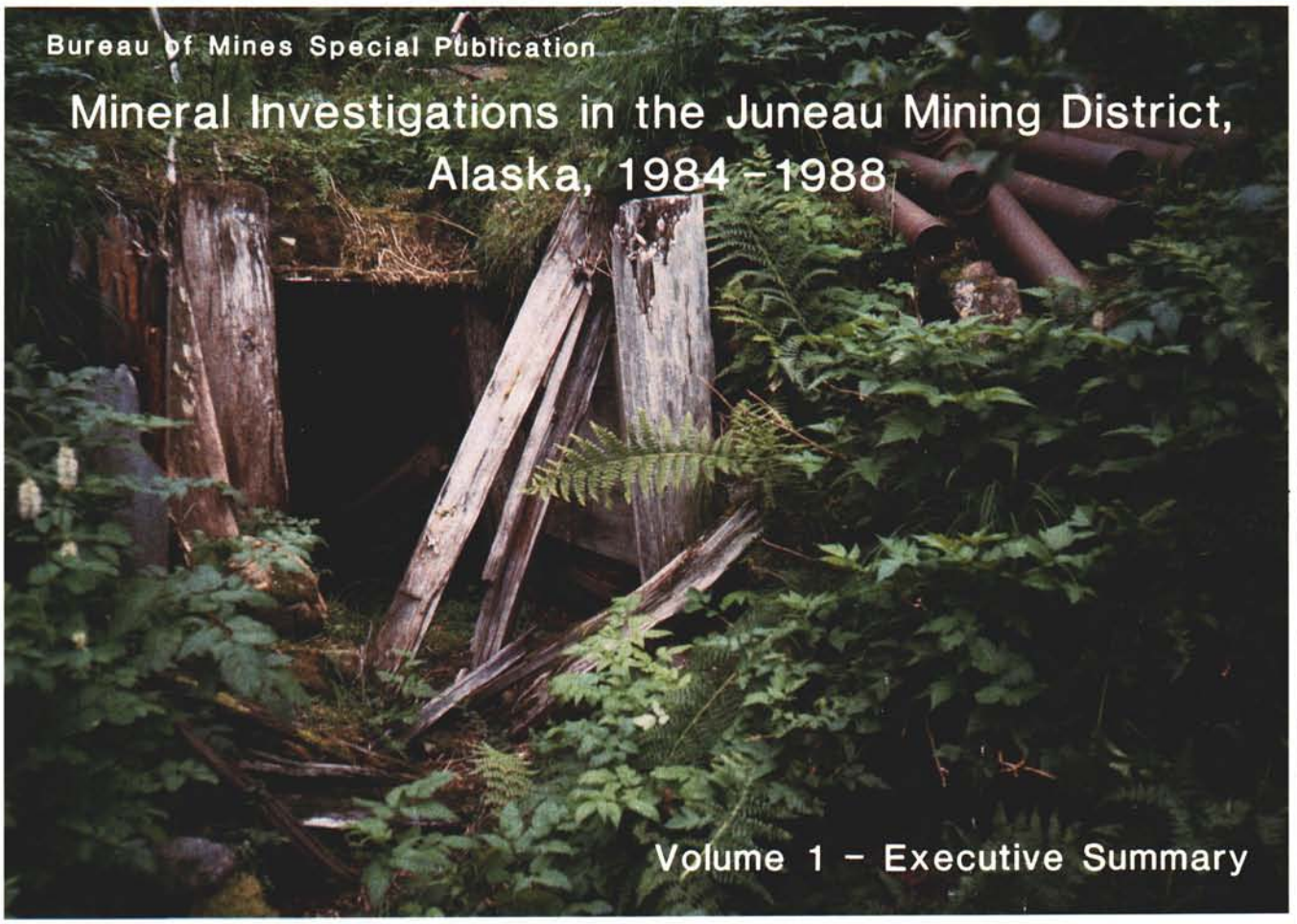
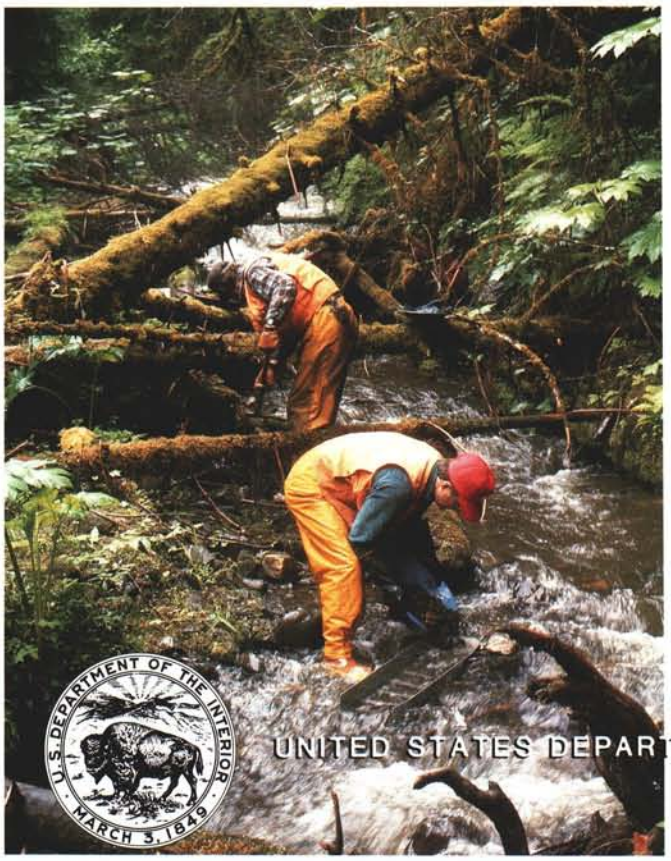
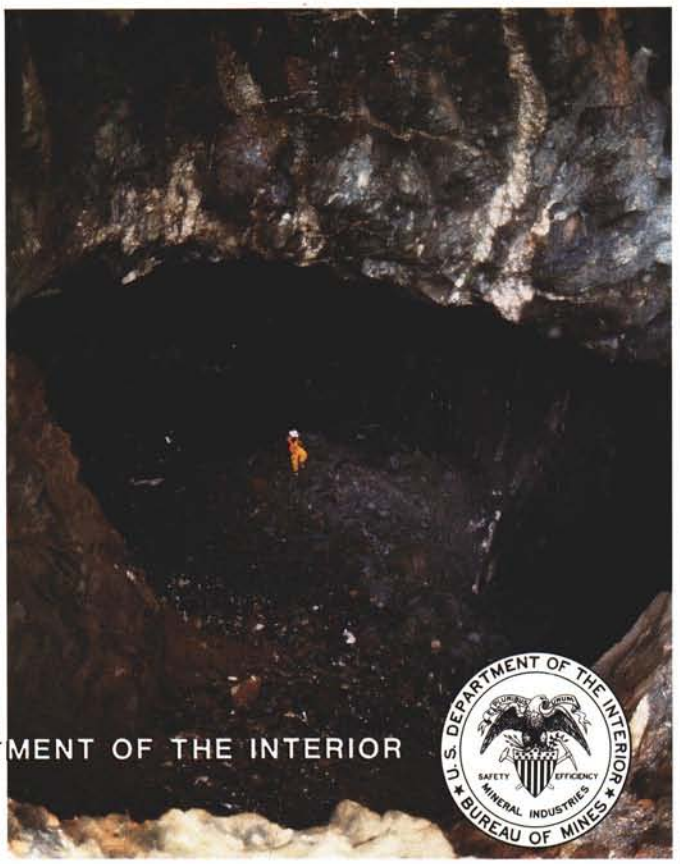
Bureau of Mines Special Publication

Mineral Investigations in the Juneau Mining District, Alaska, 1984 - 1988



Volume 1 - Executive Summary





UNITED STATES DEPARTMENT OF THE INTERIOR

Cover photography: Top – An abandoned portal along Icy Gulch at the '0' level of the Alaska Juneau Mine awaits further reclamation by mother nature.

Lower left – Bureau geologists sampling placer gravels along Windfall Creek, 13 miles N-NW of Juneau, Alaska.

Lower right – This large, cavernous stope at the Ebner Mine produced ore averaging 0.1 oz/ton gold, more than twice the grade from other parts of the Alaska Juneau mineral system.

All cover photos by Earl Redman.

BUREAU OF MINES
MINERAL INVESTIGATIONS IN THE JUNEAU MINING DISTRICT, ALASKA
1984-1988
VOLUME 1. - EXECUTIVE SUMMARY

Special Publication

UNITED STATES DEPARTMENT OF THE INTERIOR

Manuel Lujan, Jr., Secretary

BUREAU OF MINES

T S Ary, Director

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

lb	pound(s)
Ma	million years before present
oz	troy ounce(s)
oz/ton	troy ounces per short ton
oz/yd3	troy ounces per cubic yard
ton	short ton
tons	short tons
yd3	cubic yard(s)

The cities of Juneau and Douglas. At the middle right of the photo are the waste-rock and tailings dump from the Alaska Juneau Mine and the remains of the mill. At the bottom right of the photo are the tailings from the Treadwell mine 300- and 240-stamp mills (Juneau Gold Belt subarea).

BUREAU OF MINES
MINERAL INVESTIGATIONS IN THE JUNEAU MINING DISTRICT, ALASKA

1984-1988

VOLUME 1 - EXECUTIVE SUMMARY

INTRODUCTION

This report is the first in a "final" series of publications on the Juneau Mining District (JMD). This volume summarizes the results of Bureau of Mines (Bureau) investigations in the JMD during the period 1984-1988. Volume 2 consists of a detailed description of Bureau investigations of mineral deposits, prospects, and occurrences. Volume 3 is a report on industrial minerals within the district.

This study has identified and examined more than 300 mines, prospects, and occurrences containing gold, silver, copper, zinc, lead, nickel, cobalt, tungsten, molybdenum, chromium, and PGM. More than 20 of these were discovered during this study. An additional 20 prospects not mentioned in the literature were rediscovered during the JMD study.

The Bureau's work in the JMD was a 4-year study. The objectives of the program were to identify the type, amount, and distribution of mineral deposits in the district, determine ore reserves, study beneficiation technologies for the ore, make feasibility studies, and address economic effects on mineral development. The JMD study was a cooperative effort involving the Bureau and the Alaska Division of Geological and Geophysical Surveys (ADGGS). ADGGS personnel were responsible for geologic studies and mapping of selected areas, while Bureau personnel conducted site-specific examinations.

During the course of the study, more than 14 publications and presentations were prepared in order to report Bureau accomplishments in a timely manner. Most of those reports were area-specific and will be described in the "Highlights of Bureau Work" section of this executive summary.

The JMD, as the name is used in this study, was formally named by Ransome and Kerns in 1954(30)[1]. Its location and the locations of other mining districts in Alaska are based on geographic boundaries (fig. 1). The JMD is bounded by the crest of the Fairweather Range on the west, the Alaska-Canada border on the north and east, and various marine waterways on the south. The waterways include, from west to east: Cross Sound, Icy Strait, Lynn Canal, Stephens Passage, and Tracy Arm. The JMD includes several historical mining areas that have been the sites of past mineral activity. The most famous of these is the Juneau Gold Belt, located near Juneau, Alaska. Another mining area mentioned in literature is the Porcupine placer mining district, located northwest of Haines, Alaska.

[1]**Underlined numbers in parentheses refer to items in the list of references at the end of this report.**

Topography of the JMD is rugged, with elevations ranging from sea level to 15,300 feet at Mount Fairweather. Glaciers have contributed to the formation of most of the landscape features, and are still prevalent in much of the area. Of the 9,900 square miles encompassed by the JMD boundary, 16% is covered by salt water and 28% is covered by ice or permanent snow. The remaining 56% of the area, or approximately 5,600 square miles, is accessible land. Total area above sea level is approximately 8,300 square miles, or 5.3 million acres. The land above timberline, approximately 2,000 feet elevation (this varies greatly with location), is alpine, with little or no vegetation, while the land from sea level to 2,000 feet elevation is blanketed with a dense rain forest. The dominant plant species in the rain forest include the economically valuable Sitka spruce and western hemlock, as well as other plants such as alder, yellow cedar, blueberries, and devil's club. Numerous avalanche chutes and recently deglaciated areas are populated by dense thickets of alder and willow. Poorly-drained areas of muskeg are found in some locations; these areas contain their own unique flora. Population centers in the JMD include Juneau, which is the capital city of Alaska, and the communities of Haines and Skagway. Other settlements include Gustavus, Klukwan, and Excursion Inlet. Transportation between these communities is afforded by a variety of means, described below.

Haines and Skagway are connected to the Alaska Highway network via Alaska Route 7 and Klondike Highway 2, respectively. Land transport to British Columbia, Yukon Territory, interior Alaska, and the conterminous United States is afforded by those routes. Juneau, Gustavus, and Excursion Inlet have no road connection with other communities. Each community has its own road system, as shown in figure 1.

The White Pass and Yukon Route is a narrow-gauge railway that operated between Skagway and Whitehorse, Yukon Territory, between 1900 and 1982. A major reason for the shutdown of the railway was the closure of the Anvil lead-zinc mine in Yukon Territory. Concentrates from that mine had been transported to Skagway via the White Pass and Yukon Route. The mine reopened in June of 1986; however, in the interim Klondike Highway 2 had been constructed, and the Anvil concentrates are now being transported via truck to a terminal at Skagway, where they are put on deep-water vessels for shipment to smelters. The railway resumed operation in 1988 on a limited basis as a tourist attraction.

The communities of Juneau, Haines, and Skagway rely on ferries of the Alaska Marine Highway System for much of their transportation needs, as well as on other marine transport, such as barges. Scheduled air transport serves Juneau International airport, as well as paved strips at Haines, Gustavus, and Skagway. Amphibious and float-equipped aircraft serve all the communities in the JMD, and along with helicopters, provide access to the more remote locations.

Figure 2 shows the major land ownership categories in the JMD. The four major land administrators in the district are the U.S. Forest Service (USFS), the National Park Service (NPS), the U.S. Bureau of Land Management (BLM), and the State of Alaska. The Tongass National Forest covers roughly the eastern half of the JMD, and includes two wilderness areas. The Endicott River Wilderness is included entirely within the JMD, whereas only the northernmost portion of the Tracy Arm-Fords Terror Wilderness occurs within the JMD. Glacier Bay National Park covers the majority of the western half of the JMD, and the remainder, the northern portion, is a mixture of BLM-administered land and State land, and also includes the Klondike Gold Rush National Historical Park.

Not shown on figure 2 are many small areas of Native and private land occurring as inholdings within the larger areas. Also note that the Boroughs of Haines and Juneau include vast tracts of land over which they hold rights of taxation.

The JMD was subdivided into the Glacier Bay, Juneau, and Skagway subdistricts by Ransome and Kerns. However, those subdivisions were not used in the current study; instead, the JMD was divided into the following five geographical subareas:

A. Haines-Klukwan-Porcupine

B. Glacier Bay

C. West Lynn Canal

D. Juneau Gold Belt

E. Coast Range

Details of the JMD work are published in volume 2 of this study in chapters covering the five subareas.

The location of the JMD and its geographic subareas are shown on figure 1. The division of the JMD into 5 subareas was predicated on the professional staff available to do the study, their expertise and experience, the amount of previous Bureau work in some areas of the district, and the logistical considerations inherent in a project covering such a large land area.

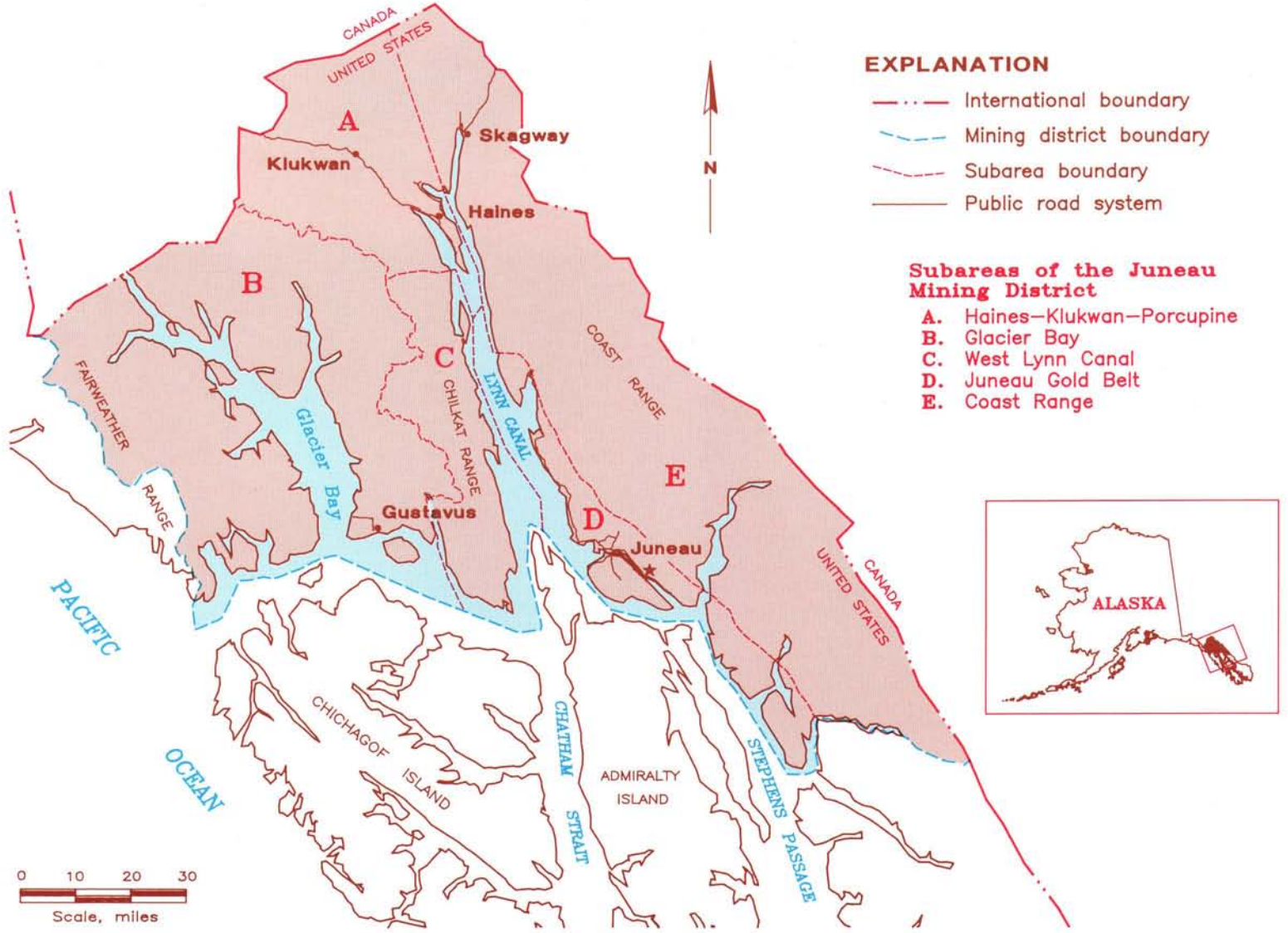


Figure 1. - Map showing location and subareas of the Juneau Mining District.

Mineral concentrates from Faro, Yukon being trucked down the Klondike Highway to the port of Skagway (Coast Range subarea).

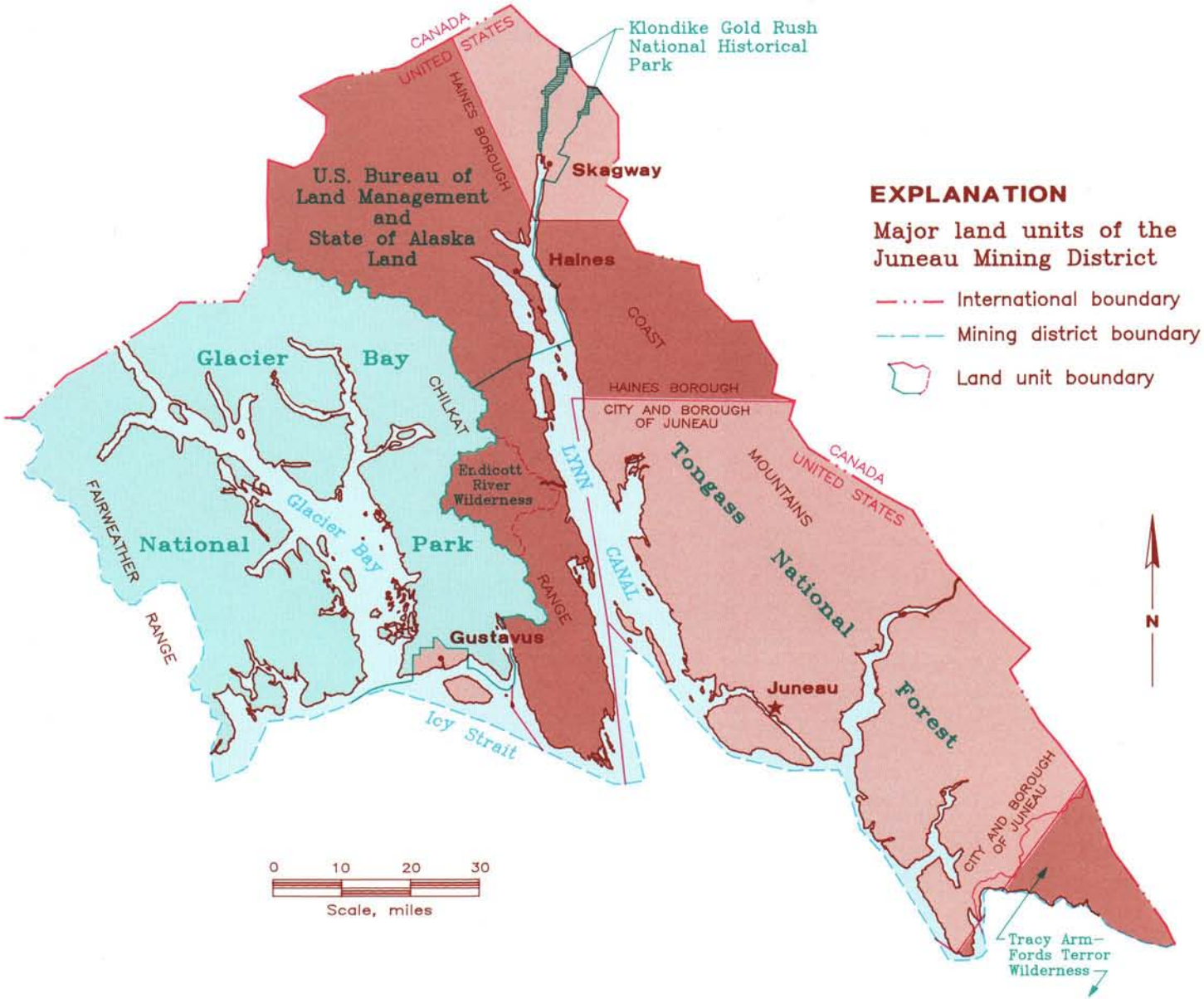


Figure 2. - Map showing major land units within the Juneau Mining District.

ACKNOWLEDGMENTS

Mining companies who cooperated in the JMD study include WGM, Inc., Echo Bay Mines, Ltd., Curator American, Inc., Salisbury and Associates, Newmont Exploration Limited, FMC Gold Co., Falconbridge Limited, BP Minerals America, Stryker Resources Ltd., Hawley Resource Group, Inc., AJT Mining Properties, Inc., Hyak Mining Company, Monument Resources, Regent Alaska, Inc., and others. Independent prospectors who contributed include Dale Henkins, Roger Eichmann, Merrill Palmer, Jim McLaughlin, Jo Jurgeleit, R.C. Manuel, Don LeGrand, and Joan Candy. State and federal agencies who contributed include the ADGGS and U.S. Geological Survey (USGS). The NPS, USFS, City of Haines, Borough of Haines, and City and Borough of Juneau also cooperated in the study, as did personnel from Sealaska Native Regional Corporation. In addition to the work done by the ADGGS, personnel from the Bureau's Salt Lake City Research Center conducted beneficiation tests. The Bureau's Albany and Reno Research Centers were also involved in mineralogical and beneficiation studies. Personnel from the Bureau's Western Field Operations Center, Spokane, Washington, assisted in the industrial minerals portion of the project, and provided mine and mill models for economic evaluation of JMD mineral deposits. Personnel from the Bureau's Minerals Availability Program published the results of economic studies in the JMD(1, 36).

HISTORY

The first recorded gold discoveries near the JMD occurred when placers were found in 1869 in the portion of the Juneau Gold Belt to the south of the district boundary. Joseph Juneau and Richard Harris found placer gold in 1880 at what is now called Gold Creek near present-day Juneau. Their search was aided by natives who showed Juneau and Harris gold they had found in the area. Extensive placer mining took place on Gold Creek, and eventually large low-grade lode gold deposits were discovered, several of which were in production by 1882.

On Douglas Island, across Gastineau Channel from Juneau, the Treadwell mining complex was developed into a world-class underground gold mine by 1887. A disastrous cave-in and subsequent flooding in 1917 permanently closed three of the four mines that made up the complex. The last mine in the complex closed in 1922 after total production of 3.2 million ounces of gold.

The Alaska Juneau Mine resulted from the consolidation of many holdings in the vicinity of Gold Creek. The mine was profitable between 1897 and 1910; in 1914 a large-scale mine and mill were started. After some initial difficulties, the mine operated as a world-class underground mine between 1928 and 1944. Total production exceeded 2.9 million ounces of gold.

The Klondike gold rush in Yukon Territory, starting in 1896, brought a flux of miners through the JMD. During 1898, prospectors working as packers on the Dalton trail, an alternative route to the more famous Chilkoot and White passes, discovered placer gold at Porcupine Creek near present-day Haines. The Porcupine district was the site of considerable placer mining activity between 1898 and 1936, and small operations are currently active.

The Reid Inlet area in present-day Glacier Bay National Park was an active area between 1938 and 1954; several thousand ounces of gold were produced from underground lodes during that period.

Mines in the JMD have produced more than 6.7 million ounces of gold, 3.1 silver, and 45 million pounds of lead. The vast bulk of this production came from the Treadwell and Alaska Juneau mines, both of which were the largest and lowest-grade gold mines in the world while they were active. Figure 3 is a graphic representation of gold production in the JMD. Tables of production from all mines are provided in the "Highlights of Bureau Work" section of this report.

Mineral-oriented studies in the JMD began before the turn of the 20th century. Most of the studies were by the USGS, the Bureau, and by Territorial/State agencies. Locations of published studies are shown in figure 4 , which is cross-referenced to the references section of this executive summary.

Figure 3.

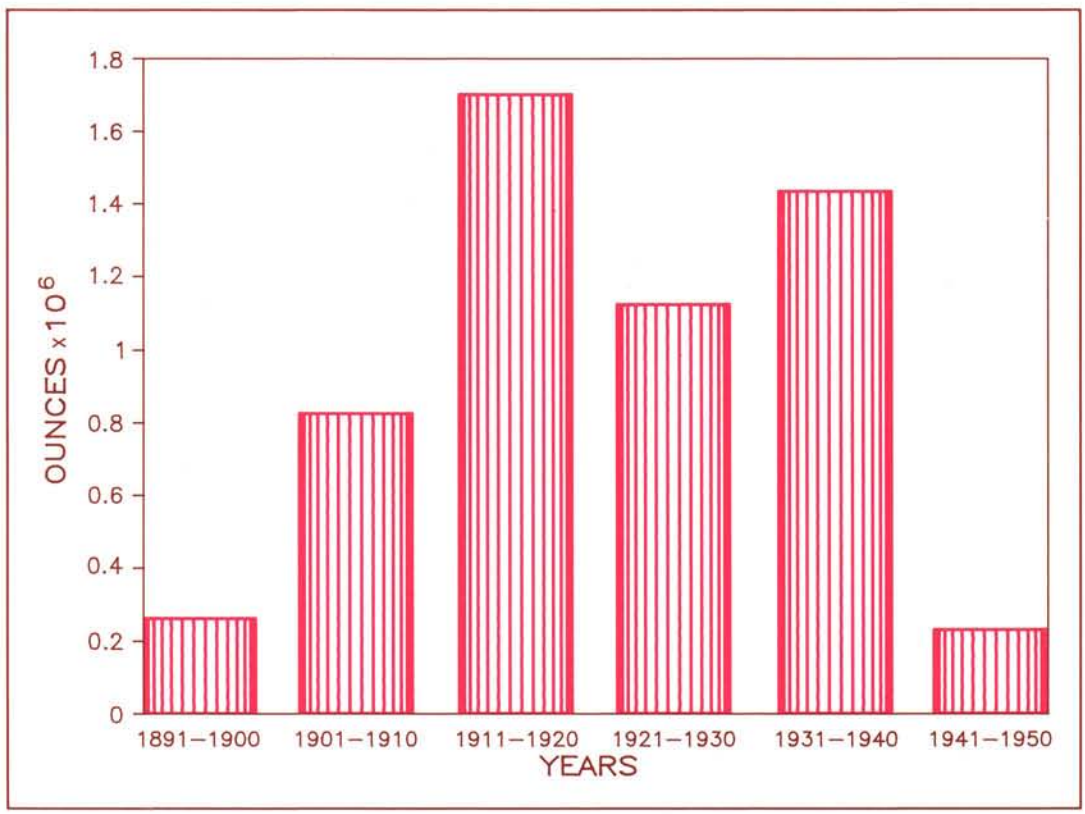


Figure 3. - Graph showing lode gold production from the Juneau Mining District.

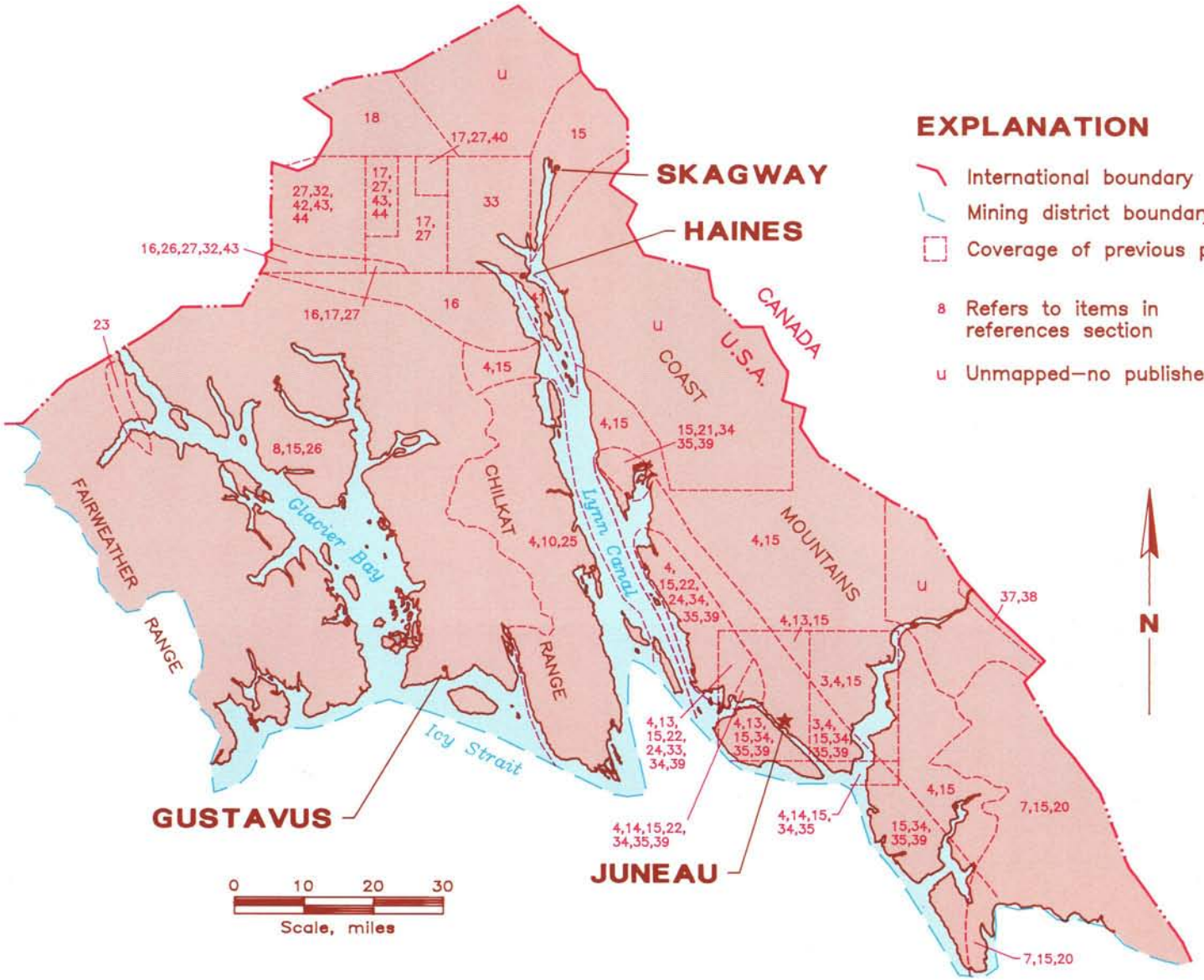


Figure 4. - Map showing previous mineral-related publications in the Juneau Mining District.

RECENT MINERAL ACTIVITY

In the Haines-Klukwan-Porcupine subarea during 1984-1988, Kennecott Exploration Company (now BP Minerals America) drilled the Mount Henry Clay prospect and Newmont Exploration Ltd. drilled the Main deposit and Cap prospect. Falconbridge Ltd. had crews exploring near Klukwan for platinum group metals (PGM). Small placer operations were active in the vicinity of Porcupine Creek.

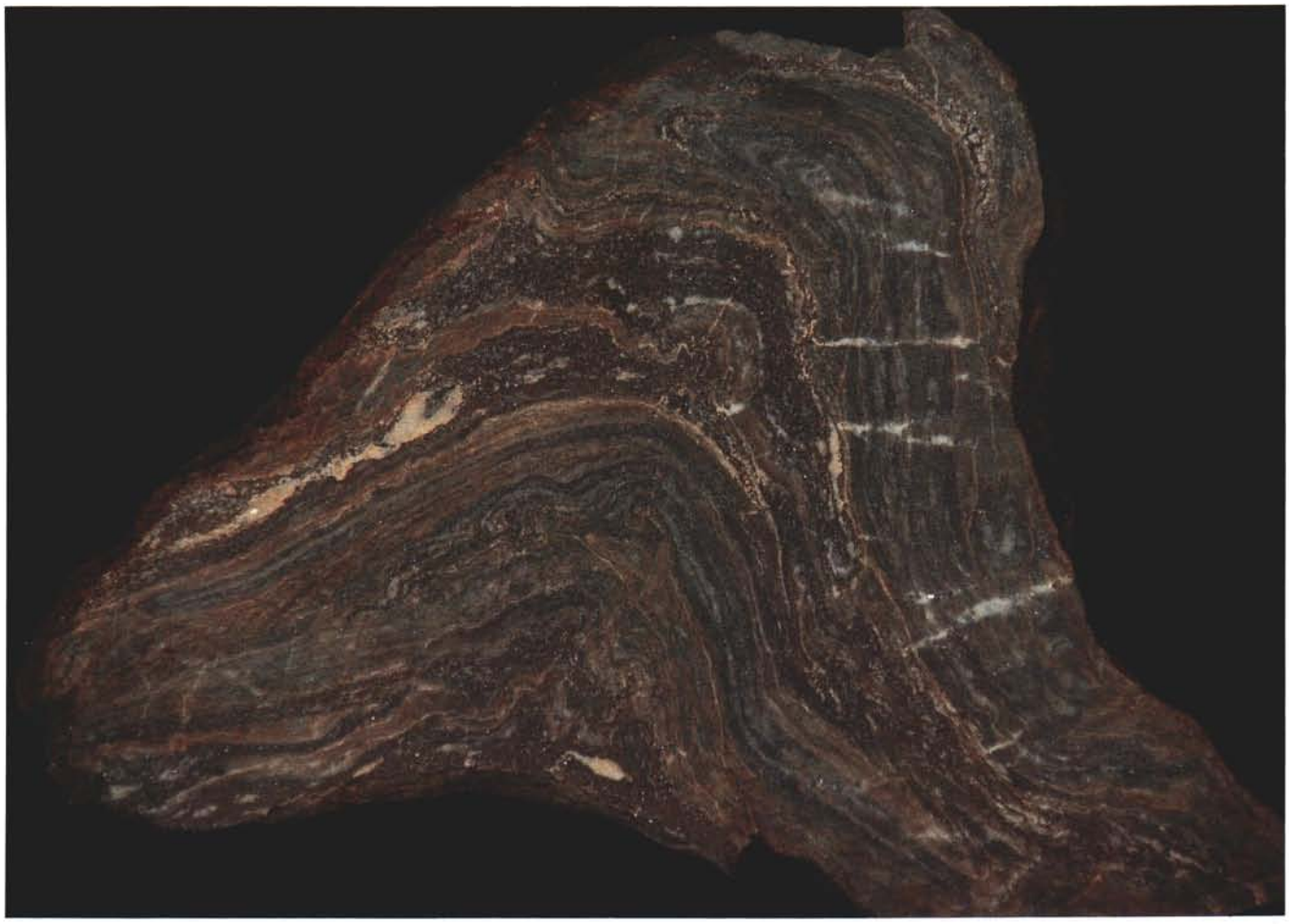
Since the 1987 discovery by the Bureau of significant mineralization in the northern West Lynn Canal subarea (see "Highlights of Bureau Work" subarea summary section) this region has received heavy prospecting and industry attention. Most activity has been in the vicinity of the Dream prospect discovery. In this region Curator American, Inc. has staked over 500 federal mining claims and traced stratiform and strata-bound mineralization for over 2 miles along strike. Salisbury and Associates has also been active with a regional exploration program in the southern and central Chilkat Range.

Since 1984, the Juneau Gold Belt has been of great interest to the mining industry. Barrick Resources and WGM, Inc. gained a lease on the Alaska Juneau and Treadwell properties in 1984. Barrick's portion of the lease was assumed by Echo Bay Mines, Ltd. in 1985 and the new company began an aggressive program to reevaluate the Alaska Juneau Mine. By 1988, the company had reopened the Sheep Creek Tunnel, driven a 2,000-foot decline to connect it with the Alaska Juneau 4-level, collected a bulk sample, done considerable diamond drilling, and initiated engineering studies. In early 1989 they were in the midst of an extensive drilling program to block out 25,000,000 tons of reserves.

Echo Bay Mines, Ltd. is also actively exploring the Kensington Mine and Herbert Glacier prospect. In 1988, Echo Bay, in partnership with Coeur d'Alene Mines, began a 5,300-foot adit at an elevation of 800 feet to undercut the Kensington ore body approximately 1,200 feet below the old Kensington Tunnel and 600 feet below the deepest drill hole. They intersected the ore body in December of 1988 and were drilling to define both upward and lateral extensions. At the Herbert Glacier prospect, Echo Bay drilled the gold-bearing veins in 1986 and 1988.

Another company active in the JMD has been Curator American, Inc., which has been exploring the Jualin Mine and Silver Falls and Gold King prospects. They have extensively drilled the Jualin and plan to drive a decline to test the ore body in 1989. They also examined the Enterprise Mine in 1988.

Other companies recently working in the Juneau Gold Belt have included FMC Gold Co. at Treasury Hill (1987-1988), BP Minerals America on the Alaska Treasure prospect (1988-1989), Houston Oil and Minerals Company in Yankee Basin (1985), Monument Resources at the Bessie and Aurora Borealis Mines (1988), Echo Bay at the Reagan prospect (1988), and Regent Alaska, Inc. on the Alaska Juneau mill tailings dump (1988-1989).



Folded band of massive sphalerite and galena from the Dream prospect (West Lynn Canal subarea).

The new Kensington adit driven by a joint venture of Echo Bay Mines and Couer d'Alene Mines in 1988 (Juneau Gold Belt subarea).

GENERAL GEOLOGY AND MINERAL DEPOSIT TYPES

Most of the effort to understand the geology of the region has been expended by the USGS, except in the Haines-Klukwan-Porcupine subarea where the ADGGS has been active during this study. A general discussion of the geology of the JMD is taken from publications by USGS personnel (**2, 4, 5, 6, 9**), and includes a discussion of the major mineral deposit types in the district.

The JMD is composed of five tectonostratigraphic terranes: 1) the Alexander terrane, including the Craig and Admiralty subterranes, 2) Wrangellia, 3) the Gravina terrane, 4) the Chugach terrane, and 5) the Stikine terrane (fig. 5).

The Alexander terrane dominates the mining district. It is composed predominantly of metamorphosed Paleozoic through Triassic clastic sediments (shale, siltstone, graywacke, and sandstone) and limestone with areas of mafic and felsic volcanic rocks. The units host volcanogenic sulfide deposits and vein deposits.

Wrangellia is restricted to a narrow belt near the western edge of the district. It is composed of Triassic metamorphosed mafic volcanics with some limestone and argillite. Volcanic units in the Johns Hopkins Inlet area of Glacier Bay host volcanogenic massive sulfide bodies.

The Gravina terrane is an overlap assemblage of Jurassic to Cretaceous flysch (argillite and graywacke) with basaltic to andesitic volcanic rocks. The terrane lies unconformably on top of the Alexander terrane and hosts vein deposits and a few volcanogenic massive sulfide horizons.

The Chugach and Stikine terranes bound the west and east sides of the mining district, respectively. The Chugach terrane is composed of Jurassic to Cretaceous graywacke, shale, and mafic volcanic rocks. This terrane has been intruded by mafic/ultramafic plutons which contain the large Brady Glacier nickel-copper deposit. Carboniferous to Jurassic mafic to felsic volcanic rocks with interbedded clastic sedimentary rocks and limestone form the Stikine terrane, which occurs in the Coast Range subarea. The Stikine terrane hosts volcanogenic massive sulfide deposits in nearby areas of British Columbia.

The JMD has also been intruded by plutonic rocks which range in composition from ultramafic to granite and in age from about 114 Ma to possibly as young as 5 Ma. Most plutonic rocks are between 75 Ma and 35 Ma. Skarns, porphyry copper and molybdenum deposits, and magmatic oxide or sulfide deposits are associated with the various plutonic bodies.

Most of the rocks in the JMD, except for rare Tertiary terrestrial clastic rocks, have undergone at least one metamorphic event. Greenschist-grade regional metamorphism has affected almost all of the rocks in the area west of and including the Juneau Gold Belt. In the vicinity of Four Winds Peaks, northwest of Haines, and from the Juneau Gold Belt to the Canadian border, the rocks have been subjected to progressive regional metamorphism. Metamorphic grade increases from lower greenschist on the southwest to amphibolite on the northeast. Extremely high-grade metamorphic rocks exist in the core of the Coast Range plutonic-metamorphic complex.

The district is cut by a number of major strike-slip faults, the most significant of which is the Chatham Strait fault, extending along Lynn Canal, which bisects the mining district. A number of subsidiary faults splay from this major feature.

The terranes in the JMD host a variety of mineral deposit types. The most important of these are vein gold, volcanogenic massive sulfide, polymetallic vein, porphyry, skarn, and magmatic oxide or sulfide. The following deposit descriptions are standardized based in part on the compilation of mineral deposit models by Cox and Singer(11).

The vein gold deposits are mostly low-sulfide gold-quartz veins hosted in regionally metamorphosed volcanic and sedimentary rocks. These deposits, which include the Alaska Juneau, Treadwell, Reid Inlet, and Road Cut, are found in the Alexander and Gravina terranes.

Volcanogenic massive sulfide deposits consist primarily of zinc- and copper-bearing deposits typically hosted in marine volcanic rocks of intermediate to felsic composition or related sediments. These deposits are classified as Kuroko massive sulfides and are found in the Alexander, Wrangellia, and Gravina terranes. Examples are the Main Deposit, Orange Point, Sweetheart Ridge, and Nevada Creek.

The polymetallic vein deposits contain gold- and silver-bearing quartz-carbonate veins with associated base metal sulfides and are related to shallow, felsic intrusives hosted in sedimentary or metamorphic rocks. Such deposits, like the Lost Silver Ledge, are found in the Alexander terrane.

Porphyry deposits consist of copper and/or molybdenum mineralization with gold and occasional tungsten in stockworks, veins, and disseminations hosted in altered felsic intrusive and adjacent country rocks. Three types of porphyry deposits were identified in the JMD: 1) porphyry copper, 2) porphyry copper-molybdenum, and 3) low-fluorine porphyry molybdenum deposits. Copper and copper-molybdenum porphyries are found in the Alexander terrane while low-fluorine porphyries are found in the Alexander and Stikine terranes. Examples are the Mount Ogden, Nunatak molybdenum and Margerie Glacier deposits.

Skarn deposits are composed of copper or zinc with associated gold, silver, and lead hosted in calc-silicate rocks adjacent to plutons. They are found throughout the JMD in all terranes and include the Massive Chalcopyrite, Inspiration , and Clair Bear prospects.

Magmatic oxide or sulfide deposits are associated with mafic-ultramafic complexes and consist of magmatic segregations of iron oxides or nickel-copper sulfides. Cobalt, gold, and PGM are also associated with this deposit type. The mafic-ultramafic complexes are located in two northwest-trending parallel belts that extend the length of the JMD. The western belt contains the Crillon-LaPerouse plutons which host the Brady Glacier nickel-copper deposit. The eastern belt includes the Klukwan and Snettisham iron deposits and the Mount Leland ultramafic body.

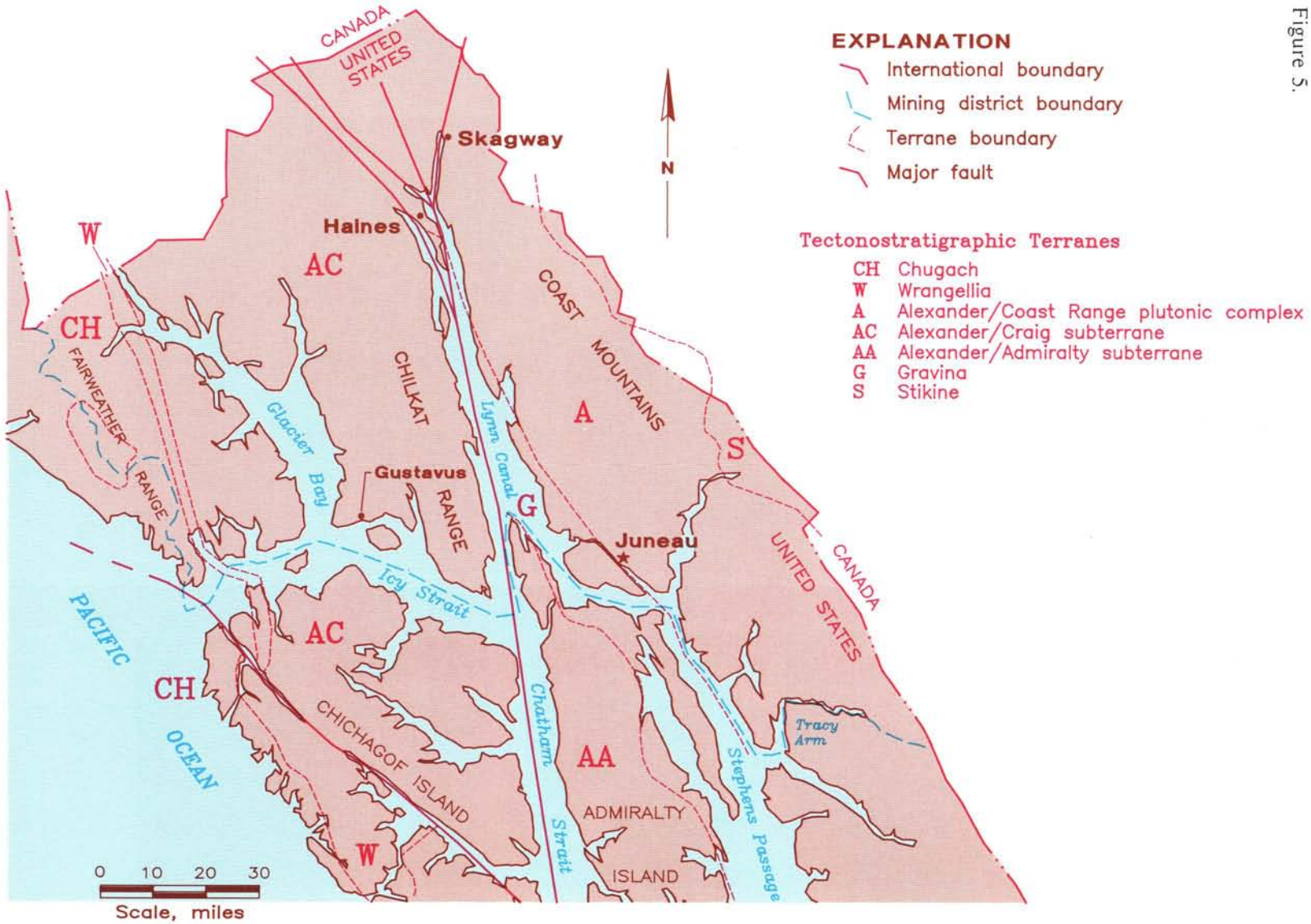
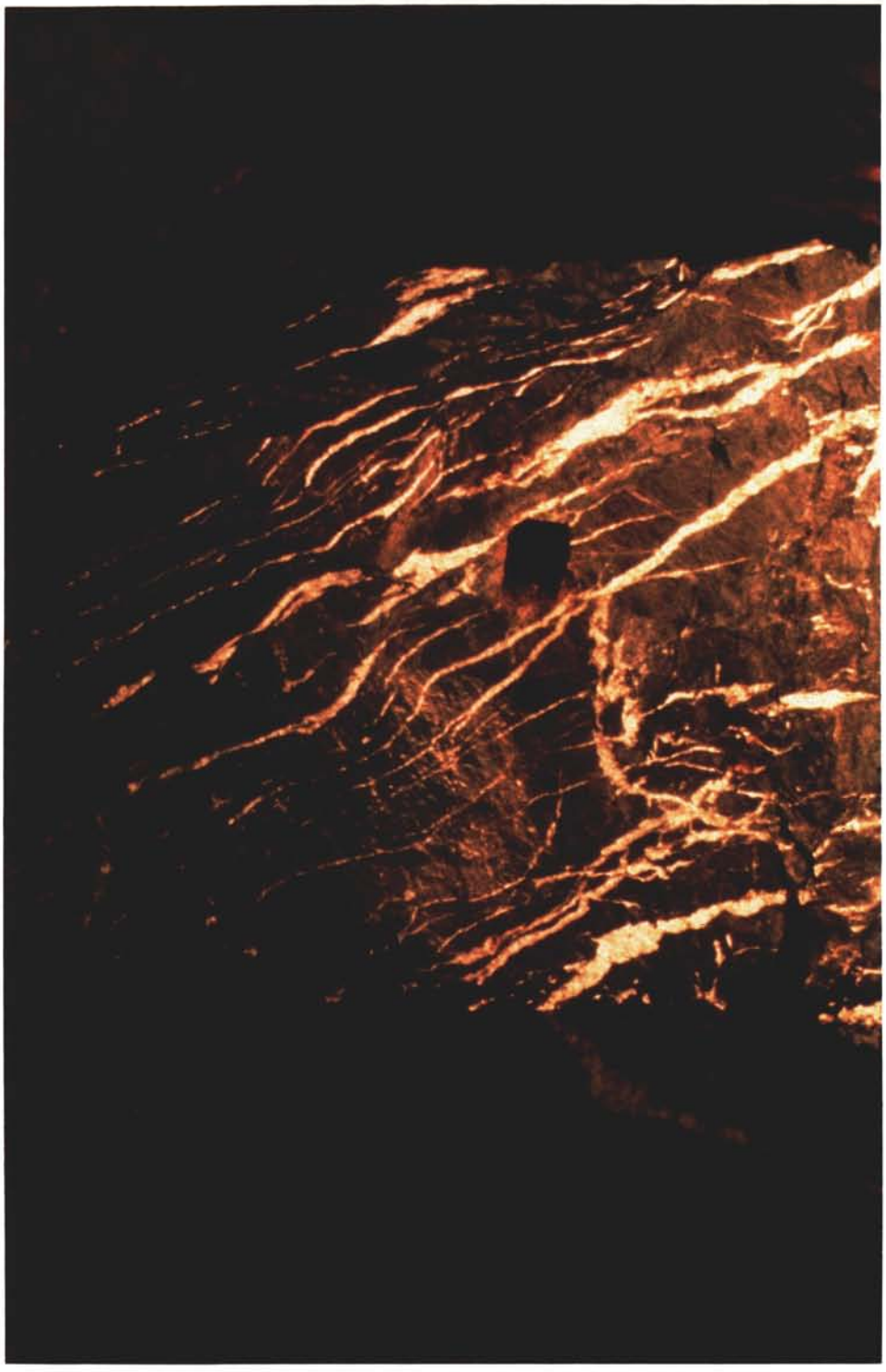


Figure 5. - Map showing geologic setting of the Juneau Mining District.

Figure 5.



Quartz veining in metagabbro exposed in the 1000-stope, Deep North Orebody of the Alaska Juneau Mine. The adit in the center of the photograph is 6 feet high (Juneau Gold Belt subarea).

Examining the Massive Chalcopyrite prospect, a skarn deposit along the contact of marble and diorite (Glacier Bay Subarea).

HIGHLIGHTS OF BUREAU WORK

Industrial Minerals

Bureau investigations in the JMD consisted of a district-wide investigation of industrial materials in addition to site-specific investigations of precious and base metals. The industrial minerals investigation concentrated on the mineral aggregate industry, including compilation of statistics on existing suppliers and evaluation of resources in large areas containing potential resources. Results of the industrial minerals investigation are summarized in table 1. Existing suppliers are listed in the left-hand column and areas of potential resources are listed in the right-hand column. Existing suppliers are located near population centers; map numbers on figure refer to sites containing potential resources.

Table 1. - Identified resources of industrial minerals in the Juneau Mining District

Skagway suppliers	Identified resources	Map No.	Skagway potential sites	Identified resources
H & H Inc.	Not Available	1.	Skagway River	1,600,000 yd3
			E. Fork Skagway River	1,900,000 yd3
Haines suppliers			**Haines potential sites**	
Northern Timber Corp.	1,000,000 yd3	2.	Klehini River	52,000,000 yd3
Heinmiller Pit	200,000 yd3	3.	Tsirku Fan	50,000,000 yd3
Turner Construction	200,000 yd3	4.	Taiyasanka Harbor	1,600,000 yd3
		5.	Takhin River Fan	3,200,000 yd3
		6.	Kicking Horse River Fan	4,800,000 yd3
		7.	Katzehin River	264,000,000 yd3
		8.	Davidson Glacier Outwash	14,500,000 yd3
		9.	Unnamed Outwash	2,400,000 yd3
		10.	Endicott River Fan	9,700,000 yd3
			Gustavus potential sites	
		11.	Gustavus (Salmon River)	7,300,000 yd3
Juneau suppliers			**Juneau potential sites**	
Barana Co.	1,000,000 yd3	12.	East Fork Lace River	100,000,000 yd3
Dwain Reddekopp Inc.	250,000 yd3	13.	Berners Bay Sand	3,200,000 yd3
Hidden Valley Assoc.	600,000 yd3	14.	Antler/Gilkey Rivers	64,000,000 yd3
Fred Honsinger	300,000 yd3	15.	Herbert/Eagle Outwash	60,000,000 yd3
S & S Development Co.	800,000 yd3	16.	Tee Harbor Borrow	390,000 yd3
Hildre Sand and Gravel Co.	375,000 yd3	17.	Dredge Lake	8,000,000 yd3
		18.	Grizzly Bar (Taku Inlet)	60,000,000 yd3
Gastineau Sand and Gravel Inc.	175,000 yd3	19.	Point Hilda	4,800,000 yd3
CBJ-Lemon Creek	400,000 yd3			
Peter Ludwig Pit	900,000 yd3			
DNR-Sheep Creek	160,000 yd3			

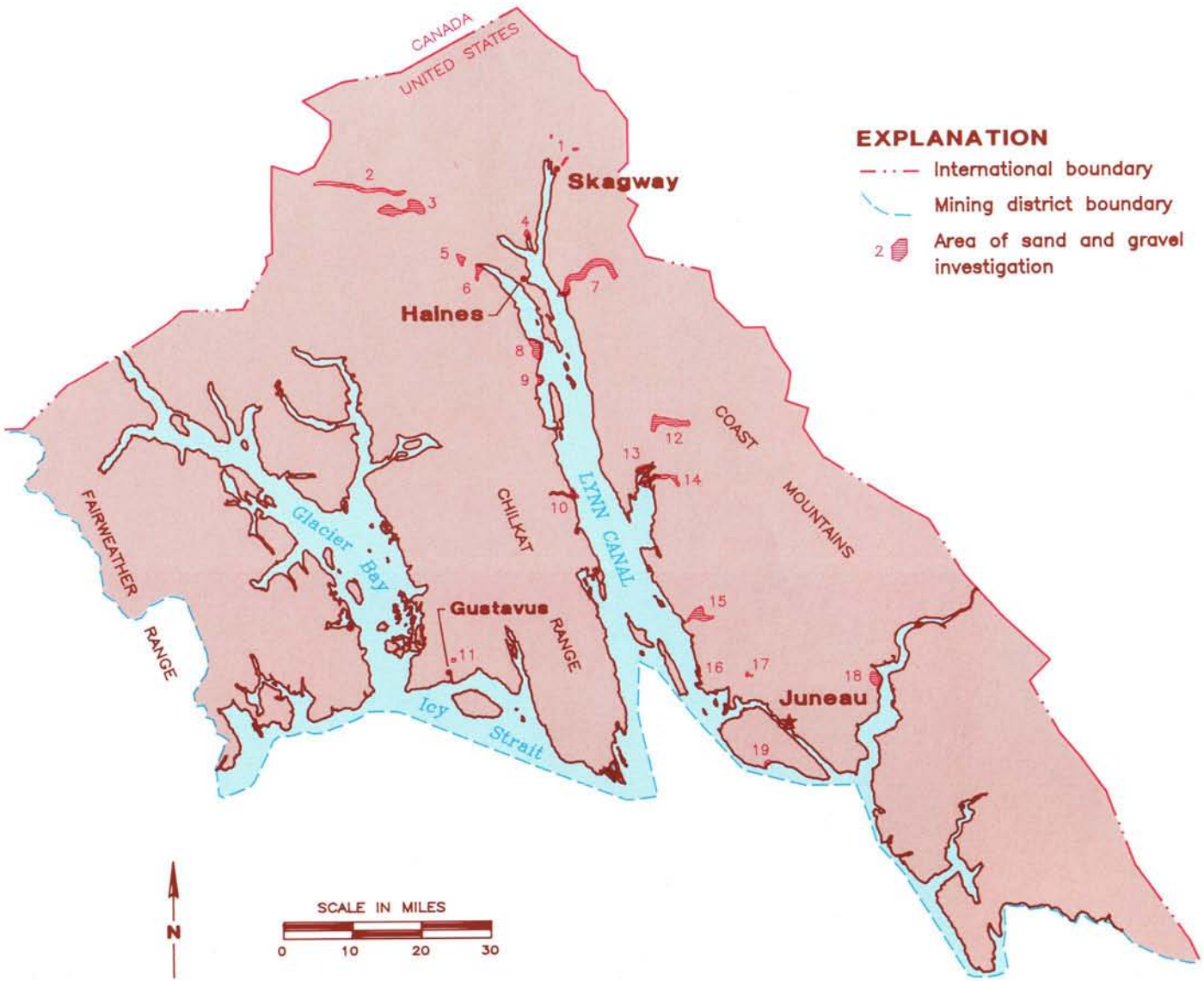


Figure 6. - Map showing industrial minerals locations in the Juneau Mining District.

Bureau personnel sample sand and gravel resources at Lace River as part of the industrial minerals portion of the Juneau Mining District study.

Haines-Klukwan-Porcupine Subarea

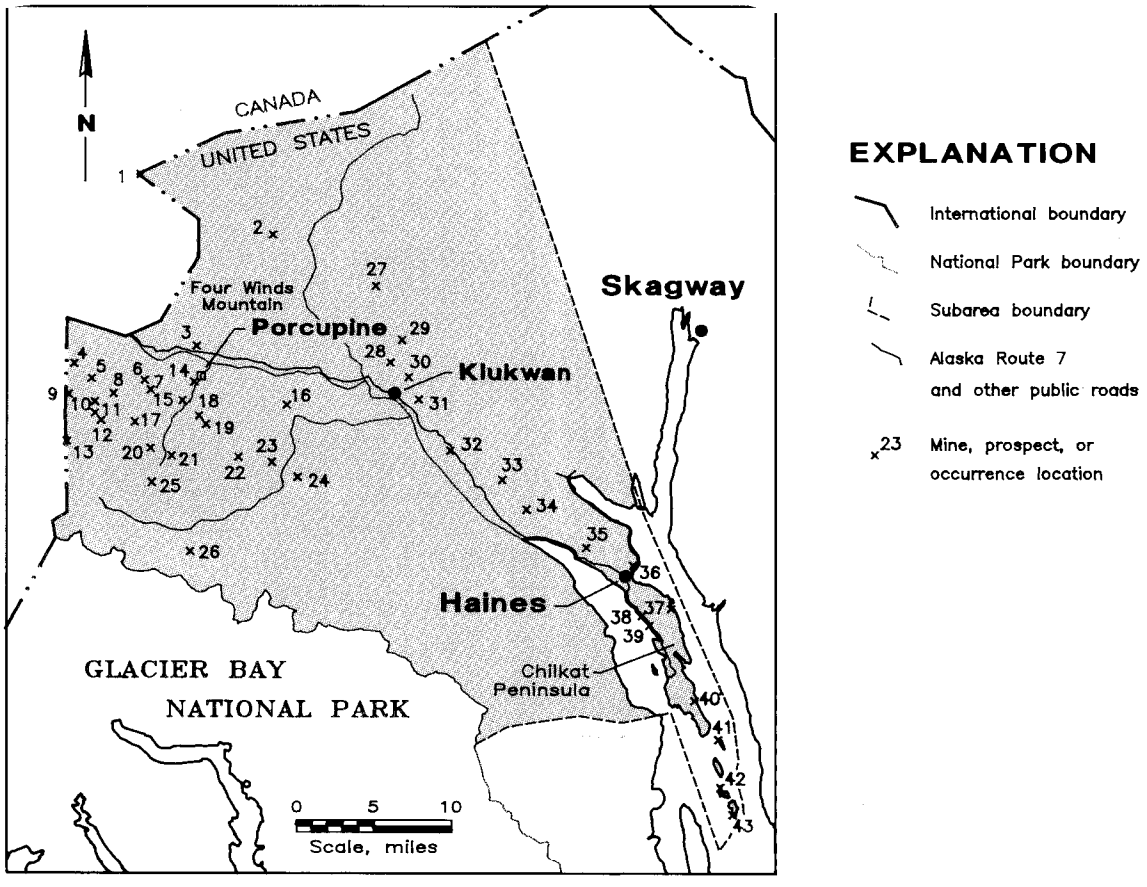
The Haines-Klukwan-Porcupine subarea is located in the northern portion of the JMD west of the Coast Range subarea and consists of the land between the Alaska-Canada boundary to the north and Glacier Bay National Park on the west; the subarea extends south to the Davidson Glacier and includes the Chilkat Peninsula and Islands. This subarea contains a high percentage of State land and was investigated as part of the larger JMD study in a cooperative effort between the ADGGS and the Bureau during 1984 to 1988 (a previous cooperative agreement was in effect during 1983, which was later incorporated into the JMD study). Field work was conducted by foot, boat, truck, and helicopter, and was based out of Juneau, Haines, or field camp.

In the Haines-Klukwan-Porcupine subarea 42 mines, prospects, deposits, and mineral occurrences were examined (see fig. 7 and table 2). Eighteen prospects and mineral occurrences were discovered during this study. A total of 125 diamond drill core, 1,420 rock, 166 stream sediment, 54 pan concentrate, 131 placer, and 10 site-specific metallurgical test samples were collected to evaluate mineralized areas. In their cooperative role, the ADGGS collected an additional 730 rock, 258 stream sediment, and 9 pan concentrate samples. Highlights of Bureau work in the Haines-Klukwan-Porcupine subarea include the discovery and subsequent drilling of the Road Cut vein gold deposit, located 3 miles south of Haines. Because of the high level of interest in the subarea, the continuing presence of the Bureau in ongoing studies, and the cooperative effort by the ADGGS, several reports were written. ADGGS personnel mapped the geology of much of the subarea and conducted geochemical studies (**12, 16, 17, 18, 32**). Bureau personnel examined, mapped, and sampled lode and placer mines, deposits, prospects, and occurrences (**19, 41, 42, 43, 44**). The Bureau also published a report on the economics of mining in the subarea (**1**).

Table 2. - Mineral production and identified resources in the Haines-Klukwan-Porcupine subarea

Map No.	Prospect	Production	Identified Resources
8.	Main Deposit		750,000,000 tons @ 60% barite, 1.73% Zn, and 1.75 oz/ton Ag
14.	Porcupine placers	79,650 oz Au	555,000 yd3 @ >0.005 oz/yd3 Au
28.	Klukwan deposit (lode)		3.5 billion tons @ 16.8% soluble Fe
28.	Klukwan deposit (fan)		990,000,000 tons @ 10.8% soluble Fe
38.	Road Cut prospect		3,000,000 tons @ 0.008 oz/ton Au

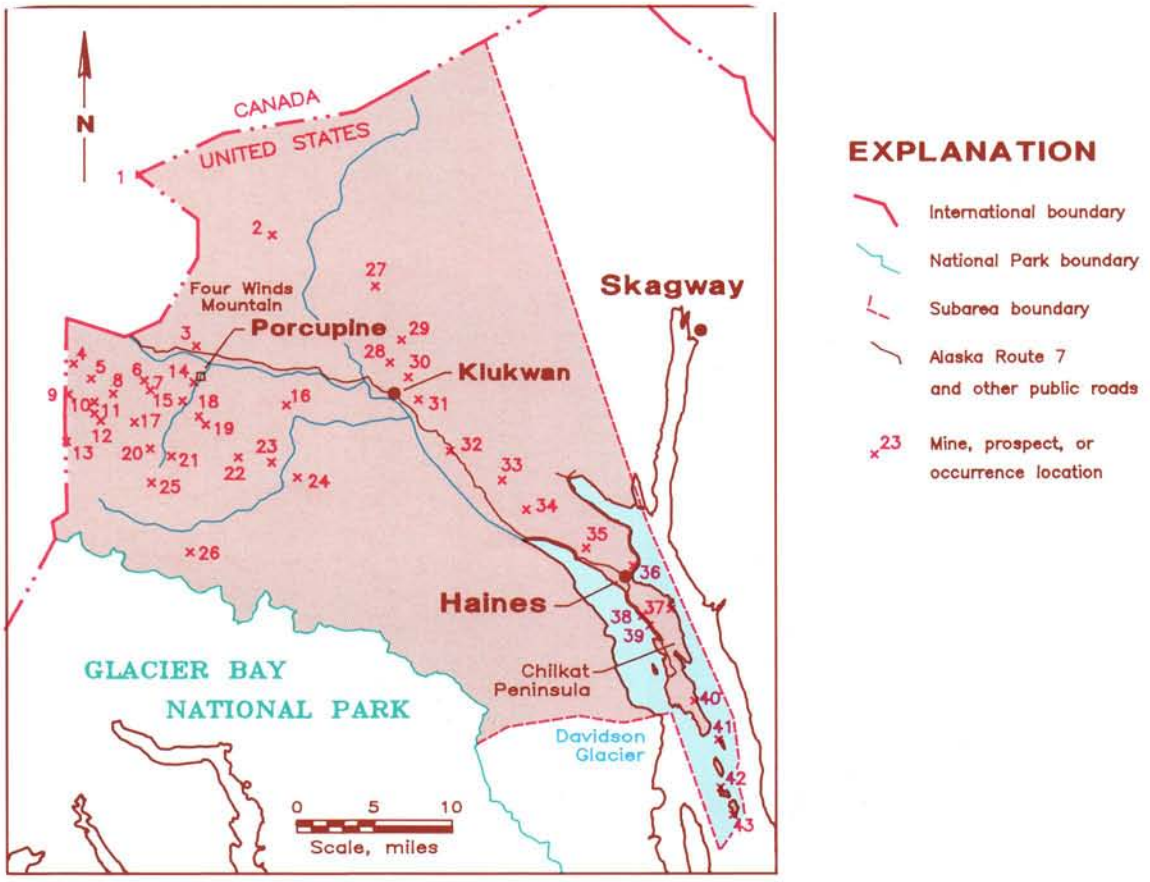
Figure 7.



1. Mount Seltat occurrence Zn, Cu, Pb, Ag
2. Iron Bridge Prospect Cu
3. Big Boulder Quartz Ledge prospect Au
4. Jarvis Glacier Gulches prospect Zn, Cu, Ag
5. Little Jarvis Glacier prospect Zn, Pb, Ag
6. Glacier Creek prospect Au, Ag
7. Wolf Den prospect Au, Ag
8. Main Deposit Au, Ag, Pb, Ba
9. Mount Henry Clay prospect Zn, Ag, Cu, Pb, Ba
10. Hanging Glacier prospect Ag, Zn, Pb, Ba
11. Cap prospect Ag, Ba
12. Nunatak prospect Ag, Zn, Pb, Ba
13. Boundary occurrence Ba, Cu
14. Porcupine Creek placers Au, Ag
15. Annex No. 1 prospect Au
16. Merrill's Silver prospect Ag, Zn, Pb
17. Shannon prospect Au
18. McKinley Creek Falls prospect Au, Zn
19. Golden Eagle prospect Au
20. Clair Bear prospect Cu, Co, Ag
21. Porcupine Roof Pendant occurrence Au, Ag
22. Summit Creek occurrence Zn
23. Lost Silver Ledge prospect Ag, Zn, Pb, Au
24. Tsirku Silver occurrence Ag, Zn, Pb
25. Quartz Swarm prospect Au
26. Le Blondeau skarn and vein occurrences Fe, Cu, Au, Ag, Pb, Zn
27. Goat Hollow North occurrence Cu, Au
28. Klukwan deposit Fe, Ti
29. Goat Hollow occurrence Cu, Au
30. 20 Mile Ridge occurrence Cu, Au
31. 19 Mile Ridge occurrence Cu, Au
32. 15-16 Mile Haines Highway occurrence Au, Ag, Cu, Zn
33. 12 Mile occurrence Au, Cu
34. Chilly occurrence Au, Cu
35. Mount Ripinski occurrence Au, Cu
36. Haines Ultramafic occurrence Fe, Ti
37. Battery Point occurrence Au, Cu
38. Road Cut prospect Au, Ag, Cu
39. Road Cut II prospect Cu, Zn, Au, Ag
40. Zinc Beach occurrence Au, Ag, Zn, Cu, Pb
41. Talsani Island jadeite occurrence Cu
42. Shikosi Island prospect Cu, Zn, Au, Ag
43. Islands Copper occurrence Cu, Zn, Au, Ag

Figure 7. - Map showing mines, prospects, and mineral occurrences in the Haines-Klukwan-Porcupine subarea.

Figure 7.



1. Mount Seltat occurrence Zn, Cu, Pb, Ag
2. Iron Bridge Prospect Cu
3. Big Boulder Quartz Ledge prospect Au
4. Jarvis Glacier Gulches prospect Zn, Cu, Ag
5. Little Jarvis Glacier prospect Zn, Pb, Ag
6. Glacier Creek prospect Au, Ag
7. Wolf Den prospect Au, Ag
8. Main Deposit Au, Ag, Pb, Ba
9. Mount Henry Clay prospect Zn, Ag, Cu, Pb, Ba
10. Hanging Glacier prospect Ag, Zn, Pb, Ba
11. Cap prospect Ag, Ba
12. Nunatak prospect Ag, Zn, Pb, Ba
13. Boundary occurrence Ba, Cu
14. Porcupine Creek placers Au, Ag
15. Annex No. 1 prospect Au
16. Merrill's Silver prospect Ag, Zn, Pb
17. Shannon prospect Au
18. McKinley Creek Falls prospect Au, Zn
19. Golden Eagle prospect Au
20. Clair Bear prospect Cu, Co, Ag
21. Porcupine Roof Pendant occurrence Au, Ag
22. Summit Creek occurrence Zn
23. Lost Silver Ledge prospect Ag, Zn, Pb, Au
24. Tsirku Silver occurrence Ag, Zn, Pb
25. Quartz Swarm prospect Au
26. Le Blondeau skarn and vein occurrences Fe, Cu, Au, Ag, Pb, Zn
27. Goat Hollow North occurrence Cu, Au
28. Klukwan deposit Fe, Ti
29. Goat Hollow occurrence Cu, Au
30. 20 Mile Ridge occurrence Cu, Au
31. 19 Mile Ridge occurrence Cu, Au
32. 15-16 Mile Haines Highway occurrence Au, Ag, Cu, Zn
33. 12 Mile occurrence Au, Cu
34. Chilly occurrence Au, Cu
35. Mount Ripinski occurrence Au, Cu
36. Haines Ultramafic occurrence Fe, Ti
37. Battery Point occurrence Au, Cu
38. Road Cut prospect Au, Ag, Cu
39. Road Cut II prospect Cu, Zn, Au, Ag
40. Zinc Beach occurrence Au, Ag, Zn, Cu, Pb
41. Talsani Island jadeite occurrence Cu
42. Shikosi Island prospect Cu, Zn, Au, Ag
43. Islands Copper occurrence Cu, Zn, Au, Ag

Figure 7. - Map showing mines, prospects, and mineral occurrences in the Haines-Klukwan-Porcupine subarea.

Exposing the vein at the Road Cut prospect (Haines-Klukwan-Porcupine subarea).

Bureau drilling at the Road Cut prospect (Haines-Klukwan-Porcupine subarea).

Bureau and ADGGS personnel at the Mount Henry Clay prospect examine a massive sphalerite-chalcopyrite boulder that measured 6 feet thick (Haines-Klukwan-Porcupine subarea).

Sampling an iron-rich spring above the Tsirku River (Haines-Klukwan-Porcupine subarea).

Glacier Bay Subarea

The Glacier Bay subarea of the JMD lies mostly within Glacier Bay National Park and extends to the western boundary of the district, which is marked by the crest of the Fairweather Range. Glacier Bay National Park has been closed to mineral location since 1976, but mineral deposits and resource potential have been studied in various degrees of detail. Field investigations in the park as part of the JMD study were therefore of limited scope and effort. All work in the park during the JMD study was conducted using helicopter support, and permission was obtained from the NPS prior to any Bureau entry into the Park.

Field investigations as part of the JMD study consisted of two efforts. Several days were spent in the Fairweather Range to obtain two metallurgical test samples of the Brady Glacier nickel-copper prospect (fig. 8, No. 19). A study was also carried out in the Johns Hopkins Inlet area to further define and evaluate massive sulfide mineralization that the Bureau had discovered in 1976 at the Orange Point deposit (fig. 8, No. 8). In the course of Bureau work in the subarea, 99 samples were collected, 17 square miles were mapped, and a geophysical survey was completed. Results of the study were published as an open file report (**23**). The 24 most important mines, prospects, and occurrences in the subarea (132 have been identified) are shown on figure 8. Production history and identified resources are summarized in table 3 .

Table 3. - Mineral production and identified resources in the Glacier Bay subarea

Map No.	Prospect	Production	Identified Resources
2.	Massive Chalcopyrite deposit		4,300 tons @ 0.52% W, 5.0% Cu, 7.0 oz/ton Ag, 0.15 oz/ton Au
3.	Margerie Glacier deposit		160,000,000 tons @ 0.2% Cu, 0.008 oz/ton Au, 0.13 oz/ton Ag, 0.01% W
6.	Nunatak Molybdenum deposit		154,300,000 tons @ 0.04% Mo, 0.02% Cu
8.	Orange Point deposit		270,000 tons @ 2.7% Cu, 5.2% Zn, 0.03 oz/ton Au, 1.0 oz/ton Ag
11.	LeRoy Mine	$250,000 in Au 1938-1950	
12.	Rainbow Mine	(see LeRoy)	
13.	Monarch No. 1 and No. 2 mines	(see LeRoy)	
19.	Brady Glacier deposit		90,000,000 tons @ 0.53% Ni, 0.33% Cu, unspecified Co, PGM

Sampling the Brady Glacier copper-nickel deposit (Glacier Bay subarea).

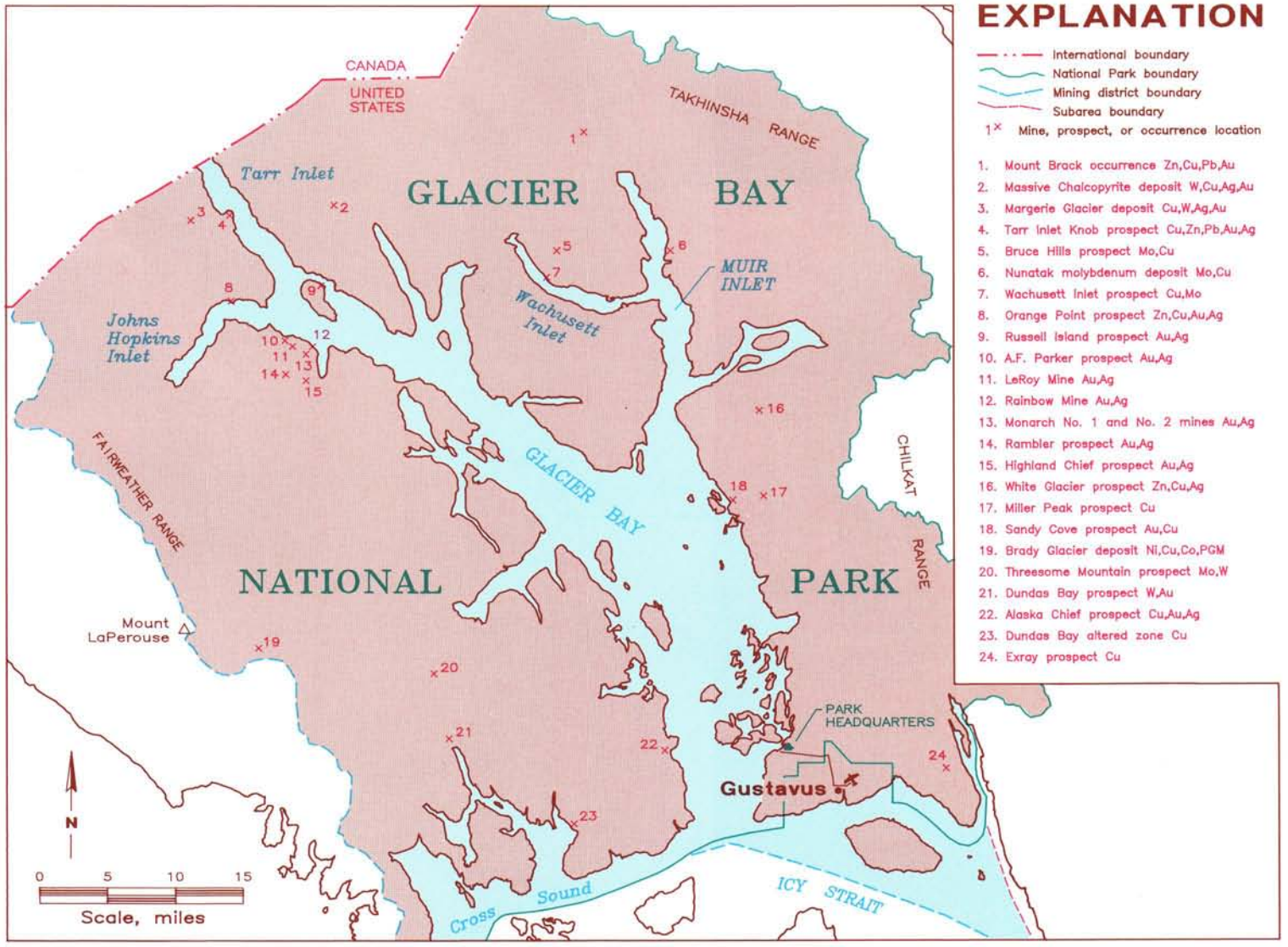
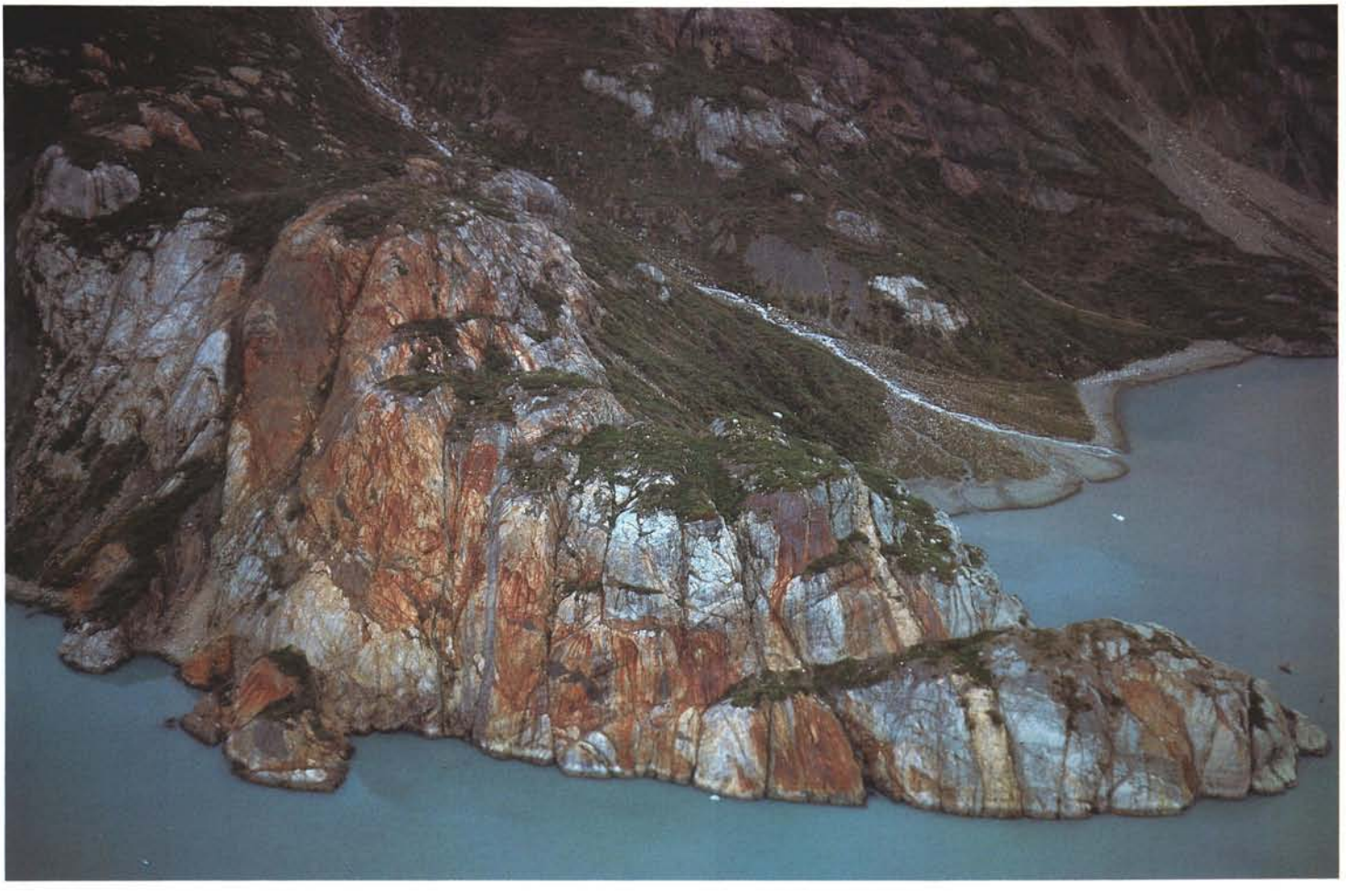


Figure 8. - Map showing mines, prospects, and mineral occurrences in the Glacier Bay subarea.



The Orange Point massive sulfide deposit (Glacier Bay subarea).

West Lynn Canal Subarea

The West Lynn Canal subarea of the JMD is defined by Lynn Canal on the east, Davidson Glacier to the north, Icy Strait to the south, and the Glacier Bay National Park boundary to the west. Approximately 48 ounces of gold and 20 ounces of silver were produced from the Alaska Endicott Mine (fig. 9, No. 11) between 1915 and 1925. A remaining identified resource of 20,000 tons of material at a grade of 0.46% copper was estimated during the JMD study. At the Howard Bay prospect (fig. 9, No. 15), reported production (prior to 1921) was 7 tons at a grade of 44 ounces/ton silver and 0.07 ounces/ton gold. The Bureau investigated the mineral deposits and occurrences of the subarea during 1985-1988. More than 428 samples were taken in the West Lynn Canal subarea. Approximately 2,500 feet of mine workings were mapped and described.

The results of the 1985 and 1986 investigations were compiled into Open File Report 13-88 (**10**). All investigations in the subarea from 1984-1988 are described in volume 2 of this series. Mine and prospect locations are shown in figure 9.

The most significant result of the Bureau's work in the West Lynn Canal subarea was the discovery of volcanogenic massive sulfide and vein mineralization west of Sullivan Island. As a result of a Bureau press release, local prospectors and industry representatives staked the area. Currently more than 500 claims are active, the most numerous being those staked by Curator American as the Dream group (fig. 9, No. 4).

Figure 9.

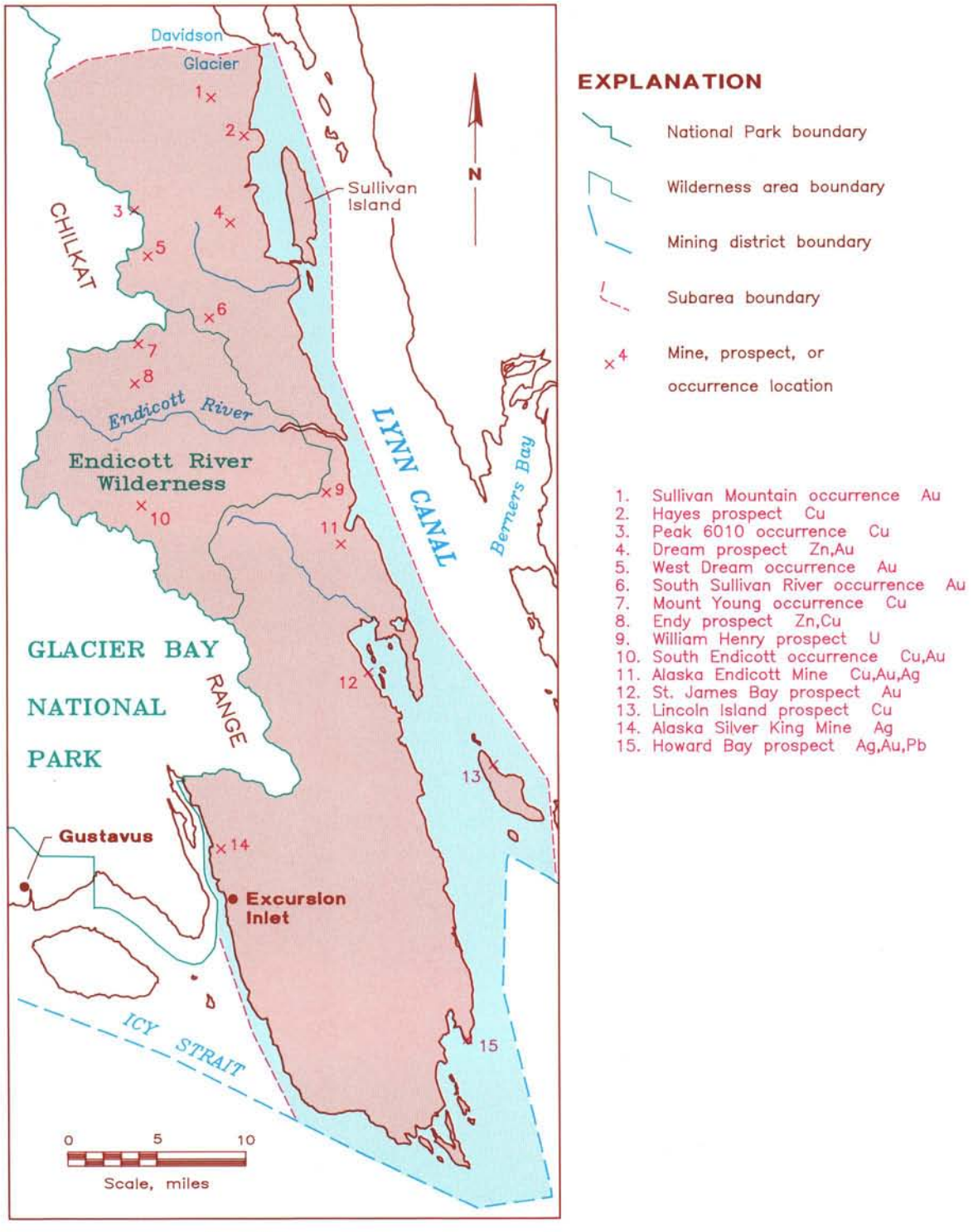
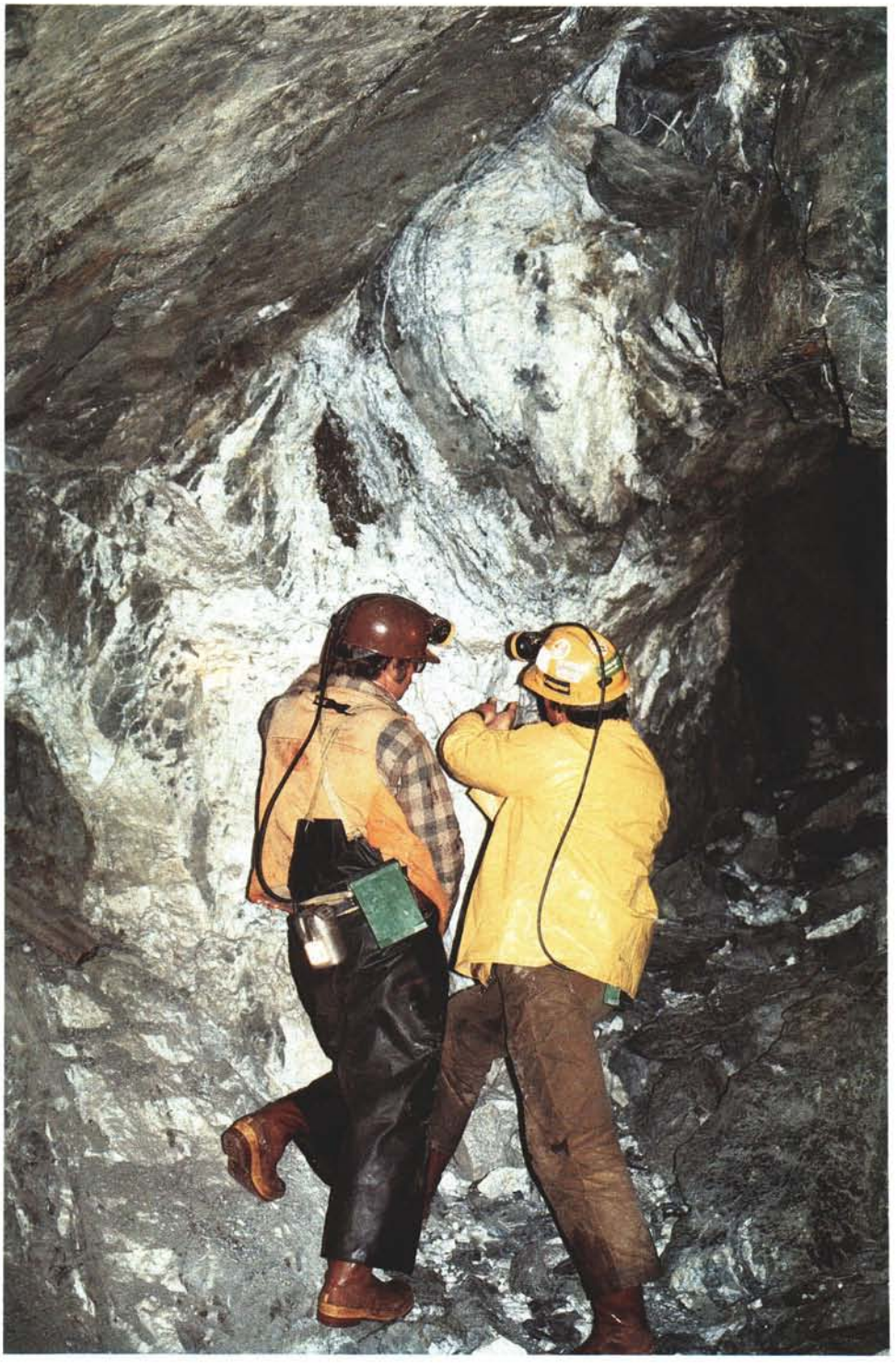


Figure 9. - Map showing mines, prospects, and mineral occurrences in the West Lynn Canal subarea.



Bureau personnel examine the calcite vein at the Alaska Endicott Mine (West Lynn Canal subarea).

Stratiform layers of massive arsenopyrite in volcanic tuffs at the Dream prospect (West Lynn Canal subarea).

Juneau Gold Belt Subarea

The Juneau Gold Belt subarea is composed of a long, narrow, mineralized region along the mainland coast on the east side of Lynn Canal and Stephens Passage. The belt, centered on Juneau and approximately 120 miles long by 10 miles wide, stretches from Berners Bay on the north to Windham Bay on the south. The majority of the belt lies within the JMD; the portion that lies south of Tracy Arm was not investigated during this study.

Access within the Juneau Gold Belt is provided by the Glacier, Thane, and North Douglas Highways, which total 53 miles in length. None of these roads connect with other highway systems. Bureau work in the subarea took advantage of the road system where practical. However, due to the remoteness of many of the mines, prospects, and occurrences, much of the work was accomplished with helicopter support out of Juneau.

During the four years of the JMD study, the Bureau visited 175 mines and prospects within the Juneau Gold Belt. A total of 263 adits and shafts were found and 56,650 feet of underground workings were mapped. The Bureau collected and analyzed 1,557 samples during the study.

Results of Bureau work were published on an interim basis in several open file reports (**24**, **31**, **34**, **35**). A report on the economic feasibility of mining in the Juneau Gold Belt was also published (**36**). Personnel from the Bureau's Salt Lake City Research Center conducted beneficiation tests on samples from the Juneau Gold Belt (**28**). Mines and prospects are summarized in figure 10. Production history and identified resources are summarized in table 4.

In addition to the discovery and rediscovery of several important prospects, perhaps the most significant result of Bureau work in the Juneau Gold Belt was the development of a model for ore control in the Alaska Juneau Mine (fig. 10 , No. 50). Miller and Redman, after three years of field work, developed a model based on the following scenario: Gold-bearing ore fluids were localized near both the upper and lower contacts of metagabbro and black phyllite along the hinge of a moderately southeast-plunging synclinal fold (see fig. 11). Structural preparation was caused by movement of polyharmonic folds extending from the metagabbro near the hinge into the phyllite during the last stages of regional dynamothermal metamorphism. Fractures and open spaces created by this movement trapped the ore fluids above and below the contacts. The metagabbro acted as a barrier to fluid movement; fluids below the contact tended to pond and form smaller, higher-grade ore zones while fluids entrapped near the upper contact formed larger, lower-grade ore zones. The model predicts that ore could exist down-plunge along the fold hinge near both metagabbro-phyllite contacts. Results of the Bureau's work were announced at an international minerals symposium (**29**).

Figure 10.

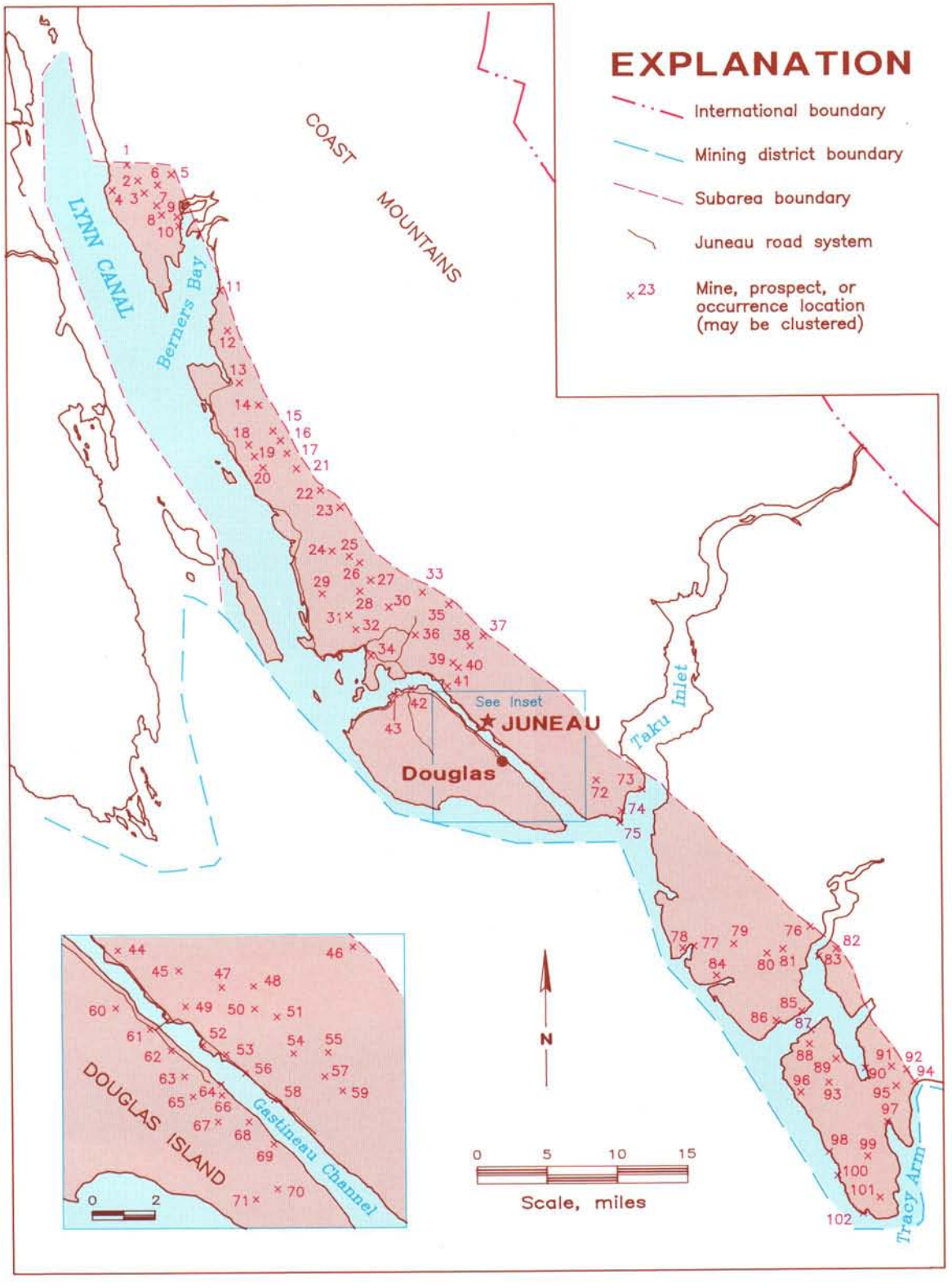


Figure 10. - Map showing mines and prospects in the Juneau Gold Belt subarea.

1. Ivanhoe Mine
   Hope
2. Ophir
   Echo Bay adit
   Horrible Mine
   Mexican
   Eureka
   Kensington Mine
   Johnson Mine
   Kensington Tunnel
   Northern Belle Mine
   Bear Mine
3. Comet Mine
   Seward
   Cumberland
4. Sweeny Creek
5. Greek Boy
6. Gold King
7. Indiana
   Jualin Mine
   Snowslide Gulch
8. Thomas
   Valentine
   Hoggatt Creek
   Fremming
   Berners Tunnel
   Mystery Lode
9. Yankee Boy
10. Johnson Creek
    Johnson Creek placer
11. Berners Bay
12. Tacoma
13. Gold Standard
    California
14. Gillen
15. Blue Jay
    Maude S
    Joyce-Jensen
16. Black Chief
    E Pluribus Unum Mine
17. Julia
    Puzzler
    Cascade
    Noonday
    Dividend
    Rex Mine
18. Aurora Borealis Mine
    Bessie Mine
19. Alaska Washington
20. Mother Lode
21. Eagle River Mine
    Mt. Queen/Westover
22. Mitchell-McPherson
    Herbert Glacier
23. Herbert Group
    Summit/St.Louis
24. Windfall Creek Mine
25. Smith & Heid Mine
26. Montana Basin
    Montana Basin placer
27. McGinnis Creek
28. Montana Creek
29. Peterson Mine
30. Mendenhall
31. Treasury Hill
32. Dull & Stephens
33. Mendenhall Glacier
34. Winn
35. Nugget Creek
36. Dutch Lady
37. Lemon Creek lode
38. Glacier Placer
39. Lemon Creek Placer
40. Clark
41. Doran
42. Bar Placer
43. Rainbow
44. Wagner
45. Goldstein
46. Silver Falls
47. Jeff & Russell
    Humboldt Mine
    Dora Mine
    Ebner Mine
    Middle Basin
48. Reilly
    Republican
    Little Basin Mine
49. Hallum
    April
    Jualpa/Last Chance
    Placer Mine
    Early Bird
    Boston
50. Silver Bow Basin Mine
    Alaska Juneau Mine
    Bridle
51. Martin
    Upper Gold Creek
    Bess
    Solo
    Margarite
    Rubicon
    Perseverance Mine
    Lurvey Placer Mine
    McKinley
    Bull Consolidated
    Ground Hog Mine
    Jumbo
52. Alaska Juneau tails
53. Snowslide Gulch
54. Ascension Mine
    Golconda
    Glacier Mine
    Hartford
    Silver Queen Mine
    Sheep Creek Tunnel
55. Anderson
    Denny
    Alaska Consolidated
    Gould & Curry Mine
56. Cross Bay
57. McCartney
    Reagan
58. Dolan
    Alaska Gastineau tails
59. Gold Belt
    Sheridan
    Middle Peak
60. Douglas Antimony
    New Boston
61. Kowee Creek
    Foster
    Lost Lucy
62. Pansy
    Lawson Creek
63. Great Eastern
    Bear Creek
    Mayflower
    Holeman
    Tyee
    Jumbo
    Skookum Chief
    Douglas Island

64. Bear's Nest
Treadwell tailings
65. Jersey
66. Treadwell Mine
700-Foot Mine
Mexican Mine
Mexico & Belvedere
67. Yakima
68. Ready Bullion Mine
Portland
Mineral Queen
69. Ulela/Alice
Zelda
70. Alaska Treasure
71. Homestake
Mammoth
Red Diamond
72. Alaska Taku
73. Pt. Cooper
74. Penn Alaska
75. Pt. Bishop
76. Bach
77. Taku Chief
Iron Lode
78. Taku placer
Bum Cat
Great Bear
79. Sunrise Canyon
80. AEK
81. Prospect Creek
82. JLC
83. Bogert Point
84. Enterprise Mine
85. Whigg placer
86. Mist Creek
87. Snettisham
Friday Mine
88. Crystal Mine
89. Gilbert Bay
90. Sweetheart Creek
91. Cook
92. Gold Nest
93. Argenta Basin
94. Arm
95. Sweetheart Ridge
96. Anmer Creek
97. Williams Cove
98. Carroll Creek
99. Mapco
100. Boulder Creek
101. South Snettisham Pen.
102. Pt. Coke

Figure 11.

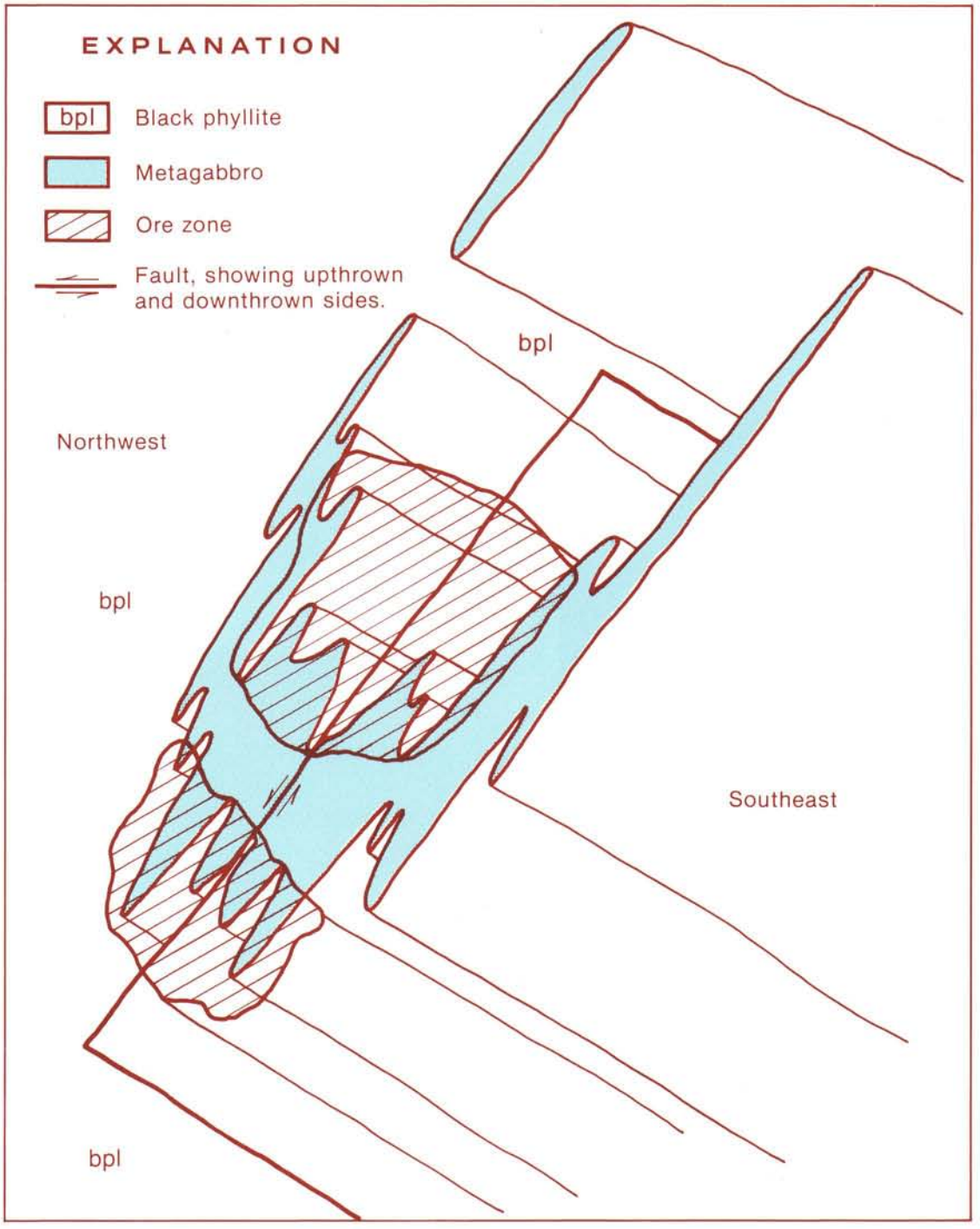


Figure 11. - Diagram showing ore control model for the Alaska Juneau Mine.

Table 4. - Mineral production and identified resources in the Juneau Gold Belt subarea.

Map No.	Prospect	Production	Identified Resources
1.	Ivanhoe Mine	340 oz Au	180,000 tons @ 0.7 oz/ton Au, 0.2 oz/ton Ag
2.	Horrible Mine/Mexican prospect	75 oz Au	130,000 tons @ 0.6 oz/ton Au, 0.22 oz/ton Ag
	Eureka		300,000 tons @ 0.17 oz/ton Au
	Kensington Mine	2,600 oz Au	1,800,000 tons @ 0.24 oz/ton Au
	Johnson Mine		125,000 tons @ 0.11 oz/ton Au
	Northern Belle Mine	940 oz Au	
	Bear Mine	800 oz Au	
3.	Comet Mine	22,485 oz Au	
5.	Greek Boy		100,400 tons @ 0.04 oz/ton Au
7.	Jualin Mine	37,913 oz Au, 12,640 oz Ag	1,060,000 tons @ 0.31 oz/ton Au
9.	Yankee Boy		200,000 tons @ 0.04 oz/ton Au
13.	Gold Standard California		1,000 tons @ 0.12 oz/ton Au
16.	E Pluribus Unum Mine	154 oz Au, 34 oz Ag	135 tons @ 0.3 oz/ton Au
17.	Rex Mine	145 oz Au	
18.	Aurora Borealis Mine	150 oz Au	2,000 tons @ 0.08 oz/ton Au
	Bessie Mine	150 oz Au	19,000 tons @ 0.2 oz/ton Au
19.	Alaska Washington		26,000 tons @ 0.03 oz/ton Au
21.	Eagle River Mine	19,451 oz Au, 8,865 oz Ag	53,100 tons @ 0.28 oz/ton Au
22.	Herbert Glacier		11,340 tons @ 0.86 oz/ton Au
24.	Windfall Creek Mine	249 oz Au	
25.	Smith & Heid Mine	205 oz Au	
26.	Montana Basin	minor	587 tons @ 0.23 oz/ton Au
	Montana Basin placer	minor	8,100 yd3 @ 0.016 oz/yd3 Au
28.	Montana Creek	46 oz Au	
29.	Peterson Mine	211 oz Au, 8 oz Ag	
31.	Treasury Hill	302 oz Au	
32.	Dull & Stephens	32 oz Au	
35.	Nugget Creek	20 oz Au	
37.	Lemon Creek lode	minor	10,000 tons @ 0.3 oz/ton Au, 0.8 oz/ton Ag, 2.9% Zn
39.	Lemon Creek Placer	minor	500,000 yd3 unknown grade

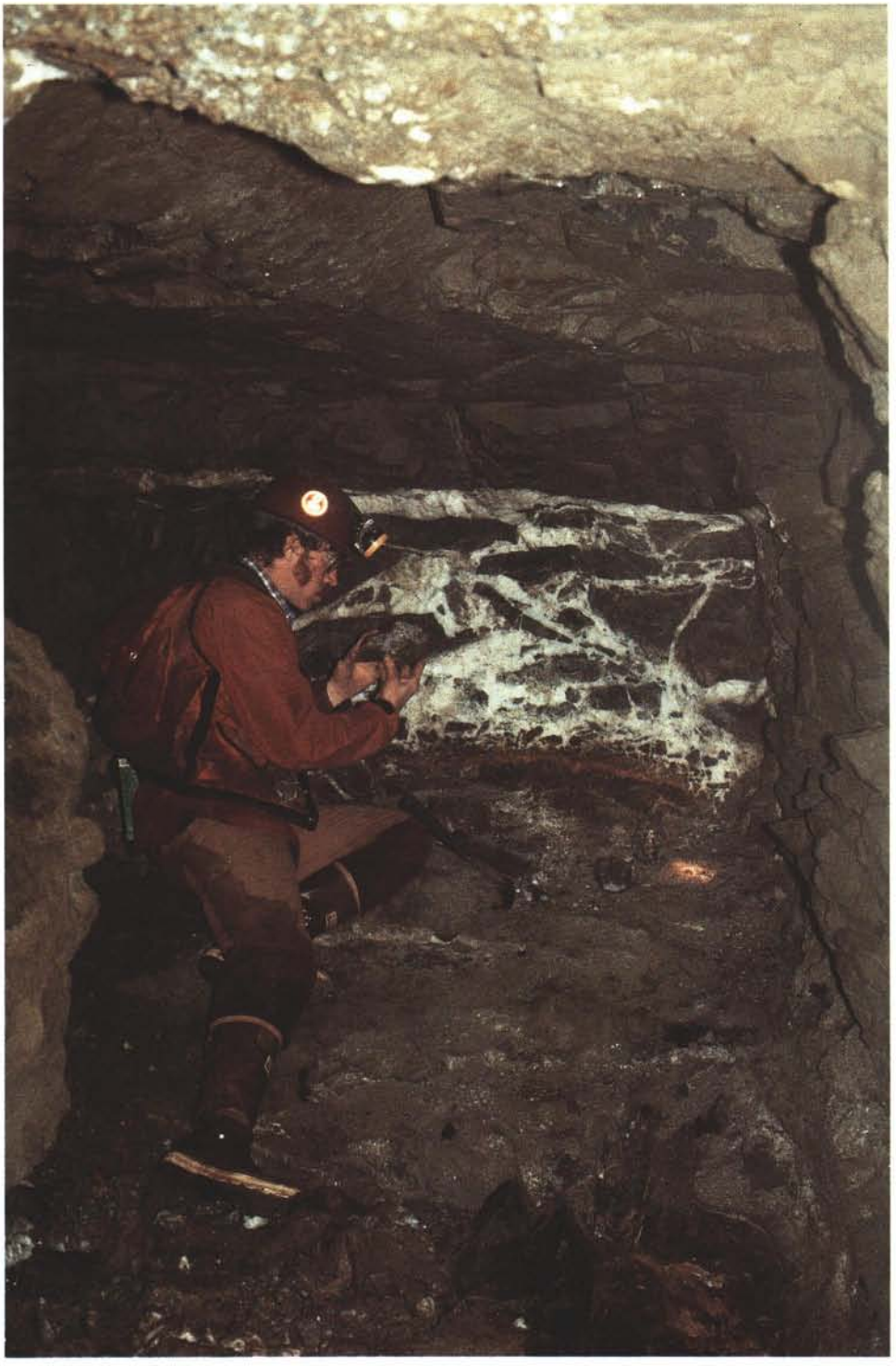
Table 4. - Mineral production and identified resources in the Juneau Gold Belt subarea--Continued.

Map No.	Prospect	Production	Identified Resources
46.	Silver Falls		150,000 tons @ 0.1 oz/ton Au, 2.2 oz/ton Ag
47.	Ebner Mine	32,000 oz Au, 987 oz Ag	300,000 tons @ 0.07 oz/ton Au
48.	Little Basin Mine	2,400 oz Au	
49.	Jualpa/Last Chance Placer Mine	minor	5,700,000 yd3 unknown grade
50.	Silver Bow Basin Mine	26,000 oz Au, 577 oz Ag	4,000,000 yd3 unknown grade
	Alaska Juneau Mine	2,870,000 oz Au, 1,890,000 oz Ag, 40,000,000 lb Pb	28,903,000 tons @ 0.04 oz/ton Au
51.	Rubicon		40,500 tons @ 0.03 oz/ton Au, 2.4 oz/ton Ag
	Perseverance Mine	500,900 oz Au, 482,279 oz Ag, 4,800,000 lb Pb	see Alaska Juneau Mine
	Lurvey Placer Mine	minor	50,000-60,000 yd3 unknown grade
	Ground Hog Mine	150 oz Au	7,700 tons @ 0.9 oz/ton Au, 2.8 oz/ton Ag
52.	Alaska Juneau tails	7,106 oz Au, 1,663 oz Ag, 2,800 lb Pb	47,000,000 tons unknown grade
54.	Ascension Mine	unknown	10,000 tons @ 0.01 oz/ton Au, 3.4 oz/ton Ag
	Glacier Mine/ Silver Queen	$500,000 total Ag, Au(1889-1905)	
55.	Anderson		3,400 tons @ 0.9 oz/ton Ag
	Gould & Curry Mine	1,250 oz Au	4,000 tons @ 0.2 oz/ton Au
57.	Reagan		82,000 tons unknown grade
58.	Alaska Gastineau tails	1,105 oz Au, 273 oz Ag	4,000,000 tons unknown grade
64.	Treadwell tailings	312 oz Au, 12 oz Ag	15,000,000 yd3 @ 0.0003 oz/yd3 Au
66.	Treadwell Mine 700-Foot Mine Mexican Mine Ready Bullion Mine	3,230,000 oz Au, 181,301 oz Ag	3,000,000 tons unknown grade
68.	Mineral Queen		6,000 tons @ 0.27 oz/ton Au, 0.1% Cu, 0.13% Mo

Table 4. - Mineral production and identified resources in the Juneau Gold Belt subarea--Continued.

Map No.	Prospect	Production	Identified Resources
70.	Alaska Treasure	minor	5,600,000 tons @ 0.05 oz/ton Au
84.	Enterprise Mine	100 oz Au	24,600 tons @ 0.23 oz/ton Au
87.	Snettisham		450,000,000 tons @ 19% Fe, 2.6% Ti
	Friday Mine	minor	600 tons @ 0.22 oz/ton Au
88.	Crystal Mine	3,441 oz Au, 204 oz Ag	9,000 tons @ 0.21 oz/ton Au
95.	Sweetheart Ridge		45,000 tons @ 0.22 oz/ton Au, 0.9% Zn, 0.9% Cu, 0.45% Pb

Sampling the Ground Hog Mine (Juneau Gold Belt subarea).



Examining quartz-filled breccia in a thrust fault at the Crystal Mine (Juneau Gold Belt subarea).

Coast Range Subarea

The Coast Range subarea of the JMD is bounded by the Canadian border on the north and east. The northern portion of the subarea lies north of the Juneau Gold Belt subarea, and the southern portion continues to Tracy Arm on the south. Lynn Canal marks the western boundary of the northern portion of the subarea and the Juneau Gold Belt marks the western boundary of the southern portion. The only reported production from the subarea is a shipment of 18 tons at a grade of 3.05 ounces/ton silver from the Inspiration Mine (fig.12 , No. 3). Bureau of Mines work in this subarea was conducted in 1985, 1986, and 1987. Helicopter-supported field activities in the northern portion of the subarea were based out of Skagway; investigations in the southern portion were based out of Juneau. Bureau investigations concentrated on examining mines, prospects and mineral occurrences. Other areas with favorable geology for hosting mineral deposits were also examined, using geochemical anomalies developed by the USGS and others as tools to guide Bureau investigations. The majority of field activities conducted by the Bureau involved brief geologic investigations supplemented by the collection of samples. Mine and prospect workings were mapped and sampled.

During the course of the study, the Bureau visited 15 mines, prospects, and occurrences in the Coast Range subarea (see figure 12). A total of 259 samples were taken. Bureau work in this largely unexplored and rugged area did not produce encouraging results in most cases, although the effort expended was not as great as in other areas of the district. Of interest, however, in the northern portion of the area, are chrome and copper mineralization in the Mount Leland area and gold-bearing veins at the north end of the Kensington area. In the southern area, the major mineral deposit type of interest was porphyry molybdenum. The Bureau visited known occurrences and discovered molybdenum mineralization near Yehring Creek; some additional samples contained encouraging molybdenum values. Detailed results of the Coast Range subarea study were not published in a separate report, but are included in volume 2 of the final JMD study report.

Figure 12.

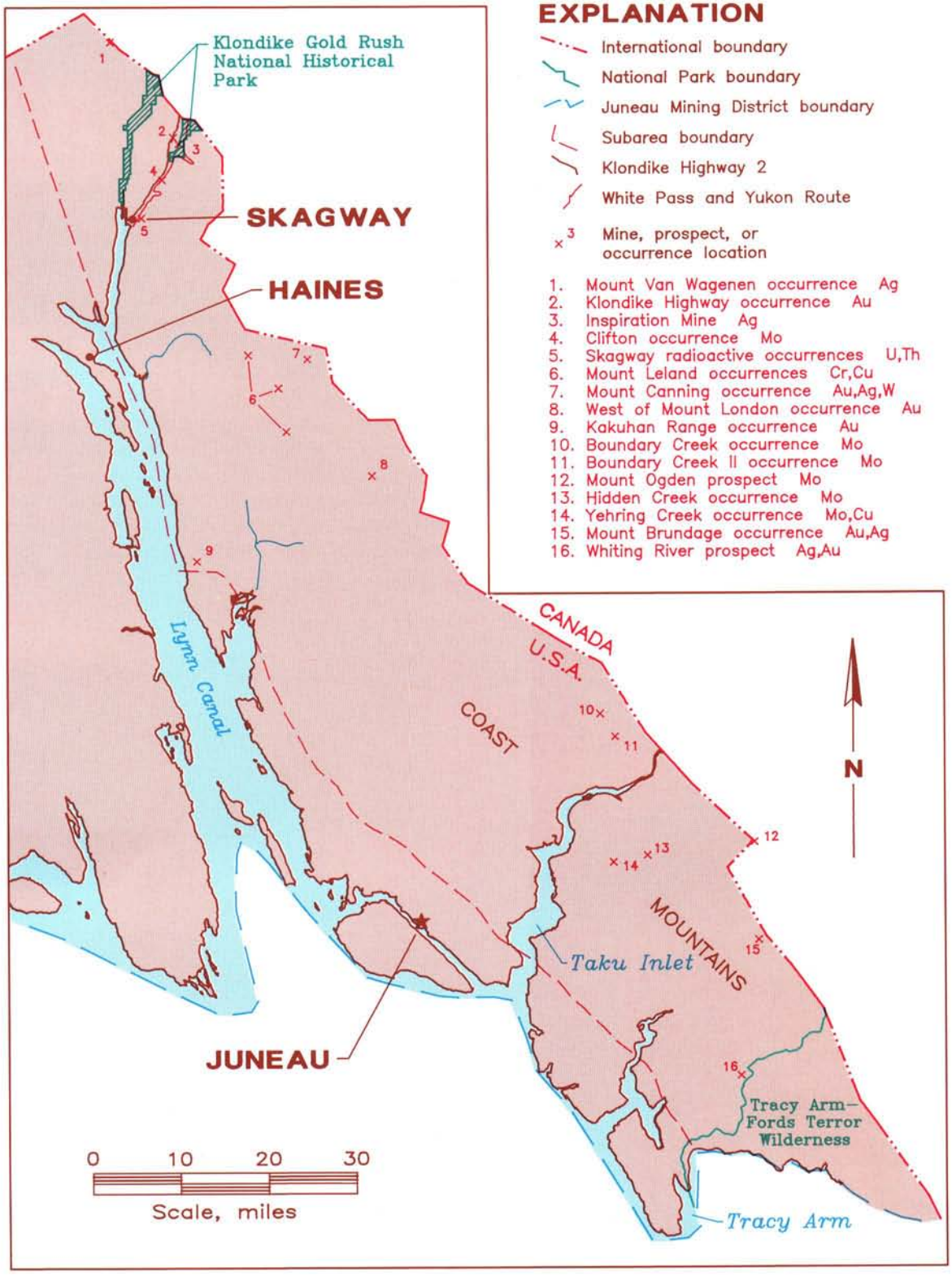


Figure 12. - Map showing mines, prospects and mineral occurrences in the Coast Range subarea.

CONCLUSIONS

This study has identified and examined more than 300 mines, prospects, and occurrences containing gold, silver, copper, zinc, lead, nickel, cobalt, tungsten, molybdenum, chromium, and PGM. More than 20 of these were discovered during this study. An additional 20 prospects not mentioned in the literature were rediscovered during the JMD study.

An up-to-date and complete mineral data base for the JMD did not exist prior to this study. The JMD study, which coincided with a tremendous increase in mineral interest and activity in the region, has proven to be valuable to both the minerals industry and land management agencies. The discovery of new mineral occurrences and compilation of data on known mines, prospects, and occurrences has helped spur industry activity in the region. Compilation of data on industrial minerals provided a much-needed update on remaining resources in the area. The JMD study enabled timely data to be made available to land management agencies. The USFS, Haines Borough, City of Haines, City and Borough of Juneau, and State of Alaska are currently using the results of this study in their planning efforts.

Over one-third of the JMD is covered by Federal or State parks, preserves, or wilderness areas in which mining is prohibited or severely restricted. Based on in-place metal value, approximately 40% of the reserves delineated in this study are in areas closed to mining. An example is the Brady Glacier prospect, which consists of 20 patented mining claims surrounded by National Park Wilderness. This prospect's viability, and the viability of other mineral deposits situated in areas where mining is prohibited or restricted, depends on the responsible consideration of all aspects of land use coupled with consideration for the environment.

Details of studies of the five separate subareas described in this Executive Summary are published in volume 2 of this report.

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