Metal Mining: Revival of a Basic Industry

by Kristen Tromble and Brigitta Windisch-Cole

In the last two decades, oil has come to dominate Alaska's economy, but originally another sector of the mining industry fueled employment and population growth in the state. Metal mining, particularly the quest for gold, sparked the founding of many communities in Alaska's first 50 years as a territory and provided an economic base for these boomtowns. Settlements in the Southeast and Interior regions and the Kenai and Seward peninsulas sprang up during the early gold rushes. Metal mining activity decreased in the years following statehood due to low metal prices, high costs and lack of infrastructure. It recently has rebounded. Although it now represents only a small portion of the state's economy, metal mining has the potential for significant growth. This article examines the current structure and economic impacts of Alaska's metal mining industry.

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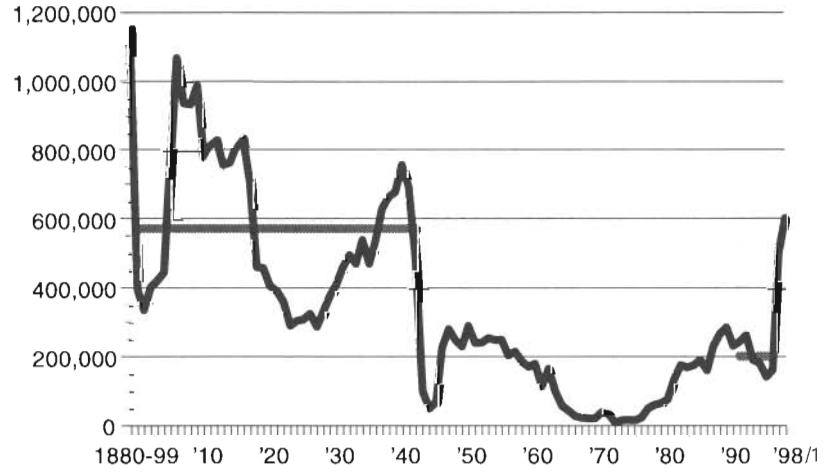
Source: Alaska Department of Commerce and Economic Development, Division of Trade and Development.

Figure • 1

The Early Quest for Gold Brought Big Rewards

Alaska's production in troy ounces



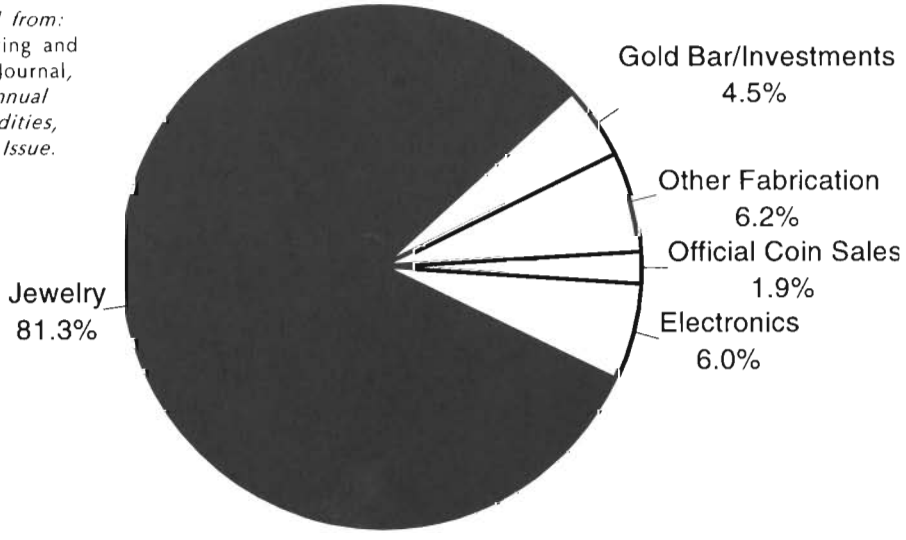
1/ Estimated output in 1998.

Source: Alaska Department of Commerce and Economic Development, Division of Economic Development.

Figure • 2

Jewelry Markets Spur Demand for Gold

Estimated global demand in 1996 = 3,432 Metric Tons



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Alaska's new gold producers

The history of metal mining in Alaska reveals the great impact of the gold rush days. Nearly 88 percent of all Alaska's gold production to date took place before the territory became a state. Yields were high. Between 1900 and 1942, average gold recovery amounted to over 575,000 ounces per year, almost three times the annual production from 1990 to 1996. (See Figure 1.)

However, in 1997, the state's gold production will increase sharply as three new mines post a full year's production. Nixon Fork, an underground lode mine situated north of McGrath, started up in the fall of 1995. It produces about 60,000 ounces of gold annually. In October of 1996, milling began at Fort Knox, Alaska's largest gold mine. This $350 million mine will produce approximately 350,000 ounces of gold per year for another 12 or more years. Fort Knox has already become one of the largest employers in the Fairbanks area. The third mine, Illinois Creek, a heap leach operation in Interior Alaska, joined the larger scale gold producers in June 1997. Extraction is expected to yield between 50,000 and 60,000 ounces per year. In addition, output of 60,000 ounces per year from the re-opened Greens Creek Mine in Southeast enhances the state's gold production outlook.

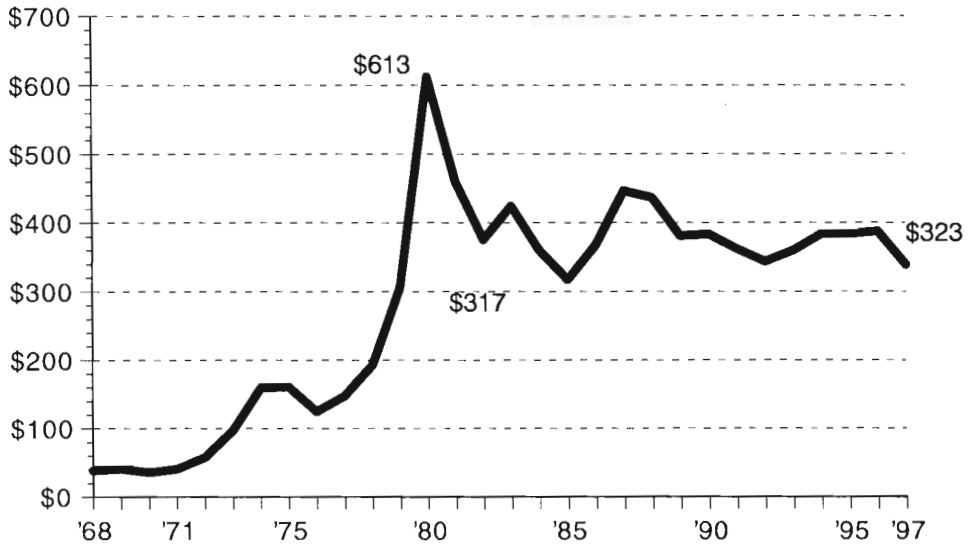
With an estimated future annual output of about 600,000 ounces (18,662 kg) per year, Alaska could

become the fourth largest gold-producing state in the nation, a significant improvement over the state's 1996 eighth place ranking. (See Table 1.) Increased state production could boost the U.S. production growth rate, which rose by less than one percent between 1995 and 1996, and solidify the nation's second place ranking among other gold producing nations. In 1996, the worldwide supply of mined gold grew by about 1.4 percent. Mine output sharply declined in South Africa, while gold recoveries increased in Australia, Canada, Peru and other nations.

Figure • 3

Historical Averages for London Gold Prices

Prices per troy ounce based on London PM Gold Fix



1/ Year to date monthly average, January through September, 1997.

Source: Kitco Inc. - Gold and Precious Metal Dealers.

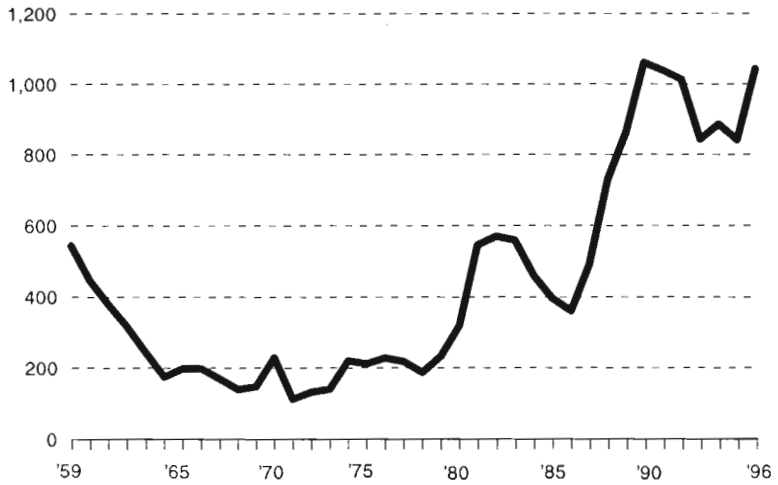
Supply and demand

Gold reaches its eventual customer through a limited number of key markets where the balance of sell and purchase orders fixes the daily prices. While newly-mined gold is the largest source of supply, official government sales or purchases from a nation's treasury vault also affect supply and demand. Worldwide government stockpiles amount to approximately 34,500 metric tons. The U.S, which controls more than any other nation, holds approximately 35

Figure • 4

Metal Mining Employment Forges Ahead

Annual average employment



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Source: Alaska Department of Labor, Research and Analysis Section.

Gold fever

Russians found gold on the Kenai Peninsula in 1849 and gold was discovered in Southeast Alaska in the early 1860s. However, serious interest in gold mining didn't develop until the United States purchased Alaska in 1867. Over the next 50 years, several areas across the vast territory yielded profitable mining reserves, with each new find sparking a wave of gold fever.

In Southeast Alaska, the first significant gold mining occurred in the 1870s. In 1880, rich discoveries led to the founding of Juneau, followed soon after by the development of large-scale hard rock mining operations such as the Treadwell, the Alaska Gastineau and the Alaska Juneau mines. This last facility operated until it was forced to close during World War II as a result of the diversion of labor and other resources to the war effort.

Gold was also discovered in the Interior in the early 1880s with the first major strike occurring on the Fortymile River in 1886. Within the next 10 years, other Interior strikes followed including discoveries on the Koyukuk River and the creeks around Circle City. The Kenai Peninsula also beckoned miners with the call of riches. Where miners congregated, communities sprang up, many of which survive today.

The Klondike strike in Canada brought a flood of prospectors through Alaska in 1897. Although the discovery was in Canada, Alaska boom towns such as Skagway and other points along the access routes reaped indirect benefits providing supplies and services to the would-be miners. The influx of prospectors into the area also encouraged further mineral exploration in Alaska.

In 1898, gold was discovered on the Seward Peninsula drawing non-Natives to settle in this remote western region where "golden sands" were literally scooped off the beach. The mining activity provided an economic base for the bustling new city of Nome. Just after the turn of the century, gold finds in the Fairbanks area started another rush to the Interior. When the last gold rushes of the early 1900s subsided, the quest for gold did not die. From the panhandle to the arctic, small gold mines continue to operate today, and prospectors still crush rocks, drill samples and kneel beside promising streams in hopes of finding a rich deposit.

percent of all known world gold reserves. The sell-off of gold holdings, therefore, by governments and international investors, and the re-use of old gold scrap, play a key role in total global supply.

Over the last 4,000 years, gold has become mankind's most reliable "store of value" and display of wealth. Jewelry use accounts for the largest consumption of gold, followed by industrial consumption, particularly the electronics industries. (See Figure 2.) Hoarding of gold bars still represents four percent of current demand. Minted coin markets have slackened during the past four years. Overall, world demand declined by 4.7% in 1996, but the jewelry sector turned in a buoyant performance requiring 1.7% more gold than in 1995.

Demand for jewelry grew especially in countries with developing economies such as India, China, Turkey, Taiwan and Vietnam. The emerging industrial nations have become more affluent and represent a populous consumer group that could spur future world demand. In India and other Asian and Middle East countries, high-grade gold jewelry is purchased as much for adornment as it is for investment.

In recent years, however, official coin sales, investing in gold-backed securities and bar hoarding have become less attractive. Expanding world economies and rapidly rising stock markets, coupled with low inflation, particularly in the United States, have detracted investors from precious metals markets to other investments. Low inflation has reduced the need to hoard gold as a security measure to protect wealth from value erosion.

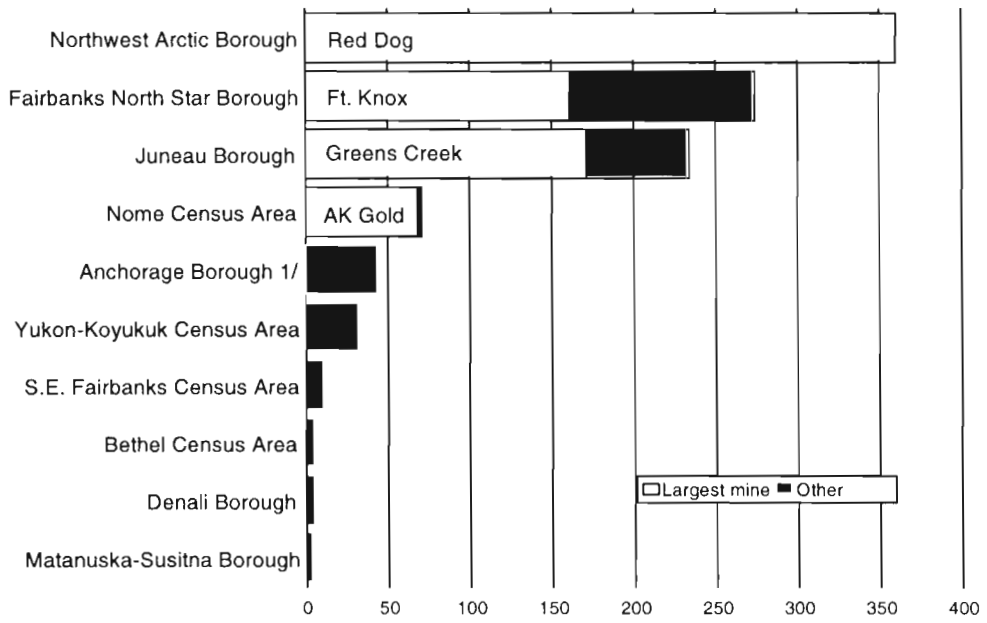
Overall, gold is still regarded as the most enduring storage of wealth and many members of society have eternal faith in its intrinsic value. This explains

why, in times of an economic downturn, some investors and other owners of wealth convert assets to gold holdings. To some degree, gyrations in gold prices reflect the state of the world economy expressed as an inverse relationship.

Figure • 5

Four Areas Share 90% of Metal Mining Employment

Annual average employment in 1996



1/ Includes workers for whom area was not known.

Source: Alaska Department of Labor, Research and Analysis Section.

Prices

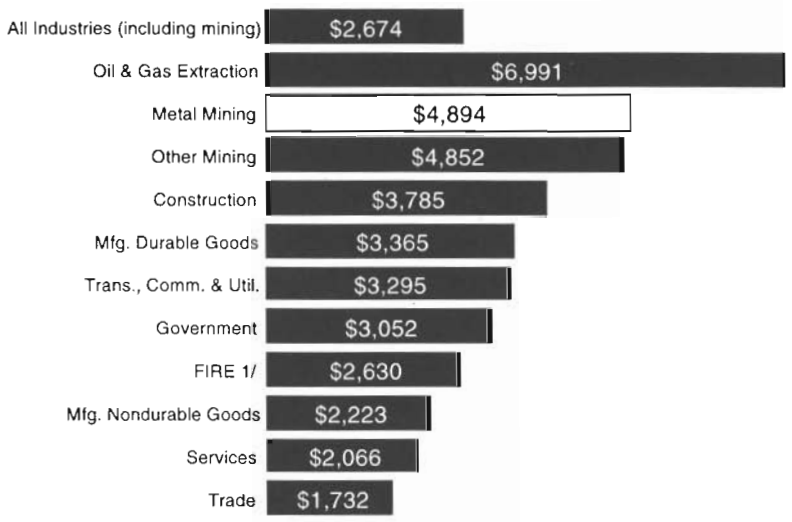
In 1971, the U.S. officially abandoned the gold standard, and its central bank was no longer obligated to convert currency to gold. Congress lifted the 25 percent gold reserve requirement for all outstanding banknotes in 1967, and gold prices started to rise after the regulation took effect. (See Figure 3.)

Recently, prices have trended lower. The average monthly price of gold fell from $369.00 per ounce in December 1996 to $322.74 in September 1997, a 12.5% drop. Strong central bank sales contributed to the decline. Gold from the treasuries of Australia and some European countries hit the market, adding to the world's trade stockpile. Some sell-off of other forms of gold holdings and increased mine output have reinforced the

Figure • 6

Mining Industry Pays Good Monthly Wages

Annual average wage in 1996



1/ FIRE = Finance, Insurance, and Real Estate.

Source: Alaska Department of Labor, Research and Analysis Section.

Table • 1

Mined Gold Production on a National and International Scale

Rank	State	1996 Mine Production in kg	Rank	Country	1996 Mine Production in kg
1	Nevada	213,000	1	South Africa	497,583
2	California	23,800	2	United States	318,000
3	Utah 1/ ,2/	24,000	3	Australia	289,000
4	South Dakota	17,406	4	Canada	164,136
5	Montana 2/	9,110	5	China	145,000
6	Colorado 2/	7,650	6	Russia	120,000
7	Idaho	7,410	7	Uzbekistan	72,000
8	Alaska	5,020	8	Indonesia	65,000
9	Arizona	1,740	9	Peru	64,786
	Other States 3/	8,864		Other Countries	514,495
	U.S. Total	318,000		World Total	2,250,000

1/ Exact mining output was not available for the State of Utah (it is rounded to the closest ton). Therefore, production data only appear to exceed the State of California's production.

2/ Estimated production output.

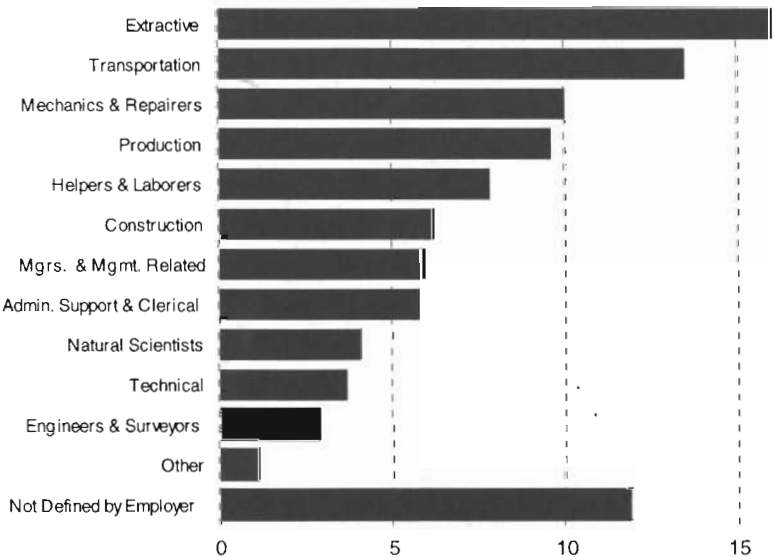
3/ Other states include: New Mexico, Washington and South Carolina.

Source: U.S. Geological Survey, Mineral Commodity Summaries.

Figure • 7

Metal Mining Provides a Variety of Jobs

Percent of metal mining jobs by occupational group 1/



1/ Based on employment in the third quarter of 1996.

Source: Alaska Department of Labor, Research and Analysis Section.

downward price trend. Demand for gold has not increased sufficiently to keep prices strong.

In recent years, Alaskans have paid close attention to gold prices because of their strong influence on future mine development. This year's price drops have sent jitters through the mining industry. Quite a few exploration projects are ready to be developed. Although current gold prices barely support investment, other considerations also enter into investment decisions. For example, operating mines have been able to cut expenses. Also, geophysical surveys have helped identify properties that are likely to contain gold deposits. In 1993, the state of Alaska commissioned these surveys to define the mineral potential of the state. As a result, new exploration sites have been identified, prompting a surge of new claim staking. The 1997 exploration results hold promise.

Gold mining modernizes

A new era of mining has begun, characterized by a large-scale approach to gold mining. Today's larger producers include four lode mines. Lode mines like Fort Knox target fine-grained gold particles imbedded in the host rock and use a multi-staged milling process to separate ore. A further chemical process extracts the gold. Illinois Creek uses a heap leach method, which applies a chemical separation process. Lode mines are usually larger, more complex, tend to employ more workers, and can operate year round.

Table • 2

A Decade of Metal Mining Production in Alaska

	Gold (oz)	$ Value	Silver (oz)	$ Value	Zinc (tons)	$ Value	Lead (tons)	$ Value
1996	161,565	62,622,594	3,676,000	19,078,440	366,780	361,646,000	70,086	52,284,000
1995	141,882	56,040,000	1,225,730	6,655,000	359,950	345,552,000	58,098	34,428,600
1994	182,100	70,290,000	1,968,000	10,391,000	329,003	296,102,700	36,447	25,512,900
1993	191,265	68,640,000	5,658,958	24,333,000	268,769	236,516,700	38,221	13,759,600
1992	262,530	88,460,000	9,115,755	34,913,000	274,507	301,957,700	68,664	31,585,000
1991	243,900	88,290,000	9,076,854	39,110,000	278,221	278,221,100	69,591	33,403,700
1990	231,700	89,200,000	10,135,000	50,675,000	181,200	253,680,000	44,220	30,954,000
1989	284,617	108,700,000	5,211,591	27,300,000	19,843	29,400,000	9,585	7,700,000
1988	265,500	112,840,000	47,790	282,000	n/r	n/r	n/r	n/r
1987	229,707	104,510,000	54,300	391,000	n/r	n/r	n/r	n/r

n/r = not reported

Source: Department of Commerce and Economic Development, Division of Economic Development.

Historic records show that placer mines accounted for 71 percent of all gold produced in the state through 1996. Many placer miners use sluice boxes and dredges to separate gold from lighter material. Placer mining tends to be seasonal and more dependent on weather than lode gold mining. In Alaska, placer miners often are individual entrepreneurs working with partners or family members, but there are notable exceptions. Alaska Gold Company, a placer operation in Nome, was among the top 10 gold producers in the state in 1996. It is also one of the oldest mines operating in Alaska. Placer gold production fell sharply last year after the 1995 closure of the Valdez Creek Mine. Following an additional slight drop, placer production may stabilize this year. Many factors contributed to the decline: placer or alluvial deposits are being mined out; bigger companies rarely look for placer deposits; operating costs are high, even for smaller-type operations; the multilayered regulatory permitting process is difficult; tremendous effort is needed to prospect in Alaska's undeveloped terrain; and business risk remains high. Placer mining could rebound if current exploration is successful.

Other metals shine

Besides gold, Alaska is also rich in other metals. Silver, platinum, copper, zinc, lead, mercury, tin, nickel, molybdenum, and uranium have all been found, and many mined, in Alaska.

Most of Alaska's historic and recent silver production comes from polymetallic mines. Most polymetallic mines extract precious and base metals and, consequently, their production mix varies. Kennecott's Greens Creek mine in Southeast Alaska is a polymetallic mine with a current production mix of silver, gold, zinc and lead. When Greens Creek started operations in 1989, Alaska's silver production increased sharply, but it slowed in 1993 when the mine temporarily shut down. Since it resumed operations in 1996, silver production has regained ground. (See Table 2.) Greens Creek is the largest silver mine in North America, and has become an important U.S. producer of zinc and lead concentrate. This mine has an expected life of at least 16 years.

Of the base metals, copper, zinc and lead have been the most important to Alaska's economy. Between 1911 and 1938, the Kennecott mines, located 60 miles inside what is now the Wrangell-St.Elias National Park, produced approximately 130 million pounds of copper concentrate valued then at $200 million. When the Kennecott mine closed in 1938 (because of low prices), Alaska's copper era subsided. During the past seven years, zinc and lead have become the most important

Table • 3

The Top Five Metal Producing Nations for Selected Commodities in 1996

Silver: Rank	Country	(metric tons)
1	Mexico	2,400
2	Peru	2,000
3	**United States**	1,800
4	Canada	1,200
5	Australia	900
	World total	14,800

Zinc: Rank	Country	(metric tons)
1	Canada	1,120,000
2	China	1,000,000
3	Australia	900,000
4	Peru	700,000
5	**United States**	650,000
	World total	7,200,000

Lead: Rank	Country	(metric tons)
1	Australia	490,000
2	China	450,000
3	**United States**	430,000
4	Canada	260,000
5	Peru	230,000
	World total	2,800,000

Source: Department of the Interior, U.S. Geological Survey.

base metal exports. Zinc's 1996 production value was nearly six-fold that of the gold recovery value for the same year. (See Table 2.) Most of Alaska's zinc ore is milled at the large Red Dog mine, north of Kotzebue.

How large is the Red Dog?

The Red Dog, a lead and zinc mine, is a growing giant characterized by superlatives. It has become the largest single supplier of zinc concentrate in the world. In 1996, it produced over half of the nation's zinc output. Last year, on a global scale, it contributed seven percent to the world's mine-produced zinc concentrate out put and is expected to increase its world production share in future years. In 1996, this mine also produced 118,500 tons (107,500 metric tons) of lead concentrate. An ongoing expansion project, representing a $200 million capital outlay, will soon increase mine capacity and raise annual output by 35 percent. A recently explored discovery, the Aqqaluk ore body, lying close to the current pit, allows for this stepped-up production. Even at this higher rate of production, the mine could operate at least another 50 years. Cominco American, Inc., operates the mine and NANA Corporation, an Alaska regional Native corporation, owns the deposit.

Since the start-up of the Red Dog mine in 1989, low zinc prices and high production costs have plagued its profit picture. From the mine's location 60 miles above the Arctic Circle in Western Alaska, ore concentrates can only be shipped to overseas markets and Canada during approximately 100 ice-free days in summer. Since transportation obstacles are a given, the mine's per unit production costs will improve with increased throughput and additional and more modern equipment. Spurred by the healthy expansion of the U.S. economy, domestic zinc consumption has increased. Prices have followed suit. Domestic prices for refined zinc, averaging 51 cents per pound last year, had risen to over 70 cents per pound in September 1997 trading. With a strong supply position, the Red Dog mine is likely to reap considerable benefits while prices remain high.

The Greens Creek Mine will also add to Alaska's output of zinc and lead concentrate. Combined output from both mines will improve the position of the U.S. as a zinc and lead concentrate producing nation. Incongruously, the U.S. is also the world's largest importer of zinc and zinc products. About 60 percent of Alaska's zinc concentrate is shipped to Canada and a good portion re-enters the U.S. as refined zinc metal of commercial grade. In 1996, global scale projections ranked U.S. zinc mine production in fifth place and lead production in third place. (See Table 3.)

Exploration budgets have increased

In present times, a resurgence in mining exploration and development is setting up a modern style rush. Activity in the Fairbanks and Southeast areas of the state has pushed the metal mining industry into the spotlight. In 1996, Alaska's metal industries spent over $44.3 million for exploration—30 percent more than in 1995.

The Interior's metal prospects

Over 40 percent of the industry's 1996 exploration budgets for Alaska were spent in the Interior. Exploration efforts continue at a fast pace with gold deposits still the most popular target.

The largest exploration program was the True North gold property, located just 12 miles northeast of Fairbanks. Newmont Exploration spent $6 million to acquire a 65 percent interest from La Teko Resources. To date, exploration expenditures have reached $10 million on this project. International Freegold Minerals, Placer Dome, and La Teko continued their programs on lands north and east of the True North exploration site.

Silverado Mines entered a $12 million purchase agreement with La Teko Resources for the Ryan Lode gold deposit on Ester Dome. This deposit has proven and probable reserves of about 822,000 ounces of gold. The purchase agreement requires production to start within 4.5 years. Silverado Mines also owns the mineral rights for the Chantanika Prospect, a 54-square-mile property. This company has expressed interest in also exploring sites at Whiskey Gulch and Marshall Dome. In addition to the Ryan Lode prospect, La Teko Resources has begun exploration on three other properties: Twin Buttes (leased from the University of Alaska), the adjacent Juniper project and Discovery Gulch property in the Circle Mining District.

Sumitomo, with its new partner Teck Corporation, continued a fast-paced $5 million exploration program in 1997 on its Pogo prospect, which lies 35 miles northeast of Delta Junction. The partnership announced high-grade gold intercepts.

Table • 4

Top Occupations in Alaska's Metal Mining Industry— 3rd Quarter 1996

Occupation	Number of Workers
Miners	133
Grader, Dozer & Scraper Operators	63
Earth Drillers	61
Extractive Occupations Helpers	53
Heavy Equipment Mechanics	52
Geologists	51
Crush., Grind., Polish. Machine Opers.	50
Millwrights	46
Extractive Occupations, NEC	43
Misc. Material Moving Equipment Opers.	38
Heavy Truck Drivers	35
Excavating & Loading Machine Opers.	31
Mining Machine Operators	30
Operating Engineers	28
Miscellaneous Machine Operators	27
Milling & Planing Machine Operators	24
Stock & Inventory Clerks	23
Welders	22
General Managers	21
Supervisors, Extractive Occupations	21
Other Construction Trade Helpers	20
Manual Occupations, NEC	20
Electricians	18
Mining Engineers	18
Metallurgical & Materials Engineers	17
Elect. Repairers, Commercial & Industrial	16

NEC = Not elsewhere classified.

Source: Alaska Department of Labor, Research and Analysis Section.

Prospects in other areas

In Southeast Alaska, Coeur Alaska is working to open the Kensington mine near Juneau. Once the approval of its last major permit is obtained, Coeur Alaska appears set to proceed with its new Kensington gold mine. However, the recent drop in gold prices could affect the time line for this project. As now planned, construction would begin in 1998 with production starting around the year 2000. About 300 workers will be needed at

full production. The expected 10-to-12-year life of the mine will likely be extended by new ore discoveries as mining proceeds.

Although Echo Bay recently scrapped plans to reopen the A-J gold mine in Juneau, the state's Southeast region holds other rich prospects for metal miners. Coeur Alaska has also examined the Jualin gold mine site, near the Kensington. Abacus Mineral Corporation is exploring the Niblack deposit, a polymetallic site on Prince of Wales Island. Following promising results from its drilling work in 1996, the company proceeded with an additional $4 million in exploratory work in 1997. If Niblack went into production, it could yield gold, silver, copper and zinc and employ up to 250 workers.

Sealaska, a regional Native corporation, holds subsurface rights on 600,000 acres in Southeast and is surveying to identify workable reserves. Also, some Southeast communities, including Skagway, Wrangell and Juneau, benefit indirectly from metal mining activity in British Columbia and Yukon Territory. Although no development is currently planned, Southeast also holds one of the largest deposits of molybdenum in the world.

In the eastern Interior region, exploration sites targeting base metals include the Robertson River and Dry Creek North sulfide properties. In the Western region, Placer Dome resumed exploration efforts at Donlin Creek, Ganes Creek, Colorado Creek and the Nyac project. Ventures Resource Corp. drilled its Golden Horn, Chicken Mountain and Black Creek properties. In 1996, the least amount of new prospect exploration money ($1.2 million) was spent in the Northern region. A few companies explored the Chandalar Lake area, the Ambler Copper Belt, and properties around Wiseman and Nolan Creek.

Employment picks up

All these production and exploration activities add jobs and wages to Alaska's economy. In 1996, metal mining provided 0.4% of Alaska's wage and salary jobs and 0.7% of wages. Metal mining's 1,043 jobs contributed over $61 million in wages to Alaska's economy. Though small, metal mining is a growing segment of Alaska's economic profile.

Since the late 1980s, employment in metal mining has reached the highest levels since before statehood. (See Figure 4.) Employment peaked in 1990, then dipped with the shut down of Greens Creek. However, employment rebounded in 1996 when that mine reopened and the Nixon Fork Mine marked a full year of operation.

The current outlook favors continued growth. The Illinois Creek mine, as well as Fort Knox, which started production late in 1996, will boost 1997's employment figures. These increases will almost certainly push metal mining employment to a new high this year.

Most current activity occurs in three areas

In 1996, 10 boroughs or census areas benefited from metal mining employment. (See Figure 5.) In the Northwest Arctic Borough, the Red Dog zinc mine, the industry's largest employer, provided 360 jobs, or 14.8% of the borough's total employment—by far the largest chunk of any area's employment. Over half of the employees at the Red Dog Mine are NANA Corporation shareholders. Other areas where metal mining provided over one percent of employment were Nome (2.1%), Yukon-Koyukuk (1.7%) and Juneau (1.5%). Fairbanks, Southeast Fairbanks, Denali, Bethel, Mat-Su and Anchorage each counted less than one percent of their total employment in metal mining.

Along with the number of jobs supported by an industry, the amount of wages paid also influences an industry's economic impact. In 1996, metal mining's average monthly wage of $4,894 was 184 percent of the average for all other industries, $2,665. (See Figure 6.) Only four industry sub-

groups reported wages higher than those in metal mining: oil and gas extraction; security and commodity brokers; petroleum refining; and fire, marine and casualty insurance.

The industry, particularly the placer mining operations, also supports many self-employed people. According to the *1996 Alaska Mineral Industry Report*, 144 placer mines were in operation with 825 jobs. Many of these jobs are not counted in the state's employment statistics, which track only wage and salary jobs.

In addition to its direct jobs, metal mining generates economic benefits through indirect jobs. In 1995 and 1996, the mining industry spent over $540 million in mine development. A good portion of the development expenditures benefited the construction sector. Several capital construction projects have provided significant temporary employment. At its peak, preproduction work at the Ft. Knox gold mine, for example, employed over 600 construction workers. The transportation industry and suppliers of goods and services to the mine also benefit. Well paid mining workers stimulate demand for retail trade, services and housing.

Mining occupations

According to Alaska Department of Labor wage filings, metal mining companies employed 1,488 workers in the third quarter of 1996. Occupational information was included for 88 percent of these workers.

As employment drops in industries such as timber, expansion in metal mining could provide jobs for some of those displaced workers. Around two-thirds of metal mining jobs fall into six occupational categories— extractive, transportation, production, and construction occupations, mechanics and repairers and helpers and laborers. (See Figure 7.) In the third quarter of 1996, nearly three-fourths of the people for whom occupational information was available worked in one of 26 occupations. (See Table 4.) Many of these occupations require manufacturing and construction skills that are compatible with the metal mining industry.

Summary

Alaska's rich metal mining industry is awakening from a slumber that lasted for more than 50 years. In the past two years, three new mines entered production and another resumed operations after a three-year pause. Gold mining production could triple by 1998, and Alaska's giant zinc mine will substantially increase production. The industry's economic impact will not only affect direct employment and wages but spread business to supporting industries as well. Current exploration activities in Southeast, the Interior and in Western Alaska indicate the potential of continued industry growth. Alaska's mining industry is becoming an important player in the international market, where a variety of forces determine the direction of base and precious metal prices. The economic success of Alaska's mining operations is directly linked to world markets. Current gold prices may have dampened overly optimistic expectations, but lower production costs, combined with newly found ore deposits, favor further mining development.