECTS ON SPECIFIC CREEK BASINS

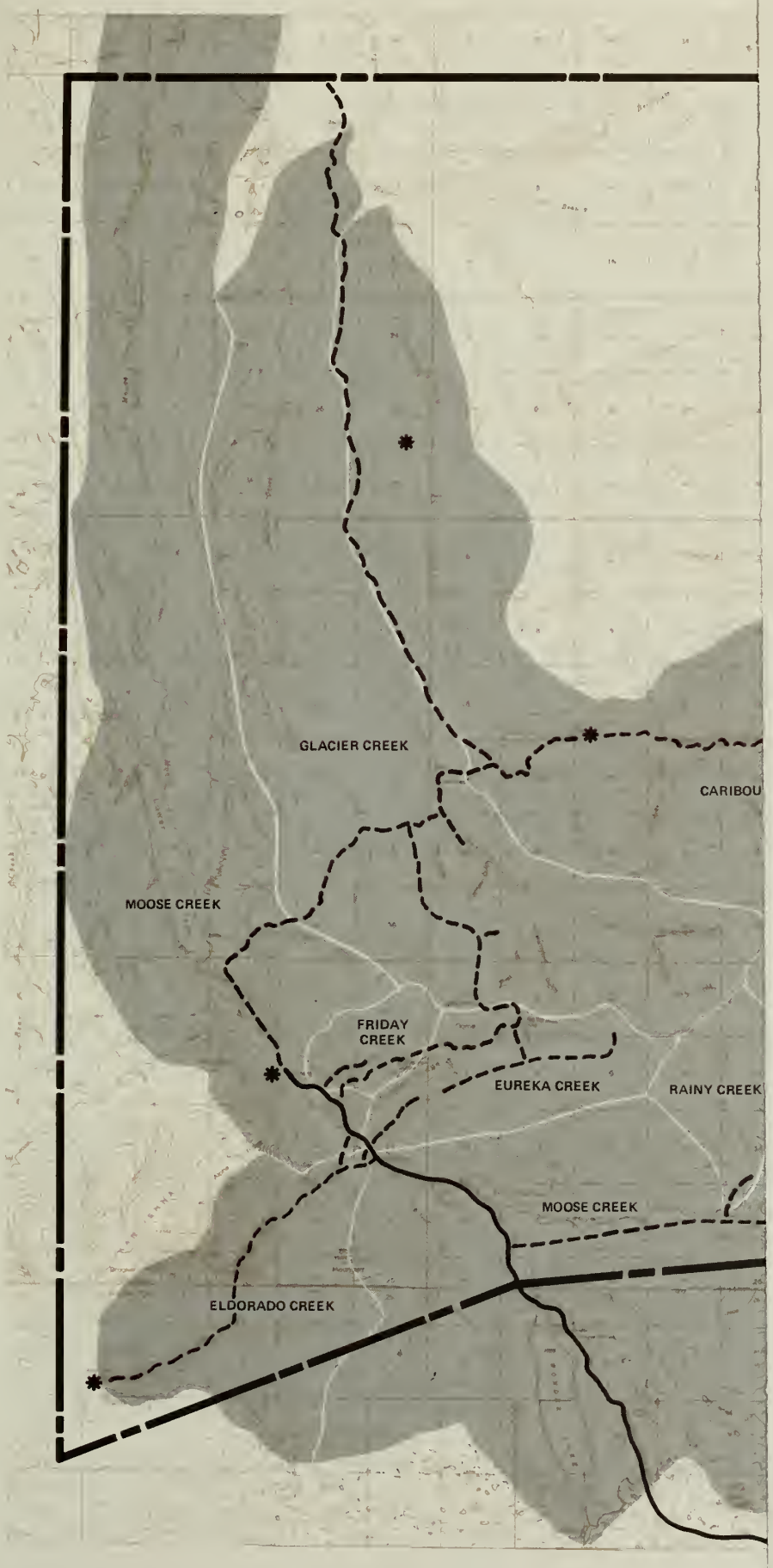
The following section presents the specific environmental effects on each creek basin that have occurred, or could occur, as a result of mining activities in the Kantishna Hills (see the Surface Hydrology and Access map for the location of the basins).

Willow Creek Basin

Willow Creek, which is approximately 2.6 miles long, flowed clear during the 1980 mining season as no mining operations were present. If mined, this stream could discharge an average of 12 cfs of silty water during summer months. Approximately 2.6 miles of stream habitat could be adversely affected by sedimentation from any future mining activities.

The vegetation in Willow Creek was not closely inspected during the 1980 field work. However, from aerial observations it appears to support an undisturbed stand of bottomland spruce-hardwood in good condition. Substantial vegetation will be disrupted if mining occurs in this basin. In addition, mining will require the construction of an access road. In all probability, any access road applied for will follow Moose Creek and then up the Willow Creek streambed, requiring the clearing of spruce-hardwood and shrubland along the watercourses and tundra on the above benches. New vegetation removal and consequent deterioration of soil structure will constitute a more significant impact than will be experienced on most of the other creeks.

Currently, the natural setting of Willow Creek is virtually unaltered. The direct, uncontrolled release of untreated sluicing waters into the creek, if it occurred, would have an adverse effect on aesthetic qualities by changing a clear-flowing stream into a turbid one. Sedimentation of Willow Creek would also adversely affect fishery values.



STUDY AREA BOUNDARY
AIRSTRIP
DRAINAGE BASIN
DENALI PARK ROAD
MINING ACCESS ROAD

NORTH
0 ½ 1 2 MILES
0 1 2 KILOMETERS

SURFACE HYDROLOGY AND ACCESS

KANTISHNA HILLS

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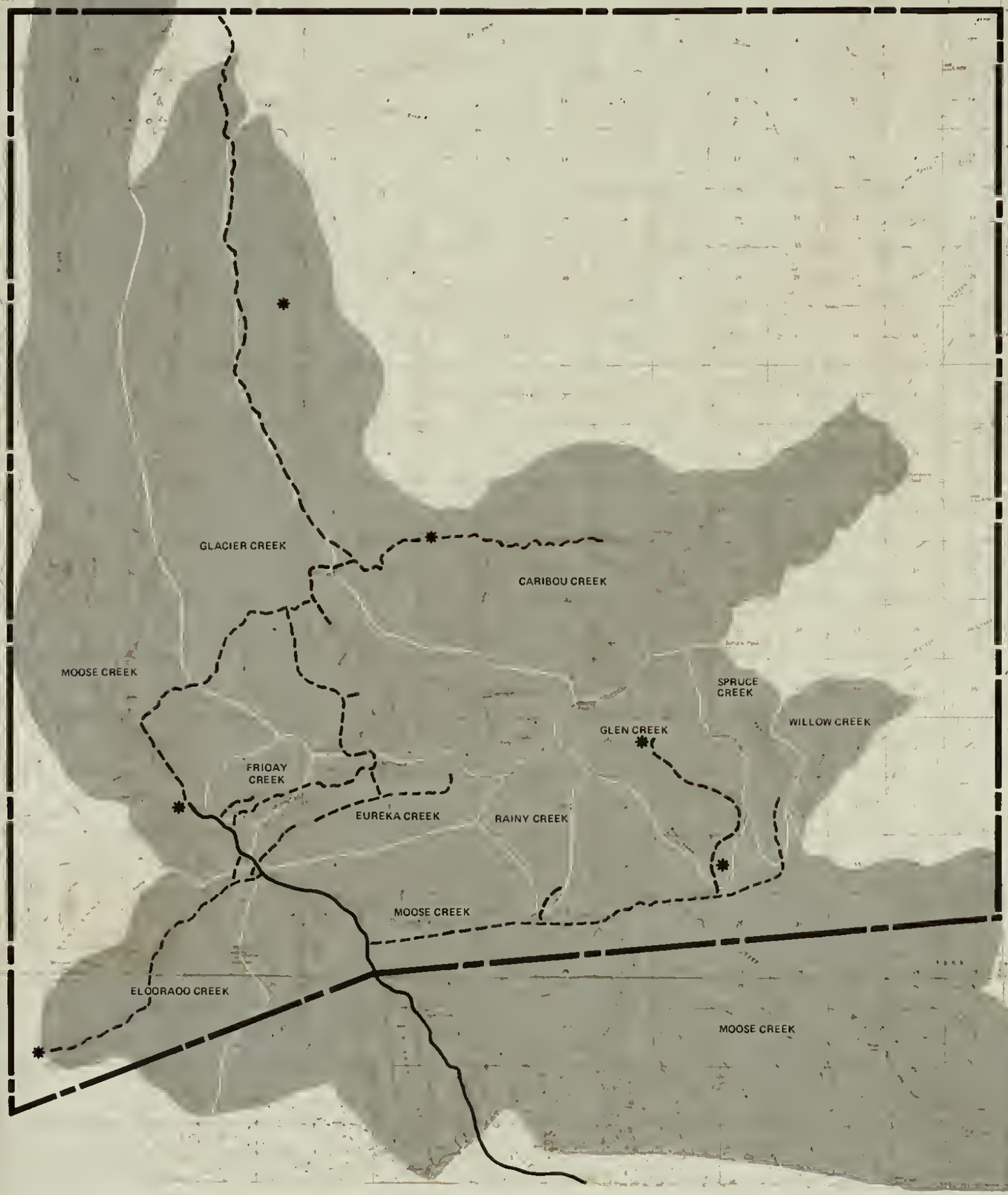

STUDY AREA BOUNDARY
AIRSTRIP
DRAINAGE BASIN
DENALI PARK ROAD
MINING ACCESS ROAD

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0 ½ 1 2 MILES
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SURFACE HYDROLOGY AND ACCESS

KANTISHNA HILLS

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Spruce Creek Basin

This creek basin has been mined intermittently during at least the past two mining seasons, but evidently it has not yielded enough gold to sustain a large operation. When mining is underway, Spruce Creek yields about 13 cfs of silty discharge into the North Fork of Moose Creek and is the first drainage to introduce sediment into this major stream. At its mouth, Spruce Creek has been diverted to an artificial channel.

If mining progresses downstream from the already disturbed upper reaches of this stream, additional vegetation removal will be necessary. This will not be entirely confined to the channel because this creek has low banks. Adjacent tundra may be used for overburden storage, and a natural stand of spruce, poplar, and willow may be partially destroyed.

Under natural conditions, Spruce Creek is a clear-flowing stream approximately 4.5 miles long. Some 1.5 miles of Spruce Creek were subjected to sedimentation by mining activities during the 1980 mining season. Future mining activities could result in an additional 0.5 mile of channel disruption and stream sedimentation.

An access road already exists to mining operations on the upper drainage. Based upon an estimated 2.5 acres of disturbance per mile of access road, approximately 4 acres of wildlife habitat and riparian vegetation has been destroyed.

A part of the Spruce Creek basin was disturbed by mining activities during the 1980 mining season, resulting in adverse effects on aesthetic qualities and recreational opportunities. Sedimentation by untreated sluicing waters has also had adverse effects on the stream's aesthetic qualities.

The effect on the fishery values of the stream is unknown.

Glen Creek Basin

Glen Creek has been mined for over 20 years. It contributes about 22 cfs of silty discharge to Moose Creek every day mining occurs each summer, exceeding maximum legal turbidity limits (see table 5).

Glen Creek canyon contains three mining camps, and it is probable that at least one camp will be expanded to provide housing in the future. It is also possible that the camp on lower Glen Creek will be removed in the future. Due to the absence of adequate sewage treatment facilities and close proximity of camps to the active stream channel, minor stream contamination could be occurring but has not been confirmed or documented.

The outwash gravels mined in this basin appear to have a very high content of sand and silt. The streambed is highly disturbed except for the extreme upper portions. The washing plant used by the Gold King

Mines operation uses approximately 3,000 gal/min, or about 6.7 cfs of water. Glen Creek basin is constricted in most areas, and working room for the miners is limited, necessitating frequent movement of the streambed to redirect flow. Some level bars exist with sufficient width to develop settling ponds, but they are prone to flooding. This stream is probably experiencing the maximum potential impact from placer mining now and is currently the largest, most consistent source of turbid water to Moose Creek.

The impact of continued mining on vegetation in Glen Creek will be minimal, because the entire channel has already been disturbed. The lack of plant cover contributes to soil loss along the creek. Extensive recontouring will eventually be required.

This drainage has approximately 7 miles of freshwater stream habitat. About 3.5 miles of the stream, which flows clear under natural conditions, are subjected to sedimentation and high levels of turbidity by the uncontrolled release of sluicing waters.

An undetermined amount of wildlife habitat and riparian vegetation has been destroyed by previous mining activities. Approximately 4 miles of access road has disrupted about 10 acres.

Mining operations in the Glen Creek basin have disturbed the area's natural setting and adversely affected aesthetic qualities and fishery values.

The area's wilderness values have been affected by existing access roads and the presence of three airstrips.

Noise from heavy equipment and generators at mining operations, as well as vehicles and earth-moving equipment on access roads, has disrupted the solitude of the area and opportunities for viewing wildlife.

There are three lode claims near the headwaters of Glen Creek. Thus, the potential exists for new disturbance in this area in the future.

Rainy Creek Basin

Rainy Creek basin was mined in 1980 for the first time in many years. An efficient high-volume operation, which used a trommel to wash the gravel and included two settling ponds, was located there for a short time. The process water appeared to be kept separate from the creek until it had passed through the ponds. The pond design appeared to be adequate. Operations on this creek have not contributed significant sediment to Moose Creek. Rainy Creek is approximately 3 miles long, has a low velocity, and flows clear under natural conditions. Approximately 2 miles of stream could be adversely impacted by mining.

This scenic creek supports a relatively large stand of spruce-hardwood on bottomlands and slopes. The creek mouth is wide, with braided channels,

and the delta is well vegetated with spruce and willow. Tundra on level poorly drained benches above the creek will probably be isolated from any mining. If increased mining occurs in the basin, there will be some loss of spruce stands, which would take many decades to reestablish and return to their former size.

Sufficient access for any type of mining operation is already available, but it has diminished the area's wilderness values.

Approximately 2 acres of wildlife habitat and riparian vegetation have been destroyed by mining activities to date.

Eureka Creek Basin

This drainage contains approximately 5 miles of stream that, under natural conditions, would be clear. As of 1980, approximately 3 miles of stream were adversely affected by the direct, uncontrolled release of heavily silted sluicing waters; future mining activities might result in sedimentation of an additional 1.5 miles. The creek was partially dammed during the 1980 mining season to provide a source of process waters for placer-mining operations on the Eureka Creek placer claim group, resulting in fluctuating flows downstream.

Eureka Creek discharges a very heavy sediment load into Moose Creek from untreated process waters from placer operations.

The potential for sewage contamination from mining camps is high because of the creek's steep slopes, restricted basin, and high probability of rapid subsurface drainage into the creek.

Mining in Eureka Creek has already disturbed the riparian vegetation of that stream. The edges of spoil piles from old placer mines are slowly revegetating with fireweed, willow, and alder, but the main bodies of the spoil piles, composed of coarse rock that is not suitable as plant substrate, will probably remain devoid of vegetation for many years.

Development of the Eureka lode deposit continued in 1980, resulting in the clearing of shrub tundra near the creek. In addition, new surface access was established into the deposit from the upper Eureka Creek road, further disrupting vegetation and soils. Although this disturbed area is small, other lode deposits in the Eureka Creek basin could be developed in the future on tundra sites with steep slopes. Recovery would be very slow, and erosion or soil movement would be a hazard. There is a potential for future acid mine drainage from the lode operation, which could eventually reduce the chemical quality of water in Eureka Creek.

Mining activities have destroyed an undetermined amount of wildlife habitat, riparian vegetation, and tundra. Future mining activities will result in additional disturbances. Approximately 6.5 miles of existing access roads have disturbed approximately 16 acres of wildlife habitat.

Mining activities on Eureka Creek have caused disruptions to the natural setting of the basin. The release of waters heavily laden with silt has caused high levels of turbidity, adversely affecting aesthetic qualities. Fishery values have been reduced by sedimentation.

Eldorado/Slate Creek Basin

Though mined in the past, this basin has about 7 miles of clear-flowing stream. Approximately 4 miles of the stream could be affected by sedimentation as a result of mining activities on the Liberty claims that began in July 1980; however, the operator indicated that he planned to use settling ponds.

The potential for sewage contamination is low because a camp is not part of the Eldorado placer-mining operation.

Slate Creek, a tributary near Eldorado Creek's headwaters, is currently contaminated by acid mine drainage from abandoned antimony spoils near its source. Arsenic and iron are present in Slate Creek at levels exceeding state and federal water quality standards (see table 11). The heavy metal content may be higher than normal in Eldorado Creek as well, but it is probably within water quality standards because the mine drainage is diluted before entering Eldorado Creek.

There is potential for additional lode-mining development in the upper portions of the canyon, which would involve additional plant removal and soil disturbance. Such development would mainly affect alpine tundra, a plant community that takes a long time to recover.

Spruce-hardwood stands and willow shrubland will be cleared for mining on Eldorado Creek, causing a long-term impact. Approximately 13 acres of wildlife habitat and riparian vegetation have been disrupted by construction of approximately 5 miles of existing access roads; previous mining activities have disrupted an undetermined additional amount.

Recreationists occasionally hike from the airstrip on upper Slate Creek to the Denali park road. Operations may be disruptive to the visitor experience; conversely, the presence of recreationists could be a potential nuisance to and a safety problem for individuals pursuing mining.

Friday Creek Basin

Friday Creek is approximately 2 miles long and its basin contains approximately 2 miles of access roads, which have caused approximately 5 acres of disturbance to riparian vegetation. Two early season suction dredge operations had no apparent effect on water quality or the physical state of the streambed and channel.

Friday Creek's channel has already been physically altered by booming, which was used as late as 1978. The streambed is very rough and coarse, while the banks on the lower portion of the basin are steep. Booming prevents sediments from building up on the stream bottom and has resulted in turbid discharge to Moose Creek at irregular intervals.

Lode claims at the head of Friday Creek could be developed in the future, creating the potential for chemical leaching and contamination of stream waters.

Miners using high-volume mining methods will remove additional willow-alder vegetation from the creek banks and disturb new soil. If sites are adequately recontoured, this type of vegetation should recover following mine abandonment.

In August 1980, a new access road about 0.8 mile in length was constructed along Friday Creek, destroying approximately 2.0 acres of wildlife habitat and riparian vegetation and adversely affecting the lower 0.8 mile of Friday Creek by sedimentation. Changes in drainage and soil moisture can be expected as a result of this construction.

Moose Creek Basin

About 700 cfs of turbid water in Moose Creek leave the Kantishna Hills mining area during an average summer day (approximately 800 cfs arrive at Bearpaw River). This water carries sufficient sediment to yield turbidity readings between 15 and 30 NTU, exceeding Alaska water quality standard for turbidity (25 NTU above background), as far downstream as the confluence of Moose Creek and Bearpaw River. The Bearpaw River below Moose Creek is within the turbidity standard, but has been turned semiopaque by the sediment load in Moose Creek. The Bearpaw joins the Kantishna River north of its confluence with Moose Creek. Although much of the sediment probably settles during this stretch, it is significant that the Bearpaw would normally be transparent over this distance if Moose Creek, and in the future Glacier Creek, and Caribou Creek waters could be kept clean. The Kantishna River is turbid from natural sources and should not be affected significantly.

Moose Creek will become more turbid if mining operations occur on additional tributary creeks without proper sediment controls. Moose Creek attains most of its final volume before leaving Kantishna Hills, and its subsequent course to the Bearpaw has a relatively even gradient. The river is diluted only slightly between Kantishna and Diamond and maintains a nearly constant velocity. This may explain why the creek does not clear up between Kantishna and Diamond. An additional factor is that changes in sediment load do not result in proportional changes in turbidity. Thus, substantial deposition of sediment occurs but turbidity levels remain high. Moose Creek does partially clear up when mining upstream ceases.

Moose Creek in the vicinity of Eureka and Eldorado creeks has a very wide bar of coarse gravel and rock underlain at 8 to 10 feet by a pan of fine silt. Disturbance of the gravel profile by mining probably has relatively little effect on any aquifer because of the coarseness and shallowness of the layer.

The potential for measurable long-term pH changes on this stream, because of acid mine drainage from lode operations on its tributaries, is low because the dilution factor is very high.

In general, the effect of placer mining on vegetation in Moose Creek is relatively minor. The wide, sparsely vegetated gravel bar is frequently disturbed by floods and has an unstable soil and plant community.

Access roads will be least disruptive along this creek, and it is the most suitable for mining facilities, such as camps and equipment storage areas. However, contamination of the creek by accidental fuel spills, sewage, and other waste disposal is possible.

Mining activities in Moose Creek have destroyed riparian vegetation and wildlife habitat, and 14 miles of access roads have disturbed 35 acres. It is possible that sedimentation of Moose Creek could be having impacts on a salmon-spawning area that extends from the vicinity of Diamond to an area approximately 6 stream miles upstream. Moose Creek has supported indigenous populations of grayling in the past. It appears there has been some adverse effects on grayling from stream sedimentation. However, further study is necessary to ascertain specific effects.

Previous mining activities in Moose Creek and its tributaries have disrupted the natural setting of the basin and have adversely affected fishery values and aesthetic qualities. Future placer mining between Rainy and Glen creeks could destroy beaver habitat and displace populations.

A staging area for mining operations, located in the vicinity of Moose Creek and the Denali park road, has resulted in adverse effects on aesthetic views and vistas of Mount McKinley and the Alaska Range from Camp Denali and other vantage points.

Glacier Creek Basin

Glacier Creek is a large stream with good water quality and stream characteristics that could be deteriorated by renewed placer mining. The potential adverse hydrologic impact on this creek is high even though placer mining has occurred in the past. The streambed could become covered with sediment, and uncontrolled release of process water could contaminate an additional 20 miles of Bearpaw River, as well as Glacier Creek.

There are lode claims near this creek, posing some risk of acid mine drainage and attendant heavy metal pollution; however, the potential for adverse effects from this source is low.

Placer mining will cause disruption of streamside willow and tundra vegetation on adjacent benches similar to that described for Eureka Creek. Recontouring will be necessary to allow adequate vegetation recovery.

Mining of the benches will involve areas not previously disturbed by past mining and may result in unusually large quantities of overburden. If stockpiled, this material will be subject to erosion and may have to be artificially stabilized.

There is access to claims on this creek along an existing road, which crosses Wickersham Dome and descends along steep ridges down to Glacier Creek, or from Moose Creek across the tundra north of Kantishna Hills. The latter route has been used in the past during the summer, causing damage to the tundra because of permafrost melting and numerous track scars, which are likely to persist for many years. This activity should be avoided because random cross-country travel may damage vegetation over a wide area. To solve the problem, a permanent stable road can be constructed or travel by this route can be limited to winter months when the ground is frozen. Alternatively, access can be restricted to the Wickersham Dome route.

Glacier Creek has about 35 miles of clear-flowing stream habitat; of this, approximately 15 miles could be adversely affected by future mining activities. Stream sedimentation could have adverse effects on a salmon-spawning area located on the Bearpaw River between Diamond and its confluence with Glacier Creek and possibly on Glacier Creek about 1 mile upstream from the confluence.

Approximately 8 miles of access road have been constructed in the drainage, disrupting approximately 20 acres of riparian vegetation and wildlife habitat. Future mining activities and construction of new access roads would affect an additional amount of wildlife habitat and riparian vegetation.

Future placer and lode mining activities will also have adverse effects on aesthetic qualities and opportunities for hiking, backpacking, nature photography, wildlife observation, and fishery values. However, the area currently does not receive high recreational use.

Caribou Creek Basin

No mining activities were observed in the drainage during the 1980 mining season but are proposed for the future. Mining has occurred in the past, and extensive tailings piles remain in some areas along Caribou Creek.

Future mining operations could destroy wildlife habitat and riparian vegetation and could also impact approximately 17 miles of clear-flowing stream habitat. In addition, an estimated 22 miles of the Bearpaw River

between Diamond (at the confluence of Moose Creek) and its confluence with Caribou Creek, which is used by salmon for spawning, could be affected.

Currently, approximately 6 miles of access roads and two airstrips exist in the basin. The roads lead to areas that have been placer mined in the past, impacting 15 acres of wildlife habitat and vegetation.

Any stream sedimentation and turbidity that result from future placer or lode mining operations could have an adverse effect on aesthetic qualities and may also reduce fishery values.

Existing old buildings have recreational interest but detract from the predominantly pristine character of the area. In many cases these structures are on mining claims and used in mining operations. Existing access roads and airstrips have had adverse effects on the area's wilderness potential.

MITIGATING MEASURES

This section presents measures or actions that could be taken to mitigate or abate the adverse effects of placer and lode mining on the natural and cultural environments. Many of these techniques are applicable to any such mining operation, but, where possible, suggestions for specific operations in the Kantishna Hills study area are supplied.

NATURAL ENVIRONMENT

Hydrology/Water Quality

All process water used in placer or lode mining and ore milling should be discharged into settling ponds or a filtration system and released to natural waters only when clear. The ponds must be of a size to hold process water for a sufficient time to clarify it to minimum standards. Several ponds in series are most effective. Pond length should normally be twice its width to adequately ensure retention time of water (baffles or either midpond obstacles can be used in wide ponds to increase their effective length). Process waters could be transported to a distant pond by ditch or pipe. Releasing contaminated water into a stream and then attempting to treat the whole stream is a method that would probably fail because of insufficient storage capacity and flooding during periods of high water. If a settling pond is kept separated from the main stream channel so that the only influent to the settling pond is process water, flooding is less likely to breach the dam and release the previously collected sediments.

In cases where the stream channel is too narrow to properly construct such a settling pond system, such as is often the case in Kantishna stream basins, a concerted effort by all operators on a given creek to construct ponds at the mouth of the stream in a wider area may provide a workable alternative.

Settling ponds should be equipped with a spillway that decants only the clean upper layer of water in the pond. The spillway should be lined with rock or made of wood. Ponds should be located as far as possible from the stream.

The best water system used in placer mining is the closed-loop system, in which process water is recycled from the settling pond. This system, especially useful in situations where water is in short supply, results in little or no contaminated process water reaching streams. However, in small placer operations, such a system may decrease economic returns.

A large placer operation of the type used in Kantishna Hills may use 4,000 gal/min in its washing plant. Allowing four hours for silt to settle

and 100 percent freeboard in the ponds to handle floods and silt volume, such an operation would require one pond 200 feet long by 100 feet wide and 13 feet deep for an adequate self-contained water system. These figures underline the difficulty of establishing adequate settling ponds in small or narrow canyons.

In many cases, increasing the efficiency of the operation reduces water use, and then settling ponds can be used more effectively. Screening out large rocks in the gravel feed to the washing plant lowers water requirements, because the water does not have to move large material through the sluice.

Filtration systems are broad dams or berms (with at least 3:1 sloped sides) constructed of size-graded material. Sand is placed on the pond side of the dam, and layers of progressively coarser material are built up on the outside. The wastewater passes through the filter or series of filters, and sediment is deposited along the way. Filters require less room than ponds because they do not have to hold several hours' worth of discharge. They make use of more of the gravel tailings material and are less vulnerable to floods. However, filters do not do as good a job of removing sediment. A qualified engineer should evaluate each mining area for the proper design and construction of settling structures.

Work areas, access roads, and other cleared areas subject to erosion should be ditched to collect runoff. This water could be heavily silt-laden and should be diverted into settling ponds along with process waters.

Spoil piles, including spoil from lode mining, should be hydrologically isolated using ditches and/or berms. This reduces the nonpoint sources of sediment and serves to alleviate potential acid mine drainage.

Placing topsoil over spoil piles has been shown to reduce siltation by increasing infiltration, slowing runoff, and hastening revegetation. This method should probably be tried on an experimental basis.

The adverse impacts of channel modification are mitigated by recontouring the spoils upon completion of mining.

Soils

Most of the adverse impacts of mining on soils can be mitigated or eliminated. Efficient sediment collection ponds at a placer mine will prevent most material from leaving the drainage. The collected silt can then be mixed with coarse rock to provide a soil medium during recontouring. Use of filtration systems results in a mixture of silt, sand, and rock in the filter berms. These may only have to be recontoured to provide an adequate growth medium.

Recontouring of waste piles should be carried out as soon as mining is completed in an area. Recontouring allows the gravel to be washed

naturally by floods and accumulate additional silt that encourages natural revegetation. All excavations should be filled.

Planning of facilities and operations is probably the most important means of avoiding soil instability problems. Construction should be avoided on potentially unstable sites. Moist tundra underlain by permafrost should not be disturbed. To avoid slope failure, overburden or other spoil should not be placed on slopes underlain by permafrost.

If access roads must cross tundra, there are at least two ways to minimize damage. A gravel pad thick enough to insulate the underlying permafrost can be laid down and used as the road surface, or travel can be restricted to winter months when the ground surface is frozen. This latter alternative is the most desirable but would entail advance planning by the miners so that needed equipment could be moved into the area during the preceding season for transportation to the mining claim group during the winter.

Erosion of work areas can be minimized by ditching around cleared areas and channeling runoff into existing drainages, by ditching cross drainages on roads, and by avoiding direct downslope road construction.

Stockpiling topsoil when an area is cleared and replacing it when work is completed avoids leaving unfertile ground when the site is abandoned. Stockpiling is of limited use in placer mining, but areas to be used as spoil dumps can be cleared first and the topsoil stored for later use in reclaiming the spoil pile.

Vegetation

Careful planning of mining operations, access roads, and associated facilities can minimize disturbance by confining as much of the development as possible to areas of low vegetation impact, such as shrub bottomland.

Recontouring spoil piles is necessary to provide a natural substrate. Tall steep piles will not revegetate, particularly if they are always higher than the floodline. Level-to-rolling and smooth contouring with gravel-silt mixtures would result in relatively rapid revegetation of placer spoils by native plants. Mixing silt collected in settling ponds with coarse gravel waste would provide a better rooting medium for plants, hastening the process of natural revegetation. Spoil from lode mines and mills should be covered with topsoil and hydrologically isolated. In cases of severe instability and potential for harmful drainage, such piles should be artifically revegetated with native species to minimize erosion.

The dominant pioneer species during revegetation are fireweed and willow, accompanied by herbaceous plants such as milk vetch, mountain avens, and possibly a few species of lichen. Establishment of pioneer vegetation may occur in a few years on parts of a streambed sufficiently removed from the wash area of flooding. Silt borne by floods, runoff from

adjacent slopes, and wind gradually accumulates among rocks and around plants, building a soil medium for the growth of a healthy plant community. Eventually, a rather dense shrub community develops along streambanks of the reestablished watercourse, consisting mainly of willow species and alder, with a ground cover of grass, moss, lichen, and several species of low shrubs. Those parts of the channel regularly washed by floods develop little more than a scattered cover of low willow shrubs and fireweed--similar to the vegetation on flood-prone alluvium in unmined streams.

Below timberline, this bottomland shrub vegetation is gradually revegetated by balsam poplar and spruce woodland, a process requiring hundreds of years to complete. The upland spruce-hardwood forest at Kantishna will only be minimally affected by placer mining because it does not grow directly in the streambeds. Wherever it is disturbed, an herb-shrub stage dominated by alders and willows will follow, and eventually a spruce forest will be established.

Tundra is subject to the greatest substrate damage when disturbed. If sufficient substrate stability is retained, then fireweed and other herbaceous plants pioneer the site, followed by small shrubs such as decumbent willow. Lichens and mosses eventually begin to cover the site and help develop an organic mat over mineral soil. This process requires many years to establish a mature tundra community.

Collection records of the threatened and endangered plants should be reviewed for more detail on their habitat. At Kantishna, field surveys should be undertaken to verify the presence or absence of any such plants still considered likely to occur.

Wildlife

Transporting equipment to and from mining claims on access roads should be timed to avoid or minimize disruption to known seasonal migrations and natural movements of wildlife in the study area.

It is essential that settling ponds be constructed to treat the sluicing waters generated by placer mining operations in order to reduce the amounts of sediment discharged into streams and avoid siltation of fish habitat and spawning areas, disruptions to incubating eggs, entrapment of fish fry that have not yet emerged from the gravel, and adverse effects on aquatic invertebrates that are sources of food for fish. Survival of eggs, fry, and aquatic invertebrates are essential in maintaining the viability of native fish populations.

Overburden should not be stockpiled close to streams, because it may be a source of sedimentation during storms and heavy rains.

Access roads, when constructed too close to streams, are a source of runoff and sedimentation during floods and heavy rains. They also should be located to avoid unnecessary damage to stream channels. The

construction of access roads close to streams also causes unnecessary destruction of riparian vegetation that provides browse for moose, breeding habitat for willow ptarmigan, and is a source of food (terrestrial insects) for fish.

Settling pond systems involving complete or partial recycling and reuse of sluicing waters should be used whenever possible, particularly when the mining discharge constitutes the majority of the flow in the receiving streams.

Intakes or inlets for water should be screened to avoid the possibility of entrapment of fish.

The use of gravity feeds instead of pumps for make-up water minimizes noise levels emanating from mining operations and could minimize potential disruptions to the natural movements of wildlife.

Berms should be placed around fuel storage tanks at mining claims and staging areas and constructed with a storage capacity capable of at least twice the maximum volume of the stored fuel to prevent the direct release of hazardous petroleum products into streams.

Under no circumstances should total man-made blockages of stream channels be permitted because they severely restrict movements and migrations of fish. Booming and hydraulic operations are also extremely disruptive to fish habitat and should not be permitted.

Blasting to loosen rock in lode-mining operations should be timed to avoid disruptions of any known migratory and/or natural movements of wildlife in the area.

CULTURAL RESOURCES

Mitigating measures that can be taken to protect archeological sites include (1) the thorough survey of prospective mining claims, staging areas, and road routes to identify sites; (2) the development of programs for the preservation or reasonable use of the resource as the situation demands; and (3) information about the values contained in archeological sites and the legal protections afforded to these values. The mitigation of adverse impacts on archeological sites by excavation should be undertaken only when the site is in imminent danger of destruction.

RECREATION AND AESTHETIC QUALITIES

To lessen visual intrusions, enhance recreational opportunities, and allow for natural revegetation, all areas subjected to mining operations should be restored to their original contours. This would involve leveling of spoil piles and replacement of overburden and topsoil.

Properly designed settling ponds capable of effectively treating projected volumes of sluicing waters should be used in order to maintain the scenic quality of clear-flowing streams and fishery values.

Staging areas for mining operations should be screened from view and located outside vistas of Mount McKinley and the Alaska Range. The staging facility located in the vicinity of the Denali park road and Moose Creek should be relocated to eliminate visual intrusions.

All claim sites should be cleared of debris after the mining season, and camps should be maintained in a clean and orderly fashion.

To reduce safety hazards to recreationists, fencing should be used to discourage access to dangerous equipment, explosive materials, toxic substances, and abandoned adits and mine shafts.

Trees uprooted during overburden removal should be properly disposed of to minimize the potential for insect infestations in healthy forests.

CHULITNA

INTRODUCTION

The Chulitna area of Denali National Park and Preserve lies along the southern flanks of the Alaska Range from approximately the Broad Pass vicinity to the Tokositna Glacier. For the purposes of this study, the area is divided into two distinct subareas where mining claims are concentrated: West Fork and Tokositna. West Fork incorporates all the claim groups concentrated around the Dunkle Hills and Golden Zone mining area. Tokositna includes the Tokachitna and Tokosha claim groups located to the south near the Ruth Glacier and Mount Goldie.

Surface access to the West Fork area has historically been via the road from the railroad village of Colorado down along the gravels of the West Fork of the Chulitna River to the now dormant Dunkle coal mine. That route is still utilized today for existing mining operations in the Golden Zone mining area, located west of the West Fork of the Chulitna River outside the park boundary. Because mining activity in these areas has been minimal, any intensive development activity would require upgrading the existing Dunkle mine road and the construction of new roads to individual claim groups located in the Ohio Creek drainage (West Fork). No surface access exists to the Tokositna claim areas. Therefore, any development activity on either claim group would necessitate construction of new access routes in this area.

MINING CLAIM STATUS

The Chulitna study areas of West Fork and Tokositna contain 21 recorded placer claims, covering approximately 420 acres, and 195 recorded unpatented lode claims, totaling approximately 3,900 acres.

A complete inventory of the mining claims recorded in the West Fork and Tokositna study areas is presented in appendix E. The listing includes, among other things, the acreage associated with each claim or claim group, the mineral commodity for which the claim was located, and the current claimant. Please refer to the Mining Claims maps for the West Fork and Tokositna areas for approximate claim locations.

The Don and Golden Bob claims are depicted on the West Fork Mining Claims map for location information only. They are not discussed in this report because the majority of the claims in each group lies outside the park boundary, and mining is not likely to occur on those claims within the boundary.

MINING HISTORY

Information on the early history of prospecting in the upper Chulitna region is limited. Certainly the discovery of workable gold placer gravels on Valdez Creek, a tributary of the Susitna River, in 1903 stimulated prospecting in the upper basin of the Susitna. It is likely that in the following years some adventurous pioneers made their way into the Chulitna basin, but no valuable discoveries of gold were made, and the region remained generally unknown. The first claim in this region was staked by John Coffee on Bryn Mawr Creek in 1907, and that claim was worked in 1909. The first lode claim, the Golden Zone, was staked in 1909, although the present owners date their holding from 1912.

By 1930, mining activity in the area had diminished considerably. Of the prospects actively being worked in 1917, only two groups of claims, the Riverside group on Colorado Creek and the Golden Zone on Bryn Mawr Creek, were still active, and only one prospector was keeping up his assessment work on lode deposits. In addition, one coal-mining permit was operative near the confluence of Camp and Costello creeks. A number of cabins are still standing in the area of the West Fork of the Chulitna River. Some of them were built during the early mining period in the area.

Mining activity in the Yentna mining district, of which the Tokositna drainage is a part, began in 1905. By 1911, about 100 miners were working in the area. The Tokositna River was a major travel route in the fall for miners leaving the claims for the winter. They built boats on the upper river and then descended the "Tokichitna," Chulitna, and Susitna rivers to Cook Inlet.

THE ENVIRONMENT

NATURAL ENVIRONMENT

The description of the natural environment for the Chulitna area is presented in relation to the claim groups in that area. Information pertinent to the Chulitna area is discussed, but for additional and more detailed information on specific resources, refer to "The Environment" section on the Kantishna Hills as environmental characteristics of the two areas are similar.

Hydrology/Water Quality

The mining claims in the Chulitna area are located within the Susitna River basin. The Chulitna River is a major tributary of the Susitna, draining most of the southside of the Alaska Range located within the park. The mining claims are located on a number of tributaries to the Chulitna, including the Bull River, Costello Creek, Colorado Creek, Ohio Creek, and the Tokositna River. The larger drainages (West Fork, Ohio Creek, and Tokositna River) are braided streams originating from receding valley glaciers located in their headwaters; each carries a heavy silt load. The Bull River is also a large braided drainage in the area of the Nim claims; however, the glaciers in its headwaters have shrunk to scattered ice fields and no longer exhibit active glacier characteristics. Costello Creek also originates from permanent but scattered ice fields at its headwaters, and the creek flows through a typically braided, glacial valley in its upper reaches. In its lower reaches, the creek channel is incised in the older glacial drift and soft sedimentary rocks and is actively cutting a narrow gorge. Colorado Creek, the only other major creek in the study area, is an unglaciated, clear-water stream system, which like Costello Creek, is cutting a sizable gorge in its lower reaches. The Colorado Creek gorge is quite narrow and deep in the vicinity of the Colorado Creek and Golden Flower claims. Camp Creek, which is a small tributary to Costello Creek, and the two unnamed drainages of the Money and Black Bear claims are all small clear-water streams that originate in lowland topography. These streams may be intermittent drainages.

The hydrologic characteristics of these streams are similar to those in the Kantishna area, and the discussion on that area can be referred to in this context also. As in the Kantishna Hills area, no streamflow gauges are located within the Chulitna area. However, using discharge rates established for the Susitna River basin (USDI, GS 1971 and 1977) and the Chulitna River basin (Selkregg 1974), we can estimate flow rates for a few drainages within the study areas (see table 13).

Table 13: Estimated Stream Discharge
Chulitna

Creek Basin	Drainage Area (sq. mi.)	Average Annual Discharge (cfs*)	Average Maximum Flows (cfs**)
Colorado Creek	11.6	38.3	580
Camp Creek	6.6	21.8	331
Bull River	130.4	430.2	6,518
Black Bear	1.3	4.4	66
Money	0.9	3.0	46
Ohio Creek	145.2	479.3	7,262
Costello Creek***	35.1	115.8	1,754

*Factor used is 3.3 cfs/sq. mi.
**Factor used is 50 cfs/sq. mi.
***Includes Camp Creek drainage.

Generally, water quality in the Chulitna area is good with specific characteristics similar to those discussed in the Kantishna area. The only exception may be Costello Creek, in the vicinity of the Dunkle mine, where past coal mining and subsequent leaching of the old tailings may be locally affecting the quality of the creek water. The general quality of surface waters is known for a few streams in the immediate area and is shown in table 14. The chemical characteristics represented in the table are probably reflective of waters draining this side of the Alaska Range.

Table 14: Chemical Analyses of Selected Streams*
Chulitna

	Chulitna River (near Cantwell)	Chulitna River (near Talkeetna)	Cantwell Creek (near Summit)
Calcium	30%	31%	43%
Magnesium	12%	12%	5%
Sodium potassium	7%	7%	4%
Bicarbonate	32%	37%	43%
Sulfate	13%	9%	5%
Chloride	6%	4%	0
TDS	< 250 mg/1	< 250 mg/1	< 250 mg/1

* Values are percentages of total dissolved solids (TDS).

Groundwater resources in the Chulitna area are restricted to large and small fracture systems in the bedrock. Yields from wells are generally less than 10 gpm. No true aquifer exists in the Chulitna area because of the shallow depth to bedrock. Permafrost is discontinuous.

Geology/Soils

Located on the southeast flanks of the west-central Alaska Range, the Chulitna area encompasses a long belt of relatively low, but locally rugged, mountainous terrain lying between the main valley of the Susitna and Chulitna rivers and the crest of the Alaska Range. The surficial geology of the area has been dominated by glaciation, especially the low-lying areas along and around the major river valleys. Six different glacial advances have altered the landscape, with most of the present topography reflective of the last three advances (Dean 1980). During these advances, bedrock was scoured and debris was transported and deposited by the glaciers and streams. When the glaciers receded, long, low, and elongated ridges of ice-molded glacial drift and bedrock were left behind. The terrain in the upper Chulitna River area, especially around Broad Pass and the Nim claim group, is typical of these processes. The glacial drift covering the valley floors trapped surface water in depressions, or bedrock basins, forming elongated lakes or bogs, while modern stream and river channels have been established by incision of stream through the glacial drift and underlying sedimentary rocks.

Mineralogically, the Chulitna area is defined principally on the basis of epigenetic metallic deposits and anomalous concentrations of metals in stream sediments. As referred to in this report, the Chulitna area includes portions of three separate mineral districts referenced in supporting literature--Yentna, Curry, and Upper Chulitna (USDI GS 1973b). In general, the Yentna mining district extends from Collinsville to the Tokositna River and includes the Tokachitna claims; the Curry mining district extends from the Tokositna River to Eldridge Glacier, which includes the Tokosha claims; and the Upper Chulitna mineral district includes all the remaining claim groups.

The area is underlain by layered rocks of Paleozoic to Tertiary age, which have been intruded by ultramafic to mafic igneous rocks. The layered rocks consist of sedimentary and volcanic rocks that are predominantly of marine deposition. Near the abandoned Dunkle mine, coal deposits of Tertiary age unconformably overlie the layered rocks. The intrusive rocks include serpentinite, gabbro, diorite, quartz diorite, and granite.

Most of the ultramafic and mafic rocks were emplaced in elongated bodies near major faults while the rocks of granitic composition form small plugs, stocks, and dikes (USDI, GS 1974).

Mineral deposits in the study areas are primarily epigenetic deposits of gold or copper, with abundant arsenopyrite and smaller syngenetic

occurrences of chromite or chromium and nickel-bearing silicates. The largest bodies of mineralized rock occur in porphyry or along local contact metamorphic zones with argillite-basalt and limestone hosts (USDI, GS 1974). The mineralization of the entire area appears to be related to the strong northeasterly structural alignment of the area and parallel fault structures. Most of the deposits are in the hanging walls of the Upper Chulitna and the West District faults. The first mineral deposits were discovered in the area around 1907; however, major development of prospects did not take place until the period between 1911 and 1915 (USDI, GS 1933a).

The Chulitna mineral area has produced gold valued at more than $60,000 (at $35 per ounce) from lode deposits, although calculable resources are much greater than known production (USDI, GS 1973b).

As in the Kantishna Hills area, soil characteristics in the Chulitna area are only generally known. The Soil Conservation Service (1979) classified soils in the Chulitna area primarily as pergelic cryorthods, a very gravelly, hilly to steep rough mountainous soil association, except for the area around the Tokosha claims that are typic cryaquents, which are a more sandy level soil association. Typically, the soils have been formed in very gravelly and stony colluvium and glacial drift under a cover of alpine tundra vegetation. Permafrost, although discontinuous, is usually present at depth.

West Fork Area. West Fork contains the largest number of claims in the Chulitna study area: the Nim, Nimbus, Golden Flower, Absolution, Denson Lode, and Glacier Queen lode claims, covering approximately 3,740 acres, and the Colorado, Black Bear, and Money placer claims, covering approximately 360 acres.

The large block of Nim claims lies in an area of low-rounded hills between Bull River and Costello Creek. The area is reported to contain traces of disseminated copper, arsenic, gold, silver, and molybdenum-bearing minerals. The claims are located atop an intrusive porphyry complex cut by a monzonite porphyry dike and granite or quartz porphyry (Hawley 1978b). This claim group was first staked in 1971 as the Snoopy claims, with the primary mineralization occurring in the southwest end of the claim group. The soils in the southwest side of the claim block are primarily well drained and shallow, with areas of bare rock and stony rubble. The soil has developed in very gravelly and stony silt loams. The soils in the northeast side of the claim block, however, are generally poorly drained soils, with a shallow permafrost table occurring in the flatter valley areas near Bull River under a cover of mosses, sedges, and low shrubs. Here the soils have a thicker peaty surface layer underlain by the glacial drift, with permafrost generally occurring at depths less than 20 inches.

The Nimbus claims, which lie just west of the Nim group, were first staked in 1976. These claims have been filed atop a northeast-trending vein zone locally intruded by a small quartz diorite porphyry body. The claims are located on gently sloping terrain, which is bisected by a fork of Camp Creek. The surficial material is primarily glacial drift, while the

soils on the Nimbus claims are locally poorly drained and similar to the soils on the northeast side of the Nim group.

The Golden Flower claims lie across Colorado Creek in a complex geologic zone near the abandoned Dunkle mine. Rock units mapped in the area include argillite, limestone, conglomerate, and tuffaceous greenstone, cut by small northeast-trending dikes of quartz diorite porphyry. Structurally, the rock units generally strike northeastward while the Upper Chulitna fault crosses the area basically subparallel to the strike of the rock units. The richest sulfide rocks (mainly pyrrhotite) are reported to occur on a round knob located approximately on the boundary between claims 4 and 6. This small hill has been extensively trenched for assay purposes. Most of the claims lie across the deep gorge of Colorado Creek, making access difficult in the very precipitous terrain. Only claim 6 is located out of the influence of the deep gorge on relatively level terrain.

The Colorado #1-#9 placer claims lie along Colorado Creek at the bottom of the gorge. The Golden Flower lode claims overlie a portion of the Colorado claims (principally, claims 6, 7, and 8). The gorge carved by the creek through the soft rock units described above is very deep and narrow, with extremely unstable and precipitous slopes.

West of Colorado Creek, the Money and Black Bear placer claims lie in an area that primarily consists of glacial drift and colluvium. Rocks of the Redbed series outcrop in the general area of the Money claims.

The Absolution claim lies on a high slope 1½ miles west of the Golden Zone mine and adjacent to the Blind Creek fault zone, which contains a thick quartz-rich breccia pipe. The claim lies on the contact zone between volcanic siltstone and conglomerate in a major fault zone striking north-northeast. The fault zone contains quartz veins and quartz cemented breccia zones up to 200 feet across, which contain minute traces of gold, arsenic, lead, and zinc (USDI, GS 1968). Directly south, a small portion of the Don limestone claim group lies just inside the park boundary.

The soils on the Golden Flower, Colorado, Money, Black Bear, and Absolution claims are primarily well-drained, gravelly, and poorly developed of the pergelic cryorthods association. Local pockets of poorly drained histic pergelic cryaquepts soils are present on the Money and Black Bear claims.

The Glacier Queen and Denson Lode claims lie in the Ohio Creek drainage, 2 to 3 miles upstream from the center of mineral activity in that area. However, locally a tourmaline-bearing granite stock (converted to greisen) has been intruded into the graywacke-argillite host rock. This event has weakly metamorphosed the host rock for up to a ½ mile from the gravite contact (Hawley 1978b). A tungsten anomaly was reported by a prospector subsequent to 1969. This evidence suggests that the area around the granite may locally have disseminated deposits and veins within the graywacke-argillite unit containing tin, tungsten, silver, and other metals (Hawley 1978b). The Denson Lode claims 1-8 principally overlie this gulch along the steep west-facing slopes of Ohio Creek. The

Glacier Queen claim appears to be located over the granite stock itself, more than 0.10 percent tin in the form of cassiterite (USDI, GS 1969). The rock units (including the granite stock) strike in a northeasterly direction, dipping steeply to the northwest. Soils are thin to nonexistent. The rough mountainous terrain in this area does not support extensive soil formation, and those that do exist are stony and shallow over bedrock or rocky slopes.

Tokositna Area. The Tokositna area contains the Tokosha placer claims and the Tokachitna lode group together covering approximately 220 acres.

The Tokosha claims lie within the broad floodplain of the Tokositna River near the toe of Ruth Glacier. Locally, the area is covered by a thick sequence of glacial drift, colluvium, and alluvium deposits. Numerous drumlins intermixed with poorly drained low-lying basins lie east of the claims. Soils in this area (typic cryaquents) are poorly drained and consist of water-laid sands deposited over very gravelly glacial outwash material. Flooding is frequent, and the water table is usually very near the surface. Permafrost is either deep or absent.

The Tokachitna claims lie on the southeastern flanks of Mount Goldie between the Tokositna Glacier and the Kanikula Glacier valleys. The terrain is very precipitous, with high peaks and narrow ridges dividing small, narrow steep valleys. Rocks exposed on the claims are primarily dark-colored argillite, graywacke, and conglomerate of early Tertiary age. The rocks strike northeastward and dip steeply to the northwest.

Located on the extreme edge of the Chulitna-Yentna mineral belt, traces of several metals have been found in the claim area, including gold, silver, tin, copper, and zinc. Some of the soils in this area are considered humic cryorthods, which are well-drained thin soils, free from permafrost. These types of soils have formed in a thin mantle of silty volcanic ash over very stony material and locally may be strongly acidic (USDA, SCS 1979). These soils cover approximately 65 to 70 percent of the claim area while the remaining area of the claims consists of bare rock and strong shallow soil of rocky slopes, ridges, and peaks.

Climate

The climate of the Chulitna area is considerably different from that in Kantishna. There are more cloudy days, substantially more snow and rain, and milder temperatures. Chulitna lies in a climatic transition zone where maritime influences begin to decline as one moves towards Alaska's interior. The Alaska Range provides an abrupt boundary between maritime and continental influences. The mountains act as a barrier, which hinders the northward migration of storms from the Gulf of Alaska as they travel up the Susitna River basin. As the air is driven upward over the range, the southern flank of the range receives a greater amount of precipitation. The dissimilar growth of glaciers on the northern and southern flanks of the range reflect this difference in precipitation.

In the study areas there are local differences in climate that can be of some importance to mining. Weather data extrapolated from Summit (located 12 miles east of the Dunkle mine area) and Talkeetna (located 24 miles south of the Tokosha claims) indicate that weather conditions may be drier, cooler, and windier in the West Fork area than in the Tokositna area (USDC, Weather Bureau 1959; Selkregg 1974; USDI, GS 1932 and 1959). The mean annual temperature for the West Fork area is estimated at 25°F, with annual precipitation averaging 22 inches and snowfall averaging 119 inches. For the Tokositna area, annual mean temperature is estimated at 30°F, with 30 inches of precipitation and 142 inches of snowfall. Average windspeeds in the West Fork area can be nearly twice those speeds for the Tokositna area (Selkregg 1974). The reason for the differences between the two areas may be associated with the fact that the crest of the Alaska Range is considerably lower in the West Fork area than it is in the Tokositna area, thus, influencing airflow and precipitation factors (USDI, GS 1959).

The implications of the above data for mining operations are evident, although they are probably not critical. Miners operating in the West Fork area can expect colder soil and ground temperatures later in the operating season, greater snowfall, a later snowmelt, and greater numbers of snowdrifts that linger far into the operating season, owing to the cooler average temperatures and higher windspeeds, which can cause greater drifting and compaction of snow during the winter.

Overall mining operations in the Chulitna area must deal with wetter conditions than Kantishna, as summer rainfall can exceed 9 inches in the months of August and September alone (which represents over 66 percent of the year's total precipitation for the Kantishna area). Mine operations should be designed with greater runoff and higher flood frequencies in mind (USDI, GS 1932).

Vegetation

Plant communities in the Chulitna study areas are quite similar in type, composition, and distribution to those of Kantishna. A more detailed description of the vegetation types discussed below can be found in the Kantishna Hills section of this report.

The Nim lode claim group is vegetated by alpine and moist tundra. Low willows line the small stream channels between hills, and permafrost is widespread at shallow depths beneath tundra.

Vegetation along Colorado Creek grades from willow-alder shrub communities in the upper drainage (flanked by steep, virtually barren slopes) to bottomland white spruce forest near the mouth. The smaller tributary drainages to West Fork of the Chulitna River support similar vegetation but in narrower strands. Moist tundra covers relatively gentle or level ground above the creeks, and dry alpine tundra grows on the steep ground throughout this area.

The remaining lode claim groups, located on high terrain above Ohio Creek and the West Fork of the Chulitna River, contain similar plant communities, except the Nimbus group on Camp Creek where slow drainage has led to development of moist tundra with abundant shrubs.

The Tokosha group, located on older, more stable riverbottom soils beyond the active channel of the Tokositna River, support stands of mature white spruce-poplar forest. The Tokachitna claims lie in an area of alpine and moist tundra.

Wildlife

The Chulitna study area is inhabited by a diversity of wildlife species. The major habitat communities are alpine and moist tundra and upland spruce-hardwood forest (Selkregg 1974).

Mammals. Prominent mammals that are known to range in the area include the barren ground caribou, grizzly bear, black bear, wolf, moose, Dall sheep, and wolverine. Caribou and Dall sheep are not known to inhabit the Tokositna study area. Other mammals that are known to occur in the habitat types of the study areas include hoary marmot, pika, coyote, red fox, lemmings, ground squirrel, snowshoe hare, lynx, marten, red squirrel, and flying squirrel.

Caribou use portions of the West Fork study area for summer range, and extensive areas of wintering range are located to the east. An established calving ground and post calving area are present in a portion of the area adjacent to it.

In May, June, and July 1981, NPS and ADFG personnel conducted a caribou study in Dunkle Hills and the surrounding area. The purpose of the study was to determine when caribou were migrating in and out of the area and by what routes, to determine the levels of use for the area during the calving and post-calving periods relative to use in the surrounding areas, and to record observations of other wildlife species in the area. A preliminary report for 1981 included the following findings:

> The pass connecting the upper Sanctuary River with the Foggy Pass mining claim area (see "Other Located Claims" discussion) appeared to be the most heavily traveled route for caribou migrating south from over the Alaska Range. The same pass was also used most frequently during the northward migration during late June and July. Cows were seen in the Dunkle Hills area on May 12, 1981.
>
> Calving activities appeared to be concentrated in the mountains surrounding Colorado and Costello creeks, within 3 to 5 miles from the Dunkle mine. Calving occurred on a lesser extent in the high slopes above Cantwell Creek, Bull River, and Easy Pass. During the post-calving period of mid-to-late June, use appeared to be heavier in the flats at the mouths of Costello and Caribou creeks

than it was in late May. The only other major concentration of cows and calves observed south of the Alaska Range occurred outside the park (and the recent additions) in the area between Copeland Creek and Lookout Mountain. A total of 623 cows and calves were counted on June 11 and 12, 1981, in the Dunkle Hills survey area.

Other wildlife species sighted in the Dunkle Hills area were grizzly bear, golden eagle, wolf, wolverine, moose, and black bear. A bald eagle and several Dall sheep were seen outside of the area surveyed.

Extensive fall and winter concentration areas for moose exist south of the Chulitna area. Dall sheep generally occur at higher elevations to the northeast of Ohio Creek in the Alaska Range. It is suspected that grizzly bear denning sites exist in the Dutch Hills.

Prior to approval of any major mining activities on claims in the West Fork area, especially in the Nim, Nimbus, Golden Flower, and Money claims, a careful study of potential mining impacts on caribou calving and migration patterns will have to be conducted. Further study is also necessary to determine the importance of this area to the health and safety of the McKinley caribou herd.

Due to the cyclical nature of populations of caribou herds and the fact that the McKinley herd is now low in numbers, the full extent and nature of calving and post-calving activities in this area when the herd numbers many more animals is difficult to determine.

Birds. Bird life in the Denali National Park and Preserve region is abundant--more than 130 species of birds have been identified, most of them migratory. Detailed surveys of bird life in the Chulitna area have not yet been undertaken. The following information on bird species in the area is based on previous studies, known habitat associations, and field observations made by the study team.

Portions of the Chulitna area, mostly at the lower elevations provide nesting and molting areas for waterfowl and shorebirds. A major migration corridor is located along the Susitna River near its confluence with the Chulitna River, and a minor route occurs through the Broad Pass area. The floodplain meadows along the Tokositna River immediately south of the Tokositna study areas provide important nesting and feeding habitat for the trumpeter swan (ADNR and USDI, NPS 1980).

Other birds, which are known to be associated with the major habitat types of the area, include the golden eagle, ptarmigan, marsh hawk, gyrfalcon, raven, shorebirds, owls, grouse, and numerous songbirds.

Species observed by the study team during the 1981 reconnaissance of claim groups included golden plover, Lapland longspur, ptarmigan, golden eagle, long-tailed jaeger, olive-sided flycatcher, and white-crowned sparrow.

Fishes. Compared to other regions of Alaska, the variety of fish species in the area is relatively limited. It is likely that glacial streams, such as the Tokositna River, and associated silt loads affect the composition and seasonal occurrences of fish species in the drainages of Chulitna.

Fish species known or believed to occur in the study area, or its immediate vicinity to the south and east, include the round whitefish, arctic grayling, rainbow trout, Dolly Varden, chinook salmon, pink salmon, chum salmon, coho salmon, and sockeye salmon. Other species are the slimy sculpin, longnose sucker, and burbot (Morrow 1980; ADNR and USDI, NPS 1980).

Grayling and whitefish are present in the upper Tokositna drainage, as well as Dolly Varden that also occur but to a lesser extent. King salmon can be found in Bunco Lake and lower Bunco Creek, and sockeye salmon can be found in Swan Lake and Kroto and Moose creeks. King salmon occur in Cache, Peters, Moose, and Kroto creeks. Pink salmon occur in Cache Creek, as well as the lower reaches of Peters Creek, and coho salmon can be found in Peters and Moose creeks. Chum salmon may be found in the lower reaches of Peters Creek (ADNR and USDI, NPS 1980). Few fish are believed to occur in any of the stream drainages in the vicinity of the mining claims, and little data are available on species occurrance.

CULTURAL RESOURCES

The foothills of the Alaska Range, lying west of the Chulitna River and the Broad Pass area and between Talkeetna and Cantwell, are not well known archeologically. Nevertheless, based on prehistoric and historic site information now available from the upper Susitna and Nenana River basins, it is only a matter of time before significant prehistoric and historic cultural resources are recorded in the Chulitna and Tokositna areas.

The first archeological reconnaissance of the Chulitna River area was conducted in 1971. Sections of Denali State Park were examined, including Spink, Byers, Lucy, and Summit lakes; Chulitna Pass; and segments of Salmon Creek, Pass Creek, and Indian River (USDI, NPS 1965a). No archeological sites were recorded in the state park. However, sites were discovered at Stephan Lake, located approximately 48 miles due south of Cantwell, just south of the upper reaches of the Susitna River. One site at Stephan Lake dates to approximately 6,000 years in age, demonstrating the prehistoric site potential of the region. It was hypothesized that the area's significant annual precipitation and snow depth amounts were factors responsible for discouraging use of the Denali State Park area by both man and animal during aboriginal times. However, more recent surveys of the upper Susitna River basin, spurred by proposals to develop the hydroelectric potential of the area, have unequivocally demonstrated that significant prehistoric sites exist in the region (ADNR 1975; Irving 1957; Bacon 1978a and 1978b). Ongoing cultural resource surveys should contribute significantly to our knowledge of Susitna River basin prehistory. Additionally, significant prehistoric

sites are known from the Nenana River area (Holmes 1975b; Bowers 1980). It is reasonable to expect that important archeological sites will come to light as surveys are undertaken along the foothills of the Alaska Range west of the Chulitna River.

A brief archeological reconnaissance in June 1981 noted a number of historic sites, but no prehistoric sites were noted. The reconnaissance was primarily designed so that estimates could be made of site potentials and priorities set for archeological survey. Estimates of historic and prehistoric site potential by mining claim group are included in table 15.

Table 15: Cultural Resource Potential
Chulitna

		Site Potential*	
Claim Group	Level of Investigation	Historic Site	Prehistoric Site
Nim	Brief reconnaissance Helicopter overflight	1	3
Nimbus	Brief reconnaissance Helicopter overflight	1	2
Colorado Creek	Helicopter overflight	4	2
Black Bear	Helicopter overflight	1	2
Denson Lode	Helicopter overflight	1	1
Glacier Queen	Helicopter overflight	1	1
Absolution	Brief reconnaissance Helicopter overflight	1	1
Money	Helicopter overflight	1	2
Golden Flower	Brief reconnaissance Helicopter overflight	2	2
Tokachitna	Brief reconnaissance Helicopter overflight	-	-
Tokosha	Brief reconnaissance	4	3

*Key: Probability for cultural resources
1 low
2 low to medium
3 medium
4 medium to high
5 high

Mining claim groups in the Chulitna area also need to be studied and evaluated in terms of history and the significance of historic structures and objects. Little is known about the history of the claim areas except for the evaluations made by USGS personnel who visited the claims in the early 1900s (USDI, GS 1915, 1919a, 1932, and 1933a).

The historical period in the Susitna River basin began when Vassili Malakoff of the Russian-American Company ascended the Susitna River for a short distance in 1834 in search of furs (Brooks 1911). However, it was not until the very late 1890s that exploration of the upper Susitna River basin began in earnest, with expeditions to the region by adventurers seeking gold and exploration teams of the U.S. Army and the U.S. Geological Survey (USDI, GS 1919a; USDI, GS 1911). This discussion focuses upon references from their reports chronicling the explorations of the foothills and drainages located west of the Chulitna River.

W.A. Dickey and three other men in search of gold ascended the Susitna River in 1896 to the mouth of Indian Creek, exploring the upper canyon of the Susitna River and also the Chulitna River to the foot of the Chulitna Glacier. Dickey named Mount McKinley and accurately estimated its height. He may also have been in the "Tokichitna" River lowland on a later expedition in 1897 (Brooks 1911). Dickey's expedition "was probably one of the first extensive journeys in this district since that of the Russian Malakoff in 1834."

In 1903, F.A. Cook and his party crossed the Alaska Range through a pass located somewhere between the Muldrow Glacier and the Nenana River. It is suspected that "he crossed an ice-filled pass at the head of the Teklanika River and descended Bull River to the Chulitna" (USDI, GS 1919). A similar feat was accomplished by a mountaineering group in 1912 (USDI, NPS 1919); a "mountaineering expedition, conducted by Herschel C. Parker and Belmore Browne, ascended Susitna and Chulitna Rivers and what is now called Ohio Creek by dog sled, crossed a high, glacier-filled pass to the west fork of Chulitna Glacier, and from the head of that glacier penetrated another divide to the north slope of the Alaska Range."

The pass across the Alaska Range from the head of the West Fork of the Chulitna to the edge of the Muldrow Glacier, now known as Anderson Pass, had been used for sledding and packing supplies in both winter and summer (USDI, GS 1919).

The Tokositna River area is also important in that Dr. Frederick A. Cook explored the area for a route by which to ascend Mount McKinley. Apparently he set up base camps near the fronts of both the Tokositna and Ruth glaciers (USDI, GS 1911; Parker 1906; Moore 1967). In conclusion, enough is known about the Chulitna study areas to indicate that they contain high potential for containing significant historic resources and a good potential for prehistoric resources as well.

Subsistence activities should also be considered in evaluation of proposed mining operations. Little is known of the subsistence pursuits engaged in the Chulitna area. The same is generally true for the Tokositna area,

but one Athabaskan individual is known to have trapped in the Tokositna Valley, and a cabin is shown on a USGS Talkeetna map of the area about 1 mile north of the Tokosha claims. Also, two old hunting camps were located on the claims during the study team's 1981 visit, and five cabins were seen east of the Tokositna River and west of a small lake about one-half mile south of the claim group. A trapline runs through the claim group, and an animal trap was found on the claims. The bend on which the Tokosha claims are located appears to be a strategic area, especially because of its proximity to the Chulitna River. It is, therefore, a high potential cultural resource area and requires further evaluation prior to approving any mining plan on the claims.

RECREATION AND AESTHETIC QUALITIES

The Chulitna area currently receives relatively low recreational use compared to the north side of the Alaska Range in the park. The West Fork region of Chulitna is partially visible from the Parks highway to the east. In particular, the southern portion of the Nim group is readily visible to motorists from areas around Summit and Colorado. Although this mining claim is situated approximately 6 to 10 air miles from the highway, surface disturbance could be visible from the highway. The remaining claim groups are not as visible because they are generally blocked from view by terrain features.

The Tokachitna claim group in the Tokositna study area lies in one of the prime viewsheds of Mount McKinley, as identified in a recent Tokositna State Park study (ADNR 1980). This area currently receives relatively low recreational use. Because of its remote location adjacent to the Tokositna Glacier and the absence of past surface disturbance, mining operations in this area could be highly noticeable, particularly from locations in Denali State Park.

OTHER LOCATED CLAIMS

INTRODUCTION

In addition to the mining claims present in Kantishna Hills and the Chulitna area, there are approximately 50 other lode claims in the former Mount McKinley National Park boundary, covering approximately 1,000 acres (see Other Located Claims maps in map pocket accompanying this document). The maps are included in this report for location information only. Although these claims are filed with the Bureau of Land Management, their validity is in question, and they are in various stages of legal and administrative processing to have them declared null and void. The Stibner and Herning groups have had mining activity associated with them in the past, as evidenced by surface disturbance in the claim area.

The following is a brief description of the resources associated with each claim group and the mineral commodity for which the mining claim was originally located.

SLIPPERY CREEK CLAIMS

Several mining claims have been located along the mountain front in the upper drainages of Slippery and Birch creeks, approximately 24 miles southwest of Wonder Lake (see Other Located Claims Area A map). Although isolated and little visited, the area offers some of the finest scenery, flora, and fauna available in the park. Most of the claims in this area were first staked by W.J. Shannon in the 1920s and 1930s but were abandoned soon afterwards (USDI, GS 1932). Most of the original claims have since been restaked by the current owners, and some recent production has come from the antimony claims (Hawley 1978b).

Most of the rocks in the area are altered sedimentary rocks adjacent to the contact with the McGonagall batholith--a large coarse-grained quartz diorite. Locally, the area is riddled with dikes and sills related to the granitic intrusions where widespread silicification has taken place (USDI, GS 1961). Within the mineralized zone, ores (primarily stibnite, mercury, and copper) occur in irregular masses, veins, and disseminated crystals (USDI, GS 1932). Only the antimony claims on upper Slippery Creek have been developed to the extent necessary to yield any accountable production.

Soil characteristics on the claims are the same as those reported for Mount Eielson--poorly developed, thin, and rocky. Permafrost is present in discontinuous pockets.

The Terminus, Greenback, Magnet, and Sourdough claims have been staked end to end running across the ridge dividing Slippery Creek from its eastern fork, Iron Creek. The claims appear to parallel the contact zone between the altered limestone country rock and the granite intrusion running generally in a northeast-southwest direction (Hawley 1978b).

Rocks outcropping on the Sourdough claim also include schist and quartzite, as well as limestone. All the rocks have been extensively fractured, and they appear to be cut by poorly defined faults (USDI, GS 1932). Slippery Creek and Iron Creek are fed by small glaciers and/or permanent ice fields located just above the claims. Both forks carry sediment loads typical of other glacier-fed streams.

The eleven claims included in the Mineral Mountain group were first staked as the Merinser claims by Mr. Shannon. The claims are located near the head of the west branch of Slippery Creek, adjacent to a small glacier that originates on Peters Dome. Extensive development of stibnite (antimony) has taken place on this claim group even though production has not seemed to justify development cost (Hawley 1978b).

Rocks that outcrop on the claims include dark banded shales and siliceous sediments interbedded with igneous sills. Mineralization has occurred where the altered sedimentary country rock has been cut by fine-grained granitic dikes (USDI, GS 1932 and 1961). The stibnite ore occurs in a thin sandy layer "which is so much decomposed that its original character is obscure and it appears now as highly colored sand" (USDI, GS 1932). Some native mercury has also been found on these claims (USDI, GS 1961).

Several improvements have been constructed on these claims associated with mineral development. These improvements include a log cabin, log storage shed or shop, corrals, four adits of different depth, an 800-foot airstrip, connecting access road (3 miles in length), and a cat trail cut into the side of the mountain from the cabin to a cut face located approximately at the 5,400-foot level on claim #8. Impacts resulting from these improvements have already proved to be significant. Two major erosional gullies in excess of 5 feet deep in places have resulted from the cat trail on the steep-sided slopes; another access road to the airstrip had to be built parallel to the original because of severe rutting caused by the differential melting of the permafrost. The same effects can be expected for the new road. With removal of the thin soil and insulating vegetative cover on the airstrip, differential melting of pockets of permafrost is also likely to occur.

The Stibner group of eight claims is located on the west side of the next sharp ridge west of the Mineral Mountain group in the headwaters of Birch Creek. Mineralization has occurred along a fault zone, which cuts the altered igneous rocks similarly to those on Mineral Mountain, resulting in the formation of small discontinuous veins of stibnite. Little development has occurred on these claims.

MOUNT EIELSON CLAIMS

The Mount Eielson claims are located in an area approximately 18 miles southeast of the Wonder Lake area (see Other Located Claims Area B map). The claims lie along the north flanks of Mount Eielson between the Muldrow Glacier and the Thorofare River, directly across from the Eielson visitor center.

The 13 claims lie in the drainages of two small tributaries to the Thorofare River, Granite Creek, and Grant Creek. The Thorofare River is part of the larger Kantishna River basin. The two creeks arise in small glaciated cirques on the north side of Mount Eielson. Both streams are clear-water streams. The Thorofare River is a large braided river channel, which is fed by the melt waters of the Sunset Glacier located a few miles south east of Mount Eielson. Although the Thorofare River is a glacial river carrying a high sediment load, grayling have been observed in the river as far up as the Copper Mountain Bar (USDI, GS 1933b). Specific water quality characteristics for the area are similar to those given for the Kantishna Hills streams and rivers.

The principal rock units in the area include a thick series of interbedded limestone, calcareous shale, and graywacke, which has been cut by a large stock of granodiorite. Dikes radiating from this stock have intruded the surrounding sedimentary rocks. Ore deposition appears to be controlled by these features extending in a narrow mineralized belt for about 4 miles along the north side of the granodiorite mass (USDI, GS 1933b). Alteration taking place along the contact zones have resulted in the replacement of the original limy minerals by epidote and sulfides of zinc, lead, iron, and copper minerals (USDI, Bureau of Mines 1947).

The first claims were staked in the 1920s by Joe and Fannie Quigley. The first development worked on the claims was conducted in the summer of 1923. None of the claims have ever been extensively developed, and very little production has come out of the area (USDI, Bureau of Mines 1947). The claims are currently owned by H.R. Herning; however, they partially overlap the 20 claims filed by Kenneth O'Hara now declared null and void.

Soils in the area are those typical of rough mountainous terrain--poorly developed, thin, stony soils that have formed over bedrock and boulders. Those claims located on the gentle morainal slopes at the base of the mountain are underlain by a deeper soil belonging to the pergelic cryaquepts group, which are soils that have developed primarily in glacial till. Most of these soils are well-drained and contain permafrost at shallow depths.

Evidence of past mining activity is exhibited by a number of improvements located on the claims. These include a natural log cabin, built in the early 1950s, a 400-foot-long ditch that diverts water from Grant Creek to the cabin, and several old adits and exploration trenches. All these improvements are visible from the Eielson visitor center, which is located less than three-fourths of a mile away across the valley.

FOGGY PASS LIMESTONE CLAIMS

Located approximately 16 miles northeast of the Dunkle mine, the 14 claims lie in the West Fork of Windy Creek north of Foggy Pass (see Other Located Claims Area C map). Windy Creek is part of the Nenana River basin, which flows northward through the Alaska Range and joins the Tanana River.

The West Fork of Windy Creek, where the claims are located, is a braided stream indicative of recent glaciation. Windy Creek is a clear-water stream system, with no permanent ice fields or glaciers located at its headwaters. The drainage area for the West Fork is approximately 16 square miles. Using the same runoff factors as used in table 13, mean annual discharge for the creek would be approximately 54 cfs, and peak discharge would be approximately 826 cfs. Water quality parameters would be similar to those of Cantwell Creek (see table 14).

The claims are located over a reddish-weathering, folded, and metamorphosed sequence of sedimentary rocks composed of limestone, graywacke, argillite, and shale. The most notable unit in the sequence is a massive limestone that outcrops in the headwaters of West Fork. This limestone, which is very dense and fine-grained, is reported to be of adequate size and chemical quality for cement-rock (USDI, GS 1959).

The massive limestone may have a stratigraphic thickness of 1,300 feet and contain large reserves of cement-graded limestone. However, it is also one of the most remote reserve of cement quality material currently known in Alaska (USDI, GS 1959).

The soil covering in the area is typical of rough mountainous terrain--thin, poorly developed, and stony. Most of the soil that does exist has developed on top of bedrock, boulders, and glacial debris.

This claim group lies in an area that is particularly critical to park wildlife. The West Fork of Windy Creek is an important migration route for the McKinley caribou herd and is used extensively by the caribou when traveling between the north slope of the Alaska Range and summer calving grounds located on the southside of the range. In 1978, the study team witnessed the movement of a 25 to 30 animals up the West Fork valley and over the low pass into the Sanctuary River drainage on the north side. Any disturbance of this critical drainage by large-scale mining activity could alter migration patterns causing severe stress in the herd.

APPENDIXES

A: LEGISLATION

B: MINING REGULATIONS

C: BLM LAND WITHDRAWAL

D: INTERIOR BOARD OF LAND APPEALS

E: CLAIM STATUS AND OPERATION DATA

F: CLAIM TYPES AND OPERATIONS

A: LEGISLATION

Legislative History from the Act of 1917 (39 Stat. 938) to the Act of 1932 (47 Stat. 68)

Mining in Parks Act of 1976 (PL 94-429)

Federal Land Policy and Management Act of 1976 (PL 94-579)

Presidential Proclamation

Alaska National Interest Lands Conservation Act of 1980 (PL 96-487)

An Act To establish the Mount McKinley National Park, in the Territory of Alaska, approved February 26, 1917 (39 Stat. 938)

Mount McKinley, National Park, Alaska, established.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land in the Territory of Alaska particularly described by and included within the metes and bounds, to wit: Beginning at a point as shown on Plate III, reconnaissance map of the Mount McKinley region, Alaska, prepared in the Geological Survey, edition of nineteen hundred and eleven, said point being at the summit of a hill between two forks of the headwaters of the Toklat River, approximate latitude sixty-three degrees forty-seven minutes, longitude one hundred and fifty degrees twenty minutes; thence south six degrees twenty minutes west nineteen miles; thence south sixty-eight degrees west sixty miles; thence in a southeasterly direction approximately twenty-eight miles to the summit of Mount Russell; thence in a northeasterly direction approximately eighty-nine miles to a point twenty-five miles due south of a point due east of the point of beginning; thence due north twenty-five miles to said point; thence due west twenty-eight and one-half miles to the point of beginning, is hereby reserved and withdrawn from settlement, occupancy, or disposal under the laws of the United States, and said tract is dedicated and set apart as a public park for the benefit and enjoyment of the people, under the name of the Mount McKinley National Park. (U.S.C., title 16, sec. 347.)

Description.

Existing entries, etc., not impaired. (Amended by 46 Stat. 1043. See p. 203.)

SEC. 2. That nothing herein contained shall affect any valid existing claim, location, or entry under the land laws of the United States, whether for homestead, mineral, right of way, or any other purpose whatsoever, or shall affect the rights of any such claimant, locator, or entryman to the full use and enjoyment of his land. (U.S.C., title 16, sec. 348.)

Rights of way. Vol. 31, p. 790.

SEC. 3. That whenever consistent with the primary purposes of the park, the Act of February fifteenth, nineteen hundred and one, applicable to the location of rights of way in certain national parks and national forests for irrigation and other purposes, shall be and remain applicable to the lands included within the park. (U.S.C., title 16, sec. 349.)

Mineral land laws not affected.

SEC. 4. Nothing in this Act shall in any way modify or affect the mineral land laws now applicable to the lands in the said park. (U.S.C., title 16, sec. 350.)

Regulations of control, etc.

SEC. 5. That the said park shall be under the executive control of the Secretary of the Interior, and it shall be the duty of the said executive authority, as soon as practicable, to make and publish such rules and regulations not inconsistent with the laws of the United States as the said authority may deem necessary or proper for the care, protection, management, and improvement of the same, the said regulations being primarily aimed at the freest use of the said park for recreation purposes by the public and for the preservation of animals, birds, and fish and for the preservation of the natural curiosities and scenic beauties thereof. (U.S.C., title 16, sec. 351.)

Game refuge established

SEC. 6. That the said park shall be, and is hereby, established as a game refuge, and no person shall kill any game in said park except under an order from the Secretary of the Interior for the protection of persons or to protect or prevent the extermination of other animals or birds: *Provided*, That prospectors and miners engaged in prospecting or mining in said park may take and kill therein so much game or birds as may be needed for their actual necessities when short of food; but in no case shall animals or birds be killed in said park for sale or removal therefrom, or wantonly. (U.S.C., title 16, sec. 352.)

Proviso.

Killing for food permitted. (Repealed by 45 Stat. 622. See p. 202.)

Leases for accommodations for visitors (Amended by 39 Stat. 535, as amended. See pp. 9–12.)

SEC. 7. That the said Secretary of the Interior may, in his discretion, execute leases to parcels of ground not exceeding twenty acres in extent for periods not to exceed twenty years whenever such ground is necessary for the erection of establishments for the accommodation of visitors; may grant such other necessary privileges and concessions as he deems wise for the accommodation of visitors; and may likewise arrange for the removal of such mature or dead or down timber as he may deem necessary and advisable for the protection and improvement of the park: *Provided*, That no appropriation for the maintenance of said park in excess of $10,000 annually shall be made unless the same shall have first been expressly authorized by law. (U.S.C., title 16, sec. 353.)

Proviso. Limit on appropriations. (Repealed by 45 Stat. 622. See p. 202.)

Punishment for violations.

SEC. 8. That any person found guilty of violating any of the provisions of this Act shall be deemed guilty of a misdemeanor, and shall be subjected to a fine of not more than $500 or imprisonment not exceeding six months, or both, and be adjudged to pay all costs of the proceedings. (U.S.C., title 16, sec. 354.)

An Act To repeal the proviso of section 6 and the last proviso of section 7 of "An Act to establish the Mount McKinley National Park in the Territory of Alaska," approved February 26, 1917, approved May 21, 1928 (45 Stat. 622)

Mount McKinley National Park, Alaska

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the last proviso of section 7 of an Act entitled "An Act to establish the Mount McKinley National Park, in the Territory of Alaska," approved February 26, 1917, which is in the words and figures following: "*Provided*, That no appropriation for the maintenance of said park in excess of $10,000 annually shall be made, unless the same shall have first been expressly authorized by law," be, and the same is hereby, repealed.

Limit on appropriations for, repealed.

Vol. 39, p. 939, repealed. See p. 201.

Provision allowing killing of game for food in, repealed.

SEC. 2. That the proviso of section 6 of an Act entitled "An Act to establish the Mount McKinley National Park, in the Territory of Alaska," approved February 26, 1917, which is in the words and figures following: "*Provided*, That prospectors and miners engaged in prospecting or mining in said park may take and kill therein so much game or birds as may be needed for their actual necessities when short of food; but in no case shall animals or birds be killed in said park for sale or removal therefrom, or wantonly," be, and the same is hereby repealed. (U.S.C., title 16, 6th supp., sec. 352, 353.)

Vol. 39, p. 939, repealed. See p. 201.

Joint Resolution To provide for the naming of a prominent mountain or peak within the boundaries of Mount McKinley National Park, Alaska, in honor of Carl Ben Eielson, approved June 14, 1930 (46 Stat. 588)

Mount Eielson, Alaska.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That a mountain or peak, unofficially known as Copper Mountain, located at the headwaters of the Mount McKinley River, lying in a northeasterly direction from Mount McKinley in the Mount McKinley National Park, Alaska, is hereby permanently named Mount Eielson in honor of the pioneer work in aviation performed in Alaska and the North by Carl Ben Eielson.

Mountain in Mount McKinley National Park named in honor of Carl Ben Eielson.

Excerpt from "An Act To provide for uniform administration of the national parks by the United States Department of the Interior, and for other purposes," approved January 26, 1931 (46 Stat. 1043)

Mount McKinley, Alaska. Regulations for surface use of mineral lands within.

(Amends sec. 2, Vol. 39, p. 938. See p. 200.)

Registration of miners, etc.

Proviso.

Entries.

SEC. 2. That hereafter the Secretary of the Interior shall have authority to prescribe regulations for the surface use of any mineral land locations already made or that may hereafter be made within the boundaries of Mount McKinley National Park, in the Territory of Alaska, and he may require registration of all prospectors and miners who enter the park: *Provided*, That no resident of the United States who is qualified under the mining laws of the United States applicable to Alaska shall be denied entrance to the park for the purpose of prospecting or mining. (U.S.C., 6th supp., title 16, sec. 350a.)

An Act To add certain lands to Mount McKinley National Park, Alaska, approved January 30, 1922 (42 Stat. 359)

Mount McKinley National Park, Alaska. Lands added to.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the south, east, and north boundaries of the Mount McKinley National Park are hereby changed as follows: Beginning at the summit of Mount Russell, which is the present southwest corner of the park; thence in a northeasterly direction one hundred miles, more or less, to a point on the one hundred and forty-ninth meridian, which is twenty-five miles south of a point due east of the upper northwest corner of the park; thence north along the one hundred and forty-ninth meridian twenty-five miles; thence west forty miles, more or less, to the present upper northwest corner of Mount McKinley National Park. And all these lands lying between the above-described boundary and the present south, east, and north boundaries are hereby reserved and withdrawn from settlement, occupancy, or disposal, and under the laws of the United States said lands are hereby made a part of and included in the Mount McKinley National Park; and all the provisions of the Act to establish Mount McKinley National Park, Alaska, and for other purposes, approved February 26, 1917, are hereby made applicable to and extended over lands hereby added to the park. (U.S.C., title 16, sec. 347.)

Vol. 39, p. 938. See p. 200.

An Act To revise the boundary of the Mount McKinley National Park, in the Territory of Alaska, and for other purposes, approved March 19, 1932 (47 Stat. 68)

Mount McKinley National Park, Alaska. Boundary Changed. Vol. 39, p. 938. See p. 200.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the boundary of the Mount McKinley National Park is hereby changed so as to read as follows:

Description.

Beginning at the summit of a hill between the Toklat River and the Clearwater Fork of that river at an approximate latitude of sixty-three degrees forty-seven minutes forty-five seconds, longitude one hundred and fifty degrees seventeen minutes forty seconds, which is intended to be same point of beginning of the boundary description as contained in the Act of February 26, 1917; thence southerly along the summit of the ridge between Toklat River and the Clearwater Fork of said river and across Stony Creek at its confluence with the said Clearwater Fork to the summit of the ridge between Stony Creek and the Clearwater Fork of the Toklat River; thence following the summit of said ridge and the summit of the ridge between the tributaries of said Clearwater Fork, the headwaters of the North Fork of Moose Creek and Boundary Creek to the intersection with the present boundary of Mount McKinley National Park at approximate latitude of sixty-three degrees thirty-two minutes forty-five seconds, longitude one hundred and fifty degrees twenty-four minutes forty-five seconds; thence southwesterly fourteen and three-tenths miles, more or less, to a point one-half mile north of Wonder Lake on the stream flowing out of Wonder Lake into Moose Creek; thence south sixty-eight degrees west forty-three and five-tenths miles, more or less, to the point of intersection with the southwest boundary extended; thence southeasterly thirty-three miles, more or less, to the summit of Mount Russell; thence in a northeasterly direction following the present south boundary approximately eighty-eight miles to Windy Creek at approximate latitude sixty-three degrees twenty-five minutes forty-five seconds, longitude one hundred and forty-nine degrees one minute thirty-five seconds; thence easterly following the north bank of Windy Creek to the western boundary of The Alaska Railroad right of way; thence northerly following the west boundary of The Alaska Railroad right of way to a point due east of the present north boundary of the park as extended due east; thence due west following the present north boundary of the park to the summit of the ridge between Toklat River and the Clearwater Fork of said river; thence southerly following

the summit of said ridge to the place of beginning: *Provided, however*, That such isolated tracts of land lying east of The Alaska Railroad right of way and the west bank of the Nenana River between the north bank of Windy Creek and the north park boundary as extended eastward are also included in said park: *Provided further*, That nothing herein contained shall affect any valid existing claim, location, or entry under the land laws of the United States, whether for homestead, mineral, right of way, or any other purpose whatsoever, or shall affect the rights of any such claimant, locator, or entryman to the full use and enjoyment of his land. (U.S.C., 6th supp., title 16, sec. 355.)

Provisos
Isolated tracts of land included.

Valid existing claims, etc., not affected.

SEC. 2. That the provisions of the Act of August 25, 1916, entitled "An Act to establish a national park service, and for other purposes," and the Act of February 26, 1917, entitled "An Act to establish the Mount McKinley National Park, in the Territory of Alaska," together with all Acts supplementary to and amendatory of said Acts are made applicable to and extended over the lands hereby added to the park. (U.S.C., 6th supp., title 16, sec. 355a.)

National park provisions made applicable.
Vol. 39, p. 938; Vol. 39, p. 535.
See pp. 200 and 9.

PUBLIC LAW 94-429
94TH CONGRESS, S. 2371
SEPTEMBER 28, 1976

An Act

To provide for the regulation of mining activity within, and to repeal the application of mining laws to, areas of the National Park System, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Congress finds and declares that—

National Park System. Mining activity, regulation. 16 USC 1901.

(a) the level of technology of mineral exploration and development has changed radically in recent years and continued application of the mining laws of the United States to those areas of the National Park System to which it applies, conflicts with the purposes for which they were established; and

(b) all mining operations in areas of the National Park System should be conducted so as to prevent or minimize damage to the environment and other resource values, and, in certain areas of the National Park System, surface disturbance from mineral development should be temporarily halted while Congress determines whether or not to acquire any valid mineral rights which may exist in such areas.

16 USC 1902.

SEC. 2. In order to preserve for the benefit of present and future generations the pristine beauty of areas of the National Park System, and to further the purposes of the Act of August 25, 1916, as amended (16 U.S.C. 1) and the individual organic Acts for the various areas of the National Park System, all activities resulting from the exercise of valid existing mineral rights on patented or unpatented mining claims within any area of the National Park System shall be subject to such regulations prescribed by the Secretary of the Interior as he deems necessary or desirable for the preservation and management of those areas.

SEC. 3. Subject to valid existing rights, the following Acts are amended or repealed as indicated in order to close these areas to entry and location under the Mining Law of 1872:

(a) the first proviso of section 3 of the Act of May 22, 1902 (32 Stat. 203; 16 U.S.C. 123), relating to Crater Lake National Park, is amended by deleting the words "and to the location of mining claims and the working of same";

Repeals.

(b) section 4 of the Act of February 26, 1917 (39 Stat. 938; 16 U.S.C. 350), relating to Mount McKinley National Park, is hereby repealed;

(c) section 2 of the Act of January 26, 1931 (46 Stat. 1043; 16 U.S.C. 350a), relating to Mount McKinley National Park, is hereby repealed;

(d) the Act of June 13, 1933 (48 Stat. 139; 16 U.S.C. 447), relating to Death Valley National Monument, is hereby repealed;

(e) the Act of June 22, 1936 (49 Stat. 1817), relating to Glacier Bay National Monument, is hereby repealed;

(f) section 3 of the Act of August 18, 1941 (55 Stat. 631; 16 U.S.C. 450r-2), relating to Coronado National Memorial is amended by replacing the semicolon in subsection (a) with a period and deleting the prefix "(a)", the word "and" immediately preceding subsection (b), and by repealing subsection (b); and

Repeal.

(g) The Act of October 27, 1941 (55 Stat. 745; 16 U.S.C. 450z), relating to Organ Pipe Cactus National Monument, is hereby repealed.

Certain mining operations, temporary cessation.
16 USC 1903.

SEC. 4. For a period of four years after the date of enactment of this Act, holders of valid mineral rights located within the boundaries of Death Valley National Monument, Mount McKinley National Park, and Organ Pipe Cactus National Monument shall not disturb for purposes of mineral exploration or development the surface of any lands which had not been significantly disturbed for purposes of mineral extraction prior to February 29, 1976: *Provided*, That if the Secretary finds that enlargement of the existing excavation of an individual mining operation is necessary in order to make feasible continued production therefrom at an annual rate not to exceed the average annual production level of said operation for the three calendar years 1973, 1974, and 1975, the surface of lands contiguous to the existing excavation may be disturbed to the minimum extent necessary to effect such enlargement, subject to such regulations as may be issued by the Secretary under section 2 of this Act. For purposes of this section, each separate mining excavation shall be treated as an individual mining operation.

16 USC 1904.

SEC. 5. The requirements for annual expenditures on mining claims imposed by Revised Statute 2324 (30 U.S.C. 28) shall not apply to any claim subject to section 4 of this Act during the time such claim is subject to such section.

Certain unpatented mining claims, recommendations for acquisition.
16 USC 1905.

SEC. 6. Within two years after the date of enactment of this Act, the Secretary of the Interior shall determine the validity of any unpatented mining claims within Glacier Bay National Monument, Death Valley and Organ Pipe Cactus National Monuments and Mount McKinley National Park and submit to the Congress recommendations as to whether any valid or patented claims should be acquired by the United States, including the estimated acquisition costs of such claims, and a discussion of the environmental consequences of the extraction of minerals from these lands. The Secretary shall also study and within two years submit to Congress his recommendations for modifications or adjustments to the existing boundaries of the Death Valley National Monument and the Glacier Bay National Monument to exclude significant mineral deposits and to decrease possible acquisition costs.

Study.
Recommendations, submittal to Congress.

Recommendations, submittal to Congress.
16 USC 1906.

SEC. 7. Within four years after the date of enactment of this Act, the Secretary of the Interior shall determine the validity of any unpatented mining claims within Crater Lake National Park, Coronado National Memorial, and Glacier Bay National Monument, and submit to the Congress recommendations as to whether any valid or patented claims should be acquired by the United States.

Mining claims, recordation.
16 USC 1907.

SEC. 8. All mining claims under the Mining Law of 1872, as amended and supplemented (30 U.S.C. chapters 2, 12A, and 16 and sections 161 and 162) which lie within the boundaries of units of the National Park System shall be recorded with the Secretary of the Interior within one year after the effective date of this Act. Any mining claim not so recorded shall be conclusively presumed to be abandoned and shall be void. Such recordation will not render valid any claim which was not valid on the effective date of this Act, or which becomes invalid thereafter. Within thirty days following the date of enactment of this Act, the Secretary shall publish notice of the requirement for such recordation in the Federal Register. He shall also publish similar notices in newspapers of general circulation in the areas adjacent to those units of the National Park System listed in section 3 of this Act.

Notice, publication in Federal Register.

Landmarks.
16 USC 1908.

SEC. 9. (a) Whenever the Secretary of the Interior finds on his own motion or upon being notified in writing by an appropriate scientific,

historical, or archeological authority, that a district, site, building, structure, or object which has been found to be nationally significant in illustrating natural history or the history of the United States and which has been designated as a natural or historical landmark may be irreparably lost or destroyed in whole or in part by any surface mining activity, including exploration for or removal or production of minerals or materials, he shall notify the person conducting such activity and submit a report thereon, including the basis for his finding that such activity may cause irreparable loss or destruction of a national landmark, to the Advisory Council on Historic Preservation, with a request for advice of the Council as to alternative measures that may be taken by the United States to mitigate or abate such activity.

Report to Advisory Council on Historic Preservation.

(b) The Council shall within two years from the effective date of this section submit to the Congress a report on the actual or potential effects of surface mining activities on natural and historical landmarks and shall include with its report its recommendations for such legislation as may be necessary and appropriate to protect natural and historical landmarks from activities, including surface mining activities, which may have an adverse impact on such landmarks.

Report to Congress.

Legislative recommendations.

Sec. 10. If any provision of this Act is declared to be invalid, such declaration shall not affect the validity of any other provision hereof.

Severability. 16 USC 1909.

Sec. 11. The holder of any patented or unpatented mining claim subject to this Act who believes he has suffered a loss by operation of this Act, or by orders or regulations issued pursuant thereto, may bring an action in a United States district court to recover just compensation, which shall be awarded if the court finds that such loss constitutes a taking of property compensable under the Constitution. The court shall expedite its consideration of any claim brought pursuant to this section.

Civil actions. 16 USC 1910.

Sec. 12. Nothing in this Act shall be construed to limit the authority of the Secretary to acquire lands and interests in lands within the boundaries of any unit of the National Park System. The Secretary is to give prompt and careful consideration to any offer made by the owner of any valid right or other property within the areas named in section 6 of this Act to sell such right or other property, if such owner notifies the Secretary that the continued ownership of such right or property is causing, or would result in, undue hardship.

16 USC 1911.

SUNSHINE IN GOVERNMENT

Sec. 13. (a) Each officer or employee of the Secretary of the Interior who—

(1) performs any function or duty under this Act, or any Acts amended by this Act concerning the regulation of mining within the National Park System; and

(2) has any known financial interest (A) in any person subject to such Acts, or (B) in any person who holds a mining claim within the boundaries of units of the National Park System;

shall, beginning on February 1, 1977, annually file with the Secretary a written statement concerning all such interests held by such officer or employee during the preceding calendar year. Such statement shall be available to the public.

Interior Department employees, financial disclosure. 16 USC 1912.

(b) The Secretary shall—

(1) act within ninety days after the date of enactment of this Act—

(A) to define the term "known financial interest" for purposes of subsection (a) of this section; and

(B) to establish the methods by which the requirement to file written statements specified in subsection (a) of this section will be monitored and enforced, including appropriate provisions for the filing by such officers and employees of such statements and the review by the Secretary of such statements; and

Report to Congress.

(2) report to the Congress on June 1 of each calendar year with respect to such disclosures and the actions taken in regard thereto during the preceding calendar year.

Possible exemptions.

(c) In the rules prescribed in subsection (b) of this section, the Secretary may identify specific positions within such agency which are of a nonregulatory or nonpolicymaking nature and provide that officers or employees occupying such positions shall be exempt from the requirements of this section.

Violation, penalty.

(d) Any officer or employee who is subject to, and knowingly violates, this section or any regulation issued thereunder, shall be fined not more than $2,500 or imprisoned not more than one year, or both.

Approved September 28, 1976.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 94-1428 (Comm. on Interior and Insular Affairs).
SENATE REPORT No. 94-567 (Comm. on Interior and Insular Affairs).
CONGRESSIONAL RECORD, Vol. 122 (1976):
Feb. 3, 4, considered and passed Senate.
Sept. 14, considered and passed House, amended.
Sept. 17, Senate concurred in House amendments.

RECORDATION OF MINING CLAIMS AND ABANDONMENT

SEC. 314. (a) The owner of an unpatented lode or placer mining claim located prior to the date of this Act shall, within the three-year period following the date of the approval of this Act and prior to December 31 of each year thereafter, file the instruments required by paragraphs (1) and (2) of this subsection. The owner of an unpatented lode or placer mining claim located after the date of this Act shall, prior to December 31 of each year following the calendar year in which the said claim was located, file the instruments required by paragraphs (1) and (2) of this subsection: 43 USC 1744

(1) File for record in the office where the location notice or certificate is recorded either a notice of intention to hold the mining claim (including but not limited to such notices as are provided by law to be filed when there has been a suspension or deferment of annual assessment work), an affidavit of assessment work performed thereon, on a detailed report provided by the Act of September 2, 1958 (72 Stat. 1701; 30 U.S.C. 28–1), relating thereto.

(2) File in the office of the Bureau designated by the Secretary a copy of the official record of the instrument filed or recorded pursuant to paragraph (1) of this subsection, including a description of the location of the mining claim sufficient to locate the claimed lands on the ground.

(b) The owner of an unpatented lode or placer mining claim or mill or tunnel site located prior to the date of approval of this Act shall, within the three-year period following the date of approval of this Act, file in the office of the Bureau designated by the Secretary a copy of the official record of the notice of location or certificate of location, including a description of the location of the mining claim or mill or tunnel site sufficient to locate the claimed lands on the ground. The owner of an unpatented lode or placer mining claim or mill or tunnel site located after the date of approval of this Act shall, within ninety days after the date of location of such claim, file in the office of the Bureau designated by the Secretary a copy of the official record of the notice of location or certificate of location, including a description of the location of the mining claim or mill or tunnel site sufficient to locate the claimed lands on the ground.

(c) The failure to file such instruments as required by subsections (a) and (b) shall be deemed conclusively to constitute an abandonment of the mining claim or mill or tunnel site by the owner; but it shall not be considered a failure to file if the instrument is defective or not timely filed for record under other Federal laws permitting filing or recording thereof, or if the instrument is filed for record by or on behalf of some but not all of the owners of the mining claim or mill or tunnel site.

(d) Such recordation or application by itself shall not render valid any claim which would not be otherwise valid under applicable law. Nothing in this section shall be construed as a waiver of the assessment and other requirements of such law.

[3195-01-M] PRESIDENTIAL PROCLAMATION

Proclamation 4616 December 1, 1978

Denali National Monument

By the President of the United States of America

A Proclamation

In the creation of Mount McKinley National Park the southern half of the mountain's massif was inadvertently excluded from the Park. The creation of Denali National Monument will bring within the protection of the National Park System the entirety of this, the highest peak on the North American continent. This face markedly differs from the north side for it has a more gradual rise and a significant system of glaciers. It is also the approach route used historically by those seeking to scale Mount McKinley.

Certain of the glaciers on the south face are among the largest in Alaska, reaching up to 45 miles in length. Yet, only the very uppermost parts are presently within the National Park. Their protection is enhanced by the creation of this monument.

In the southwest area of the monument hereby created are the geologically unique Cathedral Spires. From this granitic pluton mass radiate eight major glacial troughs exhibiting cirques and headwalls rising 5,000 feet from their bases.

The monument also protects significant habitat for the McKinley caribou herd which has provided a basis for scientific study since the early twentieth century. Associated with the herd in this ecosystem are other scientifically important mammals such as grizzly bear, wolf and wolverine.

The Toklat River region includes a unique area of warm springs which attracts an unusual late run of Chum salmon. This run provides an important late fall food source for the grizzly bear population of the area which, because of its accessibility, has been the subject of many scientific studies.

The land withdrawn and reserved by this Proclamation for the protection of the geological, biological and other phenomena enumerated above supports now, as it has in the past, the unique subsistence culture of the local residents. The continued existence of this culture, which depends on subsistence hunting, and its availability for study, enhance the historic and scientific values of the natural objects protected herein because of the ongoing interaction of the subsistence culture with those objects. Accordingly, the opportunity for the local residents to engage in subsistence hunting is a value to be protected and will continue under the administration of the monument.

Section 2 of the Act of June 8, 1906 (34 Stat. 225, 16 U.S.C. 431), authorizes the President, in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and to reserve as part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected.

NOW, THEREFORE, I, JIMMY CARTER, President of the United States of America, by the authority vested in me by Section 2 of the Act of June 8, 1906 (34 Stat. 225, 16 U.S.C. 431), do proclaim that there are hereby set apart and reserved as the Denali National Monument all lands, including

submerged lands, and waters owned or controlled by the United States within the boundaries of the area depicted as the Denali National Monument on the map numbered DENA-90,007 attached to and forming a part of this Proclamation. The area reserved consists of approximately 3,890,000 acres, and is the smallest area compatible with the proper care and management of the objects to be protected. Lands, including submerged lands, and waters within these boundaries not owned by the United States shall be reserved as a part of the monument upon acquistion of title thereto by the United States.

All lands, including submerged lands, and all waters within the boundaries of this monument are hereby appropriated and withdrawn from entry, location, selection, sale or other disposition under the public land laws, other than exchange. There is also reserved all water necessary to the proper care and management of those objects protected by this monument and for the proper administration of the monument in accordance with applicable laws.

The establishment of this monument is subject to valid existing rights, including, but not limited to, valid selections under the Alaska Native Claims Settlement Act, as amended (43 U.S.C. 1601 *et seq.*), and under or confirmed in the Alaska Statehood Act (48 U.S.C. Note preceding Section 21).

Nothing in this Proclamation shall be deemed to revoke any existing withdrawal, reservation or appropriation, including any withdrawal under Section 17(d)(1) of the Alaska Native Claims Settlement Act (43 U.S.C. 1616(d)(1)); however, the national monument shall be the dominant reservation. Nothing in this Proclamation is intended to modify or revoke the terms of the Memorandum of Understanding dated September 1, 1972, entered into between the State of Alaska and the United States as part of the negotiated settlement of *Alaska v. Morton*, Civil No. A-48-72 (D. Alaska, Complaint filed April 10, 1972).

The Secretary of the Interior shall promulgate such regulations as are appropriate, including regulation of the opportunity to engage in a subsistence lifestyle by local residents. The Secretary may close the national monument, or any portion thereof, to subsistence uses of a particular fish, wildlife or plant population if necessary for reasons of public safety, administration, or to ensure the natural stability or continued viability of such population.

Warning is hereby given to all unauthorized persons not to appropriate, injure, destroy or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

IN WITNESS WHEREOF, I have hereunto set my hand this 1st day of December, in the year of our Lord nineteen hundred and seventy-eight, and of the Independence of the United States of America the two hundred and third.

Jimmy Carter

ADDITIONS TO EXISTING AREAS

16 USC 410hh-1.

SEC. 202. The following units of the National Park System are hereby expanded:

Glacier Bay National Monument

(1) Glacier Bay National Monument, by the addition of an area containing approximately five hundred and twenty-three thousand acres of Federal land. Approximately fifty-seven thousand acres of additional public land is hereby established as Glacier Bay National Preserve, both as generally depicted on map numbered GLBA-90,004, and dated October 1978; furthermore, the monument is hereby redesignated as "Glacier Bay National Park". The monument addition and preserve shall be managed for the following purposes, among others: To protect a segment of the Alsek River, fish and wildlife habitats and migration routes, and a portion of the Fairweather Range including the northwest slope of Mount Fairweather. Lands, waters, and interests therein within the boundary of the park and preserve which were within the boundary of any national forest are hereby excluded from such national forest and the boundary of such national forest is hereby revised accordingly.

Katmai National Monument

(2) Katmai National Monument, by the addition of an area containing approximately one million and thirty-seven thousand acres of public land. Approximately three hundred and eight thousand acres of additional public land is hereby established as Katmai National Preserve, both as generally depicted on map numbered 90,007, and dated July 1980; furthermore, the monument is hereby redesignated as "Katmai National Park". The monument addition and preserve shall be managed for the following purposes, among others: To protect habitats for, and populations of, fish and wildlife including, but not limited to, high concentrations of brown/grizzly bears and their denning areas; to maintain unimpaired the water habitat for significant salmon populations; and to protect scenic, geological, cultural and recreational features.

Mount McKinley National Park.

(3)(a) Mount McKinley National Park, by the addition of an area containing approximately two million four hundred and twenty-six thousand acres of public land, and approximately one million three hundred and thirty thousand acres of additional public land is hereby established as Denali National Preserve, both as generally depicted on map numbered DENA-90,007, and dated July 1980 and the whole is hereby redesignated as Denali National Park and Preserve. The park additions and preserve shall be managed for the following purposes, among others: To protect and interpret the entire mountain massif, and additional scenic mountain peaks and formations; and to protect habitat for, and populations of fish and wildlife including, but not limited to, brown/grizzly bears, moose, caribou, Dall sheep, wolves, swans and other waterfowl; and to provide continued opportunities, including reasonable access, for mountain climbing, mountaineering and other wildnerness recreational activities. That portion of the Alaska Railroad right-of-way within the park shall be subject to such laws and regulations applicable to the protection of fish and wildlife and other park values as the Secretary, with the concurrence of the Secretary of Transportation, may determine. Subsistence uses by local residents shall be permitted in the additions to the park where such uses are traditional in accordance with the provisions in title VIII.

Post, p. 2422.

Study.
Report to Congress

(b) The Alaska Land Use Council shall, in cooperation with the Secretary, conduct a study of the Kantishna Hills and Dunkle Mine areas of the park as generally depicted on a map entitled "Kantishna Hills/Dunkle Mine Study Area", dated October 1979, and report thereon to the Congress not later than three years from the date of enactment of this Act. The study and report shall evaluate the resources of the area, including but not limited to, fish and wildlife, public recreation opportunities, wilderness potential, historic resources, and minerals, and shall include those recommendations respecting resources and other relevant matters which the Council determines are necessary. In conjunction with the study required by this section, the Council, in consultation with the Secretary, shall compile information relating to the mineral potential of the areas encompassed within the study, the estimated cost of acquiring mining properties, and the environmental consequences of further mineral development.

Land acquisition, notice and hearing.

(c) During the period of the study, no acquisition of privately owned land shall be permitted within the study area, except with the consent of the owner, and the holders of valid mining claims shall be permitted to operate on their claims, subject to reasonable regulations designed to minimize damage to the environment: *Provided, however,* That such lands or claims shall be subject to acquisition without the consent of the owner or holder if the Secretary determines, after notice and opportunity for hearing, if such notice and hearing are not otherwise required by applicable law or regulation, that activities on such lands or claims will significantly impair important scenic, wildlife, or recreational values of the public lands which are the subject of the study.

WITHDRAWAL FROM MINING

16 USC 410hh-5.

SEC. 206. Subject to valid existing rights, and except as explicitly provided otherwise in this Act, the Federal lands within units of the National Park System established or expanded by or pursuant to this Act are hereby withdrawn from all forms of appropriation or disposal under the public land laws, including location, entry, and patent under the United States mining laws, disposition under the mineral leasing laws, and from future selections by the State of Alaska and Native Corporations.

B: MINING REGULATIONS (43 CFR subpart 3833, 36 CFR 9, 36 CFR 9A, 36 CFR 13.15)

Subpart 3833—Recordation of Mining Claims and Filing Proof of Annual Assessment Work or Notice of Intention to Hold Mining Claims, Mill or Tunnel Sites

SOURCE: 42 FR 5300, Jan. 27, 1977, unless otherwise noted.

§ 3833.0-1 Purpose.

One purpose of these regulations is to establish procedures for the recordation in the proper BLM office of unpatented mining claims, mill sites, or tunnel sites on Federal lands, and for the filing in the same office of evidence of performance of annual assessment work or of a notice of intention to hold an unpatented mining claim. Another purpose is to notify the proper BLM office of the transfer of an interest in unpatented mining claims, mill sites or tunnel sites.

§ 3833.0-2 Objectives.

An objective of these regulations is to determine the number and location of unpatented mining claims, mill sites, or tunnel sites located on Federal lands to assist in the management of those lands and the mineral resources therein. Other objectives are to remove the cloud on the title to these lands because they are subject to mining claims that may have been abandoned and to keep the BLM abreast of transfers of interest in unpatented mining claims, mill sites or tunnel sites. These regulations are not intended to supersede or replace existing recording requirements under State law, except when specifically changed by the provisions of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701), and are not intended to make the BLM office the official recording office for all ancillary documents (wills, liens, judgments, etc.) involving an unpatented mining claim, mill site or tunnel site.

§ 3833.0-3 Authority.

(a) Subsections (a) and (b) of section 314 of the Act require the recordation of unpatented mining claims and the filing of information concerning annual assessment work performed or a notice of intention to hold such a claim in the proper BLM office within specified time periods. Subsection (c) sets forth the consequences of the failure to file such information or documents within the time limits prescribed.

(b) Section 8 of the Act of September 28, 1976 (16 U.S.C. 1901-1912), requires that all unpatented mining claims within the boundaries of the National Park System shall be recorded with the Secretary within one year after the date of the Act and provides penalties for failure to record.

(c) Section 2319 of the Revised Statutes (30 U.S.C. 22) provides that the exploration, location, and purchase of valuable mineral deposits shall be "under regulations prescribed by law," and section 2478 of the Revised Statutes, as amended (43 U.S.C. 1201), provides that those regulations will be issued by the Secretary.

(d) The Secretary has general responsibility and authority concerning public lands under 43 U.S.C. 2 and section 310 of the Act.

(e) The Act of August 31, 1951 (31 U.S.C. 483a) and section 304(a) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1734).

[42 FR 5300, Jan. 27, 1977, as amended at 44 FR 9722, Feb. 14, 1979]

§ 3833.0-5 Definitions.

As used in this subpart:

(a) "The Act" means the Federal Land Policy and Management Act of 1976 (Pub. L. 94-579; 90 Stat. 2743).

(b) "Unpatented mining claim" means a lode mining claim or a placer mining claim located under the General Mining Law of 1872, as amended (30 U.S.C. 21-54), for which a patent under 30 U.S.C. 29 and 34 CFR Part 3860 has not been issued.

(c) "Mill site" means any land located under 30 U.S.C. 42.

(d) "Tunnel site" means a tunnel located pursuant to 30 U.S.C. 27.

(e) "Owner" means the person who is the holder of the right to sell or transfer all or any part of the unpatented mining claim, mill or tunnel

site. The owner shall be identified in the instruments required by these regulations by a notation on those instruments.

(f) "Federal lands" means any lands or interest in lands owned by the United States, except lands within units of the National Park System, which are subject to location under the General Mining Law of 1872, supra, including, but not limited to, those lands within forest reservations in the National Forest System and wildlife refuges in the National Wildlife Refuge System.

(g) "Proper BLM office" means the Bureau of Land Management office listed in § 1821.2-1(d) of this title as having jurisdiction over the area in which the claims or sites are located.

(h) "Date of location" or "located" means the date determined by State law in the local jurisdiction in which the unpatented mining claim, mill or tunnel site is situated.

(i) "Copy of the official record of the notice of certificate of location" means a legible reproduction or duplicate, except microfilm, of the original instrument of recordation of an unpatented mining claim, mill or tunnel site which was or will be filed in the local jurisdiction where the claim or site is located or other evidence, acceptable to the proper BLM office, of such instrument of recordation. It also includes an exact reproduction, duplicate or other acceptable evidence, except microfilm, of an amended instrument which may change or alter the description of the claim or site.

[42 FR 5300, Jan. 27, 1977, as amended at 44 FR 9722, Feb. 14, 1979]

§ 3833.1 Recordation of mining claims.

§ 3833.1-1 Manner of recordation—National Park System units established before September 28, 1976.

Any unpatented mining claim, mill site or tunnel site in any National Park System unit in existence on September 28, 1976, which was not recorded on or before September 28, 1977, in accordance with the Notice of October 20, 1976 [41 FR 46357] or 36 CFR 9.5 is, pursuant to section 8 of the Act of September 28, 1976 (16 U.S.C. 1907), conclusively presumed to be abandoned and shall be void.

[44 FR 20429, Apr. 5, 1979]

§ 3833.1-2 Manner of recordation—Federal lands.

(a) The owner of an unpatented mining claim, mill site or tunnel site located on or before October 21, 1976, on Federal lands, excluding lands within units of the National Park System established before September 28, 1976, but including lands within a national monument administered by the United States and Fish and Wildlife Service or the United States Forest Service, shall file (file shall mean being received and date stamped by the proper BLM Office) on or before October 22, 1979, in the proper BLM Office, a copy of the official record of the notice or certificate of location of the claim or site filed under state law. If state law does not require the recordation of a notice or certificate of location containing the information in paragraph (c) of this section shall be filed. Where the claim so recorded lies within a unit of the National Park System, a copy of the documents filed shall be provided to the Superintendent of the appropriate unit by the Bureau of Land Management.

(b) The owner of an unpatented mining claim, mill site, or tunnel site located after October 21, 1976, on Federal land shall file (file shall mean being received and date stamped by the proper BLM office), within 90 days after the date of location of that claim in the proper BLM office a copy of the official record of the notice or certificate of location of the claim or site filed under state law or, if the state law does not require the recordation of a notice or certificate of location of the claim or site, a certificate of location containing the information in paragraph (c) of this section. Where the claim so recorded lies within a unit of the National Park System, a copy of the documents filed shall be provided to the Superintendent of the appropriate unit by the Bureau of Land Management.

(c) The copy of the notice or certificates filed in accordance with para-

graphs (a) and (b) of this section shall be supplemented by the following additional information unless it is included in the copy:

(1) The name or number of the claim or site, or both, if the claim or site has both;

(2) The name and current mailing address, if known, of the owner or owners of the claim or site;

(3) The type of claim or site;

(4) The date of location;

(5) For all claims or sites located on surveyed or unsurveyed lands, a description shall be furnished. This description shall recite, to the extent possible, the section(s), the approximate location of all or any part of the claim or site to within a 160 acre quadrant of the section (quarter section) or sections, if more than one is involved. In addition, there must be furnished the township, range, meridian and State obtained from an official survey plat or other U.S. Government map showing either the surveyed or protracted U.S. Government grid, whichever is applicable;

(6) For all claims or sites located on surveyed or unsurveyed land, either a topographic map published by the U.S. Geological Survey on which there shall be depicted the location of the claim or site, or a narrative or sketch describing the claim or site with reference by appropriate tie to some topographic, hydrographic or man-made feature. Such map, narrative description or sketch shall set forth the boundaries and positions of the individual claim or site with such accuracy as will permit the authorized officer of the agency administering the lands or the mineral interests in such lands to identify and locate the claim on the ground. More than one claim or site may be shown on a single map or described in a single narrative or sketch if they are located in the same general area, so long as the individual claims or sites are clearly identified; and

(7) In place of the requirements of paragraphs (c)(5) and (6) of this section, an approved mineral survey may be supplied.

(8) Nothing in the requirements for a map and description found in this section shall require the owner of a claim or site to employ a professional surveyor or engineer.

(d) Each claim or site filed shall be accompanied by a one time $5 service fee which is not returnable. A notice or certificate of location shall not be accepted if it is not accompanied by the service fee and shall be returned to the owner.

[42 FR 5300, Jan 27, 1977, as amended at 44 FR 9722, Feb. 14, 1979; 44 FR 20430, Apr. 5, 1979]

§ 3833.1-3 When recordation not required.

If the owner of an unpatented mining claim or mill site had on file in the proper BLM office on October 21, 1976, an application for a mineral patent which contains the documents and information required in § 3833.1-2 of this title, except if the application is for a patent for a placer claim which is located on surveyed lands and conforms to legal subdivisions, such applicant need not comply with the requirements of § 3833.1-2(c)(6) of this title, or if the owner of an unpatented mining claim or mill site located on or before October 21, 1976, files in the proper BLM office an application for a mineral patent, as described above, on or before October 22, 1979, the filing of the application shall be deemed full compliance with the recordation requirements of section 314(b) of the Act and the owner of that claim or site shall be exempt from the filing requirements of § 3833.1. For purposes of complying with the requirement of § 3833.2-1(a) of this title, upon notification to the claimant, the date of recordation in the proper BLM office shall be October 21, 1976, for claims and sites included in mineral patent applications on file as of that date. The date on which the application was actually filed shall be the date of recordation for all other claims and sites.

[44 FR 9722, Feb. 14, 1979]

§ 3833.2 Evidence of assessment work-notice of intention to hold a claim or site.

[44 FR 9723, Feb. 14, 1979]

§ 3833.2-1 When filing required.

(a) The owner of an unpatented mining claim located on Federal lands on or before October 21, 1976, shall file in the proper BLM office on or before October 22, 1979, or on or before December 30 of each calendar year following the calendar year of such recording, which ever date is sooner, evidence of annual assessment work performed during the preceding assessment year or a notice of intention to hold the mining claim.

(b) (1) Except as provided in paragraph (b)(2) of this section, the owner of an unpatented mining claim, mill site or tunnel site located within any unit of the National Park System shall file before October 22, 1979, and on or before December 30 of each calendar year after the year of recording (See 36 CFR 9.5), a notice of intention to hold the mining claim, mill site or tunnel site. Such notice shall be in the form presecribed by § 3833.2-3 of this title and shall be filed with the proper BLM office. A copy of each such filing shall be provided to the Superintendent of the appropriate unit by the Bureau of Land Management.

(2) Where a claimant has received a permit under 36 CFR 9.5 to do assessment work on a claim in a unit of the National Park System, the claimant may file with the Bureau of Land Management in lieu of the notice required by paragraph (b)(1) of this section, evidence of assessment work in the form prescribed in § 3833.2-2 of this title. A copy of such filing shall be provided to the Superintendent of the appropriate unit by the Bureau of Land Management.

(c) The owner of an unpatented mining claim located on Federal lands excluding lands within a unit of the National Park System, but including lands within a national monument administered by the United States Fish and Wildlife Service or the United States Forest Service, after October 21, 1976, shall, on or before December 30 of each calendar year following the calendar year in which such claim was located, file in the proper BLM office evidence of annual assessment work performed during the previous assessment year or a notice of intention to hold the mining claim.

(d) The owner of a mill or tunnel site located on Federal lands, excluding lands within a unit of the National Park System but including lands within a national monument administered by the United States Fish and Wildlife Service or the United States Forest Service, shall file in the proper BLM office on or before December 30 of each year following the year of recording pursuant to § 3833.1-2 of this title, a notice of intention to hold the mill or tunnel site.

[44 FR 9723, Feb. 14, 1979, as amended at 44 FR 20430, Apr. 5, 1979]

§ 3833.2-2 Form—evidence of assessment work.

Evidence of annual assessment work shall be in the form of either;

(a) An exact legible reproduction or duplicate, except microfilm, of the affidavit of assessment work performed which was or will be filed for record pursuant to section 314(a) of the Act in the local jurisdiction of the State where the claim or group of claims is located and recorded setting forth the following additional information:

(1) The serial number assigned to each claim by the authorized officer upon filing of the notice or certificate of location or patent application in the proper BLM office. Filing the serial number shall comply with the requirement in the act to file an additional description of the claim.

(2) Any change in the mailing address, if known, of the owner or owners of the claim or claims; or

(b) An exact legible reproduction or duplicate, except microfilm, of the detailed report concerning geological, geochemical and geophysical surveys provided for by the Act of September 2, 1958 (30 U.S.C. 28-1) and filed for record pursuant to section 314(a)(1) of the Act in the local jurisdiction of the State where the claim or group of claims is located and recorded setting forth the following additional information:

(1) The serial number assigned to each claim by the authorized officer upon filing in the proper BLM office of a copy of the official record of the notice or certificate of location or patent application; and

(2) Any change in the mailing address, if known, of the owner or owners of the claim.

[42 FR 5300, Jan. 27, 1977, as amended at 44 FR 9723, Feb. 14, 1979]

§ 3833.2-3 Form—notice intention to hold claim or site.

(a) A notice of intention to hold a mining claim or group of mining claims shall be in the form of either (1) an exact legible reproduction or duplicate, except microfilm, of a letter signed by the owner of a claim or his agent filed for record pursuant to section 314(a)(1) of the Act in the local jurisdiction of the State where the claim is located and recorded setting forth the following information:

(i) The serial number assigned to each claim by the authorized officer upon filing in the proper BLM office of a copy of the notice or certificate of location. Filing the serial number shall comply with the requirement in the act to file an additional description of the claim;

(ii) Any change in the mailing address, if known, of the owner or owners of the claim;

(iii) A statement that the claim is held and claimed by the owner(s) for the valuable mineral contained therein;

(iv) A statement that the owner(s) intend to continue development of the claim; and

(v) The reason that the annual assessment work has not been performed or an affidavit of assessment work performed or a detailed report of geological, geochemical or geophysical survey under § 3833.2-2, has not been filed or

(2) The decision on file in the proper BLM office which granted a deferment of the annual assessment work required by 30 U.S.C. 28, so long as the decision is in effect on the date required for filing a notice of intention to hold a mining claim under § 3833.2-1 of this title or a petition for deferment, a copy of which has been recorded with the appropriate local office, which has not been acted on by the authorized officer.

(b) A notice of intention to hold a mill or tunnel site(s) shall be in the form of a letter signed by the owner or owners of such sites or their agent setting forth the following information:

(1) The serial number assigned to each site by the authorized officer upon filing in the proper BLM office of a copy of the official record of the notice or certificate of location;

(2) Any change in the mailing address, if known, of the owner or owners of the site(s); and

(3) In the case of a mill site, a statement that a claim-related site will continue to be used for mining or milling purposes or that an independent mill site will continue to be used for the purposes of a quartz mill or reduction works; or

(4) In the case of a tunnel site, a statement that the owner(s) will continue to prosecute work on the tunnel with reasonable diligence for the discovery or development of the vein or lode.

[44 FR 9723, Feb. 14, 1979]

§ 3833.2-4 When evidence or notice not required.

Evidence of annual assessment work performed or a notice of intention to hold a mining claim need not be filed on unpatented mining claims or mill sites for which application for mineral patent which complies with 43 CFR Part 3860 has been filed and final certificate has been issued. (See 43 CFR 3851.5). The filing of an application and issuance of the final certificate will be deemed full compliance with the requirements of section 314(a) of the Act and the owner of that claim or site shall be exempt from the filing requirements of § 3833.2-1.

§ 3833.3 Notice of transfer of interest.

(a) Whenever the owner of an unpatented mining claim, mill site or tunnel site, which has been recorded in accordance with § 3833.1-2, sells, assigns, or otherwise conveys all or any part of his interest in the claim, his transferee shall file in the proper BLM office within 60 days after the completion of the transfer the following information:

(1) The serial number assigned to the claim by the authorized officer upon filing of a copy of the official

record of the notice or certificate of location in the proper BLM office: and

(2) The name and mailing address of the person(s) to whom an interest in the claim has been sold, assigned, or otherwise transferred.

(b) Whenever any person acquires an interest through inheritance in an unpatented mining claim, mill site, or tunnel site recorded in accordance with § 3833.1, he shall file in the proper BLM office within 60 days after completion of the transfer the information required by paragraph (a) of this section.

§ 3833.4 Failure to file.

(a) The failure to file an instrument required by §§ 3833.1-2 (a), (b), and 3833.2-1 of this title within the time periods prescribed therein, shall be deemed conclusively to constitute an abandonment of the mining claim, mill or tunnel site and it shall be void.

(b) The fact that an instrument is filed in accordance with other laws permitting filing or recording thereof and is defective or not timely filed for record under those laws, or the fact that an instrument is filed for record under this subpart by or on behalf of some, but not all of the owners of the mining claim, mill site, or tunnel site, shall not be considered failure to file an instrument under this subpart.

[42 FR 5200, Jan. 27, 1977, as amended at 44 FR 9723, Feb. 14, 1979]

§ 3833.5 Effect of recording and filing.

(a) Recordation or application involving an unpatented mining claim, mill site, or tunnel site by itself shall not render valid any claim which would not be otherwise valid under applicable law and does not give the owner any rights he is not otherwise entitled to by law.

(b) Nothing in this subpart shall be construed as a waiver of the assessment work requirements of section 2324 of the Revised Statutes, as amended (30 U.S.C. 28). Compliance with the requirements of this subpart shall be in addition to and not a substitute for compliance with the requirements of section 2324 of the Revised Statutes and with laws and regulations issued by any State or other authority relating to performance of annual assessment work.

(c) Filing of instruments pertaining to mining claims under other Federal law with the BLM or other Federal agency shall not excuse the filings required by this subpart and filings under this subpart shall not excuse the filing of instruments pertaining to mining claims under any other Federal law, except that filing a notice or certificate of location or an affidavit of annual assessment work under this subpart which is marked by the owner as also being filed under the Act of April 8, 1948 (62 Stat. 162) or the Act of August 11, 1955 (30 U.S.C. 621-625), will satisfy the recording requirement for O & C lands under 43 CFR Subpart 3821 and Pub. L. 359 lands under 43 CFR Part 3730, or as provided in § 3833.2-1(b) of this title.

(d) In the case of any action or contest affecting an unpatented mining claim, mill or tunnel site, only those owners who have recorded their claim or site pursuant to § 3833.1-2 or filed a notice of transfer of interest pursuant to § 3833.3, shall be considered by the United States as parties whose rights are affected by such action or contest and shall be personally notified. All methods reasonably calculated to insure that those parties receive actual notice of the action or contest shall be employed. If those methods are not successful, the interested parties shall be notified by publication in accordance with 43 CFR 4.450. Owners who have not recorded a claim or site or filed a notice of transfer shall not be personally served and will be bound by any contest proceeding even though they have not been personally served. This section applies to all unpatented mining claims, mill or tunnel sites located after October 21, 1976, and shall apply to such claims or sites located on or before October 21, 1976, only after they have been recorded pursuant to § 3833.1-2 of this title.

(e) Actual notice of an unpatented mining claim or mill or tunnel site by any employee or officer of the United States shall not exempt the claim or site from the requirements of this subpart.

(f) Failure of the government to notify an owner upon his filing or re-

cording of a claim or site under this subpart that such claim or site is located on lands not subject to location or otherwise void for failure to comply with Federal or State law or regulations shall not prevent the government from later challenging the validity of or declaring void such claim or site in accordance with due process of law.

(g) Any person who files an instrument required by these regulations knowing the same to contain any false, fictitious or fraudulent statement or entry, may be subject to criminal penalties under 18 U.S.C. 1001.

[42 FR 5200, Jan. 27, 1977, as amended at 44 FR 9723, Feb. 14, 1979]

PART 9—MINING AND MINING CLAIMS

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9.13 Performance bond.
9.14 Appeals.
9.15 Use of roads by commercial vehicles.
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9.17 Public inspection of documents.
9.18 Surface use and patent restrictions.

AUTHORITY: Mining Law of 1872 (R.S. 2319; 30 U.S.C. 21 et seq.); Act of August 25, 1916 (39 Stat. 535, as amended (16 U.S.C. 1 et seq.); Act of September 28, 1976; 90 Stat. 1342 (16 U.S.C. 1901 et seq.))

SOURCE: 42 FR 4835, Jan. 26, 1977, unless otherwise noted.

§ 9.1 Purpose and scope.

These regulations will control all activities resulting from the exercise of valid existing mineral rights on claims within any unit of the National Park System in order to insure that such activities are conducted in a manner consistent with the purposes for which the National Park System and each unit thereof were created, to prevent or minimize damage to the environment or other resource values, and to insure that the pristine beauty of the units are preserved for the benefit of present and future generations. These procedures apply to all operations conducted on claims in any unit of the National Park System.

§ 9.2 Definitions.

The terms used in this Part shall have the following meanings:

(a) *Secretary.* The Secretary of the Interior.

(b) *Operations.* All functions, work and activities in connection with mining on claims, including: prospecting, exploration, surveying, development and extraction; dumping mine wastes and stockpiling ore; transport or processing of mineral commodities; reclamation of the surface disturbed by such activities; and all activities and uses reasonably incident thereto, including construction or use of roads or other means of access on National Park System lands, regardless of whether such activities and uses take place on Federal, State, or private lands.

(c) *Operator.* A person conducting or proposing to conduct operations.

(d) *Person.* Any individual, partnership, corporation, association, or other entity.

(e) *Superintendent.* The Superintendent, or his designee, of the unit of he National Park System containing claims subject to these regulations.

(f) *Surface mining.* Mining in surface excavations, including placer mining, mining in open glory-holes or mining pits, mining and removing ore from open cuts, and the removal of capping or overburden to uncover ore.

(g) *The Act.* The Act of September 28, 1976, 90 Stat. 1342, 16 U.S.C. 1901 et seq.

(h) *Commercial vehicle.* Any motorized equipment used for transporting the product being mined or excavated, or for transporting heavy equipment used in mining operations.

(i) *Unit.* Any National Park System area containing a claim or claims subject to these regulations.

(j) *Claimant.* The owner, or his legal representative, of any claim lying within the boundaries of a unit.

(k) *Claim.* Any valid, patented or unpatented mining claim, mill site, or tunnel site.

(l) *Regional Director.* Regional Director for the National Park Service region in which the given unit is located.

(m) *Significantly disturbed for purposes of mineral extraction.* Land will be considered significantly disturbed for purposes of mineral extraction when there has been surface extraction of commercial amounts of a mineral, or significant amounts of overburden or spoil have been displaced due to the extraction of commercial amounts of a mineral. Extraction of commercial amounts is defined as the removal of ore from a claim in the normal course of business of extraction for processing or marketing. It does not encompass the removal of ore for purposes of testing, experimentation, examination or preproduction activities.

(n) *Designated roads.* Those existing roads determined by the Superintendent in accordance with 36 CFR 2.6(b) to be open for the use of the public or an operator.

(o) *Production.* Number of tons of a marketable mineral extracted from a given operation.

§ 9.3 Access permits.

(a) All special use or other permits dealing with access to and from claims within any unit are automatically revoked 120 days after January 26, 1977. All operators seeking new or continued access to and from a claim after that date must file for new access permits in accordance with these regulations, unless access to a mining claim is by pack animal or foot. (See § 9.7 for restrictions on assessment work and § 9.9(d) and § 9.10(g) for extensions of permits.)

(b) Prior to the issuance of a permit for access to any claim or claims, the operator must file with the Superintendent a plan of operations pursuant to § 9.9. No permit shall be issued until the plan of operations has been approved in accordance with § 9.10.

(c) No access to claims outside a unit will be permitted across unit lands unless such access is by foot, pack animal, or designated road. Persons using such roads for access to such claims must comply with the terms of § 9.15 where applicable.

§ 9.4 Surface disturbance moratorium.

(a) For a period of four years after September 28, 1976, no operator of a claim located within the boundaries of Death Valley National Monument, Mount McKinley National Park, or Organ Pipe Cactus National Monument (see also claims subject to § 9.10(a)(3)) shall disturb for purposes of mineral exploration or development the surface of any lands which had not been significantly disturbed for purposes of mineral extraction prior to February 29, 1976, except as provided in this section. However, where a claim is subject, for a peroid of four years after September 28, 1976, to this section solely by virtue of § 9.10(a)(3), the date before which there must have been significant disturbance for purposes of mineral extraction is January 26, 1977.

(b) An operator of a claim in one of these units seeking to enlarge an existing excavation or otherwise disturb the surface for purposes of mineral exploration or development shall file with the Superintendent an application stating his need to disturb additional surface in order to maintain production at an annual rate not to exceed an average annual production level of said operations for the three calendar years 1973, 1974, and 1975. Accompanying the application shall be a plan of operations which complies with § 9.9 and verified copies of production records for the years 1973, 1974, and 1975.

(c) If the Regional Director finds that the submitted plan of operations complies with § 9.9, that enlargement of the existing excavation of an individual mining operation is necessary in order to make feasible continued production therefrom at an annual rate not to exceed the average annual production level of said operation for the three calendar years 1973, 1974, and 1975, and that the plan of operations meets the applicable standard of approval of § 9.10(a)(1), he shall issue a permit allowing the disturbance of the surface of the lands contiguous to the existing excavation to the minimum extent necessary to effect such enlargement. For the purpose of this section "lands contiguous to the existing excavation" shall include land which actually adjoins the existing excavation or which could logically become an extension of the excavation; for example, drilling to determine the extent and direction to which the existing excavation should be extended may be permitted at a site which does not actually adjoin the excavating.

(d) The appropriate reclamation standard to be applied will be determined by the nature of the claim. (See § 9.11(a)(1) and § 9.11(a)(2).)

(e) Operations conducted under a permit pursuant to this section shall be subject to all the limitations imposed by this Part.

(f) For the purposes of this section, each separate mining excavation shall be treated as an individual mining operation.

§ 9.5 Recordation.

(a) Any claimant of an unpatented mining claim in a unit shall, within 12 months after September 28, 1976, record the claim in the Office of the Superintendent of the unit. Actual receipt by the appropriate Superintendent on or before September 28, 1977, is required. Patented claims do not have to be recorded pursuant to this section.

(b) This recordation shall include, but is not limited to, the following instruments and information:

(1) A certified copy of each location notice should provide: Name of claim; locator(s); type (placer, lode, mill site, or tunnel site); mineral(s) for which claim was located; date of location, date of amendments or relocations, if any; recording date, book, page, county and State, where recorded; and a legal description of the lands includ-

ed in the mining claim(s). If the location notice does not provide all of the foregoing information, it shall, to the extent possible, be attached in a supplement to the location notice. If the lands are surveyed or unsurveyed, the legal description shall be by:

(i) A recitation of the appropriate location of all or any part of the claim or site within a 160 acre quadrant (quarter section) of a section or sections, if more than one is involved. In addition, there must be furnished the township, range, meridian and State obtained from an official survey plat or other U.S. Government map showing either the surveyed or protracted U.S. Government grid, whichever is applicable.

(ii) A map with a scale of not less than ½ inch to a mile (1:125,000) showing the survey or protraction grids on which there will be depicted the location of the claim or site. Contiguous claims or sites and groups of claims or sites in the same general area may be depicted on this single map so long as the individual claims or sites are clearly identified.

(2) Current claimant's(s) name(s) and address(es).

(3) Statement that annual labor was performed since September 1, 1970.

(c) Pursuant to section 8 of the Act, any unpatented claim not so recorded pursuant to this section shall be conclusively presumed to be abandoned and shall be void. Such recordation will not render valid any unpatented claim which was not valid on September 28, 1976, the effective date of the Act, or which becomes invalid thereafter.

(d) A claimant who initially records under this section or under the notice of October 20, 1976 (41 FR 46357) is in full compliance with all applicable provisions of law, including the recordation provisions of section 314 of the Federal Land Policy and Management Act of 1976, 90 Stat. 2743, 43 U.S.C. 1701. Thus, a claimant does not have to file this initial notice with the Bureau of Land Management. Copies of all material received pursuant to this section or the notice of October 20, 1976, will be provided by the Regional Director to the Bureau of Land Management. However, subsequent annual filings of notice must be made under section 314 and implementing regulations with the Superintendent who will provide copies to the Bureau of Land Management. These subsequent filings with the Superintendent will satisfy the requirements of section 314 for mining claims in the National Park System.

§ 9.6 Transfers of interest.

(a) Whenever a claimant who has recorded his unpatented claim(s) with the Superintendent pursuant to the requirements of § 9.5 sells, assigns, bequeaths, or otherwise conveys all or any part of his interest in his claim(s), the Superintendent shall be notified within 60 days after completion of the transfer of: The name of the claim(s) involved; the name and legal address of the person to whom an interest has been sold, assigned, bequeathed, or otherwise transferred; and a description of the interest conveyed or received. Copies of the transfer documents will be provided by the Superintendent to the Bureau of Land Management. Failure to so notify the Superintendent shall render any existing access permit void.

(b) If the transfer occurs within the period of 12 months from the effective date of the Act and the prior owner has not recorded the unpatented claim with the Superintendent in accordance with these regulations, the holder by transfer shall have the remainder of the 12-month period to record the unpatented claim. Failure to record shall be governed by the provisions of § 9.5(c).

§ 9.7 Assessment work.

(a) An access permit and approved plan of operations must be obtained by a claimant prior to the performance of any assessment work required by Revised Statute 2324 (30 U.S.C. 28) on a claim in a unit.

(b) Permits will be issued in accordance with the following:

(1) In units subject to the surface disturbance moratorium of section 4 of the Act and § 9.4, no access permits will be granted for the purpose of performing assessment work.

(2) It has been determined that in all other units the Secretary will not

challenge the validity of any unpatented claim within a unit for the failure to do assessment work during or after the assessment year commencing September 1, 1976. The Secretary expressly reserves, however, the existing right to contest claims for failure to do such work in the past. No access permits will be granted solely for the purpose of performing assessment work in these units except where claimant establishes the legal necessity for such permit in order to perform work necessary to take the claim to patent, and has filed and had approved a plan of operations as provided by these regulations. (For exploratory or development type work, see § 9.9.)

§ 9.8 Use of water.

(a) No operator may use for operations any water from a point of diversion which is within the boundaries of any unit unless authorized in writing by the Regional Director. The Regional Director shall not approve a plan of operations requiring the use of water from such source unless the right to the water has been perfected under applicable State law, has a priority date prior to the establishment of the unit and there has been a continued beneficial use of that water right.

(b) If an operator whose operations will require the use of water from a point of diversion within the boundaries of the unit can show that he has a perfected State water right junior to the reserved water right of the United States and can demonstrate that the exercise of that State water right will not diminish the Federal right, which is that amount of water necessary for the purposes for which the unit was established, he will be authorized to use water from that source for operations, if he has complied with all other provisions of these regulations.

§ 9.9 Plan of operations.

(a) No operations shall be conducted within any unit until a plan of operations has been submitted by the operator to the Superintendent and approved by the Regional Director. All operations within any unit shall be conducted in accordance with an approved plan of operations.

(b) The proposed plan of operations shall relate, as appropriate, to the proposed operations (e.g. exploratory, developmental or extraction work) and shall include but is not limited to:

(1) The names and legal addresses of the following persons: The operator, the claimant if he is not the operator, and any lessee, assignee, or designee thereof;

(2) A map or maps showing the proposed area of operations; existing roads or proposed routes to and from the area of operations; areas of proposed mining; location and description of surface facilities, including dumps;

(3) A description of the mode of transport and major equipment to be used in the operations;

(4) An estimated timetable for each phase of operations and the completion of operations;

(5) The nature and extent of the known deposit to be mined and a description of the proposed operations;

(6) A mining reclamation plan demonstrating compliance with the requirements of § 9.11;

(7) All steps taken to comply with any applicable Federal, State, and local laws or regulations, including the applicable regulations in 36 CFR, Chapter I;

(8) In units subject to the surface disturbance moratorium of section 4 of the Act and § 9.4, proof satisfactory to the Regional Director that the surface of the area on which the operation is to occur was significantly disturbed for purposes of mineral extraction prior to February 29, 1976, or if the area was not so disturbed, proof, including production records for the years 1973, 1974, and 1975, that new disturbance is necessary to maintain an average annual rate of production not to exceed that of the years 1973, 1974, and 1975;

(9) An environmental report analyzing the following:

(i) The environment to be affected by the operations,

(ii) The impacts of the operations on the unit's environment,

(iii) Steps to be taken to insure minimum surface disturbance,

(iv) Methods for disposal of all rubbish and other solid and liquid wastes,

(v) Alternative methods of extraction and the environmental effects of each.

(vi) The impacts of the steps to be taken to comply with the reclamation plan, and

(10) Any additional information that is required to enable the Regional Director to effectively analyze the effects that the operations will have on the preservation, management and public use of the unit, and to make a decision regarding approval or disapproval of the plan of operations and issuance or denial of the access permit.

(c) In all cases the plan must consider and discuss the unit's Statement for Management and other planning documents, and activities to control, minimize or prevent damage to the recreational, biological, scientific, cultural, and scenic resources of the unit.

(d) Any person conducting operations on January 26, 1977, shall be required to submit a plan of operations to the Superintendent. If otherwise authorized, operations in progress on January 26, 1977, may continue for 120 days from that date without having an approved plan. After 120 days from January 26, 1977, no such operations shall be conducted without a plan approved by the Regional Director, unless access is extended under the existing permit by the Regional Director. (See § 9.10(g).)

§ 9.10 Plan of operations approval.

(a) The Regional Director shall not approve a plan of operations:

(1) For existing or new operations if the claim was patented without surface use restriction, where the operations would constitute a nuisance in the vicinity of the operation, or would significantly injure or adversely affect federally owned lands; or

(2) For operations which had not significantly disturbed the surface of the claim for purposes of mineral extraction prior to January 26, 1977, if the claim has not been patented, or if the patent is subject to surface use restrictions, where the operations would preclude management for the purpose of preserving the pristine beauty of the unit for present and future generations, or would adversely affect or significantly injure the ecological or cultural resources of the unit. No new surface mining will be permitted under this paragraph except under this standard; or

(3) For operations which had significantly disturbed the surface of the claim for purposes of mineral extraction prior to January 26, 1977, if the claim has not been taken to patent, or the patent is subject to surface use restrictions, where the operations would constitute a nuisance in the vicinity of the operation, or would significantly injure or adversely affect federally owned lands. Provided, however, operations under this paragraph shall be limited by the provisions of § 9.4, notwithstanding the limitation of that section's applicability to the three enumerated units;

(4) Where the claim, regardless of when it was located, has not been patented and the operations would result in the destruction of surface resources, such as trees, vegetation, soil, water resources, or loss of wildlife habitat, not required for development of the claim; or

(5) Where the operations would constitute a violation of the surface disturbance moratorium of section 4 of the Act; or

(6) Where the plan does not satisfy each of the requirements of § 9.9.

(b) Within 60 days of the receipt of a proposed plan of operations, the Regional Director shall make an environmental analysis of such plan, and

(1) Notify the operator that he has approved or rejected the plan of operations; or

(2) Notify the operator of any changes in, or additions to the plan of operations which are necessary before such plan will be approved; or

(3) Notify the operator that the plan is being reviewed, but that more time, not to exceed an additional 30 days, is necessary to complete such review, and setting forth the reasons why additional time is required. Provided, however, that days during which the area of operations is inaccessible for such reasons as inclement weather, natural catastrophy, etc., for inspection shall not be included when computing either this time period, or that in paragraph (b) of this section; or

(4) Notify the operator that the plan cannot be considered for approval until forty-five (45) days after a final environmental impact statement, if required, has been prepared and filed with the Council on Environmental Quality.

(c) Failure of the Regional Director to act on a proposed plan of operations and related permits within the time period specified shall constitute an approval of the plan and related permits for a period of three (3) years.

(d) The Regional Director's analysis may include:

(1) An examination of the environmental report filed by the operator;

(2) An evaluation of measures and timing required to comply with reclamation requirements;

(3) An evaluation of necessary conditions and amount of the bond or security deposit to cover estimated reclamation costs;

(4) An evaluation of the need for any additional requirements in access permit; and

(5) A determination regarding the impact of this operation and the cumulative impact of all operations on the management of the unit.

(e) Prior to approval of a plan of operations, the Regional Director shall determine whether any properties included in, or eligible for inclusion in, the National Register of Historic Places or National Registry of Natural Landmarks may be affected by the proposed activity. This determination will require the acquisition of adequate information, such as that resulting from field surveys, in order to properly determine the presence of and significance of cultural resources within the area to be affected by mining operations. Whenever National Register properties or properties eligible for inclusion in the National Register would be affected by mining operations, the Regional Director shall comply with section 106 of the National Historic Preservation Act of 1966 as implemented by 36 CFR Part 800.

(1) The operator shall not injure, alter, destroy, or collect any site, structure, object, or other value of historical, archeological, or other cultural scientific importance. Failure to comply with this requirement shall constitute a violation of the Antiquities Act (16 U.S.C. 431-433) (see 43 CFR, Part 3).

(2) The operator shall immediately bring to the attention of the Superintendent any cultural and/or scientific resource that might be altered or destroyed by his operation and shall leave such discovery intact until told to proceed by the Superintendent. The Superintendent will evaluate the discoveries brought to his attention, and will determine within ten (10) working days what action will be taken with respect to such discoveries.

(3) The responsibility for, and cost of investigations and salvage of such values that are discovered during operations will be that of the operator, where the claim is unpatented.

(f) The operator shall protect all survey monuments, witness corners, reference monuments and bearing trees against destruction, obliteration, or damage from mining operations, and shall be responsible for the reestablishment, restoration, or referencing of any monuments, corners and bearing trees which are destroyed, obliterated, or damaged by such mining operations.

(g) Pending approval of the plan of operations, the Regional Director may approve, on a temporary basis, the continuation of existing operations if necessary to enable timely compliance with these regulations and with Federal, State, or local laws, or if a halt to existing operations would result in an unreasonable economic burden or injury to the operator. Such work must be conducted in accordance with all applicable laws, and in a manner prescribed by the Regional Director and designed to minimize or prevent significant environmental effects.

(h) Approval of each plan of operations is expressly conditioned upon the Superintendent having such reasonable access to the claim as is necessary to properly monitor and insure compliance with the plan of operations.

§ 9.11 Reclamation requirements.

(a) As contemporaneously as possible with the operations, but in no case later than six (6) months after completion of operations and within the time

specified in an approved mining reclamation plan, unless a longer period is authorized in writing by the Regional Director, each operator shall initiate reclamation as follows:

(1) Where the claim was patented without surface use restriction, the operator shall at a minimum:

(i) Remove all above ground structures, equipment, and other manmade debris used for operations; and

(ii) Rehabilitate the area of operations to a condition which would not constitute a nuisance; or would not adversely affect, injure or damage, federally owned lands.

(2) On any claim which was patented with surface use restrictions or is unpatented, each operator must take steps to restore natural conditions and processes, which steps shall include, but are not limited to:

(i) Removing all above ground structures, equipment and other manmade debris;

(ii) Providing for the prevention of surface subsidence;

(iii) Replacing overburden and spoil, wherever economically and technologically practicable;

(iv) Grading to reasonably conform the contour of the area of operations to a contour similar to that which existed prior to the initiation of operations, where such grading will not jeopardize reclamation;

(v) Replacing the natural topsoil necessary for vegetative restoration; and

(vi) Reestablishing native vegetative communities.

(b) Reclamation under paragraph (a)(2) of this section is unacceptable unless it provides for the safe movement of native wildlife, the reestablishment of native vegetative communities, the normal flow of surface and reasonable flow of subsurface waters, the return of the area to a condition which does not jeopardize visitor safety or public use of the unit, and return of the area to a condition equivalent to its pristine beauty.

(c) Reclamation required by this section shall apply to operations authorized under this Part, except that all terms relating to reclamation of previously issued special use permits revoked by this part for operations to be continued under an approved plan of operations shall be incorporated into the operator's reclamation plans.

§ 9.12 Supplementation or revision of plan of operations.

(a) An approved plan of operations may require reasonable revision or supplementation to adjust the plan to changed conditions or to correct oversights.

(1) The Regional Director may initiate an alteration by notifying the operator in writing of the proposed alteration and the justification therefor. The operator shall have thirty (30) days to comment on the proposal.

(2) The operator may initiate an alteration by submitting to the Superintendent a written statement of the proposal, and the justification therefor.

(b) Any proposal initiated under paragraph (a) of this section by either party shall be reviewed and decided by the Regional Director in accordance with § 9.10. Where the operator believes he has been aggrieved by a decision under this paragraph, he may appeal the decision pursuant to § 9.14.

§ 9.13 Performance bond.

(a) Upon approval of a plan of operations the operator shall be required to file a suitable performance bond with satisfactory surety, payable to the Secretary or his designee. The bond shall be conditioned upon faithful compliance with applicable regulations, the terms and conditions of the permit, lease, or contract, and the plan of operations as approved, revised or supplemented.

(b) In lieu of a performance bond, an operator may elect to deposit with the Secretary, or his designee, cash or negotiable bonds of the U.S. Government. The cash deposit or the market value of such securities shall be at least equal to the required sum of the bond.

(c) The bond or security deposit shall be in an amount equal to the estimated cost of completion of reclamation requirements either in their entirety or in a phased schedule for their completion as set forth in the approved, supplemented or revised plan of operations.

(d) In the event that an approved plan of operations is revised or supplemented in accordance with § 9.12, the Superintendent may adjust the amount of the bond or security deposit to conform to the plan of operations as modified.

(e) The operator's and his surety's responsibility and liability under the bond or security deposit shall continue until such time as the Superintendent determines that successful reclamation of the area of operations has occurred.

(f) When all required reclamation requirements of an approved plan of operations are completed, the Superintendent shall notify the operator that performance under the bond or security deposit has been completed and that it is released.

§ 9.14 Appeals.

(a) Any operator aggrieved by a decision of the Regional Director in connection with the regulations in this Part may file with the Regional Director a written statement setting forth in detail the respects in which the decision is contrary to, or in conflict with, the facts, the law, these regulations, or is otherwise in error. No such appeal will be considered unless it is filed with the Regional Director within thirty (30) days after the date of notification to the operator of the action or decision complained of. Upon receipt of such written statement from the aggrieved operator, the Regional Director shall promptly review the action or decision and either reverse his original decision or prepare his own statement, explaining that decision and the reasons therefor, and forward the statement and record on appeal to the Director, National Park Service, for review and decision. Copies of the Regional Director's statement shall be furnished to the aggrieved operator, who shall have 20 days within which to file exceptions to the Regional Director's decision. The Department has the discretion to initiate a hearing before the Office of Hearing and Appeals in a particular case. (See 43 CFR 4.700.)

(b) The official files of the National Park Service on the proposed plan of operations and any testimony and documents submitted by the parties on which the decision of the Regional Director was based shall constitute the record on appeal. The Regional Director shall maintain the record under separate cover and shall certify that it is the record on which his decision was based at the time it is forwarded to the Director of the National Park Service. The National Park Service shall make the record available to the operator upon request.

(c) If the Director considers the record inadequate to support the decision on appeal, he may provide for the production of such additional evidence or information as may be appropriate, or may remand the case to the Regional Director, with appropriate instructions for further action.

(d) On or before the expiration of forty-five (45) days after his receipt of the exceptions to the Regional Director's decision, the Director shall make his decision in writing; *Provided, however,* That if more than forty-five (45) days are required for a decision after the exceptions are received, the Director shall notify the parties to the appeal and specify the reason(s) for delay. The decision of the Director shall include (1) a statement of facts, (2) conclusions, and (3) reasons upon which the conclusions are based. The decision of the Director shall be the final administrative action of the agency on a proposed plan of operations.

(e) A decision of the Regional Director from which an appeal is taken shall not be automatically stayed by the filing of a statement of appeal. A request for a stay may accompany the statement of appeal or may be directed to the Director. The Director shall promptly rule on requests for stays. A decision of the Director on request for a stay shall constitute a final administrative decision.

§ 9.15 Use of roads by commercial vehicles.

(a) After January 26, 1977, no commercial vehicle shall use roads administered by the National Park Service without first being registered with the Superintendent.

(1) A fee shall be charged for such registration based upon a posted fee

schedule, computed on a ton-mile basis. The fee schedule posted shall be subject to change upon 60 days notice.

(2) An adjustment of the fee may be made at the discretion of the Superintendent where a cooperative maintenance agreement is entered into with the operator.

(b) No commercial vehicle which exceeds roadway load limits specified by the Superintendent shall be used on roads administered by the National Park Service unless authorized by written permit from the Superintendent.

(c) Should a commercial vehicle used in operations cause damage to roads or other facilities of the National Park Service, the operator shall be liable for all damages so caused.

§ 9.16 Penalties.

Undertaking any operation within the boundaries of any unit in violation of this Part shall be deemed a trespass against the United States, and the penalty provisions of 36 CFR Part 1 are inapplicable to this Part.

§ 9.17 Public inspection of documents.

(a) Upon receipt of the plan of operations the Superintendent shall publish a notice in the FEDERAL REGISTER advising the availability of the plan for public review.

(b) Any document required to be submitted pursuant to the regulations in this Part shall be made available for public inspection at the Office of Superintendent during normal business hours. The availability of such records for inspection shall be governed by the rules and regulations found at 43 CFR Part 2.

§ 9.18 Surface use and patent restrictions.

(a) The regulations in 43 CFR 3826.2-5 and 3826.2-6, 3826.4-1(g) and 3826.4-1(h), and 3826.5-3 and 3826.5-4 will apply to any claimant who wishes to take his claim to patent in Olympic National Park, Glacier Bay National Monument or Organ Pipe Cactus National Monument.

(b) The additional provisions of 43 CFR, Subpart 3826 and 36 CFR 7.26 and 7.44(a) and (b) will continue to apply to existing permits until 120 days after January 26, 1977, unless extended by the Regional Director. (See § 9.10(g).

[4310-70-M]

Title 36—Parks, Forests, and Public Property

CHAPTER I—NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR

PART 9—MINERALS MANAGEMENT

Subpart A—Mining and Mining Claims

SUPPLEMENTAL MINING CLAIM INFORMATION IN ALASKA NATIONAL MONUMENTS

AGENCY: National Park Service, United States Department of the Interior.

ACTION: Emergency Final Rule.

SUMMARY: By this emergency rulemaking the National Park Service (NPS) revises the information required in a submission of a plan of operations under 36 CFR § 9.9 for mining in the Alaska National Monuments administered by the NPS. Under this revision, claimants of unpatented claims seeking to mine in one of these monuments will submit as a part of the plan of operations a Supplemental Claim Information Statement which will contain information on quality and quantity of a mineral discovery as well as on previous production. This information will allow the NPS to make a preliminary determination of the claimant's eligibility for an approved plan of operations. This expedited procedure is required in the Alaska National Monuments administered by the NPS because of the rapidly approaching field season and its brevity. For the same reasons, this rule is promulgated on an emergency basis as a final rule, effective upon publication.

EFFECTIVE DATE: February 27, 1979.

FOR FURTHER INFORMATION CONTACT:

Mr. John Cook, Alaska Area Office, National Park Service, 540 West 5th Ave., Room 202, Anchorage, Alaska 99501; (907) 276-8166. Mr. Roger Contor, National Park Service, U.S. Department of the Interior, 18th and C Streets NW., Washington, D.C. 20240; (202) 343-5193.

SUPPLEMENTARY INFORMATION: Under 36 CFR, Part 9 Subpart A, the regulations implementing the Mining in the Parks Act, 16 U.S.C. 1901 *et seq.*, the National Park Service requires that before a claimant may be granted access across park lands for mining purposes, the claimant must file and obtain approval of a plan of operations detailing, in essence, where mining is proposed, how and when it will be undertaken, and what steps the claimant will take to reclaim the disturbed area. The specific requirements for the contents of the plan are found at 36 CFR 9.9.

It has been the policy of the NPS in the administration of these regulations to conduct a mining examination of an unpatented claim upon receipt of a plan of operations to determine the claim's validity. This policy has allowed the NPS to avoid approving plans of operations in situations where, under the Mining Law of 1872, a claimant has not located a valid mining claim. This policy was also designed to distinguish extraction and production activities from further prospecting or exploration which is precluded as of the date an area is withdrawn from mineral entry. Because of the more temperate climatic conditions in those areas where plans of operations have been processed and the fortunate spacing of filed plans, the time periods associated with implementing this policy have not thus far imposed significant delays on those claimants who have viable claims.

In Alaska, however, with the limited field season due to the climate, and with the significantly increased number of potentially valid claims which the NPS must examine within the thirteen new or expanded NPS national monuments, the situation is quite different. Just as the climate limits the field season, it limits the season during which mining engineers may make mining examinations of claims. Waiting periods associated with continuing the current policy might easily preclude work by a claimant for one or more field seasons. For this reason a different procedure is justified in the National Monuments in Alaska administered by the National Park Service.

The revised procedure that is implemented by this rulemaking is to require the holder of an unpatented

claim to submit a statement of information concerning the quantity and quality of the deposit he has located and previous production from the claim. A suggested format for the submission of this information will be made available by the NPS upon request. It is our intent that this procedure facilitate exercise of valid rights by those who hold them. The claimant, who is in the best position to provide the requested information, has a significant amount of control over the process. It is he who comes to the NPS with an application. Thus, it is in his interest to provide as much information as he can as soon as possible. This information will be reviewed and a preliminary determination made of the claimant's apparent eligibility for an approved plan of operations. When this preliminary review indicates the claimant is eligible, the rest of the plan of operations will be reviewed in accordance with the regulations.

There is no certainty, however, that proper completion of this Supplemental Statement will enable operations to go forward, for the claimant must still comply with the other requirements of the regulations. The adoption of the Supplemental Claim Information Statement is designed only to determine a priority for dealing with the submitted plans of operations, thus more efficiently allocating administrative resources. It should be reemphasized that the NPS intends to engage in a systematic examination of all unpatented mining claims in these monuments and any approved plan of operations will be subject to revocation should this subsequent mining examination establish that the claim is invalid.

Finally, it should be noted that this amendment will apply only to claimants in the National Monuments in Alaska administered by the NPS. In all other areas, the NPS intends to continue its practice of undertaking a mining examination prior to consideration of a plan of operations.

This amendment to 36 CFR, Part 9 Subpart A, is promulgated as an emergency final rule without notice and public comment pursuant to 5 U.S.C. 553. It is hereby found that because of the need to have final procedures in effect in order to allow claimants to begin seeking compliance and because of the practice of moving equipment into the field before the spring thaw, it would be impracticable and contrary to the public interest to delay final promulgation of this rule.

Authority

Act of September 28, 1976 (16 U.S.C. 1901 *et seq.*), Act of August 25, 1916 (16 U.S.C. 1 and 2-4) and 245 DM (42 FR 12931) as amended.

Drafting Information

The following persons participated in the writing of this regulation: David Jones, National Park Service, San Francisco, California; and John G. DeKoster, Office of the Solicitor, Washington, D.C.

Impact Analysis

It has been determined that this is not a major Federal action which will significantly affect the quality of the human environment. Accordingly, no environmental impact statement has been prepared on this action. An environmental impact statement covering proposed Federal actions in Alaska was prepared in 1974 and supplemented on November 28, 1978, by an analysis covering alternative administrative actions.

It has also been determined pursuant to 43 CFR, Part 14, that this is not a significant rule requiring a regulatory analysis. The basis for this determination is the rule's limited scope of application. Additionally, the report imposes little, if any, additional burden on the claimant because it requests only a summary of information already in the possession of the claimant.

Dated: February 15, 1979.

William J. Whalen,
Director, National Park Service.

In consideration of the foregoing, Part 9 of Title 36, Code of Federal Regulations, § 9.9, subparagraphs (b)(4) and (5) is amended as follows:

§ 9.9 Plan of operations.

* * * * *

(b) * * *

(4) A description of the proposed operations and an estimated timetable for each phase of operations and the completion of operations;

(5) The nature and extent of the known deposit to be mined. When the claim is located in a National Monument in Alaska and is unpatented, a completed Supplemental Claim Information Statement shall be submitted describing the quantity, quality, and any previous production of the deposit.

* * * * *

[FR Doc. 79-5657 Filed 2-20-79, 8:45 am]

§ 13.15 Access to inholdings.

(a) *Purpose.* A permit for access to inholdings pursuant to this section is required only where adequate and feasible access is not affirmatively provided without a permit under §§ 13.10–13.14 of these regulations. Thus, it is the purpose of this section to ensure adequate and feasible access across a park area for any person who has a valid property or occupancy interest in lands within or effectively surrounded by a park area or other lands listed in section 1110(b) of ANILCA.

(b) *Application and Administration.* (1) Applications for a permit designating methods and routes of access across park areas not affirmatively provided for in this part shall be submitted to the Superintendent having jurisdiction over the affected park area as specified under § 13.31.

(2) Except as provided in paragraph (c) of this section, the access permit application shall contain the name and address of the applicant, documentation of the relevant property or occupancy interest held by the applicant (including for 1872 Mining Law claimants a copy of the location notice and recordations required under the 1872 Mining Law and 43 U.S.C. 1744), a map or physical description of the relevant property or occupancy interest, a map or physical description of the desired route of access, a description of the desired method of access, and any other information necessary to determine the adequacy and feasibility of the route or method of access and its impact on the natural or other values of the park area.

(3) The Superintendent shall specify in a nontransferable permit, adequate and feasible routes and methods of access across park areas for any person who meets the criteria of paragraph (a) of this section. The Superintendent shall designate the routes and methods desired by the applicant unless it is determined that:

(i) The route or method of access would cause significant adverse impacts on natural or other values of the park area, and adequate and feasible access otherwise exists; or

(ii) The route or method of access would jeopardize public health and safety, and adequate and feasible access otherwise exists.

(4) If the Superintendent makes one of the findings described in paragraph (b)(3) of this section, he/she shall specify such other alternate methods and routes of access as will provide the applicant adequate and feasible access, while minimizing damage to natural and other values of the park area.

(5) Any person holding an access permit shall notify the Superintendent of any significant change in the method or level of access from that occurring at the time of permit issuance. In such cases, the Superintendent may modify the terms and conditions of the permit, provided that the modified permit also assures adequate and feasible access under the standards of paragraph (b)(3) of this section.

(6) Routes and methods of access permitted pursuant to this section shall be available for use by guests and invitees of the permittee.

(c) *Access requiring permanent improvements.* (1) Application form and procedure. Any application for access to an inholding which proposes the construction or modification of an improved road (*e.g.*, construction or modification of a permanent, year-round nature, and which involves substantial alteration of the terrain or vegetation, such as grading, gravelling of surfaces, concrete bridges, or other such construction or modification), or any other permanent improvement on park area lands qualifying as a "transportation or utility system" under Section 1102 of ANILCA, shall be submitted on the consolidated application form specified in Section 1104(h) of ANILCA, and processed in accordance with the procedures of Title XI of ANILCA.

(2) Decision-making standard. (i) If the permanent improvement is required for adequate and feasible access to the inholding (*e.g.*, improved right-of-way or landing strip), the permit granting standards of paragraph (b) of this section shall apply.

(ii) If the permanent improvement is not required as part of the applicant's right to adequate and feasible access to an inholding (*e.g.*, pipeline, transmission line), the permit granting standards of Sections 1104–1107 of ANILCA shall apply.

(d) *Clarification of the Applicability of 36 CFR Part 9.* (1) 1872 Mining Law

Claims and 36 CFR Subpart 9A. Since section 1110(b) of ANILCA guarantees adequate and feasible access to valid mining claims within park areas notwithstanding any other law, and since the 36 CFR 9.3 requirement for an approved plan of operations prior to the issuance of an access permit may interfere with needed access, 36 CFR 9.3 is no longer applicable in Alaska park areas. However, holders of patented or unpatented mining claims under the 1872 Mining Law (30 U.S.C. 22 *et seq.*) should be aware that 36 CFR 9.9, 9.10 independently require an approved plan of operations prior to conducting mining operations within a park area (except that no plan of operations is required for patented claims where access is not across federally-owned parklands).

(2) Non-Federal Oil and Gas Rights and 36 CFR Subpart 9B. Since section 1110(b) of ANILCA guarantees adequate and feasible access to park area inholdings notwithstanding any other law, and since 36 CFR Subpart 9B was predicated on the park area Superintendent's discretion to restrict and condition such access, 36 CFR Subpart 9B is no longer applicable in Alaska park areas.

C: BLM LAND WITHDRAWAL

ALASKA

Notice of Proposed Withdrawal and Reservation of Lands

MAY 7, 1965.

The Bureau of Land Management, United States Department of the Interior, has filed an application, Serial Number Fairbanks 034575, for withdrawal of the lands described below, from all forms of appropriation under the public land laws, including the mining laws. The applicant desires the land for establishment of a Bureau of Land Management protective area, under Executive 10355 (43 U.S.C. 141).

For a period of 30 days from the date of publication of this notice, all persons who wish to submit comments, suggestions, or objections in connection with the proposed withdrawal may present their views in writing to the undersigned officer of the Bureau of Land Management, Department of the Interior, Fairbanks District and Land Office, Post Office Box 1150, Fairbanks, Alaska.

The authorized officer of the Bureau of Land Management will undertake such investigations as are necessary to determine the existing and potential demand for the lands and their resources. He will also undertake negotiations with the applicant agency with the view of adjusting the application to reduce the area to the minimum essential to meet the applicant's needs, to provide for the maximum concurrent utilization of the lands for purposes other than the applicant's, to eliminate lands needed for purposes more essential than the applicant's and to reach agreement on the concurrent management of the lands and their resources.

He will also prepare a report for consideration by the Secretary of the Interior who will determine whether or not the lands will be withdrawn as requested by the Bureau of Land Management.

The determination of the Secretary on the application will be published in the FEDERAL REGISTER. A separate notice will be sent to each interested party of record.

If circumstances warrant it, a public hearing will be held at a convenient time and place, which will be announced.

The lands involved in the application are:

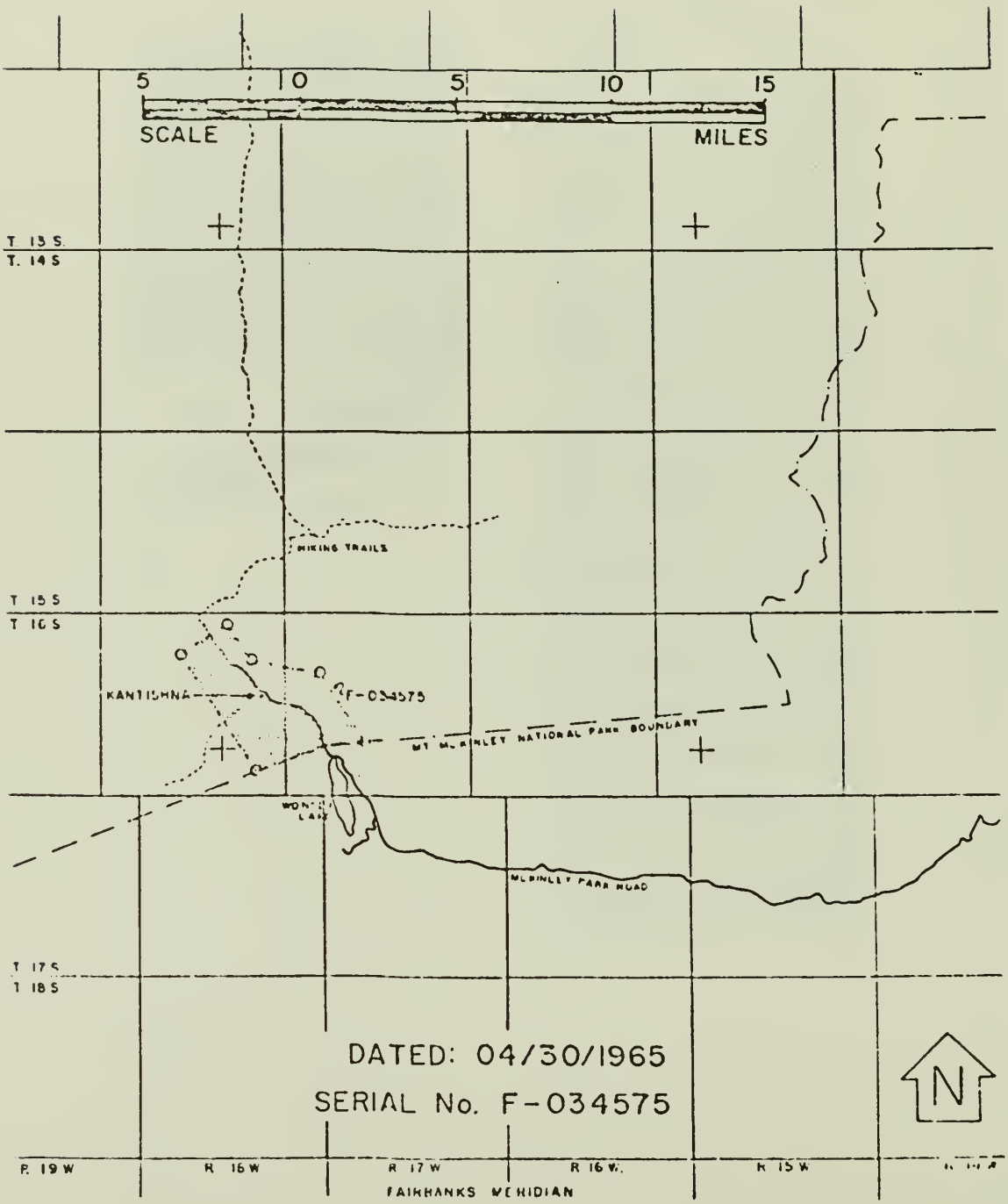
WONDER LAKE, ALASKA

Beginning at a point on the northerly boundary of Mt McKinley National Park adjacent to Wonder Lake, said point being in the vicinity of the intersection of the boundary with Willow Creek and also being twelve thousand five hundred feet (12,500') southwesterly from the boundary angle point adjacent to the Wonder Lake-Kantishna Road; thence N. 32°51' W. twenty four thousand one hundred sixty-seven feet (24,167') to a point; thence N. 57°09' E. nine thousand five hundred eighty-three feet (9,583') to a point, thence S 32°51' E six thousand eight hundred seventy-five feet (6,875') to a point, thence S. 81°06' E twelve thousand four hundred fifty-five feet (12,455') to a point; thence S. 32°51' E fifteen thousand feet more or less (15,000' more or less) to a point on the northerly boundary of the park; thence S 85°02' W. seven thousand five hundred feet (7,500') along the said boundary to the above-mentioned angle point; thence S. 88°40' W. twelve thousand five hundred feet (12,500') to the point of beginning.

The area described aggregates approximately 9,118 acres.

ROSS A. YOUNGBLOOD,
Manager, Fairbanks District and Land Office.

[F.R Doc. 65-5057; Filed, May 12, 1965; 8:49 a.m.]


5
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SCALE
MILES
T. 13 S.
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HIKING TRAILS
T 15 S
T 16 S
KANTISHNA
F-034575
MT MCKINLEY NATIONAL PARK BOUNDARY
MCKINLEY PARK ROAD
T 17 S
T 18 S
DATED: 04/30/1965
SERIAL No. F-034575
N
R. 19 W
R 18 W
R 17 W
R 16 W.
R 15 W
FAIRBANKS MERIDIAN

D: INTERIOR BOARD OF LAND APPEALS (Decision 80-787)

INTERIOR BOARD OF LAND APPEALS

United States Department of the Interior

OFFICE OF HEARINGS AND APPEALS
INTERIOR BOARD OF LAND APPEALS
4015 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22203

NORTHWEST EXPLORATIONS, INC.

IBLA 80-787 Decided January 12, 1981

Appeal from the decision of the Alaska State Office, Bureau of Land Management, declaring various placer mining claims null and void in their entirety and two placer mining claims null and void in part.

Affirmed.

1. Act of June 25, 1910--Mining Claims: Lands Subject to--Mining Claims: Withdrawn Land--Withdrawals and Reservations: Authority to Make--Withdrawals and Reservations: Effect of

   The President had nonstatutory authority to withdraw public land in addition to authority conferred upon him by the Pickett Act, 43 U.S.C. §§ 141, 142 (1970). Such nonstatutory authority was not limited by the terms of 43 U.S.C. § 142 (1970) which provided that withdrawn lands shall remain open to location for metalliferous minerals.

2. Act of June 25, 1910--Mining Claims: Lands Subject to--Mining Claims: Withdrawn Land--Segregation--Withdrawals and Reservations: Generally--Withdrawals and Reservations: Temporary Withdrawals

   Where BLM filed an application for a protective withdrawal pursuant to Exec. Order No. 10355 which would reserve the

subject land from all forms of appropriation including location and entry under the mining laws and the application was duly noted on the official status plats, the lands were segregated from the date of notation to the extent that the withdrawal, if effected, would prevent such forms of appropriation. A protective withdrawal is not a temporary withdrawal under the Pickett Act, 43 U.S.C. § 141 (1970), and is not limited by the terms of 43 U.S.C. § 142 (1970) which provides that temporarily withdrawn lands shall remain open to location for metalliferous minerals.

3. Mining Claims: Lands Subject to--Mining Claims: Withdrawn Land--Withdrawals and Reservations: Effect of

A mining claim located on land which was segregated and closed to mineral entry is properly declared null and void ab initio.

4. Administrative Procedure: Hearings--Constitutional Law: Due Process--Rules of Practice: Appeals: Effect of--Rules of Practice: Hearings

Due process does not require notice and a prior right to be heard in every case where an individual may be deprived of property so long as the individual is given notice and an opportunity to be heard before the deprivation becomes final.

APPEARANCES: Carl Winner, Esq., Robertson, Monagle, Eastaugh & Bradley, Anchorage, Alaska, for appellant; Robert Charles Babson, Esq., Regional Solicitor's Office, Department of the Interior, for the Bureau of Land Management.

OPINION BY ADMINISTRATIVE JUDGE HENRIQUES

Northwest Explorations, Inc., has appealed the decision of the Alaska State Office, Bureau of Land Management (BLM), dated June 13, 1980, declaring 28 Liberty and Chinook placer mining claims null and void ab initio and the Liberty #9 and #29 claims null and void ab initio in part.

On September 25, 1979, BLM received copies of location notices for 30 placer mining claims 1/ which appellant filed in compliance with section 314 of the Federal Land Policy and Management Act of 1976 (FLPMA), 43 U.S.C. § 1744 (1976), and Departmental regulations 43 CFR Part 3833. The claims are located in secs. 19, 20, and 21, T. 16 S., R. 17 W., and secs. 10, 11, 13, 14, 23, and 24, T. 16 S., R. 18 W., Fairbanks meridian, Alaska. The Liberty #1 and Liberty #2 claims were originally located in May 1966 but amended locations were filed in June 1969 to reduce the acreage of the claims. The remaining claims were either originally located or amended in 1969. The amended locations also reduced the acreage of previous association claims in compliance with Alaska State law. 2/

On April 9, 1965, the Director, National Park Service (NPS), requested that BLM "take such steps as may be necessary to withdraw

1/ See Appendix A.
2/ Although Federal mining law allows location of association placer claims up to 160 acres, the Alaskan law enacted in 1949 specifies that no association placer claim for previous metals in Alaska may exceed 40 acres in size or 2,640 feet in length. Alaska Statutes § 27.10.110.

[certain lands in T. 16 S., Rs. 16 and 18 W., Fairbanks meridian] from all forms of disposition under the public land laws--including withdrawal from prospecting, location, entry and purchase under the mining laws." The request explained a need for a withdrawal pending a study by NPS of requirements for additional public accommodations and services related to Mt. McKinley National Park. NPS wanted to ensure that lands would be available to meet those requirements determined necessary by the study. The lands identified by NPS were on the northern boundary of the park in the Kantishna area.

Following approval of the request by Under Secretary of the Interior Carver on April 22, 1965, BLM filed withdrawal application F 034575 to establish a BLM protective area under authority of Exec. Order No. 10355 (43 U.S.C § 141 note (1976)). BLM also published a Notice of Proposed Withdrawal and Reservation of Lands dated May 7, 1965, in the Federal Register on May 13, 1965 (30 FR 6593). The notice stated that the application was for withdrawal of the lands from all forms of appropriation under the public land laws, including the mining laws.

The BLM decision appealed herein indicates that the withdrawal application was noted on the official status plats in the Fairbanks Land Office on May 4, 1965. It explains that pursuant to 43 CFR 2311.1-2(a) (1965) the noting of receipt of the application temporarily segregated the identified lands "from settlement, location, sale, selection, entry, lease, and other forms of disposal under the public land

laws, including the mining and the mineral leasing laws, to the extent that the withdrawal or reservation applied for, if effected, would prevent such forms of disposal." The decision concluded that appellant's claims must be declared null and void because they were located on land segregated from the operation of the mining laws at the time of the locations.

In its statement of reasons, appellant argues that the Kantishna area was improperly withdrawn from mineral entry in 1965. Appellant urges that BLM lacked the authority to withdraw the lands because under the Constitution, Congress holds the power to dispose of the public lands and the only express delegation of that power to the President appeared in the Pickett Act of June 25, 1910, 43 U.S.C. §§ 141-43 (1970) (hereinafter the Pickett Act). 3/ Appellant also argues that

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3/ Relevant portions of the Pickett Act read as follows;

"§ 141. Withdrawal and reservation of lands for water-power sites or other purposes.

"The President may, at any time in his discretion, temporarily withdraw from settlement, location, sale, or entry any of the public lands of the United States, including Alaska, and reserve the same for water-power sites, irrigation, classification of lands, or other public purposes to be specified in the orders of withdrawals, and such withdrawals or reservations shall remain in force until revoked by him or by an Act of Congress. (June 25, 1910, ch. 421, § 1, 36 Stat. 847.)

"§ 142. Lands withdrawn open to exploration under mining laws; rights of occupants or claimants of oil- or gas-bearing lands; national forests.

"All lands withdrawn under the provisions of this section and section 141 of this title shall at all times be open to exploration, discovery, occupation, and purchase under the mining laws of the United States, so far as the same apply to metalliferous minerals: * * *. (June 25, 1910, ch. 421, § 2, 36 Stat. 847; Aug. 24, 1912, ch. 369, 37 Stat. 497.)"

Section 141 was repealed and section 142 amended by the Federal Land Policy and Management Act of 1976, 90 Stat. 2792.

United States v. Midwest Oil Co., 236 U.S. 459 (1915), in which the Supreme Court recognized a broad Presidential withdrawal authority by virtue of congressional acquiescence to a long continuing practice of withdrawals by the President, is of questionable validity because of Youngstown Sheet & Tube Co. v. Sawyer, 343 U.S. 579 (1952), or, at the least, is circumscribed by the Pickett Act.

Appellant also focuses on the distinction between temporary and permanent withdrawals described in Withdrawals of Public Lands, 40 Op. Atty Gen. 73 (1941). The Attorney General had concluded that the Pickett Act applied only to temporary withdrawals for public purposes and did not affect the President's authority to make permanent withdrawals for public uses. 40 Op. Atty Ger. at 76. Appellant contends that the Kantishna area withdrawal was "beyond question" a temporary withdrawal because the Attorney General had characterized such withdrawals as those made pending the enactment of legislation designed to conserve the lands or authorize development of their natural resources. 40 Op. Atty Gen. at 76-77. Appellant alleges that the BLM Kantishna withdrawal application was aimed at conserving the area for later inclusion in Mt. McKinley National Park which could only be enlarged by specific legislation. Appellant concludes that the lands identified in the application should have been left open to mineral entry because the withdrawal would be temporary and therefore limited by the Pickett Act. Appellant also points out that 43 CFR 2311.1-2 (1965) only segregated land "to the extent that the withdrawal * * * if effected, would

prevent such forms of disposal." Since mining was allowed in the park, appellant urges, mining should have been allowed in this withdrawal. 4/

Appellant ends its statement of reasons by asserting that BLM, in issuing the decision, violated its due process rights since BLM did not afford it notice that the decision would be forthcoming and an opportunity to submit written argument on its own behalf.

In response, BLM argues that (1) the withdrawal application herein was filed to establish a BLM protective area and was not a temporary withdrawal pending legislation to add the Kantishna area to Mt. McKinley National Park, (2) the proposed withdrawal of the area was permanent in nature and not subject to the Pickett Act, and (3) even if the proposal were considered to be temporary, the limitations of the Pickett Act are no longer applicable by virtue of continuing congressional acquiescence and ratification of temporary withdrawals from mineral entry. BLM contends that appellant's due process rights have been protected by appeal to this Board.

[1, 2, 3] The question of the authority of the President to make withdrawals and reservations has been addressed by this Board before. We have recognized that, until October 21, 1976, the President held and exercised over a long period of time an implied nonstatutory withdrawal power in addition to that authority which Congress has expressly

4/ Although mining activities had been permitted within Mt. McKinley National Park, 16 U.S.C. §§ 350, 350a (1970), section 3 of the Act of September 28, 1976, 90 Stat. 1342, repealed that authority.

delegated by statute. Glen H. Brooks, 45 IBLA 51 (1980); Alaska Pipeline Co., 38 IBLA 1 (1978); Harry H. Wilson, 35 IBLA 349 (1978); Sally Lester (On Reconsideration), 35 IBLA 61 (1978). In United States v. Midwest Oil Co., supra, the Supreme Court first upheld the exercise of nonstatutorily-based withdrawal authority by the President after examining congressional acquiescence in more than 250 instances of exercise of the power by various Presidents over a period of 80 years. 236 U.S. at 469-71. That decision was never overruled by the Court and the implied authority recognized therein was repeatedly exercised by the President or his delegate. See Mason v. United States, 260 U.S. 545, 553 (1922); Portland General Electric Co. v. Kleppe, 441 F. Supp. 859 (D. Wyo. 1977); Denver R. Williams, 67 I.D. 315 (1960); P & G Mining Co., 67 I.D. 217 (1960); Glen H. Brooks, supra; Harry H. Wilson, supra, Sally Lester (On Reconsideration), supra. In 1952, by Exec. Order No. 10355 (17 FR 4831 (May 28, 1952)), President Truman expressly distinguised between his statutory and nonstatutory authority when he delegated to the Secretary of the Interior both the temporary withdrawal authority set forth in section 1 of the Pickett Act "and the authority otherwise vested in him to withdraw or reserve lands of the public domain * * * for public purposes." Finally, and significantly with respect to this case, Congress repealed "the implied authority of the President to make withdrawals and reservations resulting from the acquiescence of Congress (U.S. v. Midwest Oil Co., 236 U.S. 459)" as well as various statutory withdrawal authorities by section 704(a), FLPMA, 90 Stat. 2792. We may infer

from the language in section 704(a) that Congress continued to recognize the existence of the President's implied withdrawal authority, in addition to statutorily delegated authority, until October 21, 1976.

Given section 704(a) of FLPMA, it does not appear that Congress perceived that United States v. Midwest Oil Co., supra, lost its vitality following Youngstown Sheet & Tube Co., v. Sawyer, supra, as appellant suggests. Furthermore, that case dealt with circumstances entirely different from the case before us: the physical seizure of private property by order of the President. Here we are dealing with the withdrawal authority of the President, both statutory and nonstatutory, related to management of existing public lands. The Pickett Act only limited the President's implied authority as to those temporary withdrawals addressed in 43 U.S.C. § 141 (1970). The President still held a recognized permanent withdrawal authority at the time of the Kantishna withdrawal. Harry H. Wilson, supra.

The question raised by appellant which remains is whether the withdrawal application at issue was or should have been made pursuant to the Pickett Act. Appellant urges that it was intended to be an application for a temporary withdrawal under the Pickett Act and that BLM has unconstitutionally nullified an act of Congress by the withdrawal application herein because the application does not conform to the Pickett Act. We do not agree. The withdrawal notice on its face makes it clear that the proposed withdrawal was not intended to be a

Pickett Act withdrawal. First, it states expressly that the land indentified would be withdrawn from "all forms of appropriation under the public land laws, including the mining laws," directly inconsistent with Pickett Act limitations. See Alaska Pipeline Co., supra at 13. Second, it states that the purpose of the withdrawal is to establish a BLM protective area under Exec. Order No. 10355. (See 30 FR 6593 (May 13, 1965).)

The BLM Manual at section 2321.6 explains that the objective of the protective withdrawal program was "to prevent inadvertent disposal of or the allowance of rights in lands having significant public values which require continued Federal or other public ownership for their preservation." A protective withdrawal is defined as

> a withdrawal of lands, for the purpose of withdrawing such lands from disposition under the public land laws to the extent necessary to protect the public values in the lands until a determination is made as to the use or disposition of the lands. "Bureau of Land Management protective withdrawal" is not a determination that the lands will necessarily continue under BLM administration. "Bureau of Land Management protective withdrawals" generally include withdrawal of the lands from disposition under the general mining laws, and in Alaska, the settlement laws, but usually do not include withdrawal of the lands from the mineral leasing laws, the Recreation and Public Purposes Act, or State selection laws. A "BLM protective withdrawal" may embrace lands used or to be used for various public purposes, including:
>
> a. Administrative sites
>
> b. Natural areas
>
> c. Recreation areas and sites

d. Access road locations

e. Lookout sites

f. Waterfront zones

g. Roadside tracts

h. Roadside zones or strips

i. Research areas

j. Material sites. [Emphasis added.]

Appellant's argument that the Kantishna area withdrawal application was made in anticipation of eventual inclusion of the land in Mt. McKinley National Park is not persuasive. We have no doubt from examining the record of this case that at the time in question NPS may have been studying lands surrounding the park, including those at issue, for recommended expansion of the park. 5/ Nevertheless, in 1965, NPS did not request that the Kantishna area be withdrawn pending passage of legislation to include it in the park; rather, they requested that the land be set aside so that it would be available if NPS determined that public lands adjacent to the park were needed to support additional public accommodations and services because of increasing demands placed on park facilities. NPS was not suggesting that the

5/ On March 9, 1972, pursuant to Exec. Order No. 10355 and section 17(d)(2)(A) of the Alaska Native Claims Settlement Act, 85 Stat. 688, 709, the Secretary of the Interior withdrew various lands in Alaska from all forms of appropriation including entry and location under the mining laws and reserved them "for study and possible recommendations to the Congress as additions to or creation as units of the National Park, Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems." Included in the lands withdrawn were fractional parts of T. 16 S., Rs. 15 through 18 W., Fairbanks meridian. (Public Land Order No. 5170, 37 FR 5579, 5582 (Mar. 16, 1972).)

lands be included in the park for this reason. The administrative vehicle which BLM chose for setting aside the area was the protective withdrawal, not a temporary withdrawal pending legislation to expand the park. If after evaluation, the application for the protective withdrawal had been approved as to some or all of the lands identified, those lands would have been permanently set aside for such public use as BLM determined was necessary. Pursuant to 43 CFR 2311.1-2(a) (1965), the application when noted on the records had the effect of segregating the lands to the same extent that the eventual withdrawal would have segregated them. In this case the application notice expressly prohibited appropriation under the mining laws. Since appellant's mining claims were located after the segregative date, BLM has properly declared them null and void.

[4] Appellant's argument that the failure by BLM to notify it of the BLM decision before issuance and provide it an opportunity to present written arguments on its behalf violates its due process rights is without merit. Due process does not require notice and a right to be heard in every case where a person is deprived of an asserted property right so long as the individual is given notice and an opportunity to be heard before the initial BLM decision, adverse to him, becomes final. Appeal to this Board satisfies the due process requirements. George H. Fennimore, 50 IBLA 280 (1980); Dorothy Smith, 44 IBLA 25 (1979); H. B. Webb, 34 IBLA 362 (1978). Furthermore, status of the public lands is a matter reflected on the public records of this Department and may be officially noticed. No property rights are

created by the location of a mining claim on land not subject to location. Appellant's arguments as to the status of the lands in question involved the interpretation of law, not a dispute as to the facts involved, and thus a hearing was not required. United States v. Consolidated Mines & Smelting Co., Ltd., 455 F.2d 432 (9th Cir. 1971).

Therefore, pursuant to the authority delegated to the Board of Land Appeals by the Secretary of the Interior, 43 CFR 4.1, the decision appealed from is affirmed.

Douglas E. Henriques
Administrative Judge

We concur:

Bernard V. Parrette
Chief Administrative Judge

James L. Burski
Administrative Judge

Claim Name	BLM Serial No.	Discovery Date	Date of Location	Date of Amended Location*
Liberty #1	F-59188	3/6/1966	5/22/1966	6/7/1969
Liberty #2	F-59189	3/6/1966	5/22/1966	6/7/1969
Liberty #3	F-59190	3/6/1966		6/7/1969
Liberty #4	F-59191	3/6/1966		6/15/1969
Liberty #5	F-59192	3/6/1966		6/18/1969
Liberty #6	F-59193	3/6/1966		6/18/1969
Liberty #7	F-59194	3/6/1966		6/18/1969
Liberty #8	F-59195	3/6/1966		6/18/1969
Liberty #9	F-59196	3/6/1966		6/18/1969
Liberty #10	F-59197	3/6/1966		6/15/1969
Liberty #11	F-59198	3/6/1966		6/15/1969
Liberty #12	F-59199	3/6/1966		6/18/1969
Liberty #21	F-59208	3/6/1966		7/19/1969
Liberty #29	F-59216	3/6/1966		7/14/1969
Liberty #30	F-59217	3/6/1966		7/14/1969
Liberty #31	F-59218	3/6/1966		7/15/1969
Liberty #32	F-59219	3/6/1966		7/15/1969
Liberty #33	F-59220	3/6/1966		7/15/1969
Liberty #34	F-59221	3/6/1966		7/15/1969
Liberty #55	F-59242	7/17/1969	7/18/1969	
Liberty #56	F-59243	7/17/1969	7/18/1969	
Liberty #57	F-59244	7/17/1969	7/18/1969	
Liberty #58	F-59245	7/17/1969	7/18/1969	
Liberty #59	F-59246	7/17/1969	7/18/1969	
Chinook #1	F-59250	6/10/1966		6/24/1969
Chinook #2	F-59251	6/10/1966	6/24/1969	
Chinook #3	F-59252	6/10/1966	6/24/1969	
Chinook #4	F-59253	6/10/1966	6/24/1969	
Chinook #5	F-59254	6/10/1966		6/24/1969
Chinook #6	F-59255	6/10/1966	6/24/1969	

*All location notices which purport to be amended specify that the purpose of the amendment is to reduce a previous association claim.

E: CLAIM STATUS AND OPERATION DATA

Table 16: Kantishna Hills Placer Claims and Operations, 1980

Table 17: Kantishna Hills Lode Claims and Operations, 1980

Table 18: Summary of Kantishna Hills Claim Status

Table 19: Chulitna Placer and Lode Claims, 1981

Table 20: Summary of Chulitna Claim Status

Table 21: Other Located Claims

Table 22: Summary of Other Located Claim Status

Table 23: Summary of Claim Status, Denali National Park and Preserve

Table 16: Kantishna Hills Placer Claims and Operations, 1980

BLM Serial No.	Claim Group Name	Owner and Address	Mineral Information	No. of Claims (Total Acreage)*	Access	Operation Completion Date (Length)	Equipment Information (where applicable)	Comments
	Willow Creek Basin							
FF059258-65	Willow #1-#8	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444 (leased by Thomas McMahon 8625 Contoura Drive Orlando, FL 32810)	Gold	8 (160)	Existing upper Moose Creek canyon road; no road exists up Willow Creek streambed		Magnetometer & backpack dredge	Unknown whether any work occurred in 1980 mining season
	Spruce Creek Basin							
FF059266-68	Spruce #1-#3	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444 (leased by Kantu Minerals)	Gold	3 (60)	Existing upper Moose Creek canyon road up streambed of Spruce Creek	1982 (3 yrs)	D-8 Caterpillar; front-end loader; ground sluice	Holt operator in 1980; camp located on Spruce #1
FF059269-73	Spruce #4-#8	Same as above	Gold	5 (100)	Same as Spruce #1-#3		Bulldozer; front-end loader; screen-washing plant; water pump; generator; sluice box	Leased and mined by Anstette & Goolsby early in 1980, but operators relocated to Alder claims on Friday Creek in August 1980; patent survey application filed on Spruce #4 & #5
FF055387-96	Shamrock 1-10	Shamrock Mining Co. 3702 214 S.W. Mt. Lake Terrace, WA 98043 (James W. McBride, Pres.)	Gold	10 (200)	Same as Spruce #1-#8			Shamrock claims 1-8 are overlain by Spruce #1-#8; entire claim group under adjudication
	Glen Creek Basin							
FF061232-46	Gold King #1-#15	Gold King Mines, Inc. Box 1574B Star Route A Anchorage, AK 99507 (Eric E. and Paul R. Wieler)	Gold	15 (300)	Surface access via existing upper Moose Creek canyon road and existing road up Glen Creek canyon and streambed: air-strip exists at headwaters of Glen Creek	2009 (30 yrs)	Reciprocating screen shaker; D-9 Caterpillar; front-end loader; road grader	Operation used approximately 3/4 million gallons of water per day (3,000 gal/min); East Fork of Glen Creek has been mined in the past; Paul Ziegler operated on lease from Wieler brothers downstream on Glen Creek

*A normal placer claim equals 20 acres; an association placer claim equals 40 acres.

	Glen Creek 1-11	Gary B. Golay Star Route Box 9121 Eagle River, AK 99577	Gold	11 (220)	Existing upper Moose Creek canyon road to existing road up to Glen Creek canyon	Projected to 1989 (4 yrs on claims 4, 6, 8, 9, 11) in proposed plan of operations	Front-end loader; shaker-washing plant; sluice	Claim group under adjudication; Glen Creek 11 and Gold King 1 locations in conflict; no recordation with BLM; under review; claim group also contains Glen Creek fractions 6-9
						1983 (4 yrs. on claims 3 & 4)	D-9 Caterpillar; 10-wheel dump truck; front-end loader; 530 International; shaker and sluice	Cripple Creek Mining Co.; data from 1979 plan of operation; status of operation in 1980 unknown
	Rainy Creek Basin							
FF059274-81	Rainey #1-#8	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444 (leased by Kantu Minerals)	Gold	8 (160)	Existing upper Moose Creek canyon road to new Rainy Creek road; (road constructed in 1980 for operation access)	1984 (4 yrs)	1¼ cu. yd. backhoe; bulldozer; trommel-washing plant; 5" pump and pipeline	T.J. Koppenberg, operator in 1980; moved in on July 25, 1980; work began on claim #4 by stripping and wind-rowing vegetation; settling ponds constructed; operation terminated in August 1980; patent survey application filed on Rainey #4 & #5
	Eureka Creek Basin							
FF048856-58	Discovery #1-#3	George Bailey Box 2052 Fairbanks, AK 99707	Gold	3 (60)	Existing road up streambed of Eureka Creek; road was constructed after high water in June 1980	1984 (5 yrs)	Ground sluice; D-4 bulldozer; front-end loader; 4" pump	Operation washed out in June 1980 by high water; rebuilt & operating in July 1980; mining old stream benches
FF052398-404 FF052405-07	Eureka Creek 1-7 Upper Discovery 8-10	Arley R. Taylor Box 489 Bridgeport, WA 98813	Gold	10 (200)	Existing road on Quigley Ridge to existing road paralleling Lucky Gulch down to upper Eureka Creek	1989 (10 yrs)	Elevated sluice; bulldozer; front-end loader	Operations by John Copely and men from former Washington State logging company
	Eldorado/Slate Creek Basin							
FF059192-96 FF059242	Liberty #5-#9 Liberty #55	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444	Gold	6 (120)	Existing road through Kantishna and up existing road in Eldorado Creek canyon			Liberty #5-#9 and #55 declared null and void by IBLA 80-787 on January 12, 1981
FF059200-01	Liberty #13-#14	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444 (leased by Thomas M. Mahan)	Gold	2 (40)	Same as Liberty #5-#9 & #55		Magnetometer & backpack; dredge; possible	Extent of work completed in 1980 undetermined

FF059202-05	Liberty #15-#18	Northwest Explorations, Inc. c/o Dan Ashbrook Box 397 Denali Park, AK 99755 (leased by Kantu Minerals)	Gold	4 (80)	Same as Liberty #13-#14		Trommel-washing plant & sluice bulldozer; front-end loader; 6" pump; mineral jig	
FF059206-07	Liberty #19-#20	Same as above	Gold	2 (40)	Same as Liberty #13-#18			No operations in 1980
FF062095-96	Antimony #1&#2	Jon T. Millhouse Box 426 Denali Park, AK 99755	Gold	2 (40)	Existing road up Eldorado Creek canyon			No operations in 1980
	Friday Creek Basin							
FF046218	Discovery Claim Friday Creek	Louise H. Gallop Box 4-1649 Anchorage, AK 99503	Gold	1 (20)	Existing Denali park road and by foot	Indefinite	Gold pan; 3" floating dredge	Used by visitors to Camp Denali for gold panning
FF059050-56	Alder #1-#7	Jim Fuksa Box 74624 Fairbanks, AK 99707	Gold	7 (140)	Existing Denali park road and by newly constructed road (August 1980) to operation on upper Friday Creek		Floating dredge; shaker-washing plant; bulldozer; elevated sluice; boomer used in the past	Claims used sporadically by Dennis Wyatt's 3" dredge operation in 1980; dredge operation by John Bredau ceased in July 1980; only Alder #2, #3, #4, & part of #1 properly located; Anstette & Goolsby sluicing operation on Alder #2 began in August 1980; Alder #5, #6, & #7 to be adjudicated
	Moose Creek Basin							
FF059257 FF059248-49 FF059230-37	Moose Creek #2 Taybo #3 & #4 Liberty #43-#50	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444 (leased by Kantu Minerals)	Gold	11 (220)	Existing Denali park road	1981 (3 yrs)	Backhoe; HD 11 bulldozer; shaker-washing plant & sluice; 10" x 8" pipeline	Sam Koppenberg (KLK Inc., S.R. Box 145, Palmer, AK 99645), operator; survey application filed on Moose Creek #2, and Taybo #3 & #4
FF059209-15 FF059222-29 FF059238-41 FF059247 FF059256	Liberty #22-#28 #35-#42 #51-#54 Bueno Moose Creek #1	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444 (leased by Thomas McMahon)	Gold	21 (420)	Existing Denali park road; existing upper Moose Creek canyon road		Magnetometer & backpack dredge	John McClain operated on Bueno & Moose Creek #1 in 1979 but did not operate in 1980; patent survey application filed on Moose Creek #1 & Bueno
FF059188-91 FF059199-99 FF059208 FF059216-21 FF059243-46	Liberty #1-#4 #10-#12 #21 #29-#34 #56-#59	Northwest Explorations, Inc. 14401 Pacific Ave. Tacoma, WA 98444	Gold	18 (360)				All claims declared null and void by IBLA 80-787 on January 12, 1981
FF059250-55	Chinook #1 - #6			6 (120)				

FF052018-20	Jauhola #1-#3	Milton C. Jauhola Box 245 Nenana, AK 99760	Gold	3 (60)	Existing Denali park road to existing road adjacent to airstrip at Kantishna, then existing road along Moose Creek			Cabin on claims; no mining activity in 1980; possible assessment work on claims #2 & #3
	Glacier Creek Basin							
FF045437-39	Schmuck #1-#3	Arthur J. Schmuck Box 343 Nenana, AK 99760	Gold	3 (60)	Same access as Jauhola #1-#3 but continuing on road past Jauhola claims over moist tundra in western portion of Kantishna Hills; airstrip exists in creek basin			Did not appear to be operating during 1980 season
FF052015-17	Red Hat #1-#3	Milton C. Jauhola Box 245 Nenana, AK 99760	Gold	3 (60)	Same as Schmuck #1-#3	1994 (15 yrs)	JD 440 5/8 loader; ½-yd shaker; 5" pump; D-2 bulldozer; 6x6 truck; 6" suction dredge	Did not appear to be operating in July 1980
FF055397-401 FF055402	Glacier Assoc. 1-5 Glacier Assoc. Bench 3	Aurora Mining Inc. 3702 214 S.W. Mt. Lake Terrace, WA 98043 (David W. Clark, Pres.)	Gold	6 (240)	Same as Schmuck #1-#3	1983 (Several yrs)	Bulldozer; front-end loader	Operation was to begin June 1980 but was not observed in July 1980 overflight; association claims
FF059057	Yellow Pup #3	Jim Fuksa Box 74624 Fairbanks, AK 99707	Gold	1 (20)	Same as Schmuck #1-#3 and continuing up existing road in Glacier Creek canyon			No activity observed in 1980; this claim is located on Yellow Creek between Yellow Pup #2 & #4 lode claims
	Caribou Creek Basin							
FF052366-71 FF052372-73 FF052374-97	Lee Bench Howtay Assoc. Claim 1-6 Howtay Assoc. Claim 1A & 2A Caribou Howtay Assoc. Claim 1-24	Arley R. Taylor & Arnold E. Howard Box 489 Bridgeport, WA 98813	Gold	32 (1,280)	Existing Denali park road to Kantishna airstrip; then via existing road across moist tundra at western portion of Kantishna Hills across Glacier Creek to Caribou Creek; or existing Quigley Ridge road over Wickersham Dome intersecting road crossing Glacier Creek; two airstrips also exist in creek basin	1996 (15 yrs)		Lease/purchase option requires 1,000 cu yd to be processed per day & a trommel to be part of washing plant; operations were to begin in 1981; 6 miles of bench association claims & 13 miles of creek association claims

Table 17: Kantishna Hills Lode Claims and Operations, 1980

BLM Serial No.	Claim Group Name	Owner and Address	Mineral Information (as available)	No. of Claims (Total Acreage)	Comments
	Glen Creek Basin				
FF061229-31	Silver King 16-18	Gold King Mines, Inc. Box 1574B Star Route A Anchorage, AK	Silver, gold, copper	3 (60)	Work to start on Silver King 18; no discharge planned; not visited in 1980
	Eureka Creek Basin				
F001168	*Silver Pick	Kantishna Mines, Ltd. 2020 Lake Otis Pkwy. Anchorage, AK 99504 (Leo Mark Anthony, Pres.)	silver, gold, lead, zinc (galena, sphalerite)	1 (20)	Adit to be extended into second ore zone; drifting to be done on both veins prior to mining
F001168	*Silver Pick #2	Same as above		1 (20)	
F001168	*Little Maud	Same as above		1 (20)	
F001168	*Francis	Same as above		1 (20)	
F001170	*Sulfide	Same as above		1 (20)	
F001170	*Water Level	Same as above		1 (20)	
F001556	*White Hawk	Same as above		1 (20)	
F001172	*Darling	Same as above		1 (20)	Surface development and underground mining projected
F001165	*Lucky Strike	Same as above		1 (20)	
F000225	*Jupiter Mars	August Quigley Peterson Fairbanks, AK 99701	Lead, zinc, silver, gold	1 (20)	Same as above
F000225	*Chloride	Same as above		1 (20)	
F000225	*Waterloo	Same as above		1 (20)	
F000226	*Chlorine	Same as above		1 (20)	
F000224	*Merry Widow	Same as above		1 (20)	
F000224	*Silver King	Same as above		1 (20)	
F001479	*Blue Bell	Guy B. Erwin Fairbanks, AK 99701	Gold (galena, sphalerite)	1 (20)	
F001479	*Gold King	Same as above		1 (20)	
F001479	*East Gold King	Same as above		1 (20)	

*Indicates patented claims.

F001167	*Keystone	Kantishna Mines, Ltd. and Maurice S. Butler 822 Seventh Fairbanks, AK 99701 (Kantishna Mines, Ltd., has undivided 2/3 interest)	Gold, silver	1 (20)	Surface development and underground mining projected
F001167	*Pennsylvania	Same as above		1 (20)	Same as above
F001167	*Pittsburg	Same as above		1 (20)	
F001167	*Doherty	Same as above		1 (20)	Assessment work but Banjo will be mined eventually
FF054240	Banjo	Kantishna Mines and Red Top Mining Co. 2020 Lake Otis Pkwy. Anchorage, AK 99504	Silver, zinc lead, arsenic	1 (20)	Surface trenches on Banjo and Pass; cut exists on Tugboat Annie; any ore mined to be shipped to mill on Red Top claim
FF054241	Pass	Same as above		1 (20)	
FF054242	Hardrock	Same as above		1 (20)	
FF054243	Tugboat Annie	Same as above		1 (20)	
F001309	*Galena	Estate of Charles McGonagal Fairbanks, AK 99701		1 (20)	
FF055681	Eureka	Arley R. Taylor Box 489 Bridgeport, WA 98813	Silver, zinc copper, antimony, gold	1 (20)	Pollution of Eureka Creek probable; International Mining and Development operator; small-scale mining for evaluation of metallurgy and reserves in 1980
FF058983-84	Venus #1&#2	Jim Fuksa Box 74624 Fairbanks, AK 99707		2 (40)	
FF058985-86	Iron City #1&#2	Same as above		2 (40)	
FF058987-90	Nancy Lee #1-#4	Same as above		4 (80)	
FF058997-99	Stibnite #1-#3	Same as above		3 (60)	
FF059005-13	Silver Dollar #1 -#9	Same as above		9 (180)	
FF059014	Perservence	Same as above		1 (20)	
FF059015	Polaris	Same as above		1 (20)	
FF059016	Oro Fino	Same as above		1 (20)	
FF059017	Challange	Same as above		1 (20)	
FF059018-23	Eureka #1-#6	Same as above	Stibnite	6 (120)	
FF059024-26	Silver Queen #1-#3	Same as above		3 (60)	

FF059034-35	Grizzly #1&#2	Jim Fuksa Box 74624 Fairbanks, AK 99707		2 (40)	
FF059036	Ridgetop #1	Same as above		1 (20)	
	Eldorado/Slate Creek Basin				
FF062091-94	Antimony #1-#4 Slate Creek	John T. Millhouse Box 426 Denali Park, AK 99755	Stibnite (antimony)	4 (80)	Concentrates stored in barrels; projected to go underground in future; no activity observed in 1980
FF059042-49	Comstock #1-#8	Jim Fuksa Box 74624 Fairbanks, AK 99707	Lead, zinc, silver	8 (160)	
FF058991-94	Eldorado #1-#4	Same as above	Antimony	4 (80)	
FF058995-96	Virginia City #1&#2	Same as above	Silver, gold	2 (40)	
FF059027-28	Lucky Tuesday #1&#2	Same as above		2 (40)	
FF059032	Eagles Den #1	Same as above		1 (20)	
FF059033	The Eagle's Den #2	Same as above		1 (20)	
	Friday Creek Basin				
F001168	*Little Annie	Kantishna Mines, Ltd. 2020 Lake Otis Pkwy. Anchorage, AK 99504 (Leo Mark Anthony, Pres.)	Silver, gold, lead, (galena, sphalerite)	1 (20)	Little Annie extension to be surface mined; new adit to be driven south of old adit
F001168	*Little Annie #2	Same as above		1 (20)	
F001168	*Martha Q	Same as above		1 (20)	
F001168	*Golden Eagle	Same as above		1 (20)	Deepen existing 50-foot shaft; cross cut & stope along vein
F001168	*Gold Dollar	Same as above	Silver, lead, gold	1 (20)	Reopening of Golden Eagle adit and new adit on Red Top Lode projected for 1981; reclamation would not be accomplished until 5 years following mining cessation

F001166	*Red Top Lode	Kantishna Mines, Ltd. 2020 Lake Otis Pkwy. Anchorage, AK 99504 (Leo Mark Anthony, Pres.)		1 (20)	Location of 35-ton floatation mill & camp; lode operations to disturb 2 acres of unpatented land on Red #1 and 8 to 10 acres of patented land; tailings ponds located on Red Top claim will continue to be used for mill tailings; waste rock from Red Top mine to be deposited on Red #1
FF045485	Red #1	Same as above		1 (20)	Portal for new Red Top mine adit to be located on Red #1
F001168	*Polly Wonder	Kantishna Mines, Ltd. and Maurice S. Butler 822 Seventh Fairbanks, AK 99701 (Kantishna Mines has undivided 2/3 interest)	Gold, silver	1 (20)	
F001171 F001171	*Star *Friday	Maurice S. Butler 822 Seventh Fairbanks, AK 99701	Silver, zinc (galena, sphalerite)	2 (40)	
	Moose Creek Basin				
F001169 F001169	*Whistler *Bright Light	Kantishna Mines, Ltd. 2020 Otis Lake Pkwy. Anchorage, AK 99504 (Leo Mark Anthony, Pres.)	Silver, gold, lead, zinc	2 (40)	Surface development on Whistler in future included in plan of operation for Red #1 and Red Top
FF059000-01	Highland Surprise #1&#2	Jim Fuksa Box 74624 Fairbanks, AK 99707		2 (40)	
FF059002	Highland Surprise #3 Lode	Same as above		1 (20)	
FF059003-04	Silver Surprise #1&#2	Same as above		2 (40)	
FF059037	Silver Surprise #3	Same as above		1 (20)	
	Glacier Creek Basin				
FF052410-15	Flat Creek Lode 1-6	Arley R. Taylor Box 489 Bridgeport, WA 98813 and J & D Mining 260 E. 50th Anchorage, AK 99507	Lead, silver, zinc, copper, antimony, gold	6 (120)	Small-scale exploratory work to determine grade and reserve; work by International Mining and Development was done on claim #3 in 1980; recent additional surface disturbance apparent

FF059038-41	Little Audrey #1-#4	Jim Fuksa Box 74624 Fairbanks, AK 99707		4 (80)	
FF059029-31	Yellow Pup #1, #2, #4	Same as above	Gold, antimony, copper, silver	3 (60)	
	Caribou Creek Basin				
FF052416 FF052417	Last Chance 1 Upper Last Chance Creek Fork Claim 1	Arley R. Taylor Box 489 Bridgeport, WA 98813	Antimony, gold, silver	1 (20) 1 (20)	Underground workings with tailings piles on surface
FF052418-21	Last Chance Creek Claim 2-5			4 (80)	

Table 18: Summary of Kantishna Hills Claim Status

	Placer Claims			Lode Claims	
	No. of Claims	Acreage		No. of Claims	Acreage
Recorded	150	3,760	Patented	34	680
Recorded (under adjudication)	40	800	Unpatented	92	1,840
Unrecorded (under adjudication*)	11	220	Total	126	2,520
Total**	201	4,780			

	Total No. of Claims	Total Acreage
Placer Claims	201	4,780
Lode Claims	126	2,520
Total	327	7,300

Source: Bureau of Land Management Mining Activity Report, June 1981.

* Under appeal (8/81).
** Includes 51 recorded and/or unrecorded placer claims under adjudication.

Table 19: Chulitna Placer and Lode Claims, 1981
(West Fork Area and Tokositna Areas A and B)

BLM Serial No.	Claim Group Name	Owner and Address	Claim Type and Mineral	No. of Claims (Total Acreage)	Access	Comments
West Fork						
AA022496-99	Money No 1-4	Earle C. Foster 8450 Golden St. Anchorage, AK 99502 Richard A. Pellett 4402 Forest Rd. Anchorage, AK 99503	Placer Gold	4 (80)	Existing road from Colorado along streambed of West Fork of Chulitna River	Evidence of older operation on claims; no current activity
AA023354-55	Black Bear #1&#2	Earle C. Foster 8450 Golden St. Anchorage, AK 99502	Placer Gold	2 (40)	Same as Money 1-4	Stream channel where claims are located are undisturbed; old cabin located on claim #1
AA022500-02	Black Bear No 3-5	Richard J. Pellett 3500 Woodland Park Rd. Anchorage, AK 99503	Placer Gold	3 (60)	Same as Black Bear #1 & #2	No evidence of past mining activity
AA023363-71	Colorado #1-#9	Earle C. Foster 8450 Golden St. Anchorage, AK 99502	Placer Gold	9 (180)	Existing road from Colorado along streambed of West Fork of Chulitna River to mouth of creek; airstrip near abandoned Dunkle mine	Stream channel deeply incised in area of claims; mining in gorge would be difficult
AA013539	Absolution	Paul F. Cordasci Box 174 Eagle River, AK 99577	Lode Gold, arsenic, lead, zinc	1 (20)	No existing surface access; possible access from Golden Zone mine	No evidence of past mining activity; access would be difficult without severe disturbance
AA028919-9166	Nim #1-#160 & #92A	R & M Consultants Box 2630 Fairbanks, AK 99707	Lode Copper, gold, silver, molybdenum	161 (3,220)	Via existing road from Colorado along streambed of West Fork of Chulitna River and old Dunkle mine road to Camp Creek; airstrip near abandoned Dunkle mine	Evidence of survey and extensive exploration work
AA028909-18	Nimbus 1-10	R & M Consultants Box 2630 Fairbanks, AK 99707	Lode Gold, silver	10 (200)	Same as Nim claim group	Same as Nim claim group
AA034579	Glacier Queen	Ohio Creek Mining Corp. c/o Franklin R. Doyle P.O. Box 8460 Anchorage, AK 99508	Lode Copper, Tin, silver	1 (20)	No surface access existing up Ohio Creek	No evidence of past mining activity

AA019439-46	Denson Lode No 1-8	Joe D. Denson Route #1, Box 213B Morgan, TX 76671 Lee P. Glad Box 3100 Kenai, AK 99611	Lode Tin, copper, silver	8 (160)	No surface access existing up Ohio Creek	Some evidence of minor exploration activity; surface access up Ohio Creek would cause severe disturbance
AA023357-62	Golden Flower #1-#6	Earle C. Foster 8450 Golden St. Anchorage, AK 99502	Lode Silver, gold, antimony, copper	6 (120)	Existing road from Colorado along streambed of West Fork of Chulitna River to old Dunkle mine road	Some evidence of activity
Tokositna						
AA039149-56	Tokachitna No 1-8	Larry Cummins Talkeetna, AK 99676 Talkeetna Mines Trust c/o John Jacobsen 700 Ash Place Anchorage, AK 99501	Lode Gold, silver, tin, copper, zinc	8 (160)	No existing surface access up Tokositna River to claim group location	Evidence of survey and exploration; access very difficult in steep terrain
AA030396-98	Tokosha #3-#5	Alaska Mountain Guides, Inc. Talkeetna, AK 99676	Placer Gold	3 (60)	No existing surface access; possible float plane access to Pirate Lake approx. ½ mi. to the west	No evidence of past mining activity

Table 20: Summary of Chulitna Claim Status

	Placer Claims		Lode Claims	
	No. of Claims	Acreage	No. of Claims	Acreage
Recorded	21	420	195	3,900

Table 21: Other Located Claims

BLM Serial No.	Claim Group Name	Owner and Address	Claim Type Mineral	No. of Claims (Total Acreage)	Access	Comments
AA016390-403	Lode No 1-14	Alaska Limestone Corp. 529 West Third Ave. Anchorage, AK 99501	Lode Limestone	14 (280)	No surface access up West Fork of Windy Creek	Located in principal migration route of McKinley caribou herd; null and void decision by administrative law judge in 1981 appealed
AA016407-15 AA016404-05	Mineral Mountain #1-#9 Mineral Mountain #7A & #7B	Mt. McKinley Mercury Mining Co. 12515 Shorewood Lane Seattle, WA 98146	Lode Stibnite, cinnabar	9 (180) 2 (40)	No existing surface access; old airstrip exists on north edge of claim group; road exists from airstrip to claims	Old cabin on site; related mining equipment remains on claim group; extensive development in past; erosion and thawing of permafrost damaging surrounding environment; validity contested
AA016406 AA016424 AA016425 AA016426 AA016416-23	Magnet Sourdough Greenback Terminus Stibner #1-#8	Arley Taylor Wayne Copley 319½ Rimrock Way East Wenatchee, WA 98801	Lode Garnet, copper (galena, sphalerite) Antimony	4 (80) 8 (160)	Old airstrip located north of claims	Validity contested
FF034273 FF034274 FF034275 FF034276 FF034277 FF034278 FF034279 FF034280 FF034281 FF034282 FF034283 FF034284 FF034285	Grant Dina Pearson Luella Louise Murie Kathleen Blondie Corbley Rumohr Blossoms Norman Billie	Harold Herning Box 1792 Fairbanks, AK 99707	Lode Gold, silver, lead, copper, zinc	13 (260)	No existing surface access	Claims visible from Eielson visitor center; some development has occurred in the past; validity contested

Table 22: Summary of Other Located Claim Status

	No. of Claims	Acreage
Lode Claims	50	1,000

Table 23: Summary of Claim Status, Denali National Park and Preserve

	No. of Claims	Acreage
Kantishna Hills		
Placer Claims*	201	4,780
Lode Claims	126	2,520
Chulitna Area		
Placer Claims	21	420
Lode Claims	195	3,900
Other Located Claims		
Lode Claims	50	1,000
Total	593	12,620

* Includes 51 recorded and/or unrecorded placer claims under adjudication.

F: CLAIM TYPES AND OPERATIONS

PLACER CLAIMS

A placer deposit is a mass of gravel, sand, or similar unconsolidated material resulting from the decomposition and erosion of bedrock that contains particles of valuable heavy minerals such as gold and platinum. Stated another way, placer is a term applied to deposits of one or more minerals that have accumulated in quantities of economic importance through natural weathering and transportation processes. The four types of placer deposits are (1) alluvial, or stream, deposits that include both recent and ancient placers that were deposited by fluvial action; (2) eolian, or wind-formed, deposits that are arranged by the wind, sometimes concentrating the more valuable heavy minerals; (3) residual deposits that are formed when the heavier valuable minerals remain near the bedrock source after weathering has removed lighter material; and (4) beach deposits that are the result of wave and offshore current action along lake beaches and seashores. Most placer claims in the Kantishna Hills and Chulitna study areas are on alluvial deposits. All placer-mining claims must conform as nearly as practicable with the U.S. system of public land surveys and the rectangular subdivisions of such surveys, even though the claims may be located on unsurveyed lands. On unsurveyed land, placer claims may also be located by metes and bounds.

No location for a placer claim can exceed 20 acres for each individual participating claimant. However, an association of two locaters may locate 40 acres, three may locate 60 acres, and so on up to an association of eight locating 160 acres--the maximum area that can be included in locating a placer claim. Although federal law provides for an association up to 160 acres, Alaska state law limits such claims to 40 acres. Corporations are limited to 20-acre claims (Maley 1979).

The method selected to mine a given deposit is typically based on the recovery efficiency for the minerals present and the operating cost of the equipment. Mining operations in Kantishna Hills have included the sluice box, mechanized washing plants (such as the shaker and trommel), the "boomer," ground sluice, and dredges.

Generally, placer mining in Kantishna Hills occurs on streams that drain areas near where lode deposits were mined or prospected. The heavy minerals in the placer concentrates probably come directly from such nearby sources. Most of the gravels mined are within streambeds, although bench gravels on Glacier Creek are known to be auriferous as well (USDI, GS 1973a). There are also bench placer claims located along lower Caribou Creek as well.

The majority of placer operations lie near timberline, where the streams typically run free of ice from May until late September. The mining season is limited to approximately a four- to five-month period. However, late in the summer, some of the smaller streams diminish so much in volume that they do not supply sufficient water for continuous sluicing, further restricting the length of the mining season. Most experienced miners in the area rely on an approximate 100- to 120-day working season (USDI, GS 1919b).

PLACER-MINING TECHNIQUES

Overburden Removal

Overburden is material composed of vegetation, soil, muck, and gravel that covers the placer deposit and must be removed before mining can actually begin.

Overburden removal in Kantishna Hills is accomplished by mechanical means, primarily utilizing bulldozers, front-end loaders, or backhoes. This work usually occurs within streams or stream channels. The fine sediments in the material being excavated within a stream are washed away by the water in amounts varying with streamflow rate, the type of material, and the amount of material actually exposed to the water. Where overburden removal, or stripping, occurs away from active streams, eroding of sediment occurs from spoil piles into stream courses from successive rainstorms (ADEC 1978).

Because stripping and excavating frozen material is usually difficult and expensive, overburden removal in permafrost areas is accomplished in stages by first stripping to the frost line, allowing a period of time for thawing, then stripping more area.

Although not currently utilized in Kantishna Hills, another feasible method of overburden removal is the use of high-pressure water streams, or hydraulicking. This method must have a relatively large water source, as it typically uses 1,700 to 50,000 gpm, depending on the number and sizes of hydraulic nozzles, or "giants," that are used. This large water requirement produces a heavy load of suspended solids, and of all the overburden removal techniques, this may result in the most critical or severe water quality effects (ADEC 1978).

Sizing and Recovery

Sluicing. A sluice is an inclined trough through which gold-bearing gravel is moved by a stream of water. Flowing water is directed through the sluice, washing the rock and mineral down the slight slope of the box. Gold and other heavy materials are caught by riffles located in the bottom of the sluice (Lewis and Clark 1964).

Water for sluicing operations may be supplied by the total streamflow, by a ditch that diverts only a portion of the total streamflow, or by a pumping unit connected to a catchment basin where stream water is impounded.

The two basic types of sluices are elevated and bedrock. The elevated sluice provides an effective recovery system without gradient constraints. The sluice box is fed with placer gravels by a front-end loader or large backhoe. Water from manifolds, or nozzles, washes the gravel out of the

dump box and down the sluice over a series of riffles. Once the gravels have traversed the trough, they accumulate at the end of the sluice box where they are periodically moved away.

The bedrock, or ground, sluice simply uses the gravel-lined stream channel as the sluice and large volumes of water to wash the bulk of the gravels. It is a relatively inefficient method and rarely used today.

The riffles in sluice boxes were once underlain by burlap or canvas, but a more popular material utilized today is Astroturf, which has a greater fine-gold recovery efficiency.

Trommels and Undercurrents. A trommel is a rotating cylindrical screen through which material passes lengthwise for washing and sizing. An important characteristic of this technique is its ability to break down clay-bonded ground and cemented gravels.

Undercurrents provide a means of fine-gold recovery and usually consist of a separate assembly built into the lower part of the sluice box. Care is taken to maintain a constant moderate streamflow rate to avoid surging. These systems, while requiring regular cleanup, have been credited with saving up to 20 percent of the total gold yield in an operation.

Suction Dredges. Dredges used today in placer mining are of two types--the large floating dredge and the suction dredge. The latter is the type used in Kantishna Hills, as it is a one- or two-man operation and designed for use in small streams. Although overburden may be dredged with the suction dredge, it must occur in the streambed gravels. This is not overburden removal in the sense previously discussed and is not handled as a separate operation from the mining itself (ADEC 1978).

Booming. This method of mining requires no mechanical equipment and is used to the greatest advantage in narrow restricted streams with steep gradients where coarse gold in nugget form is known to occur. The method is also applicable to streams with low water flows.

Basically, booming consists of damming and impounding water from the stream, then using controlled water discharge from the impoundment, ground sluicing the streambed area below the dam. Theoretically, this cleans the surface of the bedrock downstream, allowing coarse gold to be collected by hand. Control of water discharge is achieved by installation of a top or bottom discharge gate. The one known boomer operation in Kantishna in 1978 utilized a bottom discharge gate. In addition, a discharge chute is important to carry water clear of the gate and dam to prevent backcut erosion.

Gold Pan. The gold pan is a circular steel dish from 10 to 16 inches in diameter at the top and 2 to 2½ inches deep, with sides sloping at 35 to 40 degrees to the horizontal. The pan is utilized primarily for testing placer deposits and for working pockets and smaller placer deposits. A

pan of gravel is placed in water and stirred by hand to break up lumps of clay. Larger stones are removed, and the pan is given a gyratory motion to settle the heavier particles. The pan is tilted frequently, and the surface layer of material is washed off. At the end of the process, gold is separated from the remaining minerals by either adding mercury to amalgamate the gold or by removing iron impurities with a magnet. Most surface deposits rich enough to be mined and concentrated by panning were exhausted long ago. The gold pan is used today mainly as a tool in prospecting and exploration of placer deposits being considered for bulk-mining methods.

LODE CLAIMS

A lode is a zone, or belt, of mineralized rock that is clearly separated from neighboring nonmineralized rock. The deposit can be a well-defined vein or thin mineral streak, differing in appearance from the general mass of adjacent rock, or it can be a broken, scarcely distinguishable mass similar to the adjacent rock.

A lode claim must not exceed a parallelogram 1,500 feet by 600 feet. Federal law requires the end lines of lode claims to be parallel to each other. Lode claims must be designated with reference to the lines of the public land survey, where applicable; however, it is not necessary that the claims conform to the public survey, and posts or stone monuments should be established at the corners of the claim to mark the claim boundaries. At the point of the discovery, or discovery shaft, a post or stake should be placed containing information on the name of the lode, name or names of the locaters, and the number of feet claimed on each side of the discovery point.

To determine whether the quantity of ore, its mineability, and value per ton are of sufficient economic magnitude to constitute a legal discovery, the question must be answered whether "a person of ordinary prudence would be justified in the further expenditure of his labor and means, with a reasonable prospect of success, in developing a valuable mine" (Maley 1979).

The lode claims in Kantishna Hills contain varying amounts of gold, silver, arsenopyrite, pyrite, argentiferous galena, sphalerite, stibnite, and chalcopyrite. The main deposits are those containing chiefly lead, silver, zinc, antimony, and gold as the principal valuable metal. In addition, mercury and tungsten occur in single deposits. The best known lead-silver-zinc deposits are near Friday and Eureka creeks, and stibnite has been found near Slate and Caribou creeks. The gold lodes are similar to other main lode types in Kantishna Hills in that they are commonly in schist near exposed intrusive rocks. Gold is also a minor constituent of the lead-silver-zinc deposits and a few of the antimony lodes (USDI, GS 1967).

LODE-MINING AND MILLING TECHNIQUES

Lode-mining techniques depend on the (1) the size (tonnage), shape, and grade of the ore body; (2) the mineralogy and distribution of the ore or ores; (3) geology of the ore body; and (4) waste rock location. Other factors involved are the blasting, or ripping, characteristics of the rock, bench level intervals, pit shape, adits, shafts, exploratory drilling, haulage roads, power, and communications.

In addition, prior to the development of an ore body, it must be determined if the deposit can best be mined by an underground method or a surface method.

Underground Methods

Stoping, the technique of excavating ore in a series of steps, is a common underground mining method. The outlines of the ore body define the outlines of the stope.

Open Stoping. Small ore bodies are often completely mined out leaving no pillars in place to support the walls of the stope. In some kinds of rocks, it is possible to mine out huge stopes that remain open for years. Room and pillar stoping, which is a form of open stoping, is commonly done in flat or gently dipping bedded ore. Pillars are left in place in a regular pattern while the "rooms" are mined out.

Shrinkage Stoping. Shrinkage stoping is accomplished by mining the ore body from beneath, allowing the broken ore to support the walls of the stope, while leaving sufficient space above the broken ore for miners to work. The broken ore is drawn from below through ore chutes to maintain necessary headroom. Steeply dipping veins with well-defined hard walls are most suitable for this method.

Cut-and-Fill Stoping. Cut-and-fill stoping is similar to shrinkage stoping, except that as ore is removed from the mine a layer of waste is placed in the stope to support the walls and serve as a platform for miners and equipment. This eliminates the expense of hoisting the waste rock to the surface for dumping.

Square-Set Stoping. This method is used where the ore is weak and the walls are not strong enough to support themselves. As a block of ore is mined, it is replaced by a "set," which is a cubic frame of timber. The sets interlock and are filled with waste rock or sand. Square-set stoping requires high-value ores because it is a slow and expensive technique.

Block Caving. This method is used in mining large ore bodies that have a barren or low-grade capping that is too thick to strip away from the surface. Raises are driven up to the ore. The entire ore block is undercut so that it will cave into the raises. The weight of the capping and ore crushes and moves the ore downward. As the ore is removed, the capping will gradually descend and the surface over the worked-out mine subsides.

Surface-Mining Methods

Open Pit Mining. The basic concept of an open pit mine is simple but requires complex and costly planning to develop a large deposit. The ore grade and tonnage determine how much waste rock can be stripped, and the limits of the pit are governed primarily by economics. Bench level intervals, for the most part, determines the type of shovel or loader, and the character of the ore determines the type of mining equipment to be used.

Glory Holing. Glory holing involves a mine opening at the surface from which ore is removed by gravity through raises connected to adit haulageways beneath. The glory hole method is best suited to mining on a hillside. Reclamation of the surface is the chief objection to this method.

Ore Dressing (Milling)

At most large modern mining operations, whether underground or surface, the ores are milled at or near the mine. This involves the mechanical separation and concentration of valuable ore minerals from the accompanying ore materials and worthless minerals, or gangue. The resulting concentrate contains the valuable minerals.

Crushing and Concentration. The ore usually undergoes two stages of crushing, followed by grinding in a mill to a size small enough to liberate the ore minerals.

The most widely used method of concentration for complex and low-grade sulfide ores is done by flotation. The ground up ore is "pulped" with water and chemical reagents. The desired ore minerals attach themselves to air bubbles in the pulp mixture and float to the surface, leaving the valueless minerals behind. Often several stages of flotation and different reagents are employed.

Gravity concentration, with a box-like apparatus (called a jig), is used when the ore minerals are heavier than the accompanying mineral and rock material. The ore is stratified in the jig by the action of water

alternating in rapid succession. During the concentration process, particles of different density arrange themselves according to size and specific gravity.

Magnetic separation is utilized with highly magnetic ores. The separation process can be wet or dry. In the wet process, magnetic drum separators are used to lift the magnetic particles from a stream of ore pulped with water. In a dry process, the magnetic particles are lifted from a moving stream of ore by a moving magnetic cross belt.

OTHER CLAIM TYPES

In addition to placer and lode claims, there are two other mining claim types. Although these do not exist in Denali National Park and Preserve, they will be briefly addressed.

Mill Site

A mill site claim cannot exceed 5 acres in size. The site can be located, if needed, by the holder of a lode claim for mining and milling purposes or by the holder of a placer claim for mining, milling, processing, beneficiation, or other operations in connection with such a claim or for the purpose of establishing and maintaining a custom or independent quartz mill or reduction works.

Tunnel Site

A tunnel site claim is located to secure an area for a mining-related tunnel. It gives a locater exclusive right to prospect an area 3,000 feet by 3,000 feet where work on the tunnel is being pursued with reasonable diligence. Further, the owner has possessory right to 1,500 feet of any blind lodes cut, discovered, or intersected by the tunnel.

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