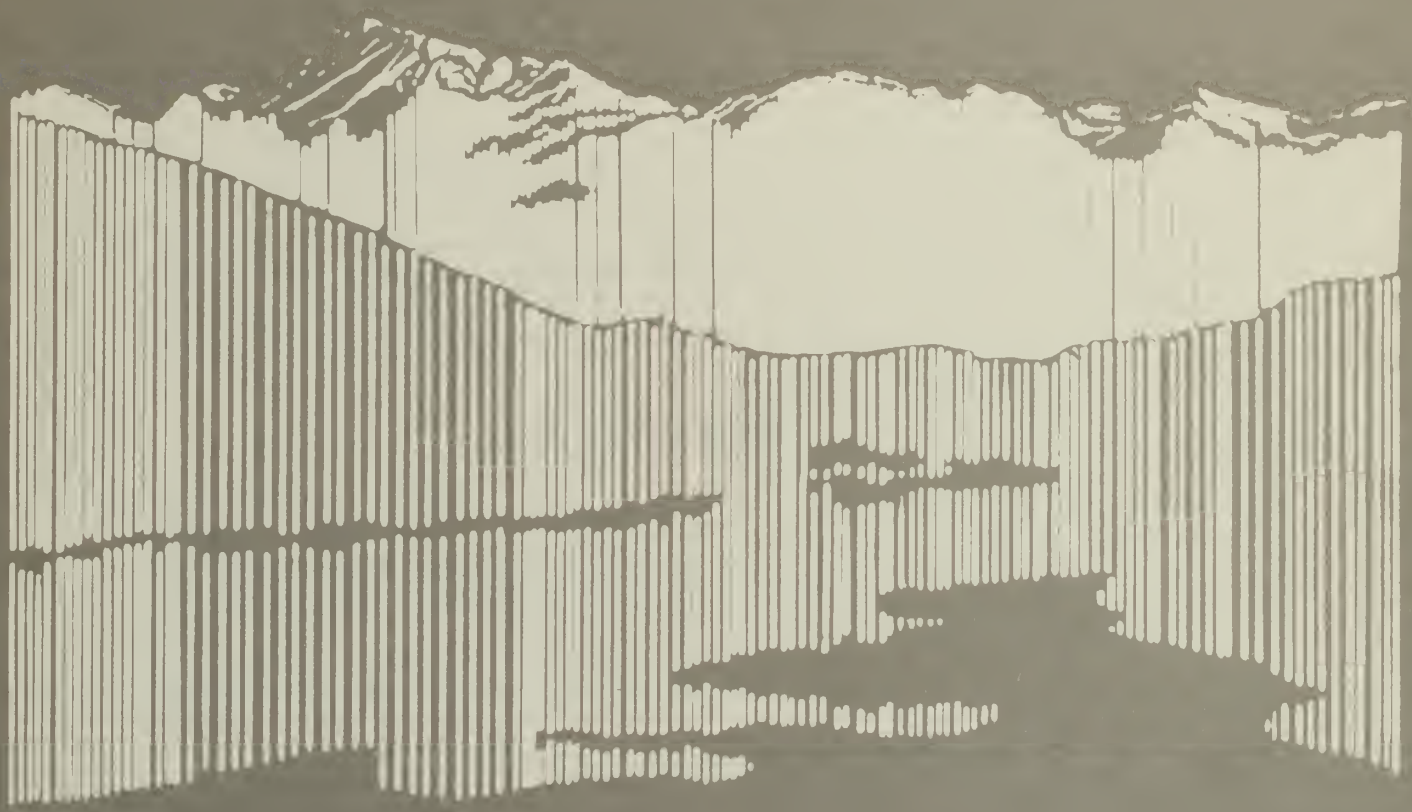
GAAR

environmental overview and analysis of mining effects

june 1983

GATES OF THE ARCTIC

NATIONAL PARK AND PRESERVE / ALASKA



GATES OF THE ARCTIC

NATIONAL PARK AND PRESERVE

ENVIRONMENTAL OVERVIEW AND ANALYSIS OF MINING EFFECTS

DENVER SERVICE CENTER
NATIONAL PARK SERVICE / UNITED STATES DEPARTMENT OF THE INTERIOR

This document does not fulfill compliance requirements of the Code of Federal Regulations (36 CFR 9A), the National Environmental Policy Act of 1969, or the federal historic preservation laws and regulations.

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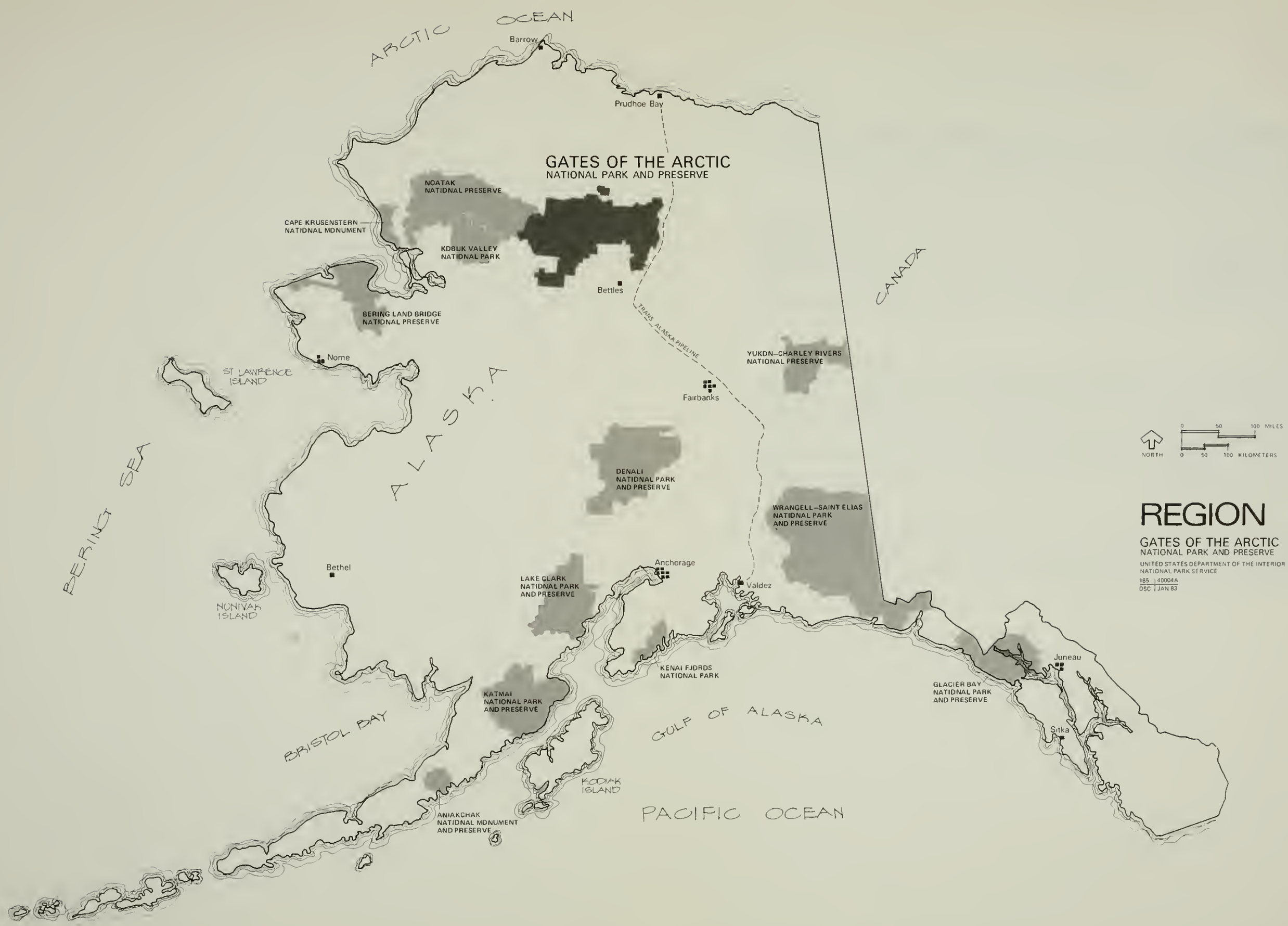
PURPOSE OF THE STUDY

The Environmental Overview and Analysis of Mining Effects for Gates of the Arctic National Park and Preserve (GAAR) is intended to assist the National Park Service and other interested agencies and individuals in assessing the effects of existing and future mining activities and to facilitate the processing of proposed mining plans of operations.

This document does not fulfill environmental compliance requirements pursuant to the 1969 National Environmental Policy Act (NEPA), federal historic preservation laws and regulations, or requirements of the Code of Federal Regulations (36 CFR 9A). Compliance must be achieved individually on each plan of operations received from an operator. The information in this document is intended for use in preparing individual compliance documents and assisting in the preparation of plans of operations.

Gates of the Arctic National Park and Preserve is situated in the central Brooks Range of Alaska, approximately 200 air miles north of Fairbanks, and encompasses approximately 8,090,000 acres of public lands (see Region map). The park currently contains 327 recorded mining claims; these claims existed prior to establishment of Gates of the Arctic as a unit of the National Park System in December 1978. In June 1981, onsite reconnaissance surveys of the existing mining claims in the Koyukuk and Noatak river regions were conducted by the Park Service to gather pertinent environmental data and to evaluate present and historical levels of activity on the claims.

Although some claims may prove to be invalid after NPS examination, all existing claims recorded with the Bureau of Land Management (BLM) are considered in this document except those claims located after the area was withdrawn from mineral location and entry.



REGION

GATES OF THE ARCTIC
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LEGISLATIVE HISTORY

The Gates of the Arctic region was brought to public attention during the 1920s and 1930s, largely as a result of Robert Marshall's writings about his summer and winter travels in the area (Marshall 1956). Over the years, the area became recognized as an outstanding part of the largest remaining wilderness in the United States and as a place of remarkable beauty and ecological integrity that was not yet represented in the National Park System.

In 1972, much of the park and preserve area was withdrawn from public entry and disposition under the public land and mining laws pursuant to section 17(d)(2) of the Alaska Native Claims Settlement Act. This section also provided for studies of areas (including Gates of the Arctic) for possible inclusion into the National Park System, National Forest System, National Wildlife Refuge System, or National Wild and Scenic Rivers System. As a result of these studies, bills were introduced in Congress during the 1970s to establish Gates of the Arctic as a national park. However, the bills languished, with no final action being taken.

On November 16, 1978, under authority of section 204(e) of the Federal Land Policy and Management Act, some 9,698,500 acres in north-central Alaska, encompassing the present GAAR boundary, were withdrawn for up to three years to protect Congress's options for national interest land legislation. On December 1, 1978, Gates of the Arctic was created as a national monument by Presidential Proclamation 4617, and the area was added to the National Park System. The Alaska National Interest Lands Conservation Act (ANILCA) of December 2, 1980, legislatively formalized the unit as the Gates of the Arctic National Park and Preserve (see appendix A for legislative information).

Gates of the Arctic National Park and Preserve was established "to maintain the wild and undeveloped character of the area, including opportunities for visitors to experience solitude, and the natural environmental integrity and scenic beauty of the mountains, forelands, rivers, lakes, and other natural features; to provide continued opportunities, including reasonable access, for mountain climbing, mountaineering, and other wilderness recreational activities; and to protect the habitat for and the populations of fish and wildlife, including but not limited to, caribou, grizzly bears, Dall sheep, moose, wolves, and raptorial birds."

The park's "Statement for Management" (May 1982) provides a means for evaluating conditions and identifying major issues and information voids for future planning and compliance documents. The document also identifies the preliminary management objectives for the park, which for mineral activities states, "Assure compliance of mining interests in maintaining high environmental standards for the protection and preservation of natural resources."

The Park Service has proprietary jurisdiction over all federal lands within the GAAR boundary. Therefore, Alaska State laws apply in the park and preserve, in addition to other more stringent federal regulations (see appendix B for mining laws and regulations).

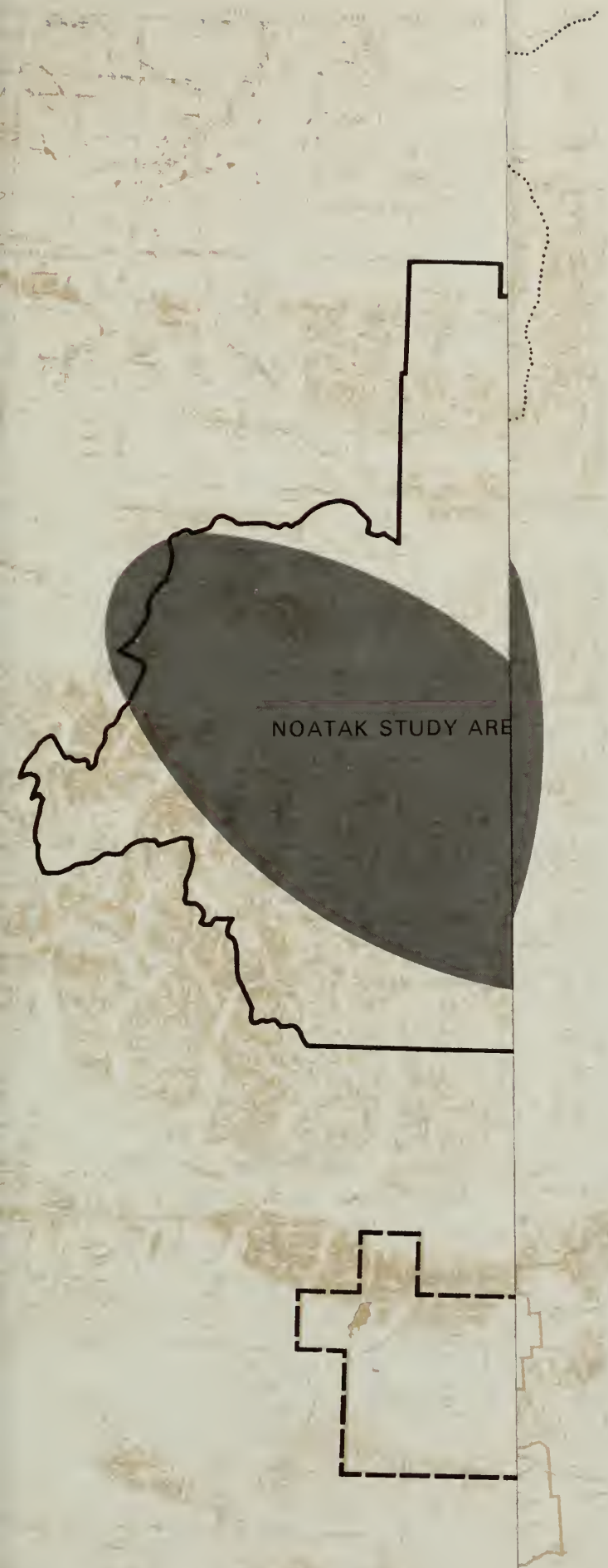
MINING CLAIM STATUS

Gates of the Arctic contains 280 recorded unpatented placer claims encompassing approximately 9,300 acres and 47 recorded unpatented lode claims covering some 940 acres. In addition, there are 23 placer claims encompassing 460 acres that the Bureau of Land Management has declared null and void. The claims occur in two primary areas--along upper tributaries of the Koyukuk River in the eastern portion of the park and along the Noatak River in the western portion (see Study Areas - Koyukuk and Noatak River Regions map).

The majority of mining claims occur in the Koyukuk River region, primarily along tributaries of the North and Middle forks of the Koyukuk River. This area contains 250 recorded placer claims and 1 recorded lode claim. In addition, there are 22 null and void placer claims in the Koyukuk area. The Noatak River region contains 9 recorded placer claims and 46 recorded lode claims, spread over three separate creek drainages. There are approximately 21 other recorded placer claims in the park, located primarily in the Wild River Basin, and 1 placer claim declared null and void by the Bureau of Land Management that is located in the Kobuk River Basin. Mining claim maps for the study areas and drainages are located in a back pocket of this document.

Table 1 lists by drainage all claim groups recorded with the Bureau of Land Management and details the present status of each claim group and any evidence of mining activity. For individual claim locations, refer to the mining claim maps in the back pocket. Names and addresses of claimants listed with the Bureau of Land Management in November 1982 are found in appendix C.

For information on types of mining claims and mining operations, see appendix D.



TRANS-ALASKA PIPELINE AND DALTON HIGHWAY

PRESERVE BOUNDARY

PARK AND WILDERNESS BOUNDARY

NORTH

0 5 10 15 MILES

0 5 10 15 20 KILOMETERS

STUDY AREAS
KOYUKUK AND NOATAK RIVER REGION

GATES OF THE ARCTIC
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NOATAK STUDY AREA

KOYUKUK STUDY AREA

WISEMAN *

* BETTLES

TRANS-ALASKA PIPELINE AND DALTON HIGHWAY

PRESERVE BOUNDARY

PARK AND WILDERNESS BOUNDARY

NORTH

0 5 10 15 MILES

0 5 10 15 20 KILOMETERS

STUDY AREAS
KOYUKUK AND NOATAK RIVER REGION

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Table 1: Mining Claim Summary

Drainage/ Claims or Claim Groups	Location	Number of Claims	Claim Type	Acreage	Claim Status	Evidence of Previous Activity
NORTH FORK KOYUKUK RIVER	Fairbanks Meridian					
Bonanza Creek	T31,32N/R15W					
Bonanza Creek Group		31	Association placer	1,240		
Conglomerate Creek	T31,32N/R14,15W					
Conglomerate Creek Group[1]		39	Association placer	1,560		Access road in lower end of drainage; dragline and sluice box present on lower end of creek, but not being operated; exploratory excavations in stream channel near confluence with Harp (Creek)[2]
Jim Pup Group		9	Association placer	360		
Joe Pup Group		13	Association placer	520		
Harp (Creek) Group		24	Association placer	960		
Big Four Association Group[1]		14	Association placer	420	No annual filing for 1981	
Glacier River	T30N/R14W					
Aras Group		3	Placer	60		
Rose Group		2	Placer	40	No annual filings	
E & T		1	Placer	20	No annual filings	
Alice Group		7	Placer	140	Declared null and void by BLM (2/7/83)	
Carol Ann #1		1	Placer	20	No annual filing for 1981	
Golden Lady #2		1	Placer	20	Declared null and void by BLM (2/7/83)	
End of Rainbow		1	Association placer	40		
Horse Creek	T29N/R14W					
Tracie Lynn Group		9	Placer	180	Declared null and void by BLM (2/7/83)	
Golden Lady #1		1	Placer	20	Declared null and void by BLM (2/7/83)	
Ipnek Creek	T29,30N/R15W					
Ipnek Creek Group		29	Association placer	1,160		Claim corners found at mouth of creek not associated with Ipnek Creek claims recorded with BLM; corners are for Iceworm claims that are not recorded with BLM
O'Malley Creek Group		5	Association placer	200		
O'Houlihan Creek Group		8	Association placer	320		

[1]Portions of the Conglomerate Creek Group and the Big Four Association Group on Conglomerate Creek overlie each other.

[2]Harp is an unnamed tributary to Conglomerate Creek; however, for purposes of reference in this document, it was assigned the same name as the claim group located on it and appears as Harp (Creek).

Drainage/ Claims or Claim Groups	Location	Number of Claims	Claim Type	Acreage	Claim Status	Evidence of Previous Activity
La Rowe (Creek)[3]	T29N/R14W					
La Rowe Group		6	Placer	120	No annual filing for 1981	
La Salle Creek	T29,30N/R14W					
Hansen Group		3	Placer	60	No annual filings for 1980-81	
Myers Group		3	Placer	60	Declared null and void by BLM (11/22/82)	
Mascot Creek	T31N/R13W					
Mascot Creek Group		22	Placer	440		Active mining operations
Wally Creek Group		7	Placer	140		
NORTH FORK KOYUKUK RIVER TOTALS (Recorded)		218 claims		7,680 acres		
(Null and Void)		21 claims		420 acres		
LOWER HAMMOND RIVER	Fairbanks Meridian					
Canyon Creek	T31N/R12W					
BVK Group (#2 and 4 and 5)		3	Placer	60	No annual filing on claim #2 in 1981	Old access road into creek from Hammond River on north side of drainage; flagged tree at approximately NE corner of claim 5
Hammond River	T31,32N/R11W					
Hammond River Group		2	Placer	40	Hammond River #2 claim declared null and void by BLM (August 1982)	Several trees flagged on claim #1
Snowshoe Creek	T31N/R12W					
Snowshoe Creek Group		5	Association placer	200		2-foot-square hole containing wooden ladder; probably associated with drift mining located on claim #3
Pasco Creek	T31N/R12W					
Pasco Creek Group		2	Association placer	80		
Pasco 1[4]		1	Lode	20	No specific location information	
Washington Creek	T31N/R12,13W					
Washington Creek Group		14	Placer	280	Filed after area closed by Public Land Order (PLO) 5213 (6/6/72)	No activity on stream channel; however, bulldozer tracks leading to stream from Glacier Pass, on the east side of the Hammond River
BVK 3		1	Placer	20		
LOWER HAMMOND RIVER TOTALS (Recorded)		27 claims		680 acres		
(Null and Void)		1 claim		20 acres		

[3]La Rowe is an unnamed tributary to the North Fork, just west of Horse Creek; however, for purposes of reference in this document, it was assigned the same name as the claim group located on it and appears as La Rowe (Creek).

[4]These claims were not mapped due to the lack of location data.

Drainage/ Claims or Claim Groups	Location	Number of Claims	Claim Type	Acreage	Claim Status	Evidence of Previous Activity
MIDDLE FORK KOYUKUK RIVER	Fairbanks Meridian					
Alder Creek Alder Group	T27N/R14W	2	Placer	40		
Middle Fork Koyukuk Down River Group	T26N/R14W	2	Association placer	80		No mining activity; claim corners present not associated with Down River claims; corners are for First Chance group that are not recorded with BLM
MIDDLE FORK KOYUKUK RIVER TOTALS (Recorded)		4 claims		120 acres		
UPPER HAMMOND RIVER	Fairbanks Meridan					
Kalhabuk Creek BVK 1	T33N/R10W	1	Placer	20	No annual filings for 1980-81	
UPPER HAMMOND RIVER TOTAL (Recorded)		1 claim		20 acres		
KUYUKTUVUK CREEK	Fairbanks Meridan					
Kuyuktuvuk Creek[5] Aldon 2	T36N/R10W	1	Placer	20	No annual filings for 1980-81	No evidence of mining or claim corners
KUYUKTUVUK CREEK TOTAL (Recorded)		1 claim		20 acres		
NOATAK RIVER AND TRIBUTARIES	Kateel River Meridian					
Lucky Six Creek Alaska's Lost Dutchman	T25N/R18E	1	Placer	20	No annual filing for 1981 and no specific location information	

[5]Several claims located along Kuyuktuvuk and Trembley creeks were filed after the area was closed by PLO 5653 (11/16/78). They are considered null and void ab initio and are not addressed in this document.

Drainage/ Claims or Claim Groups	Location	Number of Claims	Claim Type	Acreage	Claim Status	Evidence of Previous Activity
Nigikpalvgururvrak Creek	T27N/R13E					
Joiners Creek Group		8	Placer	160		Old cabin remains; unclear if associated with early mining attempts; no evidence of mining or claim corners; portions of the Discovery at mouth of Joiners Creek claim are recorded as two separate claims by two claimants
Ningyoyak Creek	T28,29N/R11E					
Ningyoyak Creek Group		42	Lode	840	Under contest	Some claim corner markers; some exploration excavations observed
Wolverine Group		4	Lode	80	No annual filing for 1981	
NOATAK RIVER AND TRIBUTARIES TOTALS (Recorded)		55 claims		1,100 acres		
WILD RIVER AND TRIBUTARIES[6]	Fairbanks Meridian					
East Creek	T30N/R16W			(Approx.)		
East Creek Group		2	Association placer	40	Portions of 2 claims extend into park	
Fall Creek	T30N/R16W			(Approx.)		
Fall Creek Group		11	Association placer	280	4 whole claims and 7 portions of claims extend into park	Temporary camp was set up at claim #2 Above Discovery; unclear if associated with mining activity
Otto Creek Group		8	Association placer	(Approx.) 300	Portion of Discovery claim outside park	
WILD RIVER AND TRIBUTARIES TOTALS (Recorded)		21 claims	(Approx.)	620 acres		
KOBUK RIVER AND TRIBUTARIES	Kateel River Meridian					
Kobuk River	T16N/R17E					
Knee Creek[7]		1	Placer	20	Declared null and void by BLM (11/16/82)	
KOBUK RIVER AND TRIBUTARIES TOTAL (Null and Void)		1 claim		20 acres		
TOTALS (Recorded)		327 claims		10,240 acres		
(Null and Void)		23 claims		460 acres		
GRAND TOTALS		350 claims		10,700 acres		

[6]The Wild River and tributaries claims are not addressed in this document because only portions of the claim groups are located within the GAAR boundary.

[7]The Knee Creek claim is not addressed in this document (nor was it mapped) because it was filed after the area was officially closed to mineral entry.

CURRENT MINING ACTIVITIES

During June 1981, only the claim group on Mascot Creek was being actively mined. This creek drainage has been subjected to mining since before the turn of the century. In 1981 the operation primarily used a bulldozer, a front-end loader, a slick plate, and a sluice box with associated support equipment. The operation required several buildings for housing and storage and employed seven people. Operations were conducted from the first of May to mid-September in 1981.

When the ground is frozen, access to the area for large equipment and supplies is gained by track vehicle from the Nolan area, through Glacier Pass, over existing trails. When the mining operation is active in the summer, access to the claim area is via an airstrip located at the mouth of Mascot Creek. From the airstrip, light trucks are driven up the stream channel on an existing road. The mining camp is about 3 to 4 miles upstream from the confluence of Mascot Creek with Glacier River.

No other obvious mining activity was being conducted on any of the other claims. However, although not observed during the 1981 survey, it is known that mining on the BVK #2 and 4 and 5 group on Canyon Creek involved the use of a small instream suction dredge, the effect of which is only evident during operation.

The operation on the Snowshoe group on Snowshoe Creek employed an underground placer-mining method known as drift mining. In permafrost areas, drift mining is normally carried out only during the winter months when freezing temperatures prevent thawing of the frozen ground; the gold-bearing gravels are thawed and stored for future processing.

OTHER MINERAL-RELATED CONCERNS

AMBLER MINING DISTRICT ACCESS

Congress recognized that valuable mineral deposits existed on the southern slope of the Brooks Range, adjacent to the southwestern park boundary. In section 201(4)(b) of ANILCA, it provided for an access corridor to be used for surface transportation purposes across the "boot" area of the park, from the Ambler Mining District to the trans-Alaska pipeline haul road, now the Dalton highway (see appendix A).

Provisions of this ANILCA section are not effective unless an application for a right-of-way is filed. If an application is filed, the secretaries of the interior and transportation jointly prepare an environmental and economic analysis report solely for the purpose of determining the most desirable route, with terms and conditions that would be attached to the right-of-way. This analysis is prepared in lieu of an environmental impact statement, which would otherwise be required by NEPA (1969), and is not subject to judicial review (see appendix A).

Although an access corridor parallel to the southern boundary of the park would have many unpredictable and potentially far-reaching effects, it would not provide increased access to any existing mining claims within the park. Construction of this mining access road would lead to increased access for many purposes, including mining, settlement, and recreational use. All of these uses would lead to substantial increases in activity, physical disturbance, and associated environmental effects along the park boundary.

KURUPA LAKE ACCESS

Section 1431(j)(1) of ANILCA provided for access parallel to the GAAR northern boundary to lands near Kurupa Lake and the Killik River drainage for development of any oil and gas reserves. This access could eventually involve construction of a major road and pipeline alongside a previously undisturbed portion of the park. Further, section 1431(j)(2) also provided for the secretary of the interior to make available to Arctic Slope Regional Corporation such sand and gravel as is reasonably necessary for the construction and maintenance of a Kurupa Lake corridor. Section 1431(k) provided for accelerated permitting by waiving all NEPA requirements in selecting the preferred routing and evaluating potential impacts. The final right-of-way corridor alignment and location of all appurtenances is left to the discretion of the secretary of the interior (see appendix A).

In addition to road and pipeline construction, the actual exploration and development of the oil and gas reserves may also pose potential threats to park resources. In the Kurupa Lake area, the U.S. government owns the surface estate, but Arctic Slope Regional Corporation retains subsurface oil and gas and other hydrocarbon rights in certain sections. Also, certain areas were leased prior to NPS acquisition; the Park Service must now manage those leases. In the Itkillik Lake area, inside the

preserve portion, subsurface mineral rights were granted to the Arctic Slope Regional Corporation, and seismic exploration activities have been conducted.

MINING CONCERNS ADJACENT TO THE PARK

Operations on mining claims adjacent to the park have potential for affecting resources administered by the Park Service. Adverse effects could involve degradation of air and water quality, reduction of aesthetic quality, threats to aquatic resources and wildlife, and reduced quality of recreational opportunities. Development of the Ambler Mining District poses the greatest potential for mining activity outside the park that may affect park values, but other claims are also located near Wild Lake along Michigan Creek and along the Middle Fork Koyukuk River. Since the Park Service cannot directly control these operations, it must maintain close consultation with the appropriate landowner or land-managing agency to ensure that NPS resources are considered.

the environment

CLIMATE

Gates of the Arctic lies within two major climatic zones--an area dominated by continental climate conditions lying generally south of the Brooks Range crest and a zone of dominant arctic influence extending from the central ridgeline of the range north to the Arctic Ocean.

General characteristics of the Continental zone include large annual and diurnal temperature variations, combined with mostly low precipitation and low wind speeds. The Arctic zone is generally characterized by smaller variations in temperature, lower precipitation, and higher winds than the Continental zone.

Most GAAR mining claims are concentrated in the Continental zone; however, local differences caused by the mountainous terrain are common. Seasonal temperature extremes in this zone can range from the -70°F in the winter to summertime highs in the 90°F range. Diurnal temperature ranges reach 30°F in both seasons. Although it is possible for the temperature to reach freezing any night of the summer, particularly in the higher mountain valleys, summer temperatures are usually pleasant, with 30 to 40 days each year reaching a maximum of 70°F or higher (Watson et al. 1971).

Winters are long and bitterly cold. Weather data from stations at Bettles, which is actually located south of the Brooks Range but may serve as an indicator of Brooks Range weather, and Wiseman indicate that the average maximum July temperature is 68°F, and the average low is approximately 46°F. January temperatures average -3°F to -4°F for a high to average lows of -20°F. Data for Bettles indicate that the last spring freeze occurs on May 25 and the first fall freeze on August 22 (Selkregg 1974). The average date for ice breakup on the Koyukuk River at Bettles is May 6, freeze-up occurs around October 21. For those streams and rivers where the mining claims are located, freeze-up dates can be expected to occur somewhat earlier while breakup dates can be somewhat later (Selkregg 1974). The short duration of the ice-free season is significant from a mining standpoint because most placer mining is active only during this period.

Precipitation amounts in the park are relatively light, averaging from 12 to 18 inches annually in the Mount Igikpak region west of the Alatna River to 8 to 12 inches over the slightly drier Mount Doonerak region to the east. However, over the higher sections of the range (and in the upper reaches of the major river valley), precipitation can be expected to exceed 20 inches annually. The three-month period from late June to early September is the wettest time of the year, when the area receives over half its total annual precipitation. Thunderstorm activity is relatively frequent for latitudes this far north, with some locations averaging between five and ten thunderstorms each summer (USDI, NPS 1974). Rainfall intensities from these storms is not well known, however, information from historical documents (Marshall 1956; USDI, GS 1913a and 1913b; Young 1974) seems to indicate storm intensities can be high, with

frequent and severe flooding occurring during the summer months. The shallow depth to permafrost in the region can also increase the suddenness of flooding due to these storms and the fact that little of this rainfall can percolate into the ground. Measurable precipitation occurs about 100 days out of each year. Normally, snow falls in eight to nine months of the year, averaging between 60 and 100 inches each season.

The frequency and intensity of thunderstorms is an important consideration for mine operators because most operations are in narrow stream valleys where flood flows could destroy settling ponds and damage equipment.

Surface winds at lower elevations are generally light throughout the year, while prevailing wind direction, although influenced by local terrain features, is from the southwest. Wind speeds in the lowlands rarely exceed 35 to 45 mph but generally increase with increasing elevation (USDI, NPS 1974).

The Koyukuk River region of Alaska receives continuous sunshine approximately 30 days during the summer while the Noatak River region receives continuous sunshine for several days longer. In contrast, a maximum of only 1 hour and 40 minutes of sunshine is received in the Koyukuk region on the shortest winter day. Cloudy skies are evident approximately 245 days of the year, with the highest incidence of cloudiness occurring on the North Slope during the summer.

The claims located along the Noatak River are located in an area of the park where arctic influences begin to dominate. Although no specific data exist for this area of the park, it is expected that annual and diurnal temperature variations would be less and wind speeds higher.

HYDROLOGY/WATER QUALITY

All mining claims located within Gates of the Arctic fall within the two major river basins of the Koyukuk and Noatak. The Koyukuk study area contains 84 percent of the claims currently listed by the Bureau of Land Management and the Noatak region contains the rest.

Koyukuk Study Area

The Koyukuk area lies in the eastern portion of the park (see Study Areas - Koyukuk and Noatak River Regions map). The Koyukuk River is a major tributary of the Yukon River, draining over 32,400 square miles of the southern slope of the Brooks Range from the Alatna River eastward to the Chandalar River. The North Fork Koyukuk drains approximately 1,826 square miles of park lands and is the major stem of the river within the park where the mining claims are located. Some claims are also located on the Middle Fork Koyukuk and its tributaries, which has a drainage area of 852 square miles.

Tributaries to the North Fork where mining claims are located include the Glacier River and Alder, Bonanza, Conglomerate, Horse, Ipnek, La Rowe,

La Salle, Mascot, and Washington creeks. Middle Fork tributaries with mining claims include the Hammond River and Canyon, Kalhabuk, Kuyuktuvuk, Pasco, Snowshoe, and Trembley creeks (see Key Drainages - Koyukuk Study Area map).

All the streams and rivers of this region are generally clear, with suspended sediment loads less than 100 milligrams per liter (mg/l) (Selkregg 1974). Although the major streams, such as the North Fork and Glacier River, carry slightly higher sediment loads and suspended solids, overall quality of surface water is excellent throughout the region.

Because no major glaciers directly feed the stream systems in either study area, flow patterns are controlled by the annual freeze and thaw cycles--snowmelt and summer rainfall. High water periods and floods occur normally during the summer, but the greatest possibility is during late spring and early summer when spring rains add to snowmelt runoff.

During the winter, overflow (or "river icings") may occur when shoals in the river channel freeze, causing upstream flow to break to the surface so that water spreads out over a large area and freezes into a thick ice sheet. This ice can last far into the summer season, long after the normal snow pack has melted.

Permafrost is essentially continuous under the GAAR region, reaching a thickness of several hundred feet in the Wild Lake area just outside the park boundary. In most areas permafrost is typically only 1 to 2 feet below the surface and may, in some cases, be only a few inches below the surface. Permafrost may also underlie streambeds where the depth and extent of frozen alluvium varies with flow characteristics of each stream and with the amount of flow each season. Higher flows would be expected to melt ice to greater depths and over a broader cross section of the stream channel.

Official streamflow records do not exist for the watersheds containing mining claims in the park. However, information from other streams in this region of Alaska permits calculation of an estimated discharge, measured in cubic feet per second (cfs), for each of the watersheds containing mining claims, using average flows per square mile of drainage. Hydrological characteristics of each watershed, including the drainage area and estimated average discharges, are shown in table 2. It must be emphasized that discharges in one water year may vary significantly from another year. Table 3 supplements the discharge estimates in table 2 with instantaneous discharge values measured in the field on selected streams during 1981. Discharge estimates are from single-point time/period measurements.

Climatological data indicate that a mean annual low monthly runoff for this region of Alaska can drop to near zero (Selkregg 1974). Although highly abnormal, this variability of annual precipitation is significant in relation to placer operations because relatively large quantities of water are required for this type of mining. Mining operations, such as at Mascot Creek, would be difficult to conduct in low water years unless the operation uses increased recycled technology to better conserve the available resource (personal communication, Reeves, ADEC 1983). In

KEY DRAINAGES
KOYUKUK STUDY AREA

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Table 2: Hydrological Characteristics of Selected Streams - Koyukuk Study Area

Drainage	Drainage Area (Sq. Mi.)	Stream Length (Miles)	Highest Elevation in Watershed (Approximate)	Average Stream Gradient (Degrees)	Mean Annual Runoff[1] (cfs)	Mean Annual Peak Runoff[2] (cfs)	Number of Mining Claims
Bonanza Creek	16.4	8.6	3,800	1	16.4	459	31
Conglomerate Creek	44.0	15.8	4,600	1½	44.0	1,232	99
Horse Creek	8.4	5.8	4,800	4	8.4	235	10
Ipnek Creek	28.4	8.5	6,000	3	28.4	795	42
La Rowe (Creek)	28.9	8.1	6,000	3	23.9	669	6
La Salle Creek	24.7	9.5	5,900	3	24.7	692	6
Mascot Creek	19.2	8.2	4,100	3	19.2	538	29
Canyon Creek	18.5	8.0	5,100	3	18.5	518	3
Snowshoe Creek	2.9	2.4	3,300	5	2.9	81	5
Pasco Creek	1.1	1.4	2,900	3	1.1	31	3
Washington Creek	12.3	6.6	4,600	2½	12.3	344	15
Alder Creek	16.5	10.9	4,500	2	16.5	462	2
Kalhabuk Creek	14.0	5.2	5,000	1	14.0	392	1
Trembley Creek	17.3	6.8	6,500	4	17.3	484	0

[1]Assumes regional mean annual runoff of 1.0 cfs/square mile (Selkregg 1974).

[2]Assumes regional mean annual peak runoff of 28 cfs/square mile (Selkregg 1974).

Table 3: Measured Stream Characteristics - Koyukuk Study Area

Drainage	Date Measured	Location	Discharge (cfs)	pH	Water Temp (°C)
Bonanza Creek	6/14/81	2.4 miles upstream from mouth	35	8.0	9
	6/15/81	1.4 miles upstream from mouth	65[1]	7.9	10
Conglomerate Creek	6/17/81	3/4 mile above Harp (Creek) confluence (6 miles from mouth of Glacier River)	--	8.1	10
Harp (Creek)	6/17/81	Just above confluence with Conglomerate Creek	--	8.1	9
Glacier River	6/23/81	Just below confluence with Horse Creek	--	7.8	12
Horse Creek	6/23/81	Just above confluence with Glacier River	5	7.7	7
Ipnek Creek	6/19/81	At confluence with North Fork Koyukuk River	--	7.7	8
La Rowe (Creek)	6/24/81	Approximately 1 mile upstream from mouth	13	7.5	7
La Salle Creek	6/23/81	Just above mouth	24	7.4	9
Mascot Creek	6/24/81	Approximately 3 miles upstream from mouth	13	7.8	16
Canyon Creek	6/25/81	Below confluence with Sunrise Gulch	8	7.8	11
Hammond River	6/25/81	At confluence with Jennie Creek Lake (outlet)	--	7.6	11
Jennie Creek Lake (Outlet)	6/25/81	Between Jennie Creek Lake and Hammond River	--	7.2	14
Snowshoe Creek	6/25/81	3/4 mile above Wiseman Creek	--	7.6	9
Washington Creek	6/25/81	Approximately 1½ miles upstream from mouth	6	7.7	9
Alder Creek	6/23/81	Approximately 7.2 miles upstream from mouth	--	7.3	6
Middle Fork Koyukuk	6/24/81	2 miles below Tramway Bar	--	7.9	12
Trembley Creek	6/25/81	At confluence with Kuyuktuvuk Creek	55	7.9	4

[1]Higher reading occurred on the morning following an afternoon thunderstorm on 6/14/81.

larger watersheds, such as Conglomerate Creek, circumstances may permit operations to continue in low water years but at a slower pace unless more efficient use of available water is incorporated into the plan of operations (personal communication, Reeves, ADEC 1983). The high variability and unpredictability of runoff in this area of Alaska makes placer mining difficult to plan on a long-range basis.

Little information is available on the chemical quality of water in these creek basins. However, the nature of these watersheds permits some general statement to be made about overall water quality, since all are located in terrain of low to moderate elevation. Generally, the chemical quality of surface waters is good, with dissolved solids usually less than 50 mg/l. Where test data are available, waters were high in calcium carbonate and low in iron concentrations (Selkregg 1974). Table 3 also summarizes temperature and pH data collected on selected streams during the 1981 field season. The pH ranged slightly alkaline in most streams, consistent with waters that are of the calcium carbonate type as mentioned by Selkregg. Water temperatures ranged from a low of 4°C on Trembley Creek to a high of 16°C on Mascot Creek.

Groundwater within the region originates from unfrozen bedrock fractures beneath the permafrost zone and locally in alluvium above or beneath permafrost or in unfrozen alluvium beneath or adjacent to riverbeds. In most areas, however, water movement is dictated by permafrost boundaries; where the frozen alluvium extends to bedrock, the unconsolidated deposits are unproductive (Selkregg 1974).

Groundwater supplies in the Koyukuk study area are most likely to originate in the alluvium of the main drainage channels. However, wells may have to be drilled through permafrost to reach suitable aquifers, where wells are likely to yield from 10 to 100 gallons per minute (gpm) (Selkregg 1974). Most small mining operations with limited domestic water requirements meet their needs with surface water from area creeks or springs, as is the case with the Mascot Creek mining operation.

It is likely that the quality of groundwater varies in the drainage basins according to types of geological materials present. Areas of high mineralization will yield groundwater higher in dissolved solids, and surface waters passing over mineralized areas are likely to pickup minerals in solution.

Pollution of groundwater is rare in the watersheds of this region, but bacterial contamination of above-permafrost groundwater is likely at most active mining sites where camps have been established.

Noatak Study Area

The Noatak area lies in the extreme western edge of the park (see Study Areas - Koyukuk and Noatak River Regions map). All claims in this area are on the Lucky Six, Nigikpalvgururvrak, and Ningyoyak tributaries to the Noatak River.

The Noatak, a major Alaska river, totals 435 miles in length and drains some 12,000 square miles of watershed. Its headwaters lie in the Mount Igikpak area, from which it generally flows westerly and southerly until it empties into Kotzebue Sound just north of the village of Kotzebue (see illustration 1). Within the park the river is confined in a 2 to 3 mile wide U-shaped valley where it meanders through glacial and fluvial sediments and where a large, wide floodplain, thaw ponds, and oxbow lakes are common features (USDI, GS 1913b; Young 1974).

Illustration 1. Upper Noatak River Valley.

Although tributaries of the headwaters of the Noatak River are fed by small glaciers, the river and most of its tributaries are clear water systems, with suspended sediment loads less than 100 mg/l (Selkregg 1974; Young 1974) and overall excellent water quality.

As with the Koyukuk study area, flooding and high flow periods are common in the summer along the Noatak River and its tributaries.

The entire river basin is underlain by continuous permafrost, with thermokarst lakes, ice-wedged polygons, pingos, and solifluction slopes as common features (Young 1974).

Hydrological characteristics of the watersheds with mining claims in the Noatak study area are presented in table 4. Again, because there are no flow records for any of the streams in this region, discharge values are estimated by extrapolation of values in other similar watersheds in the area where data exist. Table 5 contains additional data collected on the streams during 1981 and supplements the discharge data presented in table 4.

Table 4: Hydrological Characteristics of Selected Streams - Noatak Study Area

Drainage	Drainage Area (Sq. Mi.)	Stream Length (Miles)	Highest Elevation in Watershed (Approximate)	Average Stream Gradient (Degrees)	Mean Annual Runoff[1] (cfs)	Mean Annual Peak Runoff[2] (cfs)	Number of Mining Claims
Lucky Six Creek	25.1	9.0	6,200	3	50.2	1,255	1
Nigikpalvgururvrak Creek	44.0	14.3	5,600	1	88.0	2,200	8
Ningyoyak Creek	10.1	6.2	4,800	3	20.2	505	46

[1]Assumes regional mean annual runoff of 2.0 cfs/square mile (Selkregg 1974).

[2]Assumes regional mean annual peak runoff of 50 cfs/square mile (Selkregg 1974).

Table 5: Measured Stream Characteristics - Noatak Study Area

Drainage	Date Measured	Location	Discharge (cfs)	pH	Water Temperature (°C)
Nigikpalvgururvrak Creek	6/27/81	Less than 1 mile above mouth just below river bench	121	7.5	8
Ningyoyak Creek	6/27/81	Approximately 2 miles above mouth where stream leaves foothills	30	6.9	4

GEOLOGY/MINERAL RESOURCES

This area of the Brooks Range is a remote area of rugged, glaciated east-trending ridges that rise to elevations of 4,000 to 8,000 feet or more. Part of the Rocky Mountain System, the range is a gaunt, glaciated divide lying completely across the northern part of Alaska.

Gates of the Arctic lies within the physiographic provinces of Arctic Foothills, Arctic Mountain, and Western Alaska (USDI, NPS 1974). Two primary mountain ranges make up the central Brooks Range--the Endicott and Schwatka mountains.

The present form of the range resulted from uplifting that took place 10 to 20 million years ago. Further uplift, erosion, and heavy glaciation account for the rugged mountain profiles, U-shaped valleys, and braided stream valleys evident today. The southernmost belt along the south flank of the range is a sequence of metasediments and metavolcanic rocks that have undergone regional metamorphism. Major rock types are quartz mica schist and chloritic schist, as well as greenstones, glaucophane-bearing schists, and porphyroblastic schists. There are also a few thin interlays of carbonate rocks including marbles and dolomites. The sequence is intruded by a few thin tabulate bodies of granite.

North of the metamorphic belt lies a sequence of metaclastic rocks and massive carbonates--mostly marbles--of undetermined age. Massive carbonates of Mississippian age continue northward in a zone more than 50 miles wide. Structure in most of the carbonate terrane is characterized by thrust faulting.

The northern carbonate and metaclastic sequence is intruded by a series of granite plutons in the central part of the range. Many of the plutons are porphyritic, with large phenocrysts of potassium feldspar. The interior parts of the plutons, near Mount Igikpak and the Arrigetch Peaks, are generally very coarse-grained and massive. The contact zones around the granite plutons are complex, and compositional variations are common. Magmatic contact zones are typical, as are inclusions of country rock, in the granite near the contact zones. Hornfelsed rocks in the contact zones are variable in character and composition and include biotite-garnet, hornfels, gneissic rocks, and skarns. The granite was apparently highly mobile during the intrusive phase, and multiple sill-like bodies of aplite are common locally around the borders of the plutons. The granite intrusions apparently postdate the major thrust faulting (USDI, NPS 1974).

Koyukuk Study Area

Most of the mining claims are located in this study area, which lies in an area dominated by the Endicott Mountains. These mountains form the watershed division between the Yukon drainage on the south and the streams and rivers that discharge into the Arctic Ocean on the north. The mountains are deeply dissected and extensively glaciated. Below Glacier River on the North Fork and below Coldfoot on the Middle Fork, the topography becomes less dramatic, with low mountains and wide, flat, gently sloping ridges, and a few areas of basin lowlands.

Mineral interest in this region has mostly focused on placer gold, with some attention to lode gold (USDI, BOM 1979). Local mineralization appears to have taken place along thrust-fault zones, with indications of copper, lead, zinc, gold, antimony, and tungsten. A zone of stratiform copper mineralization is also reported in the Ipnek Mountain area within calcareous schist along a thrust plate.

A trend of gold placer deposits extends from Wiseman westward across the North Fork Koyukuk to Wild Lake (USDI, BOM 1979). This trend is roughly bounded on the north by the Tinayguk River and on the south by the mouth of the Glacier River. Mineral production in the region has been limited to placer gold.

Four major glaciations have been recognized within this region of the Brooks Range (USDI, GS 1979b). The first glaciation (Anaktuvuk) took place over 200 million years ago. The second (Sagvanirktok) is thought to have overlaped the Illinoian glaciation period of central North America. The last two glacial periods (Itkillik and Alapah) are thought to have correlated with the Wisconsin advance in central North America (USDI, GS 1979b). Glaciers were generated at relatively high altitudes near the crest of the range and during the more extensive glaciations. Ice flowed from these sources southward through the major valley systems to terminate at and beyond the south flank of the range.

Lineaments are evident in unconsolidated deposits within Glacier River east of Mascot Creek and along the North Fork below Rock Creek. These features are expressed as aligned and unusually straight swales, gullies, and vegetation lines, sometimes associated with stream deflections such as along Glacier River across from Mascot Creek.

The following brief description of selected stream drainages containing mining claims has been adopted from preliminary geological mapping conducted by the U.S. Geological Survey (USDI, GS 1971 and 1979b).

Bonanza Creek. This creek passes through chloritic siltstones, phyllite, and carbonate rocks before passing into glacial till near the Koyukuk. Two small normal faults cut across the mid-area of the drainage.

Horse, La Rowe, and La Salle Creeks. These creeks originate in complex thrust-faulted terrains composed primarily of calcareous schists, quartzite, and some interbedded marble. The claims on these creeks are mostly located on large fan deposits at the mouths of canyons. Both Horse and La Rowe creeks also cut through morainal ridges in the area of the claims.

Conglomerate Creek. Conglomerate flows through a complex geological terrain cut by several faults. Claims lying above Harp (Creek) are bounded by steep, highly unstable siltstone cliffs on the east side and unconsolidated glacial till and morainal deposits on the west side (see illustration 2). This portion of Conglomerate Creek also cuts through a morainal ridge. The country rocks in this watershed are mainly ferruginous siltstones, black limestone, chloritic siltstone, and phyllite.

Illustration 2. Steep unstable cliffs on lower Conglomerate Creek in vicinity of Discovery claim on Conglomerate.

Ipnek Creek. This basin is composed primarily of calcareous siltstone and phyllite, with narrow bands of shale, slate schist, and dolomite in the upper reaches of the watershed. The claims are principally on glacial till in the upper and mid-reaches of the creek and on fan deposits in the lower reaches of the creek. Several large arcuate (bowed) morainal deposits extend from glaciated tributary valleys to Ipnek Creek. The fan deposits at the mouth of Ipnek Creek represent a complex gradation between alluvial and lucustrine deposits left behind by a morainal dammed lake during the Itkillik glaciation. These deposits in turn interfinger with thick kame-terrace deposits (sand and gravel debris deposited against the edge of a glacier) from the same glaciation period.

Mascot Creek. Mascot Creek passes through much of the same terrain as Conglomerate Creek.

Canyon Creek. Canyon Creek originates in geological terrain containing chloritic siltstone, slate, and phyllite. The deep narrow gorge, cut by Canyon Creek where the BVK claims are located, appears to be cut through glacial drift material deposited downstream from an extensive terminal moraine on Hammond River. Just upstream of the gorge, thick lucustrine deposits formed behind the morainal deposits cover the claim areas.

Hammond River. The claims on the outlet from Jennie Creek Lake and the Hammond River lie in an area of thick glacial drift and lucustrine

deposits. Just downstream from these claims, the Hammond River has cut a deep narrow gorge through these same deposits, as well as a large morainal ridge left behind by a receding valley glacier of the Itkillik glaciation period.

Alder Creek. Alder Creek heads in a complex terrain of mafic green-schist, quartz-mica schist, phyllite, and undifferentiated volcanic rocks. In the area of the Alder claims, the rocks are covered by a thin, weakly stratified glaciated till.

Middle Fork Koyukuk River. The Middle Fork in the area of the Down River claims bisects a thick igneous pebble conglomerate, which in this area is covered by a thin layer of glacial till and outwash material.

Noatak Study Area

The Noatak study area is an east-west trending, high mountain valley located north of the Schwatka Mountains. Limestones, shales, sandstones, quartzites, slates, and schists are the predominant rock types. Structurally, the geology of the Noatak Basin is a complex folded and faulted region. Dominating the headwaters region are a series of granitic plutons that have locally intruded the country rock. The entire Noatak Valley was glaciated in pre-Wisconsin time, with Wisconsin-period glaciers occupying the headwaters region only (USDI, GS 1965 and 1975).

Mineral interest in this region has stayed primarily south of the Schwatka Mountains, in and around extensive copper prospects in the schists of the Ambler Mining District. Some interest has also been shown for lead, zinc, and copper showings found in and around the granite plutons. Placer-mining interests have focused primarily on two areas--Lucky Six Creek near the headwaters of the Noatak and Midas Creek, of which the Ningyoyak is a tributary, near the extreme western boundary of the park.

Gold was first discovered in Lucky Six Creek in 1898, but the creek has never had much production. The gold is reported to occur only in the cracks and crevices of the bedrock along the creek bed and is reported to be of notable size (USDI, GS 1913b). The inaccessibility of the region probably kept this area from developing.

Midas Creek prospects were first claimed in the early 1900s by William McCarmont, who was also one of the prospectors on Lucky Six Creek. The gold in this creek was reported to be disseminated into fine particles among the younger creek gravels and within the ancient glaciofluvial gravels of the Noatak (USDI, GS 1913b).

Lucky Six Creek. This creek arises in complex terrain chopped up by several thrust or high-angle reverse faults. The creek is deeply incised into the rugged terrain. Rocks located in this watershed include schist, limestone, and phyllite, with narrow bands of interbedded dolomite. The Alaska's Lost Dutchman claim area is located on glacial drift material and colluvium.

Nigikpalvgururvrak Creek. This creek arises in low subdued tundra-covered terrain underlain principally by rocks of the Hunt Fork Shale formation (USDI, GS 1980b). The Joiners Creek claims are located near the mouth of the creek where the creek cuts through glacial drift and alluvium. This area has also been mapped as part of a large inferred thrust plate, which extends eastward to Plateau Mountain above July Creek (USDI, GS 1980b).

Ningyoyak Creek. Ningyoyak Creek lies just west of Midas Creek; 42 lode claims are located there. Ningyoyak Creek arises in the low hills lying immediately north of Noatak Valley. The rocks in this area of the park are principally sediments and metasediments consisting of recrystallized limestone and dolomite, phyllite, slate, quartzite, and quartz-mica schist of the Hunt Fork Shale formation. Most of the claim area is located on Quaternary glacial drift and alluvium (USDI, GS 1913b and 1977c). Phyllite is the only rock type observed in the claim area. Mineralization consisting of sparsely distributed pyrite and chalcopyrite in quartz veinlets has been found in only one outcrop.

SOILS

Soils within the park are highly variable, depending upon topography, drainage, aspect, fire history, permafrost, and parent material. The classification used by the U.S. Department of Agriculture, Soil Conservation Service (1979), indicates that most soils in the claim areas are relatively shallow and rocky soils (lithosols) on hilly to steep topography. They are composed of poorly drained, very gravelly, loamy materials over near-surface permafrost (pergelic cryochrepts). Where topography is level, soils are deeper and less rocky.

Lower elevation benches and rolling uplands are covered by a gray to brown silty loam overlaid by a peaty organic layer that varies in depth depending on the local environment (histic pergelic cryaquepts). The soil surface is irregular, with many low mounds, solifluction lobes, and tussocks.

In the Koyukuk study area most of the claim areas are covered by very gravelly and stoney loams. These soils cover an extensive area bounded by the North and Middle forks of the Koyukuk and generally south of a line running from Moving Mountain to Snowden Mountain. These types of soils are very susceptible to solifluction processes in this terrain. Soils in the area of Ipnek Creek are more typical of steeper, higher mountain terrain in that they are generally shallower and more stoney loams.

All soils in this area overlie thick continuous permafrost zones that are sometimes located within a few inches of the surface. These soils have been subjected to millions of years of gradual downslope creep of frost-shattered rock and the constant seasonal pattern of freezing and thawing. Lower elevation sediments have combined over time with windblown silts, river and glacial deposits, and peat accumulations. The relentless processes of frost heaving and sorting, ice lens or wedge formation, and stream erosion have worked these deep soils into a complex mosaic of roughly textured tundra polygons, pingos, oxbows, and

terraces. Almost totally underlain by permafrost, the soils adjacent to the valley floodplains are highly susceptible to any kind of ground disturbance, since melting of the permafrost can result in subsequent soil collapse.

Soils in the Noatak study area were formed from calcareous rocks with a surface mat of peaty material from a few inches to more than 12 inches in thickness (USDI, NPS 1974). This type of soil covers most of the Ningyoyak Creek claims. Soils on the present floodplain of the Lucky Six Creek and Nigikpalvgururvrak tributaries consist of well-drained, moderately deep to deep loamy alluvium over gravel and sand (typic cryofluvents) in association with varied types of fluvial wash, such as coarse gravels, sands, and silts. These floodplain soils are typical of the placer claim environments within the park and are most commonly bordered on each side of a stream valley by the histic pergelic cryaquepts.

AIR QUALITY

The air quality in the Gates of the Arctic region remains essentially unaffected by human activity. Visibility and air quality could be called pristine except for small areas near Bettles and Anaktuvuk Pass, where smoke from houses accumulates at times during the winter. In addition, particulate matter from dust generated by truck traffic on the Dalton highway is noticeable along the GAAR eastern boundary in the vicinity of Kuyuktuvuk Creek and the Dietrich River.

The park is currently classified as a class II area under the Clean Air Act criteria for "Prevention of Significant Deterioration." The class II designation defines certain maximum legal limits by which particulates and sulfur dioxide may be increased in the ambient air.

As a national park and preserve, Gates of the Arctic is eligible for redesignation to class I status by the state of Alaska. For class I areas, the pollutant limits are more stringent. There are no present plans or proposals to redesignate the area. There are no existing unnatural sources of sulfur dioxide or particulate matter of any consequence (smoke contains particulates); nevertheless, the maximum allowable increments would apply to future sources of pollutants that might be proposed.

Air quality permits are not required for any type of mining activity that currently exists or could occur within the park.

VEGETATION

Vegetation in the southern Brooks Range is comprised of types that are determined by factors such as elevation, soils, slope, aspect, and fire history. In the Koyukuk study area, the five basic vegetative units are floodplain, spruce-hardwood forest, moist tundra, shrublands, and alpine tundra. These communities occur in generally predictable patterns in all of the stream channels encountered. In the Noatak study area vegetation on the claims consists primarily of floodplain willow thickets along stream

channels, shrublands on adjacent slopes, and a type of dry tundra (not common in the Koyukuk area) comprised mainly of Dryas octopetala.

Floodplain

This vegetation type occurs on the alluvial gravels, muds, and silts that collect along the floodplains of all perennial stream channels. The frequency of flooding of these deposits in part determines the species composition and the progress of succession of this community. Frequently flooded areas will have few shrubby members, consisting mainly of scattered fireweed, wild sweet pea, and fleabane. Table 6 identifies scientific names, growth forms, and distribution of selected plant species. Where flooding occurs less often, felt-leaf willow, shrubby cinquefoil, and yellow dryas begin to establish in the more stable soils. As meandering stream channels change course, previously flooded areas are able to develop more permanent vegetation allowing willows, alder, and young balsam poplar to invade (see illustration 3). Species found sporadically throughout the floodplain area include tall Jacob's ladder, Eskimo potato, yellow paintbrush, lousewort, and milk vetch. As floodplain vegetation matures, balsam poplar forms a tree canopy with a well-developed understory of these same species. Occasionally, small white spruce trees are also in these stands.

Illustration 3. Typical floodplain vegetation in wide stream channel on Ipnek Creek.

Table 6: Common Plant Species

Family	Common Name	Scientific Name	Growth Form	floodplain	shrublands	moist tundra	spruce-hardwood forest	alpine tundra
Birch	alder	Alnus crispa	shrub or small tree	X	X	X	X	
	birch	Betula sp.	shrub or small tree		X	X		
	paper birch	Betula papyrifera	tree	X			X	
Clubmoss	club moss	Lycopodium sp.	low-growing perennial					X
Crowberry	crowberry	Empetrum nigrum	decumbent shrub		X	X	X	X
Evening Primrose	fireweed	Epilobium latifolium	erect perennial herb	X				
Figwort	lousewort	Pedicularis verticillata	erect perennial herb		X	X	X	X
	yellow paintbrush	Castilleja caudata	erect perennial herb	X	X	X	X	X
Heath	Arctic bearberry	Arctostaphylos alpina	prostrate shrub		X		X	X
	bog blueberry	Vaccinium uliginosum alpinum	prostrate shrub		X	X	X	X
	Labrador tea	Ledum palustre decumbens	low shrub		X	X	X	X
	Lapland rosebay	Rhododendron lapponicum	low shrub		X	X	X	X
	lingonberry or low-bush cranberry	Vaccinium vitis-idaea	low-creeping shrub		X	X	X	X
	mountain heather	Cassiope tetragona	spreading evergreen shrub		X	X	X	X
Pea	Eskimo potato	Hedysarum alpinum americanum	erect perennial herb	X			X	X
	milk vetch	Astragalus sp.	prostrate perennial herb	X				
	wild sweet pea	Hedysarum mackenzii	erect perennial herb	X	X	X	X	X
Pine	white spruce	Picea glauca	tree				X	
Pink	moss campion	Silene acaulis	dense mat or cushion	X			X	X
Polemonium	Jacob's ladder	Polemonium acutiflorum	erect perennial herb	X			X	X
Rose	mountain avens	Dryas integrifolia	creeping shrub		X	X	X	X
	shrubby cinquefoil	Potentilla fruticosa	erect shrub	X	X	X	X	X
	yellow dryas	Dryas drummondii	creeping shrub	X				
Saxifrage	American red currant	Ribes triste	prostrate to erect shrub	X	X	X	X	
Sedge	cotton grass	Eriophorum vaginatum	tussock-forming perennial		X	X		
Sunflower	fleabane	Erigeron sp.	low perennial herb	X				
Willow	balsam poplar	Populus balsamifera	tree	X			X	
	felt-leaf willow	Salix alaxensis	erect shrub or small tree	X				
	net-leaf willow	Salix reticulata	prostrate-trailing shrub				X	X
Wintergreen	wild lily of the valley	Pyrola grandiflora	creeping perennial with erect stems				X	X

Source: Based on Hulten (1968), Welsh (1974), and NPS observations made in 1981.

Spruce-Hardwood Forest

The spruce-hardwood forest, dominated by white spruce, paper birch, and balsam poplar, occurs in all of the main stream channels within the Koyukuk study area (see illustration 4). This type is most often the dominant vegetation occurring on the elevated stream banks of water courses where the ground is generally dry. The forest extends along these channels several hundred feet out from each bank in areas where the surrounding terrain is level. The forest then grades into a shrubby, tussock tundra where the trees disappear. In the relatively small side drainages of the North Fork, the forest no longer encloses both sides of the channel, but appears mainly on warm, dry south- and east-facing slopes where there is good drainage. The elevational limits of the spruce forest extend to about 2,800 feet in this area. The understory of the forest is usually carpeted with a thick moss mat and a dense to open shrub layer, depending on microtopography, permafrost, soils, and light conditions. Wild lily of the valley, lingonberry or low-bush cranberry, crowberry, Labrador tea, net-leaf willow, Arctic bearberry, American red currant, wild sweet pea, Eskimo potato, tall Jacob's ladder, blueberry, and alder commonly occur in the understory.

In areas where the forest intergrades with moist tundra, understory will usually consist of species common to the more moist conditions of the tundra type.

Illustration 4. Spruce-hardwood forest along lower Conglomerate Creek.

Moist Tundra

This vegetation type is found intermixed with shrub thickets on poorly drained slopes above the spruce forest and on low flat sites in the valley bottoms. Cotton grass often forms extensive areas of tussocks, which are clumps of vegetation about 18 inches high separated by water-filled spaces a few inches apart. Walking through these areas is extremely difficult because when stepped on very rarely will a tussock remain erect. Small white spruce are scattered throughout the moist tundra, especially along the edges, along with birch and alder. Moist tundra areas, where tussocks do not form, contain a variety of species including alpine bearberry, mountain heather, mountain avens, Labrador tea, Lapland rosebay, bog blueberry, and low-bush cranberry.

Shrublands

This type often forms an inseparable mosaic with moist tundra, to the extent that shrub thickets often contain an understory of moist tundra. Shrub thickets are found on slopes above the spruce forest zone and in ravines and may vary from 3 to 10 feet tall, be extremely dense, or open and interspersed with moist tundra. Dominant shrubs include alder, birch, willow, bog blueberry, and shrubby cinquefoil. Most of the moist tundra species also occur in shrub thickets.

Alpine Tundra

Alpine tundra consists of low mat-forming plants interspersed between barren rock and rubble. This type occurs above shrublands on exposed ridges but may also occur on lower slopes and ridges that are dry and windswept. Plants in this type rarely achieve more than a foot in height and vary from areas of dense cushion-like mats to areas of scattered vegetation with exposed rock and mineral soil. Species characteristic of the alpine tundra include mountain avens, moss campion, mountain heather, Labrador tea, alpine bearberry, birch, willow, Indian paintbrush, and sporadic areas of dense club moss, reindeer moss, and other foliose lichens.

Dry Tundra

This vegetation is of undetermined extent in the region but is the dominant ground cover on the Ningyoyak Creek claim group in the Noatak study area. It is a dry cushion-like tundra that is dominated by Dryas octopetala, a low-creeping perennial with erect flowering stems several inches high. Other common species include Arctic bearberry, decumbent willows, sedges, Lapland rosebay, shrubby cinquefoil, and alder.

Threatened and Endangered Species

There are currently no plants in Alaska officially designated as threatened or endangered. However, the U.S. Fish and Wildlife Service (1980a)

and Murray (1980) have listed species of Alaskan plants that are currently under review for such status. Plants from this list are found in table 7.

WILDLIFE

Wildlife species in this area of the Brooks Range are relatively few; their populations are frequently low as compared to more temperate regions. Populations are characterized by spectacular local and seasonal or cyclic abundance.

Few studies have been conducted on birds and mammals within the central Brooks Range, and most of those completed have been focused in the region of Anaktuvuk Pass. The status of large mammals, such as caribou, Dall sheep, grizzly bear, moose, and wolves, is best known from studies and surveys by the Fish and Wildlife Service and the Alaska Department of Fish and Game.

Mammals

Thirty-six species of native mammals have been identified within the region. Of these, the caribou is most representative of arctic habitats and most completely illustrates many important characteristics of arctic ecology. Caribou travel incessantly, creating a lacework of trails that traverse mountain slopes or ridges and channel through valleys. However, in any given month, they may be entirely absent from an area, making quantitative generalizations difficult (personal communication, Davis, ADFG 1982).

The park supports travel routes for the Arctic caribou herd, whose population is variable and is currently estimated at 175,000 animals (personal communication, Davis, ADFG 1982). This herd is widely dispersed in midwinter when they are generally scattered in bands in forests on the southern slopes and adjacent lowlands of the Brooks Range, and again in midsummer when they may be scattered throughout the Arctic Slope west of the Sagvanirtok River.

Both winter and summer ranges are in the park, generally distributed throughout both study areas. The area around the confluence of the North and Middle forks of the Koyukuk River is a documented winter range and a spring and summer migration route of the caribou (ADFG 1973). For the last several years, an "average" of 10,000 animals have been estimated to use this area. However, their numbers can be highly variable and range from several hundred to 20,000 animals in any given year. It appears that the southeast portion of the herd's winter range, which encompasses the North and Middle Fork drainages, is being used relatively less than other areas (personal communication, Davis, ADFG 1982).

The entire Noatak study area is also part of the recognized summer range (ADFG 1973). An average of 5,000 to 10,000 animals use the Noatak area annually. However, the herd may range from several thousand to 30,000

Table 7: Proposed Threatened and Endangered Plants

Species	Review Status		Known Range		Habitat
	USFWS	Murray	Park	Other Areas	
Aster yukonensis	1	T	Two locations in the Koyukuk River drainage	One location at Kluane Lake in southwestern Yukon	River bank; dry streambed; dry silt, sand, gravel of a river delta
Castilleja annua	2	R	Common throughout interior of Alaska		Dry, often disturbed sites; along river bluffs, roadsides, trails
Oxytropis kokrinensis	1	T	Five locations in the western Brooks Range	Type locality in Kokrines and Ray mountains	Alpine species expected on ridge crests and felsenmeer

Source: USFWS (1980a) 1 - Taxa believed either threatened or endangered. Official listing procedures are underway.

2 - Taxa that would probably be eligible for listing. Additional biological information needed.

Murray (1980) T - Recommended for threatened status.

R - Rare plants, status undetermined.

to 50,000 animals in any given year (personal communication, Davis, ADFG 1982). Spring movement to summer range begins in March, when bands of females travel northward up the Alatna to the John and North Fork drainages and cross the summit of the Brooks Range into such valleys as the Killik, Chandler, and Anaktuvuk rivers, which they follow or cross in a generally westward movement, to calving grounds at the head of the Utukok and Colville rivers. In addition to the North Fork Koyukuk, in their spring migration, caribou also follow the Middle Fork Koyukuk, Wiseman Creek, cross over to Glacier River via the Glacier Pass area, and continue northward (ADFG 1973). Caribou moving northward along the Dietrich and Chandalar rivers may belong to either the Arctic herd or the Porcupine herd of eastern Alaska and adjacent portions of Canada.

After calving in late May, individual animals join increasingly larger groups as they move to the higher country of the North Slope and foothills of the Brooks Range. As they progress, dispersal commences and, although most animals drift to the coastal plain, others remain in the mountains. Bands of caribou may be found from the Arctic Ocean to the summits of the Brooks Range by late July.

A southward migration of caribou commences in August and in the central Arctic is directed toward the Anaktuvuk Pass and Killik River areas. Bulls gradually rejoin the cow segment of the herd, and as rut approaches in early October, the mixed herds move on to the southern slopes of the range. Migration continues slowly during the rut; but as breeding declines, the tempo of movement increases until wintering grounds are reached.

Other large ungulates such as moose and Dall sheep, both belonging primarily to subarctic habitats, are typically confined to relatively small segments of the arctic ecosystem. Sheep are widely distributed in alpine habitat throughout the Brooks Range, although seasonally they may range into brush or timbered zones. Rugged terrain with cliffs, steep slopes, and rocky outcrops are essential in providing sanctuary from predators, and sheep are seldom found where such escape features cannot be easily reached. The most important habitat requirement appears to be a suitable winter climate; cold and windy weather with relatively low snowfall is essential. This combination ensures that windswept alpine ridges will be free of snow, exposing critical winter forage.

Moose are most prominent in forested regions south of the Brooks Range, but their range can extend up into mountain valleys, corresponding with the limit of forest or brush that provides critical winter habitat. In the North Fork area during the winter, moose appear generally in an area from the confluence of the North and Middle forks northward, encompassing the mouth of Alder Creek to the confluence of Horse Creek and the North Fork (ADFG 1973). In summer moose may frequently move into alpine habitat, although they are uncommon at the summit of the Brooks Range. Northward, moose again appear associated with brush and woodland habitat that extends along streams nearly to the Arctic Coast. Important areas of moose concentrations found within the park are the Alatna and John rivers and the North Fork Koyukuk River valleys on the south side of the Brooks Range and the Killik and Itkillik River valleys on the north.

Although they are widely distributed over much of North America, wolves and grizzly bears are of importance in the park because they are declining or becoming increasingly subjected to pressures of civilization in the southern portion of their range.

Wolves of the central Brooks Range and Arctic Slope can be found generally throughout the entire park and are largely associated with caribou, their chief prey. During winter, wolves are normally found in packs of 3 to 6 animals but occasionally packs are as large as 15 to 18. In forested regions south of the Brooks Range, such as the North Fork Koyukuk area, wolves prey extensively on moose or snowshoe hare, whichever is more abundant. In summer, depending on the location of denning areas in relationship to herds of caribou, wolves may depend largely on other food resources, including Dall sheep, small mammals, birds, and beavers.

The barren-ground grizzly lives throughout the park and is taxonomically identical and similar in appearance to grizzlies of both the forest and alpine habitat of interior Alaska, although slightly smaller in size. It is considerably smaller and lighter in color than the brown bears of coastal regions. The Alaska Department of Fish and Game considers that "of all Alaska wildlife, brown [or] grizzly bears are probably least compatible with human activities."

Although among the earth's largest predators, the barren-ground grizzly bear of the Brooks Range is frequently a vegetarian and feeds extensively on berries, sedges, hedysarum, and other plants. It also feeds extensively on voles, lemmings, and the Arctic ground squirrel. Caribou are occasionally killed, primarily as fawns. Other large mammals consumed by the bears are probably by scavenging. The average population in the park may be higher than in the region to the west and may exceed average populations for the Brooks Range, which are estimated at one bear for each 100 square miles of habitat.

Although the grizzly bear ranges throughout all habitat types, its preference is for open areas of alpine or tundra habitat. The Alaska Department of Fish and Game (1973) identified important grizzly concentration areas along major streams within the park, including the Chandler, North Fork, Middle Fork, Anaktuvuk, John, Natuvuk, Killik, and Itkillik rivers, where use is particularly intensive during spring and fall.

In forest regions the grizzly is largely supplanted by the black bear, which has many similar behavior, habit, and food preferences. The black bear is unusually wary, and this behavior, along with the protective cover offered by its forest habitat, has precluded a significant effect on its population by activities of man. It is possible that the fluctuations may relate to annual differences in the abundance of berries or the variations in winter climate.

Black bear is documented in all drainages in the North Fork Koyukuk area from the park boundary on the south to the river's confluence with Bonanza Creek. In the Noatak study area, it is confined primarily to the Noatak River bottom (ADFG 1973).

Table 8 presents the summer ranges, migration routes, and the intensive uses of large mammals in the Koyukuk and Noatak study areas.

Fur-bearing animals common to interior Alaska are all represented within Gates of the Arctic, although many, such as beaver, marten, and lynx, are largely confined to forested habitats in the southern parts of the area. Beaver, mink, otter, and muskrat are also limited by scarcity of aquatic habitats. Red foxes, including their various color phases, are common throughout the region while the Arctic fox is largely confined to foothill regions on the North Slope of the Brooks Range. Although foxes are omnivorous, they are chiefly predators on voles, lemmings, and Arctic ground squirrels. Their populations may fluctuate sharply with the cyclic changes of abundance in their prey and with epidemics of rabies or other diseases.

Wolverine can be found throughout the entire park. They do not concentrate seasonally and do not have known specific habitat requirements other than ample food sources, which range from fruit to ungulates. They are found in environments ranging from seacoasts to mountaintops, and individuals usually range over great distances. Wolverines are often considered a wilderness species, unable to adapt to human use of their habitat (ADFG 1973).

Small rodents such as voles and lemmings, on which a host of mammal and avian predators depend, are of primary importance in arctic ecology. Within the park other cyclically abundant rodents include the singing, tundra, and redbacked voles. Collectively, these rodents may have a profound influence on tundra vegetation, which may have more significance locally than grazing by caribou.

Larger rodents include the Arctic ground squirrel and hoary marmot. The former lives primarily on well-drained soils along rivers or on slopes, whereas the latter is confined to steeper slopes, rock fields, and active talus slopes that provide protection.

A listing of probable mammal species for the northern and southern slopes of the Brooks Range are found in appendix E.

Birds

Approximately 133 species of birds have been documented within Gates of the Arctic National Park and Preserve. However, information is largely confined to alpine regions where intensive studies have been conducted, including a careful analysis of traditional knowledge of Eskimo residents of Anaktuvuk Pass. Supplementary observations also exist for the upper Noatak Valley.

The northern foothills region, along the Colville and Oolamnagavik rivers, is of particular importance for the continuing evaluation of populations of peregrines and gyrfalcons that nest on riparian cliffs.

The Noatak River is a major migration route for waterfowl and seabirds. In addition, the lower North Fork area is an important waterfowl concentration area (ADFG 1973).

Table 8: Presence of Large Mammals - Koyukuk and Noatak Study Areas

	Black Bear	Grizzly Bear	Dall Sheep	Moose	Wolverine	Wolf	Caribou
NORTH FORK KOYUKUK RIVER							
Bonanza Creek	X	X	X	X	X	X	X
Conglomerate Creek	X	X	X	X	X	X	X
Glacier River	X	X		X	X	X	X
Horse Creek	X	X	X	X	X	X	O
Ipnek Creek	X	X	X	X	X	X	X
La Rowe (Creek)	X	X		X	X	X	O
La Salle Creek	X	X	X	X	X	X	X
Mascot Creek	X	X	X	X	X	X	X
LOWER HAMMOND RIVER							
Canyon Creek	X	*	X	X	X	X	X
Hammond River	X	*	X	X	X	X	X
Snowshoe Creek	X	X	X	X	X	X	X
Pasco Creek	X	X	X	X	X	X	X
Washington Creek	X	X	X	X	X	X	X
MIDDLE FORK KOYUKUK RIVER							
Alder Creek	X	X		X	X	X	X
Middle Fork Koyukuk	X	*		X	X	X	X
UPPER HAMMOND RIVER							
Kalhabuk Creek		X	X	X	X	X	X
KUYUKTUVUK CREEK							
Kuyuktuvuk Creek		*	X	X	X	X	X
Trembley Creek		*	X	X	X	X	X
NOATAK RIVER AND TRIBUTARIES							
Lucky Six Creek	X	X	X	X	X	X	X
Nigikpalvgururvrak Creek	X	X	X	X	X	X	+
Ningyoyak Creek	X	X	X	X	X	X	+

Source: Alaska Department of Fish and Game (1973).

Note: X - Documented presence.
O - Migration route.
* - Intensive use.
+ - Summer range.

Although many species appear throughout the entire region, some are largely confined to a specific ecological zone. The great-horned, great gray, boreal, and hawk owls, spruce grouse, chickadees, white-winged cross-bills, osprey, and woodpeckers live primarily in forested regions, appearing in alpine tundra areas only as visitors. Jaegers, bluethroats, rosy finches, longspurs, snow bunting, tattlers, wheatears, and gyrfalcons are associated primarily with alpine tundra habitats.

Both lacustrine and fluviatile wading birds of diverse character are well represented in both tundra and forest zones, and nearly half of those recorded are normally associated with aquatic habitats. Varieties of birds found in alpine regions are extended by the presence of aquatic habitats and by the extension of forest or brushland habitat into mountain areas along protected and well-drained valleys of major streams.

Birds of prey are unusual in their abundance and diversity and include 11 raptors, 3 jaegers, and the northern shrike, reflecting both the diversity of habitats and the great abundance of certain avian and mammalian prey species. The endangered Arctic peregrine falcon is not known to appear in the study areas. However, in areas of the park where suitable nesting sites exist in proximity with low marshy areas and where a shorebird and waterfowl prey base may exist, peregrines could be present.

A more complete list of avian species distributions within the park is found in appendix E.

Fish

Gates of the Arctic encompasses the headwaters of four major river systems. The North Slope of the Brooks Range is drained by the Colville River and its many tributaries that flow northward and empty into the Arctic Ocean. Westernmost portions of the area are drained by the Kobuk and Noatak rivers; the Noatak circles northwest of the Baird Mountains, and the Kobuk circles southwest through lowlands south of the Brooks Range, before both empty into Kotzebue Sound. Southern and southeastern portions of the area are drained by the Alatna and John rivers, as well as other tributaries of the Koyukuk, which eventually reach the Bering Sea by way of the Yukon River. Despite the pronounced differences in the regions through which they flow and in their terminal waters, the fishery fauna of the lower river systems are remarkably similar.

The family salmonidae includes sheefish, whitefishes, grayling, trout, and salmon and is more important than all other species combined. This group is important for commercial, subsistence, and recreational fisheries. All five Pacific salmon inhabit the park. The chum and pink can be found in all drainages except the Koyukuk where there are no pink. Sheefish, broad and round whitefishes, least cisco, Arctic grayling, lake trout, and Arctic char can be found in most of the GAAR drainages.

Northern pike, Alaska blackfish, longnose sucker, burbot, nine-spined stickleback, and slimy sculpin are also found in all drainages.

Within both study areas, the Arctic grayling is most widespread and is found in nearly all permanent watercourses and larger lakes. It is a prized sport fish but does not mature as rapidly or reach as large a size in arctic waters as in the warmer waters of southern Alaska. Lake trout, northern pike, and Arctic char may also be caught in lake and stream systems of the area.

Table 9 lists the fish species that are documented in the study areas.

Table 9: Fishes - Koyukuk and Noatak Study Areas

Species	Koyukuk			Noatak
	North Fork	Middle Fork	Glacier	
Slimy sculpin - Cottus cognatus	X	X	X	X
Longnose sucker - Cotostomus cotostomus	X	X	X	X
Chinook salmon - Oncorhynchus tshawytscha	X[1]	X[2]		
Chum salmon - Oncorhynchus keta		X[3]		X[4]
Arctic grayling - Thymallus arcticus	X	X	X	X
Least cisco - Coregonus sardinella	X	X	X	X
Broad whitefish - Coregonus nasus	X	X	X	X
Round whitefish - Prosopium cylindraceum	X	X	X	X
Alaska whitefish - Coregonus nelsoni	X	X	X	
Dolly Varden - Salvelinus malma	X[5]	X[6]	X[7]	X
Lake trout - Salvelinus namaycush				X[8]
Northern pike - Esox lucius	X[9]	X[10]	X[11]	X[12]
Lake chub - Couesius plumbeus	X	X	X	
Burbot - Lota lota	X[13]	X[14]	X[15]	X[12]

Source: Alaska Department of Fish and Game (1978a and 1978b) and Morrow (1980).

Note: X denotes that the distribution includes the indicated dralnage.

[1]Present up to general vicinity of Florence Creek Lake.

[2]Present up to general vicinity of confluence with King Creek and lower Slate Creek above mouth.

[3]Present up to general vicinity of Coldfoot.

[4]Present up to general vicinity of Lake Omelaktavik.

[5]Appears on occasional basis only in North Fork drainage.

[6]Present on occasional basis only in Middle Fork drainage.

[7]Appears on occasional basis only in Glacier River drainage.

[8]Present in Lake Kipmik and Lake Omelaktavik.

[9]Present from general vicinity of Redstar Creek to main stem, including extreme lower reaches of North Fork tributaries, and adjoining lakes and marshy areas.

[10]Present from vicinity of Tramway Bar to main stem and adjoining marshy areas.

[11]Present in extreme lower reaches above mouth.

[12]Appears on occasional basis only in Noatak River, including extreme lower reaches of tributaries and adjoining marshy areas, downstream from general vicinity of Lake Isiak and Lake Matcharak. Additional information on distribution in upper Noatak drainage is not available.

[13]Present on occasional basis only from general vicinity of Redstar Creek to main stem, including extreme lower reaches of North Fork tributaries, and adjoining lakes and marshy areas.

[14]Appears on occasional basis only from Wiseman downstream to vicinity of Tramway Bar; present from Tramway Bar to main stem and in adjoining marshy areas.

[15]Appears on occasional basis only in extreme lower reaches above mouth.

CULTURAL RESOURCES

PREHISTORY

The Brooks Range has been inhabited for over 10,000 years; this habitation has been episodic, with varying lengths of time involved. Eskimos and Athapaskans used the southern slope of the Brooks Range, especially the Koyukuk River and its North Fork. In fact, the Koyukuk River and its tributaries have been a favored travel and trade route for thousands of years. It is possible to travel from the Yukon River, up the Koyukuk to the North Fork, then through the Brooks Range to Itkillik Lake, and down the Itkillik River to the Colville River and Arctic Ocean.

The archeological research and subsequent literature for the Brooks Range and surrounding area has been extensive. Campbell's (1962) and Irving's (1964) reports are the seminal works forming the basis for the major cultural sequences usually used to describe prehistoric Eskimo settlement in the central Brooks Range. Many other writers have added to and refined these sequences (see "Selected References" section).

On the southern slope of the range, some archeological work has been done. Anderson (1972) surveyed some of the upper Noatak River. Hall (1970) has done a great deal of work with the prehistoric and early historic Eskimos of interior northern Alaska. Clark (1972 and 1974) worked at the Batza Tena obsidian source at Indian, Alaska, on the Koyukuk River, as well as at Norutak Lake, Alaska. This work revealed that both Eskimo and Athapaskan groups used the general area. However, the prehistory of the Athapaskan groups (mainly Dihai Kutchin) is not well-known except through ethnohistorical accounts (McFadyen 1966; McFadyen and Clark 1972).

The North Fork Koyukuk area has not been subjected to any professional archeological investigation, as have the surrounding areas. The area can be regarded as having a high potential for archeological sites because all of the surrounding areas have numerous sites, and there is reason to believe that the North Fork was similarly used. The North Fork forms part of a route through the Brooks Range and was part of several aboriginal trade routes (Burch 1975 and 1976; Clark 1972). The North Fork and its tributaries were used for travel and as regular hunting territories by groups passing through or living around Anaktuvuk Pass, Itkillik Lake, or Wild Lake.

Other than the examinations and overflights of mining claim areas conducted during the summer of 1981, no archeological surveys of the claims or any of the upland areas and drainages away from the North Fork have been conducted by the Park Service. The presence or absence of archeological sites in the vicinity of mining claims remains to be determined. At this point, only estimates of the potential for a drainage to contain archeological and historic resources can be assessed. These estimates for the Koyukuk study area are included in table 10. The potential ratings in the table are expressed narratively (low, medium, high), with the corresponding numericals of 1, 3, 5. The potential ratings are preliminary in nature and are derived from known site

Table 10: Archeological and Historic Site Potential
Koyukuk and Noatak Study Areas

Drainage/ Claim Groups	Level of Investigation	Archeological Potential	Historic Potential	Notes
Washington Creek	Helicopter survey, brief ground visit	Low, 2	Low, 2	Very narrow creek; low-site visibility. Difficult access and travel route on the upper claims.
BVK 3	Helicopter survey	Low, 2	Low, 2	Lower claims have higher potentials due to topography and proximity to Glacier River.
Snowshoe Creek	Brief ground visit	Low-medium, 2-3	High, 4+	Both of these claim groups are near Wiseman and Nolan and on frequently traveled routes. There is a good potential for historical archeology and studies of mining history. There appears to be remains of a cabin on Pasco #2. There are several old mining shafts, handmade ladders, and possible tool remnants on the Snowshoe claims. Marshall visited this area (over Delay Pass) several times.
Pasco Creek	Helicopter survey	Low-medium, 2-3	High, 4+	
Canyon Creek	Helicopter survey, ground visit	Low, 2	Medium, 3	Marshall also visited this area, and there is an old sled trail/road that leads here from the Hammond River.
Hammond River	Helicopter survey, ground visit	Low, 2	Low, 2+	Hammond River was the scene of some early mining history.
Kuyuktuvuk Creek	Helicopter survey, ground visit	Medium, 3+	Medium, 3+	The Kuyuktuvuk is a well-known access route from the Dietrich to the Oolah Valley and the Itkillik River. Marshall visited the area in 1939. The creeks are tributaries of the Dietrich River.
Trembley Creek	Helicopter survey, ground visit	Medium, 3	Medium, 3	
Alder Creek	Helicopter survey, ground visit	Low, 1+	Low, 2	The actual claim area potential appears low from the air. The proposed access trail has a higher potential for both archeology and history, especially where it crossed the old winter trail to Wiseman. The airstrip on Tramway Bar is in an area of historic potential because Tramway Bar was the location of the first gold strike in the area.
Middle Fork Koyukuk River	Helicopter survey, ground visit	Low, 2	Medium, 3+	The remains of a cabin are located on these sites. The old winter trail is fairly close. Both the trail and the Middle Fork Koyukuk River are historic travel routes.
Bonanza Creek	Helicopter survey	Low, 2	Medium, 3	The remains of several cabins were seen from the air. They are probably post-1900 mining/ trapping cabins.
Ipnek Creek	Helicopter survey, visual on-the-ground reconnaissance	Low, 2+	High, 4+	The creek bottom areas were surveyed by visual inspection for likely site locations; none were seen. The confluence with the North Fork Koyukuk has a high potential for prehistoric sites. The remains of a cabin and old tools were found at the confluence. Marshall, as well as other travelers, camped here. Ipnek Creek was part of the route from Wiseman to the gold fields at Wild Lake during the rush of 1913-15.

Note: The potential scale is rated low, medium, and high, with the corresponding numericals of 1, 3, and 5.

Drainage/ Claim Groups	Level of Investigation	Archeological Potential	Historic Potential	Notes
Mascot Creek	Helicopter survey, ground visit	Low, 1	High, 4+	The prehistoric site potential of the claim area is extremely low due to the active mining activity but is higher around the airstrip and access road. The historic and archeology potential is much higher. The drainage has been mined since 1897. The remains of a 1907 cabin and cache are still present. A well-preserved 1920s cabin and cache are being used by the Mascot Mining Co. These should be evaluated for eligibility to the National Register of Historic Places. Harry Leonard, now living in Nolan, is a possible source for oral mining history of this area.
Conglomerate Creek	Helicopter survey	Low, 2+	Medium, 3	The creek bottom prehistoric site potential is low but is higher up the banks, especially on the western side. The historic site potential is medium. Marshall is known to have visited the area. The remains of a cabin, probably for hunting, were found at the confluence of Conglomerate with Harp (Creek).
Jim Pup	Ground visit	Low, 2+	Medium, 3	
Harp (Creek)	Helicopter survey	Low, 2+	Low-medium, 2-3	The remains of a cabin/hunting camp at the confluence with Conglomerate Creek are noteworthy, as are Marshall's visits to the area.
Joe Pup	Helicopter survey	Low, 2+	Low, 2	
Horse Creek	Helicopter survey, brief ground visit	Low, 1+	Low, 1+	
La Rowe (Creek)	Helicopter survey, brief ground visit	Low-medium, 2+	Low-medium, 2+	Site potentials are medium because of proximity to the North Fork Koyukuk River. Secondary effects from mining activities on more sensitive areas should be considered.
Glacier River (near mouth)	Helicopter survey, brief ground visit	Medium, 3+	Medium, 3+	These claims have a good potential because of their proximity to the confluence with the North Fork and Squaw Rapids. Marshall visited here several times. The Glacier River was a well-used travel route.
Glacier River (upstream of La Salle Creek)	Helicopter survey	Low, 2	Low, 2	Glacier River is a major tributary of the North Fork and was a well-known travel route.
La Salle Creek				
Myers 1-3	Helicopter survey, brief ground visit	Low-medium, 1-3	Low, 2	Myers 1 is at the confluence with Glacier River, so it has good potential.
Hansen 1-3	Helicopter survey, brief ground visit	Low, 2	Low, 2	
East Creek	Helicopter survey	Low, 1+	Medium, 3	This creek forms a route over a low pass to Ipnek Creek and North Fork.
Fall Creek	Helicopter survey	Low, 2	Low, 2	These creeks are in the Wild River drainage system, which was a major travel route.
Otto Creek	Helicopter survey			
Ningyoyak Creek	Helicopter survey, brief ground visit	Medium, 3+	Low, 2+	This is in the upper Noatak River Valley, a known prehistoric and ethnohistoric Eskimo habitation zone. The terrain appears favorable for hunting in the creek bottom.
Nigikpalvgururvrak Creek	Helicopter survey, brief ground visit	Medium, 3	Low, 2+	This claim group is also in the upper Noatak River Valley, with good archeological potential. Caribou migrations regularly pass through this area on their yearly migrations, and the upper Noatak is a natural route for travelers. The remains of a modern cabin are present.
Lucky Six Creek	Helicopter survey	Medium, 3+	Medium, 3	This claim group is in the upper end of the Noatak River Valley and was part of an ethnohistoric Eskimo travel route between the Kobuk River and the North Slope.

locations, ethnohistoric, and historic data. Where no other data were available, a generalized site-specific evaluation by the NPS archeological staff based on topography and ecological communities was used. The evaluation was derived from extrapolation of known site locations and ethnohistoric settlement patterns in similar or nearby locations.

Also included in table 10 are claim groups in the Noatak study area. This area has a long history of Eskimo and probably pre-Eskimo occupation. There is also a fairly high potential for archeological sites in this area.

Areas at or near confluences with major streams would have higher potential than areas far up the tributaries because of this hypothesized prehistoric usage pattern. In addition, any sites occurring in this area would be significant because so few sites have been found as yet and because they could shed some new light on the shifting Eskimo and Athapaskan populations that used the rivers.

HISTORY

The historical period for Alaska probably began around 1778, the year Capt. James Cook made the first recorded landfall by a European on the northern Alaskan mainland (Spearman 1980). Actual contact with the native Alaskans in and along the central Brooks Range occurred many years later. Trade goods passed through native middlemen preceded actual contact with Koyukon and Kutchin Indians and Nunamiut Eskimos.

Lieutenant Zagoskin of the Russian Navy explored the lower Koyukuk River in 1842. In 1885 and 1886, Lt. G.M. Stoney and Ens. W.L. Howard of the U.S. Navy ascended the Kobuk River into the western and central Brooks Range, traveling near Anaktuvuk Pass (Spearman 1980). The first white men to enter the Koyukuk River drainage north of the Arctic Circle were Lt. Henry Allen and Pvt. Fred Fickett of the U.S. Army, in 1885 (Thompson 1972).

During the following years a few prospectors entered the area in search of gold. Gold was discovered at Tramway Bar on the Middle Fork Koyukuk River in 1887. The Klondike gold rush of 1898 brought at least 1,000 men to the Koyukuk area. As a result, Bettles, Coldfoot, and Wiseman became established mining and trading camps. Some historic studies of the Wiseman mining area have been done by Thompson (1972) and Will (1981) for the Bureau of Land Management. A historic resources study of Gates of the Arctic National Park and Preserve and specifically the North Fork Koyukuk area has not yet been done. There are remains of cabins that have some historical value in some of the claim areas (especially Mascot Creek) that should be studied and evaluated.

Around the turn of the century, the outer edge of the Klondike gold rush reached the area of the Noatak River headwaters. Records of miners are in the place names of the region, such as Midas and Lucky Six creeks. The names were apparently based on hope rather than actuality because no worthwhile gold strikes were ever made in the area (Young 1974).

There was a small gold rush in the Wild Lake area from 1913-15, and one of the main routes was from Wiseman over Delay Pass, up Ipnek Creek to East Creek, and then on to Wild Lake (Marshall 1956).

Since trapping and mining activities occurred in the area up until the present day, there has often been the continued, adaptive use of many of the same cabins and equipment that the first trappers and miners used. This adaptive use of the historic fabric and the continuity established from the past to the present constitutes an important historical theme.

Another important historical theme for this area is the explorations of Robert Marshall. Beginning in 1929 and continuing until 1939, Marshall explored and named many of the features of the North Fork area. He wrote several popular books about his sojourns and about the village of Wiseman. His work and writing was the original impetus that eventually led to the establishment of Gates of the Arctic National Park and Preserve. In evaluating the historical potential of the different claim groups, one factor that was noted and considered was whether Marshall or his traveling companions visited the area and whether it was described in one of Marshall's books.

Many of the cabin remains have value as historic archeological sites, as well as possible historic sites. In fact, the time depth possible from using both techniques gives added value to those remains, even if only a few rotting timbers are left. It is recommended that these cabin sites be noted, mapped, preserved, and left undisturbed.

Further detailed information can be found in U.S. Geological Survey bulletins 532, 536, and 662 (USDI, GS 1913a, 1913b, and 1918).

ETHNOGRAPHY

There is extensive literature extant on the recent and present inhabitants of the Brooks Range and the Koyukuk River. The Nunamiut Eskimos have lived in the area for several centuries. (There was a 50-year hiatus that ended in the 1930s with the settlement at Anaktuvuk Pass.) The Athapaskans have also lived in the area, mostly south of the mountains, for hundreds of years. Both these groups lived a nomadic hunting and gathering life, covering wide ranges of territory. Gubser (1965), Ingstad (1954), Larsen (1959), and Spencer (1959) have published major studies on the Nunamiuts. Binford (1978) and Spearman (1980) have done more recent studies. Nelson, Mautner, and Bane (1978), Nelson (1973), and McKennan (1965) have published major studies on the Kutchin Athapaskans.

Literature, plus more recent observations (Spearman, personal communication, 1982), indicates that despite acculturative pressures, a lifestyle oriented towards using local resources continues. Mining activities should be assessed for socioeconomic effects on rural residents, especially those in Anaktuvuk Pass, Bettles, and Wiseman.

SUBSISTENCE

The North Fork is used by local residents for subsistence purposes. The Nunamiut Eskimos of Anaktuvuk have a well-established history of winter hunting and trapping along the North Fork, from its headwaters to the confluence of the Tinayguk River. The residents from Bettles and Evansville, and more rarely from Allakaket and Alatna, use resources along the North Fork, from its mouth upstream to just above the mouth of the Tinayguk. Subsistence activities along this lower section of the river include fall moose hunting, harvest of logs for houses, bear hunting, and a small amount of waterfowl hunting. During the winter months trappers from Bettles penetrate up the North Fork Valley as far north as the mouth of the Glacier River. A single trapper seasonally residing near the river in the vicinity of Delay Pass has trapped furs from the mouth of the Tinayguk River to the mouth of the Glacier River.

Mining activities that might cause heavy siltation of the Koyukuk River could adversely affect the ability of local residents to navigate the shallow waters of the river. Any disruption of wildlife movements and/or destruction of habitat would impose a hardship on local subsistence-dependent persons.

Currently, there appears to be no direct land use conflicts on these claims from native allotments, homesteads, homesites, or cemetery/historic sites (Alaska Native Claims Settlement Act). A native corporation has selected some lands around the Mascot Creek drainage; the status of those land selections has not yet been determined (see mining claim maps of North Fork Koyukuk River and Lower Hammond River in back pocket).

RECREATION AND AESTHETIC QUALITIES

Gates of the Arctic National Park and Preserve retains for America a vast, wild, adventuring area of superlative natural beauty and exceptional scientific value. Here, the recreationist experiences frontier conditions and a sense of isolation and discovery amid rugged yet traversible country. The area is characterized by a maze of deep-glaciated valleys and gaunt and rugged mountains, culminating in Mount Igikpak, the highest peak in the central Brooks Range.

The aesthetic quality of most of the park is essentially pristine. Of prime importance to this pristine character is crystal-clear streams with natural fish populations, an environment free of man-made noise, wildlife not accustomed to man's presence, and valley after valley with little or no sign of man's presence.

Recreational opportunities in the Koyukuk River and Noatak River regions of the park include river rafting, canoeing, kayaking, sportfishing, hiking, camping, wildlife observation, nature photography, and mountaineering. In the Koyukuk River area, recreationists fly into Anaktuvuk Pass from Bettles, hike cross-country to the "Gates of the Arctic" on the North Fork Koyukuk, and then float back to Bettles. Float trips are currently the most common visitor use of the Noatak River drainage. Most of the other opportunities listed above are also part of the experience that individuals are exposed to on these river trips. Day hikes from overnight camps probably occur, but the primary visitor use is confined to a fairly narrow corridor along the river channels.

Recreational use of the park will likely increase annually for the next several years as access improves. Uses other than float trips and kayaking will probably also continue to increase. The areas around Mount Doonerak, Mount Igikpak, and Arrigetch Peaks will likely become widely used by hikers. Increasing use of drainages such as Kuyuktuvuk Creek by backpackers will occur as travel increases on the Dalton highway. Opportunities for solitude and a true wilderness experience will undoubtedly attract many people in the future.

environmental effects of mining

EFFECTS ON NATURAL RESOURCES

HYDROLOGY/WATER QUALITY

The most significant hydrological impact of placer mining is the introduction of heavy sediment loads into clear-flowing streams. For example, placer-mining activities on Mascot Creek have created sedimentation, streamflow and channel modification, decreased oxygen content, increased dissolved solids contents, and increased water temperatures. The constricted Mascot Creek drainage makes the risk of washout of settling ponds more likely than if the ponds were located in wider valleys. Washouts have occurred at least twice during the 1981 season, resulting in the sudden release of heavily sediment-laden waters that affected the North Fork Koyukuk River as far as 35 miles downstream.

Sediments are introduced into waters by two mechanisms. The first is the process of washing placer gravels to separate the gold. The fines in gravels remain in suspension in the effluent water and if discharged directly back into the stream remain suspended as long as water movement continues to be fast-moving and turbulent. If water velocity decreases, such as at a break in slope, a local change in streambed slope, a stream junction, or the inside of a bend, the heaviest particles settle covering the stream bottom with silt. Bottom siltation of placer-mined streams can have a long-term adverse impact on areas of important habitat for aquatic life. Years after mining has ceased, streams continue to move fine sediment from the bottom deposits during high water flows. This process continues to adversely affect bottom-dwelling aquatic life as a result of scouring, but eventually the streambed will be flushed of accumulated silt. Complete flushing of silt from a placer-mined stream may take as long as 35 years, as documented by a study of Caribou Creek in the Kantishna Mining District in central Alaska (Bundtzen 1978).

The second source of sediment is erosion from cleared areas, piles of overburden, access roads, airstrips, and tailings. When subjected to rainstorms or floods, these exposed areas contribute additional sediment to nearby streams. Although this second mechanism normally contributes less sediment to the affected drainage, it is difficult to evaluate and requires more control measures because it is a nonpoint source of sediment. The amount of silt generated by a placer mine depends upon the overall size of the operation, character of the local geology and soils, volume of process water, topography, stream gradient, placer-mining techniques used, and the control practices used. For instance, hydraulic stripping of overburden produces much more stream sediment than mechanical removal, and use of settling ponds substantially reduces sediment loads and permits recycling of water for gravel washing.

Higher sediment loading results in increased turbidity. Materials causing turbidity can include clay, silt, and finely divided organic and inorganic matter. Turbid water may contain materials ranging from nearly pure inorganic substances to almost all organic particles and compounds (ADEC 1978 and 1979). Turbidity is a measure of light scatter and absorption in a liquid; it is rated in nephelometer turbidity units (NTUs). The size, shape, and refractive index of suspended materials are important

optically, but they have variable relationships to the specific gravity and concentration of the suspended particles. Although turbidity is not a direct quantitative measure of sediment concentrations, the greater the sediment load, the less light is transmitted by the water.

Unless a stream is classified industrial, turbidity should not exceed 5 NTUs above natural background when the natural turbidity is 50 NTUs or less, and not have more than a 10 percent increase in turbidity when the natural background is more than 50 NTUs--not to exceed a maximum increase of 25 NTUs. If a stream is classified industrial, then turbidity should not cause detrimental effects on established water supply treatment levels (personal communication, Reeves, ADEC 1983).

Low turbidity in naturally clear streams is important for the health of aquatic life. Increases in turbidity adversely affect fish populations by reducing visibility for feeding and by directly reducing food supplies. More generally, turbidity affects aquatic food webs and photosynthetic processes. It also adversely affects recreational use and aesthetic appeal of the affected waterways.

No turbidity readings were taken during the 1981 field inspection of the placer-mining locations; however, it was observed that all watersheds contained clear water upstream from all past or present mining activity. Turbid water was observed downstream from the Mascot Creek operations, but the extent of turbidity is unknown.

Modification of streamflow characteristics and physical changes in channel morphology are inevitable when placer mining occurs in a natural drainage. One of the most significant effects on stream regimen is diversion of water from its original channel. The original streambed either becomes dry or is subject to much lower flows than prior to mining, with subsequent physical changes and destruction or alteration of aquatic habitat. Where stream water is diverted, erosion occurs, sediment loads and turbidity increase, and surface vegetation is inundated, if it has not already been removed. Naturally flowing streams develop a fluvial balance or equilibrium that determines channel size and shape, location of bends in the drainage, and the amount of suspended sediment; perturbations to the stream or to its channel disrupt this equilibrium, causing a host of secondary physical and biological changes as the stream attempts to set up a new regimen. For example, additional loads of sediment cause increased scouring of the stream bottom, destroying or altering the habitat of bottom-dwelling organisms and physically altering the shape of the stream channel.

Streamflow characteristics can also be modified by construction of ancillary facilities such as access roads, airstrips, and mining camps. Graded surfaces and cleared areas increase erosion, cause localized blockage of surface flow, and may cause conditions for flooding to develop. The result, in almost any case, is a further increase in sediment load, with the ensuing impacts of alteration of streamflow equilibrium previously described.

If sluicing techniques include automatic dams, effects on streamflow and channel configuration become even more significant because of the

oscillatory flow patterns introduced by the repeated collection and rapid release of water. Collecting water reduces or eliminates flow, affecting aquatic life that has developed under conditions of normal seasonal stream flows. Sudden release of impounded water increases the sediment load, which causes even greater channel scouring and bank erosion, with subsequent destruction of riparian vegetation.

Clear-flowing streams in the north-central portion of Alaska are normally very high in dissolved oxygen, which is essential to fish and other aerobic organisms in the aquatic environment. If large amounts of organic materials are introduced into the drainage system of a watershed during the process of placer mining, dissolved oxygen concentrations decrease to low values. An increase in water temperature, which can also occur as a result of placer mining, increases the demand rate of organics on available oxygen. Since organic materials are common in the overburden of all the watersheds containing placer-mining claims, placer-mining activities could significantly reduce oxygen in the affected streams and thereby be detrimental to aerobic life forms in the aquatic environment.

Concentrations of dissolved solids in streams of north-central Alaska are generally low. However, introduction of heavy loads of fine sediment from placer-mining operations can affect water chemistry by creating a vast supply of potentially reactive surface areas from the suspended particles. Where stream gravels have developed from mineralized bedrock, the potential for water chemistry changes is even greater. Minor element content of water is likely to increase due to exposure and oxidation of metal-bearing minerals (USDI, GS 1980a). Although some water chemistry changes are likely, they are far overshadowed by the physical effect of increased suspended sediment and turbidity.

Another effect of placer mining is the change in water temperature. Hydraulic stripping of overburden can decrease or increase downstream water temperatures, depending on whether the overburden is frozen or unfrozen (ADEC 1979). Floodplain alluvium is usually unfrozen to depths of at least 4 to 6 feet; thus, shallow stripping of overburden by hydraulic methods may cause an increase in the downstream water temperature. Where stripping is to greater depths, water temperatures may decrease if frozen alluvium melts.

Decreases in water velocity and spreading of flow, which are likely to happen with sediment-laden water during placer operations, also result in increased water temperatures (USDI, FWS 1980b). Use of settling ponds also results in greater water temperatures through stratification and release of warmer, upper water layers. Stream temperatures in Mascot Creek below the settling ponds were the highest recorded of all streams measured in 1981. Changes of water temperature are of concern because of the effects on fish life.

GEOLOGY/SOILS

The primary impact of placer mining is the movement and resorting of thousands of cubic yards per mining season of unconsolidated streambed

materials. Much of the fine sand and silt in the mined stream deposits is separated from the coarser pebbles, cobbles, and boulders and washed downstream where it is either redeposited or carried in suspension. Coarser mining materials are left at the mining site and stacked in waste piles. Pile areas of waste rock with the fine sand and silt removed do not revegetate until new fines are deposited by wind or floodwaters, a process that normally takes hundreds of years. Placer mining in the park does not have any significant effect on consolidated rock materials.

Soils are affected by placer mining in a number of ways--the most obvious is their complete removal over areas that are going to be scraped for collection of sluicing gravel. Large placer-mining operations, such as those along Mascot Creek, involve the removal of many acres of floodplain soils per operating season. Piling of overburden and spoils, usually to one side of the drainage, covers additional soil and vegetation. Areas scraped for mining are easily eroded and create unnatural streamflow conditions that are reestablished only after major flooding events. Wherever a stable land surface is disrupted, mass movement and slope failure is likely to result if the surface has appreciable slope. Grading of access roads and airstrips, as well as stream placer gravels, undermine upslope soils in some areas, causing slumping, soil creep, or other types of mass wasting. These types of soil disturbances greatly increase the total area disturbed by mining activity.

Continuous permafrost under the benches and low slopes of all watersheds containing placer claims is likely to occur under some sections of the streambeds. Exposure of bare soil or stripping of soil from the ground surface results in thawing of the underlying permafrost to greater depths because of a change in thermal balance. Such thawing is likely to cause development of muddy areas and local depressions that tend to get gradually larger each year (see illustration 5). Where access roads are constructed or where vegetation is destroyed by vehicles passing over the surface, the problem is exacerbated as wheel ruts lose their load-bearing ability (see illustration 6). These muddy areas must often be circumvented by vehicles, further compounding the effects by spreading the disturbance over a wider area.

Another impact on soils is compaction, which occurs anywhere when machinery is used or permanent or temporary camps are set up. Soil compaction reduces infiltration, causing higher rates of runoff and erosion, and renders the soil less suitable for plant growth. Compaction of thick accumulations of spongy organic material reduces insulation of underlying permafrost, which results in melting until a new thermal equilibrium is reached.

AIR QUALITY

Placer mining has limited effects on air quality. Diesel emissions and dust from mines and roads would affect air in the immediate vicinity of the activity, but would have no general effect on the air quality of the park.

Illustration 5. Unusable airstrip constructed in moist tundra near Mascot Creek. Note ponding of water and vegetational changes caused by thawing of underlying permafrost.

Illustration 6. Severe erosion occurring along winter trail from Wiseman to Mascot Creek. Picture was taken at point where trail crosses Glacier River 3 miles east of Mascot Creek.

VEGETATION

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

Plant habitat is affected when topsoil is scraped away as overburden, often becoming mixed with or buried by subsoil, and when fine soil particles are physically separated from coarse material during the placer-mining process. Covering adjacent areas with mine waste damages additional areas of vegetation. Reduced stability of disturbed soils results in further deterioration of mined sites even after operations have ceased, retarding the process of recovery.

Clearing vegetation is necessary for access to mining operations. Access roads 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 does not materially change the rock and soil of a streambed, it simply relocates them. In this sense, mining is not unlike natural processes, such as glaciers and floods, that move stream gravel, except mining separates sand and silt from coarse material and usually leaves the 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.

If not reclaimed, the abandoned mines can remain too unstable for forest growth, supporting only shrubs and herbaceous species characteristic of disturbed lands. Because the shrubby and deciduous tree components of the forest reestablish more rapidly than conifers after disturbance, one of the more obvious effects of disturbance is the temporary replacement of conifer stands by other woody vegetation.

Roads, trails, and camps for mines are usually built on benches or low slopes above the creeks where the forest is more open and access is convenient. These facilities have their greatest effect on open upland spruce-hardwood stands and on tundra plant communities, which are frequently underlain by thick insulating mats of low vegetation and organic material and by shallow permafrost.

The impacts of construction or vehicular travel across such vegetation may be progressive. Once the surface layer is disturbed, deepening of the active thaw layer and channeled drainage may result, creating eroding ruts that widen the area of impact (see illustration 6). The effect of clearing on the revegetation process in such areas is twofold. Once the

organic layer is removed, the plant microenvironment is greatly changed in the direction of drier, warmer conditions with less competition. This situation is favorable for opportunistic herbs and shrubs or tree seedlings to become established. A great length of time is usually required for the organic mats to become reestablished, especially if the disturbance has resulted in soil instability. Old roads or ditches lined with shrubs--chiefly willow, alder, and hardwood saplings--illustrate these vegetation shifts (see illustration 5). Mining disturbance generally increases the area dominated by shrubs and deciduous trees.

Once disturbed, the vegetation of this area can recover if adequately stable substrate is present. The recovery of plant communities progresses through a series of plant cover types beginning with a thin, scattered cover of herbaceous species, through a willow-shrub stage, and finally arriving at a mature forest or other community similar to the original. Upland sites of at least average productivity that are protected from disturbance for long periods usually develop stands of coniferous forest. This process is similar to postfire succession, but takes much longer to complete following mining or other activities that disrupt the soil. Mining and the abandonment of unreclaimed spoils pose a significant risk of permanent loss of the capability of the disturbed tract to support the original vegetation type. This loss can occur from permanent damage to the soil caused by separation of silt from gravel during placer washing, from erosion of slopes, and from abandonment of coarse spoils in mounds on the surface. In all three cases, the soil is eliminated or reduced and recovery requires extremely long periods.

Secondary or indirect impacts of mining on vegetation result from erosion, thawing of permafrost, drainage alteration, fire, or insect infestations caused in abandoned slash piles. The physical impacts are normally confined to the mined area and can cause localized changes in community types. Fire and insect infestations resulting from the careless piling of slash could affect areas beyond the claims. The spruce budworm may pupate in downed trees, which have been known to foster infestations. Concentrations of dried dead vegetation are fire hazards, especially when human activity is prevalent nearby.

Mining of lode claims also involves complete removal of vegetation from the surface of the claims, depending on the mining method employed. 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 affected area. The effects of vegetation removal is essentially the same as for placer mining, except that lode mines are more likely to occur in upland spruce, shrubland, and alpine tundra communities and are less likely to affect bottomland vegetation. Alpine tundra disturbed by such operations takes 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 drainage may affect adjacent vegetation physiologically, as heavy metals building up in plant tissues have been known to reach toxic levels; however, the probability of this happening is 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.

Threatened or Endangered Species

Placer mining in the Koyukuk River region could potentially affect two plant species that are being considered for listing as threatened or endangered by the U.S. Fish and Wildlife Service. Aster yukonensis, a potentially threatened species, has been previously collected in the Koyukuk drainage. Its habitat is such that it could potentially be found on any of the placer claims. Oxytropis kokrinensis, another potentially threatened species, could possibly appear on the Ningyoyak Creek claim groups in the Noatak River region. However, since it prefers ridge crests and alpine felsenmeer fields, these lode claims provide only marginal habitat for its existence. Castilleja annua is a rare plant of undetermined status that often grows on disturbed sites and river bluffs. It may be found on many of the claims; however, since it is a species that proliferates on disturbed sites, mining is more likely to promote its spread rather than harm it.

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 for placer-mining activities to adversely affect the reproduction, growth, and survival of aquatic species.

Sedimentation of streambeds causes fish egg mortality, as silt particles become attached to the eggs and clog spaces between the gravel substrate. Specifically, sedimentation 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 development that may delay hatching or result in deformities. In the later 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 1979b).

Turbidity interferes with the migration patterns and natural movements of fish spawning and feeding (USDA, FS 1979b). It also impairs the feeding activities of sight feeders, such as the grayling. Excessive turbidity levels 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 increased mortality from destruction of specific fish habitat (EPA 1976). Young fish often use tributaries for shelter during floods, but excessive turbidity levels render the tributaries unsuitable for this purpose.

Because suspended sediments and turbidity reduce light penetration in streams, the primary productivity of aquatic plants is lowered, and the availability of natural fish foods is decreased. Siltation further reduces the abundance of foods available to fish by smothering aquatic invertebrates.

Because erosion of topsoils or the removal of overburden increase organic matter in streams, dissolved oxygen levels are 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 adversely affect the survival of fish eggs and organisms that live in the streambed. Mining operations frequently use the entire streamflow volume for cleaning gravels. Placer-sluicing operations act as barriers to fish spawning, migration, or feeding activities.

Because sedimentation alters streamflow characteristics, stream depths are 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) also causes physical disturbances to fish habitat. Spawning areas are destroyed, as are 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 frequently fall into the water and become prey for fish.

The use of suction dredges in the vicinity of spawning areas, particularly during critical stages in the life cycles of fish, causes adverse effects on spawning activities or causes 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, which can affect fish habitat. There is also potential for disruption of stream channels by heavy equipment using access roads.

In the North Fork area, the aquatic habitat has been considerably altered on most of Mascot Creek. It was observed that attempts were made by the mining operator to construct and operate settling ponds on Mascot Creek downstream of the existing operation. However, heavy rains had already breached the pond dam and even after repairing the dam, process waters from the settling pond were still quite turbid. The sediment plume was easily distinguished as far south as the confluence of Glacier River with the North Fork.

Although no stream sampling was conducted because of the high turbidity levels in Mascot Creek, it can be expected that populations of Arctic grayling, Dolly Varden, and whitefish possibly do not exist here.

The potential impacts of lode mining on aquatic life include acid mine drainage and pollution of aquatic habitat by heavy metals. The closer a stream is to the mining operation, the greater the potential for disturbance. Acid mine drainage lowers 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 the park would be required to determine whether pH levels fall below 6.5, either as a result of mining or by natural causes. Preliminary stream pH data collected in 1981 are presented in tables 3 and 5.

The impacts of placer mining on terrestrial wildlife species are also 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 reduces 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 entire Koyukuk and Noatak study areas. The Noatak area serves as a summer range and the North Fork Koyukuk as a principal migration route. Construction of additional access facilities in either area could result in reduced food sources for caribou and disrupt migration patterns.

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.

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

It is not likely that placer-mining operations interfere with the flight patterns of migratory birds. It is also unlikely that mining operations have significant impacts on waterfowl nesting, because nesting occurs primarily in lakes, ponds, and lowland areas south of the North Fork Koyukuk and of the Noatak River Valley.

It is not known whether mining activities, either placer or lode, could adversely affect Arctic peregrine falcons, as no nesting sites are known in the study areas. Should nesting peregrines be discovered in the area, mining activities that have potential for disturbing them should be evaluated.

EFFECTS ON CULTURAL RESOURCES

The following is a description of the potential impacts to prehistoric and historic resources associated with mining development and production activities. These impacts are also summarized in table 11.

Some placer-mining operations and associated activities are of such magnitude that they pose an immediate threat to any prehistoric or historic site in the area of the mining claim and often to sites outside the claim. Placer-mining operations on low-lying stream-based deposits will probably not affect significant archeological sites in the region; however, stream terraces, stream banks, stream confluences, knolls, hilltops, hill benches, and other landform features in the vicinity of stream channels contain a higher potential for the presence of archeological sites. Prehistoric sites (game lookouts and kill sites) and historic sites or materials are likely to be found in association with these landforms. Areas with these features should be surveyed for sites when mining operations or related activities are proposed in their vicinity.

Bulldozing or backhoe excavations and blasting are the most obvious and immediate causes of site destruction or disturbance (see table 11). Any activities that alter the spatial relationship of surface artifacts or the "setting" of the artifacts in the ground (site context) effectively destroy a site's scientific value.

Building a mining access route can completely destroy a site during construction; it also provides access to sites that would normally be difficult to visit. Access to sites increases the chances that materials at the site would be collected or "potted." Federal laws and regulations prohibit such activity, but the best protection is achieved only when the public realizes the importance of information contained in the distribution of materials at an archeological site.

Other less apparent sources of site disturbance include destruction of the vegetative cover, which can lead to site erosion by wind, water, and permafrost thaw, and the contamination of organic remains through chemical or petroleum spills, thereby possibly ruining the opportunity to date these remains.

Table 11: Potential Effects of Mining on Cultural Resources

Source	Effect
Mining excavation (overburden removal, drilling, blasting) access roads material source borrow areas water diversion channels staging areas camps	Obliteration of all or part of a site exposure of a buried site strata disruption changes in artifact condition destruction of artifacts alterations in erosional patterns resulting in site destruction, loss of context of materials, etc. destruction of historic structures and objects
Human activity	Increased potential for discovery disturbance, and looting of sites
Emergency environmental cleanup procedures due to flooding, fuel spills, etc.	Chemical contamination of artifacts or other materials making them useless for radiocarbon determinations
Reclamation procedures (stabilization activities, revegetation recontouring, or lack thereof)	If undisturbed areas are involved, the effects listed under mining apply

Source: United States Department of the Interior, Geological Survey (1979a).

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 affected 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.

Access roads affect aesthetic qualities, solitude, and opportunities for enjoying wildlife. Abandoned, revegetated access roads that support vegetation different from their surroundings are visually intrusive. In some cases, however, the changes in vegetation are of benefit to wildlife.

Highly turbid streams diminish opportunities for sportfishing, for example, grayling are sight feeders and are not likely to feed in turbid streams. Also, high sediment loads being released in tributaries of the North Fork Koyukuk diminish the clearness of this popular recreation river. As more mines are permitted to operate, the cumulative effect on the river resources could be significant. Individual reactions to this turbidity on a designated wild river will naturally vary from person to person.

If operations occur on Bonanza, Ipnek, Horse, or La Rowe creeks, the impact on the recreationist would be much greater than at the present time. All these creeks empty into the North Fork, and operations on any of them would significantly reduce the wilderness experience that many of the people have traveled thousands of miles to get. River running is currently the main draw to this region of the park, and all of the effects previously discussed would be directly visible to every river runner. Also, general recreational use of each of these currently pristine streams would be discouraged by the operators; inquisitive recreationists pose a nuisance to individuals conducting operations, as well as pose a safety hazard.

The same is true for all the operations on the Noatak River. This river is also currently the main attraction for people visiting this part of the park. For most recreationists, just the logistics of getting to this very isolated region of Alaska is a phenomenal experience. To encounter a mining operation in the middle of a float trip in a remote wilderness would be a dramatic letdown in the eyes of many people.

EFFECTS ON SPECIFIC DRAINAGES

The following environmental concerns are for specific drainages within the Koyukuk and Noatak study areas. These concerns should be considered should mining occur or be proposed on claims located within the drainages; they represent preliminary judgments regarding possible effects. Until specific mining plans of operations are submitted, the full range of mining impacts on a given claim group cannot be assessed.

NORTH FORK KOYUKUK RIVER

Bonanza Creek

This creek basin is virtually undisturbed, contains approximately 9 miles of clear-flowing stream, and supports an Arctic grayling population for at least 4 miles upstream. If mining occurred on the 1,240 acres of claims, the entire creek basin could be altered. A placer operation similar to Mascot Creek could discharge an average of approximately 16 cfs of silty water directly to the North Fork less than 1 mile below the last claim. Only the lower reach of Bonanza Creek, near claims 4-7 Below Discovery, offers sufficient channel width to accommodate settling pond construction without affecting side slopes or mature vegetation.

There is no existing surface access to this area. The nearest road or trail is located at the mouth of Conglomerate Creek, 9 miles southeast of the claim area. Access from Conglomerate Creek across the intervening ridge or via Richmond Creek could affect large moist tundra areas. Direct river access along the North Fork is a possibility. However, there are significant concerns for the effects of an access route on the value for which the North Fork was designated a wild river. The entire drainage is underlain by continuous permafrost, and any disturbance of side slopes could increase solifluction and other mass wasting processes.

Effects of mining on vegetation would be significant in all but the extreme lower reaches of the creek basin due to the narrowness of the creek channel and stable stream banks covered by dense, mature vegetation (see illustration 7). Approximately 4 to 5 miles of productive fish habitat would be destroyed while operations on the lower claims could potentially affect spring migration of the Arctic caribou herd along the North Fork.

Two small historic cabin sites associated with early trapping and subsistence activities and explorations of Robert Marshall could be destroyed by mining activities unless properly protected. Mining activities along the lower creek reaches of the North Fork could also potentially affect the wild value of the river and adversely affect the quality of river recreation in the vicinity.

Conglomerate Creek

This large creek basin encompasses approximately 16 miles of clear-flowing stream and a watershed that is still essentially undisturbed, despite some

evidence of earlier exploration work (1981) in the lower 5 miles of the channel. The Harp (Creek) and Jim Pup claim areas (see North Fork Koyukuk River Mining Claims map in back pocket) contain clear water streams with undisturbed watersheds. The total claim area in the Conglomerate Creek Basin is 3,400 acres. Placer-mining operations could cause an average discharge of 44 cfs of silty water to the Glacier River, 12 miles upstream of where it joins the North Fork. This silty flow would combine with the heavily silted flow (average of 19.2 cfs) coming from the Mascot Creek mining operation to significantly degrade the water quality of the Glacier River and eventually affect the wild character of the North Fork for many miles downstream. Channel width in the lower 5 to 6 miles of Conglomerate Creek appears broad enough to accommodate settling pond construction without seriously affecting side slopes or mature vegetation.

Access to the claim group is currently from an existing airstrip on the Glacier River at Mascot Creek (see illustration 8). Most of this route was previously disrupted by a tracked vehicle and bladed to a width of 15 feet in some locations. Improvement of this access would cause additional loss of mature vegetation in the extreme lower end of Conglomerate Creek. Access to claims in the remaining drainage upstream would be difficult due to the narrow channel width with its bordering mature vegetation. Harp (Creek) has an extremely narrow, incised channel that has formed a gorge in its lower reaches. Any activity on claims 1-8 Above Discovery could cause serious sloughing on the steep, unstable cliffs along the northeast side of the creek. These cliffs could provide raptor-nesting habitat.

Conglomerate Creek in the main stream above the Harp (Creek) tributary is a known grayling habitat. Placer mining could potentially destroy up to 6 miles of productive fish habitat, while operations in the upper reaches of the watershed could disrupt important wildlife habitat in the high tundra areas.

Effects on cultural resources would be minimal unless the higher benches on the west side above Harp (Creek) were disturbed. Recreational effects would probably be minimal; however, Conglomerate Creek may be attractive to hikers and backpackers because of easy access from the Wiseman area and the Dalton highway.

Glacier River

Glacier River is a primary tributary of the North Fork, which under natural conditions carries a very low-sediment load. However, discharge of silty water from the Mascot Creek mining operation is flowing into the Glacier River and degrading the lower 11½ miles of the river above its confluence with the North Fork.

Currently, there are 8 recorded placer claims covering 180 acres along Glacier River from the confluence with Conglomerate Creek downstream to the North Fork. Placer-mining operations on these claims would be susceptible to high annual runoff and floods, releasing large sediment loads to downstream riverine environments. The present river morphology along the claim groups is typical of a meandering profile in a

Illustration 7. Moist tundra vegetation bordering stable stream channel in upper reach of Bonanza Creek.

Illustration 8. Airstrip built on floodplain of Glacier River near Mascot Creek.

broad valley. Placer mining could change channel morphology, potentially disrupting natural processes and result in artificial channeling of the river.

Currently, there is no trail or road access to any of the claims. The road to Conglomerate Creek comes within 1½ miles of the E & T claim, and the airstrip at Mascot Creek is within 4½ miles of the upper claims. The lower claims can be reached only via the Koyukuk River. Some mature spruce vegetation could be lost along certain stretches of the river if mining were conducted on the lower river claims. In addition, any mining activity in the confluence area could potentially disrupt important wintering grounds for moose and the spring migration pattern of the Arctic caribou herd. Both of these concerns should be carefully evaluated if mining is considered.

Cultural resource concerns would be the highest along the lower river. The confluence with the North Fork and the area of Squaw Rapids could contain important archeological and historic sites. Mining could affect recreational use along Glacier River. The confluence area is a popular camping site for river users and recreationists. Mining on these lower Glacier River claims would also affect values for which the North Fork was designated a wild river.

Horse Creek

Horse Creek has 10 placer claims, covering some 200 acres. These claims were declared null and void by the Bureau of Land Management; however, if mining were conducted on these claims, it would disrupt approximately the lower 3 miles of this clear water stream, adversely affecting a small but productive fish habitat. Without proper controls, placer mining could result in the average discharge of approximately 8½ cfs of silty water to the Glacier River, less than a fourth mile above its confluence with the North Fork.

If mining ever occurred on the upper reaches of Horse Creek, severe undercutting of steep side slopes, which are underlain by permafrost, would result in sloughing and other mass wasting processes. The lower creek basin, although in flatter terrain, offers little room for the construction of settling ponds without the significant loss of mature spruce-hardwood forest and the disruption of shallow permafrost zones. Placer mining on lower Horse Creek would also potentially cause destruction or damage to a narrow band of white spruce. In addition, mining along this section of the creek would potentially adversely affect moose wintering grounds.

Mining operations in this area would be disruptive to river users and recreationists along the North Fork and the Glacier River.

Ipnek Creek

The Ipnek Creek drainage is a beautiful, pristine watershed supporting a productive wildlife habitat and an abundant Arctic grayling fishery

throughout its 8½ miles of clear-flowing stream. If mining were conducted on the 1,680 acres of claims in this watershed, many of these natural resource values would be adversely affected.

Mining operations in tributary drainages and the upper 4 miles of the main stem, where mining claims exist, would be extremely damaging due to the narrowness of the creek channel and the dense, mature vegetation along the stream banks. Mining along lower Ipnek Creek on claims 5-12 Below Discovery could damage large mature white spruce trees that border the creek; however, the channel width from approximately 5 Above to 12 Below Discovery appears sufficient to accommodate settling ponds in certain locations.

There is currently no existing access to these claims other than by river. If road or trail access were to be constructed to these claims, it would affect the whole wilderness character of this part of the park.

Mining operations on Ipnek Creek would seriously affect a very productive grayling fishery and probable spawning area, and mining in the upper watershed could potentially disrupt grizzly and sheep populations. Small mammal populations are also likely to be unusually high in this watershed and, in turn, would support a diverse raptor population.

Ipnek Creek could potentially have high historical values because it was a well-known travel route between Wiseman and the Wild Lake area. Several historic sites and small tools from the early twentieth century were noted at the mouth of Ipnek Creek, and although sites upstream were not documented, this concern should be carefully evaluated.

Mining of this drainage would also have significant adverse effects on river recreationists along the North Fork, particularly at the mouth of Ipnek Creek, which is a popular campsite. Even if mining operations were far upstream, sedimentation of this crystal-clear stream would destroy its use by campers for drinking and cooking water.

La Rowe (Creek)

La Rowe (Creek) has approximately 120 acres of claims covering about 1 mile of the creek channel. It is a clear water stream supporting a healthy aquatic habitat and population of Arctic grayling. Mining could result in an average discharge of approximately 24 cfs of silty water directly to the North Fork. Most of the claim area is located on a relatively wide floodplain, sufficient enough to allow for the construction of settling ponds.

Access concerns are again significant; there are no roads or trails into the area and the nearest point of access is 10 miles away (the Mascot Creek airstrip).

Concerns for effects on the cultural and recreational resources are similar to those expressed for Horse Creek and the lower Glacier River.

La Salle Creek

The mining claims in this watershed include several environments and represent different problems if they were mined.

The Myers 1 and 2 claims covering 40 acres were declared null and void by the Bureau of Land Management. They are situated in a relatively wide floodplain where settling ponds could be constructed and mining activities would have minimal effect on mature vegetation if mining ever occurred on these claims.

The upper claims (Myers 3--also declared null and void--and Hansen 1 and 2), however, cover 60 acres in an area where effects on mature vegetation would be greater because of their location in a narrower stream valley, increasing potential for sloughing along the steeper side slopes.

Hansen 3 lies high up in a tributary drainage where it would virtually be impossible to control offsite mining effects because of the steeper terrain and tundra environment underlain by permafrost. Access would be difficult, and significant damage to surrounding terrain would occur if a road were constructed to the Hansen 3 claim.

The watershed is heavily used by Dall sheep and caribou, which could be significantly affected by mining.

Cultural resource concerns would be the highest on the Myers 1 claim located at the mouth of La Salle Creek, and operations in this same area would have the highest impact on recreationists using the Glacier River Valley.

Mascot Creek

Currently, this drainage is being severely affected by placer mining. The basin contains 29 claims, encompassing some 580 acres. In 1981 the mining operator focused work primarily on approximately 11 of these claims.

Under natural conditions, the main stem of this drainage contains approximately 8 miles of clear-flowing stream. In 1981, approximately 4 miles of the stream were adversely affected by either direct stream modification or the release of heavily silted sluicing waters. The creek was completely dammed just above the Wally Creek tributary during the 1981 season to provide a source of process waters for placer-mining operations, resulting in fluctuating flows downstream. Heavily silted processing waters were then released back into the total streamflow, where they traveled another 2 miles downstream to a series of settling ponds (see illustration 9). Because the entire flow of the creek was directed into these ponds, they failed to adequately clean the water. In 1981, Mascot Creek was discharging an average of 19 cfs of heavily silted water into the Glacier River (see illustration 10). However, two known flood events from localized rainstorms in this watershed during the mining season caused the breaching of the settling ponds and resulted in the sudden release of a heavy sediment load into the Glacier River. The resulting sediment

Illustration 9. Aerial view of settling pond on Mascot Creek. Original stream channel in this area no longer exists.

Illustration 10. Sedimentation from the Mascot Creek mining operation visible at the confluence of Mascot Creek and Glacier River during operations with settling ponds in use.

plume caused by this flood flow was visible in the North Fork as far as 15 miles downstream of where the Glacier River joins it and 28 miles downstream of the mining operation.

The potential for sewage contamination from the mining camp located midway up the drainage is high because of the creek's steep slopes, restricted basin, and shallow permafrost. Because of these factors, there is a high probability of rapid subsurface drainage into the creek from the latrine facility located 30 feet from the creek (see illustration 11).

Mining in Mascot Creek has completely destroyed the riparian vegetation on the 2 miles of stream in the area of the claims actively being mined (see illustration 12). Some undercutting of bordering side slopes has also occurred, with resulting disturbances of ice lenses and underlying permafrost on these slopes. The continued uphill migration of sloughing and landsliding can be expected to continue in these areas. The morphological characteristics of the stream channel in this area have also been completely altered from its original form, which can be expected in most placer-mining operations in narrow valleys (see illustration 13).

The creek channel below the active mining area (claims 5-8 Below Discovery) is less severely disturbed except for stream rechannelization, which has occurred in certain locations where the access road has cut across stream meanders (see illustration 14).

Past and present mining operations have resulted in significant impacts to adjoining areas outside claim boundaries. These impacts demonstrate the results of uncontrolled activity in sensitive natural terrains. Specifically, the airstrip was built on the high bench lying between Glacier River and Mascot Creek (not attributable to the present mine operator); this is terrain underlain by shallow permafrost. It is now unusable due to differential settling as the permafrost melted, turning the whole airstrip into a bog. Changes have also occurred in the tundra vegetation. A road through this same area has caused serious erosion problems, not only in this area but all the way along the road over Glacier Pass to Wiseman. These effects will be long-lasting.

Concern for future effects in this basin are necessarily focused on the upstream areas where mining has not yet occurred. Access to the upper watershed and the Wally Creek tributary is difficult due to the narrowness of the drainage. Road construction could cause significant disturbance to side slopes and vegetation. A cache and several historic cabins along the creek could be adversely affected if protection is not maintained during future operations.

LOWER HAMMOND RIVER

Canyon Creek

Canyon Creek is tributary to the Hammond River and lies just inside the park boundary, 6 miles upriver from the Middle Fork Koyukuk River. The 3 claims on this creek cover 60 acres in the extreme lower end of its watershed just above its confluence with the Hammond River.

Illustration 11. Aerial view of Mascot Creek mining camp and support equipment. Historic cabin and cache located right center of photograph.

Illustration 12. Stream channel manipulation by placer mining on Mascot Creek has completely altered the natural stream channel in this area. Stream bank sloughing has also occurred on left side of stream channel. Pipeline transports process waters to sluice box located downstream.

Illustration 13. Channel disturbance associated with placer mining on Mascot Creek. Note unbermed fuel and chemical storage tanks adjacent to Mascot Creek. Also note access road across tundra slope in background, with large slump at bottom.

Illustration 14. Stream channel in lower Mascot Creek has been diverted from its natural streambed by construction of access road that crosses natural stream meanders.

Most of the claim area is within a 350- to 400-foot-deep gorge with narrow, steep, and unstable bordering cliffs. The bottom of the gorge is only as wide as the creek, and any mining would, in all probability, cause landsliding and rock falls from the surrounding cliffs.

Canyon Creek discharges an average of 18.5 cfs of water to the Hammond River. The quality of this water fluctuates. During 1981 the creek was running very turbid due to natural upstream landslides along Sunrise Gulch. Canyon Creek above Sunrise Gulch was running clear.

The biggest concern for mining on these claims would be its potential effect on area wildlife. The benches above the deep gorge is prime moose habitat, and the entire area is within an important grizzly bear spring and fall intensive use area. In addition, the area is within an area used by caribou during their spring migration.

Sufficient access is already available to the claims by a road up the Hammond River to Vermont Creek and then by road or trail to the claim area. An old road over the high benches above the gorge also exists in a relatively stable condition.

Hammond River/Jennie Creek Lake (Outlet)

Any mining on the two 20-acre claims could potentially affect the important clear water resource of the Hammond River. Hammond River claim #2 was declared null and void by the Bureau of Land Management. King salmon are known to occur in the Hammond River as far as approximately 16 miles upstream, and any disturbance of the river in the area of the Hammond River claims could result in the potential loss of 8 miles of this important habitat.

Wildlife values similar to those on Canyon Creek would also be threatened by mining on these claims, and recreational and aesthetic values are high in this pristine and scenic river valley.

No access is currently available to these claims, and any proposed access would have to be carefully evaluated. The park boundary is less than 3 miles east of the claims and 2 miles from the claims in a southerly direction. Terrain to the east, by Jennie Creek Lake (outlet), is not as steep as that to the south and may be able to accommodate an access route more easily and with less impact.

Snowshoe and Pasco Creeks

These two small creek basins contain 8 claims covering some 300 acres, including 1 lode claim near the boundary between the two watersheds. The creeks draining these watersheds appear to be intermittent and discharge directly into Wiseman Creek.

Wiseman Creek, although of generally good quality above its confluence with Snowshoe Creek, is affected heavily downstream by Nolan Creek and the ongoing mining in that creek basin.

The present mining technique being applied on the Snowshoe claims is drift mining, conducted primarily during the winter months. The impacts from this type of mining are not well-documented.

In 1981, the vertical shafts associated with the drift-mining operation on the claims were filled with discolored water, indicating the existence of shallow groundwater in the basin. Any shaft extending through the permafrost zone is also likely to act as a thermoconductor during the summer months, causing further melting of the permafrost and possible future subsidence. The water in the shafts could be an indication that this process has already begun.

Red-stained pools of water with pH readings considerably more acidic than the flowing creek waters indicate possible leaching from old mine workings on the claims.

Other concerns for mining on these claims would be the disturbance to tundra slopes underlain by permafrost that could occur from development on steeper hill slopes, which are already susceptible to solifluction processes. In any underground mining operation, there is also the possibility of acid drainage from the mine.

Access already exists from the Wiseman area and presents no real concerns for the future. Although the claims are not located in an area critical to future park management concerns, mining could affect the spring migration of caribou through the area.

Washington Creek

Washington Creek contains 15 placer claims totaling 300 acres. This undisturbed watershed contains a clear water stream some 6½ miles in length, with very stable, heavily vegetated stream banks throughout its entire length. This heavy vegetation has caused a slight discoloration of the creek water. Mining on any of the claims would most likely affect mature spruce stands along the creek, and although the creek appears to have good fish habitat, no fish were observed in the creek.

If mining commences, Washington Creek could contribute an average of approximately 12 cfs of silty water directly to the Glacier River. Only the lowest claim (Washington claim) offers room enough to construct settling ponds without affecting mature vegetation.

The major concern is access. At the present time, there is a single bull-dozer track extending from the winter trail on Glacier Pass to the lower claim area. However, this trail traverses several miles of moist tundra slopes, and if use is continued, severe and long-term disturbance can be expected; this would be similar to the problems associated with the winter trail in the area of Glacier Pass (see illustration 15).

Mining on the lower claims could also affect the spring and fall migration of caribou up the Glacier River Valley. Recreational use in the Glacier River Valley could also become important to park visitors due to its easy access from the Dalton highway and the Wiseman area.

Illustration 15. Winter trail crossing moist tundra in area of Glacier Pass.

MIDDLE FORK KOYUKUK RIVER

Alder Creek

Mining operations conducted within this basin would disrupt a one-half-mile section of this approximately 11-mile-long drainage that encompasses some 40 acres. If not properly designed and operated, a placer-mining operation located here could discharge an average of 16.5 cfs of sediment-laden water directly to the North Fork 6½ miles downstream. Channel width in the claim area, however, is sufficient to accommodate settling ponds if properly designed and constructed and if the main volume of the creek is separated from process waters.

Access to this claim group is a major concern due to the distance of the claims from existing access routes, due to the fragility of the surrounding terrain, and due to the potential effects on archeological and historic resources. A proposed access route alignment indicated on the claimant's location notice is southeasterly from the claims approximately 5 miles to the existing Wiseman winter trail leading from Bettles to Wiseman (see Middle Fork Koyukuk River Mining Claims map in back pocket of document). This route would traverse undisturbed moist tundra, steep slopes, and an unstable slide area. All alternative access routes should be considered before approving this proposed route.

Effects on vegetation would be minor if operations were confined within the floodplain. Approximately 1 mile of productive fish habitat would be directly disrupted during the life of any mining operations, while fish habitat in the lower 6½ miles of the creek would be significantly affected. Wintering grounds for moose located in the area of the North Fork at its confluence with Alder Creek would be only minimally affected unless operations or access were proposed through this area during the winter.

Prehistoric and historic resource potential is low in the actual claim area. The effects on the wild river designation for the North Fork would be lessened by the 6½-mile distance of mining operations from the river and the topographic screening between the claim area and the river. Mining operations would probably not be noticeable to recreationists using the river.

Middle Fork Koyukuk

Two claims covering 80 acres within the park are located on the Middle Fork a few miles downstream from Tramway Bar.

The major concerns over allowing mining on these claims are primarily changes in water quality, disruption of streamflows, and changes in river channel morphology. Runs of chum or king salmon in the Middle Fork could be adversely affected by mining. Other wildlife values associated with grizzly bear intensive use in the spring and fall and caribou migration in the spring could also be affected. Mining activities on claims located just upstream and outside the park boundary may also affect these values.

UPPER HAMMOND RIVER

Kalhabuk Creek

Only one 20-acre claim is located on this creek, which is a small tributary to the Hammond River. Kalhabuk has a stream length of approximately 5 miles and discharges an average of 14 cfs of clear water directly to the Hammond River less than 1 mile below the claim.

The major concerns if mining occurred on this claim would be impacts associated with access and the effects on wildlife and recreation in this area of the park. Some mature vegetation would be lost on the claim area, and disruption to grizzly habitat and spring migration of caribou could potentially occur. The nearest access is the Dalton highway and airstrip at Dietrich Camp located 4.5 miles east of the claim.

The claim area is located in an easily traveled route between the Dalton highway and the upper Hammond River Valley, which could be attractive to recreationists seeking easy access to the highly scenic Mount Doonerak region of the park.

KUYUKTUVUK CREEK

Kuyuktuvuk Creek/Trembley Creek

This highly scenic creek basin provides easy and attractive access to the northeastern corner of the park and has already become popular with backpackers and other recreationists.

If the Aldon 2 claim situated on 20 acres in this basin were mined, the high recreational values could potentially be lost, along with significant wildlife values associated with grizzly bear use and caribou migration.

Other concerns are the potentially high archeological values that could be affected by mining in this valley. Kuyuktuvuk Creek has historically been a popular travel route between the Dietrich River and Itkillik River on the Arctic Slope.

The claim area is located on a broad floodplain where settling ponds could be constructed and access could be restricted to gravel bars. Kuyuktuvuk Creek and its tributary Trembley Creek have clear water and excellent fish habitat, with large populations of grayling expected to be present. Placer mining could seriously damage these values for the duration of mining and for several years following.

NOATAK RIVER

Nigikpalvgururvrak Creek

This creek basin contains 160 acres of placer claims located primarily within the first 2 miles of the creek. Under existing natural conditions, the creek discharges an average flow of 88 cfs of clear, good quality water to the Noatak River.

A major concern in mining these claims is the potential effect mining could have on recreationists using the Noatak River Valley. Although the claims are located above the point where most float trips begin, the discharge of over 80 cfs of silty water directly to the Noatak could cause visually apparent turbidity in the river as far as 15 to 20 miles downstream. Lake Matcharak, where many commercial float trips begin, is located 12 miles downstream and could be affected by severe siltation of the quantity currently being experienced on Mascot Creek. Only the lower 2 or 3 claims offer enough area to construct settling ponds with minimal impact; however, they would be located within the floodplain of the Noatak River, making them vulnerable to flooding.

The Noatak River Valley is a very remote and highly scenic area with pristine wilderness values. Any mechanized mining operations or increased access would severely damage these values, especially if mining operations were to occur on the claims located within or directly adjacent to the Noatak River floodplain, which is the primary travel route for most recreationists in this area of the park.

Mining could also affect the high wildlife values present in this area, including black bear populations along the rim, important sport fishery habitats in the Noatak, and intensive waterfowl nesting along this whole stretch of the Noatak Valley.

Ningyoyak Creek

This creek basin contains some 46 claims covering 920 acres. All these claims are lode claims and represent concerns that are somewhat different from placer mining concerns.

Most of the claims are located on tundra slopes that are underlain by continuous and shallow permafrost. Any disturbance of the vegetative cover in this area either for access purposes or mining operations could destabilize these slopes and lead to erosion or increased downhill soil movement. Recovery of disturbed sites would be very slow, resulting in long-lasting scars for the area. There is a potential for future acid mine drainage from lode mining, which could eventually reduce the chemical quality of nearby surface waters. The danger of chemical leaching for the Noatak River would be dependent upon the size and type of mining operation proposed for the claims.

Access to these claims is also a major concern. Indications are that an airstrip would be constructed on the claims to facilitate removal of the ore. If the airstrip is constructed on tundra, severe impacts can be expected, similar to those experienced on the older airstrip located at Mascot Creek. Unless properly constructed, the airstrip would be useless within a few years. If an airstrip is necessary, it would be much more desirable, from an environmental standpoint, to construct it on the active gravel bars of the Noatak River.

Any mining operation in these claims, however, would most significantly affect river recreationists using the Noatak River. Most commercial float trips begin at Lake Matcharak located 6 to 7 miles upstream of the claim area. Although the claims are set back from the river 1½-2 miles, the terrain characteristics would make any operation conducted on them very visible. Because this area of the park is an important destination goal for many park users, the pristine wilderness character of this area is important to maintain; any mining would severely damage this character.

The extensive floodplain marsh habitats, oxbow lakes, and sag ponds of the area make this site even more of an important waterfowl habitat area than areas further upstream on the Noatak. Any disturbance of these sites by mining are likely to cause potential impacts of a significant nature to local waterfowl nesting areas.

SUMMARY OF SPECIFIC EFFECTS

Table 12 presents a summary and evaluation of the potential effects presented in this section. This table also highlights those effects that would be of greatest concern in evaluating plans of operations should mining occur in any of the indicated drainages in the future.

Table 12: Evaluation of Potential Effects From Mining

Drainage	Hydrology and Water Quality[1]	Physical Modification of Terrain[2]	Access[3]	Wildlife[4]	Vegetation[5]	Cultural Resources[6] Arch.	Cultural Resources[6] Hist.	Recreation and Aesthetic Quality[7]
Bonanza Creek								
Above Discovery	H	H	H	H	H	M	H	L
Below Discovery	M	L	H	H	L	M	L	H
Conglomerate Creek								
Above Jim Pup	M	H	H	M	H	L	L	L
Below Jim Pup	M	L	L	M	M	M	M	L
Tributaries	H	H	H	M	H	M	M	L
Glacier River								
Above La Salle	M	M	M	M	M	L	L	L
At Confluence	M	M	M	H	M	H	M	H
Horse Creek								
Canyon	H	H	H	M	H	L	L	M
Flats	M	M	M	H	H	M	L	H
Ipnek Creek								
Above O'Houlihan	H	H	H	H	H	L	M	M
Below O'Houlihan	H	M	H	H	H	M	H	H
La Rowe (Creek)	M	L	M	H	M	L	L	H
La Salle Creek								
Upper	M	M	H	M	M	M	L	M
Lower	M	L	M	M	M	H	M	M
Tributary	H	H	H	H	H	M	L	M
Mascot Creek								
Tributary & Upper	M	H	M	M	H	L	M	L
Lower	L	L	L	L	L	L	H.	L
Canyon Creek	H	H	L	H	H	M	M	M
Hammond River	M	L	M	H	L	M	M	H
Snowshoe/Pasco Creeks	M	L	L	H	H	M	H	M
Washington Creek								
Canyon	H	H	H	H	H	L	H	M
Flats	M	L	M	H	M	L	M	H
Alder Creek	M	L	H	M	L	L	L	L
Middle Fork Koyukuk	M	L	L	H	L	L	H	M
Kalhabuk Creek	M	L	H	H	L	L	L	H

Drainage	Hydrology and Water Quality[1]	Physical Modification of Terrain[2]	Access[3]	Wildlife[4]	Vegetation[5]	Cultural Resources[6] Arch.	Hist.	Recreation and Aesthetic Quality[7]
Kuyuktuvuk Creek								
Upper	M	L	M	H	M	M	L	H
Lower	M	L	L	H	L	M	L	H
Trembley Creek	M	M	M	H	M	M	L	H
Nigikpalvgururvrak Creek								
Upper	M	M	H	H	H	H	L	H
Lower	M	L	H	H	M	H	L	H
Ningyoyak Creek	H	H	H	H	H	H	M	H

Assumptions: All evaluations are based on comparison of effects of the Mascot Creek operation.
Evaluations assume single operation conducted on claim group during normal mining season in Alaska on a creek-by-creek basis. They do not reflect cumulative effects.
All mining activity except access to claims would occur within claim boundaries.

Notes: H = high potential effect--greatest concern for future evaluation/assessment.
M = medium potential effect--significant, but less of a concern than previous category.
L = low potential effect--not of special concern unless proposed mining operation is significantly different from Mascot Creek operation.

[1]Evaluations are based on the morphological characteristics of the stream channel to absorb mining without significant change in stream hydrology and to accommodate settling pond construction to mitigate water quality degradation.

[2]Evaluations are based on the physical constraints of the stream channel to accommodate mining without significant disruption to stable stream banks, benches, or surrounding canyon slopes.

[3]Evaluations are based on whether access already existed to claim area. Low effect was given if existing trails/roads into claim area could be used without further improvement and terrain modification. Medium rating was given if new access would be needed; however, access could be confined to active floodplain or gravel, or by river or by crossing small segments of park lands in winter. A high rating was given if access would be difficult due to significant terrain modification in steep or restricted topography.

[4]Evaluations assume that high impact on fish resources would occur in conjunction with mining in all instances, since sedimentation and siltation would render the aquatic habitat unsuitable for fish use for the duration of the mining period and would affect the entire length of the stream. Evaluation of effects on other wildlife is based on presence of a species normal habitat in an area, location of documented migration routes, important concentration zones, and intensive use areas.

[5]Impacts on vegetation are considered low if mining operations can be confined to the active floodplain channel. High impacts occur in drainages with steep slopes where mature vegetation would be definitely disturbed by mining. Areas of medium concern are those where the mining operations could probably be located without affecting large amounts of mature vegetation.

[6]The evaluations are based on effects within actual claim boundaries. Secondary effects are not considered.

[7]The evaluations of recreation and aesthetic qualities considered the present and projected use of the area. Areas along major river channels, especially the wild North Fork, were considered to have high concerns. Also, areas with relatively easy foot access and passes that may provide access from one drainage to another were currently disturbed areas or those thought to have only a small attraction to recreationists.

mitigating measures and recommendations

HYDROLOGY/WATER QUALITY

Settling ponds or other adequate measures should be used to treat all process waters from placer-mining operations.

Settling ponds should be designed to hold water long enough in order to meet minimum standards of clarity and should provide sufficient storage capacity for the sediment to be removed from suspension. Provisions of the Federal Water Pollution Control Act, as amended, require settling ponds large enough to contain the maximum process waters used during any one day of operation, or other treatment of process wastes so that maximum daily concentration of settleable solids generated from the mining operation is 0.2 milliliter of solids per liter of effluent. A wastewater disposal permit is required from the state of Alaska for the operation of a placer mine and may carry similar requirements (see appendix B for permit requirements).

If settling ponds are used, channeling or diversions should be provided to enable routing of all uncontaminated waters around the treatment system and to prevent washout of ponds during periods of high runoff. Ponds should be located as far from the stream as possible so that the only influent is process water.

Outlets from settling ponds should have a spillway that releases only the upper layer of water in the pond and should be placed as far from the inlet as possible to avoid "short circuiting" of sediments. If the outlet must be placed near the inlet because of limiting physical factors, a baffle should separate the two to ensure adequate water circulation in the pond.

Pond length should typically be twice the width to provide sufficient settling time for sediments. If the length/width ratio is less than 2, baffles or other obstacles should be placed in the center to increase the effective settling length of the pond. Several ponds in a series can make an effective system for removing sediment in sequential stages. An operator can work upstream, lengthening his chain of ponds as he progresses. Where stream geometry is limiting, process waters can be transported to a distant pond by ditch or pipe.

A possible drawback to the use of settling ponds is the amount of additional surface disturbance that might be required for their construction. Although this would possibly create additional impacts on aesthetic qualities and vegetation in the area being mined, it must be considered a trade-off for the benefit of maintaining high water quality downstream. The presence of settling ponds or other water purification devices is short-term, assuming that they are regraded, covered with topsoil, and eventually become revegetated.

Retention and stratification of impounded water result in high water temperatures. The amount of warmer water discharged to the environment would be quite small if a recycling, closed system were used.

In 1981, the mining operation on Mascot Creek had settling ponds downstream of the washing plant. However, the effectiveness of these ponds was minimal. At the Mascot Creek operation, gravel washing is estimated to require 600 gallons of water per minute. If the sluice is operated for one 11-hour shift per day, 396,000 gallons of effluent water would be generated. This volume of water occupies 52,938 cubic feet. Allowing for 100 percent additional volume to handle accumulated silt volume, a pond the size of the one constructed on Mascot Creek (100 feet wide, 300 feet long, and 8 feet deep) would be sufficient to handle the approximate 106,000 cubic feet of effluent generated from 11 hours of sluicing. However, the Mascot Creek operation also runs the entire volume of Mascot Creek through the same ponds. Using the 19 cfs mean annual flow values for Mascot Creek, the ponds would need to hold over 1.6 million cubic feet of water per a 24-hour day. Considering the potential flood flows for this same drainage, the present pond capacity is insufficient to store normal flow volumes, much less storm flows. Another settling pond constructed upstream in 1981, with the capacity estimated at 36,000 cubic feet, still does not provide sufficient storage to handle the total streamflow of silty water.

Increased efficiency of mining operations is a possible solution to reducing the size of holding ponds. Recycling water from settling ponds, forming a closed-loop system, not only requires less water but also permits reduction in pond size and results in little or no sedimentation of receiving streams.

Another technique that lessens sluicing water requirements is removal of large rocks from the gold-bearing gravel before it is washed. Care must also be taken to impound and/or divert only the amount of water actually needed to operate the sluice. The addition of flocculants to increase the efficiency of settling ponds may save even more water and increase the speed at which sediments settle out. Application of this technique must be evaluated on a creek-by-creek basis, taking into consideration the characteristics of native clays and the possible effect of the flocculant on the environment.

Where geometry or size of drainage channels does not permit construction of settling ponds, filtration systems can be used to capture suspended sediments. One method of filtration employs a multiple sequence of dams or berms constructed of tailings, which should have a 3:1 slope on the impoundment side. Process water is then filtered as it seeps through the dam, with each successive dam removing progressively more sediment. The degree of filtration by this method depends on the number and thickness of dams, the rate of application of wastewater, the size and gradation of dam materials, and the characteristics of the sediment to be removed. Design of such systems must allow for natural runoff, spring and summer flooding, and potential effects of seasonal frost and permafrost. Dams should be breached at the end of the summer to prevent damage from freezing and accumulation of ice in the storage basin. A spillway or overflow bypass should also be provided to control overflow and should be designed to handle runoff from a 10-year flood (ADEC 1978).

Where placer mining occurs, some modification of stream morphology and flow characteristics cannot be avoided or entirely mitigated. However, the effects of channel alteration and flow can be mitigated by certain practices. Sluicing or dredging could be conducted on the opposite side of the channel from where the main stream is flowing or has been channeled to reduce turbidity in water not directly used for processing. However, where valley bottoms are narrow and/or steep topography exists, this practice may be difficult or impossible.

If impoundments are used to collect water for washing gold-bearing gravels, steps should be taken to ensure that the flow rate in the active stream channel is sufficient for survival of downstream fisheries and other aquatic life. This was not being done on Mascot Creek. If downstream flow is completely cut off, even for a short time, damage to aquatic life can be significant. Maintaining streamflow is most critical in low water years when available surface water is substantially reduced. It is under these conditions that miners may be tempted to fill reservoirs quickly to maintain washing operations, cutting off downstream flow. Use of a closed system of settling ponds with water pumped back for reuse greatly reduces water requirements and permits maintenance of higher streamflows, especially in low water years.

Sudden release of flows should also be avoided to minimize the transport of suspended sediment, scouring of stream channels, and bank erosion. Settling ponds are most effective for regulating surges of process water, but filtration systems can also reduce a sudden increase in downstream discharge.

To minimize the long-term impacts of channel modification upon completion of mining, washed gravels and topsoil should be recontoured to facilitate restoration of natural flow characteristics.

Nonpoint sources of sediment, including waste piles, work areas, camps, access roads, airstrips, and other cleared areas, should be hydrologically isolated, using ditches and/or berms to contain runoff. Water draining from these disturbed areas is likely to be high in sediment and should be diverted into settling ponds.

It is especially important that stockpiles of topsoil rich in organic matter be protected from direct runoff into streams. If large amounts of organic material are permitted to enter the active drainage channel, dissolved oxygen concentrations can be significantly reduced, which can be detrimental to downstream aquatic life. Silt entering streams from soil stockpiles would also be detrimental.

The access shaft for the drift-mining operation on the Snowshoe claims should be adequately sealed, well-insulated, and shaded during periods when mining is not being conducted to minimize thawing of permafrost and possible subsidence; this would also avoid problems with the shafts filling with water. In addition, once mining is completed and an access shaft is abandoned, a permanent insulated plug or proper refilling of the shaft should be required.

GEOLOGY/SOILS

To facilitate the process of reestablishing soils in mineral areas, topsoil should be conserved and stockpiled. When an area is to be cleared, stockpiling of topsoil provides a soil resource for later reclamation. Fine sand and silt should also be prevented from leaving the mining site so they can be remixed with coarse material during recontouring to provide a soil medium for revegetation. This can be accomplished by construction of settling ponds, which capture the water/silt mixture resulting from processing of the placer gravels.

Recontouring of waste piles, settling ponds, and other disturbances should be done as soon as mining ceases. All trenches, holes, and small depressions should be filled or smoothed. Proper reclamation with fine materials in the surface layer permits the areas to stabilize and hastens natural revegetation.

Problems of soil erosion and instability in soils can be avoided by careful planning of locations for facilities, operations, and access. If possible, construction should be avoided on potentially unstable sites; for example, tundra with underlying permafrost should not be disturbed if possible. To avoid slope failure or mass wasting, excavation or grading should not be undertaken on slopes underlain by permafrost.

If access roads must cross tundra, a gravel pad thick enough to insulate the underlying permafrost should be laid down and used as the road surface. Where long distances make this too expensive, travel can be restricted to winter months when the ground surface is frozen. This necessitates advance planning so that needed equipment can be moved into the mining area during the winter preceeding the next anticipated mining season.

VEGETATION

Although a placer-mining site cannot be returned to its original natural condition, several mitigating measures can be taken to restore an impacted area to the point that it can again be vegetated and support natural processes such as soil development. 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 and to the area within claim boundaries. Examples of low impact areas are gravel bars and land disturbed by mining in the past. Maximum use of river gravel bars for transport of equipment and supplies can minimize the effects of overland travel.

The most important measure that can be taken to mitigate the effects of mining on vegetation is to reclaim mine spoils by leveling waste piles and by mixing fine-particle spoil material with coarse gravel and rock waste. Piles of coarse rock should not be left exposed on the surface, since it is difficult for such material to accumulate sufficient soil for plant growth, even after long periods. Spoil piles do not accumulate alluvial soil during floods because they are too high; leveling to reasonable conformity with the surrounding landscape is much more conducive to natural

revegetation. 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 artificially revegetated with native species to minimize erosion.

The dominant pioneer species during natural revegetation are fireweed, alder, 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 stream banks of the reestablished watercourse, consisting mainly of willow species and alder, with a ground cover of grasses, mosses, lichens, 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 would 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 would follow, and eventually a spruce forest would 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. Field surveys should be undertaken to verify the presence or absence of any such plants whenever a request to operate is received.

Other means to reduce the impact of mining on surrounding vegetation are as follows:

Debris from the clearing of new areas to be mined should be disposed of, especially timber slash, to minimize unsightly waste and the hazard of fire, insect infestations, or disease.

Offroad or offtrail travel should be reduced. There are many areas where vehicles have traveled across tundra parallel to existing roads, spreading the damage over a wider area, and much of the impact is exerted outside claim boundaries. Proper placement and construction of roads and trails in the first place should make parallel offtrail travel unnecessary.

New road miles should be minimized. Methods to achieve this include using existing roads wherever feasible, even if the access route is somewhat longer; placing new roads where the need for maintenance would be low (in many cases, ridgelines or the edges of valleys at the slope base would serve this purpose); providing drainage across roads, using ditch checks and sloping; and regularly maintaining roads to keep them serviceable.

Only winter travel for overland transportation of supplies and equipment should be allowed.

Plant species in the undisturbed parts of the creek basins with claims should be surveyed to reduce the possibility that rare species or unusual plant communities (such as those near springs or other anomalies) are not inadvertently destroyed.

A comparative study should be done of revegetation now occurring on abandoned mines and claims, documenting site characteristics and time of recovery. This helps determine the most rapid means of inducing natural revegetation and allows the Park Service to avoid unforeseen problems with reclamation after existing and future mines are abandoned.

The performance bonds of operators should be retained until successful reclamation is apparent. This could be indicated by obvious signs that revegetation is occurring, lack of erosion, and clear water draining the site.

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 areas. In addition, transporting equipment along established access routes would minimize disruption to wildlife and destruction of additional habitat. Where feasible, movement of heavy mining equipment should be limited to winter when the ground surface is frozen.

It is essential that settling ponds be constructed to treat the sluicing waters generated by placer-mining operations to reduce the amounts of sediment discharged into streams and to avoid siltation of fish habitat and spawning areas, the disruptions to incubating eggs, the entrapment of fish fry that have not yet emerged from the gravel, and the 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 become a source of sedimentation during storms and heavy rains.

Because 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 bird species, and 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 for water should be screened to avoid the possibility of entrapment of fish.

Berms should be placed around fuel storage tanks at mining claims, staging areas, and airstrips 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.

Streamflow should not be totally blocked by a man-made structure, such as a dam. A dam would severely restrict movements and migrations of fish and may be lethal to other forms of aquatic life. In low water years, special efforts must be made to budget streamflow so as not to impair downstream aquatic life.

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.

All mining and transportation activities should be conducted in a manner that will not harrass wildlife.

CULTURAL RESOURCES

The mitigation of adverse impacts on archeological sites by excavation should not be the first choice, particularly when avoidance of the site remains an option. Excavation should be undertaken only when the site is in imminent danger of destruction. Any mining activities that could result in the destruction of significant historic structures or materials should be addressed with the mining operator to examine possible alternatives. It is in the interest of mining operators and claimants, the general public, and the Park Service that historic sites and events associated with the gold rush period in the Koyukuk and Noatak areas and that resources important to an understanding of Alaskan prehistoric events and processes be preserved and protected.

The objective is to allow for the consideration of archeological and historical values on and in the vicinity of mining claims prior to approval of a plan of operations or the start of mining activities so that those resources worthy of protection would be identified and preserved. Areas that are less significant should be examined for the information they contain. Such evaluation is the process by which valuable resources can be identified, preserved, and protected.

Protection measures should include the development of programs for the preservation or reasonable adaptive use of identified sites, as the situation demands--informing all concerned of the values contained in sites and the legal protections afforded to these values. It is very important that mining plans of operations, outlining activities to be undertaken in areas with historic or prehistoric site potential, be received at least one year before mining activities are to commence.

A claimant, lessee, or operator should not collect, move, injure, alter, or destroy any archeological or historic object, artifact, site, structure, or any other resource of cultural importance; to do so would be in violation of the Antiquities Act of 1906 and the Archeological Resources Protection Act of 1979, both of which carry considerable penalties. In the interest of protecting the nation's and Alaska's cultural resources, all archeological, historic, and paleontological sites or objects should be immediately reported upon discovery to the superintendent of Gates of the Arctic National Park and Preserve. All activities that would endanger a site or materials should be stopped. Appendix B contains additional stipulations for protection of cultural resources from mining operations in NPS units in Alaska.

RECREATION AND AESTHETIC QUALITIES

To lessen visual intrusions, to enhance recreational opportunities, and to allow for natural revegetation, all areas subjected to mining operations should be restored as closely as possible to their original contours. Spoil piles should be leveled, and overburden and topsoil should be replaced.

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 as far as possible from the North Fork Koyukuk River. The park should consider requiring the use of some existing facilities on Mascot Creek whenever the claimants propose moving into other drainages to mine.

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.

Traffic into and from the operations during the mining season should be the absolute minimum necessary to perform the job. Airplanes and other vehicles moving in and out of the mining operations would reduce the quality of the wilderness experience for many people.

appendixes

APPENDIX A: LEGISLATION

Presidential Proclamation 4617 - Gates of the Arctic National Monument December 1, 1978

Alaska National Interest Lands Conservation Act - December 2, 1980

Title I - Purposes, Definitions, and Maps
Section 101
Title II - National Park System
Section 201
Section 206

Title VI - National Wild and Scenic Rivers System
Section 601

Title VII - National Wilderness Preservation System
Section 701

Title XIV - Amendments to the Alaska Native Claims Settlement Act and Related Provisions
Section 1431(j)(1) and (2) and 1431(k)

THE PRESIDENT

[3195-01-M]

Proclamation 4617 **December 1, 1978**

Gates of the Arctic National Monument

By the President of the United States of America

A Proclamation

Lying wholly north of the Arctic Circle, the Gates of the Arctic National Monument hereby created preserves an area containing a wide variety of interior arctic geological and biological forms. The essence of the geology of the area is its great diversity. There are excellent examples of glacial action which formed U-shaped valleys and morraine-dammed lakes. In contrast are the fissure-shaped precipices of Ernie Creek and the tilted limestone blocks along the northern edge of the Brooks Range.

Associated with these various land forms is a progression of ecosystems representing a continuum of communities from the boreal spruce forest and riparian shrub thickets in the south to the arctic tussock tundra in the north. These communities of plants and undisturbed animals offer excellent opportunities for study of natural interaction of the species.

The monument also protects a substantial portion of the habitat requirements for the Western Arctic caribou herd which uses ancient routes through the mountains for migration. This herd, which has suffered severe population losses recently, is of great value for the study of the population dynamics relating to both the decline and recovery of the herd.

The archeological and historical significance of the area is demonstrated by the studies which have revealed evidence of human habitation for approximately 7,000 years. Several known traditional Indian-Eskimo trade routes run through the monument area giving the promise of further important archeological discoveries. In the Wiseman and Ernie's Cabin mining regions in the south are offered opportunities for historical study of the life of the Alaskan pioneer miner of the early twentieth century.

The land withdrawn and reserved by this Proclamation for the protection of the biological, geological, archeological, historical, 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 upon 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 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 Gates of the Arctic 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 Gates of the Arctic National Monument on the map numbered GAAR-90,011 attached to and forming a part of this Proclamation. The area reserved consists of approximately 8,220,000 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 acquisition 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

Public Law 96-487
96th Congress

An Act

To provide for the designation and conservation of certain public lands in the State of Alaska, including the designation of units of the National Park, National Wildlife Refuge, National Forest, National Wild and Scenic Rivers, and National Wilderness Preservation Systems, and for other purposes.

Dec. 2, 1980
[H.R. 39]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. This Act may be cited as the "Alaska National Interest Lands Conservation Act".

Alaska National Interest Lands Conservation Act.
16 USC 3101 note.

TITLE I—PURPOSES, DEFINITIONS, AND MAPS

PURPOSES

SEC. 101. (a) In order to preserve for the benefit, use, education, and inspiration of present and future generations certain lands and waters in the State of Alaska that contain nationally significant natural, scenic, historic, archeological, geological, scientific, wilderness, cultural, recreational, and wildlife values, the units described in the following titles are hereby established.

16 USC 3101.

(b) It is the intent of Congress in this Act to preserve unrivaled scenic and geological values associated with natural landscapes; to provide for the maintenance of sound populations of, and habitat for, wildlife species of inestimable value to the citizens of Alaska and the Nation, including those species dependent on vast relatively undeveloped areas; to preserve in their natural state extensive unaltered arctic tundra, boreal forest, and coastal rainforest ecosystems; to protect the resources related to subsistence needs; to protect and preserve historic and archeological sites, rivers, and lands, and to preserve wilderness resource values and related recreational opportunities including but not limited to hiking, canoeing, fishing, and sport hunting, within large arctic and subarctic wildlands and on freeflowing rivers; and to maintain opportunities for scientific research and undisturbed ecosystems.

(c) It is further the intent and purpose of this Act consistent with management of fish and wildlife in accordance with recognized scientific principles and the purposes for which each conservation system unit is established, designated, or expanded by or pursuant to this Act, to provide the opportunity for rural residents engaged in a subsistence way of life to continue to do so.

(d) This Act provides sufficient protection for the national interest in the scenic, natural, cultural and environmental values on the public lands in Alaska, and at the same time provides adequate opportunity for satisfaction of the economic and social needs of the State of Alaska and its people; accordingly, the designation and disposition of the public lands in Alaska pursuant to this Act are found to represent a proper balance between the reservation of national conservation system units and those public lands necessary and appropriate for more intensive use and disposition, and thus Congress believes that the need for future legislation designating new conservation system units, new national conservation areas, or new national recreation areas, has been obviated thereby.

TITLE II—NATIONAL PARK SYSTEM

ESTABLISHMENT OF NEW AREAS

Administration by Interior Secretary.
16 USC 410hh

SEC. 201. The following areas are hereby established as units of the National Park System and shall be administered by the Secretary under the laws governing the administration of such lands and under the provisions of this Act:

Gates of the Arctic National Park.

(4)(a) Gates of the Arctic National Park, containing approximately seven million fifty-two thousand acres of public lands, Gates of the Arctic National Preserve, containing approximately nine hundred thousand acres of Federal lands, as generally depicted on map numbered GAAR-90,011, and dated July 1980. The park and preserve shall be managed for the following purposes, among others: To maintain the wild and undeveloped character of the area, including opportunities for visitors to experience solitude, and the natural environmental integrity and scenic beauty of the mountains, forelands, rivers, lakes, and other natural features; to provide continued opportunities, including reasonable access, for mountain climbing, mountaineering, and other wilderness recreational activities; and to protect habitat for and the populations of, fish and wildlife, including, but not limited to, caribou, grizzly bears, Dall sheep, moose, wolves, and raptorial birds. Subsistence uses by local residents shall be permitted in the park, where such uses are traditional, in accordance with the provisions of title VIII.

Post, p. 2422.

(b) Congress finds that there is a need for access for surface transportation purposes across the Western (Kobuk River) unit of the Gates of the Arctic National Preserve (from the Ambler Mining District to the Alaska Pipeline Haul Road) and the Secretary shall permit such access in accordance with the provisions of this subsection.

Publication in Federal Register.

(c) Upon the filing of an application pursuant to section 1104 (b), and (c) of this Act for a right-of-way across the Western (Kobuk River) unit of the preserve, including the Kobuk Wild and Scenic River, the Secretary shall give notice in the Federal Register of a thirty-day period for other applicants to apply for access.

Environmental and economic analysis.

(d) The Secretary and the Secretary of Transportation shall jointly prepare an environmental and economic analysis solely for the purpose of determining the most desirable route for the right-of-way and terms and conditions which may be required for the issuance of that right-of-way. This analysis shall be completed within one year and the draft thereof within nine months of the receipt of the application and shall be prepared in lieu of an environmental impact statement which would otherwise be required under section 102(2)(C) of the National Environmental Policy Act. Such analysis shall be deemed to satisfy all requirements of that Act and shall not be subject to judicial review. Such environmental and economic analysis shall be prepared in accordance with the procedural requirements of section 1104(e). The Secretaries in preparing the analysis shall consider the following—

42 USC 4332.

Post, p. 2459.

(i) Alternative routes including the consideration of economically feasible and prudent alternative routes across the preserve which would result in fewer or less severe adverse impacts upon the preserve.

(ii) The environmental and social and economic impact of the right-of-way including impact upon wildlife, fish, and their habitat, and rural and traditional lifestyles including subsistence activities, and measures which should be instituted to avoid or minimize negative impacts and enhance positive impacts.

(e) Within 60 days of the completion of the environmental and economic analysis, the Secretaries shall jointly agree upon a route for issuance of the right-of-way across the preserve. Such right-of-way shall be issued in accordance with the provisions of section 1107 of this Act.

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.

TITLE VI—NATIONAL WILD AND SCENIC RIVERS SYSTEM

PART A—WILD AND SCENIC RIVERS WITHIN NATIONAL PARK SYSTEM

ADDITIONS

SEC. 601. DESIGNATION.—Section 3(a) of the Wild and Scenic Rivers Act, as amended (16 U.S.C. 1274(a)), is further amended by adding the following new paragraphs:

"(30) JOHN, ALASKA.—That portion of the river within the Gates of the Arctic National Park; to be administered by the Secretary of the Interior.

"(31) KOBUK, ALASKA.—That portion within the Gates of the Arctic National Park and Preserve; to be administered by the Secretary of the Interior.

"(33) NOATAK, ALASKA.—The river from its source in the Gates of the Arctic National Park to its confluence with the Kelly River in the Noatak National Preserve; to be administered by the Secretary of the Interior.

"(34) NORTH FORK OF THE KOYUKUK, ALASKA.—That portion within the Gates of the Arctic National Park; to be administered by the Secretary of the Interior.

"(36) TINAYGUK, ALASKA.—That portion within the Gates of the Arctic National Park; to be administered by the Secretary of the Interior.

TITLE VII—NATIONAL WILDERNESS PRESERVATION SYSTEM

DESIGNATION OF WILDERNESS WITHIN NATIONAL PARK SYSTEM

SEC. 701. In accordance with subsection 3(c) of the Wilderness Act (78 Stat. 892), the public lands within the boundaries depicted as "Proposed Wilderness" on the maps referred to in sections 201 and 202 of this Act are hereby designated as wilderness, with the nomenclature and approximate acreage as indicated below: 16 USC 1132.

(2) Gates of the Arctic Wilderness of approximately seven million and fifty-two thousand acres; 16 USC 1132 note.

TITLE XIV—AMENDMENTS TO THE ALASKA NATIVE CLAIMS SETTLEMENT ACT AND RELATED PROVISIONS

SEC. 1431 (j) RIGHTS-OF-WAY, ETC.—(1) In recognition that Arctic Slope Regional Corporation has a potential need for access in an easterly direction from its landholdings in the Kurupa Lake area and the watershed of the Killik River to the Trans-Alaska Pipeline corridor, the Secretary is authorized and directed, upon application by Arctic Slope Regional Corporation for a right-of-way in this region, to grant to such corporation, its successors and assigns, according to the provisions of section 28 of the Mineral Leasing Act of 1920, as amended, a right-of-way across the following public lands, or such other public lands as the Secretary and Arctic Slope Regional Corporation may mutually agree upon, for oil and gas pipelines, related transportation facilities and such other facilities as are necessary for the construction, operation and maintenance of such pipelines: 30 USC 185.

Umiat Meridian

Township 11 south, range 10 west;
Township 10 south, ranges 8 through 10 west;
Township 10 south, range 7 west, sections 19 through 36;
Township 11 south, range 7 west, sections 1 through 18;
Township 11 south, range 6 west;
Township 11 south, range 5 west, sections 1 through 18;
Township 10 south, range 5 west, sections 19 through 36;
Township 10 south, ranges 1 through 4 west; and
Township 10 south, ranges 1 through 10 east.

The final alignment and location of all facilities across public lands shall be in the discretion of the Secretary.

(2) Arctic Slope Regional Corporation shall not be entitled to exchange, pursuant to the provisions of paragraph (1) of this subsection, any in-lieu subsurface estate which the corporation has developed for purposes of commercial extraction of subsurface resources; unless the Secretary determines such an exchange to be in the national interest.

(k) NEPA.—The National Environmental Policy Act of 1969 (83 Stat. 852) shall not be construed, in whole or in part, as requiring the preparation or submission of any environmental document for any action taken by the Secretary or the Secretary of Defense pursuant to this section. 42 USC 4321 note.

APPENDIX B: MINING LAW OVERVIEW AND CURRENT REGULATIONS, STIPULATIONS, AND PERMIT REQUIREMENTS

Mining Law Overview and Current Regulations

Regulations Pertaining to Mining and Mining Claims in NPS Areas
- 36 CFR 9A
- 36 CFR 13
- 43 CFR 3833

Stipulations Applicable to the Conduct of Mining Related Operations on Mining Claims Within Units of the National Park System in Alaska

Permits Required for Placer Mining in Alaska

Under the laws of the United States that provide for acquisition of mineral deposits on the federal public domain, mineral substances are divided into three classes--locatable, leasable, and salable minerals--as follows:

> Minerals subject to location under the mining laws, sometimes called locatable minerals, include all of the metallic minerals and some of the nonmetallics, such as asbestos, barite, gemstones, and mica.
>
> Minerals subject to leasing, sometimes called leasable minerals, include oil, gas, coal, phosphates, oil shale, potash, and sodium; rights to deposits of these minerals are acquired by leasing lands containing deposits from the federal government.
>
> Materials subject to sale, sometimes called "common varieties" or salables, include sand, stone gravel, pumice, pumicite, and cinders; these materials are sold by the federal government.

American citizens and citizens of specified foreign nations have a right to prospect on unappropriated federal lands. If a locatable mineral is discovered by prospecting, a mining claim can be staked and the locator has an exclusive right to explore or exploit the deposit. A mining claim is a withdrawal of land from exploration and staking by another party.

The valid right includes as much of the surface and its resources (for example, timber) as are necessary for the prospecting and mining; these are regarded as mineral rights, not surface rights. The claim holder has the exclusive right to work the claim and not be interfered with by others.

Mining claims on federal public domain are generally of two types: lode and placer. In both cases, a valuable mineral on or in the ground must be discovered before a claim can be staked, and the claim must include the discovery point inside its boundaries.

A discovery is defined by a number of early court and land department decisions as a valuable mineral deposit of sufficient quantity and quality as to encourage a normally prudent man, not necessarily an experienced miner, to expend time and money in the hopes of developing a profitable mine. A discovery at one single point cannot legally be used as a basis for staking more than one claim. There is no restriction on the number of claims that may be staked.

Lode claims are staked where the valuable mineral is "in place"--undisturbed in its original position in a vein or a lode in bedrock.

Placer claims are staked on the ground where the mineral is not "in place," that is, where it has been moved from its original position in bedrock by erosion and weathering to another location and is in an unconsolidated deposit, usually an ancient or modern streambed.

There is no limit to the number of placer claims that can be staked as long as various legal requirements for a discovery are met. A location notice must be posted on the claim and must state the name of the claim, name of the locator, date of location, description of the claim (including dimensions and compass directions), and signature of the locator.

Claims may be patented or unpatented. Patenting consists of surveying, mineral examination, and purchase of the ground. Full surface title is usually acquired with the patent. 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 to 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 affidavit 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, Sect. 21-54) precipitated promulgation of regulations (36 CFR 9A) in 1977 for the Park Service to control all mining activities on patented or valid unpatented mining claims in all NPS areas. These regulations enable the Park Service to prevent or minimize potential damage to the environment and resource values through control of mining activities.

Typically, these NPS regulations require the mining operator to submit a proposed plan of operations to the 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 operations. 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(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 36 CFR 9.3, 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 1111(b) of the Alaska National Interest Lands Conservation Act. However, sections 9.9 and 9.10 still independently require an approved plan of operations prior to conducting mining activities in the park.

PART 9—MINERALS MANAGEMENT

Subpart A—Mining and Mining Claims

Subpart A—Mining and Mining Claims

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. Subpart A designated at 43 FR 57825, Dec. 8, 1978.

§ 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 the 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 period 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 pro

duction 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 unpatented mining claim in a 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 as promulgated on January 26, 1977, is, pursuant to section 8 of the Act, conclusively presumed to be abandoned and shall be void.

(b) Any unpatented mining claim in a unit established after September 28, 1976, or in an area added to an existing unit after that date, shall be recorded with the Bureau of Land Management in accordance with the provisions of section 314 of the Federal Land Policy and Management Act (FLPMA), 90 Stat. 2769, 43 U.S.C. 1744, and regulations implementing it (43 CFR 3833.1).

(c) A claimant of an unpatented mining claim in any unit must file annually with the Bureau of Land Management a notice of intention to hold a claim or evidence of annual assessment work required by section 314 of FLPMA, as implemented by 43 CFR 3833.2. A copy of each such filing will be provided to the Superintendent of the appropriate unit by the Bureau of Land Management.

(d) The effect of failure to file the instruments required by subsections (b) and (c) of this section shall be controlled by 43 CFR 3833.4. Recordation or filing under this section shall not render any claim valid which would not otherwise be valid under applicable law and shall not give the claimant any rights to which he is not otherwise entitled by law.

(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)

[44 FR 20427, Apr. 5, 1979]

§ 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) 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;

(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).)

[42 FR 4835, Jan. 26, 1977, as amended at 44 FR 11069, Feb. 27, 1979]

§ 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 Region-

al 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).

PART 13—NATIONAL PARK SYSTEM UNITS IN ALASKA

§ 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.

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 prescribed 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 recording 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]

National Park Service
Alaska Region

1982

STIPULATIONS APPLICABLE TO THE CONDUCT OF MINING RELATED OPERATIONS ON MINING WITHIN UNITS OF THE NATIONAL PARK SYSTEM IN ALASKA

The Claimant/Operator must comply with all applicable National Park Service, other Federal, State and local laws or regulations applicable to mining, water or air quality, water use, sanitation, solid waste disposal, licensing, general park use or other related matter.

The following stipulations identify matters of particular concern but do not include all requirements.

1. Existing access routes to claims must be used when available and suitable as stated in the plan of operations or supplementation as approved.

2. Vehicle movement shall be confined to the existing routes or trails in a manner to minimize further disturbance to the trail area or surface of the route.

3. Any new surface access route to claims or on claims requiring new surface disturbance must be approved by the park superintendent and thoroughly described in the plan of operations or modifications thereto.

4. Prior to approval and use of new surface access routes, the route must be identified and marked in the field by National Park Service personnel in coordination with the claimant/operator. Before any route surface preparation is allowed, a survey by National Park Service personnel for the existence of cultural resources must be made. Rerouting will be done if necessary to avoid any sites found and to minimize actual impact to both natural and cultural resources.

5. Camps and all supporting facilities must be located within claim boundaries.

6. Garbage and refuse disposal shall be either by removal from the park or burning and burial at a site away from any stream or water-body. Disposal should be discussed with the park superintendent to determine any specific concerns.

7. Pit toilets shall be located, or effluent discharged from other toilet facilities, so that surface or ground water supplies in the vicinity are not contaminated.

8. Waste water from the kitchen, "washhouse" or other camp activity shall be discharged so that surface or ground water supplies in the vicinity are not contaminated.

9. All mining operations must be addressed in the plan of operations, and confined within the boundaries of the claim groups unless otherwise authorized.

10. Corners of all mining claims must be properly staked.

11. There will be no direct discharge of mining processing waters or other waste materials into any streams or lakes without adequate treatment or otherwise meeting State and EPA standards. This generally involves maintenance of settling ponds or other adequate systems of filtration.

12. Timber or vegetative resources may not be removed from a claim for other than mining related purposes. Cutting of timber not on the claims to provide materials for use in the conduct of mining operations will not be authorized.

13. If any amalgamates are used they must be properly contained and not allowed to escape into natural waters or gravels.

14. Reclamation of lands disturbed by mining shall be accomplished at the same time as the mining operations or as soon as possible thereafter to minimize the backlog of reclamation work. Generally, some reclamation work should be accomplished each year unless the plan provides for other satisfactory approaches.

15. Reclamation shall consist at minimum of restoring the approximate natural contour of the area and restoring saved topsoil over the graded overburden and spoil.

16. Sec. 36 CFR 9.11 for additional reclamation requirements and concerns.

17. The following steps must be taken to protect cultural resources.

    a. The claimant or lessee shall not collect, move, injure, alter, or destroy any archeological or historical object, artifact, site, structure or other value of cultural scientific importance. To do so would be in violation of the Antiquities Act of 1906 and the Archeological Resources Protection Act of 1979, both of which carry considerable penalties for such actions. In the interest of protecting our Nation's and Alaska's archeological and historical resources, please report all archeological, historical and paleontological sites or objects immediately upon discovery to the Superintendent, and stop any and all activities that would endanger the site or materials. Additional information for the protection of cultural resources is contained in 36 CFR Part 9 and the laws listed above.

    b. Report information about the site to the park superintendent or to the Archeologist, NPS Alaska Regional Office, 540 W. 5th Avenue, Anchorage, Alaska 99501.

18. The Regional Director may temporarily halt all or part of the operation for failure to comply with an approved plan of operations.

4/30/82

State placer permits listed
(from Alaska Miner, Nov 1980)

Listed here are all the state and federal requirements that may be needed for a placer mining operation. Not all of them are needed for every operation, however; Section A lists the state certificates that are required for all operations. Section B describes the state permits that might be required, depending on the size, type and location of the mining operation. Section C lists the federal certificates that might be required, depending on the characteristics of the operation.

A. STATE REQUIREMENTS FOR ALL OPERATIONS

There are three forms that must be submitted for all placer mining operations every year, whether the mining is done on state land or federal land.

1. Alaska mining license.
   (a) Required for anyone engaged in mining activities in Alaska; (b) The form can be obtained from Department of Revenue, Pouch SA, Juneau, AK 99811; (c) Issued for 1 year; (d) No fee; (e) If the form is complete, the license will be issued within 1 week.
2. Affidavit of Annual Labor Performed.
   (a) Required to keep a mining claim valid. It gives proof that at least $200 of improvement work was done on the claim during the previous year; (b) The form can be obtained from the Division of Minerals and Energy Management (DMEM), 703 W. Northern Lights, Anchorage, AK 99501; (c) issued for 1 year; (d) No fee is required by DMEM, but the State Recorder's Office charges a recording fee of $8 for the first page and $3 for each additional page; (e) The completed form must be taken to the State Recorder's Office for recording and then to DMEM for filing.
3. Triagency permit.
   (a) One form applies for a Fish Protection Permit from Department of Fish and Game; a Wastewater Disposal Permit from Department of Environmental Conservation; and a Miscellaneous Land Use Permit and a Water Rights Permit, both from Department of Natural Resources; (b) The form can be obtained from DMEM; (c) The application must be submitted once each year; (d) $25 fee; (e) There used to be four different application forms to fill out and four different offices for a miner to go to. Now this one form, submitted to one office, applies to all four permits. You will still receive four separate permits.

B. STATE PERMITS THAT MAY BE REQUIRED.

Depending on the size, type and location of the mining operation, one or more of the following permits may also be required by the state.

1. Discharge to Navigable Water certificate.
   (a) Required for any discharge to navigable waters; (b) The form is available from Department of Environmental Conservation (DEC), Pouch O, Juneau, AK 99811; (c) Issued for a maximum of 5 years; (d) No fee.
2. Solid-Waste Disposal permit.
   (a) Required for disposal of all unwanted or discarded solid waste or hazardous material; (b) The form can be obtained from DEC, Pouch O, Juneau, AK 99811; (c) Issued for a maximum of 5 years; (d) No fee.
3. Special Land Use permit.
   (a) Required to place temporary improvements or equipment on special state-owned land. This permit is needed instead of the Miscellaneous Land Use Permit if the special land designation was made before the permit application; (b) The form is available from Division of Forest, Land, and Water Management (DFLWM), 323 E. 4th, Anchorage, AK 99501; (c) Issued for a maximum of 5

years; (d) $10 fee; (e) This permit is issued at the discretion of the director of the DLFWM.

4. Tideland permit.
(a) Required for any temporary, short-term use of state-owned tidelands or submerged lands; (b) the form is available from DFLWM; (c) Issued for a maximum of 5 years; (d) $20 fee; (e) This permit is used, when needed, in place of the Miscellaneous Land Use Permit and the Special Land Use Permit.

5. Offshore locatable-Mineral Prospecting permit.
(a) Required when prospecting for offshore locatable minerals on State land; (b) The form is available from the Department of Natural Resources, Pouch M, Juneau, AK 99811; (c) Issued for a 10-year period, not renewable; (d) $20 fee.

FEDERAL PERMITS THAT MAY BE REQUIRED

The federal government also requires one or more permits, depending on the size, type, and location of the mining operation. Note: the NPDES permit (below) is required for all placer operations.

1. National Pollutant Discharge Elimination System (NPDES) permit.
(a) Required of all mining operations that discharge wastes into a waterway; (b) The form may be obtained from the U.S. Environmental Protection Agency (EPA), 701 C St., Box 19, Anchorage, AK 99513; the state triagency form satisfies some of the information requirements; (c) Issued for a maximum of 5 years. Apply 180 days before beginning to discharge; (d) No fee.

2. Dredge-and-Fill Disposal permit.
(a) Required to discharge dredged or fill material to U.S. waters or wetlands; (b) The form may be obtained from the Army Corps of Engineers, P.O. Box 7002, Anchorage, AK 99510; (c) Issued for 3 years; (d) $100 fee for commercial use; $10 fee for noncommercial use.

3. Prospecting permit.
(a) Required to prospect on and explore specific federal lands; (b) the form is available from the Bureau of Land Management (BLM), Pouch 7-512, Anchorage, AK 99510; (c) Issued for 2 years; (d) $10 fee, plus 25 cents per acre but not less than $20.

4. Recording of mining claims.
(a) Required of all holders of unpatented claims on federal land; (b) There is no specific form. Contact the BLM; (c) The recording is needed once only, but evidence of assessment work must be filed annually; (d) $5 per claim.

5. Oil-Spill Prevention, Control and Countermeasure (SPCC) plans.
(a) Required if above-ground storage of fuel will be provided for as much as 660 gallons in a single tank or 1,320 gallons in more than one tank; (b) No specific form. Contact the EPA; (c) The plan must be developed within 6 months after operation begins; (d) No fee.

6. Upland locatable mineral rights.
(a) To obtain rights to locatable minerals on State uplands, you must stake a prospecting site or mining claim and file a location Notice with the District Recorder's Office in the area in which the site or claim is located and with DNRM; (b) The location notice form is available from a stationery store; (c) Expires on September 1st of each year; (d) No fee.

APPENDIX C: NAMES AND ADDRESSES OF CLAIMANTS

NAMES AND ADDRESSES OF CLAIMANTS

[Excerpted from the BLM Alaska Automated Land Records System]

CLAIM/CLAIM GROUP	CLAIMANT
Golden Lady #1	Gail Padden 7441 2nd Street Fairbanks, AK 99701
End of Rainbow	Wade and John Legerat 78 Timberland Drive Fairbanks, AK 99701
La Rowe Group	L.C. Mead and John Rowe SR 10698 Fairbanks, AK 99701
Hansen Group	Thorwald H. Hansen 3 3/4 Mi. Steese Highway SR 40300 Fairbanks, AK 99701
Myers Group	Carlos D. Myers 3 3/4 Mi. Steese Highway SR 40300 Fairbanks, AK 99701
BVK 1, 3, 4, 5	Melvin R. Vostry SR 1 Box 404 Kenai, AK 99611
BVK #2	Melvin R. Vostry and Thomas Berry 220 Haines Avenue Fairbanks, AK 99701
Hammond River #1	Robert Emerson 1811 Phillips Field Road Fairbanks, AK 99701
Hammond River #2	Stephen A. Greene 2010 Sanduik Road Fairbanks, AK 99701
Bonanza Creek Group Conglomerate Creek Group Jim Pup Group Joe Pup Group Harp (Creek) Group Ipnek Creek Group O'Malley Creek Group	Maple Leaf Gold, Inc. Box 4-2375 Anchorage, AK 99509

CLAIM/CLAIM GROUP	CLAIMANT
O'Houlihan Creek Group Washington Creek Group Mascot Creek Group Wally Creek Group Otto Creek Group East Creek Group Fall Creek Group	Maple Leaf Gold, Inc. Box 4-2375 Anchorage, AK 99509
Big Four Association Group	Vernon F. Miller SR 40127 Fairbanks, AK 99701
Aras Group	Les Aras SR 51371 Fairbanks, AK 99701
Rose Group	Rosalie Delaney 3 3/4 Mi. Steese Highway SR 40300 Fairbanks, AK 99701
E & T	Bruce W. Easton 3 3/4 Mi. Steese Highway SR 40300 Fairbanks, AK 99701
Alice Group Tracie Lynn Group Golden Lady #2	Herb Ricketts and Gail Padden 4771 2nd Street Fairbanks, AK 99701
Carol Ann #1	William D. Moss SR 20123-F Fairbanks, AK 99701
Down River Group	Janette Bouton 3 Mi. Farmers Loop Road SR 30608 Fairbanks, AK 99701
Aldon 2	Allan Jacobson and Donald Manthey Box 73993 Fairbanks, AK 99701
Joiners Creek Group Discovery at Mouth of Joiners Creek #1 Above Discovery #4 Above Discovery #5 Above Discovery	E.B. Joiner Box 1 Kotzebue, AK 99752
#2 Above Discovery #3 Above Discovery #6 Above Discovery #6A Above Discovery	David Alan and Linda James MacPhee P.O. Box 324 Palm Springs, CA 92263

CLAIM/CLAIM GROUP	CLAIMANT
Discovery at Mouth of Joiners Creek	Bill Boucher P.O. Box 60174 Fairbanks, AK 99701
Wolverine Group	Nelson Walker P.O. Box 57 Kotzebue, AK 99752
Pasco 1 (Lode)	Jerry Morang Rt. 2 P.O. Box 975 Ellensburg, WA 98926
Pasco Creek Group	Lester G. and Norma Kay Cobb Rampart, AK 99767 (winter) Manley Hot Springs, AK 99756 (summer) Pete Pasquali III Wiseman, AK 99767
Snowshoe Creek Group	Lester G. and Norma Kay Cobb Rampart, AK 99767 (winter) Manley Hot Springs, AK 99756 (summer)
Alaska's Lost Dutchman	Donald J. Ferguson, Sr. and Homer Russell P.O. Box 93 Kotzebue, AK 99752
Knee Creek	Charlie Horner c/o Alaska Legal Services P.O. Box 316 Kotzebue, AK 99752
Alder Group	Glen Bouton P.O. Box 8-1583 College, AK 99708
Ningyoyak Creek Group Nuna Goose Rabbit Fox Caribou Peak Wood's Stars River Swan Snow	Levy A. and Clifford C. Mills, Sr. P.O. Box 139 Kotzebue, AK 99752

CLAIM/CLAIM GROUP	CLAIMANT
Sun	Levy A. and Clifford C. Mills, Sr. P.O. Box 139 Kotzebue, AK 99752
Moose	
Sheep	
Duck	
Stone	
Rock	
Owl	
Squirrel	
Porky	
Link	
Mink	
Beaver	
Bear	
Dear	
Snipe	
Bird	
Swallow	
Bee	
Crane	
Lucky	
Dawn	
Ningyoyak	
Midas	
Noatak	
Kobuk	
Night	
Day	
Northern	
Northern Light	
Summer	
Moon	

APPENDIX D: MINING CLAIM TYPES AND OPERATIONS

Placer Claims
Placer-Mining Techniques
Lode Claims
Lode-Mining and Milling Techniques
Other Claim Types

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.

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 1,320 feet in length or include more than 20 acres (1,320 by 600 feet) for each individual participating claimant. An association placer claim (staked by two or more persons) for precious metals--gold, silver, or platinum--may not exceed 2,640 feet in length or include more than 40 acres. Usual sizes are 1,320 by 1,320 feet or 2,640 by 660 feet. For any claims other than precious metals, the maximum area that may be embraced by a single placer claim is 1,600 acres; a claim of this size would have to be located by an association of at least eight persons. 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. The mining operation on Mascot Creek included a sluice box and mechanized washing plant.

Generally, placer mining 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 occurring on some streams are known to be auriferous as well (USDI, GS 1973).

The majority of placer operations lie where the streams typically run free of ice from late May until 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.

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 on Mascot Creek is accomplished by mechanical means, primarily using bulldozers and front-end loaders. 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 used in Gates of the Arctic National Park and Preserve, 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 back hoe. 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 used 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 suction dredge. The latter type 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, and 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. 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 used 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 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 locators, 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).

LODE-MINING AND MILLING TECHNIQUES

Lode-mining techniques depend on (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 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 will subside.

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, determine 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 used 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 Gates of the Arctic 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 locator exclusive right to prospect an area 3,000 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.

APPENDIX E: WILDLIFE - KOYUKUK AND NOATAK STUDY AREAS

Table 13: Mammals of the Brooks Range

Species	Probable Presence South Slope	North Slope
Sorex obscurus, dusky shrew	X	X
Sorex cinereus, masked shrew	X	X
Sorex arcticus, Arctic shrew		X
Sorex vagrans, vagrant shrew	X	
Myotis lucifugus, little brown bat	?	?
Lepus americanus, snowshoe hare	X	
Lepus othus, Alaskan hare		X
Marmota claigata, hoary marmot	X	X
Spermophilus undulatus, Arctic ground squirrel	X	X
Tamiasciurus hudsonicus, red squirrel	X	
Castor canadensis, beaver	X	
Clethrionomys rutilus, northern red-backed vole	X	X
Microtus pennsylvanicus, meadow vole	X	
Microtus oeconomus, tundra vole	X	X
Microtus miurus, singing vole	X	X
Ondatra zibethicus, muskrat	X	
Synaptomys borealis, northern bog lemming	X	
Dicrostanyx groenlandicus, collared lemming		X
Rattus norvegicus, norway rat	?	?
Mus musculus, house mouse	?	?
Erethizon dorsatum, porcupine	X	
Canis latrans, coyote	X	X
Lemmus trimucronatus, lemming	X	X
Canis lupus, gray wolf	X	X
Alopex lagopus, Arctic fox		X
Vulpes fulva, red fox	X	X
Ursus americanus, black bear	X	
Ursus arctos, grizzly or brown bear	X	X
Martes americana, marten	X	
Mustela erminea, ermine	X	X
Mustela rixosa, least weasel	X	X
Mustela vison, mink	X	X
Gulo gulo, wolverine	X	X
Lutra canadensis, river otter	X	X
Lynx canadensis, lynx	X	X
Alces alces, moose	X	
Rangifer tarandus granti, barren ground caribou	X	X
Ovibos moschatus, musk ox		X
Ovis dalli, Dall sheep	X	X
TOTAL	31	25

Note: 11 species limited to southern slope only.
5 species limited to North Slope only.
19 species found on both northern and southern slopes.

BIRDS

The abundance or status of birds in the Brooks Range are based on actual observations rather than assumed distribution, although the latter procedure may provide a more accurate estimate of the presence and status for some species. Observations at Kobuk were primarily in forested areas, although some alpine areas were also included. The Noatak and Anaktuvuk areas where observations were made included both alpine and valley habitats and in many adjacent mountain valleys, including the Killik. Observations on the Noatak were limited to summer months and are far less comprehensive than those of Anaktuvuk.

Table 14: Birds of the Brooks Range - A Selected Checklist

	Kobuk (forest)	Noatak (alpine)	Anaktuvuk (alpine)
Common loon	x n	- -	u n
Yellow-billed loon	x m	u v	u n
Arctic loon	x n	c n	c n
Red-throated loon	x n	c n	a n
Red-necked grebe	x n	- -	- -
Horned grebe	x n	- -	u v
Whistling swan	x n	- -	c m
Black brant	c m	- -	c m
Canada goose	x n	- -	c m
White-fronted goose	c n	- -	c m
Snow goose	x m	- -	c m
Mallard	c n	- -	u n
Pintail	c n	c n	a n
Green-winged teal	c n	c n	c n
American wigeon	c n	- -	c v
Shoveler	u n	- -	r m
Greater scaup	c n	c n	c n
Lesser scaup	x x	- -	u n
Old squaw	x n	c n	c n
Harlequin	u n	- -	u n
Bufflehead	u x	- -	- -
Steller's eider	- -	- -	r v
White-winged scoter	c n	u n	c n
Surf scoter	x n	u n	u n
Black scoter	u v	- -	- -
Red-breasted merganser	x n	c n	c n
Goshawk	x r	- -	u v
Sharp-shinned hawk	x m	- -	- -
Rough-legged hawk	x m	- -	c n
Golden eagle	x n	u n	c n
Bald eagle	x v	- -	u v
Marsh hawk	x n	c n	c v
Osprey	x n	- -	u v
Gyrfalcon	x r	c r	c r
Peregrine falcon	- -	u n	u x

	Kobuk (forest)	Noatak (alpine)	Anaktuvuk (alpine)
Merlin	x n	- -	u n
Kestrel	- -	- -	u v
Spruce grouse	x r	- -	*
Ruffed grouse	x x	- -	*
Sharp-tailed grouse	x x	- -	*
Willow ptarmigan	c r	c r	c r
Rock ptarmigan	c r	c r	a r
Sandhill crane	x n	- -	c m
Semipalmated plover	x n	c n	c n
Golden plover	x n	c n	a n
Killdeer	x x	- -	r v
Ruddy turnstone	x m	- -	c m
Surfbird	r v	- -	- -
Common snipe	c n	c n	c n
Whimbrel	c n	- -	u m
Upland sandpiper	r x	u n	r v
Spotted sandpiper	x n	c n	u m
Solitary sandpiper	x n	- -	u m
Wondering tattler	x n	r x	c n
Lesser yellowlegs	c n	c n	c n
Stilt sandpiper	- -	- -	u m
Pectoral sandpiper	x n	c n	u n
White-rumped sandpiper	x n	- -	u v
Baird's sandpiper	u m	c n	c n
Dunlin	u v	- -	m v
Least sandpiper	x n	u n	c n
Long-billed dowitcher	x m	c n	c x
Semipalmated sandpiper	x n	- -	a n
Buff-breasted sandpiper	x m	- -	u m
Sanderling	x m	- -	u m
Bar-tailed godwit	x n	- -	u m
Red phalarope	u m	- -	c m
Northern phalarope	c n	c n	c n
Pomarine jaeger	u v	- -	u m
Parasitic jaeger	x n	c n	c n
Long-tailed jaeger	x n	c n	c n
Glaucous gull	x n	x n	u n
Gerring gull	c n	- -	u v
Mew gull	c n	c n	c n
Ross's gull	- -	- -	r v
Bonaparte's gull	x n	u x	- -
Sabine's gull	x v		u v
Arctic tern	c n	c n	c n
Snowy owl	c v	- -	c r
Great-horned owl	x r	- -	u v
Hawk owl	x r	- -	*
Great gray owl	x r	- -	*
Short-eared owl	x n	- -	c n
Boreal owl	x m	- -	u v
Belted kingfisher	c n	- -	*

	Kobuk (forest)	Noatak (alpine)	Anaktuvuk (alpine)
Yellow-shafted flicker	c n	u x	r v
Downy woodpecker	u r	- -	u v
Black-backed three-toed woodpecker	x r	- -	- -
Northern three-toed woodpecker	x r	u x	*
Say's phoebe	x n	c n	u n
Horned lark	x n	c n	c n
Violet-green swallow	- -	- -	r v
Tree swallow	c n	c n	u v
Bank swallow	c n	c n	u v
Barn swallow	u v	- -	u v
Cliff swallow	c n	c n	r n
Gray jay	c r	c r	u r
Common raven	c r	c r	c r
Black-capped chickadee	c r	- -	c v
Gray-headed chickadee	x r	- -	- -
Boreal chickadee	x r	- -	*
Dipper	u r	- -	u r
Robin	c n	c n	c n
Varied thrush	c n	- -	- -
Gray-cheeked thrush	c n	- -	c n
Wheatear	x n	c n	c n
Bluethroat	- -	u n	u v
Ruby-crowned kinglet	x n	- -	u r
Arctic warbler	c n	u n	u n
Yellow wagtail	x n	x x	c n
Water pipit	x n	c n	a n
Bohemian waxwing	x m	x n	*
Northern shrike	x n	c n	c n
Yellow warbler	c n	- -	u v
Orange-crowned warbler	x n	x n	- -
Myrtle warbler	x n	- -	r v
Black poll warbler	x n	- -	- -
Wilson's warbler	c n	c n	u n
Rusty blackbird	x n	x n	u n
Pine grosbeak	x r	- -	c r
Gray-crowned rosy finch	x n	x n	c n
Hoary redpoll	c r	- -	a r
Common redpoll	a r	a n	c r
White-winged crossbill	x r	- -	r v
Savannah sparrow	c n	a n	c n
Slate-colored junco	x n	- -	u v
Tree-sparrow	c n	a n	a n
Golden-crowned sparrow	x x	u n	- -
White-crowned sparrow	c n	a n	c n
Fox sparrow	x n	c n	c n
Lapland longspur	x n	a n	a n
Smith's longspur	- -	u n	c n
Snow bunting	c r	c n	u n

Source: United States Department of the Interior, National Park Service 1974.

Note: Codes for the abundance and status of individual species are as follows:

Abundance
- (a) Abundant
- (c) Common
- (u) Uncommon
- (r) Rare
- (x) Unknown

Status
- (r) Resident
- (n) Nesting
- (m) Migrant
- (v) Vagrant or stray
- (x) Unknown

*Reported from forest habitat on John River, Hunt Fork, or Savioyuk River.

Table 15: Status of Brooks Range Birds

Status	Kobuk	Noatak	Anaktuvuk
Resident	22	5	11
Nesting	75	53	53
Migrant	3	nd	17
Vagrant	8	1	29
Status Unknown	7	5	2
Area Totals	115	64	112

Note: The nesting status combined with residents gives the total of breeding species. A part of the population of nesting species may migrate to other breeding grounds.

SELECTED REFERENCES

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

1978 Placer Mining/Water Quality: Technical Alternatives. Juneau.

1979 Placer Mining and Water Quality Management Planning Program. Nonpoint Source Study Series. Anchorage.

1983 Personal Communication with John Reeves, Environmental Field Officer. Northern Regional Office. Fairbanks.

ALASKA DEPARTMENT OF FISH AND GAME

1970 "The Caribou in Alaska," by James E. Hemming. Wildlife Notebook Series.

1973 Alaska's Wildlife and Habitat. Vol. 1. Tacoma, Washington: Print Northwest Company.

1978a Alaska's Fisheries Atlas. Vol. 1: Commercial Fisheries. Tacoma, Washington: Print Northwest Company.

1978b Alaska's Fisheries Atlas. Vol. 2: Sport Fisheries. Tacoma, Washington: Print Northwest Company.

1978c Alaska's Wildlife and Habitat. Vol. 2. Tacoma, Washington: Print Northwest Company.

1978d "The Ptarmigan in Alaska," by Robert B. Weeden. Wildlife Notebook Series.

1978e "The Moose in Alaska," by Robert A. Rausch. Wildlife Notebook Series.

1978f "The Wolf in Alaska," by Bob Stephenson. Wildlife Notebook Series.

1978g "The Brown Bear in Alaska," by Sterling Eide. Wildlife Notebook Series.

1978h "The Wolverine in Alaska," by Ken Taylor. Wildlife Notebook Series.

1982 Personal Communication with Jim Davis, Caribou Research Biologist. Game Division. Fairbanks.

ALASKA DEPARTMENT OF FISH AND GAME, ALASKA DEPARTMENT OF NATURAL RESOURCES, AND U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE

1976 Logging and Fish Habitat.

ALASKA DEPARTMENT OF NATURAL RESOURCES

1979 "Ethnohistory of Four Interior Alaskan Waterbodies," by Dianne Gudgel Holmes. Anchorage.

ALASKA DEPARTMENT OF NATURAL RESOURCES
1980a Information for Placer Miners. Juneau.

1980b "Proper Claim Staking." Information Circular 1.

ALASKA DEPARTMENT OF NATURAL RESOURCES, DIVISION OF PARKS
1977 "Archaeological Survey Projects, 1976." In: Miscellaneous Publications. History and Archaeology Series, no. 16. Anchorage.

ALEXANDER, H.
1969 "Prehistory of the Central Brooks Range--An Archeological Analysis." Unpublished Ph.D. dissertation. University of Oregon.

AMSDEN, CHARLES WYNN
1977 "A Quantitative Analysis of Nunamiut Eskimos Settlement Dynamics: 1898-1969." Unpublished Ph.D dissertation. University of New Mexico.

ANDERSON, DOUGLAS
1972 "An Archaeological Survey of Noatak Drainage, Alaska." Arctic Anthropology. Vol. IX, no. 1: pp. 66-102.

ANDERSON, DOUGLAS D.
n.d. "Archaeology of the Northwestern Arctic." Manuscript. Brown University.

ANTHONY, LEO MARK
1979 The Alaskan Prospector's Short Course in Introductory Prospecting and Mining. 6th ed. Fairbanks: University of Alaska.

ARMSTRONG, ROBERT H.
1980 A Guide to the Birds of Alaska. Anchorage: Alaska Northwest Publishing Company.

BACON, G.H.
1971 "Archeological Survey and Excavation Near Murphy Lake in the Arctic Foothills." In: Final Report of the Archeological Survey and Excavations Along the Alyeska Pipeline Service Co. Pipeline Route. Edited by J.P. Cook, University of Alaska, pp. 208-272.

BATTEN, ALAN
1974 "Vegetation of the John River Valley." Typed manuscript. Prepared for the U.S. Bureau of Outdoor Recreation.

BINFORD, LEWIS
1978 Nunamiut Ethnoarchaeology. New York: Academic Press.

BLISS, D.D., AND J.E. CANTLEN
1957 "Succession on River Alluvium in Northern Alaska." American Midland Naturalist 58(2):452-469.

BLISS, LAWRENCE C., AND KAREN M. GUSTAFSON
1981 Proposed Ecological Natural Landmarks in the Brooks Range, Alaska. Seattle: University of Washington.

BUNDTZEN, THOMAS K.
1978 "A History of Mining in the Kantishna Hills." The Alaska Journal.

BURCH, ERNEST S., Jr.
1975 "Inter-regional Transportation in Traditional Northwest Alaska." Anthropological Papers of the University of Alaska. Vol. 17, no. 2: pp. 1-11.

1976 "Overland Travel Routes in Northwest Alaska." Anthropological Papers of the University of Alaska. Vol. 13, no. 1: pp. 1-10.

CAMPBELL, JOHN
1962a "Anaktuvuk Prehistory: A Study of Environmental Adaptation." Unpublished Ph.D. dissertation. Yale University.

1962b "Cultural Succession at Anaktuvuk Pass, Arctic Alaska." In: Prehistoric Cultural Relations between the Arctic and Temperate Zones of North America. Arctic Institute of North America. Technical paper no. 11: pp. 39-54.

1968 "Territoriality Among Ancient Hunters: Interpretations from Ethnography by Nature." In: Anthropological Archeology in the Americas. Edited by Betty Meggers. Anthropological Society of Washington. Washington, D.C., pp. 1-21.

CARLSON, PHYLLIS D.
1973 "The Koyukuk." The Alaskana. Vol. III, no. 1.

CHAPIN, F. STUART, AND M.C. CHAPIN
1980 "Revegetation of an Arctic Disturbed Site by Native Tundra Species." Journal of Applied Ecology 17:449-456.

CLARIDGE, FREDERICK B., AND A.M. MIRZA
1981 "Erosion Control along Transportation Routes in Northern Climates." Arctic 34(2):147-157.

CLARK, DONALD W.
1972 "Archaeology of the Batza Tena Obsidian Source, West-Central Alaska." Anthropological Papers of the University of Alaska. Vol. 15, no. 2.

1974 "Archaeological Collections from Norutak Lake on the Kobuk-Alatna River Portage, Northwestern Alaska." Archaeological Survey of Canada, paper. no. 18. National Museum of Man Mercury Series. Ottawa.

CLARK, DONALD W.
1975a Prehistory of the Western Subarctic. Canadian Archaeological Association. Bulletin no. 7.

1975b "Archaeology of Interior Alaska." The Western Canadian Journal of Anthropology 5(3-4).

COOPER, DAVID
1982 Brooks Range Passage. Seattle, Washington: The Mountaineers.

CORBIN, J.
1975 "Anaganigaruk: A Study In Nunamiut Archaeology." Ph.D. dissertation. Washington State University.

ENVIRONMENTAL PROTECTION AGENCY
1976 Quality Criteria for Water. Washington, D.C.

ENVIRONMENTAL PROTECTION AGENCY, NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
1977 "Evaluation of Settleable Solid Removal: Alaska Gold Placer Mines." EPA 330/2-77-021. Denver, Colorado.

GOLDEN, JACK R., P. QUELLETTE, SHARON SAARI, and PAUL N. CHEREMISINOFF
1979 Environmental Impact Data Book. Ann Arbor: Ann Arbor Science Publishers, Inc.

GUBSER, NICHOLAS J.
1965 The Nunamiut Eskimo: Hunters of Caribou. New Haven: Yale University Press.

HALL, ED
1970 "The Late Prehistoric/Early Historic Eskimos of Interior Northern Alaska: An Ethnoarcheological Approach." Anthropological Papers of the University of Alaska. Vol. 15, no. 2: pp. 1-11.

HALL E., ed.
1976 "Contributions to Anthropology: The Interior Peoples of Northern Alaska." Archaeological Survey of Canada. Paper no. 49. National Museum of Man Mercury Series. Ottawa.

HAMILTON, THOMAS D.
n.d. Glacial Geology of the Lower Alatna Valley, Brooks Range, Alaska. Geological Society of America. Special paper 123.

HAWLEY, C.C.
1978 "Industry Status: Mining, 1978." Paper presented at Alaska Mineral Development Institute Conference. Anchorage. September 21-22.

HELLER, CHRISTINE
1966 Wildflowers of Alaska. Anchorage: Heller Enterprises.

HELMER, J.S., DICK VAN DYKE, AND F.J. KENSE, eds.
1977 "Problems in the Prehistory of the North American Subarctic: The Athapaskan Question." In: Proceeding of the Ninth Annual Conference of the University of Calgary. Calgary: Archaeological Association, Department of Archaeology, University of Calgary.

HERBERT, CHARLES F.
1970 Alaska Mining Law Manual. Fairbanks: University of Alaska.

HICKEY, JOSEPH J.
1969 Peregrine Falcon Populations--Their Biology and Decline. Madison: University of Wisconsin Press.

HILL, GEORGE M.
1909 "The Koyukuk, One of the Richest Districts in the Far North." Alaska-Yukon Magazine. Vol. III:210-213.

HINES, J.Q.
1963 "Birds of the Noatak River, Alaska." Condor 65(5):410-425.

HULTEN, ERIC
1968 Flora of Alaska and Neighboring Territories: A Manual of the Vascular Plants. Stanford, California: Stanford University Press.

INGSTAD, HELGE
1954 Nunamiut: Among Alaska's Inland Eskimos. New York: W.W. Norton and Company.

IRVING, W.
1953 "Evidence for Early Tundra Cultures in Northern Alaska." In: Anthropological Papers of the University of Alaska. Vol. 1, no. 2: pp. 55-85.

1964 "Punyik Point and the Arctic Small Tool Tradition." Unpublished Ph.D. dissertation. Department of Anthropology, University of Wisconsin.

JOHN GRAHAM COMPANY
1976 "The Environment of Alaska: An Analysis of Physical and Biological Determinants." Prepared for Joint Federal-State Land Use Planning Commission.

JOINT FEDERAL-STATE LAND USE PLANNING COMMISSION
1973 Major Ecosystems of Alaska (Map). On file in USDI Library, Anchorage.

JORDAL, L.H.
1951 "A Floristic and Phytogeographic Survey of the Southern Slopes of the Brooks Range, Alaska." Unpublished Ph.D thesis. University of Michigan. Ann Arbor.

KLEIN, DAVID R.
1970 "Tundra Ranges North of the Boreal Forest." Journal of Range Management 23:8-14.

LAGLER, KARL F.
1977 Freshwater Fishery Biology. 15th ed. Dubuque, Idaho: William C. Brown Company.

LAROI, GEORGE H.
1962 "Ecological Studies in the Boreal Spruce-Fir Forests of the North American Taiga. Analysis of the Vascular Flora." Ecological Monographs 37(3):229-253.

LARSEN, HELGE
1959 "The Material Culture of the Nunamiut and its Relations to Other Forms of Eskimo Culture in Northern Alaska." In: Proceedings of the Thirty-Second International Congress of Americanists 1956. Copenhagen, pp. 574-582.

LEWIS, ROBERT S., AND GEORGE B. CLARK
1964 Elements of Mining. 3rd ed. New York: John Wiley and Sons, Inc.

MALEY, TERRY S.
1979 Handbook of Mineral Law. Boise, Idaho: MMRC Publications.

MARKLE, D.
1979 "Geothermal Energy in Alaska: Site Data Base and Development Status." OIT Geo-Heat Utilization Center. Klamath Falls, Oregon.

MARSHALL, ROBERT
1956 Alaska Wilderness: Exploring the Central Brooks Range. University of California Press.

McFADYEN, ANNETTE M.
1966 "Koyukuk River Culture of the Arctic Woodlands: A Preliminary Survey of the Material Culture, with an Analysis of Hostility and Trade as Agents of Cultural Transmission." M.A. thesis. George Washington University.

McFADYEN, ANNETTE, and DONALD W. CLARK
1972 "Koyukuk Athapaskan - Kobuk Eskimo Cultural Relationships." Paper presented at the Thirty-Seventh Annual Society for American Archaeology. Ball Harbour, Maine.

McKENNAN, ROBERT A.
1965 The Chandalar Kutchin. Arctic Institute of North America. Technical paper 17.

MORLAN, RICHARD E.
1973 The Later Prehistory of the Middle Porcupine Drainage, Northern Yukon Territory. Archaeological Survey of Canada. Paper no. 11. National Museum of Man Mercury Series. Ottawa.

MORROW, JAMES E.
1980 The Freshwater Fishes of Alaska. Anchorage: Alaska Northwest Publishing Company.

MURRAY, DAVID F.
1978 "Vegetation, Floristics, and Phytogeography of Northern Alaskan Arctic Tundra." In: Vegetation and Production Ecology of an Alaskan Arctic Tundra. Edited by L.L. Tieszen. New York: Springer-Verlag.

1980 "Threatened and Endangered Plants of Alaska." Prepared for U.S. Department of Agriculture, Forest Service, and U.S. Department of the Interior, Bureau of Land Management.

NEILAND, BONITA J., AND L.A. VIERECK
1977 "Forest Types and Ecosystems." Paper presented at North American Forest Lands at Latitudes North of 60 Degrees Symposium. Fairbanks.

NELSON, R., KATHLEEN MAUUTNER, and RAY BANE
1978 Tracks in the Wildland: A Portrayal of Koyukuk and Nunamiut Subsistence. Cooperative Park Studies Unit. Occasional paper no. 9. Fairbanks: University of Alaska.

NELSON, RICHARD K.
1973 Hunters of the Northern Forest. University of Chicago Press.

PATTERSON, WILLIAM A., and J.G. DENNIS
1981 "Tussock Replacement as a Means of Stabilizing Fire Breaks in Tundra Vegetation." Arctic 34(2):188-189.

PEWE, TROY L.
1966 "Permafrost and its Effect on Life in the North." In: Arctic Biology. 2nd ed. Edited by H.P. Hansen. Corvallis: Oregon State University Press.

RAUSCH, ROBERT
1951 "Notes on the Nunamiut Eskimo and Mammals of the Anaktuvuk Pass Region, Brooks Range, Alaska." Arctic. Vol. 4, no. 3: pp. 147-195.

REED, I. M.
1938 "Upper Koyukuk Region, Alaska." Unpublished report to Territory of Alaska Department of Mines, p. 169.

SELKREGG, LIDIA L.
1974 "Alaska Regional Profiles." Vol VI: Yukon Region. Anchorage: University of Alaska, Arctic Environmental Information and Data Center.

SMITH, ROBERT L.
1974 Ecology and Field Biology. 2nd ed. New York: Harper and Row Publications.

SOLECKI, RALPH S., and ROBERT J. HACKMAN
1951 "Additional Data on the Denbigh Flint Complex in Northern Alaska." Journal of the Washington Academy of Sciences. Vol. 41, no. 3.

SOLECKI, RALPH S., BERT SALWEN, and JEROME JACOBSON
1973 Archaeological Reconnaissances North of the Brooks Range in Northeastern Alaska. Department of Archaeology. Occasional paper no. 1. University of Calgary.

SPEARMAN, GRANT
1980 Land Use Values Through Time in the Anaktuvuk Pass Area. Anthropology and Historic Preservation Unit, Cooperative Park Studies Unit. Occasional paper no. 22. Fairbanks: University of Alaska.

SPENCER, ROBERT T.
1959 The North Alaskan Eskimo, A Study in Ecology and Society. Smithsonian Institution, Bureau of American Ethnology. Bulletin 171.

STENMARK, RICHARD J.
1978 "An Introduction to Alaska." Paper presented at Alaska Mineral Development Institute Conference, Anchorage. September 21-22.

TENBRINK, NORMAN W.
1978 "Preliminary Proposal for Reconstruction of the Glacial Geologic and Related History of the North Alaska Range, with Particular Emphasis on Prehistoric Archeologic Potential." Proposal submitted to the National Geographic Society and the National Park Service. On file at Grand Valley State College. Annendale, Michigan.

THOMPSON, LINDA K.
1972 "Wiseman, A Study of the Wiseman Historic District." BLM Report. On file at Fairbanks District Office. Fairbanks.

TIESZEN, LARRY L., ed.
1978 Vegetation and Production Ecology of an Alaskan Arctic Tundra. New York: Springer-Verlag.

UNDERWOOD, LARRY S., and GLENN P. JUDAY
1979 "An Ecological Reserves Report." Vol. 1: Establishing a System for Alaska. Prepared for Joint Federal-State Land Use Planning Commission. Alaska.

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE

1972 Alaska Trees and Shrubs. Agriculture handbook 410. Washington, D.C.: Government Printing Office.

1977 Anatomy of a Mine from Prospect to Production. Surface Environment and Mining Program. General technical report INT-35. Ogden, Utah.

1979a A Guide to Reclaiming Small Tailings Ponds and Dumps. Intermountain Forest and Range Experiment Station. General technical report 57. Ogden, Utah.

1979b Influence of Forest and Rangeland Management on Anadromous Fish Habitat in the Western U.S. and Canada. General technical report PNW-96. Ogden, Utah.

1979c User Guide to Vegetation. General technical report INT-64. Ogden, Utah.

1980a User Guide to Hydrology: Mining and Reclamation in the West. General technical report INT-74. Ogden, Utah.

1980b A Preliminary Classification System for Vegetation of Alaska. Pacific Northwest Experiment Station. General technical report 106. Fairbanks.

1980c Insects and Diseases of Alaska Forests, by E.H. Holsten. Alaska Region report 75. Washington, D.C.: Government Printing Office.

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

1979 Exploratory Soil Survey of Alaska. Washington D.C.: Government Printing Office.

U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

1959 Climates of the States, Alaska. Washington, D.C.: Government Printing Office.

1974 "Climates of the States." Vol. II: Western States, Including Alaska and Hawaii. Port Washington, New York: Water Information Center, Inc.

1980 Climatological Data, Alaska, 1980. Annual Summary. National Climatic Center.

U.S. DEPARTMENT OF ENERGY

1980 Geothermal Resources of Alaska. Contract no. DE-AS07-781 D01720. Washington, D.C.: Government Printing Office.

U.S. DEPARTMENT OF THE INTERIOR

1978a Report for Alaska Land Withdrawals. Section 207(e) of FLPMA (P.L. 94-579).

U.S. DEPARTMENT OF THE INTERIOR

1978b Final Environmental Statement, Alternative Administrative Actions, Alaska National Interest Lands.

1980 Report for Alaska Land Withdrawals. Section 204(c) of FLPMA (P.L. 94-579).

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT

1969 Placer Examination Principles and Practices. Bulletin 4. Washington, D.C.: Government Printing Office.

1981 Effects of Placer Mining on Hydrologic Systems in Alaska: Status of Knowledge. BLM-Alaska technical report 81/07.

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF MINES, ALASKA FIELD OPERATIONS CENTER

1978a Alaska's Mineral Potential. Juneau.

1978b "Mineral Appraisal of the Proposed Gates of the Arctic Wilderness National Park, Alaska: A Preliminary Comment." Open file report no. 109-78.

n.d. "A Mineral Appraisal of the Areas Traversed by the Kobuk, Killik, Alatna and John Rivers and the North Fork of the Koyukuk River, Brooks Range, Alaska: A Summary Report." Open file report no. 36-79.

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF OUTDOOR RECREATION

1973a "Wild and Scenic River Analysis: Noatak River." Alaska Task Force.

1973b "Wild and Scenic River Analysis: Tinayguk River and North Fork of the Koyukuk River." Alaska Task Force.

1976 "Wild and Scenic River Analysis: Middle Fork of the Koyukuk River." Alaska Task Force.

U.S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

1980a "Endangered and Threatened Wildlife and Plants: Review of Plant Taxa for Listing as Endangered or Threatened Species." Federal Register. December 15.

1980b Gravel Removal Studies in Arctic and Subarctic Floodplains in Alaska. Biological Services Program. FWS/OBS-80/08.

1980c "Selected Vertebrate Endangered Species of the Seacoast of the United States. American Peregrine Falcon." Biological Services Program. FWS/OBS-80/01.57.

U.S. DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY

1913a The Koyukuk-Chandalar Region. Bulletin 532. Washington, D.C.: Government Printing Office.

U.S. DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY

1913b The Noatak-Kobuk Region. Bulletin 536. Washington, D.C.: Government Printing Office.

1918 Mineral Resources of Alaska: Report on Progress of Investigations in 1916. Bulletin 662. Washington, D.C.: Government Printing Office.

1955 Permafrost and Ground Water in Alaska. Professional paper 264F. Washington, D.C.: Government Printing Office.

1964 Metalliferous Lode Deposits of Alaska. Bulletin 1246. Washington, D.C.: Government Printing Office.

1965 Extent of Glaciations in Alaska. Misc. Field Studies. Map MF1-415, scale 1:250,000.

1971 Preliminary Bedrock Geologic Map, Wiseman and Eastern Survey Pass Quadrangles. Open file map 479, scale 1:250,000.

1973 Placer Deposits of Alaska. Bulletin 1374. Washington, D.C.: Government Printing Office.

1975 Quaternary Geology of Alaska. Professional paper 835. Washington, D.C.: Government Printing Office.

1977a Preliminary Reconnaissance Geologic Map of the Survey Pass Quadrangle. Open file map 77-27, scale 1:250,000.

1977b "Water Resources Along the TAPS Route, Alaska, 1970-74." Open file report 78-137.

1977c Preliminary Reconnaissance Geologic Map of the Ambler River Quadrangle, Alaska. Open file map 77-28, scale 1:250,000.

1979a "An Environmental Evaluation of Potential Petroleum Development on the National Petroleum Reserve in Alaska." Anchorage.

1979b Surficial Geologic Map of the Wiseman Quadrangle, Alaska. Misc. Field Studies. Map MF-1122, scale 1:250,000.

1980a Catalog of Information on Water Data. Water Resources Region 19 - Alaska. Reston, Virginia: Office of Water Data Coordination.

1980b Geologic Map of the Survey Pass Quadrangle, Brooks Range, Alaska. Misc. Field Studies. Map MF-1176-A, scale 1:250,000.

1981a "Permit Requirements for Development of Energy and Other Selected Natural Resources for the State of Alaska." Prepared for the Four Corners Regional Commission and the U.S. Geological Survey.

U.S. DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY

1981b "Effects of Placer Mining on Hydrologic Systems in Alaska--Status of Knowledge." Open file report 81-217.

U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE

1973a Draft Environmental Impact Statement, Proposed Gates of the Arctic National Wilderness Park and Nunamiut National Wildlands, Alaska.

1973b Gates of the Arctic National Wilderness Park and Nunamiut National Wildlands, Alaska - Master Plan.

1974 Final Environmental Statement, Proposed Gates of the Arctic National Park, Alaska.

1980 Environmental Overview and Analysis of Mining Effects, Kantishna Hills, Denali National Monument, Alaska. Denver, Colorado: Denver Service Center.

1982a Environmental Overview and Analysis of Mining Effects, Yukon-Charley Rivers National Preserve, Alaska. Denver, Colorado: Denver Service Center.

1982b "Draft Statement for Management, Gates of the Arctic National Park and Preserve." On file at Gates of the Arctic National Park and Preserve.

1982c "Mining Claim Field Inventory, Gates of the Arctic National Park and Preserve." On file at Gates of the Arctic National Park and Preserve.

UNIVERSITY OF ALASKA

1970 Report of Archeological Survey and Excavation Along the Alyeska Pipeline Service Co. Haulroad and Pipeline Alignments. Department of Anthropology. College, Alaska.

UNIVERSITY OF ALASKA, MINERAL INDUSTRY RESEARCH LABORATORY

1979 "Focus: Gold Recovery Systems." Report 43. Presented at the Conference on Alaskan Placer Mining. Fairbanks. April 3-4.

UNIVERSITY OF COLORADO, ROCKY MOUNTAIN MINERAL LAW FOUNDATION

1978 Alaska Mineral Development Foundation. Paper 2. Boulder, Colorado.

VIERECK, L.A.

1975 "Wildlife in the Taiga of Alaska." Journal of Quaternary Research 3(3):465-495.

WATSON, C.E., C.I. BRANTLIN, and J.E. NEWMAN

1971 "Climatic Characteristics of Selected Alaskan Locations." Technical bulletin no. 2. University of Alaska.

WELSH, STANLEY L.
1974 Anderson's Flora of Alaska and Adjacent Parts of Canada. Provo, Utah: Brigham Young University Press.

WILL, SUSAN M.
1981 Coldfoot, An Historic Mining Community on the Middle Fork of the Koyukuk River, Alaska. Report prepared for the Eighth Annual Meeting of the Alaska Anthropological Association. Anchorage. March 20-21.

WILLIAMS, IDA
1910 "Nolan on the Koyukuk." Alaska-Yukon Magazine 10:221.

WILSON, IAN R.
1978 Archaeological Investigations at the Atigun Site, Central Brooks Range, Alaska. Archaeological Survey of Canada. Paper no. 78. National Museum of Man Mercury Series. Ottawa.

YOUNG, S.B., ed.
1974 The Environment of the Noatak River Basin, Alaska. Contributions from the Center for Northern Studies. No. 1. Wolcott, Vermont.

ZASADA, J.C.
1977 "Forest Biology and Management in High-Latitude North American Forest." Paper presented at North American Forest Lands at Latitudes North of 60 Degrees Symposium. Fairbanks.

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