

ALASKA'S Mineral Industry 1997: A Summary

by R.C. Swainbank and K.H. Clautice

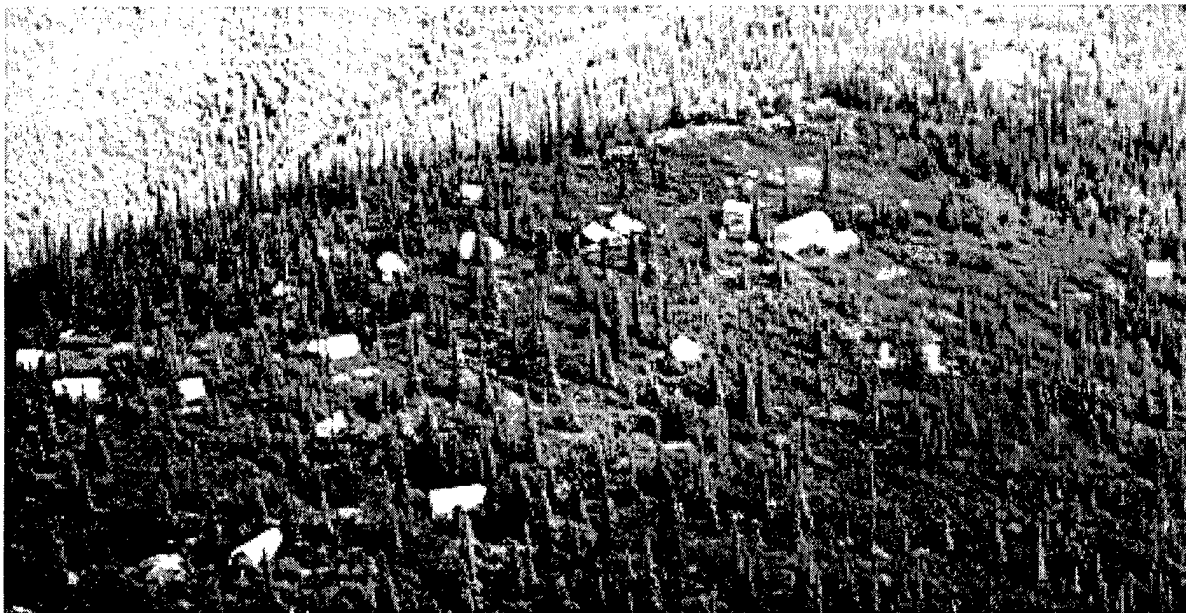


Photo of the 45-man exploration camp at the Sumitomo-Teck Pogo joint venture, where a geologic resource of 4.5 million ounces of gold was announced in 1997. Photo by T.K. Bundtzen.

PRODUCTION—The value of production in 1997 increased 53 percent over the 1996 level to \$901.6 million. Expanded production and higher prices of zinc increased profits at the Red Dog Mine and the fully operational Greens Creek Mine. Gold production tripled in 1997 due to the commissioning of the Fort Knox and Illinois Creek mines, and continued production at the Nixon Fork, Greens Creek and several dozen placer mines.

DEVELOPMENT—Expenditures in 1997 were \$167.4 million, considerably less than the record \$394.0 million in 1996 as the Fort Knox and Illinois Creek mines reached production. Construction continued at the Red Dog mine and port, which will allow a production rate increase to begin in 1998.

EXPLORATION—The pace of exploration continued to increase in 1997, with an investment of \$57.3 million, an increase of 28 percent over the previous year. Highlights include exciting new discoveries and an increase in the number of exploration companies active in the state.

EMPLOYMENT—Preliminary reports suggest that employment was steady in the minerals industry in 1997. There was a decrease in the amount of mine development jobs, but the number of people employed in hard rock mines almost doubled.

GOVERNMENT ACTIONS—Airborne geophysical surveys were conducted in 1997 in the Wrangell, Wiseman, Ruby, and Talkeetna areas. Results for the 1996 Rampart, Chulitna, and Petersburg geophysical surveys were released in 1997. The Mental Health Land Trust legal questions were finally settled, and several placer miners received awards for superlative reclamation.

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Rainer Newberry investigating a silver prospect in the Chulitna mining district during a DGGS mapping project in July 1997, to follow up recently-flown geophysical surveys. Denali is in the background. (Photo by K.H. Clautice.)

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Division of Trade and Development



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by R.C. Swainbank¹ and K.H. Clautice²

INTRODUCTION

Highlights for 1997 include new production at the Fort Knox gold mine near Fairbanks and the Illinois Creek gold-silver mine near Galena, full production at the Greens Creek polymetallic mine near Juneau, increased production at the Red Dog zinc-lead mine near Kotzebue, and continued production at Nixon Fork. There was placer production by Alaska Gold in Nome, Yellow Eagle Mining and Polar Mining in Fairbanks, as well as dozens of smaller mines. Coal was produced by Usibelli at Healy. Development was reported at Red Dog, the Kensington gold mine near Juneau, and the Calder Bay limestone deposit on Prince of Wales Island.

Exploration highlights include continued success at gold prospects such as True North, Ester Dome and Golden Summit near Fairbanks, Donlin Creek and Golden Horn near Flat, and Pogo near Delta. Substantial base metal and polymetallic exploration was reported at Red Dog, throughout the eastern interior, at the Pebble Copper Prospect near Iliamna, and at the Niblack Mine on Prince of Wales Island.

Although investment in mining development was less in 1997 than in 1996, an increase in exploration investment and in the value of the minerals and materials produced resulted in a slight increase in the total value of the industry (table 1). Exploration expenditures in 1997 were \$57.3 million (\$44.6 million in 1996), development investment was \$167.4 million (\$394.0 million in 1996), and the value of production in 1997 was \$901.6 million compared with \$590.4 million in 1996. The net result is that the total value of the industry in 1997 was \$1.13 billion versus \$1.03 billion in 1996.

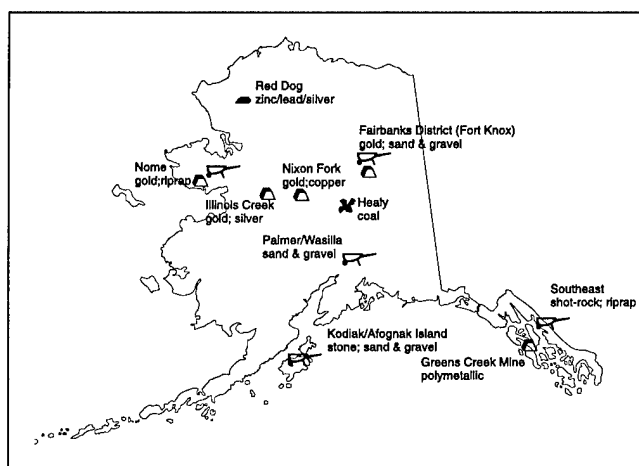
Note that there is a vague line between exploration and development, and we rely on the companies to make that distinction. The value of production is calculated using the average spot price of the metal on the London Metal Exchange multiplied by the quantity of the metals produced, as reported by companies. It does not take into

Table 1. Total value of the mineral industry in Alaska by year (in millions of dollars)

	Exploration (expenditure)	Development (expenditure)	Production (value)	Total
1981	\$ 76.0	\$ 26.4	\$ 188.6	\$ 291.0
1982	45.0	41.6	196.4	283.0
1983	34.1	27.8	232.4	294.3
1984	22.8	53.6	199.4	275.8
1985	9.2	34.1	226.6	269.9
1986	8.9	24.3	198.5	231.7
1987	15.7	100.3	202.4	318.4
1988	45.5	275.0	232.2	552.7
1989	47.8	134.3	277.0	459.1
1990	63.3	14.3	533.0	610.6
1991	39.9	25.6	546.5	612.0
1992	30.2	30.0	560.8	621.0
1993	30.3	27.7	448.7	506.7
1994	31.1	44.9	507.5	583.5
1995	34.3	148.6	537.2	720.1
1996	44.6	394.0	590.4	1,029.0
1997 ^a	57.3	167.4	901.6	1,126.3
TOTAL	\$636.0	\$1,569.9	\$6,569.2	\$8,785.1

^aEstimates.

SOURCE: Alaska's mineral industry reports published annually by DGGS.



Selected significant production sites in Alaska, 1997.

¹Alaska Division of Trade and Development, 751 Old Richardson Hwy., Suite 205, Fairbanks, Alaska 99701-4948.

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account items such as smelter charges and penalties, or shipping costs. Forward sales at higher than spot prices are used if reported by a company. The number of companies using the exploration tax credit increased in 1996, but the 1997 numbers will not be available until mid 1998. Likewise we do not have an accounting of the number of claims staked, as there is a 90-day delay in recording requirements.

This preliminary summary of Alaska's mineral industry in 1997 is made possible by information provided on mineral questionnaires returned to the Division of Geological & Geophysical Surveys (DGGS). The final report will follow later in the year when all the questionnaires have been returned. The report is a cooperative venture between the Division of Trade & Development (DTD) in the Department of Commerce & Economic Development, and DGGS and Division of Mining & Water Management (DMWM) in the Department of Natural Resources.

EMPLOYMENT

Table 2 shows the estimated employment in the mineral industry in Alaska in 1997. Information regarding employment in placer mines, the industrial minerals sector and in recreational mining is incomplete at this time, but will be refined for the final version of this report. There was a substantial increase in all types of hard rock mining employment in 1997, offset to some extent by a decline in placer mining and particularly in mine development work.

Table 2. *Estimated Alaska mine employment, 1991-97^a*

	1991	1992	1993	1994	1995	1996	1997
Gold/silver/mining							
Placer	1,240	1,251	1,205	1,150	975	825	780
Lode	N/A	N/A	N/A	--	38	138	415
Polymetallic	35 ^b	240 ^b	26	--	--	68	230
Base metals	331	349	376	311	397	407	478
Recreational	320	325	270	280	255	260	270
Sand & gravel	685	640	580	640	577	598	592
Building stone	165	145	205	210	200	149	121
Coal	115	115	109	115	120	115	118
Peat	45	40	49	55	30	38	40
Tin, jade, soap-stone, ceramics, platinum	25	20	20	25	20	20	20
Mineral development	133	164	132	115	637	862	405
Mineral exploration	268	137	164	182	157	257	273
TOTAL	3,362	3,426	3,136	3,083	3,406	3,737	3,742

^aCalculated on a 260-day work year.

^bRevised estimate based on new company data.

N/A = Not available.

-- Not reported.

PRODUCTION

The total value of production in Alaska in 1997, \$901.6 million, is shown in table 3. With the commissioning of the Fort Knox and Illinois Creek gold mines, and full production at the Greens Creek polymetallic mine, there was a surge in the amount of gold and silver production in 1997, and increased production of lead and zinc. These factors, coupled with higher average prices for zinc than in 1996, led to a much higher value of base metals for 1997.

Northern Alaska

The Red Dog zinc-lead-silver mine owned by NANA Corp. and operated by Cominco Alaska Inc. produced 675,900 short dry tons of 55.2 percent zinc concentrate and 123,500 short dry tons of 56.1 percent lead concentrate from 2,127,000 tons of ore milled. Average grades of the mill-feed were 20.3 percent zinc, 5.2 percent lead and 2.9 ounces per ton silver. Operating profit for 1997 was \$102 million compared with \$25 million in 1996.

Several placer mines produced gold from the Wiseman and Chandalar Lake areas in the eastern Brooks Range.

Western Alaska

Alaska Gold Company continued with open-pit placer gold mining of the raised beaches north of Nome, while Novus Resources tested its suction-dredge methods offshore.

About 40 miles south of Galena the Illinois Creek lode gold-silver mine poured its first gold in June. Although most of the concerns voiced during permitting regarded whether the valley-fill leach would overflow, a near drought throughout the summer (and fires bigger than those in Indonesia) prevented Dakota Mining Corp. from sufficiently watering the heap. By September, the flow to the heap was at 90 percent of the predicted rate, and 1 million tons of 0.074 ounces per ton rock was on the pad, with an additional 350,000 tons expected before year-end. Dakota expects to produce about 22,000 ounces in 1997, about 80,000 ounces in 1998, and average about 65,000 ounces per year for the next 5 years.

At the Nixon Fork gold-copper skarn mine near McGrath, Consolidated Nevada Goldfields expects to

produce about 40,000 ounces of gold as well as copper concentrates.

Eastern Interior Alaska

With the commissioning of the Fort Knox gold mine about 15 miles northeast of Fairbanks, this region became the second most productive region of the state in 1997.

Although the first official gold pour at the Fort Knox mine was on December 20, 1996, the first commercial gold was produced in March 1997. Production through the end of December, including 45,701 ounces of pre-commercial production prior to March 1, was 366,223 ounces, from 11,689,000 tons grading 0.0343 ounces per ton. The cash cost per ounce was \$170, the total production cost was \$342, and the average selling price

Table 3. *Estimated mineral production in Alaska, 1995-97^a*

Metals	Quantity			Estimated values ^b		
	1995	1996	1997	1995	1996	1997
Gold (ounces)	141,882	161,565	574,423	\$ 56,043,390	\$ 62,664,600	\$ 198,420,000
Silver (ounces)	1,225,730	3,676,000	14,546,000	6,655,714	19,078,440	71,420,900
Platinum (ounces)	NR	2,065	NR		NR	NR
Copper (tons)	NR	390	1,720	NR	803,400	3,543,200
Lead (tons)	58,530	70,086	87,284	34,428,600	52,284,000	48,879,400
Zinc (tons)	359,950	366,780	418,097	345,552,000	361,646,000	493,354,500
Tin (pounds)	W	NR	NR	W	NR	NR
Subtotal				\$442,680,134	\$494,779,820	\$815,618,000
Industrial minerals						
Jade and soapstone (tons)	2.0	2.0	2.0	\$ 25,000	\$ 25,000	\$ 25,000
Sand and gravel (million tons)	9.8	10.0	9.6	30,886,821	33,650,000	32,304,000
Rock(million tons)	2.8	3.0	2.0	22,163,703	24,400,000	16,380,000
Subtotal				\$ 53,075,524	\$ 58,075,000	\$ 48,709,000
Energy minerals						
Coal (tons)	1,670,000 ^c	1,481,000	1,446,000	\$ 41,300,000	\$ 38,000,000	\$ 37,104,000
Peat (cubic yards)	35,000	38,000	37,000	157,500	175,000	170,400
Subtotal				\$ 41,457,500	\$ 38,175,000	\$ 37,274,400
TOTAL				\$537,213,158	\$591,029,820	\$901,601,400

^aProduction data from DGGs questionnaires, phone interviews with mine and quarry operators, Alaska Department of Transportation and Public Facilities, and federal land management agencies.

^bValues for selected metal production based on average prices for each year; for 1997—gold (\$330.76/ounce); silver (\$4.91/ounce); copper (\$1.03/lb); zinc (\$0.59/lb); lead (\$0.28/lb). All other values provided by mine operators.

^cAdjusted from new company data.

NR = None reported.

W = Withheld.

for all operations worldwide was \$360 per ounce. The 174-million-ton deposit is hosted by a 93-million-year-old multi-phase granitic stock. Gold occurs within northwest-trending quartz vein stockwork associated with minor bismuth and tungsten, and trace sulfides.

There were several medium-sized placer gold mines operating in the Fairbanks area in 1997, including the Cripple Creek Venture between Yellow Eagle Mining and Exploration Orbite at Ester; Polar Mining's open-pit operation at Fox; and the Little Eldorado Group's underground operation on its namesake creek. Alaska Placer Development was actively mining the Livengood Bench about 80 miles north of Fairbanks, and there were about a dozen smaller operations in the Manley-Rampart area about 100 miles to the west of the city. Placer operations were also active in the Circle, Seventymile, Fortymile, and Bonfield districts of central Alaska.

Usibelli Coal Mine Inc. produced 1.446 million tons from its mine near Healy, about half of which is exported to Korea, the remainder firing five interior Alaska power plants. A new Clean Coal Plant at the mine mouth has already added power to the Fairbanks-Anchorage intertie. The plant will be in a demonstration mode in 1998, in full production in 1999, and will use up to 300,000 tons of poorer quality coal that is presently discarded.

Southcentral Alaska

Mineral production in southcentral Alaska consisted of small placer gold mines, sand, rock, and gravel pits, and minor peat production.

Southwestern Alaska

Several placer mines operated in this area in 1997; both the number of mines and gold production were less than in previous years.

Southeastern Alaska

The Greens Creek Mine (Kennecott 70.3 percent, Hecla Mining 29.7 percent), expects to produce concentrates containing payable 40,000 tons of zinc, 20,000 tons of lead, 62,000 ounces of gold, 11 million ounces of silver and 1,000 tons of copper. The only other mines reporting production were two placer mines in the panhandle.

Regional distribution of development dollars for 1997. Statewide total expenditures for development were \$167.4 million (1996 expenditures in parentheses).

DEVELOPMENT

Table 4 shows reported development expenditures by region in 1997, and table 5 shows cumulative development expenditures since 1982. The \$167.4 million expenditures are down considerably from the \$394.0 million spent in 1996 because the Illinois Creek gold mine near Galena and the Fort Knox gold mine near Fairbanks became operational, and the Greens Creek Mine near Juneau had reached full productivity.

Northern Alaska

The \$133.9 million development expenditure reported at the Red Dog Mine and port site are part of the Production Rate Increase (PRI) project which began in 1996. The project is designed to allow a 35 percent increase in production which will be phased in beginning in early summer of 1998.

At the port site, the original 1.2 million gallon fuel storage tank was moved to the mine, and a new 2.4 million gallon tank constructed. The accommodations and ancillary facilities were expanded, and the concentrate storage and load-out facilities increased.

At the mine site, an additional drill, Caterpillar tractor, loader, and truck were added to the fleet, and at the mill a new 42-inch gyratory crusher was added, the ore storage facility modified, and the grinding and recovery systems upgraded. A fifth wing with 80 additional rooms was added to the accommodations complex.

About 800 people were on site in 1997, including the regular workforce of about 479.

There was also 25,000 feet of development drilling in the area of the main pit and 205,000 feet of blast hole drilling.

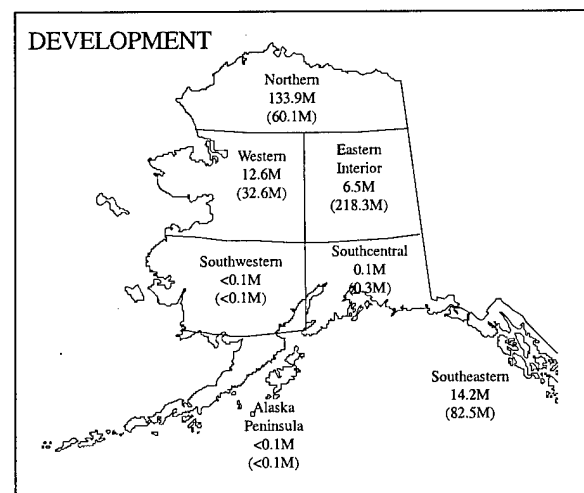


Table 4. Reported mineral development expenditures and employment in Alaska by commodity and region, 1997

	Northern	Western	Eastern interior	South-central	South-eastern	Total
Development expenditures						
Base metals	\$133,880,000	\$ --	\$ --	\$ --	\$ --	\$ 33,880,000
Polymetallic	--	--	--	--	7,300,000	7,300,000
Precious metals						
Placer	--	540,000	250,000	49,000	8,000	847,000
Lode	--	12,100,000	5,852,000	--	6,500,000	24,452,000
Coal and peat	--	--	310,000	100,000	--	410,000
Industrial minerals	--	--	100,000	--	400,000	500,000
TOTAL	\$133,880,000	\$12,640,000	\$6,512,000	\$149,000	\$14,208,000	\$167,389,000
Development employment						
Employment						
Workdays	72,240	13,588	5,357	450	13,566	105,201
Workyears ^a	278	52	21	2	52	405
Number of companies reporting ^b	2	5	14	4	4	29

-- No expenditures reported.

^aBased on 260-day workyear.^bSome companies active in more than one area.

Table 5. Reported mineral development expenditures in Alaska by commodity, 1982-97

	Base metals	Polymetallics	Precious metals	Industrial minerals	Coal and peat	Total
1982	\$ 10,270,000	\$ N/A	\$ 19,320,000	\$ 4,251,000	\$ 7,750,000	\$ 41,591,000
1983	19,500,000	N/A	7,112,500	1,000,000	250,000	27,862,500
1984	10,710,500	N/A	15,058,555	579,000	27,000,000	53,348,055
1985	13,000,000	N/A	16,890,755	1,830,000	2,400,000	34,120,755
1986	3,260,800	8,000,000	12,417,172	124,000	530,000	24,331,972
1987	38,080,000	48,000,000	13,640,848	188,000	342,000	100,250,848
1988	165,500,000	69,000,000	40,445,400	--	--	274,945,400
1989	118,200,000	411,000	6,465,350	7,000,000	2,196,000	134,272,350
1990	--	4,101,000	7,136,500	30,000	3,079,000	14,346,500
1991	--	8,000,000	14,994,350	262,000	2,318,000	25,574,350
1992	80,000	4,300,000	23,151,300	404,000	1,655,000	29,590,300
1993	--	10,731,136	15,103,000	433,500	1,400,000	27,667,636
1994	10,000,000	5,000,000	27,392,850	5,000	2,545,000	44,942,850
1995	11,200,000	9,590,000	127,165,750	426,000	200,000	148,581,750
1996	60,000,000	60,100,000	273,042,000	495,000	400,000	393,987,000
1997	133,880,000	7,300,000	25,299,000	500,000	410,000	167,389,000
TOTAL	\$593,681,300	\$234,533,136	\$644,535,330	\$17,477,500	\$52,475,000	\$1,543,017,266

N/A = Figures not available prior to 1986.

-- Not reported.

Western Alaska

Alaska Gold Company continued its open-pit operation at Nome, and the 1997 program included a 17,000 foot churn-drill program to develop reserves. Several of the smaller placer mines on the Seward Peninsula also reported some development work including stripping the overburden from the pay gravel, constructing roads and ponds, and reclamation.

Construction continued into 1997 at Dakota Mining Company's Illinois Creek gold-silver mine south of Galena, and by mid year the project had evolved into a production facility.

Consolidated Nevada Goldfields continued development of its Nixon Fork gold-copper mine near McGrath, driving almost 3,500 feet of 10 foot by 14 foot decline to access the deeper orebodies.

Eastern Interior Alaska

The only major development in this region was at the Fort Knox gold mine where work continued on the tailings dam and some modifications were made to the leach tanks. An in-pit drilling program of 38,000 feet was completed, resulting in an addition of approximately 450,000 ounces to the reserve base in 1997.

Many of the small placer mines reported development of their properties, generally consisting of stripping and thawing ground in preparation for mining, and construction of settling ponds, roads and other facilities.

Southcentral Alaska

The only development reported in this region was by placer mines.

Southeast Alaska

About \$13.81 million was invested in this region in 1997 on development projects at the Kensington and Greens Creek mines, and at the Calder Island limestone quarry.

Coeur-Alaska continued its permitting process for the Kensington Mine. In August the U.S. Forest Service approved the Final Supplemental Environmental Impact Statement, and signed the Record of Decision. The City & Borough of Juneau approved the Large Mine Permit

in early November, leaving only the Corps of Engineers 404, the EPA discharge, and the State DEC Solid Waste permits to be approved.

At the Greens Creek mine, Kennecott reported 30,000 feet of development drilling.

EXPLORATION

Statewide exploration expenditures reported in 1997 were \$57.25 million, up 28 percent from the previous year. Tables 6 and 7 show the regional distribution and the commodities sought.

Northern Alaska

Exploration expenditures reported in this region in 1997 were \$3.45 million, as compared with \$1.25 million in 1996.

At the Red Dog Mine near Kotzebue about 29,300 feet of exploration drilling continued on the new Lower Plate massive sulfide deposit discovered in 1996 at depths of 400 to 1,200 feet below surface. The new base-metal orebody is 100 to 200 feet thick, with some thicker sections over an area of 600 by 3,300 feet, and is open in all directions. In 1996 the estimated reserves were 7.7 million tons with grades of about 16 percent zinc, 3 percent lead and 3 ounces of silver per ton. Reserve estimates for 1997 are not yet available.

Farther east, NANA and Kennecott drilled about 5,000 feet on the Bormite Mississippi Valley-type copper deposit, and Kennecott continued exploration in the Ambler copper belt, which contains its Arctic Kuroko-type deposit.

Regional distribution of exploration dollars for 1997. Statewide total expenditures for exploration were \$57.3 million (1996 expenditures in parentheses).

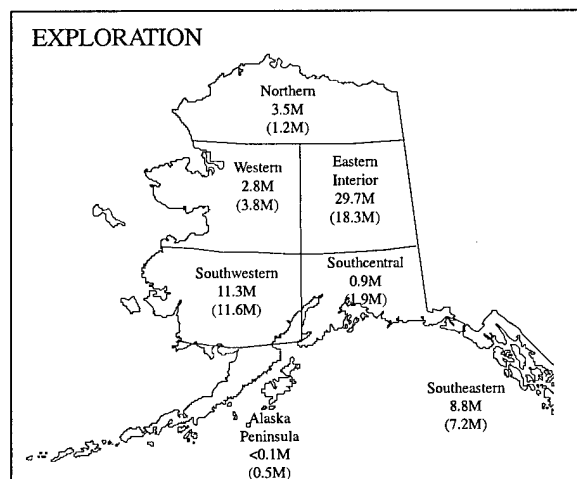


Table 6. Reported exploration expenditures and employment in Alaska, 1997

	Northern	Western	Eastern interior	South-central	South-western	Alaska Peninsula	South-eastern	Total
Exploration expenditures								
Base metals	\$1,700,000	\$ --	\$ --	\$ --	\$ --	\$ --	\$ --	\$ 1,700,000
Polymetallic	1,525,000	47,000	10,012,000	73,000	2,200,000	--	8,340,000	22,197,000
Precious metals								
Placer	210,000	115,000	326,000	37,000	296,000	--	76,000	1,385,000
Lode	--	2,615,000	19,139,500	255,000	8,801,000	--	360,000	31,170,500
Coal and peat	--	--	200,000	520,000	--	--	--	720,000
Industrial minerals	150,000	--	10,000	30,000	--	25,000	--	80,000
Other ^a	--	--	--	--	--	--	--	--
TOTAL	\$3,450,000	\$2,777,000	\$29,687,500	\$915,000	\$11,297,000	\$25,000	\$8,776,000	\$57,252,500
Exploration employment								
Employment								
Workdays ^b	7,410	3,407	35,470	1,177	14,768	30	8,488	70,750
Workyears ^b	29	13	137	5	57	0	33	273
Number of companies reporting ^c	7	15	57	15	10	1	10	114

-- Not reported.
^aJade, platinum, gemstones.
^bBased on 260-day workyear.
^cSome companies were active in several areas.

Table 7. Reported exploration expenditures in Alaska by commodity, 1982-97

	Base metals	Polymetallic ^a	Precious metals	Industrial minerals	Coal and peat	Other	Year's Total
1982	\$31,757,900	\$ N/A	\$ 10,944,100	\$ --	\$ 2,900,000	\$ 15,300	\$ 45,617,300
1983	9,758,760	N/A	20,897,555	2,068,300	1,338,454	70,000	34,133,069
1984	4,720,596	N/A	14,948,554	270,000	2,065,000	279,500	22,283,650
1985	2,397,600	N/A	6,482,400	--	270,000	--	9,150,000
1986	1,847,660	N/A	6,107,084	170,000	790,000	--	8,914,744
1987	2,523,350	N/A	11,743,711	286,000	1,150,000	31,000	15,734,061
1988	1,208,000	N/A	41,370,600	160,200	2,730,000	--	45,468,800
1989	3,503,000	N/A	43,205,300	125,000	924,296	5,000	47,762,596
1990	5,282,200	N/A	57,185,394	370,000	321,000	97,000	63,255,594
1991	4,789,500	N/A	34,422,039	92,000	603,000	2,000	39,908,539
1992	1,116,000	3,560,000	25,083,000	25,000	425,000	--	30,209,000
1993	910,000	5,676,743	23,382,246	163,500	--	125,000	30,257,489
1994	600,000	8,099,054	18,815,560	225,000	2,554,000	810,000	31,103,614
1995	2,770,000	10,550,000	20,883,100	100,000	--	3,000	34,306,100
1996	1,100,000	11,983,364	31,238,600	400,000	--	--	44,581,964
1997	1,700,000	20,797,000	32,555,500	80,000	720,000	--	57,252,500
TOTAL	\$75,984,566	\$60,666,161	\$399,264,143	\$4,535,000	\$16,790,750	\$1,437,800	\$559,939,020

^aPolymetallic deposits considered as a separate category for the first time in 1992.

N/A = Not available.

-- Not reported.

At the eastern end of the southern Brooks Range near Wiseman, Silverado Gold Mines continued exploration for the lode source of the large nuggets found in its Nolan Creek placer gold mine. Ventures Resource Alaska found good copper values (3 plus percent) over substantial widths (20 to 30 feet) on the Luna deposit and on the Venus skarn prospect northeast of the town. The Luna also contains zinc, cobalt, silver, and gold, while the Venus contains silver and gold. These prospects are on lands controlled by Doyon Ltd. In the Chandalar Lake area, Gold Dust Mines continued placer mining and had a small exploration program.

In an unusual arrangement, the U.S. Bureau of Land Management (BLM) contracted with On-Line Exploration and Sial Geosciences to conduct an airborne geophysical survey of the Chandalar copper belt northeast of Wiseman. The survey area contains the Venus and Luna prospects and the Nolan area west of the haul road. The program was managed by the Division of Geological & Geophysical Surveys (DGGS) to conform to the standards set in almost a dozen surveys elsewhere in the state.

Western Alaska

Exploration expenditures reported in this region in 1997 were \$2.78 million, down from \$3.8 million the previous year.

Cominco continued exploration in the Aurora trend northwest of Nome both on land owned by the Bering Straits Native Corp. and on claims leased from Altar Resources or owned by Cominco. Much of the land covered by the 1993 state airborne geophysical survey is now under claim, and there is a lot of activity east of Nome, where Intercontinental Mining drilled 6,000 feet of core on the Big Hurrah Mine. Visible gold was evident in several holes, and hole 3 cut 30 feet with a gold grade of 0.134 ounces per ton and 15 feet of 0.108 ounces per ton. Hole 5 cut 17.5 feet of 0.212 ounces per ton. Numerous individuals are active in the Solomon and Council area placer gold mines.

Late in the year La Teko Resources Ltd. announced that it had acquired the Mt. Distin prospects north of Nome from Kennecott Exploration.

Consolidated Nevada Goldfields had a modest exploration program on its own claims and on land leased from Doyon Ltd. near the Nixon Fork Mine.

Exploration by Cominco and Placer Dome in the Central Kuskokwim Mountains and near Ruby resulted in the staking of mining claims by both companies, and Placer Dome drilling at Colorado and Ganes creeks.

There was exploration activity in the Melotzitna area west of Tanana by Footwall Exploration, and Ventures Resource had a trenching program west of Tanana on a coincident geochemical/geophysical anomaly.

The Division of Geological & Geophysical Surveys (DGGS) contracted with WGM-Dighem to fly an airborne geophysical survey of the Ruby-Poorman area in 1997, with the results released in February 1998.

Eastern Interior Alaska

Reported exploration in the eastern interior region was \$29.69 million in 1997, up 62 percent from 1996. Several junior mining companies were very active, acquiring land positions by staking claims and by leasing or purchasing existing prospects and properties.

Fairbanks Gold Mining Inc., owner of the Fort Knox gold mine, had a 12-hole, 5,000-foot exploratory reverse-circulation drilling program on the Gil East claims about 8 miles east of the Fort Knox Mine, where the best of six mineralized holes returned 170 feet of 0.048 ounces per ton gold.

Newmont Exploration Ltd. continued an aggressive exploration and acquisition program with La Teko Resources on the True North property about 8 miles west of the Fort Knox mine. Newmont can earn 65 percent ownership by spending \$21 million and producing a feasibility study. Mineralization at True North is associated with quartz-carbonate veins in a high-grade metamorphic package containing calcareous eclogites, particularly where carbonaceous schists and quartzite are prevalent. Northwest-trending fractures along the northeast-trending Eldorado Creek Fault seem to have offset and possibly control the higher-grade zones. Prior to this year's 55,000-foot reverse-circulation and core drill programs, and the discovery of the Merlyn and Dome Creek mineralized zones, geologic resources were calculated to be 1.3 million ounces of gold.

Placer Dome North America also had a drill program to the southwest of True North in the same type of rocks. La Teko contracted for a close-spaced airborne geophysics program for its large Juniper Creek prospect about 15 miles northeast of the True North property, and for the adjacent Twin Buttes block that it leased from the University of Alaska. Several interesting anomalies were found in 1997 in the Twin Buttes block, and more claims were acquired.

La Teko Resources also had encouraging results, including gold-in-soil anomalies up to 0.07 ounces per ton at the Discovery Gulch prospect in the Circle District. The company also agreed to sell its Ryan Lode Mine on Ester Dome (6 miles west of Fairbanks) to Silverado Gold Mines for \$12 million. Ryan Lode has proven/probable reserves in the schist-hosted Ryan Shear and igneous-hosted Curlew deposit to 300-foot depth of 820,000 ounces of gold. The shear extends at least to the 1,100 foot depth.

Silverado also controls most of the land around La

Teko's Ester Dome property, including the former producer, Grant Mine, about 2 miles northeast of Ryan Lode. Mineralization at Grant mine in the Irishman and O'Dea veins extends to at least 1,200 feet deep and may represent an offset continuation of the Ryan Shear deposit. Elsewhere on Ester Dome, Silverado drilled and trenched the St. Paul zone (about a mile north of, and subparallel to, Ryan Lode), and has outlined igneous-hosted gold mineralization at the Rhyolite prospect on the northwestern side of the dome. Silverado also holds claims immediately northeast of True North at the Whiskey Gulch and Marshall Dome blocks.

International Freegold Mineral Development had a robust exploration program managed by Avalon Development Corp., including 10,000 feet of reverse-circulation drilling and 3,600 feet of core drilling at various prospects within its 22,560-acre landholdings of the Golden Summit project. Barrick Gold has the right to buy up to 70 percent of the project by purchase of \$10 million in Freegold stock over the next 4 years. The Golden Summit property contains several old mines (Cleary Hill, Newsboy, Tolovana, Christina, Hi-Yu) with gold grades from 0.29 ounces per ton to more than one ounce per ton. Recent drilling shows Cleary Hill mine, in addition to the 100,000 ounce resource grading 0.81 ounces per ton, has potential for bulk tonnage, lower-grade material in the footwall of the high-grade veins.

The Golden Summit property also contains the Dolphin igneous-hosted gold-bearing system west of the Cleary Hill mine which has drill-indicated reserves of 30.6 million tons at a grade of 0.02 ounces per ton, but is still open to the east, west, and at depth. Elsewhere on the property there are numerous early- to mid-stage prospects (Charles, Northern Extension, Wolf Creek, Goose Creek, Too Much Gold, and Iowa) that are being systematically explored. Several are strategically situated relative to the eastern extension of the Eldorado Creek Fault that bounds the True North property.

Placer Dome transferred ownership of its 20,000-acre holdings northeast and southwest of True North to International Freegold on November 5, 1997.

There was no activity reported at Can-Ex Resources' Eagle Creek project west of True North, but newly-staked claims to the west of Eagle Creek, including the mineralized Our Creek igneous stock, were being explored in 1997.

At the Pogo prospect 40 miles northeast of Delta Junction, Teck Corp. in June started its buy-in to Sumitomo's project by funding the \$5.5 million, 46-hole, 47,200-foot 1997 drilling program, which was supported by five drills and a 45-person crew. Teck announced that Pogo contains a geologic reserve of almost 4.5 million ounces of gold in 10.9 million tons of rock in two 24-foot-thick, flat-lying veins, with a

possible third layer below. The gold occurs as veins in almost horizontal quartzite about 400 feet below a steep-sided valley, so advanced exploration will be from underground. To date over 42 line-miles of induced polarization (IP) survey, 35 line-miles of constant source audio magneto telluric (CSAMT) survey, 10 miles of magnetic survey, 385 miles of airborne electromagnetic (AEM) survey and 83,903 feet of drilling have been completed. An ice road is under construction to transport fuel and equipment to the site of the portal for the access tunnel.

Tri Valley Corp. had a 5,000-foot core and reverse-circulation drill program on its large block of claims in the Richardson district about 40 miles west of Pogo, and Ventures Resource Alaska Inc. confirmed high-grade silver-lead-zinc mineralization on its Eva prospect about 50 miles to the east of Pogo.

Ventures Resource also drilled 3,000 feet of core on the north and west sides of a 3,000 by 4,000 foot geochemical anomaly at the Champion II prospect. At Lead Creek, 30 miles southwest of Eagle, Ventures drilled 3,800 feet on a coincident soil silver-lead-zinc and electromagnetic anomaly. Several holes cut massive sulfide mineralization in silicified and brecciated limestones with up to 8.8 ounces of silver per ton, 14.2 percent lead and some zinc over 3.5 feet. Thicker mineralized horizons were also encountered. At the Eva prospect a vein about 20 feet wide and with at least 1,800 feet of strike assayed 28.7 percent lead, 9.4 percent zinc, 0.28 percent copper, 0.003 ounces per ton gold and 19.4 ounces of silver per ton across an 18-foot trench sample. All of these prospects are on land controlled by Doyon Ltd. In late November, Teck Corp. agreed to invest \$4.1 million in Ventures to explore the Veta block, with an option to invest \$3.5 million more to acquire 60 percent of a target of their choice within the area.

American Copper & Nickel Company (ACNC) had a 16,000-foot diamond drill program on its Delta project southwest of Tok, and managed its Nikolai joint venture for which Fort Knox Gold Resources Inc. provided the funds. A 7,500-foot core-drill program in the 3.5-mile strike length of the Ice prospect near Canwell Glacier cut mafic and ultramafic rocks with 17 feet of 0.78 percent nickel, 0.55 percent copper, 0.023 ounces per ton platinum, 0.026 ounces per ton palladium and 0.006 ounces per ton gold. Elsewhere in the Nikolai project a 6,566-foot six-hole drill program at the Fish Lake prospect cut 278 feet with up to 10 percent disseminated pyrrhotite, with assays ranging from 0.03 percent to 0.26 percent copper, 0.16 percent to 0.36 percent nickel, 35 to 220 ppb platinum and 60 to 222 ppb palladium. An 80-foot intercept and a 190-foot intercept in two other holes cut disseminated sulfides with similar

grades. At year end Grayd Resource Corp. acquired an interest in the Delta Project in addition to several other polymetallic properties through agreements with Pacific Northwest Resources Company and Pacific Alaska Resources Corp.

Several other companies were active in the Nikolai area, including Falconbridge Ltd., Tullaree Alaska Inc., and Golden Phoenix Minerals Company. The mineralization at Nikolai is hosted in Triassic(?) mafic and ultramafic plutonic and volcanic rocks cut off to the north by a strand of the Denali Fault system. The offset portion of the mafic rocks would be expected to occur near Kluane Lake.

North of Tok, Cross-Canada International had a modest program on the Taurus copper-gold porphyry.

In the Bonfield district east of Healy, Liberty Bell Mining had a 5,000-foot core-drill program on the epithermal-type gold prospect, and Grayd Resource Corp., with the backing of Atna Resources, had a 12,900-foot core-drill program on the Red Mountain zone of the Dry Creek massive sulfide project. One hole in this 6,000-foot conductive zone cut 18 feet of 25.9 percent zinc, 11.7 percent lead, 0.88 percent copper, 10.1 ounces per ton silver, and 0.1 ounces per ton gold. Sulfides were also found 2,400 feet along strike. The WTF zone of the project may be on the north limb of a synclinal structure, with the Red Mountain zone on the south limb. Grayd also investigated a 4,000-foot electromagnetic conductor at Anderson Mountain 16 miles west of Red Mountain, and is preparing a second drill rig for the 1998 season.

In the Rampart-Manley area, numerous large claim groups have been staked and at least one airborne geophysical survey was conducted. ASA continued its evaluation of Doyon land in the area east of Manley, with a 1,000-foot core-drill program. Placer Dome had a core-drill program on holdings leased from Alaska Placer Development at Livengood.

There was a little activity in the Sourdough Creek area midway between Fairbanks and Circle after a major staking program in 1996.

Southcentral Alaska

Investment in exploration in this area in 1997 was only \$915,000, compared to \$2 million in 1996.

There was substantial exploration activity in the area, particularly along the south flank of the Alaska Range between Valdez Creek and Summit Lake.

In the Valdez Creek area, La Teko Resources had a trenching and sampling program at its Lucky Gulch prospect, and discovered several good anomalies for future follow-up. International CanAlaska Resources continued its exploration of the Rainbow Hill prospect nearby. Intercontinental Mining announced its intention

to explore the Denali (Pass Creek) copper deposit, which has reserves of about 5 million tons of fine-grained sulfides running about 2 percent copper.

Staking occurred in 1997 in the vicinity of the Golden Zone Mine, following the release that year of an airborne geophysical survey. Kennecott drilled one of the more striking conductive zones. The Division of Geological & Geophysical Surveys began mapping the district to provide ground truth for the survey.

There was also a lot of claim-staking in the Petersville-Collinsville geophysical survey area, and unexpected northwest-trending features were evident in this area of predominantly northeasterly-trending geology.

DGGS contracted for another airborne survey in the Iron Creek area of the Talkeetna Mountains during the summer of 1997.

Southwestern Alaska

Exploration expenditures in 1997 were \$11.3 million, about the same as in 1996.

Placer Dome's activity at Donlin Creek near Flat continued to excite interest in the Kuskokwim Mountains as a whole, and there was renewed interest in the Pebble Copper deposit near Lake Iliamna.

At Donlin Creek, about midway between Bethel and McGrath, Placer Dome had a 52,546-foot core-drill and a 26,892-foot reverse-circulation program continuing evaluation of several areas of gold-sulfide mineralization associated with 65-million-year-old granitic plutons intruded into Jurassic-Cretaceous flysch. The purpose of the program was to identify areas where oxidation of the sulfide-rich ore was deeper, thus increasing the oxide ore inventory.

Ventures Resource Alaska drilled 17,128 feet of core in the Flat area, and at the Golden Horn Mine another vein was discovered parallel to the former producer, and the potential for bulk-tonnage mineralization was identified. One of the first drill holes cut 27 feet with 0.3 ounces of gold per ton. A separate program at the Chicken Mountain area 5 miles to the south showed 70 feet of 0.416 ounces per ton gold in one hole, and 6,655 feet of trenching revealed a 90-foot zone that assays 0.193 ounces per ton. The gold-in-soil anomaly associated with these results extend over an area 12,000 by 2,000 feet. Ventures also increased the size of its holdings along the Donlin Creek trend to the northeast of Placer Dome's holdings.

Corral Creek Resources continued exploration for platinum at Red Mountain near Goodnews Bay on Calista Corp. lands.

Cominco has reportedly discovered higher grades of gold in a portion of its Pebble Copper porphyry deposit north of Lake Iliamna, and several thousand claims were

staked in late 1996. Activity in 1997 included 15,000 feet of core drilling trying to investigate the gold potential and delimit the extent of the huge mineralized system.

Southeastern Alaska

Reported exploration expenditures in this region were \$8.78 million, a slight increase over the \$7.2 million invested in 1996.

At the Niblack Mine on the southern tip of Prince of Wales Island, Abacus acquired the Trio and Broadgauge claims east of its main target at the Lookout Zone, and had a 39,000-foot diamond-drill program. They recently announced an inferred mineral resource for the Lookout Zone of 2.78 million tons grading 0.087 ounces per ton gold, 1.14 ounces per ton silver, 1.70 percent copper and 3.30 percent zinc. Abacus and Teck plan a 2,000-foot exploration adit heading west from the Trio Zone into the Lookout for 1998.

The City of Wrangell provided matching funds to BLM to contract an airborne geophysical survey of part of Etolin Island, Zarembo and part of the Kupreanof Islands near Wrangell, with the expectation that the results might spur exploration investment. This area contains several known mineral deposits, and is

prospective for Greens Creek-type deposits. Barite was formerly mined at Castle Island within the survey area. The contract was awarded to WGM-Digham, and DGGs managed the contract to conform to the State-sponsored surveys elsewhere. Results of the survey were released in Wrangell and Fairbanks on September 22, 1997.

At the Greens Creek Mine, Kennecott completed 90,000 feet of exploratory drilling in 1997 at the mine site, and Kennecott Exploration also had a regional program in southeastern Alaska.

DRILLING

Tables 8 and 9 summarize the drilling activity in the regions of the state in 1997. The total amount of drilling, 673,620 feet, compares well with the 729,137 feet drilled in the previous year. Placer exploration continues to decline, although there is a renewed interest in coal, particularly in the high-rank fields of southcentral Alaska at Wishbone Hill. Core drilling continues to dominate hardrock exploration, though there is a regional preference, with reverse-circulation drilling favored in western and interior Alaska, while core drilling is used exclusively in southeastern Alaska where most of the 1997 drilling was underground.

Table 8. *Drilling footage by region in Alaska, 1997*

Type of drilling	Northern	Western	Eastern interior	South-central	South-western	Alaska Peninsula	South-eastern	TOTAL
Placer exploration	1,500	17,000	1,000	--	--	--	--	19,500
Placer thawfield	--	--	--	--	--	--	--	--
Placer subtotal	1,500	17,000	1,000	--	--	--	--	19,500
Coal subtotal	--	--	4,000	4,540	--	--	--	8,540
Hardrock core	59,036	10,543	109,343	--	83,544	--	169,000	436,016 ^a
Hardrock rotary	--	24,360	156,644	--	26,568	--	--	208,064
Hardrock subtotal	59,036	34,903	265,987	--	110,112	--	169,000	644,080
TOTAL (feet)	60,536	51,903	270,987	4,540	110,112	--	169,000	673,620
TOTAL (meters)	18,397	15,820	82,597	1,384	33,562	--	51,528	205,319

-- Not reported.

^a130,000 feet of core drilling was underground.

Table 9. Drilling footage reported in Alaska, 1982-97

Year	Placer Exploration	Placer Thawing	TOTAL PLACER	TOTAL COAL	TOTAL HARDROCK	Hardrock Core ^a	Hardrock Rotary ^a	TOTAL FEET	TOTAL METERS
1982	30,000	94,000	124,000	80,000	200,000	--	--	404,000	123,139
1983	23,000	30,000	53,000	12,000	180,500	--	--	245,500	74,828
1984	31,000	98,000	129,000	25,700	176,000	--	--	330,700	100,797
1985	46,000	34,000	80,000	8,700	131,700	--	--	220,400	67,177
1986	32,400	227,000	259,400	28,800	50,200	--	--	338,400	103,144
1987	50,250	130,000	180,250	19,900	115,100	95,600	19,500	315,250	96,088
1988	152,000	300,000	452,000	26,150	353,850	223,630	130,230	832,000	253,593
1989	97,250	210,000	307,250	38,670	332,230	242,440	89,790	678,170	206,700
1990	78,930	105,000	183,930	18,195	760,955	648,600	112,355	963,080	293,547
1991	51,247	130,000	181,247	16,894	316,655	205,805	110,850	514,796	156,910
1992	6,740	65,000	71,740	12,875	359,834	211,812	148,022	444,449	135,502
1993	25,216	--	25,216	--	252,315	124,325	127,990	277,531	84,591
1994	21,000	--	21,000	8,168	438,710	347,018	91,692	467,878	141,781
1995	27,570	--	25,570	--	415,485	363,690	51,795	443,055	135,043
1996	61,780	--	61,780	8,500	658,857	524,330	134,527	729,137	222,241
1997	19,500	--	19,500	8,540	644,080	436,016 ^b	208,064	673,620	205,319

^aCore and rotary drilling not differentiated prior to 1987.

^b130,000 feet of core drilling was underground.

-- Not reported.

GOVERNMENT ACTIONS

During 1997 the Division of Geological & Geophysical Surveys (DGGs) released new geophysical surveys in the historic mining regions of Rampart, Chulitna, and Petersville-Collinsville. New surveys were contracted and flown during 1997 near Iron Creek in the Talkeetna Mountains north of Anchorage, and south of Ruby on the Yukon River. The Iron Creek survey results were released in January 1998 and the Ruby survey in February 1998. The Division also worked with the U.S. Bureau of Land Management to contract for airborne surveys near Wiseman in the Brooks Range and, together with municipal funds, near Wrangell in southeastern Alaska. The Wrangell surveys were released late in 1997 and the Wiseman survey is expected to be released early in 1998.

There was continued progress in clarification of water quality standards for the state in 1997, and the U.S. Geological Survey, working with the Division of Mining & Water Management, started baseline studies of water quality in the Fortymile River drainage. The study includes differentiation of the total versus dissolved metals, metal speciation by valency, and

lithochemical controls. It is hoped that these data will allow for more flexible permit conditions in the future.

Access to mineralized areas, especially across conservation systems units such as national parks or refuges, continues to be a state priority, and assertions of rights-of-way continue.

The appeal by some of the Mental Health Land Trust plaintiffs was denied by the State Supreme Court in 1997, leading to a final settlement of this contentious legal battle. The result is that the lands can now be offered for mineral leasing.

The Governor's 1997 Award for Mined Land Reclamation was given to Ed Salter of Manley for his work on Doric Creek, a tributary of Pioneer Creek near Eureka in the Manley Hot Springs district. Awards were also presented to Marc Poage for work on Crooked Creek at Central, to Morris Wolters of Cathlamet, Washington, for his work on Crooked Creek, and to Ryan Lode Mines of Fairbanks. The prestigious Health of the Land Award was presented to Cambior USA Inc. by Patrick Shea, Director of the U.S. Bureau of Land Management, for the exemplary reclamation of the Valdez Creek placer mine.

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