environmental overview and analysis of mining effects

july 1982

YUKON-CHARLEY RIVERS

NATIONAL PRESERVE / ALASKA

ENVIRONMENTAL OVERVIEW AND ANALYSIS OF MINING EFFECTS

YUKON-CHARLEY RIVERS NATIONAL PRESERVE

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

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PURPOSE OF THE STUDY

Yukon-Charley Rivers National Preserve currently contains 284 placer gold mining claims and other mineral encumbrances that existed prior to the time of its authorization as a National Park System unit. Because mining may take place on valid claims after the National Park Service approves a plan of operations submitted by the owner or operator, these encumbrances could have profound future effects on portions of the preserve. This study is to assist the National Park Service and other interested agencies or individuals in assessing the effects of existing and future mining at these sites. It will also address immediate management concerns regarding currently active operations on claims. In addition, the study will expedite the administrative review of proposed plans of operation by providing a general analysis of the environmental effects of mining in the preserve. Site-specific, supplemental analyses based on field review will be made as each plan is submitted; however, the current analysis should eliminate the need for a separate detailed environmental review in all but the most complex cases.

Information sources used in the preparation of this document included planning documents prepared during the period when the establishment of a national park unit in the Yukon-Charley area was first being considered, technical reports of the U.S. Geological Survey and other state and federal agencies, and numerous other publications written about this region of Alaska. This material is listed in "Selected References." Specific information about the claims was obtained from public records of the Bureau of Land Management, communications with miners, and field observations made during summer 1981.

LEGISLATIVE BACKGROUND

The Yukon-Charley region was first proposed for study as a possible addition to the National Park System in 1970. The Department of the Interior recommended to Congress that over two million acres containing the region's most significant natural features and cultural resources be included in the system following passage of the Alaska Native Claims Settlement Act (ANCSA) of 1971, and the land was withdrawn from the major forms of appropriation under the "national interest lands" provisions of that act. On December 1, 1978, Yukon-Charley National Monument was proclaimed in Presidential Proclamation 4626 and the area became part of the National Park System. The Alaska National Interest Lands Conservation Act (ANILCA) of December 2, 1980 (appendix A), legislatively formalized the unit in its current form as the Yukon-Charley Rivers National Preserve. The estimated area within the authorized boundary is 2,520,000 acres, about 2,207,000 acres of which is federal land.

Yukon-Charley Rivers National Preserve was established "to maintain the environmental integrity of the entire Charley River basin . . . in its undeveloped natural condition for public benefit and scientific study . . .," to protect wildlife, to interpret the gold rush history of the Yukon area, and to interpret the paleontological and cultural prehistory of the area. As a national preserve, the unit is to be managed as any other unit of the National Park System except that sport hunting, trapping, and fishing under state regulation are permitted uses. Valid existing mineral rights within the preserve that were established prior to withdrawal will be honored. Mining operations on valid claims within the preserve must be conducted under National Park Service regulations governing mining (appendix B).

GENERAL SETTING - PHYSIOGRAPHY

Yukon-Charley Rivers National Preserve is situated wholly within the Northern Plateaus physiographic province in east-central Alaska. The province is located within the interior and western Alaska "natural region" between the Brooks Range and the Alaska Range mountain systems. The preserve is characterized by intricately dissected uplands with rounded contours and alluvium-covered valleys. Elevations vary from 600 feet at the west end of the preserve where it borders the Yukon Flats to 6,435 feet in the Yukon-Tanana uplands above the upper Charley River.

The Yukon River passes from southeast to northwest through the center of the preserve, where it has carved a major valley into the uplands and has left a pronounced series of terraces at several different elevations. Many highly scenic bluffs were also formed along the edges of the valley, ranging in relief from several hundred feet to over 2,000 feet.

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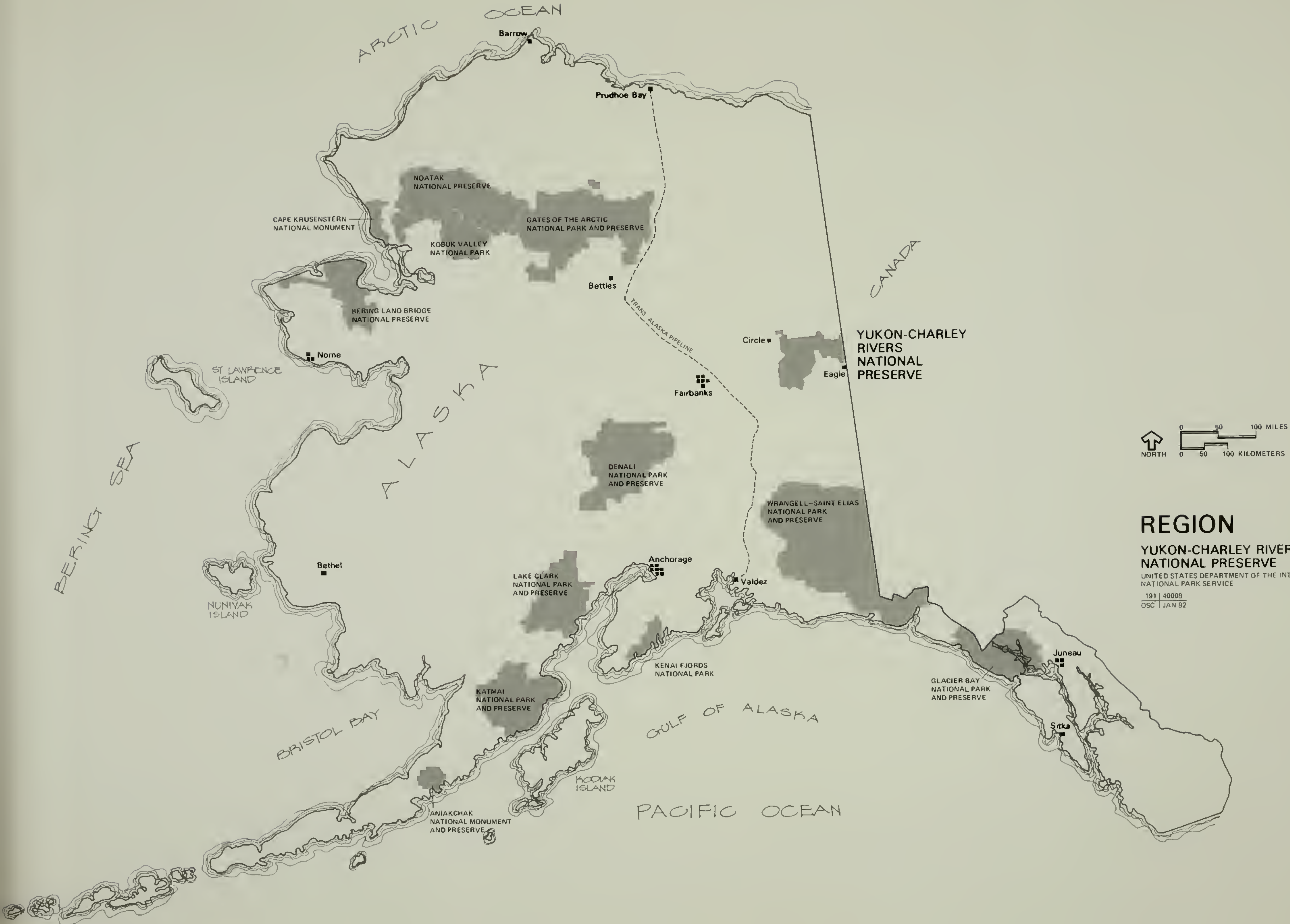

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A few miles south of the Yukon River valley there is a belt of rounded ridges and open valleys related to the Tintina Fault. This belt roughly parallels the Yukon River valley from southeast to northwest. Most drainages containing placer-mining claims in the preserve are found within this fault-related belt.

Up the Charley River, elevations increase rapidly as the mountains rise to above 6,000 feet. Except for stream valleys, most of the Charley River portion of the preserve is above 3,000 feet in elevation.

SIGNIFICANT RESOURCES

The preserve is representative of the Northern Plateaus physiographic province and contains all the topographic features typical of that region. Within its boundaries the preserve contains all or portions of four major drainages: the Yukon, Charley, Kandik, and Nation, each with its own scenic character, history, and recreational opportunities.

The preserve includes examples of virtually all common vegetative types in east-central Alaska and supports healthy populations of a variety of large mammals, including Dall sheep, moose, caribou, grizzly bear, black bear, wolf, and lynx. Besides being highly scenic, the precipitous bluffs along the Yukon and Charley rivers provide naturally protected breeding habitat for twenty or more pairs of peregrine falcons. This is one of the largest breeding populations of this endangered species in Alaska.

Geologically, the preserve is highly significant because of the completeness of the sedimentary rock record in the region north of the Tintina Fault zone. There are few locations worldwide where such an uninterrupted sequence of paleontologically significant sediments exist from the Precambrian era to the Tertiary period.

Perhaps of paramount importance, the preserve includes the entire Charley River basin, a pristine watershed containing one of the most scenic clear-flowing streams in this part of Alaska.

Cultural resources in the preserve include a wealth of prehistoric archeological sites and a rich historical background associated with the gold rush on the Yukon River during the late 1800s and early 1900s.

MINING STATUS

MINING LAW OVERVIEW

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 and 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 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. In Yukon-Charley Rivers National Preserve, all the existing claims are placer claims for gold.

A placer claim may not exceed 1,320 feet in length or include more than 20 acres (1,320 by 660 feet).

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 160 acres; a claim of this size would have to be located by an association of at least eight persons.

There is no limit to the number of placer claims that can be staked as long as the 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. In Yukon-Charley there are 15 patented gold placer claims and 269 unpatented gold placer claims with total areas of 233 and 9,225 acres, respectively. Table 1 summarizes the location of the claims by drainage.

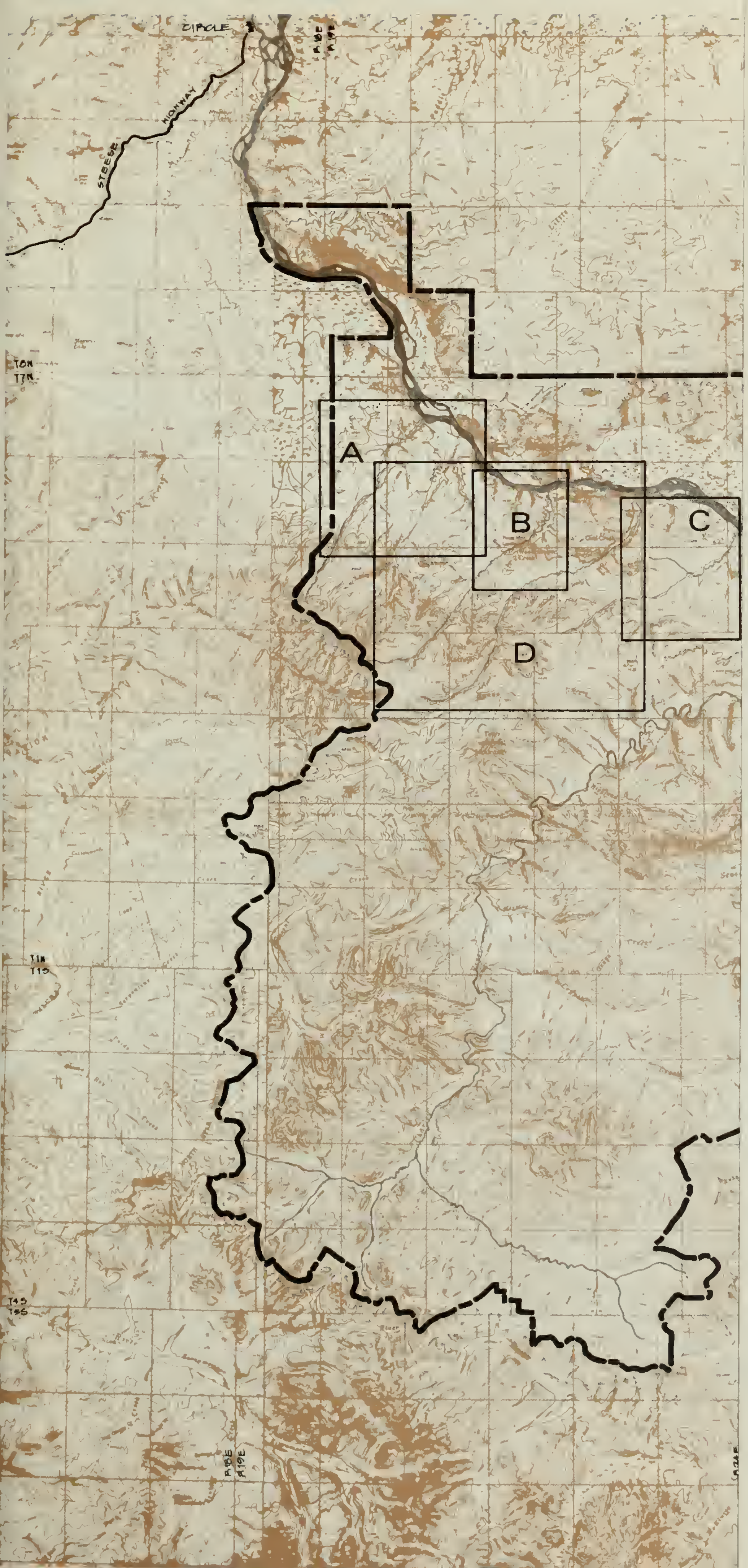
Maps of the existing claims in the preserve are in the accompanying map pocket. The area within each claim map may be seen by reference to the key on the following page.

Table 1

Mining Claims

Yukon-Charley Rivers National Preserve

Drainage	Mining Claims Unpatented	Patented	Acres
Thanksgiving Creek	6		120
Woodchopper Creek		15	233
	146		3,910
Coal Creek	85		4,555
Sam Creek	6		120
Ben Creek	15		300
Fourth of July Creek	11		220
Total	269	15	9,458



A Thanksgiving Creek
B Woodchopper Creek
C Ben and Sam Creeks
D Woodchopper and Coal Creeks
E Fourth of July Creek

NORTH

0 5 10 MILES

0 5 10 KILOMETERS

KEY TO MINING CLAIM MAPS

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- A Thanksgiving Creek
- B Woodchopper Creek
- C Ben and Sam Creeks
- D Woodchopper and Coal Creeks
- E Fourth of July Creek

NORTH

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STATUS OF MINING CLAIMS IN THE PRESERVE

Prior to the Alaska Native Claims Settlement Act (ANCSA) of 1971, the land within what is now the preserve was open to mineral location under the general mining laws of the United States (RS 2319; 30 USC 21 et seq.). "Mineral location" means the process of staking a claim on public domain land. Of lands within the preserve, ANCSA withdrew from mineral location about 1,000,000 acres along the Yukon and Charley rivers under section 17(d)(2), effective on March 16, 1972 (part of this withdrawal became effective a week later).. Approximately 880,000 acres withdrawn from the public domain under section 17(d)(1) remained open to mineral location until November 16, 1978, when it was withdrawn from mineral location by public land orders 5653 and 5654 (emergency withdrawals). The presidential proclamation two weeks later and subsequent legislation establishing the preserve continued the withdrawals. Thus, the withdrawals of mineral land affecting the preserve date from 1972 and November 1978. Like other units of the park system, all the federal land in Yukon-Charley remains closed to mineral entry.

Section 206 of the Alaska National Interest Lands Conservation Act (appendix A) states:

> "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."

The phrase "subject to valid existing rights" means that valid unpatented claims will continue to be honored. Patented mining claims, as private lands, are also valid existing rights.

To be valid, a mining claim in the preserve must have been located prior to the withdrawal affecting the parcel claimed; and it must satisfy the other legal requirements of claim location, annual maintenance, and discovery. For the purposes of this document, mining claims in the preserve not known to be relinquished or abandoned are treated as though they are valid. However, subsequent examination of claim status and mineral "show" may reveal that some claims are actually not valid (if, for example, a valuable mineral deposit cannot be demonstrated or the staking was done illegally) and they would become void. The maps and discussions in this study of recorded claims are not an endorsement by the National Park Service of the validity of any unpatented claim. Mapped claim boundaries are based on best available information, usually provided by claimants. However, the precise location of a given claim is not known until completion of a mineral survey. No mineral examinations have been made of any unpatented claims in the preserve.

Mining operations are managed by the National Park Service under regulations contained in title 36, Code of Federal Regulations (CFR), part 9A (appendix B). Access to mining claims is governed by regulations in 36 CFR 13.15 (appendix B). Mining may take place on any valid claim if the National Park Service has approved a plan describing the proposed activity.

A third category of land withdrawals within the preserve (in addition to sections 17(d)(1) and 17(d)(2)) was the approximately 550,000 acres of land withdrawn from the public domain for Native regional and village corporation selections (see Mine Access and Land Status map). All this acreage has been closed to mineral entry since 1972. A large area in the northeast part of the preserve has already been conveyed to the Natives on an interim basis (pending surveys) and is, for all practical purposes, private land.

The conveyance of land to the Natives includes title to all subsurface minerals as well as the surface. The conveyed townships in Yukon-Charley were selected mainly for oil and gas potential. A block of Native selections west of Washington Creek (Mine Access and Land Status map) was selected for potential coal resources, but has not been conveyed. Any of the Native lands within the preserve could be developed for their mineral resources at some time in the future.

Any unconveyed Native selections would remain part of the federally owned land in the preserve.

HISTORY OF MINING IN THE YUKON-CHARLEY REGION

Gold was first discovered along the Yukon at Stewart River in Canada's Yukon Territory during the mid-1880s. This first discovery was not significant in volume, but further prospecting uncovered a rich placer deposit in the Fortymile drainage in 1886.

The Fortymile River discovery spurred prospecting up and down most of the tributaries of the upper Yukon (Grauman 1977). In 1892, gold was discovered along the Birch Creek drainage, leading to the establishment of the town of Circle City, which grew to a population of 700 by 1896. However, in the fall of 1896, word of new gold discoveries on the Klondike resulted in a new mass movement of people to Canada. By 1898, Circle City had shrunk to a population of 250, while literally thousands of people went to the Klondike. Most of the rich placers had already been staked before even the first crowds arrived in Dawson.

Large numbers of miners, disappointed with their try at the Klondike, began prospecting other tributaries of the upper Yukon more intensely than ever, finding numerous placers with moderate or low yields. By the end of the first decade of the 20th century, placer gold deposits had been worked in Fourth of July, Sam, Ben, Coal, and Woodchopper creeks within what is now the preserve. At first these drainages were mined by panning and rocker box methods on old stream bars where gold had been concentrated naturally by stream action. Soon after gold was found in these drainages, it was discovered that gravels and benches in permafrost could be worked in the winter by drift mining. No timbering or pumping was needed, and a single miner could work year-round on his claim, stocking gold-bearing gravels all winter and sluicing them in summer. Drift mining was the most widely used technique in the early days of mining along all the placer streams in Yukon-Charley.

Small communities sprang up along the Yukon River to service miners along the various tributaries. Eagle City, established in the spring of 1898, had 500 cabins and a population of 1,700 by that summer. Small settlements appeared at the mouths of Fourth of July and Coal creeks, and roadhouses were constructed approximately every 20 miles between Eagle City and Circle City. In 1899, however, the gold rush at Nome reduced populations of these towns to almost nothing. There were numerous other gold strikes throughout Alaska until 1913, but the Tanana discovery in 1902 near Fairbanks was the last great bonanza. The rush associated with this discovery attracted all but the most determined miners from the Yukon-Charley area, leaving Eagle and Circle as the only two significant communities in the region.

Amid the boom and bust of the major gold discoveries, with the attendant rapid shifts of population, a few persistent miners remained in the Yukon-Charley area to probe the placers of several creeks draining into the Yukon. During the early part of the 20th century, the largest quantity of gold mined in the Yukon-Charley area was taken from Fourth of July and Woodchopper creeks. Low-grade gravels were generally ignored, with exploitation of only the rich placer deposits by panning, rocker, and drift mining. Sam and Ben creeks also were mined during this period by drift methods.

During the 1920s, hydraulic mining was introduced to Fourth of July Creek. Because Fourth of July Creek did not contain adequate water supplies, a ditch was dug to carry water from Washington Creek. Although the water diversion functioned only during periods of heavy rainfall, the tailing piles are a testimony to the size of the mining effort and its extensive alteration of the valley. The use of hydraulic techniques on Fourth of July Creek resulted in the greatest gold production within Yukon-Charley before dredging operations began on Coal and Woodchopper creeks.

In the 1930s, more efficient mining techniques were introduced at Coal and Woodchopper creeks in the form of bucket-ladder and stacker dredges. These machines permitted mining of lower grade gravels but required consolidation of both Coal and Woodchopper creek claims and investment of large sums of capital. The dredges operated for nearly 30 years, into the 1960s, creating extensive unreclaimed piles of stacked gravel which have remained largely unvegetated to the present day. The two dredges are still there, one on each creek, and may still be operable although neither has been used for mining for many years.

Other mining methods were also used at the Yukon-Charley placers as the 20th century progressed. Ben Creek was mined by open-cut methods into the 1970s, with ground sluicing (booming), movement of overburden by hydraulicking, and use of sluice boxes. Most recently, movement of overburden and placer gravels was done by bulldozer. Water for these operations was supplied by automatic dams because of low flow rates in Ben Creek. Open-cut techniques were also used in places along both Coal and Woodchopper creeks. In these drainages, hydraulic removal of overburden and thawing of mining gravels preceded dredging operations.

Placer-mining activities continued at a low level in Yukon-Charley through the mid-1970s but production was marginal. A new surge of mining activity began in 1979 after an unprecedented rise in gold prices. Open-cut methods, with mechanical overburden removal and transport of gravels to sluice boxes by bulldozer, prevailed.

Although gold prices have declined considerably from their peak level, mining is likely to continue within Yukon-Charley, largely because of improved sluicing techniques that are permitting recovery of a high percentage of fine gold. The dredge on Coal Creek may be modified and reactivated within the next few years according to the present claim managers. Other mining techniques that are likely to continue within the existing placer claims in Yukon-Charley are mechanical removal of overburden and bulldozer transport of gold-bearing gravels to sluice boxes, screening of coarse gravels, and accumulation of sluicing water by dams or holding ponds. Hydraulic mining, although used in the past, is not likely to occur because present-day water quality regulations prohibit excessive siltation of downstream water.

A detailed review of the mining history of the Yukon-Charley region is provided by Grauman (1977).

CURRENT MINING ACTIVITIES

During the summer of 1981, there was mining activity in the Coal, Woodchopper, and Thanksgiving creek drainages. In Coal Creek, open-cut and sluicing operations were being conducted in the vicinity of Coal Creek camp. Sluicing operations on Mineral Creek of Woodchopper Creek were also noted. At both of these locations, bulldozers were used to strip overburden and move gravels to the sluice boxes. At the Thanksgiving Creek claims, two miners were conducting some preliminary exploration work with a portable 5-inch suction dredge. No active mining was taking place on Sam, Ben, or Fourth of July creeks during the 1981 mining season, but it is possible that future mining could occur in these localities. The sites of active operations are indicated on the claim maps in the map pocket.

The existing developments associated with mines in the preserve are shown on the Mine Access and Land Status map. The watersheds with claims are crisscrossed by equipment trails made over the past few decades, mostly with bulldozers. Many are now obscured by vegetative growth. Trails and roads appear on the Mine Access and Land Status map wherever their locations could be verified on aerial photos, topographic maps, or direct observation in the field.

Movement of equipment to and from mining claims in the preserve has been accomplished in three ways. The first is utilization of a winter trail originating at Circle Hot Springs. Caterpillar tractors can safely travel this route in winter when the ground is frozen and can support heavy loads. The trip is long (40 miles to Woodchopper Creek and 56 miles to Coal Creek) and requires at least one overnight stay along the trail.

Another method used to move smaller pieces of equipment is to break the machinery down and fly it piecemeal to the mining site in light aircraft. Provisioning of the camps is often accomplished by aircraft as well.

The third technique is to barge equipment along the Yukon to the mouth of the drainage being mined. Access roads link the river with mine camps at Woodchopper, Coal, and Fourth of July creeks.

CLIMATE

Located in the interior portion of Alaska, the preserve experiences a continental climate where low precipitation and temperature extremes are common (U.S. Department of Commerce, NOAA 1974).

Summer temperatures frequently reach or exceed 90°F in the lowlands under conditions of minimal cloud cover and long solar days. Diurnal summer temperatures can range 40°F. Although it is possible for the temperature to dip below freezing any night of the summer, usually the fall freeze-up occurs in late August and the spring thaw takes place in late May. Data from weather stations at Eagle and Circle City for 1980 show the last spring freezing temperatures on May 23 and 21, respectively, and the first fall freeze on August 21 and 22, respectively (U.S. Department of Commerce, NOAA 1980a).

The short duration of the frost-free season is significant for placer-mining operations since they can be active only during this period, which is seldom longer than three months. One of the few winter activities that miners are able to perform is movement of heavy equipment to mining sites over frozen trails, avoiding the soft muck of summer. Other winter activities include core drilling or other exploration and stocking supplies.

Winter temperatures average from 25°F to -24°F at Eagle, sometimes dipping as low as -75°F. Similar temperatures have been recorded at Circle City. Temperatures of -40°F are commonplace and may persist for weeks at a time as arctic high pressure systems stagnate over central Alaska in the winter. Lowland areas and larger valleys become sumps of frigid air, forming temperature inversions that often exhibit 20 to 30 degree contrasts within only a few hundred feet elevation.

As spring approaches in late May, a rapid warming trend normally occurs. Similarly, a pronounced fall cooling trend usually occurs by late August/early September.

Average annual precipitation in the preserve is approximately 10 to 12 inches. The air of the region is usually dry because it is forced to rise over several mountain ranges to the south and southwest, where much of its moisture is lost. Most precipitation occurs during the summer in the form of convective thundershowers. Such storms create very uneven distribution patterns of rainfall and often result in local high water conditions along drainages tributary to the Yukon River. Placer-mining operations can be affected by this sudden increase in runoff, which can cause water levels in streams to rapidly rise several inches or even a few feet, depending on the size of the watershed and antecedent soil moisture conditions.

Precipitation patterns vary according to topographic conditions. Higher elevations of the preserve undoubtedly receive average annual precipitation in excess of 10 to 12 inches. Average winter snow accumulation is 50 inches at Eagle and Circle City, but again is undoubtedly greater at higher elevations.

The year-to-year variability in precipitation in the preserve is of great concern to placer miners. Some years may yield only 5 to 6 inches of precipitation, while others may yield in excess of 15 inches. Such variability makes placer-mining operations difficult to plan, since low water years may result in too little runoff for gravel washing and high water years may result in flooding of mining developments.

Winds in the preserve are generally light in the summer, with local gusts likely during convective storms. During the winter, winds are usually calm, as cold stagnant air masses hover over the region for long periods of time. Local drainage winds sometimes develop in valleys of tributaries to the Yukon, often quite suddenly. Such conditions might be potential hazards to low flying aircraft traveling to or from mining operations.

HYDROLOGY/WATER QUALITY

Yukon-Charley Rivers National Preserve is situated at approximately the midpoint of the 2,300-mile-long Yukon River drainage system. The Yukon River flows through the preserve from southeast to northwest for approximately 130 miles. Between Eagle and Circle City the Yukon River drops 277 feet, with an average gradient of 1.6 feet per mile. Between these two points, which are the only locations in the vicinity where regular stream records are kept, the Yukon River drains an area of 7,930 square miles. About one-third of this drainage area, or approximately 2,700 square miles, is within the boundaries of the preserve. Stream records from Eagle and Circle City indicate that 80 percent of the total annual runoff occurs during the summer season (U.S. Department of the Interior, NPS 1974b). Peak discharges on the Yukon, occurring at breakup in late May and early June, often exceed 300,000 cubic feet per second (cfs). In late February or early March the river is covered by ice up to 6 feet thick, and low flows of 16,000 to 20,000 cfs are common. Average flow at Eagle is 79,000 cfs, but fluctuations caused by local snowmelt, distant upstream glacial melt, and temporary damming by ice jams can result in severe flooding, especially if two or more of these events occur together. During the summer, heavy convective rain showers can also cause a swift water rise in the Yukon and its tributaries.

The Yukon River is highly turbid, largely because of glacial meltwater from Canadian tributaries far upriver from the preserve and because of the extensive area drained. Turbidity decreases substantially during low winter flows.

Within the preserve, tributaries of the Yukon are generally clear throughout most of the year because there is no glacial ice in their watersheds. However, turbidity can result from increased erosion during heavy rains, after forest fires, and from streambed disturbances due to placer mining.

The gold placer-mining claims in the preserve are limited to five drainage basins, all tributaries of the Yukon River. They are, from west to east, Thanksgiving Creek, Woodchopper Creek, Coal Creek, Sam Creek, and Fourth of July Creek (see Mine Access and Land Status map). All are located south of the Yukon and drain the dissected uplands, which are so characteristic of the preserve. The only exception is the lower half of the Thanksgiving Creek drainage, which traverses the transition zone between the Yukon Flats and the uplands. This locality has much less relief and extensive reaches of flat, lowland topography.

All five watersheds are below 4,500 feet in elevation and none contain major perennial snowfields or glaciers. Consequently, the streams draining these basins are normally clear. Flow volumes are very high during spring snowmelt but depend upon local rainfall patterns during the summer. As expected, stream flow from these basins decreases throughout the summer as soil moisture is depleted. The amount of water storage in soils is limited by permafrost, often located only 2 to 3 feet below the surface. Heavy winter snows can prolong the period of soil moisture saturation, but only to the extent allowed by total above-permafrost soil volume. Abnormally wet summers also contribute to higher stream flows by saturating the soil and increasing runoff.

Permafrost is extensive beneath all of these basins, particularly under benches adjoining the creeks. Permafrost exists under the streambed in middle and lower sections of the Coal Creek drainage. During the summer of 1981, ice was observed in deep holes 6 to 8 feet below the surface near Discovery Creek, a tributary of Coal Creek. Since Coal Creek is the largest of the five basins, it is likely that the other four also have permafrost at some depth under their main and tributary streambeds. The depth and extent of frozen alluvium undoubtedly varies with flow characteristics of each stream and with the amount of flow occurring each season. Higher flows would be expected to melt ice to greater depths and over a broader cross section of the stream channel.

There are no official stream flow records within any of the five watersheds containing placer mining claims. However, information from other streams in this portion of Alaska permits calculation of an estimated discharge for each of the watersheds using average flows per square mile of drainage. Estimated average, maximum, and minimum discharges for each of the five drainages is shown in table 2. It is to be emphasized that these are average figures. In reality, one water year in the preserve may be significantly wetter or drier than another. This high variability of annual precipitation is significant in relation to placer operations because of the large quantities of water required for this type of mining. Some mining operations, such as those practiced in the past at Fourth of July Creek, cannot operate in low water years. In the larger watersheds, such as Woodchopper and Coal creeks, operations may continue in low water years but at a slower pace because of longer water-collecting times. The high variability of available runoff makes placer mining in this part of Alaska difficult to plan on a long range basis because of the unpredictability of water supplies.

Table 2

Estimated Stream Discharge

Yukon-Charley Rivers National Preserve

Drainage	Area (square miles)	Mean annual runoff (cubic feet per second)*	Mean annual peak runoff (cubic feet per second)*	Mean annual low monthly runoff (cubic feet per second)*
Thanksgiving Creek	69.0	34.5	690	6.9
Woodchopper Creek	74.7	37.4	747	7.5
Coal Creek	84.6	42.3	846	8.5
Sam Creek	69.6	34.8	696	7.0
Fourth of July Creek	53.7	26.9	537	5.4

*Assumes regional mean annual runoff of 0.5 cfs/square mile, mean annual peak runoff of 10 cfs/square mile, and mean annual low monthly runoff of 0.1 cfs/square mile (Selkregg 1974)

Little data has been published on the chemical quality of water in the five basins containing placer-mining claims. However, the nature of these watersheds permits some general statements to be made about overall water quality. All the watersheds are located in terrain of low to moderate elevation, where thick vegetative cover is present over most of the drainage area. Water moving laterally through the upper soil layer toward drainage channels picks up organic compounds from partially decomposed plant materials. Tannin is one of the most common organic materials present in runoff of local streams within the watersheds. It is found in varying concentrations in many of the major streams and tributaries of the five placer-mining basins. When tannin is present, it imparts a brown or tea colored hue to the water in proportion to its concentration.

A brief but quantitative study of surface water quality in the Charley River basin (Young 1976) shows that the clear-flowing streams in the region (including Sam Creek) were high in dissolved oxygen; low in dissolved solids; low in chloride, phosphorous and nitrogen; and had low to moderate conductivity. Streams in the Charley River watershed had pH values very close to neutrality, ranging from 6.5 to 7.5. Sam Creek was found to have unusually high conductivity, which is probably due to its high sulfate content (87 milligrams per liter (mg/l)). Streams in the preserve observed during summer 1981, that were not being affected by mining had clear water slightly colored by organic material. Natural turbidity is low during most of the open water season. High turbidity occurs during spring break-up or after heavy rains.

Examination of surface waters in other drainages of east-central Alaska has shown that chemical quality is good, with dissolved solids ranging from about 65 to 240 mg/l (Selkregg 1974). All waters tested in the region were low in iron and were of the calcium carbonate type of mineralization. It is likely that quality of groundwater varies in the five placer-mining basins according to types of geologic materials present. Areas of high mineralization will yield groundwater higher in dissolved solids, and surface drainage passing over mineralized areas is also likely to pick up minerals in solution. Such areas are most likely to occur along the Tintina Fault, which crosses four of the five watersheds with placer-mining claims. Reddish-brown stain on the streambed of the upper part of Coal Creek, a carbonated spring discussed by Markle (1979) in the midsection of Woodchopper Creek, and the high sulfate content of Sam Creek are but three indications of the probable relationship between the Tintina Fault, mineralization, and the quality of waters draining the area.

Groundwater supplies in the five placer-mining drainages are most likely to be obtained in the alluvium of the main drainage channels. Wells may have to be drilled through permafrost to reach suitable aquifers. Where water is found in this manner, wells are likely to yield from 10 to 100 gallons per minute (Selkregg 1974). However, most small mining operations with limited domestic water requirements probably meet their needs by collecting surface water.

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

GEOLOGY AND MINERAL RESOURCES

The geology of Yukon-Charley Rivers National Preserve can be divided into two basic rock assemblages having very different characteristics. They are separated by the Tintina Fault zone, which trends southeast to northwest, running parallel to and 6 to 12 miles south of the Yukon River valley.

South of the fault zone lies a deformed sequence of regionally metamorphosed Precambrian to Cambrian sediments, volcanics, and intrusive bodies (U.S. Department of the Interior, Geological Survey 1969). North of the fault zone, unmetamorphosed sedimentary rocks range in age from Upper Precambrian to Upper Tertiary. This sequence of sediments is highly inclusive of virtually all periods of geologic history with the exception of the Pennsylvanian period and some gaps within the Mesozoic era (U.S. Department of the Interior, Geological Survey 1969). Few geologic localities worldwide contain localized exposures of rocks with so continuous a span of geologic time. Fossils are abundant throughout much of the sedimentary sequence, presenting a valuable paleontological record tracing the development of many life forms from the earliest Precambrian multicellular organisms to the complex organisms of more recent geologic time.

During the Pleistocene epoch, most of the present-day preserve escaped the glacial inundation that was characteristic of localities farther south in

Alaska. About 10 to 12 million years ago, Alaska's higher mountain ranges experienced a series of three major glaciations. Yukon-Charley was unaffected by the first, but the second, thought to be correlated with the Illinoisan glaciation of central North America, resulted in formation of alpine glaciers in the highest portion of the Charley River drainage. Although some of these glaciers extended 12 to 15 miles down the Charley River valley, no broad ice sheets covering extensive areas were ever formed. The third major ice age, correlated with the Wisconsin advance in central North America, again affected the upper elevations of the Charley River basin, but not to the extent of the second (U.S. Department of the Interior, Geological Survey 1967).

The region south of the Tintina Fault zone is considered a very favorable geologic environment for formation of metallic mineral deposits because of complex relationships between the metamorphosed sediments, granitic intrusive bodies, and extensive faulting (U.S. Department of the Interior, Bureau of Mines 1978). Historically, gold in the form of placer deposits has been the primary economic metallic mineral produced from the Yukon-Charley region, and it is still mined within and around the preserve. The mining claims within the preserve are all within 10 miles of the Tintina Fault zone. This suggests that the fault, in connection with the metasedimentary and igneous rock assemblage, may have provided the mineralized environment required for formation of lode gold deposits, which have since eroded and become concentrated in alluvial sediments of the streams below. Whatever the mechanisms of origin, most significant gold discoveries in the preserve are in northerly trending drainages that originate in the vicinity of the Tintina Fault zone.

Tin, tungsten, uranium, and other metals are suspected to be present in mineralized areas within the preserve and westward into the Circle gold placer district (U.S. Department of the Interior, Bureau of Mines 1978). There are no mining claims for lode deposits anywhere in the preserve, although some lode claims have been located outside and adjacent to the boundaries.

Sedimentary rocks north of the Tintina Fault are known to contain oil shale in the vicinity of the Yukon River between the Nation and Tatonduk rivers. More generally, there is thought to be some oil and gas potential within the sedimentary section from the Kandik River to the Canadian border. This same region may contain deposits of lead, zinc, copper, iron, and uranium (U.S. Department of the Interior, Bureau of Mines 1978). Although there are no mining claims in this portion of the preserve, much of the area has passed or will pass into private ownership through conveyance to Native corporations (Mine Access and Land Status map).

Lignitic coal deposits exist in the vicinity of Washington Creek, in the south-central portion of the preserve. Doyon Ltd., a Native regional corporation, has selected approximately two townships west of the creek for possible coal resources. If Doyon takes title to these townships then coal might someday be developed in the Washington Creek area if it proves to be of high quality.

Studies of potential geothermal resource areas in Alaska include several locations within the preserve that show evidence of geothermal activity.

A carbonated spring is located 2 to 3 miles upstream from the airstrip on Woodchopper Creek. This site is within poorly consolidated Cretaceous-Tertiary sediments lying directly over the Tintina Fault zone. Although the spring itself is not thermal, its location and mineralization suggest fault-controlled thermal activity, perhaps at great depth.

Another area has been noted within the Flat Creek drainage, some 45 miles west of Eagle. At this location, along the north slope of Mt. Sorenson, Cretaceous granite is found in association with Precambrian schist and Paleozoic greenstone. This site was reported in 1917 by C.H. McCartney, who observed that Flat Creek stays open along part of its upper course during the winter. More recent reports of this site include winter observations of a 20- to 25-meter-wide snow-free mound. No vents or hydrogen sulfide have ever been noted in this area. Aerial field observations in August 1981 yielded no other surficial indications of thermal activity such as running water, vapors, algae, or vegetative anomalies.

A third site, located in the upper Charley River drainage at lat. 64° 41.2' and long. 143° 37.9' (Turner et al 1980), was tentatively located in the field on a topographic saddle between two ridges that straddle the boundary between two Mesozoic igneous intrusive bodies. One is a granite and quartz diorite pluton, while the other is a strongly altered shallow intrusive of felsic rock. A small lake at the base of the saddle was examined in August 1981. Water temperatures ranging from 50°F to 67°F were measured along the perimeter of the lake at a 6-inch depth. Deeper measurements were unobtainable with the equipment at hand. Field pH measurements of the lake water ranged from approximately 5.2 to 6.2. It is unclear whether the lake temperatures represented the presence of thermal waters from deeper parts of the lake and thus the presence of geothermal activity, or if the measurements reflected simple solar heating of the lake surface. Winter observation of the lake is recommended to see if it remains ice-free for all or part of the cold weather season. No vapor or hydrogen sulfide was detected at the site, although the lake did contain algae in places around its perimeter.

SOILS

Soil types within the preserve are highly variable, their characteristics depending upon topography, drainage, aspect, fire history, permafrost, and type of parent material. Nomenclature of soil types is from the classification used in the Soil Conservation Service exploratory soil survey of Alaska (U.S. Department of Agriculture 1979). The upper elevations of the preserve contain relatively shallow and rocky soils (lithosols) on hilly to steep topography. These soils are composed of poorly drained, very gravelly, loamy materials over near-surface permafrost (pergelic cryochrepts). Where topography is flatter, soils are deeper and less rocky.

Lower elevation benches and rolling uplands, which comprise the vast majority of land surface within the preserve, are covered by a gray to brown silty loam covered by a peaty organic layer which varies in depth depending on the local environment (histic pergelic cryaquepts). The soil surface is very irregular, with many low mounds, solifluction lobes, and tussocks, rendering foot travel difficult and laborious. In the vicinity of the Yukon River, this soil type is underlain by loess deposits that originated when the Yukon had a much higher elevation floodplain. This cryofluvent soil type in the vicinity of the Yukon River valley is a nearly level, poorly drained silty loam with shallow permafrost (also a histic pergelic cryaquept soil type).

Soils on the present Yukon River floodplain and other large 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 most typical of the placer-mining environments within the preserve, most commonly bordered on each side of a stream valley by the histic pergelic cryaquepts.

Within the floodplain soils, permafrost is at considerable depth below most of the placer-mining sites along the larger drainages. It is shallow on benches and buried river channels, deep under existing streams. However, during dredging operations along Coal Creek from 1936 to 1958, frozen stream alluvium had to be thawed ahead of the dredge by hydraulic giants.

Permafrost is within 2 to 3 feet of the surface under the soils of the valley slopes and lowlands that border the stream floodplains. These soils have been subjected to millions of years of gradual downslope creep of frost-shattered rock and soil from the constant seasonal pattern of freezing and thawing. Lower elevation sediments have combined over time with wind-blown silts, river deposits (from a formerly higher floodplain of the Yukon), and peat accumulations to form relatively deep sediments. 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.

VEGETATION

The vegetation of the Yukon-Charley region is part of the North American taiga, an extensive subarctic forest dominated by conifers and several widespread species of deciduous hardwoods. Lowlands and drainages within the preserve are heavily forested. Uplands become more thinly forested with increasing elevation and most areas above 2,000 feet are cloaked with treeless tundra vegetation. Forests are most commonly open and slow-growing, although dense vigorous stands of spruce occur on the most favorable sites. Large areas of open tundra are common in taiga where drainage is poor or some other condition inhibits tree growth.

The preserve is largely trackless wilderness. Except for narrow bands along the Yukon and lower reaches of its tributaries, the forest and tundra are in a completely natural condition. The effects of topography, drainage, and fire history control the local distribution of plant communities and cause abrupt discontinuities. Seen from the air, the vegetation has a markedly patchy appearance. Approximately 475 vascular plant species are reported by Young (1976) from the Yukon-Charley area.

The classification of vegetation types in Alaska has long been a difficult and unresolved problem for botanists, not the least because floristically similar communities are often structurally different due to variant proportions of their dominant species or to growing conditions. For the purpose of this report, community designations based on U.S. Department of Agriculture (1980a) and Joint Federal-State Land Use Planning Commission (1973) guidelines will be used.

The major vegetation types occurring in the preserve are upland spruce-hardwood forest, bottomland spruce-poplar forest, shrubland, tundra, and muskeg.

Upland Spruce-Hardwood Forest

This forest type is most characteristic of the Alaskan taiga. Dominated by white spruce with admixtures of aspen, paper birch, and black spruce, this forest cloaks most of the land in Yukon-Charley above the Yukon River and below 2,000 feet. Spruce forest extends considerably higher than this in drainages, however, especially on south slopes. At these higher elevations, the forest is of open aspect; elsewhere stands with closed canopy predominate (greater than 60 percent tree cover). On wet sites with low slope, black spruce dominates in stunted, open stands underlain by a dense cover of dwarf birch, sphagnum, and ericaceous shrubs. This condition occurs extensively on benches above the major creeks and usually indicates permafrost at shallow depths. Vigorous white spruce-balsam poplar stands with willow and rose shrub understory line the lower reaches of the larger creeks. On dry, well-drained south slopes or in post-fire conditions, birch-aspen mixtures often dominate over white spruce.

Bottomland Spruce-Poplar Forest

This type covers many of the low terraces and floodplains along both sides of the Yukon and deltas of its major tributaries. These forests are tall, closed stands of white spruce mixed with balsam poplar on open sites. A dense undergrowth of willow, alder, rose, and other shrubs is usually present and especially thick near open banks.

Shrubland

Shrubland consists of willow-alder thickets growing in upper drainages beyond the limits of tree growth and on floodplain deposits at lower elevations. In the latter case it represents a sere in the successional sequence following flooding or other disturbance. The shrubs are usually 2 to 4 feet high in these stands. In high drainages, the groundcover may be a thick mat of mosses and low heaths similar to the tundra above, but on floodplains fireweed, grasses, horsetail, and other herbaceous perennials provide a thin groundcover.

Tundra

A treeless vegetation of cold regions dominated by low (less than 2 feet) woody plants, grasses and sedges, mosses, and lichens, tundra is a diverse formation difficult to describe except in general terms. Tundra vegetates the area above treeline and also occurs in various forms at lower elevations on locations edaphically unfavorable for tree growth.

Alpine tundra occurs at high elevations in the Yukon-Charley preserve, covering most of the slopes and ridges above 3,000 feet. This is a mat-and-cushion vegetation dispersed among large patches of bare ground and rock. The mats are rarely more than a few inches high. Mountain-avens, mosses, lichens, low heaths, prostrate willows, crowberry, moss campion, and other small flowering plants comprise the bulk of the thick vegetation mats.

Shrub tundra covers much of the high slopes and valleys above 2,000 feet. It consists of a dense mat of low shrubs (less than 2 feet high) such as dwarf birch, heaths, low-growing willow species, sphagnum and other mosses, grasses and sedges, and lichens. This vegetation type intergrades with upland spruce-hardwoods and comprises the understory in many of the open, higher elevation forest stands.

In poorly drained locations too wet for black spruce, a form of tundra occurs which is dominated by tussock-forming sedges and grasses and sphagnum. This type is not very extensive in the preserve.

Muskeg

Muskeg occurs in the northwest corner of the preserve on old river terraces of the Yukon. It is essentially a black spruce bog with tamarack as a codominant. Muskeg does not occur in areas affected by mining claims and will not be discussed further in this report.

Vegetation on the Claims

Thanksgiving Creek. This valley is wide with a nearly level floor, leading to wet soil conditions and extensive shallow permafrost. A band of white spruce-birch-poplar forest lines the creek. Tall willows and alder, together with poplar and aspen saplings, comprise the shrubby understory. The potentially active portion of the Thanksgiving mine claims lies within this narrow gallery forest. Beyond the creek banks are broad expanses of tussock sedge tundra and open black spruce stands underlain by sphagnum moss, sedges, dwarf birch, and other low shrubs. The winter trail from Circle Hot Springs crosses the creek on the claims. A small campsite in the trees at the juncture of the winter trail and Thanksgiving Creek is the only other obvious disturbance to vegetation on this claim group (Mine Access and Land Status map).

Woodchopper Creek. Lower Woodchopper is lined with spruce-hardwood forest. The broad, low benches on either side support extensive open stands of black spruce and dispersed patches of shrub tundra where drainage is poorest. Tributaries cutting across the benches are also lined with spruce. The valley slopes are forested with white spruce, birch, and aspen. The hardwoods dominate large areas on south-facing slopes. The creek flows through a thick stand of bottomland spruce-poplar forest at its mouth.

The midportion of Woodchopper Creek has been greatly disturbed by past mining. Most of the spruce along the main creek stem have been removed, and thick stands of young poplar and willow line the dredge spoils.

The upper valley is less disturbed and the vegetation remains much as described for lower Woodchopper.

A number of trails, both major and minor, follow the lower and middle valley on the north side. Trails also extend up several of the tributaries. Where these cross steeper well-drained ground they are lined with alder and willow. Where trails cross flat tundra and black spruce stands, they leave a visible track or scar through the vegetation.

Coal Creek. The vegetation of Coal Creek is very much like that of Woodchopper. The upper drainage, which was examined more closely, is forested on the south slope, and the stream is lined with dense willow brush. As elsewhere, low slopes and the valley floor are vegetated with dwarf birch shrub tundra. Most of lower and middle Coal Creek has been disturbed by past mining. Colorado Creek, Coal Creek's major tributary, is lined with white spruce-poplar forest; some claims are located here. The benches support moderately open black spruce stands. On the south slope aspen-birch groves alternate with spruce, while spruce dominates most of the north slope. A single trail, not distinct, apparently leads up the lower and middle reaches of this creek. It may have been used only once, possibly during claim staking.

Sam and Ben Creeks. Sam and Ben creeks occupy narrower, steeper basins than the previous streams and are more heavily forested with upland spruce-hardwoods, probably because drainage is better. Balsam poplar is mixed with white spruce near the creeks. Large patches of open black spruce stands are common, but treeless tundra areas are relatively infrequent in the vicinity of the claims. Small areas on Ben Creek have been cleared for the camp and for mining; these areas support an open cover of grasses, willow, and hardwood saplings. The slopes and ridges above these creeks are well forested with aspen and white spruce.

Fourth of July Creek. The portion of this creek occupied by claims lies in a basin with a gently sloping floor vegetated with black spruce and tundra meadow. The bulk of the claimed area has been disturbed by mining at various times in the past and is dominated by aspen, poplar, and willow in various stages of maturity. Elevated benches were avoided and still support considerable spruce. Various trails traverse the tundra and black spruce forest the length of the claim area, and at least one improved trail leads to the Yukon.

Factors Affecting Plant Populations

Although there may in the past have been limited commercial harvesting of timber for local use along the Yukon, it was never a major economic activity. The region has always been too far from significant population centers in a state dominated by forest vegetation.

Fire is a major ecological factor in interior Alaska. It is a common event and has created a large scale mosaic of different-aged, submature forests. Man-caused fires are common near habitation, but in remote areas most are caused by lightning.

Insect outbreaks periodically decimate large areas of timber. The principal offenders are spruce beetle (white spruce) and the spear-marked black moth (deciduous trees). Spruce beetles may develop in, and are encouraged by, felled timber. They will attack standing live trees, sometimes causing widespread mortality in individual stands. The moth is a defoliator that has caused large economic losses in paper birch. It overwinters in litter on the forest floor.

Endangered Species

There are no plants from Alaska officially designated as either threatened or endangered. However, the U.S. Department of the Interior (Fish and Wildlife Service 1980) and David Murray (1980) have published names of Alaskan plants which are under review for such status. Plants from these lists which could be found in the Yukon-Charley area are listed in table 3.

It is clear from the table that the relatively dry bluffs and rubble slopes along the Yukon River, and Kathul Mountain in particular, may be sensitive habitats from the standpoint of rare plants.

Table 3

Proposed Threatened or Endangered Plants

Yukon-Charley Rivers National Preserve

Species	Review Status[a]		Known Range		Habitat
	USDOI	Murray	Preserve	Other Areas	
Castilleja annua	2	R		East-central[b] Alaska	Dry bluffs, bars roadsides, disturbed areas. Taxon in doubt.
Cryptantha shackletteana	1	E	Near Eagle		Steep, dry slopes, grass margins.
Eriogonum flavum var. aquilinum	1	E	Kathul Mountain; Eagle		Dry south slopes.
Erysimum asperum var. angustatum	1	T	Along Yukon between Circle and Eagle	Dawson	Dry grassy bluffs, rubble slopes. Taxon status in doubt.
Montia Bostockii	1	T	Headwaters, Thanksgiving Creek (Young, 1976)	East-central Alaska, SW Yukon Terr.	Wet alpine meadow. Moist frost scars, near springs.
Podistera yukonensis	1	T	Kathul Mountain; Eagle	Yukon Terr.	Dry, south rubble slopes. Grassland.

[a]USDOI: 1 - Taxa believed either threatened or endangered. Official listing procedures underway.

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

Murray: E - Recommended for endangered status.
T - Recommended for threatened status.
R - Rare plants, status undetermined.

[b]Distributed in geographic vicinity of the preserve, although not yet collected from within.

WILDLIFE

Wildlife is an important attribute of the Yukon-Charley Rivers National Preserve, which is inhabited by a rich diversity of species. Based upon previously published wildlife resource information, reports from persons knowledgeable of the area, and field observations made by the study team, at least 34 species of mammals, 158 species of birds, 18 species of fish, and one species of amphibian inhabit the preserve (see appendix C). The major habitat types are alpine and moist tundra, shrubland, upland spruce-hardwood forest, bottomland spruce-poplar forest, and aquatic.

Mammals

Three large species of ungulates occur in the preserve. Dall sheep occupy restricted alpine areas where the terrain is blown clear of snow in winter and is rugged enough to allow escape from predators. However, these sheep are mobile and cross broad lowlands at times. Ewes and lambs often summer in considerable numbers along the partially wooded bluffs of the Charley River, mainly between the mouths of Flat and Hosford creeks. Due to their generally restricted upland habitat, it is unlikely that sheep would be found in the claim areas. Population estimates for the preserve vary from 200 to 350 individuals (U.S. Department of the Interior, NPS 1974b and Young 1976).

Moose occur in moderate numbers throughout the preserve. During summer, they disperse into a diversity of habitats but are most common in the subalpine habitats and along stream-margin brushlands. Severe winter conditions may force them into river bottoms along the Yukon and its major tributaries, where ample browse is available in sheltered areas. The animals return to higher elevations as soon as the weather warms in early spring.

Moose browse extensively on willow, dwarf birch, and aspen during the fall and winter. In the spring, they graze on a variety of plants, such as sedges and horsetails. The summer diet consists of willow, birch, alder, and aspen (Alaska Department of Fish and Game 1978d). Moose are relatively more adaptable than other wildlife species, and they can exist on transitional vegetation types that develop after forest fires or disturbances by man. The breeding season for moose begins in early September and continues into October. Calving occurs during late May and early June; most calves are born in swampy muskeg areas.

The caribou of the preserve are part of the Fortymile herd, which ranges throughout east-central Alaska and adjoining portions of Canada. Its numbers totaled 50,000 in the early 1950s. More recent data are lacking, but numbers appear to be considerably reduced at present. Caribou are nomadic animals. They range over vast areas of terrain and a variety of habitats in fulfilling their needs for calving grounds, summer range, rutting/fall range, and wintering grounds. Calving occurs during late May or early June; rutting occurs in September and October. The caribou diet includes a wide variety of plants, such as willow, dwarf birch, and lichens. Lichens are an important constituent of their winter diet.

Caribou generally winter in forests and at forest margins along the southern periphery of the preserve (principally in the Charley River watershed) and outside the preserve to the northeast. During the spring, they move across the Yukon to join animals wintering in the south. They then may concentrate in calving areas on highlands at the southern edge of the Charley River drainage and/or in the White Mountains well to the west. The herd disperses during the summer. In fall, caribou tend to aggregate and move via established migration routes to wintering grounds. Most often they travel east, to the south of the Yukon River, crossing the river in Canada; but they are known to cross the Yukon between Eagle and Circle.

Grizzly and black bears range throughout the preserve in moderate numbers. Populations are believed to have increased over the past several years, though blacks appear to have fluctuated more than grizzlies. Both species may be encountered in virtually any habitat, but grizzlies are most often found in open country, while blacks prefer forests and brushlands and are thus more often encountered on the placer claims. Both are omnivorous, being opportunistic predators while obtaining the bulk of their diets from herbage. Berries are a favored food source in late summer prior to hibernation. Both species have been reported at Coal Creek, Thanksgiving Creek, Fourth of July Creek, and Ben Creek. Bear sign was observed at Sam, Ben, Colorado, and Coal creeks.

Interior Alaska is excellent red fox habitat. Red foxes are omnivorous and food includes small mammals and birds. Red fox population densities fluctuate with respect to changes in the population densities of their prey.

Wolverine are wide-ranging animals and can occur in all five of the habitat types in the preserve. Wolverine are considered to be a wilderness species, as they are relatively sensitive to human disturbances of their habitat. Food items are mammals, berries, and carrion.

Lynx are relatively common in the preserve. Lynx feed heavily on the varying hares and their numbers tend to fluctuate with the ten-year cycle of the hares. During the study, seven were seen together near the Sam Creek claims. Hare sign was observed only at Ben Creek, although hares are widespread and very common.

Marten distribution generally coincides with spruce forests. They are abundant in interior Alaska and prey primarily on voles. Marten is an important species for trappers and evidence of trapping was noted at Fourth of July Creek.

Mink are normally found in riparian habitats where they prey on small mammals, birds, fish, and insects. Population densities of mink appear to be relatively lower in interior Alaska as compared to other regions; this is attributed to seasonal or unstable sources of food. Mink populations are sensitive to fluctuations of vole population densities.

Porcupines occur in forested areas and are known to inhabit both coniferous and deciduous forests as well as willow thickets along streams.

Food includes bark and vegetation. Porcupine sign was noted at the confluence of Patterson and Coal creeks.

One beaver was observed on Coal Creek, along with numerous dens and dams. Beaver evidence was also observed on Boulder Creek; these mammals are probably quite common in the preserve.

Red squirrels are particularly abundant in interior Alaska along rivers and streams with stands of spruce, as they greatly depend on spruce seeds for food. Red squirrels were observed on every claim group.

Other mammals that can be expected on the claim groups include four species of shrews, the little brown bat, northern flying squirrel, red-backed and meadow voles, northern bog and Siberian lemmings, muskrat, coyote, ermine, least weasel, and otter.

Birds

Of the 338 species of reguarly occurring birds of Alaska, about 158 are known to utilize the preserve; of these, only 24 species are permanent year-around residents (see appendix C). Approximately 132 bird species can be expected to frequent habitats found on the claims. Birds were not abundant in the preserve, and only 18 species were observed during the study period.

The most abundant species of aquatic birds in the preserve are lesser scaup, widgeon, pintail, white-winged scoter, green-winged teal, and red-breasted merganser. Also present are Canada and white-fronted geese, sandhill cranes, loons, grebes, and several species of shore birds. Canvasbacks, which commonly nest on the Yukon flats, occur much more sparingly in the preserve. During spring and fall, the Yukon River forms a conduit through which moderate to large numbers of birds pass on their way to and from the Yukon flats and other nesting areas in northern Alaska. Notable are good numbers of snow geese.

Five species of gallinaceous birds occur in the preserve. Spruce grouse are abundant in forests. There are high numbers of rock and willow ptarmigan in the tundra and willow bottoms, respectively. Sharp-tailed and ruffed grouse also occur in the preserve in smaller numbers.

Grouse and ptarmigan populations have recurring cycles of abundance and scarcity. A complete cycle may vary from 8 to 12 years; population oscillations in interior Alaska appear to be greater relative to those occurring in coastal areas to the south. Although the factors causing population oscillations are not well understood, it is believed that weather, predation, diseases, and availability of food are all probably involved in varying degrees of influence during the cycle (Alaska Department of Fish and Game 1978c).

Willow ptarmigan have the greatest distribution of the ptarmigan species occurring in Alaska. Breeding habitat is close to timberline, usually at elevations between 2,000 and 2,800 feet, in the fringes of coniferous forests, along streams, and in riparian shrub communities. Willow ptarmigan prefer wetter habitats than those preferred by the rock ptarmigan. Willows are their primary source of food and they forage primarily on leaves in the summer and twigs and catkins in the winter. Population densities fluctuate, with peaks occurring every seven to nine years. Locally, population densities may vary from the overall pattern of larger geographical areas (Alaska Department of Fish and Game 1978c).

Rock ptarmigan are found at higher elevations than willow ptarmigan. Their preferred breeding habitat includes scattered shrubs and herbaceous vegetation in tundra areas, with elevations ranging from timberline to approximately 3,500 feet. Like other ptarmigan species, rock ptarmigan are subject to periodic fluctuations in number (Alaska Department of Fish and Game 1978c).

Spruce grouse occur in forested areas, such as mature white spruce and birch woodlands. Diet items include spruce needles, berries, seeds, flowers, and herbaceous vegetation.

Ruffed grouse prefer relatively dry, well-drained deciduous forests that are interspersed with spruce and are on southfacing slopes. Like spruce grouse, they tend to occur along roadsides, where they seek grit (Alaska Department of Fish and Game 1978c).

Of Alaska's upland game birds, sharp-tailed grouse are the least abundant and are primarily limited to the central interior areas. In Yukon-Charley preserve they are found only in the southern portion and out of the claim groups. Sharp-tailed grouse occur in a variety of forest and brushland habitats with sparse or open canopy coverage, and they feed on insects, berries, and vegetation. Grassy areas are an important component of their breeding habitat.

Twenty species of raptors (hawks, eagles, and owls) are found in the preserve, all but two of which are likely breeders. Both the bald and golden eagles nest in the preserve in moderate numbers. Several pairs of bald eagles nest along or near the Yukon River and are closely associated with the lowlands. Golden eagles nest on ledges in tundra uplands. Rough-legged hawks reportedly nest in substantial numbers in the preserve, principally along tributaries to the Yukon. America's largest falcon, the gyrfalcon, is known on highlands in the southern part of the preserve and presumably nests there. Peregrine falcon are also present; they are discussed in the section on endangered species.

Prominent passerine birds include the horned lark, gray jay, black-billed magpie, raven, robin, mountain bluebird, Bohemian waxwing, northern shrike, rusty blackbird, pine grosbeak, Lapland longspur, snow bunting, five swallows, three chickadees, four thrushes, six warblers, seven sparrows, and two juncos.

Other common birds associated with the study area include the killdeer, American golden plover, spotted sandpiper, dunlin, western sandpiper, northern phalarope, long-tailed jaeger, mew gull, Arctic tern, belted kingfisher, downy and hairy woodpeckers, and sandhill crane.

Amphibians and Fishes

Only one amphibian, the northern wood frog, is found in the preserve. It occurs in moist to wet lowland habitats. None were noted on any of the claim groups during the study, but they could be found there.

The preserve has a diversity of aquatic habitats that support a fish fauna typical of the eastern Alaskan interior. Eighteen species are known to occur in the preserve. Of these, sixteen inhabit the Yukon during some portion of the year. Seven of these, plus two additional species, are found in tributary streams, six occur in lakes, and three are found in ponds.

Principal fish are whitefish (sheefish and humpback, broad and round whitefish), salmon (chinook, coho, and chum), grayling, burbot, northern pike, and longnose suckers.

On the Charley River, moderate numbers of sheefish occur at the mouth; chinook, chum, and probably coho salmon occur in the lower 8 to 12 miles. Grayling and round whitefish occur in modest numbers throughout the watershed and are the principal species that would be affected on the mining claims. Round whitefish and grayling inhabit the lower portions of tributary streams during summer, with grayling moving farther up these drainages. In winter, however, low flow rates and deep ice apparently force most fish from the tributaries into the Yukon, at which time there are no fish in the secondary streams.

Grayling spawn in the spring immediately after ice breakup. Prior to upstream spawning runs, the adults congregate at the mouths of clear-running tributaries during April, arriving from overwintering sites in the Yukon as well as areas near the mouths of tributary streams. Upstream spawning runs may even occur in channels formed in the ice by surface runoff. Spawning streams may be only 1-1/2 to 2 feet wide. Spawning occurs from mid-May to June, most commonly over sandy, gravelly substrates. No gravel nest is constructed. Territories are established by the males during spawning, and spawning movements may create a slight depression over which the eggs are laid.

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

Round whitefish are commonly found in rivers and lakes but are more abundant in clear streams with gravelly bottoms where a majority of the spawning takes place. Mid-September through mid-October is the most important spawning period. Gravel nests are not prepared in the streambed; rather the eggs are simply laid over gravel and hatch the following spring after spending the winter in crevices among rocks and gravel. The young develop in the shallow portions of lakes, rivers, and streams after hatching as sac fry and remain in the spawning grounds for two to three weeks to absorb the yolk sac. The diet items of round whitefish include aquatic insects, terrestrial insects, other invertebrates, and the eggs and fry of other fishes (Alaska Department of Fish and Game 1978a and Morrow 1980).

The broad whitefish primarily inhabits the Yukon; however, it is considered to be an anadromous species and spawns in streams with gravel bottoms during September and October. The eggs hatch the following spring. After hatching, the young begin downstream movements. Broad whitefish feed on bottom insects, snails, and other invertebrates; they appear to be bottom feeders (Alaska Department of Fish and Game 1978a and Morrow 1980).

Humpback whitefish have the greatest distribution of any whitefish species in Alaska. The habitats preferred by humpback whitefish include freshwater lakes, slow-moving streams, and sloughs associated with larger rivers. They also appear to be anadromous. Adult humpback whitefish begin migrations to spawning areas, usually the shallow sections of rivers and rocky areas in lakes, in the summer and early fall. Spawning takes place from mid-September to mid-October. The eggs, after overwintering in rock and gravel, hatch the following March or April. The young fish develop in flowing waters and lakes, preferring shallow, protected, nearshore areas. Humpback whitefish eat benthic organisms and small fishes (Alaska Department of Fish and Game 1978a and Morrow 1980).

The least cisco is also widely distributed in interior Alaska. This species is most abundant in lakes and slow-moving streams. Although it is one of Alaska's more abundant freshwater fish, population distributions are seasonal as a result of its migratory habits. Least cisco spawn in streams having sand and gravel substrates. Stream depth ranges from approximately 4 to 8 feet. Spawning occurs during late September and early October. After overwintering in gravel crevices, the eggs hatch in the early spring. By the middle of June, large numbers of the young embark on movements downstream to deeper and slower waters. Least cisco feed primarily on aquatic insects and zooplankton (Alaska Department of Fish and Game 1978a and Morrow 1980).

The sheefish is found in the Yukon River and also migrates up the Koyukuk. It spawns in late September or early October in clear, fairly swift streams. Following spawning the adults migrate to the wintering ground and begin to feed. Upstream migration begins at ice breakup. The adults feed primarily on fish, especially the least cisco.

Chinook salmon, being anadromous, ascend freshwater streams to spawn. In the Yukon River, a single run occurs and may take place over a period of several months. Chinook enter the Yukon River in May; by late July, they have traveled as far as the Canadian border. In general, the chinook that migrate the farthest enter freshwater earlier. Within the Yukon drainage, chinooks spawn from July to early September. Females construct redds in gravel stream bottoms. In interior Alaska, the eggs may require 12 weeks or more to hatch. After hatching, the alevin remain in the gravel for two to three weeks and emerge after absorbing the yolk sac. The free-swimming fry thrive in cool, clear streams and remain in freshwater for as long as two years. However, most fry leave freshwater after their first year. While in freshwater, the young prey on aquatic and terrestrial insects and other invertebrates. Yukon River chinooks are six to seven years old when they ascend the river.

Coho salmon are three to five years old when they ascend the river. They move into the Yukon in July and are in the streams by August. Eggs are laid in redds constructed by the female; egg development normally requires six or seven weeks. After hatching, the alevin remain in the gravel for two or three weeks or more and emerge after absorbing the yolk sacs. At this stage, the fry are free-swimming and begin feeding immediately; a majority of their diet consists of terrestrial insects. Young coho salmon usually spend the first year of their life in freshwater prior to migrating to the sea (Morrow 1980).

Chum salmon are considered to be fall spawners. Most spawning activities occur in September and October. Within the Yukon River, distinct spawning runs occur in summer and fall. Summer chums spawn in lower Yukon tributaries, located for the most part downstream from the Koyukuk River. Fall chum enter the Yukon River in late June or July and go as far as its headwaters. Chum salmon spawn in gravel-bottomed streambeds in which redds are constructed. It is not known exactly when the eggs hatch in interior Alaska; hatching is believed to occur under ice cover. The alevin remain in the gravel for 60 to 90 days after hatching to absorb their yolk sacs. After emerging from the gravel, young chum salmon begin migrating to the sea. Whether the young feed during their seaward migrations depends on how much distance must be covered. Chum spend five to six years at sea before they return to spawn.

Northern pike occur in lakes and the Yukon. Spawning occurs in the spring, usually in waters ranging from 3 inches to 2 feet deep with muddy vegetated bottoms, emergent vegetation, and little or virtually no current. After hatching, which may require as long as 30 days, the young remain in the spawning area for several weeks, whereupon they move to other areas and establish territories. Diet items of northern pike include insects, crustaceans, other fish, and occasional small birds and mammals (Alaska Department of Fish and Game 1978a).

Endangered Species

Grizzly bears, wolves, and bald and golden eagles are not considered to be rare or endangered species in Alaska, but the peregrine falcon is legally classified as endangered by the U.S. Fish and Wildlife Service. The American peregrine (Falco peregrinus anatum) is relatively common along the Yukon River. A stable population of between 17 and 20 pairs was recorded at various times before 1969 nesting on bluffs along the river between Circle and the Canadian border (Hickey 1969 and U.S. Department of the Interior, Fish and Wildlife Service 1980c). Between 1969 and 1977, Alaskan peregrines--like those resident in other parts of North America--experienced drastic declines in population number and the birds seemed about to disappear from some parts of the state. The upper Yukon population was reduced to a low of 11 breeding pairs in 1973, or about 60 percent of normal (populations in most other areas suffered much greater declines). After 1977 the peregrines began to recover statewide. By 1981 the upper Yukon population was back up to 18 breeding pairs and, most importantly, raised 54 young. This is the highest breeding success rate (young per pair) yet recorded for Alaska. In 1981 four falcon pairs raised eight young at nest sites along the Charley River, giving a total of 22 known breeding pairs for the preserve. This is about 18 to 20 percent of Alaska's breeding population, making the preserve an extremely important habitat for this endangered species (Ambrose 1982).

The reason for the peregrines' decline is not thoroughly understood but appears related to an accumulation of pesticide residues in the birds' tissues. Recovery has been attributed to prohibition of general use of DDT in most of North America. Alaskan populations, including those of the upper Yukon, are migratory and probably encounter(ed) prey contaminated with pesticides while away from their breeding sites. There are no known sources of DDT or like contaminants that could affect the birds in the Yukon-Charley area.

Peregrine nesting occurs on bluff faces too steep to support continuous vegetation or carnivore access to the nest site. One nest site may be used repeatedly, though it is common for a pair to utilize several sites over a period of years. There are no nest sites on claims. Of 32 nest sites known in the preserve, six are located near the mouths of the five drainages with mining claims. Four of these were active in 1981.

AIR QUALITY

The air over Yukon-Charley remains essentially unaffected by human activity. Visibility and air quality could be called pristine, except for small areas near Eagle and Circle where smoke from dwellings accumulates at times during winter.

The preserve is a class II area under the Clean Air Act rules for "Prevention of Significant Deterioration." The class II designation carries with it certain maximum legal limits by which particulates and sulfur dioxide may be increased in the ambient air. As a national preserve, Yukon-Charley 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 at present no plans or proposals to redesignate the preserve. There are no existing unnatural sources of sulfur dioxide or particulate matter of any consequence (cabin smoke contains particulates); nevertheless, the maximum allowable increments would apply to any future sources of pollutants that might be proposed.

Air quality permits are not required for placer mining.

RECREATION AND AESTHETIC QUALITIES

Throughout most of its 130-mile traverse of the preserve, the Yukon is bounded on one or both sides by bluffs and mountains that rise rapidly from river level. Although most of these bluffs are no more than a few hundred feet high, some rise sharply 1,100 to 2,100 feet above river level near Biederman's Bluff, Woodchopper Canyon, Kathul Mountain, and a few other areas. These high and exceedingly rugged bluffs form some of the most spectacular scenery associated with the rivers of interior Alaska.

To the south of the Yukon River, rolling uplands give way to a rugged mountain province where several peaks reach an elevation of 6,500 feet or more, rivalling mountains of the Brooks Range. The interior mountains of the preserve are drained by a network of rivers and creeks, of which the Charley River is the largest. The Charley drainage is deeply incised into the mountainous terrain, and relief on the order of 4,000 feet within a very few miles is common in the area. Perhaps the most appealing aspect of the scenery of the preserve is the great expanse of unspoiled wilderness. This pristine character is a major attraction for visitors.

The preserve has excellent potential for a wide variety of recreational uses. Existing uses include camping, nature photography, hunting, wildlife observation, sport fishing, canoeing, and river running.

The segment of the Yukon in the preserve, along with the portion upstream to Dawson, comprises one of the most scenic yet safely traversable stretches of any large river in North America. The tributaries of the Yukon offer river travel in an even more remote atmosphere.

The lower Kandik is an intermediate-sized river with a gentle gradient suitable for safe boating by people with only moderate experience.

The Charley River, one of the most beautiful rivers in Alaska, is utilized by perhaps only a few parties each year. Travel on the Charley is primarily for the challenge and thrill of floating a remote, pristine river. The river is an outstanding canoe run at sufficiently high water stage; rapids are strewn with boulders, the current is swift, and pools are few and short in length. Water classification using the International Difficulty Rating is primarily Class II (Intermediate). The water clarity in this river is also exceptional.

CULTURAL RESOURCES

History

The area encompassed by the Yukon-Charley Rivers National Preserve has had a rich and varied history. This region of the Yukon River is best known historically for the assorted gold rushes that took place there in the late 1880s and 1890s, but it is also known for the role it played in the development of the trapping industry and trade and the attendant rush of civilization that occurred since the mid-1800s. The sites related to trapping and mining activities are the primary historical values found on or adjacent to mining claims within the preserve.

The historical sites within or near mining claims are summarized in table 4. The table has been organized by creek drainage because the mining activity occurs within drainages and because the specific claims in which the sites may occur have not yet been identified. The table also has a "note" section summarizing site recommendations made by Grauman in her study, "Yukon Frontiers: Historic Resource Study of the Proposed Yukon-Charley National Rivers." Recommendations are also made for additional cabin remains observed along the middle and upper sections of Coal Creek by the mining assessment team.

Currently there are no sites in the preserve listed on or declared eligibile for the National Register of Historic Places.

The most significant sites listed in the table are those structures or objects deemed by Grauman to be eligible for nomination to the National Register of Historic Places. Specifically, this includes the Slaven cabin, the Coal Creek dredge, the Woodchopper Creek mining camp, the Fourth of July Creek mining camp, the Arthur "Cap" Reynolds cabin, and the Ben Creek mining camp. Many of the other sites listed may qualify for the register, but site visits and evaluations have not yet been undertaken. Some of the sites tentatively identified by Grauman as being potentially eligible for the National Register also require additional evaluation.

Because trapping and mining activities have continued in the area to the present day, there has often been adaptive use of many of the same cabins and equipment that the first trappers and miners used. This adaptive use of the historical fabric and the continuity established from the past to the present constitutes an important historical theme. Such property is considered for all intents and purposes as the private property of the claim owner unless it is abandoned.

Grauman's historical treatise on the Yukon-Charley preserve and the recommendations made therein make it abundantly clear that significant buildings and materials indicative of the great Alaskan mining adventure on the Yukon still exist in the area. As she states, "the mining frontier has not yet passed."

Two additional geographical locations that have high resources extraction potential must be assessed for conflicts with historic resources.

Table 4

Known Historic Sites In the Vicinity of Mining Claims

Yukon-Charley Rivers National Preserve

Drainage	Area of Consideration	Historic Sites Present*	Notes
Coal Creek and tributaries	A) Lower Coal Creek from approximately Sec 24, T6N, R22E, to the Yukon River B) Middle Coal Creek from approximately Sec 25, to the confluence of Colorado Creek (including tributaries)	Slaven cabin Coal Creek dredge Coal Creek mining camp Middle Coal Creek cabins Boulder Creek mine Road to Ben Creek mining district, Ben Creek trail, and Coal Creek-Woodchopper Creek road	Grauman believes that the Slaven cabin "might qualify" for the National Register of Historic Places. She also recommends the Coal Creek dredge for nomination. Of course, the property owner's permission is required in this process. The Coal Creek mining camp is recommended for preservation by Grauman. It may possibly be used to interpret the evolution of placer mining in the area. The Boulder Creek mine needs to be documented and evaluated, as do the middle Coal Creek cabins. The latter were observed during the summer of 1981 and had not been previously recorded. The trails and road in the area have no intrinsic historical value at present.
Ben Creek	Upper Ben Creek	Ben Creek mining district Alfred Johnson's cabin Ben Creek trail and the road to the Ben Creek mining district	Grauman recommends that the Ben Creek mining site be nominated to the National Register of Historic Places. The Alfred Johnson cabin needs to be visited, documented, and evaluated. The various roads or trails in the area have no intrinsic historical value at present.
Sam Creek	Sam Creek	Arthur "Cap" Reynolds cabin	Grauman recommends protection of this site and states that it "might qualify" for the National Register of Historic Places.

*After Grauman, 1977, unless otherwise noted

Table 4

Known Historic Sites In the Vicinity of Mining Claims

Yukon-Charley Rivers National Preserve

Drainage	Area of Consideration	Historic Sites Present*	Notes
Coal Creek and tributaries	A) Lower Coal Creek from approximately Sec 24, T6N, R22E, to the Yukon River B) Middle Coal Creek from approximately Sec 25, to the confluence of Colorado Creek (including tributaries)	Slaven cabin Coal Creek dredge Coal Creek mining camp Middle Coal Creek cabins Boulder Creek mine Road to Ben Creek mining district, Ben Creek trail, and Coal Creek-Woodchopper Creek road	Grauman believes that the Slaven cabin "might qualify" for the National Register of Historic Places. She also recommends the Coal Creek dredge for nomination. Of course, the property owner's permission is required in this process. The Coal Creek mining camp is recommended for preservation by Grauman. It may possibly be used to interpret the evolution of placer mining in the area. The Boulder Creek mine needs to be documented and evaluated, as do the middle Coal Creek cabins. The latter were observed during the summer of 1981 and had not been previously recorded. The trails and road in the area have no intrinsic historical value at present.
	C) Upper Coal Creek and tributaries including Colorado, Patterson, Crossley, and Discovery Creeks	Colorado Creek mine Upper Coal Creek cabins	Grauman recommends that the Colorado Creek mine be visited and documented; preservation recommendations can then be made. The same treatment is necessary for the upper Coal Creek cabins. One Coal Creek cabin and a "lean-to" structure are located at the confluence of Coal and Patterson creeks, while the other cabins are located along upper Coal Creek in both Sec 1 and the NW 1/4 of Sec 21, T4N, R21E.
Woodchopper Creek and tributaries	A) Lower Woodchopper Creek from approximately the SE 1/4 of Sec 26, T6N, R21E, to the Yukon River	No known sites	
	B) Middle Woodchopper Creek from Moose Creek to Caribou Creek	Woodchopper dredge Mineral Creek mouth cabins Mineral Creek cabins Iron Creek mining camp Woodchopper Creek mining camp	Grauman encourages that the Woodchopper Creek mining camp be nominated to the National Register of Historic Places--with the owner's permission, of course. The Woodchopper dredge and Mineral Creek cabins are recommended by her for preservation and possibly interpretation. The Iron Creek camp needs to be visited, documented, and evaluated. No specific historic preservation treatment was recommended for the Mineral Creek mouth cabins.
	C) Upper Woodchopper Creek including Caribou Creek	No known sites	
Thanksgiving Creek	Thanksgiving Creek mining claim areas	No known sites	
Fourth of July Creek	Fourth of July Creek	Fourth of July Creek mine Fourth of July Creek road	Grauman recommends preservation of the mining camp as well as nomination to the National Register of Historic Places. No specific historic preservation recommendations were made for the Fourth of July Creek road although she notes that the road has some historical value.
Ben Creek	Upper Ben Creek	Ben Creek mining district Alfred Johnson's cabin Ben Creek trail and the road to the Ben Creek mining district	Grauman recommends that the Ben Creek mining site be nominated to the National Register of Historic Places. The Alfred Johnson cabin needs to be visited, documented, and evaluated. The various roads or trails in the area have no intrinsic historical value at present.
Sam Creek	Sam Creek	Arthur "Cap" Reynolds cabin	Grauman recommends protection of this site and states that it "might qualify" for the National Register of Historic Places.

Certain lands near Washington Creek that contain low-grade deposits of coal are currently selections of Doyon, Ltd. (Mine Access and Land Status map). If conveyed, they can be developed as private land. Significant historical values related to mining and trapping activities may be found in the upper Seventymile River portion of the selections, although remains associated with these activities probably can also be found on secondary drainages feeding both the Seventymile River and Washington Creek. As opportunities are presented, historic site reconnaissances should be undertaken in these areas.

In addition, certain lands of the Kandik and Nation River drainages have been selected by Doyon and conveyed to them; they have oil and gas potential. Old trapping trails and line cabins have been identified on these lands (Grauman 1977). Of historical note are the traplines and cabins of Christopher "Phonograph" Nelson (Grauman 1977). It is conceivable that other historic sites and structures related to trapping activities and perhaps even mining exist in the area.

Archeology

Yukon-Charley Rivers National Preserve has high potential for containing significant prehistoric and historic archeological resources and Quaternary period paleontological resources (Bowers and Hoch 1978, Knoll 1975, Hall 1976, ANILCA).

Limited archeological studies have been undertaken within the preserve (West 1965, Hall 1976, Bowers and Hoch 1978). Apparently West or his students did a literature review for much of the area encompassed by the Yukon River corridor within the preserve (Hall 1976, Anon. n.d.) and in the early 1960s conducted a boat-based survey of the river upstream to the Nation River, including a short trip up the Charley River (West 1965, Bowers and Hoch 1978). A brief boat-based reconnaissance along the lower Charley River and sections of the Yukon River was carried out by Hall and Stern during July 1974 (Hall 1976).

No prehistoric sites were found by either West or Hall and Stern during their surveys, although Hall and Stern did identify some relatively recent cabins along the lower Charley River. The search for remains of "Charlie's Village," an Athapaskan site reported to be near the mouth of the Kandik River, was also unsuccessful (Hall 1976).

A survey was conducted in 1976 by Bowers and Hoch along Copper Creek, a tributary to the Charley River (Bowers and Hoch 1978). This survey was more intensive than any of the previous efforts and resulted in the identification of a number of prehistoric lithic sites.

NPS work in the Copper Creek drainage in 1981 resulted in the identification of additional sites in the area. Bowers and Hoch (1978) have commented that the Yukon-Tanana uplands, part of which are included in the Yukon-Charley preserve, may have had a "substantial human occupation." They suggest that this utilization is "probably as old as 11,000 years, and may possibly be as old as 30,000 years." Their report is the foremost literature review and summary of Yukon-Charley region prehistory. As surveys are conducted in other areas of the preserve, additional significant prehistoric remains will probably be found.

More recent archeological sites related to prehistoric Athapaskan use of the area probably exist. These may be as many as 2,500 years old (Cook and McKennan 1968, Cook 1970, 1975). Reports by Osgood (1971), Andrews (1977), and Hall (1976) contain information about the Han, the Athapaskan Indian group that inhabitated the Yukon-Charley area at contact.

Many of the cabin and camp remains associated with early mining, trading, and trapping activities also constitute valuable historical archeological resources containing important information about the behaviors and practices of the Yukon pioneers who built and used them.

Because no full archeological surveys have been done of the claims or any of the upland areas and drainages away from the Yukon River, the presence or absence of archeological sites near mining claims is unknown. However, estimates of the site potential in each drainage containing mining claims within the preserve are included in table 5. The estimates are based upon an evolving generalized site-locational design for interior Alaska being developed by the NPS archeological staff from available literature. Again, field investigations of site potential have been minimal or nonexistent.

As can be seen from table 5, the areas most likely to contain prehistoric archeological sites are the lower sections of major tributaries that drain into the Yukon River. The area around a stream mouth or where a stream enters the Yukon River has high potential, as does the area near secondary stream confluences upstream from the mouth. Site potentials are estimated to be low in other sections of a drainage, especially within the active floodplain, except for stream confluence areas and distinctive stream terraces, hill benches, or points of ridges outside the active floodplain but commanding an exceptional view of the drainage valley.

The middle sections of both Coal and Woodchopper creeks are unlikely to contain prehistoric archeological sites because they have been extensively disturbed by mining activities since the turn of the century. Nevertheless, significant sites can occur in any of the drainages or sections of drainages identified as having a projected low site potential.

Estimates of site potential are useful because they establish priorities for the survey of areas and form a basis for testing site location hypotheses.

Two additional geographical locations that have high resource extraction potential must be assessed for conflicts with prehistoric resources.

Doyon has land selections with mineral potential near Washington Creek and in the upper Seventymile River drainage. Overall, the prehistoric site potential for these areas is low. However, the upper reaches of the Seventymile River may contain significant upland hunting sites, including lookouts, caribou fences, and kill sites. A factor supporting the estimate of a relatively high prehistoric site potential for this area is the

Table 5

Estimated Archeological Site Potential of Mining Claim Areas

Yukon-Charley Rivers National Preserve

rainage	Area of Consideration	Site Potential	Archeological Notes
oal Creek and ibutaries	A) Lower Coal Creek from approximately Sec 24, T6N, R22E, to the Yukon River	Medium to High	
	B) Middle Coal Creek from approximately Sec 25, T6N, R22E, to the confluence of Colorado Creek	Low	In common sense terms, potential is particularly low in areas of previous mining activities. However, the confluence area of Coal and Colorado creeks is expected to have medium potential.
	C) Upper Coal Creek including Patterson, Crossley, and Discovery creeks	Low	There is a possibility that upland hunting sites of the historic and prehistoric periods occur in these areas.
odchopper eek and ibutaries	A) Lower Woodchopper Creek from approximately the SE 1/4 of Sec 26, T6N, R21E, to the Yukon River	Medium to High	
	Middle Woodchopper from Moose Creek to Caribou Creek	Low	
	C) Upper Woodchopper Creek, including Caribou Creek	Low	The area around the confluence of Woodchopper and Caribou creeks holds medium potential. Upland hunting sites likely occur, though sporadically, at select locations, along both of these creeks.
anksgiving eek	Thanksgiving Creek mining claims	Low	Areas with at least medium potential include stream terraces and hill benches in the vicinity of sections 13 and 14, T6N, R19E, and, in particular, the area around the confluence of the two main headwater drainages of the creek.
urth of July eek	Fourth of July Creek	Low	There is some potential for upland hunting sites along the points of select hillslopes in the general area.
n Creek and m Creek	Ben Creek and Sam Creek	Low	The area of the confluence of Ben and Sam creeks has an expected medium potential. There is some potential for upland hunting sites along the points of select hillslopes in the general area of the creeks, but these places are apparently located outside of the mining claims proper.

occurrence of significant archeological sites in the vicinity of Copper Creek, a short distance to the south. Also, some terrain to the west of Washington Creek and east of Fisher Creek may contain upland hunting sites. As possible, site reconnaissances should be undertaken in these areas.

In addition, there is a good likelihood that significant prehistoric sites exist on the Doyon lands in the Kandik and Nation rivers drainages. This is based primarily upon the nature and qualities of the Kandik and Nation river basins, accessory drainages, and associated landforms. Further evaluation may be necessary in connection with any land exchanges that might be worked out with Doyon.

Other Cultural Resource Considerations

No Native allotments, homesteads, homesites, or cemetery/historical sites are recorded for the Thanksgiving, Woodchopper, Coal, Sam, Ben, or Fourth of July creek drainages, and thus no direct land use conflicts exist in this regard. However, there are Native allotments, cemetery/historical sites, and homesteads along the Yukon near the mouths of the Charley, Kandik, and Nation rivers and Fourth of July Creek, among others. Mining operations accessing interior claims via these drainages should not make camps or staging areas in the lower reaches of these streams to avoid inadvertent disturbance to private property on lands in these areas. Use of existing roads to access claims is recommended. In addition, the other historical sites in these areas should be treated similarly.

Sam, Ben, Coal, and Woodchopper creeks have had active traplines in the past (Caulfield 1979), and evidence of recent trapping was found on Ben and Fourth of July creeks during 1981. There are no apparent land use conflicts between mining and trapping activities, as mining is usually done during the summer months while trapping is a fall/winter activity.

Historically, miners often resorted to trapping in the winter to supplement their income and provide funds for acquiring supplies to support the next season's mining activities (Grauman 1977). The compatibility of these activities should continue as long as large areas of animal habitat for species are not destroyed and fur-bearer populations are not reduced to unacceptable levels.

ENVIRONMENTAL EFFECTS OF MINING

HYDROLOGY/WATER QUALITY

Placer-mining activities within the five watersheds in the preserve create a variety of impacts on the hydrologic environment, including sedimentation, stream flow and channel modification, decreased oxygen content, increased dissolved solids, and increased water temperature.

By far, the most significant hydrologic impact of placer mining is the introduction of heavy loads of sediment into clear-running streams of the affected drainages. Sediments are introduced into the drainages by two mechanisms.

The first is the process of washing placer gravels to separate the gold by settling. The fines in the gravel remain in suspension in the effluent water, and if discharged directly back into the drainage 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 pitch, a stream junction, or the inside of a bend, the heaviest particles settle, coating 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 will continue to move fine sediment from the bottom deposits during high water flows. This process continues to damage 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 Hills 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, and placer-mining techniques used. Hydraulic stripping of overburden produces much more stream sediment than mechanical removal. Use of holding ponds substantially reduces sediment loads and permits recycling of water for gravel washing.

The five major streams in the preserve that are or may be subjected to placer mining are all clear-flowing in a natural, undisturbed state. However, because they are all tributary to the highly turbid Yukon River, the effects of sediments and turbidity cease to be a major factor once the streams empty into the Yukon. The longest stream distance that could be affected by mining in the preserve is along Coal Creek, which contains placer claims (presently undisturbed) 21.1 miles upstream from its confluence with the Yukon. Woodchopper Creek contains undisturbed placer claims 15.5 miles upstream from the Yukon.

Another consequence of introducing suspended solids in water is 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 (Alaska Department of Environmental Conservation 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. Natural, nonglaciated streams in Alaska with "crystal-clear" water can be expected to have NTU values of 25 or less, with clearest water having the lowest values. Field samples taken during the summer of 1981 from Thanksgiving, Coal, and Ben creek drainages ranged from 136 to 242 NTUs in localities with no mine-related disturbance. This represents a low to moderate level of natural turbidity, probably due mostly to organic substances. Light sediment loads could have been present from old disturbances in the vicinity of all three sample sites. Industrially caused turbidity in natural freshwaters of Alaska cannot legally exceed 25 NTU above background level.

Low turbidity is important for the well-being of aquatic life. Increases in turbidity adversely impact 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 impacts 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-flowing water upstream from all past or present mining activity. Turbid water was observed downstream from all current mining operations, but the extent of turbidity is unknown. Mining activity was limited to three locations during the summer of 1981. At Thanksgiving Creek, two men were operating a small portable suction dredge to determine the depth of gold-bearing zones. Operation of the dredge was introducing small amounts of sediment into the stream, but the water had regained its clarity one-half mile downstream.

The most extensive mining operation was along the lower portion of the Coal Creek drainage. Overburden was being mechanically cleared by bulldozing and sluicing water was directed into temporary holding ponds. From there, the process water flowed back into Coal Creek. Although water in the immedate vicinity of the operation was turbid, water 1 mile downstream was notably clearer.

Evidence of active mining was noted along the midportion of Woodchopper Creek near the airstrip. Areas of freshly cleared overburden and turbid water were observed from high flying aircraft. Ground observation of Woodchopper Creek was not possible, however the nature of the operation and the environment are quite similar to that at Coal Creek, which was examined on the ground.

Modification of stream flow 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 will 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.

Stream flow 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 described above.

If sluicing techniques using automatic dams are used, impacts on stream flow and channel configuration become even more significant because of the oscillatory flow patterns introduced by the repeated collection and rapid release of water. Collection of water reduces or eliminates flow, affecting aquatic life that has developed under conditions of normal seasonal water 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 east-central portion of Alaska are normally very high in dissolved oxygen, which is essential to fish and other aerobic organisms in the aquatic environment. Oxygen concentrations measured during the summer of 1975 at ten locations in the Charley River watershed and at Sam Creek were either at or slightly above 100 percent saturation (Young 1976). If large amounts of organic materials are introduced into the drainage system of a watershed during the process of placer mining, dissolved oxygen concentrations can decrease to low values. An increase in water temperatures, which can also occur as result of placer mining, will increase the demand rate of organics on available oxygen. Since organic materials are common in the overburden of all five 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 east-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 (U.S.Department of Interior, Geological Survey 1980). Although some water chemistry changes are likely, they are far overshadowed by the physical effects of increased suspended sediment and turbidity.

Another impact of placer mining is the change of water temperature resulting from various mining practices. Hydraulic stripping of overburden may decrease or increase downstream water temperatures, depending on whether the overburden is frozen or unfrozen (Alaska Department of Environmental Conservation 1979). In the five affected drainages, overburden may or may not be frozen. Flood plain 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 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, will result in increased water temperatures (U.S. Department of the Interior, Fish and Wildlife Service 1980b). Use of holding ponds also results in greater water temperatures through stratification and release of warmer, upper water layers. Changes of water temperature are of concern because of the effect 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 to the Yukon River. Coarser mining materials are left at the mining site and stacked in waste piles. Piles 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 preserve does not have any significant effect on consolidated rock materials.

Soils are impacted 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 Coal and Woodchopper creeks 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, can undermine upslope soils in some areas, causing slumping, soil creep, or other types of mass wasting. These types of soil disturbances can greatly increase the total area disturbed by mining activity.

Continuous permafrost can be expected under the benches and low slopes of all five watersheds containing placer claims and is likely to occur under some sections of 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. Where access roads are constructed, the problem is exacerbated where wheel ruts lose their load-bearing ability. These muddy areas must often be circumvented by vehicles, further compounding the impact by spreading the disturbance over a wider area.

Another impact on soils is compaction, which can occur anywhere that machinery is used or permanent or temporary camps are set up. Compaction of soil 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.

VEGETATION

Surface Vegetation

Placer mining requires removal of surface vegetation from the area to be mined and from land required for related activities. Where new ground is disturbed, this results in the temporary loss of vegetative cover.

The 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 can result in further deterioration of mined sites even after operations have ceased, retarding the process of recovery. Clearing vegetation is necessary for access roads, airstrips, mine camps, storage facilities, and at times, equipment staging.

Table 6 summarizes the estimated acreage which has been used for various mining purposes in the Yukon-Charley area. About 824 acres have been disturbed by these activities during the last few decades, relatively insignificant in comparison to the size of the preserve. Additional, older mine disturbances in the Coal Creek and Woodchopper Creek drainages are now obscured by vegetative regrowth. Most such areas were originally disturbed by mining methods more primitive and less disruptive to land adjoining creeks than the methods used today.

Table 6

Lands Disturbed by Mine-Related Activities

Yukon-Charley Rivers National Preserve

	Acreage Disturbed
Access to the District[1]	
Winter road: West boundary--Woodchopper Creek	28.5
State road: Woodchopper to Coal creeks	16.3
Total disturbed area	44.8
Woodchopper Creek	
Main access road:[1] Yukon River - camp	7.4
Trails[2] Woodchopper valley	8.3
Penstock[2]	4.2
Dome Creek trail	4.1
Camp	11.0
Mine waste and workings, Woodchopper valley	206.6
Mineral Creek	4.3
Total disturbed area	245.9
Coal Creek	
Main access road:[1] Yukon River - camp	4.6
Trails:[2] Coal Creek valley	13.8
Penstock	1.7
Boulder Creek trail[2]	2.6
Trail: Lower Coal to Ben Creek[2]	7.9
Camp	10.0
Mine waste and workings	413.0
Total disturbed area	453.6

<u>Ben Creek</u>	
Trails	3.9
Camp	2.0
Mine waste and workings	4.0
Total disturbed area	9.9
<u>Thanksgiving Creek</u>	
Camp	1.0
<u>Fourth of July Creek</u>	
Main access road:[4] Yukon River - camp	12.9
Camp	2.0
Mine waste and workings	54.0
Total disturbed area	68.9
<u>Totals for the District</u>	
Mine waste and workings	682.0
Major access roads	69.7
Trails	40.6
Camps	26.0
Penstocks	5.9
Total disturbed area	824.0

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1. These major roads are given a 15-foot width, which includes a 15 percent factor for cut-and-fill or peripheral disturbance.
2. Assume an 8-foot width.
3. Plane surface disturbances were planimetered on aerial photos and/or maps.
4. Assume a 10-foot width.

The entire area within some of the claims in Woodchopper, Coal, and Fourth of July creeks has been disturbed by past mining; this suggests that the potential surface disturbance from future mining can include all 9,458 acres within existing mining claims (8,400 of this would be new disturbance, or a 900 percent increase over the present level) and perhaps additional land for roads. The loss of vegetation on that much land could have significant long-term adverse effects on the drainages involved, especially if mined areas were left covered with unreclaimed waste.

Clearing of vegetation on claims has the greatest effect on bottomland spruce-poplar forests that line the creeks. If all of the claimed land is mined, this type of forest will be virtually eliminated, at least temporarily, along the main stems of Woodchopper and Coal creeks. This is because the claims extend above the altitudinal growth limit of these riparian stands. The bottomland forest grows on coarse alluvium that typically lines streams where permafrost is absent or begins at depth. Mining the alluvium does not necessarily change its physical character greatly, and if adequately reclaimed, bottomland forests will readily regenerate on the same sites after a period of time. If not reclaimed, the abandoned mines can remain too unstable for forest growth and may support only shrubs and herbaceous species characteristic of disturbed lands. Because the poplar and aspen component of the bottomland forest reestablishes more rapidly than conifers after disturbance, one of the more obvious effects of disturbance will be 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 convenient. These facilities have their greatest effect on open upland spruce-hardwood stands or 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 can 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. 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 the establishment of opportunistic herbs and shrub or tree seedlings. 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 penstocks lined with shrubs--chiefly willow, alder, and hardwood saplings--illustrate these vegetation shifts. In valley bottoms with claims, the result of past disturbance has been to increase the area dominated by shrubs and deciduous trees. The effect of future mining would be much the same.

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 post-fire succession, but takes much longer to complete following mining or other activities that disrupt the soil. Mining and the abandonment of unreclaimed spoils poses a significant risk of permanent loss of the capability of the disturbed tract to support the original vegetation type. This can occur after permanent damage to the soil caused by separation of silt from gravel during placer washing, erosion of slopes, and abandonment of coarse spoils in mounds on the surface. In all three cases, the rooting medium for plants is eliminated or reduced and recovery requires extremely long time periods.

Secondary, or indirect, impacts of mining on vegetation result from erosion, thawing of permafrost, drainage alteration, or fire and 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. Spruce budworm may pupate in downed trees, which have been known to foster infestations. Concentrations of dried, dead vegetation are fire hazards, especially where human activity is prevalent nearby.

Land selections by Doyon, Ltd. west of Washington Creek can conceivably lead to the mining of coal seams in the future. It would most likely be surface mining and result in the removal of great quantities of soil and rock overburden. A heavy-duty haul road would also be required. The impacts of such an operation on vegetation would obviously be great, but few specific conclusions can be reached on the basis of conjecture. It does appear, however, that the area's vegetation (shrub tundra) is not unusual for the preserve in terms of the plant communities present.

Doyon land holdings north of the Yukon may have some speculative value as potential oil and gas basins. If exploration ever takes place, impacts on vegetation would result from new roads and drilling pads. Such operations would disturb limited surface area, but could lead to other development on private land in that part of the preserve.

Endangered Plant Species

Placer mining is unlikely to affect any of the proposed rare, threatened, or endangered plants noted in the preserve because all but one seem to inhabit environments not found in the claims. *Castilleja annua*, whose taxonomic status is doubtful, can occur on bars, roadsides, or other open sites in the creek basins with claims, but the plant occurs on disturbed areas and mining would not destroy its habitat, even locally. *Montia bostockii* can occur on high elevation wet sites and near springs in creek basins. This plant might be encountered near upper-elevation claims and their access roads, but the chance that a significant population would be harmed is remote.

WILDLIFE

The mining season in Alaska coincides with the period of greatest biological productivity in streams--from ice break up in the spring to winter freeze-over. Thus placer-mining activites can adversely affect the reproduction, growth, and survival of aquatic species.

The environmental requirements for whitefish, salmon, and grayling include clear, cool, well-oxygenated water and a stable, permeable stream substrate. Sedimentation of streambeds can cause fish egg mortality as silt particles become attached to the eggs and clog spaces between the gravel substrate. Specifically, silt particles impede 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 (U.S. Environmental Protection Agency 1976). Laboratory tests with coho and chum salmon eggs indicate that reduced or less-than-optimal oxygen concentrations can cause egg mortality or result in smaller and weaker fry having reduced chances of survival. Lowered oxygen levels during the early stages of development may delay hatching or result in deformities. In the latter stages of development, lowered availability of oxygen can induce premature hatching. Siltation of spawning beds after hatching can also affect emergence of fry by trapping them in the gravel (U.S. Department of Agriculture, Forest Service 1979).

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

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

The hydraulic removal of overburden can be particularly disruptive because it drastically increases sediment loads and turbidity levels downstream. Mechanically stripped and stored overburden can erode and cause stream sedimentation. Frozen overburden, which thaws during stripping, can also result in downstream sedimentation. The division and impoundment of large volumes of water destroys aquatic habitat at the water source, at least temporarily.

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

Stream flow regimes resulting from placer operations are unreliable; irregular fluctuations in stream flow can adversely affect the survival of fish and organisms that live in the streambed. Booming dams and sluicing operations can also act as barriers to fish spawning or feeding activities. Placer operations frequently use the entire stream flow volume for mine process waters, causing a section of stream to be completely dry.

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

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

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

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

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

The region's clear-running nonglacial streams are naturally exposed to sedimentation during the spring thaw and periods of heavy rains. Because of this, it has been alleged that sedimentation and turbidity resulting from mining operations have little adverse effect on fish. However, during natural episodes of high runoff and at spring break up most of this material is discharged from the system within a short time. Therefore, the impacts of naturally caused stream sedimentation are relatively minor compared to sedimentation resulting from mining operations; a stream may receive high sediment loads daily during the entire mining season, allowing for accumulation of sediments in the streambed and causing frequent, persistent levels of high turbidity. At Yukon-Charley, additional research is needed to determine how long it takes for natural rehabilitation from sedimentation resulting from mining activites and whether biological productivity can return to preimpact levels.

In the study area, the aquatic habitat has been considerably altered on much of Woodchopper and Coal creeks as well as on portions of Fourth of July and Ben creeks. It was observed that care was taken to provide for grayling passage on Coal Creek by allowing a portion of the stream to remain free-flowing. Although time did not permit sampling in any of the streams, grayling were reported in Coal Creek above Colorado Creek, which is 7 miles upstream from the Yukon and is currently the farthest upstream location of recent mining activity. Most placer claims in the preserve are now being worked only in the lower reaches of the drainages involved, with the upper portions of the watersheds undeveloped. However, as the upstream claims are worked, turbidity can be expected to increase over much greater lengths along the affected streams, resulting in greater overall stream-related impacts. Upon reaching the Yukon, no further impacts would be expected since the Yukon is already a highly turbid waterway during the summer months when placer mining takes place.

Impacts of placer mining on terrestrial species are associated with the removal of overburden, construction and use of access roads, the use of generators and heavy earth-moving equipment, and the presence of humans.

Overburden removal and heavy machinery at least temporarily destroy wildlife habitat; for example, the destruction of riparian vegetation can reduce available willow ptarmigan breeding habitat. Wildlife habitat disturbances also 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. Because of their position in the food chain, a decrease in the abundance of small mammals adversely affects higher order predators.

The construction of airstrips and access roads to mining claims adversely affects wildlife habitat by destroying lichens and other vegetation, thus reducing available winter food sources for caribou. Caribou sign has been observed on upper Coal Creek, and caribou are known to migrate through the claim areas.

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 caribou, moose do not depend upon climax vegetation for survival and can thrive on plants that revegetate sites disturbed by man (Alaska Department of Fish and Game 1973).

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

It is not likely that future placer-mining operations will interfere with the flight paths of migratory birds. It is also unlikely that mining operations will have significant adverse impacts on waterfowl nesting, because a majority of this activity occurs primarily on the Yukon and in the lakes, ponds, and lowland areas of the preserve.

No direct threats to endangered or threatened animal species are likely to result from current or anticipated mining activities. The known nesting sites for the peregrine falcon in Yukon-Charley are not near the claim groups and it is doubtful that they would be impacted by any mining activity. The Yukon River nesting sites near the mouths of creeks with mining claims are active in at least some years (not all nesting sites are active every year) and the birds have apparently coexisted with mining for many years. The mining operations are 5 to 10 miles from nesting sites, which are screened by intervening ridges and hills.

Under present conditions the only mining-related activities which have the potential for disturbing peregrines are river traffic and low-flying aircraft associated with the operations. Normal traffic appears to have no effect on the birds, but it is possible that deliberate harassment or regular aircraft flights near a nest (neither of which is occurring now) would cause breeding failures. This might occur if a pair was caused to abandon a nest, or if startled adults accidentally kicked eggs or young out of the nest.

Any future mineral developments directly affecting the Yukon River corridor would have to be evaluated for their potential effect on peregrines at the time they are proposed. For example, if mining clams at the mouths of Woodchopper and Coal creeks are mined, any falcons nesting within sight and sound of the operations could be affected.

AIR QUALITY

Placer mining has very 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 preserve. The mining would not cause any legal standards for air pollutants to be exceeded.

RECREATION AND AESTHETIC QUALITIES

Mining activities generally impair the quality of scenic views and vistas, diminish wilderness values, and disrupt opportunities for solitude. Surface disturbances associated with mining and destruction of vegetation adversely affect the area's natural setting and diminish appreciation of the area by recreationists.

The noise of earth-moving machinery, drills, generators, pumps, and other heavy equipment disrupts solitude and the appreciation of being in a natural environment. Noise also diminshes opportunities for viewing wildlife which tends to avoid areas where operations are ongoing.

Access roads impact aesthetic qualities, solitude, and opportunities for enjoying wildlife. Abandoned, revegetated access roads support vegetation different from their surroundings and are visually intrusive. Highly turbid streams diminish opportunties for sport fishing. For example, grayling are sight feeders and will not bite in turbid streams. In some cases, however, the changes in vegetation are of benefit to wildlife.

General recreation use in both the Woodchopper Creek and Coal Creek drainages is discouraged by the mining owners/operators. Mining operations could attract inquisitive recreationsists and pose a nuisance to individuals conducting operations as well as a safety hazard.

CULTURAL RESOURCES

Placer-mining operations and supporting activities such as road building and development of staging areas, settling ponds, airfields, etc., are ground-disturbing in nature. Some are of such magnitude that they would pose an immediate threat to any prehistoric or historic site in the area of the mining claim and sometimes to sites located in areas outside the claim. Placer-mining operations in active stream channels probably would not encounter archeological sites significant for this region. However, stream terraces, stream banks, stream confluences, knolls, points of hills, hill benches and other landform features near stream channels, all of which have a higher potential for the presence of archeological sites, could be impacted. Prehistoric sites (game lookouts, kill sites, etc.) and historic sites or materials are likely to be found in association with these landforms.

Activities such as bulldozing, backhoe excavations, and blasting are the most obvious and immediate causes of potential site destruction or disturbance, as can be seen from table 7. There are varying degrees of impact. Any activity that alters the spatial relationship of surface artifacts or the "setting" of the artifacts in the ground (site context) effectively destroys a site's interpretive value. Road building, in particular, can lead to impacts. These may occur in two ways: Building a mining access route can destroy a site outright during construction and may also provide access to the vicinity of cultural sites, increasing the chances that artifacts might be collected illegally.

Destruction of the vegetative cover (which can lead to severe site erosion by wind, water, permafrost thaw, etc.) and the contamination of organic remains through chemical or petroleum spills (possibly ruining the opportunity to use radiocarbon dating methods or other types of analysis) are other sources of site disturbance.

Table 7

Potential Impacts of Mining on Cultural Resources

Yukon-Charley Rivers National Preserve

Source	Impact
Mining Excavation (overburden removal, drilling, blasting, etc.) Roads Material source borrow areas Water diversion channels Staging areas Camps	Obliteration of all or part of 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 the discovery, disturbance, and looting of sites
Emergency environmental clean-up procedures due to flooding, oil spills, etc.	Chemical contamination of artifacts or other materials making them useless for radiocarbon determinations
Termination procedures (stabilization-reclamation activities, revegetation, contouring, etc., or lack thereof)	If undisturbed areas of ground are involved, the effects listed under construction apply

Note: A positive result of development is that it may lead to the increased discovery and scientific consideration of sites, through both application of archeologic procedures for site identification and as a result of mining activity. It is imperative, in the latter case, that sites be reported by operators as soon as they are discovered.

*Adapted from table 4, p. 48, U.S. Dept. of Interior, U.S. Geological Survey, 1979.

MITIGATING MEASURES AND RECOMMENDATIONS

All proposed mining plans of operations in Yukon-Charley must comply with applicable federal and state legal requirements before they are approved. Adherence to the standards and requirements will mitigate many of the general impacts of mining. Appendix D lists the permits required to begin a mine operation in Alaska.

All claims should have clearly marked corners, which define claim limits and minimize unnecessary inadvertent disturbances outside the claims.

HYDROLOGY/WATER QUALITY

Settling ponds or other adequate measures, such as filtration systems, should be used to treat all wastewater from placer-mining operations.

Settling ponds should be designed to hold water long enough to bring it to 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 (FWPCA), as amended (33 USC, S. 1251) require either settling ponds large enough to contain the maximum process water used during any one day's operation or other treatment of process wastes such 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 (appendix D) for the operation of a placer mine. This permit may carry similar 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. In a given pond, the outlet 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 due to limiting physical factors, a baffle should separate the two to ensure adequate water circulation in the pond. Pond length should normally be twice its width to provide adequate 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 make a very 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 land surface that might be disturbed for their construction. This could occur if part of a claim was not disturbed for mining but the undisturbed area was needed for the pond. Although this would create additional impacts on aesthetics and vegetation in the valley being mined, it must be considered a trade-off for the benefit of maintaining high water quality downstream. In any event, 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.

Another possible drawback, although probably a minor one, is the increase in water temperature that will result from the retention and stratification of impounded water. The amount of warmer water discharged to the environment would be quite small if a recycling, closed system was used.

The construction and use of settling ponds may significantly increase the cost of mining in some situations, with the risk of making marginal operations unprofitable.

At Coal Creek, the largest placer-mining operation in the preserve, gravel washing is estimated to require 4,000 gallons of water per minute. If the sluice is operated for two consecutive eight-hour shifts per day, 3,840,000 gallons of effluent water would be generated. This volume of water occupies 513,408 cubic feet. Allowing for 100 percent additional volume to handle accumulated silt volume and flood waters, a single pond 230 feet wide, 450 feet long, and 10 feet deep would be required to handle the effluent of 16 hours of sluicing. Two ponds in series, each 160 feet wide, 320 feet long, and 10 feet deep, will handle the same water volume and will remove sediments more effectively. If total sluicing time is eight hours per day, which probably is a more realistic estimate of mining time, the total volume of process water would be 256,704 cubic feet. This amount of effluent will require a single pond 160 feet wide, 320 feet long, and 10 feet deep, using the same assumption of 100 percent extra volume. If two ponds are constructed in series, each would have to be 113 feet wide, 226 feet long, and 10 feet deep. This clearly illustrates the difficulty of using settling ponds where drainages are small or stream channels are narrow.

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 contaminated water reaching streams. Another technique that lowers sluicing water requirements is to remove 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 has been suggested as a means of saving even more water and increasing the speed at which the sediments settle out. Application of this technique must be evaluated on a case-by-case 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 is construction of a multiple sequence of dams or berms. Dams or berms are constructed of tailings, which should have a 3:1 slope on the impoundment side. Effluent water is then filtered as it seeps through the dam, with each successive dam removing progressively more sediment. The amount of filtration that can be accomplished by this method depends on the number of dams, the 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 effects of seasonal frost and permafrost. Dams should be breached at the end of the summer to prevent freezing damage to the dam 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 (Alaska Department of Environmental Conservation 1979).

Another method of filtration is simply to direct mining wastewater into piles of mining waste rock. Success of sediment removal by this method is difficult to predict. In some instances, it has proved to be highly effective. In other situations it is not able to remove enough sediment to meet FWPCA standards. The variability of results from filtration through tailings piles is due, at least in part, to both the size and sorting of the gravel used and to the difficulty of predicting the pathway of water flow once it is discharged into the tailings. The longer the effluent flows through the tailings, the greater the filtration effect. Conversely, the rapid return of effluent water through the tailings to a stream channel will likely result in continued transport of appreciable quantities of suspended sediment. In general, use of filtration techniques is not as dependable a method for removing suspended sediments and requires that effluent be monitored on a monthly basis to meet FWPCA provisions in 33 USC, S. 1251.

Where placer mining occurs, modification of stream morphology and flow characteristics cannot be avoided or entirely mitigated. However, the impact of changes in channel alteration and flow can be ameliorated by certain practices. Sluicing or dredging can be done on one side or the other of where the main stream is flowing or has been channeled to reduce unnecessary turbidity in water not directly used for processing. However, where valley bottoms are narrow and/or steep topography exists, working to one side of the stream may become difficult or impossible. This situation exists along many of the tributary drainages of Coal and Woodchopper creeks, where streams have cut narrow, V-shaped valleys with little or no stream floodplain. In such cases, clean water not used for processing can sometimes be channeled or piped around the operation.

If impoundments are used to collect water for washing gravels, care should be taken to maintain a flow rate in the active stream channel that is sufficient to assure survival of downstream fisheries and other aquatic life. If downstream flow is completely cut off, even for a short time, damage to downstream life can be significant. Maintaining stream flow 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 enables miners to maintain higher stream flows, especially in low water years.

Bursts of high water flows also should be avoided as much as possible to minimize the transport of suspended sediment, scouring of stream channels, and bank erosion. Settling ponds are most effective for regulating bursts of process water, but filtration systems are also likely to reduce a sudden increase in downstream discharge.

To minimize the long-term impacts of channel modification, mining waste should be recontoured upon completion of mining, after which flow characteristics would be restored to a more natural regimen.

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 gather runoff. Water draining 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 stock piles would also be detrimental.

GEOLOGY/SOILS

To facilitate the process of reestablishing soils on mining sites, topsoil should be conserved and stockpiled. Fine sand and silt should also be prevented from leaving the mining site so they can be remixed with coarse material to provide a soil medium during recontouring. This can be accomplished by construction of settling ponds which capture the water/silt mixture resulting from processing of the placer gravels.

When an area is to be cleared or scraped, stockpiling of topsoil would provide a soil resource for later reclamation.

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. Redistribution of stockpiled topsoil over the recontoured area would restore an initial soil base on the abandoned mine areas. Proper reclamation permits the areas to stabilize and hastens natural revegetation.

Problems of instability in soils can be avoided by planning of 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 done on moderate to steep slopes and overburden should not be piled on slopes underlain by permafrost.

If access roads must cross tundra, a gravel pad thick enough to insulate the underlying permafrost can 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. Winter travel requires advance planning by the miners so that needed equipment can be moved into the mining site during the winter preceeding the next anticipated mining season.

VEGETATION

Although nothing can be done to return a placer-mining site to its original natural condition, numerous 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 the Yukon River 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. Adequate reclamation of abandoned mines facilitates natural revegetation, so artificial plantings should not be necessary. Fireweed, grasses, and other pioneer herbs, together with willow seedlings, will begin to stabilize reclaimed areas during the first season following termination of activities. Later, after the establishment of poplar and aspen seedlings, stablization will be more complete and the long process of natural reforestation will be underway.

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

> Disposal of debris from the clearing of new areas to be mined, especially timber slash. This helps minimize unsightly waste and the hazard of fire, insect infestations, or disease.
>
> Reduction of off-road or off-trail travel. There are many areas where vehicles have traveled across tundra parallel to existing roads. This spreads the damage over a wide 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 off-trail travel unnecessary.
>
> Minimization of new road miles. 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; regularly maintaining roads to keep them serviceable.

Winter travel for overland transportation of supplies and equipment.

Survey of plant species in the undisturbed parts of the creek basins with claims. This reduces the possibility that rare species or unusual plant communities (such as those near springs or other anomalies) are inadvertently destroyed.

Comparative study 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 National Park Service to avoid unforeseen problems with reclamation after existing and future mines are abandoned.

Retention of the performance bonds of operators 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.

In some cases it may be desirable to survey mining claims and limit disturbance, except for necessary access, to the claim boundaries.

WILDLIFE

Transporting equipment along established access routes would minimize disruption to wildlife and fish habitat. If a new route is necessary, equipment barged along the Yukon can be left at the mouth of the drainage being accessed and later moved up the drainage to the mining claims during winter when the ground is frozen and potential conflicts with most forms of wildlife are minimized.

This reduces the amounts of sediment discharged into streams and avoids siltation of fish habitat and spawning areas, disruptions to incubating eggs, entrapment of fish fry that have not yet emerged from the gravel, and adverse effects on aquatic invertebrates that are sources of food for fish. Survival of eggs, fry, and aquatic invertebrates is essential in maintaining the viability of native fish populations.

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

When constructed too close to streams, access roads are a source of runoff and sedimentation during floods and heavy rains and should be positioned in locations that avoid unnecessary damage to stream channels. If too close to streams, they can also destroy riparian vegetation that provides browse for moose and breeding habitat for willow ptarmigan, and is a source of food for fish because it provides habitat for terrestrial insects.

Hydraulic operations and booming should be prohibited because they are extremely destructive to fish habitat.

Inlets or water intakes could be screened in areas of high-density fish habitat to avoid the possibility of entrapment of fish.

The use of gravity feeds instead of pumps for makeup water minimizes noise levels emanating from mining operations and can lessen potential disturbance to wildlife. However, if sluicing water is being recycled, the benefits to the aquatic environment from this procedure would usually outweigh the disadvantages of noise generated by pumping equipment.

Berms should be placed around any fuel storage tanks at mining claim camps and staging areas. Holding capacity should be 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. This 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 stream flow so as not to impair downstream aquatic life.

Direct conflicts with endangered animal species are not anticipated on any of the mining claims. Increased river and air traffic along the Yukon corridor because of mining could, however, disturb peregrine falcon nesting on the river bluffs. Close contact with the bluffs should be avoided. If aircraft maintain adequate altitude and watercraft remain in midchannel while passing by falcon nesting sites, then the birds should not be significantly affected. All transportation activities should be conducted in a manner that will not harrass wildlife.

RECREATION AND AESTHETIC QUALITIES

Reclamation, as detailed above, would lessen visual intrusions, restore recreational opportunities, and generally minimize the adverse aesthetic impacts of mining. Settling ponds would maintain the scenic quality of clear-running streams and improve fishery values.

Staging areas for mining operations should be screened from view, particularly where mining claim drainages intersect the Yukon River.

Maintenance of camps and claims in a clean and orderly fashion and cleaning of debris should be encouraged.

To reduce safety hazards to recreationists, fencing, lock-up, or other restraints should be used to discourage access to dangerous equipment, explosive materials, toxic substances, and abandoned workings. Yukon-Charley visitors should be clearly informed of where mining activities are taking place and briefed on the location of land that is off limits to recreation activities.

CULTURAL RESOURCES

Any planned mining activities that might destroy significant historical structures or other cultural resources should be discussed between the mining operator and National Park Service representatives to examine possible alternatives to the proposed action.

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. This gives cultural resources specialists time to evaluate the plan relative to known resource values and conduct any needed field surveys during the summer preceding the planned work. The objective is to allow for the consideration of archeologic and historic values on and near mining claims prior to the start of mining activity so that those sites worthy of protection are identified and preserved, while those sites that are less significant are tapped for the information they contain.

In cases where archeological sites are found in or near a proposed mining area, the site should be avoided if possible. Otherwise, excavation of the site by professional archeologists should be undertaken prior to mining, thereby obtaining whatever cultural information the site may contain.

The mitigation of adverse impacts on archeological sites by excavation to salvage information should not be the first choice, particularly when avoidance of a site remains a viable option. Excavation should be undertaken only when a site is in imminent damger of destruction. Even then, enough time and money should be allowed so that appropriate hypotheses testing and excavation strategies can be designed and carried out. Provisions must be made for the analysis and publication of research results.

General measures that can be taken to protect prehistoric and historic resources include 1) the thorough survey of prospective mining claims, staging areas and road routes to identify sites, 2) the development of programs for the preservation or reasonable adaptive use of the resource as the situation demands, and 3) informing all claimants and operators about the values contained in sites and the legal protections afforded to those values.

More specific recommendations are as follows:

> Archeological surveys need to be undertaken along the lower sections of Woodchopper and Coal creeks, which have the highest overall site potential of all claim group areas considered. Surveys should then be undertaken in other undisturbed areas for which mining plans of operations have been filed, concentrating especially on those landforms where prehistoric sites are most likely to be found, as described in the environmental effects section. Surveys should ideally be done the summer prior to commencement of planned mining activity on a claim. As opportunities arise to do reconnaissance level surveys of drainages in which mining activities are taking place, these should be done.

Where feasible, temporary facilities should be placed in the active floodplains of drainages, where they will have the least expected effect upon archeological sites.

Cabin remains on middle and upper Coal Creek need to be visited, documented, and evaluated, as nothing is now known about these structures. Additional structural remains will probably be discovered in the Coal Creek drainage and elsewhere, but these would likely be reported as a function of continued assessment or compliance work and continued archeological survey.

Section 201(10) of ANILCA stipulates that the Yukon-Charley Rivers National Preserve shall be managed, among other reasons, "to protect and interpret historical sites and events associated with the gold rush on the Yukon River and the geological and paleontological history and cultural prehistory of the area." The preservation and protection of buildings and equipment associated with early mining history that are on existing, active claims should be undertaken by both mining claim owners and the National Park Service. The National Park Service should contact claim owners to discuss opportunities for preservation of such material. This would benefit both those who participated in and take pride in the mining adventure and the general public, which has only read about the activities and exploits of mining on the Yukon. If a claim is to be abandoned or if reclamation programs are scheduled, agreements should be reached between the NPS and the claim owner to preserve or protect historically significant buildings or equipment. If an owner of a structure or object eligible for the National Register is interested in nominating his property to the register, the NPS will advise him on how to proceed, usually in conjunction with the Alaska Office of History and Archeology and the state historic preservation officer.

The National Park Service needs to set priorities for documentation, evaluation, and interpretation of historic properties located within the preserve. This is an especially important task for those historic structures and objects located on or near mining claims. The same goal holds true for archeologic sites as they are found.

Claim corners must be well-marked. This greatly facilitates claim surveys and evaluations from cultural resources standpoints.

APPENDIXES

A: Legislation for Yukon-Charley Rivers National Preserve

B: National Park Service Regulations Pertaining to Mining and Mining Claims

C: Wildlife in Yukon-Charley Rivers National Preserve

D: Permits Required for Placer Mining in Alaska

PUBLIC LAW 96-487—DEC. 2, 1980 94 STAT. 2371

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 II—NATIONAL PARK SYSTEM

Sec. 201. Establishment of new areas.
Sec. 202. Additions to existing areas.
Sec. 203. General administration.
Sec. 204. Native selections.
Sec. 205. Commercial fishing.
Sec. 206. Withdrawal from mining.

Sec. 201.

(10) Yukon-Charley Rivers National Preserve, containing approximately one million seven hundred and thirteen thousand acres of public lands, as generally depicted on map numbered YUCH-90,008, and dated October 1978. The preserve shall be managed for the following purposes, among others: To maintain the environmental integrity of the entire Charley River basin, including streams, lakes and other natural features, in its undeveloped natural condition for public benefit and scientific study; to protect habitat for, and populations of, fish and wildlife, including but not limited to the peregrine falcons and other raptorial birds, caribou, moose, Dall sheep, grizzly bears, and wolves; and in a manner consistent with the foregoing, to protect and interpret historical sites and events associated with the gold rush on the Yukon River and the geological and paleontological history and cultural prehistory of the area. Except at such times when and locations where to do so would be inconsistent with the purposes of the preserve, the Secretary shall permit aircraft to continue to land at sites in the Upper Charley River watershed.

Yukon-Charley Rivers National Preserve

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.

ADMINISTRATION OF NATIONAL PRESERVES

SEC. 1313. A National Preserve in Alaska shall be administered and managed as a unit of the National Park System in the same manner as a national park except as otherwise provided in this Act and except that the taking of fish and wildlife for sport purposes and subsistence uses, and trapping shall be allowed in a national preserve under applicable State and Federal law and regulation. Consistent with the provisions of section 816, within national preserves the Secretary may designate zones where and periods when no hunting, fishing, trapping, or entry may be permitted for reasons of public safety, administration, floral and faunal protection, or public use and enjoyment. Except in emergencies, any regulations prescribing such restrictions relating to hunting, fishing, or trapping shall be put into effect only after consultation with the appropriate State agency having responsibility over hunting, fishing, and trapping activities.

16 USC 3201.

Ante, p. 2430.

PART 9—MINERALS MANAGEMENT

Subpart A—Mining and Mining Claims

Sec.

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 peroid of four years after September 28, 1976, to this section solely by virtue of § 9.10(a)(3), the date before which there must have been significant disturbance for purposes of mineral extraction is January 26, 1977.

(b) An operator of a claim in one of these units seeking to enlarge an existing excavation or otherwise disturb the surface for purposes of mineral exploration or development shall file with the Superintendent an application stating his need to disturb additional surface in order to maintain production at an annual rate not to exceed an average annual production level of said operations for the three calendar years 1973, 1974, and 1975. Accompanying the application shall be a plan of operations which complies with § 9.9 and verified copies of 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 unde separate cover and shall certify that it is the record on which his decision was based at the time it is forwarded to the Director of the National Park Service. The National Park Service shall make the record available to the operator upon request.

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

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

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

§ 9.15 Use of roads by commercial vehicles.

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

(1) A fee shall be charged for such registration based upon a posted fee schedule, computed on a ton-mile basis. The fee schedule posted shall be subject to change upon 60 days notice.

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

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

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

§ 9.16 Penalties.

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

§ 9.17 Public inspection of documents.

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

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

§ 9.18 Surface use and patent restrictions.

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

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

§ 13.15 Access to inholdings.

(a) *Purpose.* A permit for access to inholdings pursuant to this section is required only where adequate and feasible access is not affirmatively provided without a permit under §§ 13.10-13.14 of these regulations. Thus, it is the purpose of this section to ensure adequate and feasible access across a park area for any person who has a valid property or occupancy interest in lands within or effectively surrounded by a park area or other lands listed in section 1110(b) of ANILCA.

(b) *Application and Administration.* (1) Applications for a permit designating methods and routes of access across park areas not affirmatively provided for in this part shall be submitted to the Superintendent having jurisdiction over the affected park area as specified under § 13.31.

(2) Except as provided in paragraph (c) of this section, the access permit application shall contain the name and address of the applicant, documentation of the relevant property or occupancy interest held by the applicant (including for 1872 Mining Law claimants a copy of the location notice and recordations required under the 1872 Mining Law and 43 U.S.C. 1744), a map or physical description of the relevant property or occupancy interest, a map or physical description of the desired route of access, a description of the desired method of access, and any other information necessary to determine the adequacy and feasibility of the route or method of access and its impact on the natural or other values of the park area.

(3) The Superintendent shall specify in a nontransferable permit, adequate and feasible routes and methods of access across park areas for any person who meets the criteria of paragraph (a) of this section. The Superintendent shall designate the routes and methods desired by the applicant unless it is determined that:

(i) The route or method of access would cause significant adverse impacts on natural or other values of the park area, and adequate and feasible access otherwise exists; or

(ii) The route or method of access would jeopardize public health and safety, and adequate and feasible access otherwise exists.

(4) If the Superintendent makes one of the findings described in paragraph (b)(3) of this section, he/she shall specify such other alternate methods and routes of access as will provide the applicant adequate and feasible access, while minimizing damage to natural and other values of the park area.

(5) Any person holding an access permit shall notify the Superintendent of any significant change in the method or level of access from that occurring at the time of permit issuance. In such cases, the Superintendent may modify the terms and conditions of the permit, provided that the modified permit also assures adequate and feasible access under the standards of paragraph (b)(3) of this section.

(6) Routes and methods of access permitted pursuant to this section shall be available for use by guests and invitees of the permittee.

(c) *Access requiring permanent improvements.* (1) Application form and procedure. Any application for access to an inholding which proposes the construction or modification of an improved road (*e.g.*, construction or modification of a permanent, year-round nature, and which involves substantial alteration of the terrain or vegetation, such as grading, gravelling of surfaces, concrete bridges, or other such construction or modification), or any other permanent improvement on park area lands qualifying as a "transportation or utility system" under Section 1102 of ANILCA, shall be submitted on the consolidated application form specified in Section 1104(h) of ANILCA, and processed in accordance with the procedures of Title XI of ANILCA.

(2) Decision-making standard. (i) If the permanent improvement is required for adequate and feasible access to the inholding (*e.g.*, improved right-of-way or landing strip), the permit granting standards of paragraph (b) of this section shall apply.

(ii) If the permanent improvement is not required as part of the applicant's right to adequate and feasible access to an inholding (*e.g.*, pipeline, transmission line), the permit granting standards of Sections 1104-1107 of ANILCA shall apply.

(d) *Clarification of the Applicability of 36 CFR Part 9.* (1) 1872 Mining Law Claims and 36 CFR Subpart 9A. Since section 1110(b) of ANILCA guarantees adequate and feasible access to valid mining claims within park areas notwithstanding any other law, and since the 36 CFR 9.3 requirement for an approved plan of operations prior to the issuance of an access permit may interfere with needed access, 36 CFR 9.3 is no longer applicable in Alaska park areas. However, holders of patented or unpatented mining claims under the 1872 Mining Law (30 U.S.C. 22 *et seq.*) should be aware that 36 CFR 9.9, 9.10 independently require an approved plan of operations prior to conducting mining operations within a park area (except that no plan of operations is required for patented claims where access is not across federally owned parklands).

(2) Non-Federal Oil and Gas Rights and 36 CFR Subpart 9B. Since section 1110(b) of ANILCA guarantees adequate and feasible access to park area inholdings notwithstanding any other law, and since 36 CFR Subpart 9B was predicated on the park area Superintendent's discretion to restrict and condition such access, 36 CFR Subpart 9B is no longer applicable in Alaska park areas.

C: WILDLIFE IN YUKON-CHARLEY RIVERS NATIONAL PRESERVE

Mammals	Habitat Type: Bottomland Spruce-Poplar Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland	Aquatic
Pygmy Shrew, Microsorex hoyi					X	
Masked shrew, Sorex cinereus cinereus	X	X		X	X	
Tundra shrew, Sorex tundrensis			X	X		
Dusky shrew, Sorex obscurus obscurus	X	X				
Little brown bat, Myotis lucifugus pernox	X	X				
Pika, Ochotona princeps collaris			X			
*Varying hare, Lepus americanus dalli	X	X			X	
Hoary marmot, Marmota caligata caligata			X			
*Red squirrel, Tamiasciurus hudsonicus preblei	X	X				
Northern flying squirrel, Glaucomya sabrinus sabrinus	X	X				
*Beaver, Castor canadensis canadensis	X					X
Red-backed vole, Clethrionomys rutilus dawsoni	X	X				
Northern bog lemming, Synaptomys borealis borealis						
Meadow vole, Microtus pennsylvanicus drummondii	X					
Tundra vole, Microtus oeconomus macfarlani				X		
Singing vole, Microtus miurus muriei			X			
Siberian lemming, Lemmus sibiricus trimucrunatua				X		
Muskrat, Ondatra zibethicus spatulatus					X	
*Porcupine, Erethizon dorsatum myops	X	X				
Coyote, Canis latrans latrans	X	X			X	
*Wolf, Canis lupus	X	X	X	X	X	
Red fox, Volpes volpes alascensis	X	X		X	X	
*Black bear, Ursus americanus americanus	X	X	X		X	
*Grizzly bear, Ursus arctos horribilis	X	X	X	X	X	
*Marten, Martes americana actuosa	X	X				
Ermine, Mustela erminea arctica	X	X	X	X	X	
Least weasel, Mustela nivalis eskimo		X		X	X	
Mink, Mustela vison energumenos	X				X	
Wolverine, Gulo gulo luscus	X	X	X	X	X	
Otter, Lutra canadensis	X				X	
*Lynx, Felis canadensis canadensis	X	X			X	
*Moose, Alces alces gigas	X	X	X	X	X	
*Caribou, Rangifer tarandus caribou		X	X	X		
*Dall sheep, Ovis nivicola dalli			X			

Birds		Habitat Type: Bottomland Spruce-Poplar Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland	Aquatic
Common loon, *Gavia immer*					X		X
Arctic loon, *Gavia arctica*							X
Red-throated loon, *Gavia stellata*							X
Red-necked grebe, *Podiceps grisegena*							X
Horned grebe, *Podiceps auritus*							X
Whistling swan, *Olor columbianus*					X		X
Trumpeter swan, *Olor buccinator*							X
Canada goose, *Branta canadensis*					X		X
Black brant, *Branta nigricans*							X
White-fronted goose, *Anser albifrons*					X		X
Snow goose, *Chen hyperborea*					X		X
Mallard, *Anas platyrhynchos*					X		X
Gadwell, *Anas strepera*							X
Pintail, *Anas acuta*					X		X
Blue-winged teal, *Anas discors*							X
*Green-winged teal, *Anas carolinensis*					X		X
American widgeon, *Mareca americana*					X		X
European widgeon, *Mareca penelope*					X		X
Shoveler, *Spatula clypeata*					X		X
Canvasback, *Aythya valisineria*							X
Redhead, *Aythya americana*					X		X
Ring-necked duck, *Aythya collaris*							X
Greater scaup, *Aythya marila*					X		X
Lesser scaup, *Aythya affinis*					X		X
Common goldeneye, *Bucephala clangula*		X	X				X
Barrow's goldeneye, *Bucephala islandica*		X	X				X
Bufflehead, *Bucephala albeola*		X	X				X
Oldsquaw, *Clangula hyemalis*			X		X		X
Harlequin, *Histrionicus histrionicus*			X				X
White-winged scoter, *Melanitta deglandi*							X
Surf scoter, *Melanitta perspicillala*							X
Ruddy duck, *Oxyura jamaicensis*							X
Red-breasted merganser, *Mergus serrator*					X		X
Goshawk, *Accipiter gentilis*	PR	X	X				
Sharp-shinned hawk, *Accipiter striatus*		X	X			X	
*Red-tailed hawk, *Buteo jamaicensis*						X	
Harlan's hawk, *Buteo harlani*						X	
Swainson's hawk, *Buteo swainsoni*						X	
Rough-legged hawk, *Buteo lagonpus*			X	X		X	
*American Golden Eagle, *Aquila chrysaetos*			X			X	

		Habitat Type					
		Bottomland Spruce-Poplar Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland	Aquatic
Bald eagle, *Haliaetus leucocephalus*		X					X
*Marsh hawk, *Circus cyaneus*				X		X	
Osprey, *Pandion haliaetus*		X	X				X
Gyrfalcon, *Falco rusticolus*			X	X			
*Peregrine falcon, *Falco peregrinus*			X				X
Pigeon hawk, *Falco columbarius*			X		X		
Sparrow hawk, *Falco sparverius*						X	
Spruce grouse, *Canachites canadensis*	PR	X	X				
Ruffed grouse, *Bonasa umbellus*	PR	X					
*Willow ptarmigan, *Lagopus lagopus*	PR		X		X	X	
Rock ptarmigan, *Lagopus mutus*	PR			X	X		
Sharp-tailed grouse, *Pedioecetes phasianellus*	PR		X			X	
*Sandhill crane, *Crus canadensis*					X		X
Semipalmated plover, *Charadrius semipalmatus*							X
Killdeer, *Charadrius vociferus*							X
American golden plover, *Pluvialis dominica*				X			
Black-bellied plover, *Squatarola squatarola*					X		
Surfbird, *Aphriza virgata*					X		
Ruddy turnstone, *Arenaria interpres*				X			
Common snipe, *Capella gallinago*					X		
Whimbrel, *Numenius phaeopus*							X
Upland plover, *Bartramia longicauda*					X		
*Spotted sandpiper, *Actitis macularia*		X					X
Solitary sandpiper, *Tringa solitaria*							X
Wandering tattler, *Heteroscelus incanum*				X	X		X
Greater yellowlegs, *Totanus melanoleucus*					X		
Lesser yellowlegs, *Totanus flavipes*					X		
Pectoral sandpiper, *Erolia melanotos*							X
White-rumped sandpiper, *Erolia fuscicollis*							X
Baird's sandpiper, *Erolia biardii*				X			
Least sandpiper, *Erolia minutilla*					X		
Dumlin, *Erolia alpina*					X		
Longbilled dowitcher, *Limnodromus scolopaceus*							X
Semipalmated sandpiper, *Ereunetes pusillus*							X
Western sandpiper, *Ereunetes mauri*					X		
Hudsonian godwit, *Limosa haemastica*							X
Buff-breasted sandpiper, *Tryngites subruficollis*					X		
Sanderling, *Crocethia alba*							X

		Habitat Type					
		Bottomland Spruce-Poplar Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland	Aquatic
Wilson's phalarope, *Steganopus tricolor*							X
Northern phalarope, *Lobipes lobatus*					X		X
Long-tailed jaegar, *Stercorarius longicaudus*					X		
Herring gull, *Larus argentatus*							X
*Mew gull, *Larus canus*					X		X
Bonaparte's gull, *Larus philadelphia*							X
Arctic tern, *Sterna paradisaea*							X
Mourning dove, *Zenaidura macroura*		X	X				
Great horned owl, *Bubo virginianus*	PR	X	X				
Snowy owl, *Nyctea scandiaca*					X		
Hawk owl, *Surnia ulula*	PR	X	X				
Great gray owl, *Strix nebulosa*	PR	X	X				
Short-eared owl, *Asio flammeus*					X		
Boreal owl, *Aegolius funereus*	PR	X	X				
Common nighthawk, *Chordeiles minor*					X	X	
Rufous hummingbird, *Selasphorus rufus*			X				
Belted kingfisher, *Megaceryle alcyon*		X					X
Yellow-shafted flicker, *Colaptes auratus*		X	X				
Hairy woodpecker, *Dendrocopos villosus*	PR	X	X				
Downy woodpecker, *Dendrocopos pubescens*	PR	X	X				
Black-backed three-toed woodpecker, *Picoides arcticus*	PR	X	X				
Northern three-toed woodpecker, *Picoides tridactylus*	PR	X	X				
*Say's phoebe, *Sayornis saya*						X	
Yellow-bellied flycatcher, *Empidonax flaviventris*		X	X				
Traill's flycatcher, *Empidonax traillii*						X	
Hammond's flycatcher, *Empidonax hammondii*		X	X				
Western wood pewee, *Contopus sordidulus*		X					
Olive-sided flycatcher, *Nuttallornis borealis*		X	X				
Horned lark, *Eremophila alpestris*				X			
Violet-green swallow, *Tachycineta thalassina*							X
Tree swallow, *Iridoprocne bicolor*			X				
Bank swallow, *Riparia riparia*			X	X		X	X
Barn swallow, *Hirundo rustica*			X	X		X	
*Cliff swallow, *Petrochelidon pyrrhonota*			X	X		X	
*Gray jay, *Perisoreus canadensis*	PR	X	X				
Black-billed magpie, *Pica pica*	PR		X			X	
*Common raven, *Corvus corax*	PR	X	X	X	X	X	
*Black-capped chicadee, *Parus atricapillus*	PR	X	X				

		Habitat Type					
		Bottomland Spruce-Poplar Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland	Aquatic
Gray-headed chickadee, Parus cinctus	PR		X				
Boreal chickadee, Parus hudsonicus	PR	X	X				
Brown creeper, Certhia familiaris	PR	X	X				
Dipper, Cinclus mexicanus							X
*Robin, Turdus migratorious		X	X				
Varied thrush, Ixoreus naevius		X	X				
Hermit thrush, Catharus guttatus		X	X				
Swainson's thrush, Catharus ustulatus		X	X				
Gray-cheeked thrush, Catharus minimus			X			X	
Mountain bluebird, Sialia currucoides			X				
Wheater, Oenanthe oenanthe				X			
Townsend's solitaire, Myadestes townsendi			X	X			
Ruby-crowned kinglet, Regulus calendula		X	X				
Water pipit, Anthus spinoletta				X			
Bohemian waxwing, Bombycilla garrula						X	
Northern shrike, Lanius excubitor		X	X			X	
Starling, Sturnus vulgaris						X	
Orange-crowned warbler, Vermivora celata		X				X	
*Yellow warbler, Dendroica petechia						X	
Myrtle warbler, Dendroica coronata		X	X				
Blackpoll warbler, Dendroica striata			X				
Northern waterthrush, Seiurus noveboracensis			X			X	
Wilson's warbler, Wilsonia pusilla						X	
Rusty blackbird, Euphagus carolinus						X	
Pine grosbeak, Pinicola enucleator	PR	X	X				
Gray-crowned rosy finch, Leucosticte tephrocotis				X			
Hoary redpoll, Acanthis hornemanni						X	
Common redpoll, Acanthis flammea	PR		X			X	
Pine siskin, Spinus pinus		X	X				
White-winged crossbill, Loxia leucoptera	PR	X	X				
Savannah sparrow, Passerculus sandwichensis				X	X		
Slate-colored junco, Junco hyemalis		X	X				
*Oregon junco, Junco oreganus			X			X	
Tree sparrow, Spizella arborea						X	
Chipping sparrow, Spizella passerina			X				
*White-crowned sparrow, Zonotrichia leucophrys		X	X			X	
Golden-crowned sparrow, Zonotrichia atricapilla				X		X	
Fox sparrow, Passerella iliaca		X			X		

	Habitat Type					
	Bottomland Spruce-Poplar Forest	Upland Spruce Hardwood Forest	Alpine Tundra	Moist Tundra	Shrubland	Aquatic
Lincoln's sparrow, *Melospiza lincolnii*	X			X		
Lapland longspur, *Calcarius lapponicus*			X	X		
Smith's longspur, *Calcarius pictus*			X			
Snow-bunting, *Plectrophenas nivalis*			X	X		
Amphibians						
Wood frog, *Rana sylvatica*						X

Fish	Rivers	Lakes	Streams	Ponds
Arctic lamprey, *Lampetra japonica*	X			
Lake trout, *Salvelinus namaycush*	X	X		
Dolly Varden, *Salvelinus malma*	X			
Chinook (king salmon), *Oncorhynchus tschawytscha*	X		X	
Coho (silver salmon), *Oncorhynchus kisutch*	X		X	
Chum (dog salmon), *Oncorhynchus keta*	X			
Arctic grayling, *Thymallus arcticus*	X		X	
Sheefish (inconnu), *Stenodus leucichthys*	X			
Humpback whitefish, *Coregonus pidachian*	X	X	X	
Broad whitefish, *Coregonus nasua*	X			
Least cisco, *Coregonus sardinella*	X	X		
Round whitefish, *Prospopium cylindraceum*			X	X
Northern pike, *Esox lucius*	X	X		
Lake chub, *Couesius plumbeus*	X	X	X	X
Longnose sucker, *Catotomus catostomus*	X		X	
Trout perch, *Percopsis omiscomaycus*	X	X		
Burbot, *Lota lota*	X	X	X	X
Slimy sculpin, *Cottus cognatus*	X		X	

*Indicates the species was observed or direct evidence encountered in the preserve between July 24 and August 2, 1981.

PR on bird list indicates permanent year-round resident.

D: PERMITS REQUIRED FOR PLACER MINING IN ALASKA

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 DMEM; (b) The location notice form is available from a stationery store; (c) Expires on September 1st of each year; (d) No fee.

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