CHISANA STUDY AREA

GEOGRAPHY

The Chisana study area is located in the central section of the south side of the Nutzotin Mountains, which comprise the eastern terminus of the Alaska Range (see the Chisana study area map). The topography is characterized by rolling, vegetated hills and steep, but generally vegetated, creek canyons. Study area elevations range from 3,700 feet in the Chavolda and Chathenda creek drainages, 5,815 feet at the top of Gold Hill itself, to 8,010 feet on the ridge forming the northeastern portion of the study area. The lowest elevation is 3,100 feet near the confluence of Chathenda and Chavolda creeks. Permafrost is discontinuous throughout the study area. The creeks flowing from the Chisana study area are clear, nonglacial streams.

GEOLOGY AND MINERAL RESOURCES

The rocks in the study area are composed of the Cretaceous volcanic Chisana formation, Cretaceous marine sedimentary rocks, and Cretaceous intrusives.

Quartz veins containing gold, silver, lead, zinc, and copper occur in the area, but there has never been any production from them. Placer deposits have been the source of about 45,000 to 50,000 ounces of gold since 1913. Bonanza and Little Eldorado creeks and Gold Run Creek and its tributaries were the most extensively mined streams. According to Capps, most of the gold in these creeks was reconcentrated from Tertiary gravel, a 200-foot-thick remnant of which is preserved as a cap on Gold Hill. Gold from Big Eldorado Creek was derived from local lode sources (USGS 1973). Quaternary colluvium and glacial deposits occur in the larger drainages.

VEGETATION AND WETLANDS

Low shrub accounts for almost 70 percent of the study area. Other important land cover types are upland barren, alpine tundra, and tall shrub (see appendix 4).

TRANSPORTATION AND ACCESS

The Chicken airstrip, located on the west bank of Chicken Creek and north of Glacier Creek, is the primary means of access for the Chisana mining claims during the mining season. In addition, the study area has eight vehicle trails covering approximately 20 miles. Some were created by bladed bulldozers, while others are rutted tracks formed by mechanized vehicles driving over vegetative cover. Three of the eight trails are for nonmechanized use and one is no longer used by vehicles. The remaining four trails are currently used for vehicle travel. Most trail sections which have not experienced recent mechanized vehicle use display some degree of revegetation, primarily by cottongrass and sedge species. The vegetative communities most affected by these eight trails are low shrub, tall shrub, and coniferous forest.

AQUATIC RESOURCES

There are 42 stream miles and 19 named streams in the Chisana study area, most of which are nonglacial. Only Chavolda (Wilson) and Chathenda (Johnson) creeks are influenced by glaciers in

their headwaters. Tundra ponds are found in Caribou Pass between the headwaters of Glacier and Little Eldorado creeks. Permafrost is intermittent in the study area. Fish were not observed in the Chisana study area streams in 1985-1987.

Big Eldorado Creek

Big Eldorado Creek is a small clear water stream with an average flow of approximately 10 cfs near the mouth. It has been mined sporadically since 1913. Early mining involved diverting and ditching the entire stream. The stream morphometry and riparian habitat have been disturbed for most of the stream length.

Remnants of dams are found along the stream course and intact diversion ditches and dams remain today. Stream gravels have been sorted and piled along side the stream and an access trail parallels the stream.

The existing chemical conditions (pH, conductivity, alkalinity, and dissolved oxygen) are in an acceptable range for aquatic life (table 14). Total recoverable metals measured in 1986 were below instrument (ICP) detection limits. Turbidity and suspended solids, as measured in 1985 and 1986, were higher downstream of the disturbed areas than upstream of the disturbance in spite of the discharge being nearly equal.

Algal growth and macroinvertebrates are apparent in the upper portion of Big Eldorado Creek, but less so in the lower reach. Existing conditions indicate that fish may have inhabited Big Eldorado Creek before the physical habitat was substantially altered in the early 1900s (Tacoma Public Library Historic Photo Collection). Although fish are not known to occur today, physical habitat loss and stream obstructions may be limiting factors for fish.

Gold Run Creek

Gold Run Creek is a small (average midcourse flow, 9 cfs) clear water stream, which has been intermittently mined since the early 1900s. In the past, ground sluicing, booming, hydrauliking, dredging and drift mining were common mining practices on Gold Run Creek. Nine dams remain intact in Gold Run Creek from past mining activities.

The existing water quality in Gold Run Creek is within an acceptable range for the survival of aquatic life (table 14). Total recoverable metals concentrations measured in 1987 were below instrument (ICP) detection limits. Sediment and metal concentrations, however, would increase above the natural background after storm events due to nonpoint runoff from disturbed areas (EPA 1973).

Detritus, primary productivity and aquatic invertebrates occur in the upper portion of Gold Run Creek, but are less evident in the downstream portion of the stream. Although fish are not known to occur today, physical habitat loss and stream obstructions may be limiting factors for fish.

Little Eldorado Creek

Little Eldorado Creek is a small (average midcourse flow, 7 cfs) clear water stream which has been extensively mined since the early 1900s. Water was diverted from Little Eldorado Creek through ditches, to Skookum Creek. Today, the diversion channel is still evident along the west side of the stream. Stream gravels have been sorted and piled along the streambanks, and stream gravels have

Table 14. Summary of Water Quality Parameters for Streams in the Chisana Study Area.

Location	BIG ELDORADO upstream of disturbed area	BIG ELDORADO downstream of disturbed area	GOLD RUN CR. upstream of disturbed area	LITTLE ELDORADO upstream of disturbed area	LITTLE ELDORADO downstream of disturbed area	SKOOKUM CR. upstream of disturbed area	BONANZA CR. upstream of disturbed area	BONANZA CR. downstream of disturbed area	CHATHENDA CR. downstream of Bonanza Cr.	CHAVOLDA CR. downstream of Glacier Creek
Date	6/24/87	6/25/87	9/25/87	6/23/87	6/22/87	6/23/87	6/24/87	6/24/87	6/18/87	6/17/88
Flow (cfs)	8.5	7.8	1.0	2.9	10.9	2.1	2.5	21.3	115.0	51.3
Suspended solids (mg/l)	<2.0	3.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	–	–
Turbidity (NTU)	1.0	1.8	3.2	3.0	9.2	0.8	1.6	4.45	22.5	1.2
pH	7.0	7.3	6.6	8.5	8.3	7.6	8.0	7.8	7.5	–
Conductivity (umho)	31.0	65.0	29.0	240.0	185.0	40.0	240.0	170.0	172.0	187.0
Alkalinity (mg/l)	60.0	23.0	8.0	97.0	69.0	50.0	183.0	73.0	77.0	71.0
Hardness	136.0	45.0	41.0	95.0	88.0	19.0	165.0	78.0	86.0	112.0
Arsenic (mg/l)0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	–	–	–
Cadmium (mg/l)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	–	–
Chromium (mg/l)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	–	–
Copper (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	–	–
Iron (mg/l)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.069	<0.03	<0.06	–	–
Lead (mg/l)	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	–	–
Manganese (mg/l)	<0.003	<0.003	<0.003	0.006	<0.003	<0.003	<0.003	<0.006	–	–
Zinc (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	–	–

Note: Metal data are ICP total recoverable values, averaged over 6 replicates.

been impacted due to instream vehicle traffic over many years. Riparian habitat has been disturbed most of the length of the stream.

The pH, dissolved oxygen, alkalinity, hardness and conductivity in Little Eldorado Creek are within acceptable limits for the survival of aquatic life (table 14). Total recoverable metal concentrations as measured in 1987 showed concentrations less than the instrument detectable level (ICP). Iron staining, due to pyrite oxidation and subsequent deposition, is apparent on the stream bottom. Turbidity and suspended solids are naturally low during low flow in Little Eldorado Creek. Increases in turbidity and suspended solids occur, however, due to storm runoff from naturally unvegetated headwaters and 18 acres of mining disturbance along the stream (EPA 1973).

Aquatic invertebrates are present in Little Eldorado Creek. Fish, although not observed in 1986 or 1987, may have occurred in Little Eldorado Creek before the physical habitat was substantially altered (Tacoma Public Library Historic Photo Collection). Today, the occurrence of fish in Little Eldorado Creek may be limited by the loss of the natural channel, redistribution of gravels, and less than minimum instream flow due to stream diversions.

Skookum Creek

Skookum Creek, a small (average flow at mouth, <2 cfs) naturally clear water tributary to Little Eldorado Creek, has been mined heavily in the past. Extensive ground sluicing and dredging has occurred in Skookum Creek over the years. Boomer dams were used in the past and dam sections still exist instream. A 6-foot floodgate and flume remain intact on the upper portion of Skookum Creek. Due to the mining activities over the years, there was a progressive shift of the streambed to the north and the overall gradient of the stream decreased (NPS 1986a). Wooden planks were placed in the stream, to channelize the stream and today the upper channel of Skookum Creek is still defined by wooden planks. Tailings piles remain along the stream and in the stream. Water was always a limited resource for miners in Skookum Creek so water was diverted via ditches from other streams to Skookum Creek.

The existing pH, dissolved oxygen, alkalinity, hardness, and conductivity in Skookum Creek today is within acceptable limits for aquatic life (table 14). Total recoverable metals, as measured in 1986, were either below EPA standards (EPA 1986) or below detectable levels of the laboratory instrument (ICP). Turbidity and suspended solids are naturally low in Skookum Creek, but these parameters increase with storm runoff from the six acres of disturbance in the watershed. Staining is apparent on the streambed where iron oxides have been deposited.

The riparian vegetation has been removed or disturbed along most of Skookum Creek, thus limiting detrital input. Aquatic invertebrates were present in 1986; however, density and diversity were low. Fish were not observed in Skookum Creek in 1986 and 1987, but may have occurred prior to substantial alterations in the channel and gradient and the placement of instream obstructions.

Bonanza Creek

Bonanza Creek is a clear water stream with an average flow of 20 cfs at the mouth. Extensive mining, including damming and ground sluicing, hydraulic mining and suction dredging, have occurred on Bonanza Creek since the early 1900s (NPS 1988a). Splash dam ruins remain in the stream today. In the early 1900s, a major flume system was constructed which diverted Bonanza Creek waters from the stream course (Tacoma Public Library Historic Photo Collection). A portion of the dilapidated system still runs along the northwest bank of Bonanza Creek.

The water quality conditions which exist in Bonanza Creek (pH, conductivity, alkalinity, hardness, dissolved oxygen) are within an acceptable range for survival of aquatic life (table 14). Total recoverable metals measured in Bonanza Creek in 1987 were below instrument (ICP) detection limits, with the exception of manganese which was still at a safe concentration according to EPA standards (EPA 1986). Suspended solids and turbidity are naturally low in Bonanza Creek at low flow (table 14). Storm runoff from 30 acres of disturbed area in the drainage basin, however, can cause an increase in sediment and adherent metals above natural background levels.

Bonanza Creek riparian habitat has been disturbed for a majority of the stream length. Physical habitat, including gradient and pool-riffle ratio has been altered. Aquatic invertebrates were present in Bonanza Creek in both the headwaters and mouth in 1986. No fish were observed in 1986 or 1987; however, it is possible that fish once used Bonanza Creek as summer habitat.

In addition to the five streams discussed above, nine other streams in the Chisana study area have past impacts and are discussed below.

Snow Gulch and Bug Gulch

Snow Gulch and Bug Gulch, small steep gradient tributaries to Gold Run Creek, were disturbed during early mineral exploration. Natural stream characteristics (steep gradient, high velocity, intermittent flow) in combination with habitat changes (loss of riparian vegetation, nonpoint runoff, bank disturbance) limit the primary productivity and aquatic invertebrate populations in these drainages.

Coarse Money Creek and Canyon Creek

Coarse Money Creek and Canyon Creek, tributaries to Bonanza Creek, were extensively mined in the past. Hydraulic mining and water diversion were common practices on these two clear running streams and a splash dam still remains in Coarse Money Creek. The physical characteristics of these streams have been altered.

Chathenda (Johnson) Creek and Chavolda (Wilson) Creek

Chathenda Creek and Chavolda Creek are the receiving streams for the smaller Chisana study area streams. Both streams have small glaciers in their headwaters, and therefore the waters run slightly turbid in their natural state (table 14). Although there was not heavy mining in Chathenda and Chavolda creeks in the past, mining related activities, such as transportation and sawmilling occurred along these streams. Primary productivity and aquatic invertebrates occur in these streams today; however, they are limited by natural factors such as velocity and scour.

Discovery Pup, Poorman Creek, and Glacier Creek

Discovery Pup and Poorman Creek are two small (average flow, <5 cfs at the mouths) tributaries to Gold Run Creek. Both of these streams have impacts from early mining including diversion and damming (Hovis, 1986). A splash dam still exists in Poorman Creek today. Glacier Creek has been hydraulically and drift mined in the past. There are remnants of a large dam in Glacier Creek and sorted rock piles are found along the banks (Tacoma Public Library Historic Photo Collection).

These three streams are biologically productive (algae and invertebrates); however, productivity is limited by changes in the physical habitat, stream obstructions and nonpoint runoff from disturbed areas. Fish may have occurred in Glacier Creek prior to early mining disturbance, but they were not found in 1986 or 1987.

WILDLIFE RESOURCES

Grizzly Bear Habitat

Most of the Chisana study area is good grizzly bear habitat. The population level and density is unknown for the Chisana area. Soapberries, an important fall food for grizzlies, typically grow on river floodplains, or in the understory of forest or open tall shrub communities. In the Chisana study area, soapberries grow in areas classified as coniferous forest and tall shrub; floodplain barrens, though used as travel routes, have no other habitat value. Upland areas with alpine tundra, low shrub, and tall shrub communities provide important seasonal shoots, roots, berries, and prey items like caribou calves or ground squirrels.

Existing areas of vegetative disturbance are concentrated along the edges of Upper Bonanza Creek, Little Eldorado Creek, and Big Eldorado Creek. Other disturbed vegetation occurs on upper Gold Run Creek and along numerous motorized access trails between the drainages.

Vegetative cover types of primary habitat value to grizzly bears are alpine tundra, low shrub, tall shrub, and coniferous forest.

A total of 13,409 acres of these communities currently exist within the study area. Disturbed grizzly bear habitat totals 131 acres.

Moose Habitat

Moose population densities and numbers in the Chisana study area are unknown. Moose can make use of habitat at higher elevations here than at other study areas because of the more accessible, rolling terrain. Narrow, riparian stringers of tall willow preferred by moose grow at elevations that often exceed 5,000 feet in many of the draws.

Vegetative communities of primary habitat value to moose are tall shrub, coniferous forest, mixed forest, and deciduous forest, and, below a 55 percent slope angle, tall shrub. Existing primary moose habitat totals 1,652 acres. Disturbed moose habitat totals eight acres.

Dall Sheep Habitat

Chisana has important year-round habitat for Dall sheep. Over three (3.8) sheep per square mile were counted in the area in 1981 (NPS 1982a). Hunting for Dall sheep is heavily practiced adjacent to the study area (NPS 1986d).

The availability of snow-free slopes can be an important limiting factor for winter survival of Dall sheep. In the Chisana study area, portions of the high rolling terrain have a southern exposure or are windswept free of snow in the winter. In the summer, sheep can usually be sighted on the slopes above Chathenda Creek, on the south side of Gold Hill, and in the canyon of Bonanza Creek (NPS Mullen, pers. comm. 1987).

Primary Dall sheep habitat is defined by vegetative type, slope angle, and use. All alpine tundra, and tall shrub and low shrub communities, growing on slopes at an angle greater than 55 percent, are defined as primary Dall sheep habitat. The area classified as upland barren at the northern edge of the study area is at a high elevation, and although sheep may cross this area, it is not considered primary sheep habitat. Areas classified as upland barren in the remainder of the study area, most notably the slope to the south of Gold Hill, are part of a mosaic of low shrub, tall shrub, and alpine tundra, and are vegetated in spots. These upland barren areas are included as Dall sheep habitat.

Dall sheep primary habitat in the study area currently totals 2,184 acres. Disturbed sheep habitat totals 3 acres.

Caribou Habitat

Chisana is the only study area where caribou occur in significant numbers. (Sporadic caribou use occurs in the Nabesna study area.) The study area is used throughout the year by the Chisana herd, and it is an important calving area and sporadic wintering area. Unlike most herds in Alaska, the Chisana herd is not known to migrate between winter and summer range. Only dispersed movements between winter and summer range have been recorded.

On the rolling hills, lichen mats that grow in low shrub and alpine tundra communities are windswept free of snow in the winter, and are readily consumed by grazing caribou. Calving in the spring is dispersed, and only small groups of up to 10 to 15 animals are sighted in the summer. Vegetative communities of primary habitat value to caribou are alpine tundra, low shrub, and tall shrub, and currently total 12,758 acres. Disturbed caribou habitat totals 126 acres.

Wolves

Wolves are the main predator of moose, caribou, and Dall sheep in the study area, and range wherever prey can be found. Knowledge of wolf populations and pack home ranges is extremely limited. A population of 75 to 85 wolves in 14 packs was estimated during a 1982 survey of that portion of GMU 12 which overlaps the park/preserve (ADFG 1983b).

VISUAL QUALITY

The Chisana study area is characterized by rolling hills covered with moist tundra. From the top of rounded Gold Hill, several shallow valleys flow north and east. Bonanza Creek forms a steep-sided, narrow and rocky canyon in its lower reaches, while Chavolda and Chathenda creeks, both wide, braided streams, have formed major, spruce-lined valleys on the north and south ends of the study area. A long barren ridge of talus forms the northeast edge of the study area.

Views from the study area are often down the broad shallow drainages, across the unseen valleys of Chavolda or Chathenda creeks, and are then limited by small, nearby, rocky mountains. From some of the higher sites in the study area, the very wide and braided channel of the Chisana River and the Nutzotin Mountains can be seen. A total of 134 acres were disturbed by past mining in the Chisana study area. Obvious existing disruptions to the natural visual quality of the area include ATV routes across open tundra, numerous old cabins, barren placer-mined areas, abandoned fuel barrels, and ruins of two flumes.

CULTURAL RESOURCES

Prehistoric sites have not been found within the study area.

Sixteen historic sites associated with placer mining have been located within the study area. These include: log and woodframe cabin structures which vary in condition from good to ruinous; tent frame platforms; open cut (ground surface) workings such as prospect pits, and hydraulic cuts; underground workings such as drift pits; remnants of water diversion systems such as dams, ditches, pipelines, and flumes; hydraulic mining equipment such as pipe, nozzles, and sluice boxes; a saw mill site; and numerous mining equipment scatters, including boilers, a diamond drilling platform, and small hand mining tools; and remains of the Bonanza City townsite. The Chisana study area was the site of a gold rush in 1913. Small-scale hand mining methods predominated. Very little heavy equipment has been used to mine in this area due to the district's remote location and the difficulty of access. As a result, this study area has a large proportion of sites depicting early placer mining methods. These sites are located within or adjacent to existing mining claims.

RECREATION

The predominant recreational activity in the Chisana study area is sport hunting. The major species hunted are caribou (in the study area) and Dall sheep (just to the north of the study area). The Chisana study area and surrounding area are one of the few locations within the park that offers the opportunity to hunt moose, grizzly bear, caribou, and Dall sheep. Access to the study area for hunting is somewhat limited, and, for that reason, the Chisana airstrip serves as the primary staging area for hunting around Chisana. Other types of recreation are also limited by the poor access to and from the study area, although hiking, backpacking and cross-country skiing are gaining in popularity due to the relatively flat topography and good drainage accessibility.

WILDERNESS VALUES

According to the Wilderness Suitability Review incorporated into the 1986 General Management Plan, the Chisana study area is not suitable for wilderness designation due to disturbance from past mining operations and related activities. The proposed action in the final environmental impact statement for wilderness recommendation also finds the Chisana study area to be unacceptable for wilderness designation.

LOCAL ECONOMY

Historically, the Chisana area had heavy mining activity in the early 1900s. Since World War II, mining activity has been limited and small scale in nature. In 1985, three miners operated in the study area with a total of five to seven employees. Two of these operations were one-man operations while the other operation had as many as four employees working at one time. Approximately 20 percent of all expenditures from these mining operations occurred in the local communities.