

PLACER SAMPLING AND RELATED BUREAU OF MINES ACTIVITIES
IN THE SOUND STUDY AREA OF THE CHUGACH NATIONAL FOREST, ALASKA

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ABSTRACT

The Bureau of Mines has completed three years of a four-year (1979-1982) mineral appraisal of the Chugach National Forest, Alaska. The appraisal is in conjunction with the RARE II Program on the Forest. This report deals with the eastern half of the forest which has been unofficially designated as the SOUND Study Area.

In 1981, field investigations of gold mineralization in the SOUND Study Area included placer sampling and mine/prospect examinations. This report presents the results of one hundred seven placer samples taken in 1981. Recoverable placer gold values were found in twenty-six of the one hundred seven samples. Gold values ranged from: 1) 0.0005 to 0.0010 ounces per cubic yard in three drainages that contained historical lode gold mines/prospects; 2) 0.0005 to 0.0049 ounces per cubic yard in six drainages with historical placer activity; 3) 0.0001 to 0.0280 ounces per cubic yard in ten drainages with Valdez Group rocks and no recorded lode or placer mineralization; and 4) 0.0003 to 0.0020 ounces per cubic yard in 30% of the drainages with gold values from 0.0012 to 0.1200 ounces per cubic yard in stream sediment samples.

Recoverable gold values were found in the historical lode and placer gold-bearing drainages of Columbia Glacier, Gold, McAllister, and Mineral Creeks, Miners River, Red Head Beach, and Solomon Gulch.

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Ten drainages, which contain Valdez Group rocks and no reported gold mineralization were found to contain recoverable placer gold. The highest potential for gold mineralization is in the Brown Creek, Cleave Creek, Copper River, tributary to Jack Bay, and Tasnuna River drainages.

Recoverable placer gold values were also present in five drainages that contain gold in stream sediments. A tributary to Port Fidalgo has the highest potential for gold mineralization.

The results of the placer sampling also indicate possible eastern and western extensions of the Valdez mineralized belt through the Tasnuna River, Cleave Creek, and Miners River drainages.

INTRODUCTION

In conjunction with the RARE II Program (Public Law 94-588), the Bureau of Mines (BOM) and U.S. Geological Survey (USGS) are conducting a four-year (1979-1982) mineral appraisal of the Chugach National Forest, Alaska (Figure 1). The Forest encompasses approximately 4.76 million acres. To facilitate the appraisal, the BOM subdivided the Forest into three study areas: PENINSULA, ISLANDS, and SOUND (Figure 2). This report presents the results of placer sampling conducted in the SOUND Study Area during the 1981 field season.

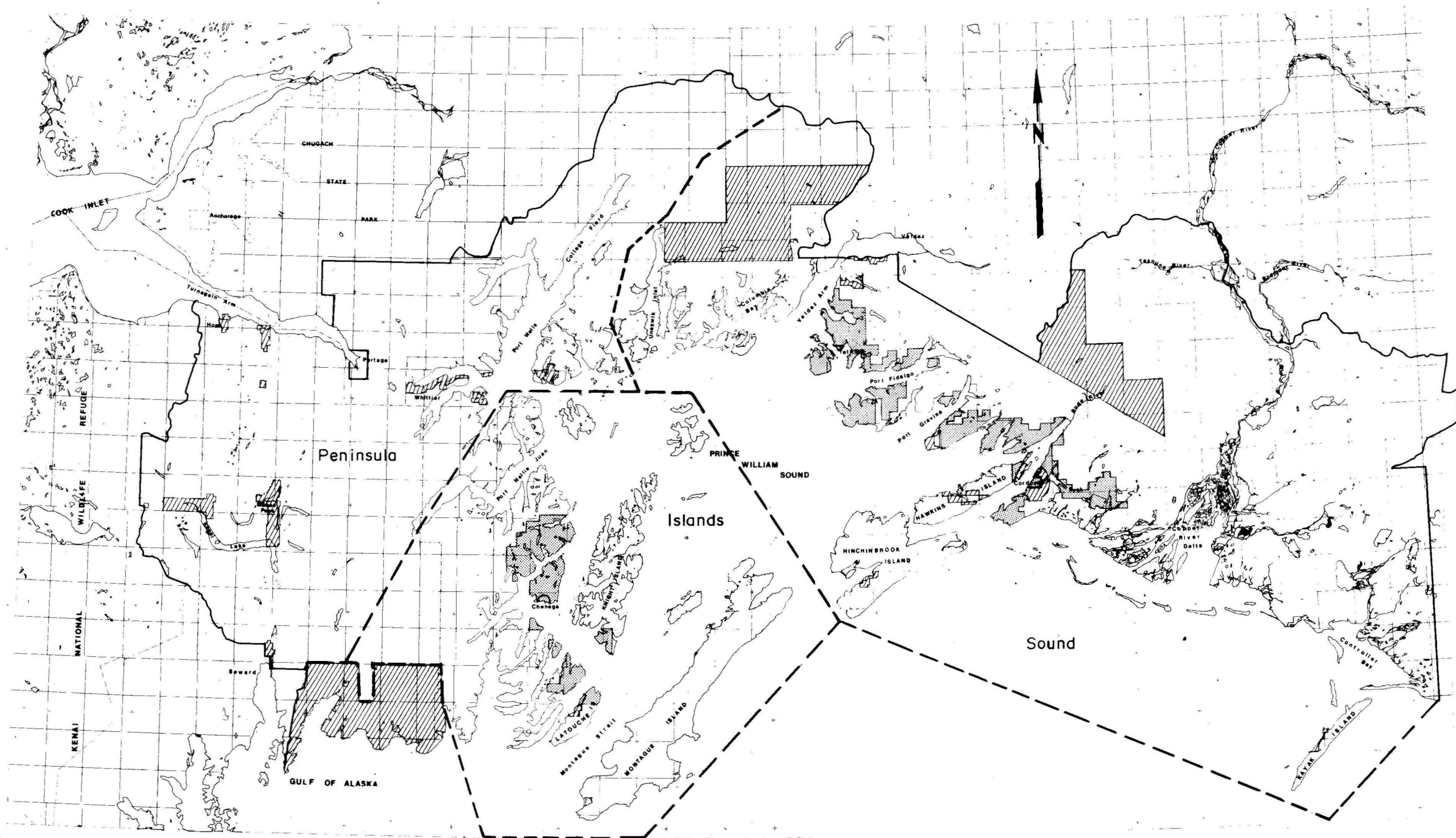
The SOUND Study Area comprises approximately 2.8 million acres and includes the area from Eaglek Bay on the west to Bering Glacier on the east; and Kayak Island on the south to Mt. Siegfried on the north (Figure 3). Included in the study area is the Valdez Mining District. Although a portion of the district is located outside the Forest, it is included in this study because mineral trends may extend into, and similar types of mineralization may be present in the Forest.

Physiography

The study area is characterized by high relief and glaciers. The coast of Prince William Sound is rugged with a typical relief of 1,000 to 3,000 feet. Inland elevations range from 4,000 to 10,000 feet. The mountains are snowcapped. Vegetation along the coast consists primarily of muskeg and spruce forests. Inland vegetation consists primarily of thick growths of alder and birch below 1,500 feet, and alpine tundra above 1,500 feet elevation. Large river drainages, which include the Copper and Tasnuna Rivers, are present in the study area. Most of the drainages, however, are steep, poorly developed, and contain falls and canyons.

Mining History

The earliest recorded attempts to identify mineral resources in the Chugach National Forest were made by Russian explorers in the mid-1800's. Serious mineral prospecting started in 1894, when auriferous gravels were found in the streams of the Valdez area. The Klondike gold discovery in 1896 brought an influx of prospectors into the study area. In 1896 and 1897, oil and gas seeps and coal were located in the Katalla area, and the first lode gold and copper deposits were staked. 1897 through the mid 1920's were the most active mineral exploration and production years for the study area. During this period, mines in the study area produced approximately 25.2 million pounds of copper, 105,823 ounces of gold, 223,423 ounces of silver, and 20,000 tons of coal. The major mines in the area, Ellamar, Schlosser, Midas, and Cliff, and Bering River Coal Co. were developed at this time. These mines were responsible for 90% of the total mineral production in the study area. The Ellamar Mine produced 60% of the copper, 45% of the gold, and 85% of the silver.



Compiled by USDA Forest Service
Chugach National Forest
Anchorage, AK 99511 Source: Maps USGS
Topographic Series, Scale 1:250,000

0 8 16 Miles
0 8 16 24 Kilometers
Scale

- LEGEND**
- National Forest Land
 - State Land
 - Non-National Forest Land
 - Chugach National Forest boundary
 - U.S. B.O.M. Rare II Study Area boundaries

Figure 2. Land Status and BOM Study Area Map - Chugach National Forest, Alaska

The Schlosser and Midas Mines together produced 30% of the copper. The Cliff Mine produced 45% of the gold. The Bering River Coal Co. produced 100% of the coal.

By the mid 1920's, low market prices for copper caused most of the mines in the area to close. A minor revival of gold mining activity occurred when the price of gold rose from \$20.67 to \$35 per ounce in 1934, but most mining activity ceased during World War II. Approximately 8,447 ounces of gold were produced during this time. The Cliff Mine alone produced 7,293 ounces.

Approximately 154,000 barrels of oil were produced from 18 wells in the Katalla field until 1933. In the 1960's and 1970's some oil wells were drilled in the Katalla area, but no economically recoverable oil was found.

Although over 200 mines/prospects exist in the study area, no mining operations are presently active. The coal potential of the Bering River area is currently being examined by private concerns.

Previous Work

The majority of the publically available geologic studies in the SOUND Study Area have been published by the U.S. Geological Survey. F. C. Schrader [57, 58]^{3/} and Becker [3] were the first to describe the geology of the study area in 1898 and 1900. From 1905 to 1910, U. S. Grant, S. Paige, D. F. Higgins, and G. C. Martin studied the geology and mineral deposits of the area [15, 16, 17, 18, 37, 38]. In 1911, Brooks described the geology and distribution of the gold-bearing quartz veins and placers near Valdez [5]. In 1912, Capps and Johnson [6,7] began a study of the geology and ore deposits of the Ellamar district. From

^{3/} Underlined numbers in brackets refer to items listed in the reference section.

1913 to 1919, Johnson continued to study the mineral deposits of the area and reported on these in annual USGS reports [26, 27, 28, 29, 30, 31, 32, 33]. F. H. Moffitt studied the geology and copper deposits of Prince William Sound in the 1920's and 1940's [44, 45, 46]). Plafker and MacNeil [51], dated the Tertiary Orca and Cretaceous Valdez Group by use of fossils in 1964. Plafker [48, 49] studied the tectonic effects of the 1964 Alaska earthquake in the area. Geologic maps of various parts of the study area have been published by the USGS [9, 10, 11, 12, 36, 42, 43, 50, 59, 60, 61, 69, 74, 75, 76]. In the 1970's, the USGS has been studying the possible origins of the rocks of the Orca and Valdez Groups [20, 21, 24, 34, 35, 52, 63, 70, 71, 72]. Winkler, et al. [73], Hawley [19], and Wilse [68], interpreted some of the iron-copper-zinc deposits in the area as being "stratabound" volcanogenic sulfide deposits. Alaska Mineral Resource Assessment Program studies have been and are being conducted of the Seward, Valdez, Cordova, and Anchorage Quadrangles [8, 9, 10, 59, 60, 74, 76].

The Bureau of Mines has conducted various investigations in the SOUND Study Area. The investigations have included examinations of the Blackjack zinc claims, Miners Bay nickel prospect, Ellamar Mine, the copper mines/ prospects around Landlocked Bay, the Fidalgo and Schlosser mine near Port Fidalgo and oil and gas seeps near Katalla [4, 23, 40, 65]. BOM field investigations for the RARE II Program began in 1979. The 1979 investigation was restricted to stream sediment sampling and cursory examinations of mines and prospects [25]. In 1980, more detailed examinations of mines and prospects were conducted.

The Territory of Alaska Department of Mines and the State of Alaska Department of Natural Resources have conducted site specific examinations

in the area [14, 47, 55, 67]. The examinations included mapping and sampling the Four-in-One Mine, A. D. Thompson's property, and Midas Mine.

Land Status

State, private, and Federal lands are present in the SOUND Study Area (Figure 2). State land occurs in and near Valdez and Cordova, near Rude River, Miners River, and Columbia Glacier. Private land occurs around the cities of Valdez and Cordova, along much of the coast, and as isolated groups of patented mining claims. The remaining land is Federally owned and is managed by the U.S. Forest Service.

The Alaska National Interest Lands Conservation Act (P. L. 96-487), of December 1980, almost doubled the size of the SOUND Study Area. The passage of the act closed the additions and opened the previously closed portions of the Chugach National Forest to mineral entry.

Geologic Setting

The general geology of SOUND Study Area is divided into the Cretaceous Valdez and Tertiary Orca Groups, younger Tertiary rocks, and Tertiary intrusive rocks. The Valdez and Orca Groups, which underlie most of the study area, are distributed in two concentric arcs with the former north of the latter. Younger Tertiary rocks are present in the southeastern portion of the area. Intrusive rocks are widely scattered.

The Valdez Group, of Cretaceous age, consists of metasedimentary rocks, with a subordinate quantity of greenstones. The Group is interpreted as being a highly deformed flysch and melange belt, 1,700 km long and up to 100 km wide, that extends along the Gulf of Alaska margin from Chatham Strait to the Kodiak and Shumagin Islands [48, 52, 53]. The

Group is regionally metamorphosed. West of the Copper River, metamorphic grades range from the zeolite to the lower greenschist facies and locally to amphibolite facies [75]. East of the Copper River, the rocks are predominantly epidote-amphibolite- and amphibolite-facies schist, gneiss, and migmatite [75].

The Orca Group, of Tertiary age, consists of metasedimentary rocks and greenstones. The Group is interpreted as being a widespread, very thick, and complexly deformed accretionary sequence of flysch and tholeiitic basalt in fault contact with the southern margin of the Valdez Group [75]. The Orca Group extends from Wingham Island in the eastern portion of the study area to the Kodiak Islands and probably underlies much of the contiguous continental shelf [48]. The thickness is estimated as many thousands of meters [75]. The Group has mostly been metamorphosed to the zeolite or prehnite-pumpellyite facies; however, rocks adjacent to the Contact Fault may be metamorphosed to the greenschist facies [75].

Tertiary rocks, younger than the Orca Group, are present at Kayak Island and east of the Ragged Mountains. These rocks consist of unmetamorphosed siltstones, claystones, shales, sandstones, and basalt. The rocks comprise the Yakataga, Redwood, Poul Creek, Tokun, Kulthieth, and Stillwater Formations, and undivided sedimentary and volcanic rocks. The rocks were deposited on the Orca Group and associated plutonic rocks during periods of marine transgression and regression [75].

Intrusive rocks in the study include: dacite; mafic dikes, plugs, and sills; and granitoid rocks. Dacite of Pliocene (?) age crops out on Kayak Island. Mafic dikes, sills, and plugs have intruded the younger Tertiary rocks. One basaltic dike from Kayak Island has been dated at 31.2 m. y. by potassium-argon methods [75]. Granitoid rocks are comprised of biotite granodiorites, granites, and minor tonalites.

The granitoid rocks are present in the Orca and Valdez terranes. Ages dated by potassium-argon methods, for the intrusive rocks are approximately 50 m.y. [75].

Structurally the rocks in the SOUND Study Area have been complexly folded and faulted. The Valdez and Orca Groups are tightly folded, commonly overturned in various directions and are imbricated along numerous steep-to northward-dipping thrust faults [75]. The structure of the younger Tertiary rocks is less complex than that of the Valdez or Orca Groups. The folds have small amplitudes, are tightly compressed, and are asymmetric or overturned [75].

Two major fault systems are present in the study area. The Contact Fault system consists of northward-dipping reverse faults which separate the Valdez and Orca Groups. The system extends from Mt. St. Elias to Kodiak Island. An unnamed fault system, which separates the Orca Group from the younger Tertiary, consists of low angle reverse faults [62, 63]. Faults within the system are present on the east side of the Ragged Mountains, along Martin River, and on Wingham Island.

Mineral Resources

The Valdez and Orca Groups, and younger Tertiary rocks contain lode and placer gold, copper, zinc, nickel, petroleum, and coal deposits.

The Valdez Group predominantly contains gold mineralization. Gold is present in quartz veins, which are hosted in slates, argillites, and graywackes. In the Valdez area, Johnson [29] identified an east-west trending mineralized belt. The belt trends from Thompson Pass on the east, across Valdez Glacier, Mineral Creek, Gold Creek, and Shoup Glacier, to Columbia Glacier on the west. Bremner River gold deposits, which are

located approximately 60 miles east of Valdez, may be the eastern extension of the mineralized belt. Hoekzema [22] traced a northeast trending mineralized belt for 12 miles on the west side of Unakwik Inlet. Placer gold has also been reported in Gold, McAllister, and Mineral Creeks, Lowe River, Miners River, and Solomon Gulch (Figure 3). Stratabound iron-copper-zinc sulfide mineral deposits, which are spatially associated with greenstones, are also present in Solomon Gulch [73]. Nickel mineralization is associated with a felsic intrusive in the Unakwik Inlet area.

The mineral resources of the Orca Group consist primarily of numerous, mainly stratabound, iron-copper-zinc sulfide deposits [6, 7, 19, 73, 75]. Minor gold mineralization occurs in the Orca Group. Gold has been reported in quartz veins near McKinley Lake, in beach placers at Red Head in Port Gravina, in offshore beach bars of the Copper River Delta, and on Wingham Island [13, 54, 64].

Coal, oil, and gas deposits occur in the younger Tertiary rocks. Coal deposits in the Kulthieth Formation range from a few inches to 60 feet in thickness [1, 2, 56]. Oil and gas seeps occur in the Bering River area [4, 39, 41, 42, 43]. The probable sources for the seeps are carbonaceous shaly horizons in the upper part of the Poul Creek Formation [75].

PRESENT INVESTIGATIONS

The investigation of gold mineralization in the SOUND Study Area started in 1979, and expanded in 1981 with the addition of 1.4 million acres to the study area. The investigation has included literature research, field programs, a geologic evaluation of the controls and environments of gold deposition, and the delineation of areas which have high potentials for gold mineralization.

Literature Research

A literature search has been conducted of: USGS publications, which include a review of historical files in Menlo Park; Bureau of Mines reports, which include MAS files; U.S. Forest Service reports; Territory and State of Alaska reports; and unpublished mining company reports. Mining claim records have been obtained from the State of Alaska Kardex recording system. Files were established for all known mines, claims, and prospects in the study area. The above information and new data obtained by the ongoing BOM and USGS RARE II study have been placed in these files.

Field Programs

In 1981, field investigations of gold mineralization in the SOUND Study Area included placer sampling and examinations of mines and prospects which had not been located in either the 1979 or 1980 field seasons.

Placer sampling was conducted in 80% of the drainage basins which contained either: historical lode gold mines/prospects; historical placer gold mines/prospects; Valdez Group rocks and no reported lode or placer gold mineralization; or anomalous gold values in stream sediment samples. One hundred seven placer samples were taken. At least one placer sample was taken from each drainage basin. Surficial material was sampled in the drainages. Where feasible a 0.1 cubic yard sample of the stream gravels was taken. The sample was processed in the field by using a portable sluicibox and the concentrate was panned to retain only the gold and heavy minerals. Twenty-six of the one hundred seven heavy mineral concentrates, which contained sufficient quantities of recoverable gold (more than 30 gold particles greater than 0.25 mm), were processed

in the BLM Anchorage District Office Placer Lab by panning and amalgamation. The procedures followed are outlined in Wells [66]. Table 1 lists the gold content in the samples. All of the heavy mineral concentrates were saved for atomic absorption analysis to determine their gold, silver, copper, lead, zinc, tin, tungsten, cobalt, nickel, and arsenic contents.

Results

In 1981, twenty-six samples with recoverable gold values were found in drainages which contained either: historical lode gold mines/prospects; historical placer gold mines/prospects; Valdez Group rocks and no reported lode or placer gold mineralization; and gold in stream sediment samples.

The lode gold mines/prospects in the study area are located primarily in the Columbia Glacier, Gold Creek, McAllister Creek, Mineral Creek, Shoup Glacier, and Valdez Glacier drainages. Gold values, based on past production data and current BOM sampling of quartz veins from some lode gold mines and prospects range from 0.03 to 101.49 ounces per ton (Table 2). Recoverable quantities of placer gold, which ranged from 0.0005 to 0.0010 ounces per cubic yard, were found in all of the drainages except those of the Shoup and Valdez Glaciers (Table 1). The Shoup drainage was not placer sampled because the glacier enters Shoup Bay and no gravels were available for sampling.

Historical placer activity has been reported from Gold, McAllister, and Mineral Creeks, Lowe River, Miners River, Red Head Beach, and Solomon Gulch. Placer sampling, in 1981, found recoverable quantities of placer gold, which ranged from 0.0005 to 0.0049 ounces per cubic yard, in all of the streams except Lowe River (Table 2).

Placer samples were taken in drainages that contained Valdez Group rocks and no reported lode or placer gold mineralization. Thirteen samples

contained recoverable gold values from 0.0001 to 0.0280 ounces per cubic yard (Table 1). The highest gold values (0.0190 and 0.0280) were taken from bedrock.

Drainages which contained stream sediments with gold values from 0.0012 to 0.1200 ounces per cubic yard [25] were also placer sampled. Although gold values from 0.0003 to 0.0020 ounces per cubic yard were found in Dead Creek, Mineral Creek, two tributaries to Port Fidalgo, and Solomon Gulch (Table 1), approximately 70% of the drainages with gold values in stream sediments did not contain recoverable placer gold.

SUMMARY

Results of twenty-six out of one hundred seven placer samples taken in the SOUND Study Area during the 1981 field season indicated that historical and potential lode and placer gold-bearing areas can be determined by placer and possibly stream sediment sampling.

Placer samples found gold mineralization in seven historical lode and placer gold-bearing drainages: Columbia Glacier, Gold, McAllister, and Mineral Creeks, Miners River, Red Head Beach, and Solomon Gulch.

Thirteen placer samples delineated potential lode and placer gold mineralization in ten drainages with Valdez Group rocks and no reported lode or placer gold mineralization. Although all of the samples indicate potential gold mineralization in the drainages, the highest potential, which was determined either by large gold particle size (greater than 0.5 mm) or large amounts of gold particles (greater than 100) in the placer samples, is in the Brown Creek, Cleave Creek, Copper River, tributary to Jack Bay, and Tasnuna River drainages.

Placer sampling also found recoverable gold values in five of the drainages, which contained gold in stream sediments. A tributary to Port Fidalgo has the highest potential for gold mineralization, with the exception of the historical lode and placer gold bearing drainages of Mineral Creek and Solomon Gulch.

Placer sampling may have further delineated the eastern extent of the Valdez mineralized belt through the Tasnuna River and Cleave Creek drainages. The presence of placer gold in Miners River may indicate an eastern extension of the mineral belt in Port Wells, which was previously suggested by Hoekzema [22], or a western extension of the Valdez mineralized belt.

RECOMMENDATIONS

Recommendations for additional resource evaluation of the SOUND Study Area after three field seasons should include:

1. Systematic evaluation of the placer potential of Brown and Cleave Creeks, Copper, Miners, and Tasnuna Rivers, a tributary to Jack Bay, some tributaries to Port Fidalgo and Solomon Gulch is warranted. Drilling or small bulk sampling equipment is needed to obtain samples at depth.
2. Exploration for gold-bearing quartz veins within the anomalous drainages is recommended.

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Table 1. 1981 BOM Placer Sample Results, SOUND Study Area,
Chugach National Forest, Alaska

Quad	Drainage	Sample No.	Sample Size (Cu. Yd)	oz/cu. yard	Comments
Valdez A-6	Brown Creek	1898	*3 pans	0.0190	Sample taken on bedrock
Valdez A-3	Cleave Creek	1569	0.1	0.0014	
Valdez A-8	Columbia Glacier	1814	0.1	0.0005	Lg
Cordova C-2	Copper River	1693	0.1	0.0008	
Valdez A-3	Trib. of Copper River	1570	0.1	0.0001	
Cordova D-2	Trib. of Copper River	1576	0.1	0.0009	
Cordova D-2	Trib. of Copper River	1578	0.1	0.0002	
Cordova D-2	Trib. of Copper River	1680	0.1	0.0007	
Cordova D-6	Dead Creek	1639	0.1	0.0007	Gold also in stream sed. samples (0.0012- 0.0022 oz/cu yd)
Valdez A-7	Gold Creek	1742	0.1	0.0005	Sample taken from gravel bench. Pg/Lg
Cordova D-7	Trib. to Jack Bay	1758	0.1	0.0012	
Valdez A-7	McAllister Creek	1739	0.1	0.0010	Pg/Lg
Cordova D-3	McCune Glacier	1574	0.1	0.0006	
Valdez A-7	Mineral Creek	1929	0.33	----	Sample sent to BOM lab in Albany, Ore. Results not yet available. Gold also in stream sed. samples (0.0012 - 0.0075 oz/cu. yd.)Pg/Lg

Table 1. 1981 BOM Placer Sample Results, SOUND Study Area,
Chugach National Forest, Alaska - continued

Quad	Drainage	Sample No.	Sample Size (Cu. Yd)	oz/cu. yard	Comments
Anchorage A2	Miners River	1854	0.1	0.0049	Pg
Cordova D-7	Trib. to Pt. Fidalgo	1596	0.1	0.0004	Gold also in stream sed. samples (0.0012 - 0.0156 oz/cu. yd.)
Cordova D-6	Trib. to Pt. Fidalgo	1599	0.1	0.0007	
Cordova D-6	Trib. to Pt. Fidalgo	1600	0.1	0.0003	Gold also in stream
Cordova D-6	Trib. to Pt. Fidalgo	1635	0.1	0.0020	sed. samples (0.0012 -
Cordova D-6	Trib. to Pt. Fidalgo	1751	0.1	0.0003	0.0075 oz/cu. yd.)
Cordova C-7	Red Head	1516	0.1	0.0002	Pg
Cordova D-7	Solomon Gulch	1808	0.1	0.0008	Gold also in stream sediment sample (0.0057 oz/cu. yd.) Pg
Valdez A-3	Tasnuna River	1677	0.1	0.0003	
Valdez A-4	Trib. to Tasnuna Riv.	1831	0.1	0.0005	
Valdez A-4	Tasnuna River	1835	0.1	0.0008	
Valdez A-4	Tasnuna River	1893	*2 pans	0.0280	Sample taken from bedrock

* oz/cu. yard calculation assumes 160-16 inch pans equals 1 cubic yard

Pg Reported placer gold

Lg Reported lode gold

Table 2. Average Gold Value from Production Data and BOM Sampling for Lode Gold Mines in Selected Drainages in the Valdez Mining District, Alaska

Drainage	Mine	*Average Gold oz/ton Produced	BOM Sample No.	Sample Type	Gold oz/ton
Columbia Glacier	Gold King	1.28	ND	ND	ND
"	Mayfield	1.00	1050	Grab	1.50
"	Ruff and Tuff	0.82	ND	ND	ND
Mineral Creek	Big Four	0.69	1036	Grab	3.78
"	Ethel (Cash)	ND	1058	Grab	0.24
"	Home Group (Quitsch)	1.00	ND	ND	ND
"	Little Giant Group	1.11	1057	Grab	0.36
"	Millionaire	0.72	ND	ND	ND
"	(Hercules) Mountain King	ND	1059	Grab	1.35
Shoup Glacier	Cameron-Johnson	1.30	993	Grab	0.03
Valdez Glacier	Donohue	ND	1930	Grab	101.49
"	Ramsay-Rutherford	0.91	1048	Grab	0.07
"	Rose Johnson	3.27	ND	ND	ND

* Production data taken from Bureau of Mines mine records, Juneau, Alaska.
ND Data not available