STATE OF ALASKA

Department of Natural Resources

Division of Geological & Geophysical Surveys

MINES & GEOLOGY BULLETIN

Vol. XXVIII | September 1979 | No. 3

P.O. Box 80007 | Published Quarterly | College, Alaska 99708

Jay S. Hammond—Governor | *Robert E. LeResche — Commissioner* | *Ross G. Schaff—State Geologist*

*Pouch M, Juneau, AK 99811** | *941 Dowling Rd, Anchorage, AK 99502** | *3001 Porcupine Drive, Anchorage, Alaska 99501* | *P.O. Box 80007, College, Alaska 99708** | *P.O. Box 7438, Ketchikan, Alaska 99901**

IN THIS ISSUE

**Mining information office.*

Historic gold production in Alaska - A 'minisummary'

By M.S. Robinson[1] and T.K. Bundtzen[2]

Many of the events that have filled Alaskan history during the past century have been interwoven with the lives and dreams of seekers of the precious yellow metal, gold.

Among the fifty states, Alaska ranks in the top four in total gold production. So far, more than 30 million troy ounces of gold have been produced from lode and placer deposits from every corner of the state.

The total production of gold in ounces shown in table 1 is the result of researching a number of sources from both state and federal agencies. They include U.S. Geological Survey Professional Papers, Bulletins, and 'RAMRAP' project reports, U.S. Bureau of Mines data, and compilations by the DGGS and UA Mineral Industry Research Laboratory.

Compiling production figures from individual districts was at times difficult because many previous reports lumped production into regions that included a number of other mining areas. For example, the Fairbanks district totals often included those of the Richardson, Livengood, and Circle precincts. Nevertheless, the 63 camps shown in the figure are those that are believed to have separate and distinctive production and mining histories. Some are known by several names, a few of which are shown in parentheses. The total production figures of all districts are conservative and vary in accuracy.

Early Alaskan Gold

Indians, Eskimos, and Aleuts knew of gold early in Alaska's history and used it and other metals---especially copper---for ornamental beadwork and jewelry as well as some functional purposes such as

[1]Ass't geologist, UA Mineral Industry Research Laboratory.
[2]Mining geologist, DGGS.

pottery, utensils, and weapons. The first Westerners to learn of gold in Alaska were members of a party of Russian-Americans under the direction of Malakoff, who reported gold on the Russian River drainage of the Kenai Peninsula in 1834; no production was reported from these initial discoveries.

Gold was mined near Sitka in the late 1860s and early 1870s, but the first major gold-mining activies in Alaska began in southeastern Alaska near Juneau during the early 1880s. The initial discoveries in the Juneau area were gold placers in the Silver Bow Basin area. Later, large low-grade lode deposits of gold-quartz were discovered on Douglas Island and on the east side of the Gastineau Channel.

Lode Mines

By 1887 the Treadwell mining operation on Douglas Island was one of the largest underground gold mines in the world. When production ceased in 1922, over 3 million ounces of gold had been won from 28.8 million tons of ore. Until a disastrous 1917 cave-in, almost 2,000 miners worked in the four mines within the 4-mile-long lode line.

The Alaska Juneau (AJ) Mine was consolidated in 1893 and remained in almost continuous operation until 1942, when General Closure Order L-208 silenced her mill. At the end of the war, increased operating costs and other pitfalls put an end to any hopes of reopening what was once one of the lowest grade gold mines that ever successfully operated with a profit. During full-scale operations, over 1,000 workers were employed by the AJ. Other mineralized areas were discovered along the coast in southeastern Alaska near Ketchikan and Hyder. Additional discoveries in Prince William Sound, on Chichigof Island, on Prince of Wales Island, on the Kenai Peninsula, and in the Aleutian Islands resulted in significant gold production.

Hard-rock gold mining has taken place at many localities throughout the state. Other mines in the south-central and interior of the state that have produced a significant amount of lode gold include the Independence Mine in the Willow Creek district, the Nabesna Mine of the northern Wrangell Mountains, the Apollo Mine on Unga Island, the Cliff Mine near Valdez, the Nixon Fork Mine near Medfra, the Cleary Hill Mine north of Fairbanks, and the Big Hurrah Mine near Solomon on the Seward Peninsula. Small hard-rock mines scattered throughout the Fairbanks, Yentna, Kantishna, Chandalar, Kenai Peninsula, Ketchikan-Hyder, and Glacier Bay districts also produced a significant amount of gold.

Placers

Interest in gold placers of the Yukon Basin in both Alaska and the Yukon Territory began as early as 1870, when rugged explorers and pioneers ventured into the unknown interior and brought back tales of gold. The first significant strike in Alaska occurred in the Fortymile camp in 1886. Other discoveries made in the region include Circle (1893) and Seventymile (1895). But the gold find that captured the imagination of people from all corners of the globe was the Klondike strike of 1896. After the Klondike rush---there were more than 34 back-to-back mining stampedes in Alaska, including such notable strikes as Koyukuk (1894), Nome (1898), Council (1898), Fairbanks (1902), Innoko (1906), and Iditarod (1909), culminating with the Livengood or (Tolovana) discoveries of 1914.

About two-thirds of Alaskan gold production has come from placer deposits, most of which were located in the vast interior of the state. Here the general absence of extensive late Pleistocene glaciation allowed for long fluvial erosion cycles and the development of extensive heavy mineral placers. Such placers also

Table 1. Historic gold production.

No.	Camp	Production (oz.)[a]	Discovery Date	No.	Camp	Production (oz.)	Discovery Date
1.	Nome	4,051,155	1898	32.	Tolovana	375,000	1914
2.	Solomon	251,000	1899	33.	Fairbanks	7,464,167	1902
3.	Bluff	98,560	1899	34.	Chena (included in Fairbanks production)		1902
4.	Council	705,443	1898	35.	Bonnifield	45,000	1903
5.	Koyuk	87,225	1915	36.	Richardson	95,000	1906
6.	Fairhaven (Candle)	299,890	1901	37.	Circle	730,000	1893
7.	Fairhaven (Inmachuck)	277,000	1900	38.	Woodchopper-Coal Creek (included in Circle production)		
8.	Kougarok	245,000	1900	39.	Seventymile (included in Fortymile production)		
9.	Port Clarence	45,294	1898	40.	Eagle	40,220	1895
10.	Noatak	9,000	1898	41.	Fortymile	415,000	1886
11.	Kobuk (Squirrel River)	7,000	1909	42.	Valdez Creek	37,000	1903
12.	Kobuk (Shungnak)	15,000	1898	43.	Delta	2,500	
13.	Koyukuk (Hughes)	209,000	1910	44.	Chistochina-Chisna	141,000	1898
14.	Koyukuk (Nolan)	295,000	1893	45.	Nabesna	63,300	1899
15.	Chandalar	80,708	1905	46.	Chisana	44,760	1910
16.	Marshall (Anvik)	120,000	1913	47.	Nizina	143,500	1901
17.	Goodnews Bay	29,700	1900	48.	Nelchina	2,900	1912
18.	Kuskokwim (Aniak)	230,556	1901	49.	Girdwood	125,000	1895
19.	Kuskokwim (Georgetown)	14,500	1909	50.	Hope (included in Girdwood production)		1888
20.	Kuskokwim (McKinley)	173,486	1910	51.	Kodiak	4,800	1895
21.	Iditarod	1,320,000	1908	52.	Yakataga	15,709	1898
22.	Innoko	350,000	1906	53.	Yakutat	2,500	1880
23.	Tolstoi-Cripple	87,218	1916	54.	Lituya Bay	1,200	1894
24.	Iliamna (Lake Clark)	1,500	1902	55.	Porcupine	53,250	1898
25.	Skwentna (included in Yentna production)		1906	56.	Juneau (Gold Belt)	6,883,556	1880
26.	Yentna (Cache Creek)	115,200	1905	57.	Ketchikan-Hyder	62,000	1898
27.	Kantishna	55,000	1903	58.	Sumdum	15,000	1869
28.	Ruby	389,100	1907	59.	Glacier Bay	11,000	
29.	Gold Hill	1,200	1907	60.	Chichagof	770,000	1871
30.	Hot Springs	447,850	1898	61.	Willow Creek	652,000	1897
31.	Rampart	86,800	1882	62.	Prince William Sound	137,900	1894
				63.	Unga Island	107,900	1891

[a]Gold production data through 1960 are relatively accurate; subsequent data are rough estimates.

occurred in recently glaciated terranes such as Yentna-Cache Creek, Chistochina-Chisna, Koyukuk-Nolan, and districts on the Kenai Peninsula.

The patterns of development in each of the gold mining districts were similar. The initial discovery of high-grade "pay" in both lode and placer form resulted in early exploitation ('high grading') by individuals and small companies. This exhaustion of the initial rich deposits led to consolidation of mining ground by larger companies and the subsequent exploitation of the lower grade deposits.

Slump

After World War II the price of gold still remained fixed at the 1933 standard, which caused a fundamental decline in the industry. Inflation and the buildup of a large goverment infrastructure in Alaska competed with gold-mining activities both large and small. Military and construction buildup did have one positive effect, however; used heavy equipment became available through auction at prices that small operators could afford. By the early 1960's almost all of the great gold dredges of the "FE" company had been shut down; most other larger scale operations had long since ceased production.

Rise

The recent rise in the price of gold in recent years, due to federal decontrol (p. 1), has revitalized Alaska's gold-mining industry. In 1978, several hundred individual mechanized placer mines were in operation and in 1979 even more were producing. Two floating dredges have been reactivated at Nome.

With the price of gold hovering at about $325/ounce, the future of gold mining appears bright. However, this must be balanced with several factors, including 1) the high cost of petroleum fuels and equipment, 2) general inflation of all goods and materials necessary for mining, 3)

recognition of the fact that many of the very best placers and obvious lode deposits have already been worked (leaving the placer gold industry in a stage of 'secondary recovery' in many respects), 4) burgeoning restrictions of an environmentally sensitive society, and 5) restrictive land withdrawals, both present and pending, which will directly and indirectly affect many mining ventures in Alaska.

Nevertheless, it's good to see an old friend, the Alaska gold mining industry, return to significance.

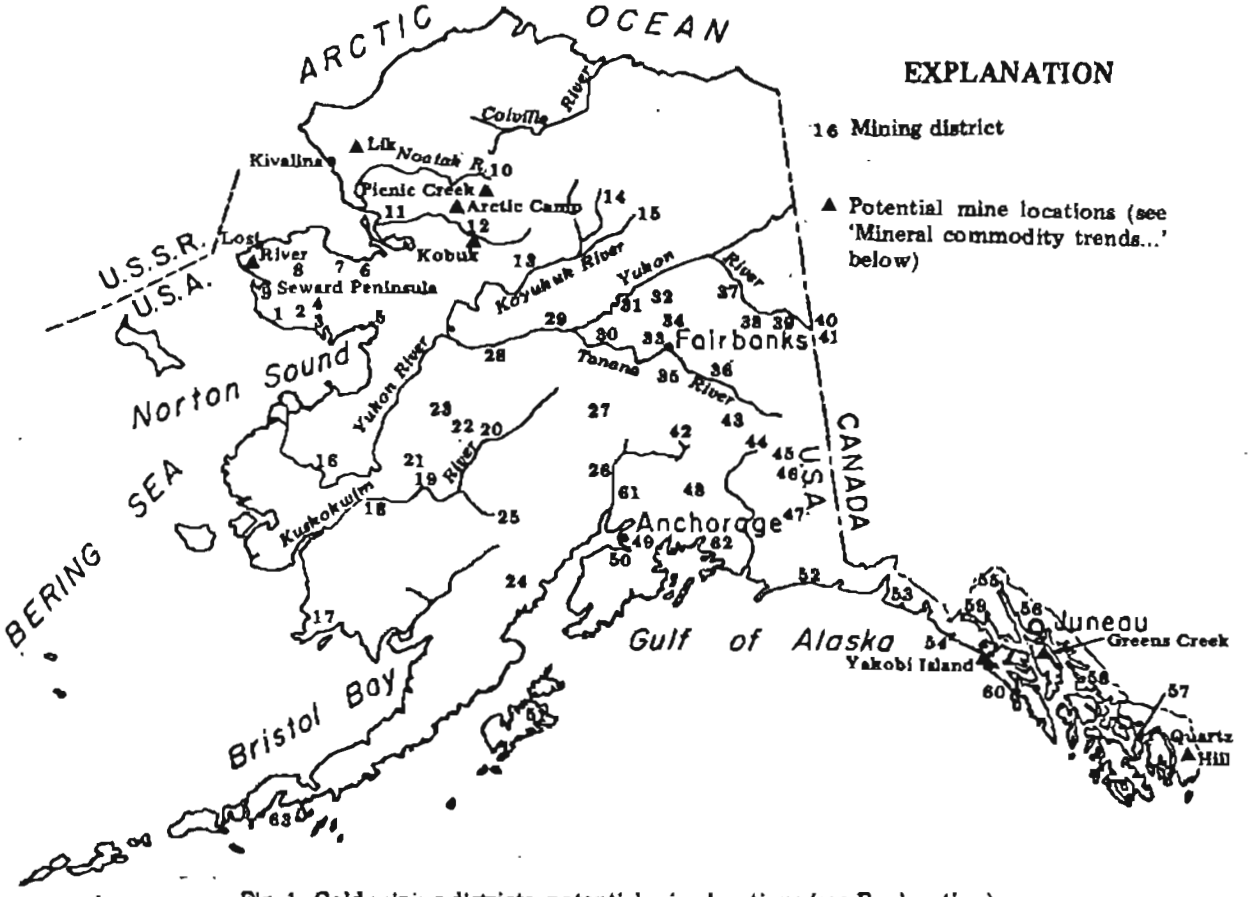

Fig. 1. Gold-mining districts; potential mine locations (see Explanation).

Mineral commodity trends and the Alaskan mining industry

By C.N. Conwell, DGGS Mining Engineer

In charting exploration expenditures and the metals prices of Alaskan ores in constant dollars (that is, greenbacks of the non-shrinking variety), several things become apparent:

1. The price of metals in general has increased more than the rate of inflation.
2. Precious-metal prices have increased faster than base-metal prices.
3. There has been a rapid increase in exploration expenditures in Alaska.
4. Expenditures in exploration have resulted in major finds.
5. On a find-vs-cost ratio, the Alaskan exploration effort has been relatively successful.

Exploration in Alaska in this decade has risen tenfold on paper---from less than $7 million in 1970 to an estimated $75 million in 1979. However, in constant dollars,

the actual increase is closer to fourfold (fig. 1). Such is the effect of inflation.

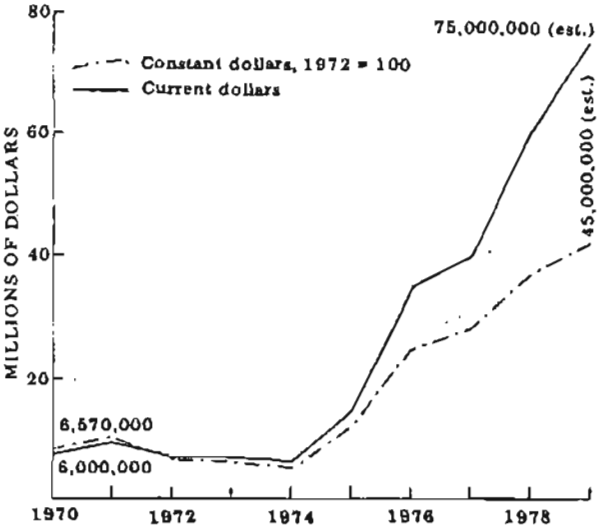

Fig. 1. Exploration in Alaska, 1970-79.

The constant-dollar base used here (determined from U.S. Dept. of Commerce figures for 1970-77 and from other published sources for 1978 and 1979) show the purchasing power of the dollar has shrunk from a 1972 base of $1.00 ($1.09 in 1970) to an estimated $0.60 today. Nevertheless, the new dollars invested in exploration resulted in the discovery of several major metal deposits during the decade.

Eight metals are reviewed for price, for U.S. position, and for Alaskan contribution. The metals are divided into three classes: a) precious metals, b) base metals, and c) tin and molybdenum.

Precious Metals

Gold. - For nearly a century, gold mining in the U.S. has had its share of ups and downs. As inflation increased, purchasing power and production decreased (figs. 2 and 3).

The price of gold was controlled by the U.S. Treasury at $20.67 an ounce until 1933, when it was raised to $35. Gold was held at this price until 1967. After two minor adjustments, gold was decontrolled by the Treasury on December 30, 1974. Then

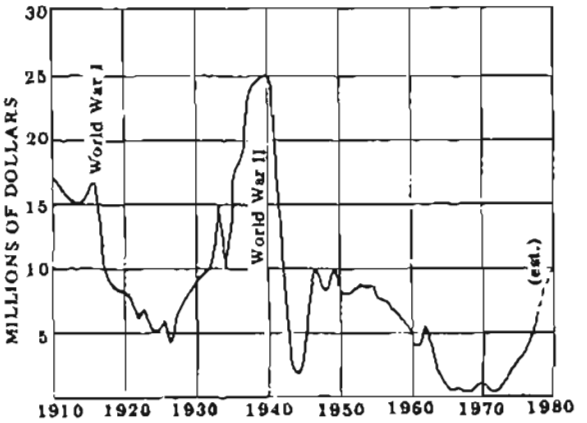

Fig. 2. Alaskan gold production in current dollars.

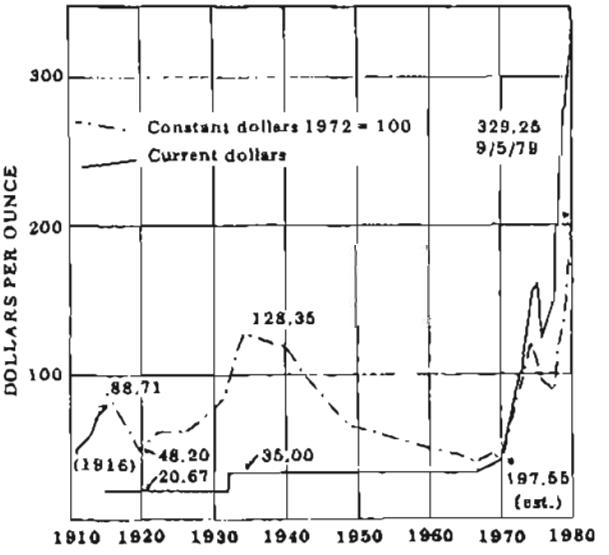

Fig. 3. Price of gold, 1910-79.

on March 2, 1977, the U.S. Treasury joined the International Monitary Fund Auction to sell its gold, again attempting to regulate price.

More ups and downs ensued---but mostly ups. On decontrol, gold immediately skyrocketed to $195.50. The price then started falling and hit a low of $102 an ounce in August, 1976. Since then, gold has been trending upward, reaching the $300 plateau in July, 1979.

The constant-dollar price of gold now compares favorably with that when gold mining in Alaska reached its peak in the 1930s. Figures 2 and 3 indicates the close relationship between production and the constant-dollar price of gold. The increase

in price has stimulated gold production in Alaska (fig. 3), including the reactivation of two large floating dredges near Nome. Exploration for other metals has also increased the gold resource in Alaska.

Silver. - Silver has also been a monetary metal. A federally established price for silver coins of $1.29 per ounce existed from 1933 until 1966, when the market price exceeded the statutory price. When silver hit a high of $2.655 on June 12, 1968, the U.S. Treasury started selling silver to depress the price; it gave up 2-1/2 years later, with but 24 million ounces left in its coffers. The price of silver rapidly increased in both current and constant dollars between 1970 and July 1979 (fig. 4).

United States silver consumption is about 170 million ounces per year. It is supplied by an import of 95 million ounces, a mine production of 35 million ounces, and the rest from secondary recovery.

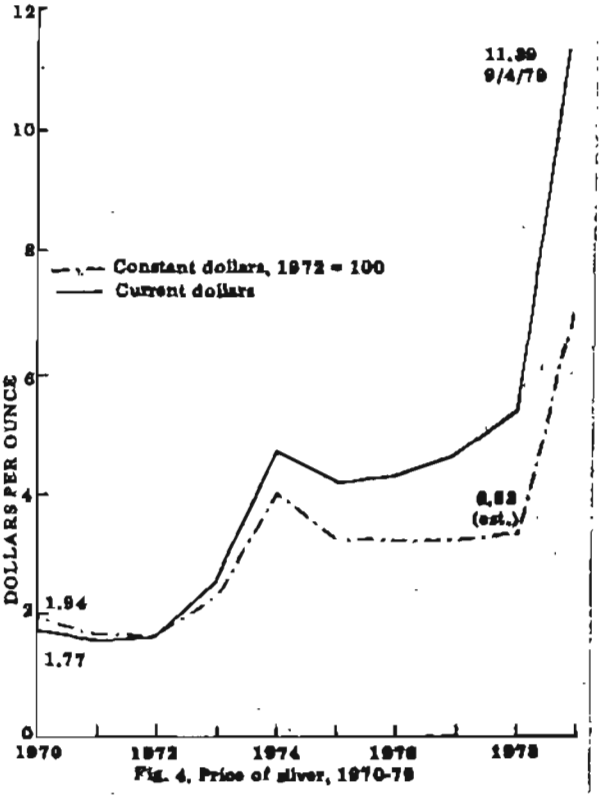

Fig. 4. Price of silver, 1970-79

Silver has been produced in Alaska, but most of it as a by-product of placer gold and copper mining. Small-scale primary production has taken place at Omalik on the Seward Peninsula, in the Kantishna area, near Ruby, and in southeastern Alaska.

A recent surge of exploration by Pan Sound Joint Ventures has yielded a significant deposit on Admiralty Island, in southeastern Alaska. This could very easily be the first new major mining development in Alaska since World War II. Although the ore contains some gold, zinc, and lead, the principal economic mineral is silver. The indicated ore body of 2.5 million tons averages 9.5 ounces of silver per ton, for an in-place value of about $500 million. Unfortunately, this deposit is located on land withdrawn by President Carter's 1978 Antiquities Act, and future development is cloudy.

Platinum. - Unlike gold, the price of platinum in constant dollars kept pace with inflation because it was not under price control and it is not a monetary metal. On June 29, 1979, the price of platinum increased to a high of $420 per ounce, or $252 in constant dollars (fig. 5).

The apparent consumption of platinum in the United States is 2,330,000 ounces annually with no primary mine production. With the

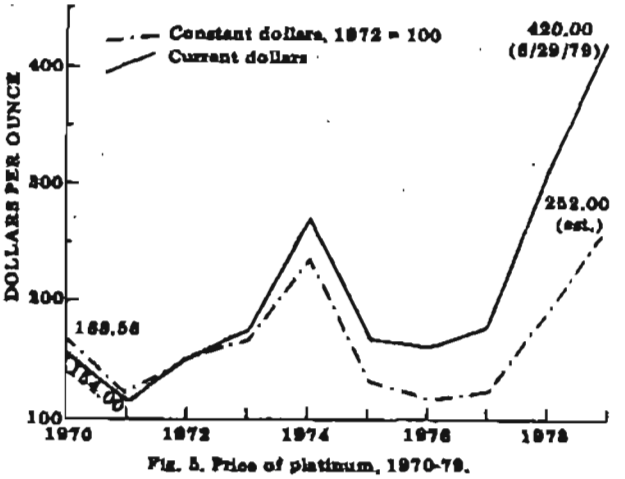

Fig. 5. Price of platinum, 1970-79.

continued use of platinum as a catalyst for automobile emissions, the forecast is for an increase in demand and a near $1 billion trade deficit.

An estimated 650,000 ounces of platinum were mined in a 41-year period from a placer operation near Goodnews Bay in southwestern Alaska. (Production ceased in 1976 because the owners wanted to begin spending some of their hard-won money.)

There is both a measured onshore and offshore resource near Goodnews Bay, and a continued favorable price for platinum in constant dollars could renew mining.

Base Metals

Base metals, particularly copper, have not fared as well as the precious metals on a constant-dollar basis.

Copper. - Copper has been a depressed metal for most of this decade. Only in 1974 (fig. 6) did copper exceed the constant-dollar base of 1970. The depressed price plus continued high inventories resulted in the decline of copper production in 1978.

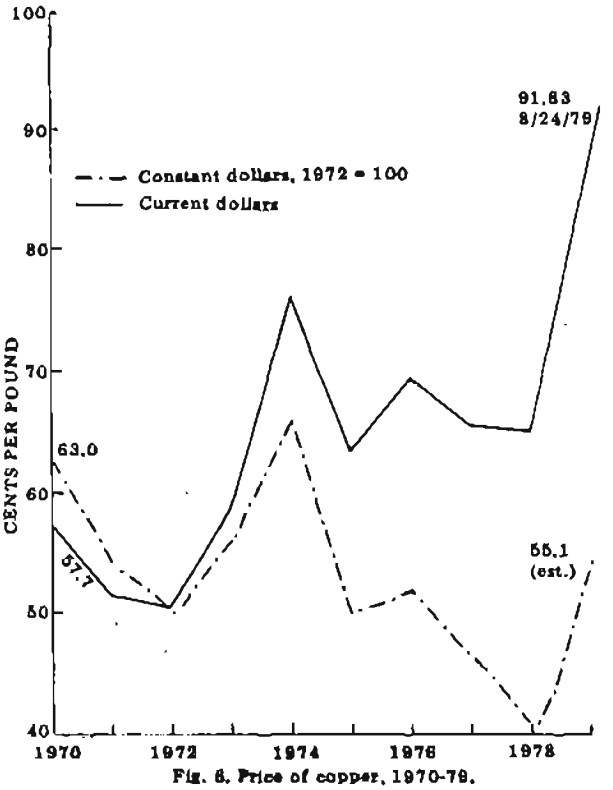

Fig. 6. Price of copper, 1970-79.

Although the U.S. is the world's largest copper producer, it is also its largest consumer, and 25 percent of the annual requirement is imported. Thus, the price is highly influenced by other major producers---Chile, Canada, Zambia, and Zaire.

Alaska has large copper deposits. Three large deposits in the Brooks Range (Ambler River-Kobuk district) are the Bornite and Arctic Creek mines of Kennecott and the Picnic Creek deposit of Anaconda Copper. These mines have a gross discovered metal value of not less than $7 billion (probably more than $10 billion) on today's market. However, these deposits will probably be slow in developing because of their remoteness, the current market, and the land status (30 percent of the Picnic Creek orebody is in the Gates of the Arctic National Monument, where disturbing the land is verboten). On June 5, 1979, Anaconda Copper filed suit against (Secretary of the Interior) Cecil Andrus, (Secretary of Agriculture) Robert Bergland, and (President) James Carter to protect its interest.

Zinc. - The price of zinc (fig. 7) has fared better than that of copper. About two-thirds of the zinc used in the U.S. must be imported.

General Crude and Houston Oil and Minerals are currently drilling their large deposit (Lik) on the Wulik River drainage. This deposit is located over 50 miles east of the

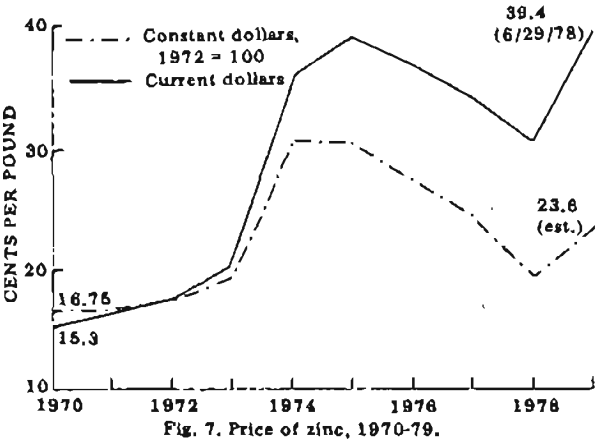

Fig. 7. Price of zinc, 1970-79.

village of Kivalina on the Chukchi Sea, and tidewater access would probably cross Native lands. In 1978 the U.S. Bureau of Land Management, citing section 608 on the Organic Act, denied a request to expand an airfield for exploration at the deposit site.

Zinc is also associated with copper at Arctic Camp and with silver at the Greens Creek deposit on Admiralty Island.

Lead. - The lead industry and price has fared better than either copper or zinc since 1974. Figure 8 shows a parallel increase in constant and current dollars since 1971. The value in current dollars increased from $0.15 per pound in 1971 to $0.58 on June 29, 1979, a nearly 400-percent increase; the value in constant dollars more than doubled.

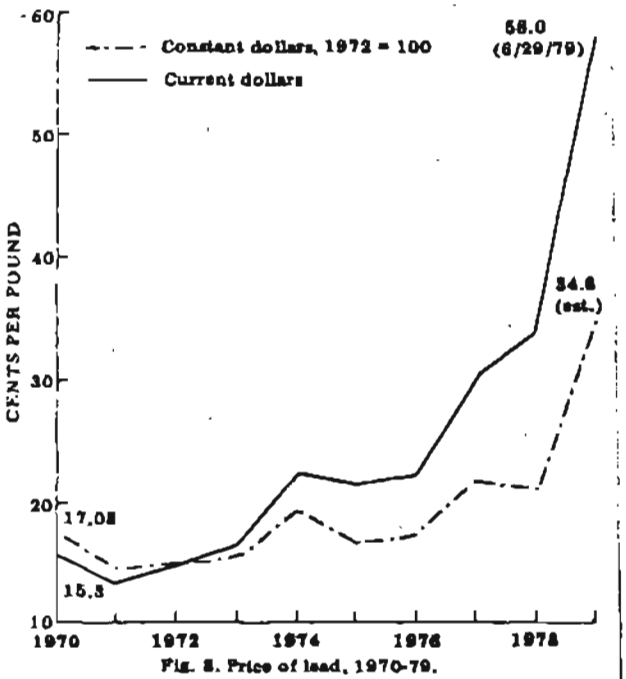

Fig. 8. Price of lead, 1970-79.

As with copper, the U.S. is a major producer, but must import about 20 percent of demand. U.S. production is about 16 percent of world total production. The ability of the U.S. to maintain a position as a leader in production appears favorable. The demand for lead should increase about 2 percent per year for the next 5 years.

No major deposit primarily containing lead has been located by recent Alaskan exploration. Nevertheless, lead has a major economic position in the Lik deposit (3 percent) and in the Arctic Camp and Picnic Creek deposits (1 percent). The lead from these deposits would constitute a potential gross value of nearly $2 billion in today's current dollars.

Tin and Molybdenum

Tin. - Except for a brief drop in 1974, tin has shown a constant price increase in both current and constant dollars since 1972 of 450 and 250 percent respectively (fig. 9).

The U.S. is a primary consumer of tin in the free world and annually imports 98 percent of its supply, or 55,000 tons, worth $843 million. Tin is produced in the U.S. from three sources: the tin placer mines west of Nome, as a by-product of some gold placer mining in interior Alaska, and as a by-product from the American Metal Climax molybdenum mines in Colorado.

In the early 1970s, Lost River Mining Company delineated a major lode tin mine with fluorite on the Lost River northwest of Nome. The estimated tin reserve is about 124 million pounds with a current dollar value of $942 million. (Only two of seven potential mineral zones at Lost River have been adequately explored.)

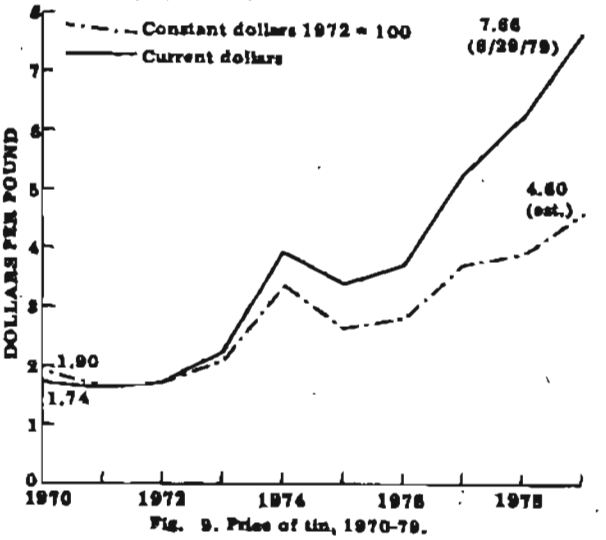

Fig. 9. Price of tin, 1970-79.

Of the major metal discoveries in Alaska, this deposit may not be affected by federal land withdrawals. (Yet.)

Molybdenum. - Molybdenum stayed close to a price of $1.72 per pound for the first third of the 1970s decade (fig. 10). In 1974 the price started to increase, reaching a high on June 29, 1979 of $8.40 a pound to current dollars, a 450-percent increase in current dollars (nearly 300 percent in constant dollars). On the international spot market, molybdenum reached a high of $30 per pound. The increased price of molybdenum in early 1979 was due to 1978 consumption, which exceeded production by 7 million pounds. The U.S. is the major producer of molybdenum (59 percent), primarily from the mines of American Metal Climax in Colorado and from by-product production from copper mines. In 1978, about 127 million pounds of molybdenum were produced; of this the United States consumed half and exported the rest.

The U.S.Borax discovery at Quartz Hill, 40 miles east of Ketchikan, is one of the world's largest molybdenum deposits. The potential reserve is 700 million tons of ore containing 0.18 percent molybdenum, or 3.6 pounds per ton. At today's current value of $8.40 per pound, the gross value is $21 billion. So far, U.S. Borax has spent 3 years in cooperation with the U.S. Forest Service to obtain a road permit from the mining area to salt water to conduct the necessary feasibility and appraisal studies. The Forest Service granted a permit at the district, region, and national level, but at each level, pressure groups such as the Sierra Club appealed the decision until final rejection was made by the Assistant Secretary of Agriculture. U.S. Borax is now appealing the permit application in court. Because the area has been severly affected by the wilderness withdrawal, it is difficult to predict when (or if) mining will begin.

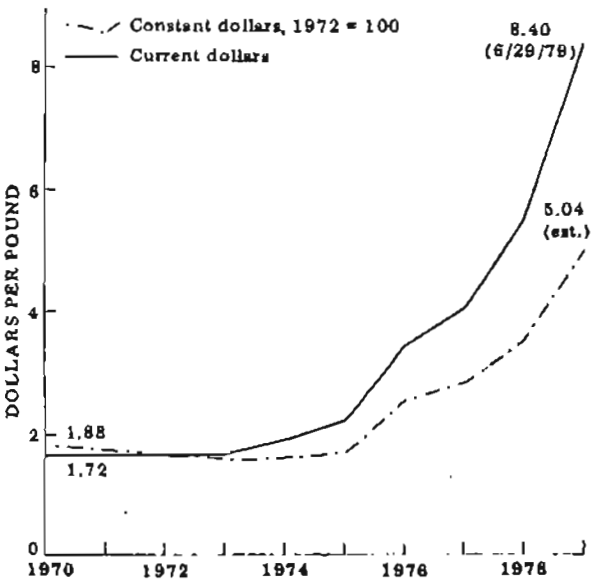

Fig.10, Price of molybdenum, 1970-79.

Exploration in the 49th state productive

An estimated $254 million was spent on Alaskan exploration in this decade. This included at least $12 million on coal and nonmetallics. The metal reserve at Bornite has been deleted from the total because exploration was conducted during the '60s, but the copper-nickel reserve at Yakobi Island is included. The gross metal found by exploration during the decade[3] is listed below in descending order.

Metal	Total (in millions)
Zinc, lb	13,889
Copper, lb	5,663
Lead, lb	3,553
Molybdenum, lb	2,520
Tin, lb	124
Nickel, lb	108
Silver, oz	192.8
Gold, oz	1.5

The metal in place represents a gross value of about $37 billion at prevailing prices (August 1979). An expenditure of seven-tenths of 1 cent in exploration located $1 dollar in metal values. (This figure could even lower if information on Cominco's American Creek and Red Dog

[3]To conserve space, the locations of the major mineral deposits discovered by exploration in the 1970s are located in figure 1 of the preceding article (p. 4).

prospects, near the Lik deposit, was available.) Inasmuch as exploration projects are considered successful if $1 in metal values is found by an expenditure of 5¢, the Alaskan effort must be considered, to quote an old bedsheet manufacturer, 'a buck well spent.'

Impact of Mining in Alaska

Employment in mining has had its share of ups and downs. In 1915, about 8,300 people were employed in placer and lode operations. This number slowly shrunk to 3,600, but with the 1933 increase in the price of gold, it grew to 6,400 by 1940. World War II forced a decline to 1,400 and by 1947, only 2,500 were active in metal mining. The declining constant dollar and decline in gold mining reduced this number to less than 300 in 1970. Exploration in the 1970s brightened the bleak picture, and by 1979 about 1,700 people were employed in exploration.

The exploration effort has been successful, and the impact may be stated by repeating four short paragraphs from a report about Alaska that was published by the Stanford Research Institute:

"In the absence of extensive legislative or regulatory impediments a mining industry could develop by 1990. The industry would:

- Provide the nation with substantial quantities of nonfuel minerals, including gold, silver, copper, nickel, lead, zinc, molybdenum and asbestos, valued at between $850 million and $1 billion annually (in 1977 dollars).
- Provide the nation with 20,000 to 40,000 additional jobs, representing about 0.5 percent of current unemployment.
- Reduce the nation's balance of payment deficit by between $700 million and $1 billion annually (in 1977 dollars)."

BLM mining claims deadline Oct. 22

(from The Mining Record, June 13, 1979)

Thousands of people who staked mining claims on federal lands before Oct. 21, 1976 have only until Oct. 22 to file their claims with the Bureau of Land Management (BLM) or the claims will be voided.

This is a requirement of the Federal Land Policy and Management Act of 1976, a BLM spokesman said.

Roger Dierking, of BLM's records and data management branch in Portland, said persons who located mining claims before that date should file the following promptly with the BLM:

-An exact, legible copy of the official notice of location of the claim and a copy of the current assessment statement, or notice of intention to hold the claim.

-A map or narrative description of the claim.

-Name and address and a $5 fee for each claim recorded.

The maps do not have to be designed by professional surveyors or engineers, a spokesman said.

Dierking stressed that persons with recorded claims are required to perform assessment work and record an annual assessment statement or record a notice of intent to hold the mining claim with both the district recorder and the BLM. Copies of the statement or notice recorded with the county must be received by BLM on or before Dec. 30 of each year or claims are voided by law.

Claims on federal land in Alaska may be filed in person or by mail at the offices in either Anchorage (707 C St.) or Fairbanks (Fort Wainwright; PO Box 1150, Fairbanks 99707).

Claims located after Oct. 21, 1976 must be recorded with the district recorder and with BLM within 90 days of location or the claims are automatically void.

For older claims, notices of assessment work performed or of the intent to hold the claims must be filed with the district recorder and with BLM each year after the year in which they are located, or they are automatically void.

New claims double

The number of new mining claims recorded has doubled since the last quarter, but the total is still substantially lower than that recorded at this time last year. The total for the 3-month period ending August 31 was 2,760, nearly double the 1,406 recorded for the preceding quarter. In this quarter last year, 4,075 new claims were recorded. The totals by recording district follow.

Fairbanks	523
Manley Hot Spr.	191
Nulato	392
Mt. McKinley	9
Nenana	25
Rampart	3
Ft. Gibbon	79
Kotzebue	169
Talkeetna	306
Palmer	171
Nome	411
Seward	8
Juneau	45
Haines	21
Ketchikan	314
Sitka	12
Anchorage	66
Glenallen	11
Cordova	4
Total	2,760

In a related development, the Anchorage mining-information office has moved from its location on Fairbanks street to a new office. The new site, 941 Dowling Road, is between the Old and New Seward Highways. It is the second office move in a year for information specialist Ona McBride, who said, "Finally, we may have room for all the necessary files." The temporary phone number at the new facility is 349-7923.

Geophysicist presents two avalanche papers

In August, DGGS geophysicist Steve W. Hackett presented two papers at the Scientific Symposium on Snow in Motion, held in Fort Collins, CO. The conference was sponsored by the Rocky Mountain Forest and Range Experimental Station, Mountain Snow and Avalanche Research Project (USDA, Forest Service) and the International Glaciological Society; the presentations are being published in a Proceedings Volume edited and printed by the International Glaciological Society.

Avalanche Zoning in Alaska

Over 30 percent of Alaska's 586,400 square miles (1,518,900 km^2) is subject to snow avalanche activity. For a statewide avalanche hazard evaluation, Alaska has been divided into six major snow avalanche regions on the basis of topography, climatological data, dominant snowpack conditions, and typical avalanche activity: Arctic Slope; Brooks Range; western; interior; south-central; and southeastern.

Most of the mountainous areas in the south-central and southeastern regions, because of their northern latitude, closeness to large masses of water, and large orographic and cyclonic weather processes, are susceptible to major avalanche activity. For areas near the population centers of Anchorage and Juneau, the potential avalanche terrain has been identified from data on known and suspected avalanche activity through airphotos, terrain analysis, and documented snow avalanche occurrences compiled at scales of 1:250,000 and 1:63,360.

The statewide regional data compilation and study are beginning steps toward avalanche zoning in Alaska. Local land-use planning and detailed investigations are needed to establish effective natural-hazard zoning in municipal areas as related to snow avalanche activity. (Hack-

ett's coauthor on this paper was Henry S. Santeford of the National Weather Service in Anchorage.—Ed. note.)

Informal Cooperative State-Federal Avalanche Warning System and Public Education Program for South-central Alaska

Since 1971, forty-three people are known to have been caught in avalanches---five died within the popularly used Chugach State Park. The western boundary of this park borders the city of Anchorage, which has half of the state's population.

Avalanches have claimed more than 100 people since 1898, including 67 gold stampeders who lost their lives one tragic April morning in the famous Chilkoot Pass. The most recent tragedy near Anchorage occurred in the Chugach National Forest in January 1978, when four ski mountaineers lost their lives to an avalanche while skiing in the Turnagain Pass Winter Recreation area. A fifth person was caught but escaped.

Some efforts toward establishing a south-central Alaska Avalanche Warning System have been initiated by state and federal agencies. An informal cooperative system of categorizing avalanche hazards and issuing avalanche bulletins currently exists between the Alaska State Division of Parks, the National Forest Service, and the National Weather Service.

Joint public announcements are made through newspaper, radio, and television during times of high danger. Additionally, a 24-hour avalanche information telephone number (274-4113) provides the public with up-to-date snow-hazard reports for local mountainous areas near Anchorage.

Future aims in reducing snow avalanche accidents and fatalities in south-central Alaska are threefold: a) to continue current cooperative efforts between state and federal agencies in Alaska to establish a reliable avalanche warning system and public education program, b) to expand a weather and snowpack monitoring network, and c) to conduct and increase educational programs in avalanche awareness and safe winter recreational use of the mountains. (Hackett's coauthor on this paper is Douglas Fesler of the Alaska Division of Parks. The avalanche warning system was the subject of an article in the June Mines and Geology Bulletin.—Ed. note.)

UA to offer mining courses

The University of Alaska will offer mining extension courses in 12 communities during the 1979-80 school year, according to Dr. Earl Beistline, Dean of the School of Mineral Industry.

Four-week courses in basic prospecting will be held in Fairbanks beginning 9/24, Anderson 10/22, Copper Center 11/19, Juneau and Soldotna 1/3/80, Haines and Chugiak 1/28, Valdez and Elmendorf AFB 2/25, North Pole and Wasilla 3/24, and in Anchorage and Fairbanks 4/21.

The Anchorage campus will be the site of courses in geophysical prospecting (10/1), basic prospecting (10/15), rock identification (11/12), ore deposits (12/3), and environmental factors (5/19/80).

The instructors will be James A. Madonna and Leo Mark Anthony. For futher details contact the University, ph 479-7388 in Fairbanks or 279-4702 in Anchorage.

DGGS issues call for 'Short notes - 1979' contributions

DGGS will publish its fourth annual 'Short notes' volume next year, and is now soliciting manuscripts from earth scientists who have made recent investigations of a limited scope on Alaskan geology. Manuscripts are accepted for review with certain qualifications: that manuscripts must not have been published or submitted for publication elsewhere; that all persons listed as authors have given their approval for

submission of the paper; and that any person cited as a source of personal communication has approved such a citation.

Two copies of the manuscript, typed double spaced including references and figure captions, should be submitted to Editor, Alaska Division of Geological & Geophysical Surveys, Box 80007, College, AK 99708. No more than seven double-spaced manuscript pages (2,000 words), including references, figures, and tables, will be accepted. All figures should be camera ready and suitable for black-and-white reproduction at a maximum size of 6-1/2 by 9-1/2 inches; foldout or color art will not be accepted. Contributors should keep one copy of material submitted. All manuscripts will be examined and approved by DGGS reviewers.

Deadline for manuscripts for the next Short Notes on Alaska Geology is December 1, 1979.

New aeromagnetic maps of Brooks Range published

Forty new aeromagnetic maps of the Brooks Range were recently released in a joint project with the U.S. Geological Survey. The product of the cooperative program fills a 'data void' that existed between the USGS regional coverage of the eastern Brooks Range and that of DGGS in the southwestern part of the Brooks Range.

According to DGGS geophysicist Steve Hackett, about 8,900 square miles of area were covered by the 1978 geophysical survey, in which an instrument-laden fixed-wing aircraft gathered data on the magnetic intensities of the underlying rock. A total of 12,600 line miles were flown in July and August 1978 by the contractor, Geometrics, Inc., of Sunnyvale, CA.

North-south traverse lines were flown 3/4 mile apart at an elevation 1,000 feet above ground level, with east-west 'tie lines' flown in a crossing pattern for every tier of 15-minute quadrangles, or about every 18 miles.

The maps, which show total residual magnetic field intensity superimposed on a 1:63,360-scale topographic base, cover the following quadrangles: Shungnak C1; Hughes C1-C6; Survey Pass A1, B1, C1, D1; Wiseman A4-A6, B2-B6, C2-C6, D2-D6; and Bettles A5-A6, B5-B6, C5-C6, D4-D6.

Under a new policy, no maps are available for sale. Rather, the mylar originals are available from any DGGS information office (p. 1) for reproduction at requester expense. (This policy will eliminate the costly and cumbersome storage of unsold printed maps.)

During the quarter, DGGS also published two new information circulars, No. 23, 'Index map of DGGS publications;' and No. 25, 'Information on water and water rights in Alaska.' The former IC consists of a map with the areas covered by all previous documentation cross indexed to a booklet listing the report particulars, whereas IC-25 gives the names and addresses of other agencies to contact for additional water information. In addition, DGGS issued an updated IC-8, 'Consultants available for work in Alaska - 1979.' All ICs are free.

DGGS gets $209,000 in study funds

DGGS recently announced the receipt of $209,000 in funds from the Department of Energy for studies in Alaska's geothermal potential.

The Survey was funded $162,000 for the first year of a 3-year program to equip a geochemical lab and to investigate and assess the geothermal hot-spring resources of the state. DGGS geologist Roman J. Motyka will head the project; he will be aided by geological assistant Mary Moorman (p. 14).

The results of the study will be

compiled and published by the State Survey as a geologic atlas of hot-spring areas in Alaska. It will provide a ready reference of hot-spring site geology, geochemistry, temperatures, flow rates, and heat reservoirs plus additional information bearing on the potential uses of these areas.

A companion study will identify and evaluate 12 specific sites in the state with the most potential for geothermal power development. Sites already slated for detailed studies include Pilgrim Hot Springs on the Seward Peninsula, Goddard Hot Springs near Sitka, Unalaska in the eastern Aleutians, and a site near Fairbanks, possibly Manley Hot Springs. Geologist John Reeder of the Anchorage Survey office will head the $47,000 program.

The two studies will be conducted concurrently and in close cooperation with the UA Geophysical Institute and the Division of Energy and Power, of the Alaska Department of Commerce and Economic Development. The Seward Peninsula has already been reconnoitered and extensive investigations have been performed on Pilgrim Hot Springs. Southeastern Alaska will be the focus of the study the rest of this year, with the Alaska Peninsula and Fairbanks slated for examination next summer.

DGGS data-gathering role expanded

After an in-depth departmental study, Commissioner Robert E. LeResche reorganized the DNR effective July 1, the beginning of the new fiscal year.

LeResche explained when announcing the reorganization plan, "I wish to emphasize that the reorganization is not limited to redrawing boxes on the organizational chart. It is in fact a package consisting of three distinct projects designed to bring departmental operations to a maximum efficiency level."

The three distinct projects the Commissioner's comments referred to are:

a) Revising Department's organization structure
b) Establishing a complete set of department procedures
c) Creating a departmentwide program management procedure.

In the reviewed organization, the role of the DGGS was expanded to include additional data-collection responsibilities, which resulted in a broader scope of activities. Although the number of sections reporting directly to State Geologist Ross Schaff was increased, most of the day-to-day administrative duties previously handled by him, were delegated to the section chiefs.

There are now eight sections reporting to Schaff: six 'investigations' sections (geochemical, geologic hazards, mineral resources, petroleum resources, water resources, and forest resources) and two 'service' sections (information and administrative). However, except for forest resources, the duties of all but one of the new sections are not new: DGGS had been performing them in the past in larger, less specialized groups.

The forest resources section will gather data on vegetation and soils to determine the best use of Alaska's lands---agriculture, forests, game management, recreation, transportation systems, etc. The primary means of obtaining the data will be by remote sensing (photo interpretation) and ground samples.

DGGS adds new people to staff

The awarding of the geothermal studies from the Department of Energy (p. 13) and the expanded scope of both DNR (above) and the DGGS hydrology program have brought several new faces to the Survey.

Heading up the new Forest Resource Investigations section is Enzo

E. Becia, 50, who transferred to DGGS from the federal-state Land Use Planning Commission, where he was 'on loan' from the DNR. Before coming to Alaska in 1965, Becia had a similar position---that is, resources planner---with the Washington State DNR. He holds a B.S. degree in forestry from Michigan Tech.

Thomas R. Williams, 35, joined the DGGS hydrology section in early August. He will be in charge of ground-water hydrology data collection and compilation, and will apply geophysical methods to ground-water exploration. Thomas has a B.A. and an M.S. in geology from the University of Montana, and has 'most' of his Ph.D. in geophysics completed. Before coming to Alaska 1 year ago, he served as a hydrologist with the USGS in Washington. A bachelor, Williams lists ski mountaineering, bicycling, and kayaking as hobbies.

Geologist Roman J. Motyka will help guide the new DGGS geothermal studies. He has an M.S. in physics from Michigan State University and expects to receive his doctorate in geology and geophysics this fall from the University of Alaska, where he has been employed at the Geophysical Insitute for the past 5 years. During this time, he has done work on the Mt. Wrangell Caldera, Katmai Caldera, Mt. Redoubt, and the Ukinrek maars eruption (1977). Motyka lists cross-country skiing, climbing, and ocean kayaking as his leisure interests. He is also single.

John W. Reeder, 29, also joined the DGGS staff as a geologist on the geothermal program. He will be working with Motyka on the geothermal atlas and performing detailed geothermal-site studies throughout the state. Reeder, who was born in Palmer, has a B.S. in engineering geology from the University of Idaho, and an M.S. (landslides in Alaska) and a Ph.D. from Stanford University. A professed 'scholastic junkie,' Reeder is also doing work for an additional M.S. degree in geophysics at Stanford (on the Augustine Island eruption of 1976). He is also a bachelor, and spends his free time diving and sailing.

Working with Motyka and Reeder on the geothermal studies will be new geological assistant Mary A. Moorman, who has a B.S. degree in microbiology from the University of Wyoming and an M.S. in geology from UC-Santa Barbara. She enjoys outdoor activities and is learning to fly.

In other personnel notes, geological assistant Karen S. Emmel has taken a leave of absence to accompany her husband to Florida, where he is taking a 1-year sabbatical leave; he is an Anchorage teacher.

Also, veteran cartographer Charlotte M. Renaud left the Survey last June because of a reduction in funds appropriated by the legislature. She had been with DGGS 12 years.

Lastly, congratulations are in order for Tom and Fran Bundtzen, who are parents of a 6-lb, 14-oz daughter, born June 23. Sarah Lynn is their first child (and probably the only one whose arrival will again conflict with Tom's field season).

Sharp Aleutians quake does no damage

(from Fairbanks Daily News-Miner, Sept. 1, 1979)

An earthquake registering 5.3 on the Richter scale Friday night was "sharply felt" at Dutch Harbor and Unalaska in the Aleutian Islands of Alaska but caused no damage or injuries, officials said.

Unalaska Police Officer Royal Nelson said police received about two dozen calls from residents after the quake, but no reports of damage.

"Things did move, but nothing on the wall fell down," he said. It was the strongest quake to hit the area in about two years, Nelson said.

The town of 800 is now crowded with about 3,000 people gathered for crab fishing, he said.

The quake was centered about 50

miles southeast of the town, according to John Sindorf at the Alaska Tsunami Warning Center in Palmer, Alaska. The center, about 40 miles north of Anchorage, is a branch of the National Weather Service.

Schaff names acting Deputy State Geologist

Garnett H. Pessel, an 8-year DGGS petroleum geologist, was named acting Deputy State Geologist by Ross G. Schaff, DGGS Director and Alaska State Geologist.

Of Pessel, who brings 19 years experience in Alaskan geology to the post, Schaff said, "Gar's past assignments required extensive travel and research throughout Alaska, giving him the broad scientific background necessary to the position." Pessel previously worked for US Steel, Richfield Oil, Arco, and the Alaska Division of Oil and Gas. His wife, Jan, is an Anchorage elementary-school teacher.

University to operate mine as laboratory

(from Alaska on Alaska, Aug. 27, 1979)

Thanks to the generosity of long-time Fairbanks miner Tury Anderson, the University of Alaska's School of Mineral Industry will soon be one of the few institutions in the country to operate a working mine as a laboratory and research facility. Anderson donated his right to 13 claims that make up the Silver Fox mine, a lead-zinc-gold-silver mine near Fox north, of Fairbanks. The university is purchasing only the equipment and main tunnel.

In a cooperative agreement the university has been using the mine for instruction of mining engineering and geology engineering students for several years. School of Mineral Industry Dean Earl Beistline says that use of the mine is a great aid in continuing accreditation from the Engineers Council for Professional Development.

Next large earthquake predicted for Yakataga

(from Fairbanks Daily News-Miner, June 1, 1979)

Alaska's next large and potentially destructive earthquake is likely to occur within the next two to four decades in the state's southern Yakataga region, government and Columbia University scientists predicted today.

The Cape Yakataga region, about 150 miles southeast of Valdez on the Gulf of Alaska, probably will be hit by an earthquake measuring eight or more on the Richter scale, according to experts. Damaging tremors could affect a 30,000-square-mile area.

The scientists say an earthquake is likely because the region lies on a 150-mile-long, 100-mile-wide 'seismic gap'--an area along a major fault where no strain-relieving quakes have taken place in recent years.

Since 1899, when the last large earthquake occurred at Yakataga, about 16 feet of strain has accumulated, according to the U.S. Geological Survey and university scientists.

The strain has built up along the fault as two large plates of the earth's surface have converged and collided. The plates have been pressuring each other at a rate of two inches per year, the USGS said.

USGS Director William Menard said it was impossible to pinpoint when the quake will take place, but predicted it could occur anytime and is most likely within the next 20 to 40 years.

The area has been targeted for special study by the USGS and the Lamont-Doherty Geological Observatory of Columbia University. Menard said such a study would be useful in "predicting when and where quakes will occur in Alaska and elsewhere."

The Yakataga region was first identified as a seismic gap a decade ago by Lamont scientists.

Our Gangue....
By Frank Larson, editor

Inflation, like The Bomb, is very democratic. It affects everybody, regardless of race, color, creed, or NFL affiliation. Unlike The Bomb, however, inflation is not a Yankee innovation. A prime example was post-WWI Germany, when currency was weighed, not counted. "How much for a loaf of bread, Herr Schmidt?"/ "Three wheelbarrows full of hundred-mark notes. If you buy within the next half hour, that is."/"Well, I only brought two suitcases of marks with me. We're dieting, you know."/ "Ja. Dieting is 'in' this year. Can I interest you in a 'Bismarck'?".... Well, the Incredible Shrinking Dollar has hit the bureaucrats, too. And, like The Bomb, the belt tightening is very democratic....(Although one can't help but notice that it always seems to be 'a little more democratic' for the Chiefs than us Indians, however.).....For instance, the presence of Yours Truly was requested by the Head Shed to attend a meeting in Anchorage---a budget meeting, no less. "But don't come down here a minute too soon," the boss warned. "We can't afford the extra per diem."/"But I have other things to coordinate in Anchorage," I protested, "and I can get them done by coming down a day early."/"Sorry, but you'll go way over your annual travel budget if you come a day early."/ "Well, what if I came down on the Alaska Railroad? I'll even pack my own lunch." (A mashed-potato sandwich and a six-pack.)/"Sorry, but we need you here this week."/"Well, what if I brought my sleeping bag and stayed at your place? That will save money. You can put me up in your laundry room like you did last time."/"No way. Your snoring kept us up all night."/"But I always let you crash at our place when you come up here," I whined. "I even give you our bed, and the wife and I sleep in our laundry room."/"T.S."/"But what am I to do? You won't let me come down a day early, or stay at your place, or even come down on the Toonerville Trolley."/The boss relented to my sycophantic blubbering. "Well, I'll tell you what I'll do. Since you have given the State these many years of loyal service and unflinching dedication, you may fly down here on TWA---and a day early at that."/ "Wow, Boss. Thanks."/"No, don't bother thanking me. Now you just get on out to the airport and make the necessary arrangements, and I'll have somebody meet you here tomorrow. Now remember, Kid, that's TWA---Tally Whacker Aircargo."/"OHHHHhhhhhhhhhhh NOOOOoooooooo. They don't even have pressurized planes....."....In other news, Amoco Production and several individuals were the only bidders in the $158K Copper River basin lease sale in July. The highest bid was $34/acre.....A little farther south, Arco plugged and abandoned its West Trading State 1 well in upper Cook Inlet. The well, drilled in 68 feet of water to a depth of 9,087 feet, had "no indications of recoverable hydrocarbons," according to an Arco veep. The platform is now being moved to lower Cook Inlet, where it will drill on a lease purchased in the 1977 OCS sale....C.C. Hawley and Associates of Anchorage received an $861K contract from DOE to evaluate uranium favorability in the Colleen, Black River, Circle, and Charley River Quadrangles. The project will include planning, investigations, and folio preparation....Finally, you will be pleased to note that inflation is not nearly as bleak as portrayed above. Pres. Carter's chief inflation fighter Alfred Kahn announced price drops in what he considers 'key economic categories.' He noted that ski goggles dropped 17%, galoshes were down by 38%, and rock salt was down a whopping 190%. This was for July. The Administration is optomistic about further price declines in August. Cheers...

Metals Market

	Aug. 24, 1979	3 Months Ago	1 Year Ago
Antimony ore, stu equivalent European ore	$ 19.96-21.09	$ 17.37-19.50	$ 16.20-18.20
Barite (drilling-mud grade per ton)	$ 24-47	$ 24-47	$ 19-28
Beryllium ore, stu	$ 60-65	$ 50-55	$ 40-42
Chrome ore per long ton (Transvaal)	$ 58.00	$ 54.00	$ 54.00
Copper per lb. (MW-prod.)	$ 0.91	$ 0.90	$ 0.68
Gold per oz.	$314.75	$270.90	$198.25
Lead per lb.	$ 0.58	$ 0.515	$ 0.33
Mercury per 76-lb flask	$300.00	$325.00	$153.00
Molybdenum conc. per lb.	$ 8.84	$ 6.84	$ 4.41
Nickel per lb. (cathode)	$ 2.75	$ 2.85	$ 2.06
Platinum per oz.	$421.20	$449.00	$264.20
Silver, New York, per oz.	$ 9.78	$ 8.768	$ 5.41
Tin per lb., MW composite	$ 7.35	$ 7.38	$ 6.43
Titanium ore per ton (ilmenite)	$ 50.00	$ 50.00	$ 55.00
Tungsten per unit (GSA domestic)	$134.74	$125.00	$117.31
Uranium per lb., MW US spot oxide	$ 42.70	$ 43.25	$ 42.50
Zinc per lb. (MW-US PW)	$ 0.36	$ 0.39	$ 0.32

-Reproduction by Printing & Duplication Services, Dept. of Administration, Anchorage-

Alaska Department of Natural Resources
Division of Geological & Geophysical Surveys
P.O. Box 80007
College, AK 99708

Bulk Rate
U.S. Postage Paid
Permit No. 39
Fairbanks, Alaska

RETURN POSTAGE GUARANTEED