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Placer Gold Sampling in and Near the Chugach National Forest, Alaska

By Robert B. Hoekzema and Steven A. Fechner

UNITED STATES DEPARTMENT OF THE INTERIOR

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UNITED STATES DEPARTMENT OF THE INTERIOR
Donald Paul Hodel, Secretary

BUREAU OF MINES
Robert C. Horton, Director

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environment and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

ft	foot	oz/h	ounce per hour
gpm	gallon per minute	oz/yd^3	ounce per cubic yard
hp	horsepower	pct	percent
h	hour	ppm	part per million
in	inch	ppt	part per thousand
lb	pound	yd^3	cubic yard
m.y.	million years	yd^3/d	cubic yard per day
oz	ounce	yr	year

PLACER GOLD SAMPLING IN AND NEAR THE CHUGACH NATIONAL FOREST, ALASKA

By Robert B. Hoekzema[1] and Steven A. Fechner[2]

ABSTRACT

The Bureau of Mines and U.S. Geological Survey completed a 4-yr (1979-82) mineral appraisal of the Chugach National Forest (CNF), AK. This report summarizes the Bureau's placer gold studies in the CNF.

Placer mining from the mid-1890's through 1982 produced an estimated 133,800 oz of gold, of which two-thirds was produced prior to 1920. As much as 6,800 oz of placer gold was produced from 1979 to 1982. Most production came from Crow, Canyon, and Resurrection Creeks. Five types of placer gold deposits were identified in the CNF: (1) alluvial placers, (2) bench placers, (3) eluvial placers, (4) glacial placers, and (5) marine placers.

Placer sampling indicated a potential for gold production from alluvial and bench placers associated with historically mined drainages such as Crow, Canyon, Resurrection, Sixmile, and Mills Creeks and from unmined drainages including the Avery, Kings, Snow, Copper, and Tasnuna Rivers and several smaller streams throughout the CNF. Results of fineness tests indicated that gold from the CNF ranges from 455 to over 950 fine. Subsequent investigations in drainages with anomalous placer sample values also identified previously unknown lode mineralization.

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INTRODUCTION

A mineral resource investigation of the CNF (fig. 1) was conducted from 1979 to 1982 by an interagency team made up of personnel of the U.S. Geological Survey (USGS) and the Bureau of Mines. The investigation was initiated under the Roadless Area Review and Evaluation (RARE II) program (Public Law 94-588). The USGS compiled and evaluated data on regional geology, geochemistry, and geophysics. The Bureau compiled data and conducted field investigations of mines, prospects, mineral occurrences, and areas of mineralization. Reports discussing geology and lode mineralization are available from the Bureau (*1*)[3] and USGS (*2*). This report summarizes the results of the Bureau's placer program, which included the collection and processing of 420 bulk placer samples, fineness determinations for 125 samples, and classification of placer deposits into 5 categories.

PREVIOUS WORK

The earliest works describing the placer gold deposits of the CNF were published by the USGS (*3-5*). Moffit (*6*) and Johnson (*7*) were the first to publish detailed descriptions of the placer gold deposits in the Hope-Sunrise and Valdez areas. Martin and others (*8*), Park (*9*), and Tuck (*10*) published reports on the geology and mining on the Kenai Peninsula and nearby areas. Cobb (*11*) published a map on placer deposits of Alaska. Tysdal (*12*) published a map showing the placer deposits of the Seward and Blying Sound quadrangles on the USGS 1:250,000 topographic map series. Hoekzema (*13*) and Fechner and Meyer (*14*) discussed the results of 1980 and 1981 Bureau placer sampling studies in the CNF. Sherman and Jansons (*15*) discussed the economic feasibility of placer mining in the CNF.

[3]Italic numbers in parentheses refer to items in the list of references preceding appendix A.

LAND STATUS WITHIN THE CHUGACH NATIONAL FOREST

The CNF encompasses portions of the Anchorage, Nelchina, Nizina, Prince William Sound, Yakataga, Hope, and Seward Mining Districts (*16*). Federal, State, and private lands (including native regional corporation selections) are present within the CNF (fig. 2). State land is located near Seward, Kenai Lake, Whittier, Valdez, and Cordova. Private land is located in the cities of Cordova, Valdez, and Seward; along the coast from Cordova to Valdez; and on Latouche, Evans, Knight, and Chenega Islands. Private inholdings are also scattered throughout the CNF, with the majority on the Kenai Peninsula. The remaining land is managed by the U.S. Department of Agriculture (USDA), Forest Service.

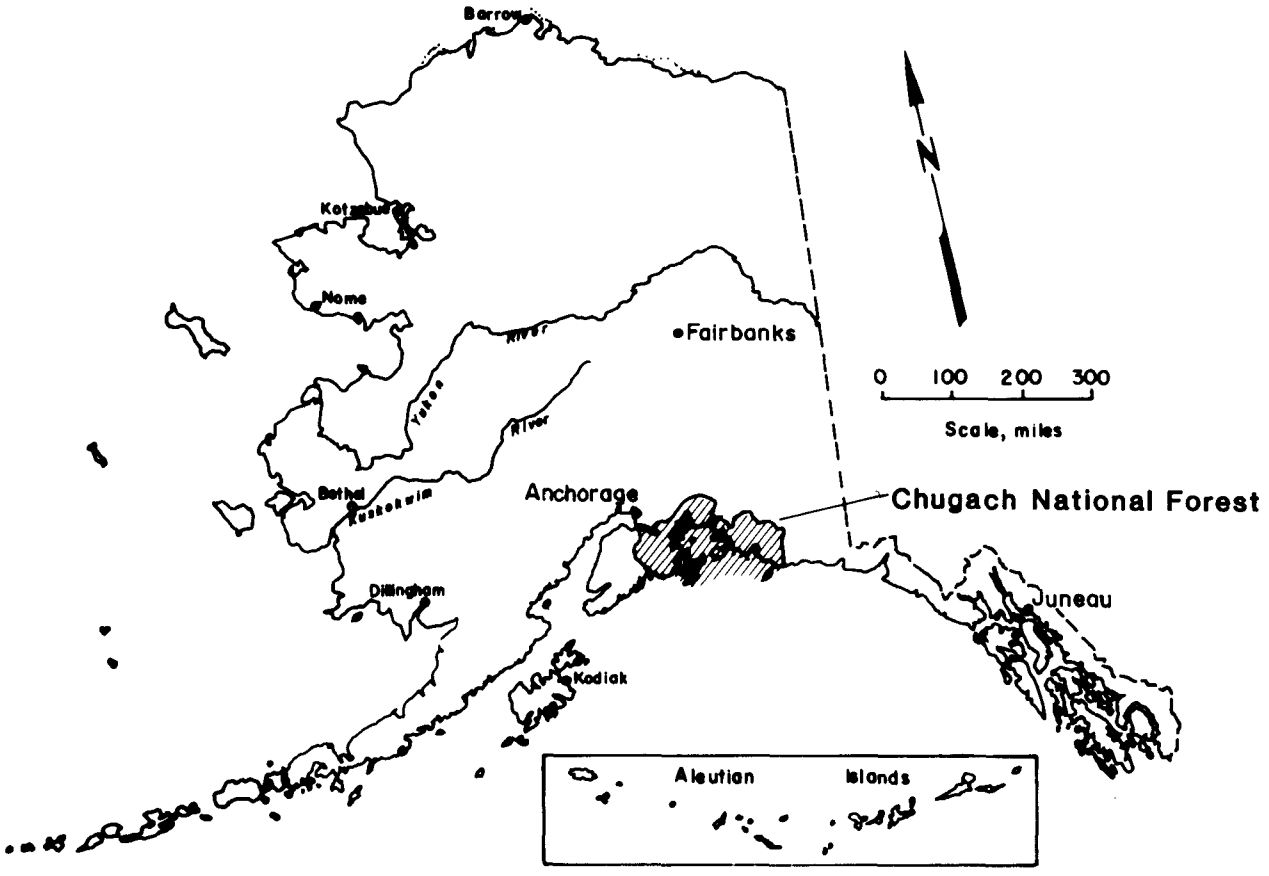

FIGURE 1. Index map of Alaska showing Chugach National Forest.

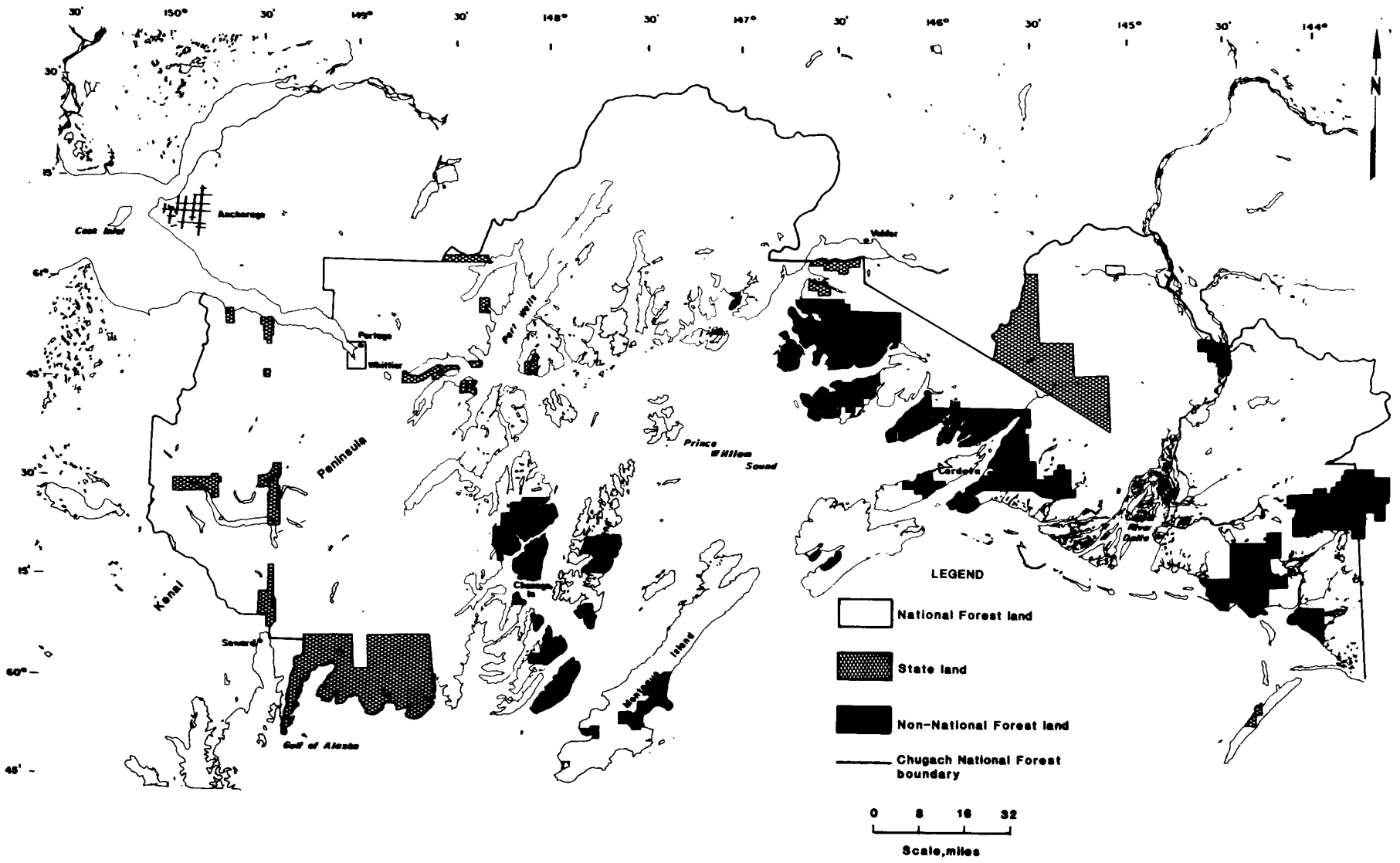

FIGURE 2. Land status map of Chugach National Forest.

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Numerous miners on the Kenai Peninsula cooperated with Bureau efforts during the study. The authors would especially like to thank the following for their contributions of data, time, and resources, which greatly helped to improve the study: Edward Ellis, Crescent Creek miner; George and Lillian Zimmer, Milo Flothe, and Robert Kelley, Quartz Creek miners; Al Johnson, president of Hope Mining Co., Resurrection Creek; Marty Marht, Falls Creek miner; Marvin Self, Mills Creek miner; Donald Goodman, Colorado Creek miner; Doug Keating, Cooper Creek miner; Barney and Cynthia Toohey, Crow Creek miners and operators; and Gary McCarthy, David Cavanaugh, and Gene Backus, Crow Creek miners.

MINING HISTORY AND PRODUCTION

The earliest recorded attempts to identify mineral resources in the CNF were made by Russian explorers in the mid-1800's. Peter Doroshin, a mining engineer sent by the Russian-American Co., reported finding widespread auriferous gravels along the Kenai River system in 1848, but was apparently unsuccessful in locating commercial quantities of gold. Gold placers were discovered on Mineral (P-25),[4] Mills (P-63), Canyon (P-67), Resurrection (P-71), and other creeks in the 1800's and 1890's. Many prospectors originally bound for the Klondike goldfields were attracted by the gold discoveries in the Prince William Sound-Kenai Peninsula area. Evidence of past mining, such as wingdams, hydraulic pipes, mills, and workings, is common throughout the CNF. Barry (*17*) summarized the history of mining on the Kenai Peninsula.

The U.S. Bureau of Land Management (BLM) mining claim report dated October 19, 1984 (*18*) indicates that there are over 2,420 current placer claims in the CNF.

Placer gold production figures for the CNF were compiled from records maintained by the Bureau and the U.S. Mint, USGS reports, smelter returns, and company data.

Placer gold production in the CNF has been limited mostly to the Kenai Peninsula and Turnagain Arm drainages. The estimated production from these drainages is 133,800 oz Au (table 1), of which 67 pct was produced prior to 1920. There was a resurgence of mining activity when the price of gold rose from $20.67 to $35.00 per ounce in 1934, but activity decreased dramatically with the advent of World War II.

A rise in the price of gold in the 1970's led to renewed placer mining activity and gold production. Approximately 35 gold placer operations, with a combined production of up to 6,800 oz, were intermittently active during the 1979-82 mining seasons. The operations ranged from 4- to 8-in suction dredges (fig. 3) and hand placer operations capable of processing 10 to 15 yd^3/d to backhoe-dozer-washing plant operations capable of processing as much as 2,000 yd^3/d (fig. 4). Numerous recreational miners also work gold-bearing gravels along the streams, but their aggregate production probably does not exceed 100 oz/yr Au.

[4]Numbers with letter prefix in parentheses reference placer gold deposits shown in appendix A maps and described in appendix B.

GEOLOGY AND MINERALIZATION

Most of the CNF is underlain by tightly folded and extensively faulted metasedimentary rocks of the Cretaceous Valdez and Eocene Orca Groups. Younger Tertiary sedimentary rocks are exposed in the easternmost part of the CNF. Tertiary plutons are scattered throughout. The general geology of the CNF is shown in figure 5.

Table 1.—Estimated placer gold production and identified resources for selected drainages on Kenai Peninsula and Turnagain Arm, by decade

Placer number[1]	Drainage	Estimated gold production, oz										Identified resources, 10^3 yd^3
		Pre-1910	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69	1970-79	1980-82	Total	
P-43	Crow Creek	23,000	5,000	8,000	5,000	500	500	100	100	300	42,500	1,000
P-67, P-63	Canyon-Mills Creek	25,000	10,000	3,000	2,000	100	500	100	200	800	41,700	2,000
P-71	Resurrection-Palmer Creek	8,000	3,000	1,000	8,000	1,000	1,000	1,000	2,000	1,800	26,800	2,000
P-61	Lynx Creek	5,000	500	100	500	100	1,000	100	150	50	7,500	1,000
P-70	Bear Creek	2,000	NA	1,000	1,000	NA	NA	NA	1,000	500	5,500	1,000
P-68	Gulch-East Fork Creek	1,500	500	NA	NA	NA	NA	NA	100	150	2,250	ND
P-69	Sixmile Creek	1,000	500	NA	100	NA	NA	NA	100	50	1,750	3,000
P-94, P-95	Cooper-Stetson Creek	300	1,000	NA	NA	NA	NA	NA	50	50	1,400	ND
P-74	Quartz Creek	300	100	NA	NA	NA	NA	NA	100	300	800	750
P-56	Bertha Creek	500	200	NA	NA	NA	NA	NA	Some	50	750	ND
P-62	Silvertip Creek	250	100	NA	NA	NA	100	NA	100	100	650	1,000
P-90	Crescent Creek	50	50	NA	NA	NA	NA	NA	NA	350	450	ND
	Others (15 areas)	500	500	50	50	NA	NA	NA	50	600	1,750	ND
	Total	67,400	21,450	13,150	16,650	1,700	3,100	1,300	3,950	5,100	133,800	NAp

NA Not available. NAp Not applicable. ND Not determined. [1]From maps in appendix A.

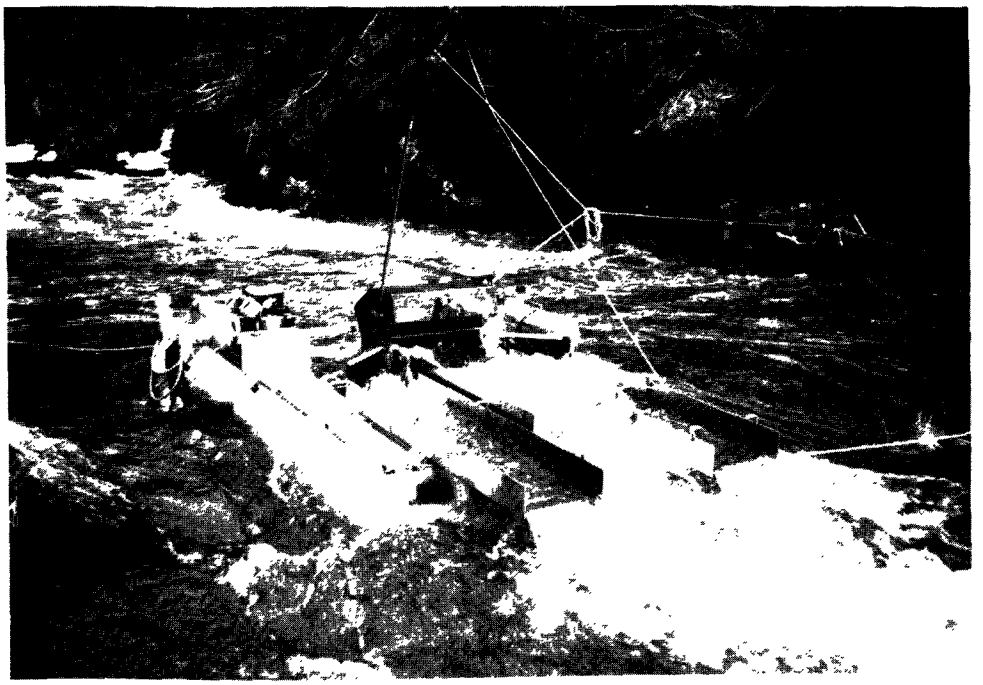

FIGURE 3. Eight-inch suction dredge used to recover gold from Ingram Creek.

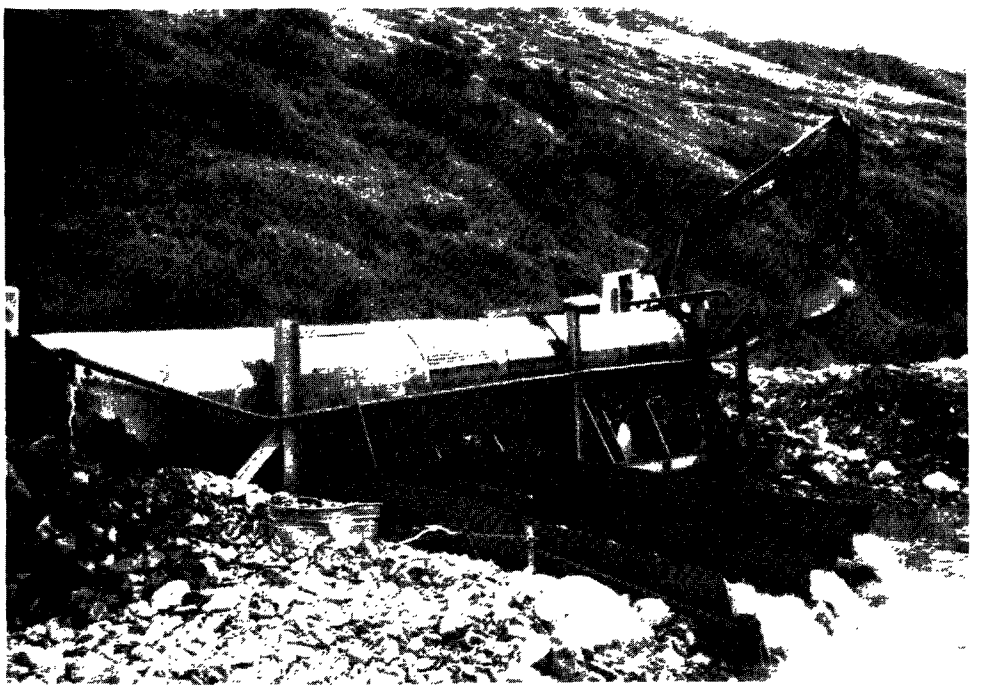

FIGURE 4. Backhoe-fed trommel washing plant used to recover gold from Mills Creek.

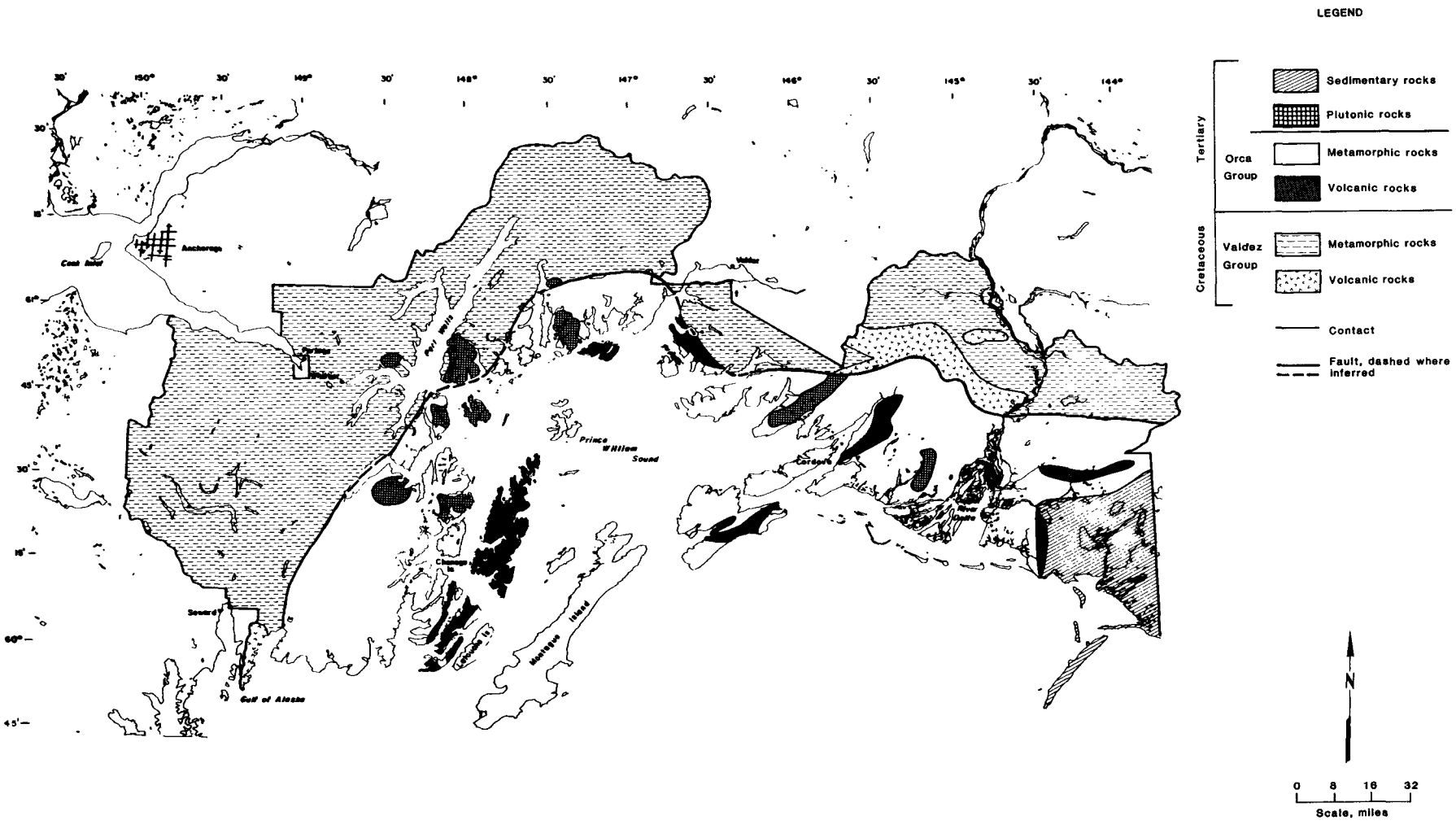

FIGURE 5. Geologic map of Chugach National Forest.

VALDEZ GROUP

The Valdez Group crops out in the western and northern portions of the CNF as an arcuate-shaped band of rocks and consists primarily of a slightly metamorphosed, steeply dipping, marine clastic (flysch) sequence. Plafker, Jones, and Pessagno (*19*) speculate that these rocks accreted to the southern Alaska mainland during late Cretaceous and early Tertiary time.

The Valdez Group hosts small, high-grade gold lodes. Streams draining this unit commonly contain gold-bearing gravels. All placer gold production in the CNF recorded prior to this study occurred from streams draining rocks of the Valdez Group.

ORCA GROUP

The Orca Group crops out in the central portion of the CNF as an arcuate-shaped band of rocks located immediately east and south of the Contact Fault, which separates it from the Valdez Group (fig. 5). Orca Group rocks are similar in appearance and composition to those of the Valdez Group, but tend to contain more mafic volcanics. Plafker, Jones, and Pessagno (*19*) speculate that the rocks accreted to the southern Alaska mainland during the Paleogene epoch.

The Orca Group rocks host numerous copper deposits and a few small, widely scattered gold lodes. Although historically no placer gold mines have been developed in Orca terrane, a few placer samples containing anomalous values of gold (>0.0005 oz/yd^3 Au) were collected during the 1979-82 investigations from streams draining the group.

YOUNGER TERTIARY ROCKS

Tertiary rocks, younger than the Orca Group, are present at Kayak Island and areas east of the Copper River. Younger rocks consist of unmetamorphosed siltstones, claystones, shales, sandstones, and basalt. The younger Tertiary strata include the Yakataga, Redwood, Poul Creek, Tokun, Kulthieth, and Stillwater Formations, plus undivided sedimentary and volcanic rocks that were deposited on the Orca Group and its associated plutonic rocks during periods of marine transgression and regression (*20*).

The younger Tertiary sedimentary rocks contain known deposits of subbituminous coal, oil, and gas. However, recent exploration has not resulted in the discovery of commercial quantities of hydrocarbons.

TERTIARY PLUTONS

Tertiary plutonic rocks were emplaced during two major and one minor intrusive episodes (*2*). On the basis of potassium argon dating, major episodes occurred at 50 to 53 m.y. and 34 to 36 m.y. (*2*). Older plutons are generally medium-grained biotite and/or hornblende-biotite granite. Younger plutons, which occur in the western portion of the CNF along the Orca-Valdez contact, have multiple phases and range widely in composition from granitic to gabbroic. A minor episode of plutonism is represented by a 6-m.y.-old dacitic plug at the southern tip of Kayak Island (*2*).

Lode gold mineralization in Valdez Group rocks is associated spatially with Tertiary plutons at many locations in the CNF. Streams draining these areas characteristically contain gold-bearing gravels and one, Crow Creek (P-43), has been the largest placer gold producer in the CNF.

PRESENT INVESTIGATIONS

Bureau studies of placer mineralization in the CNF began in 1979 and included literature research and related data compilation, a 4-yr field program, and evaluation of the data.

LITERATURE RESEARCH

A literature search and compilation of references were made using the following sources: USGS (including a review of historical files in Menlo Park, CA), Bureau files (including Minerals Availability System and Mineral Industry Location System files), U.S. Forest Service, State of Alaska, and mining companies that were active in the study area. Claim records were obtained and updated using the BLM (*18*) and State of Alaska MinFile reference systems (*21*). Additional information was obtained from interviews and correspondence with miners and individuals knowledgeable about the geology, mining history, and mineral development of the area. Much of the above information, together with recent data obtained by the Bureau and the USGS, has been placed in Bureau files that have been established for known mines, claims, and prospects in the study area.

FIELD INVESTIGATIONS

Field investigations of the CNF commenced in 1979 and continued during the 1980, 1981, and 1982 field seasons. Sluicing, hydraulic concentration, panning, and suction dredging techniques were used to collect 420 placer samples.

The best available trap sites were sampled whenever possible. The usual sampling procedure consisted of hand digging a pit and processing 0.1-yd^3 increments of gravel through a portable aluminum mini sluice box or hydraulic concentrator or by panning. The sluice box measured 34 in long by 10 in wide and had 3/8-in-high transverse riffles resting on expanded metal on indoor-outdoor carpeting. Sixteen-inch-diameter pans were used. These recovery devices were used to process recent alluvial deposits adjacent to the stream channels. The hydraulic concentrator consisted of a small grizzly attached to an aluminum mini sluice similar to the one described above. Water was pumped to the concentrating unit by a 125-gpm-rated pump coupled with a 3-hp engine. The concentrator was used to process bench gravels up to 150 ft from a stream. Wherever possible, channel samples of gravels were taken from surface to bedrock (fig. 6). Some bedrock was included in the lowermost segment of each channel sample whenever possible. The efficiency of gold recovery using these techniques varied, depending upon the size and shape of the gold, the clay content of the gravels, and processing parameters such as rate of flow and gradient of the sluice box, but it generally exceeded 80 pct, based upon tests of tailings.

Seventy-five 3-in suction-dredge samples were collected to evaluate gravel deposits in active stream channels. Suction-dredge sampling is most successful during periods

FIGURE 6. Typical channel sample used for evaluating placer deposits.

of low water. This method was of limited use during the 1980 and 1981 field seasons due to unusually long periods of high water. Most of the samples were collected in the spring of 1982 during low-water conditions. The efficiency of gold recovery using the suction-dredging technique is highly variable. The method was used to obtain quick semiquantitative estimates of the placer gold development potential of the streams tested. Each sample was collected over a period of 0.5 to 1 h. Sample volumes varied from approximately 0.25 to 0.75 yd^3, depending on the nature of the material sampled. An attempt was made to reach bedrock during each sampling effort.

Bulk placer sampling combined with field processing is a viable method of testing for placer mineralization. Advantages include the following:

1. Results are quickly available. Immediate decisions can be made as to whether additional evaluation is warranted. (Lode sources of mineralization were successfully identified in the CNF in a followup study.)
2. Samples are obtained at greater depths, and are of larger volume, than samples collected for stream-sediment or panned-concentrate analysis; therefore, bulk samples are likely to be more representative. Bulk samples are especially useful for evaluating short, steep, youthful drainages in which heavy minerals are not readily concentrated.
3. Cuts made for bulk samples allow samplers to examine the surficial geology of the deposits in detail.

ANALYTICAL METHODS

Concentrates recovered from the sluices were hand panned to retain only the gold and heavy minerals, which were sent to the Bureau's Alaska Field Operations Center in Anchorage for further processing. Free gold coarser than 0.01 in diam was separated from the concentrate by a 5-in magnet to remove the magnetic portion, and a blower brush was used to separate the remaining material from the gold. Finer grained gold was recovered by amalgamation. The gold and heavy-mineral concentrate were visually examined using a microscope and ultraviolet light to identify the heavy minerals and note any unusual characteristics of the gold. Gold from 324 samples was weighed, and gold from 129 samples was sent to the Bureau's analytical laboratory in Juneau for semiquantitative multielement X-ray fluorescence spectrographic analysis for trace elements and/or fire assay to identify fineness.

4. Large numbers of processed samples can be transported from remote areas by helicopter, whereas only one or two 300 to 400-lb unprocessed bulk samples can be carried at one time by most helicopters.
5. Because much greater amounts of gravel are processed for bulk samples than for pan concentrates, larger quantities of gold are available for further laboratory analysis.

RESULTS

The Bureau's placer evaluation of the CNF consisted of (1) bulk sampling of most of the stream drainages, (2) classification of the types of placer deposits, (3) evaluation of the origin, characteristics, and distribution of placer gold, and (4) determination of the placer gold development potential of each stream drainage sampled.

TYPES OF PLACER DEPOSITS

Gold placer deposits within the CNF can be classified into five categories: (1) alluvial, (2) bench, (3) eluvial, (4) glacial, and (5) marine. General characteristics, production history, and examples of each type of placer deposit are summarized in appendix C. Most of the gold from the CNF has been produced from alluvial placers, with less production from bench deposits. Eluvial and glacial placers have produced only minor amounts of gold, but have potential for future development. Both deposit types contain disseminated gold that may be further concentrated by alluvial processes. Marine placers have potential for relatively large-scale development. Detailed descriptions of the major producing drainages and other areas with placer gold development potential are given in appendix B.

ORIGINS, CHARACTERISTICS, AND DISTRIBUTION OF PLACER GOLD

Placer gold in the CNF is believed to have originated by erosion and fluvial concentration of numerous small high-grade epigenetic gold lodes in Valdez Group metasedimentary rocks. Bedrock in the region has been extensively eroded during at least five periods of Pleistocene glaciation (22). Gold placers have been developed during preglacial and interglacial stages as well as since the last glacial advance. The preservation of preglacial and interglacial placers was dependent largely upon their location relative to subsequent glacial scour. Several deposits of this type, recognized by their relatively high degree of compaction and cementation, have been identified in the Girdwood and Kenai Peninsula areas at Crow Creek (P-43), Mills Creek (P-63), and possibly Quartz Creek (P-74). The time elapsed since the last glacial stage and minor postglacial advances has been insufficient to allow the development of large high-grade placer deposits in the CNF such as those found in interior Alaska. Most streams are actively downcutting due to isostatic rebound. Portions of many drainages are characterized by steep narrow canyons with abundant falls and cascades. Past production has come mostly from small, occasionally high-grade placers in current stream valleys.

Placer gold in the CNF is generally fine-grained (<0.1 in diam) and flaky. However, coarser gold, including nuggets weighing as much as several ounces, has been recovered from Crow (P-43), Gulch (P-68), and Bear (P-70) Creeks.

A total of 129 samples of gold flakes and nuggets were tested for fineness (appendix A). Results indicated that the gold ranged from 455 to over 950 fine, with the balance of the samples ranging from 770 to 850 fine. Silver, copper, and traces of other elements made up the remainder of the fineness values. Gold-to-silver ratios calculated for gold recovered from placer samples collected in the CNF ranged from 0.8 to 492.5 and are listed in appendix A along with the samples' respective gold, silver, and base metal contents. Preliminary data suggested that gold fineness increases with distance from source, as does the gold-to-silver ratio. Additional work is needed to relate placer gold deposits to specific source area(s) and to determine whether gold-to-silver ratios can be related to distance from source.

Gold samples collected from several drainages, including Quartz (P-74) and Cooper (P-94) Creeks, have variable gold contents. Many placer samples examined under the microscope appear to contain more than one type of gold on the basis of color and shape. The data suggest multiple source areas of gold in some of the drainages.

The locations of all historically mined drainages, together with those previously not known to have placer gold potential, are shown in figures A-1 through A-13 of appendix A, and these drainages are described in appendix B. Bulk placer sampling methods were highly effective in identifying high-grade (>0.02 oz/yd^3 Au) placer deposits on historically producing streams such as Crow (P-43), Mills (P-63), Canyon (P-67), Sixmile (P-69), Quartz (P-74), Crescent (P-90), and Cooper (P-94) Creeks. Samples from these creeks contained from 0.002 oz/yd^3 Au to more than 1 oz/yd^3 Au.

Samples collected from several drainages previously not known to have placer gold potential contained placer gold values ranging from 0.002 to 0.15 oz/yd^3 Au. These drainages were the Copper River (P-2), Tasnuna River (P-6), Marshall Glacier (P-8), Bench Creek (P-11), Brown Creek (P-14), Port Fidalgo (P-17), Silver Lake (P-22), Salmon Creek (P-23), Northwest Fork of Coghill River (P-32), an unnamed glacial drainage (P-33), Avery River (P-36), Siwash Bay Creek (P-37), and Kings River (P-80 and P-81).

The presence of placer gold in a drainage may reflect nearby lode gold sources. Placer data suggests the presence of three mineralized belts in the CNF. Two of the belts strike north-northeast and occur as limonite-stained units in the Valdez Group cut by numerous felsic dikes, sills, and sulfide-bearing quartz veins. One belt extends northeast from the toe of Wolverine Glacier along both sides of the Kings River to Blackstone Glacier. The second was traced 12 miles northeast from Davis Lake to the headwaters of Unakwik Inlet. The third belt strikes east-west and extends from Miners Bay on the west to the headwaters of the Bremner River on the east. Portions of these areas have recently been exposed by retreating glaciers, so they were incompletely prospected during the heavy exploration period of the early 1900's.

PLACER GOLD MINERAL DEVELOPMENT POTENTIAL AND RESOURCE ESTIMATES

Appendix B summarizes the geology, mining history, and placer gold development potential of 102 drainages in the CNF. Based upon the criteria described below, 44 drainages have moderate or high mineral development potential for placer gold production.

Criteria Used To Assess Placer Gold Mineral Development Potential

Grades are described as follows:

Highly anomalous–Recovered values higher than 0.005 oz/yd^3 Au

Anomalous–Recovered values from 0.0005 to 0.005 oz/yd^3 Au

Background–Recovered values less than 0.0005 oz/yd^3 Au

Mine size and grade assumptions used for resource assessments were as follows:

Small (includes suction dredges)–<500 yd^3/d processed; grade–>0.015 oz/yd^3 Au

Medium–500 to 2,000 yd^3/d processed; grade–>0.010 oz/yd^3 Au

Large–>2,000 yd^3/d processed; grade–0.007 oz/yd^3 Au

The three categories of development potential used in appendix B are explained below.

High Development Potential

Grade.–Highly anomalous samples collected and/or current production indicates a high probability that minable grades exist.

Reserves.–Established; or sampling indicates geologic conditions offer a high probability of establishing reserves to supply a mine of given size.

Study recommendations.–Site-specific evaluation including strong recommendation for drilling and/or pit sampling. Excellent chance for identifying a minable reserve.

Moderate Development Potential

Grade.–A single highly anomalous sample and/or anomalous samples indicating possibility that minable grades exist.

Reserves.–No established reserves. Geologic conditions are conducive for establishing enough reserves to supply mine of given size.

Study recommendations.–Additional reconnaissance and/or site-specific evaluation recommended. Reasonable chance for identifying a minable reserve.

Low Development Potential

Grade.–Anomalous samples not obtained. No indications that minable grades are present.

Reserves.–No established reserves. Geologic conditions are poorly suited for establishing reserves to supply a mine of given size.

Study recommendations.–Additional reconnaissance would have little possibility of identifying a minable reserve.

Undetermined Development Potential

No sample results, or available sample results are inconclusive. Additional reconnaissance is recommended before development potential is determined.

Resource Estimates

Order-of-magnitude resource estimates of gravel were made for streams, or portions of streams, having moderate to high potential for placer gold mineral development. Resource estimates were derived by multiplying the length of the stream section being evaluated by the average width of the flood plain (as identified from available maps and information obtained during traverses) by the average depth of gravel. Average depths used were based upon field observation as much as possible, but at times were estimated. The results of these estimates are listed in table 1 and in appendix B.

CONCLUSIONS

Regional studies carried out from 1979 to 1982 in and near the Chugach National Forest evaluated the types of placer deposits present; the origins, characteristics, and distribution of placer gold; and the placer gold mineral development potential of all named drainages and most of their significant tributaries in the CNF.

Bulk placer sampling indicated that anomalous placer gold occurs in most drainage basins underlain by Valdez Group rocks. Although the highest gold values and most of the production has been from alluvial and bench deposits, the eluvial, glacial, and marine deposits may locally contain significant amounts of gold. Forty-four drainages have moderate to high placer gold mineral development potential. The highest concentrations of placer gold were identified in streams that have previously been mined for placer gold.

Results from gold fineness determinations indicated that gold ranged from 455 to over 950 fine in the CNF, with the balance of the samples ranging from 770 to 850 fine.

Lode mineral occurrences were discovered by following up metal anomalies identified in placer samples. Placer samples can be used as very large pan concentrates to successfully detect anomalous base metals or precious metals in stream gravels collected from the numerous short, steep, and poorly graded drainages in which heavy particles have not had the time needed to concentrate because of recent glaciation.

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APPENDIX A.—PLACER DEPOSIT AND SAMPLE DATA

Table A-1 gives detailed results of the Bureau's field investigation of CNF placer deposits. Data are reported for samples from numerous locations througout the CNF.

The locations of the placer deposits and sample sites listed in table A-1 are shown in figures A-1 through A-13 (maps).

Table A-1.—Sample results for placers P-1 through P-102

Placer number[1]	Placer name	Sample location		Sample type	Sample size, yd³	Gold, oz/yd³	Gold composition, ppt			Ratio, gold to silver	Comments, including sample quality[2]
		Figure	Site				Gold	Silver	Base		
P-1	Whale	A-2	[3]	Pan	0.07	[4]	NS	NS	NS	NS	Marine, beach; poor.
NAp	Copper River	A-2	1	Pan	.1	0.0002	971	29	0	33.5	Marine, sand bar; fair.
P-2	..do	A-3	2	Pan	.1	.0001	992	8	0	124	Alluvial fan; poor.
		A-3	3	Pan	.1	.0008	994	6	0	165.6	Gravel bar; good.
		A-3	4	Pan	.1	.005	904	45	51	20.1	Do.
		A-3	5	Pan	.1	.0008	985	2	13	492.5	Do.
		A-3	10	Pan	.1	.0005	705	91	204	7.7	Do.
		A-3	10	Pan	.02	.002	990	10	0	99.0	Bedrock; excellent.
NAp	Copper River tributary	A-3	6	Sluice	.1	.0002	1,000	0	0	NAp	Alluvial fan; poor.
P-3	Shiels Glacier	A-3	7	..do	.1	.0007	NS	NS	NS	NS	Do.
P-4	Copper River tributary	A-3	8	..do	.1	.0009	954	43	3	22.2	Gravel bar; poor.
P-5	McCune Glacier	A-3	9	..do	.1	.0006	1,000	0	0	NAp	Do.
NAp	Whiting Falls	A-5	11	..do	.1	.0002	800	NS	NS	NS	Alluvial fan; poor.
P-6	Tasnuna River	A-5	12	..do	.1	.0003	960	40	0	24	Gravel bar; fair.
		A-5	18	..do	.1	.0005	898	40	62	22.4	Do.
		A-5	19	..do	.1	.0008	706	74	220	9.5	Do.
		A-5	20	Pan	.1	.028	857	NS	NS	NS	Bedrock; excellent.
NAp	Copper River tributary	A-5	13	Sluice	.1	.0001	958	24	18	39.9	Alluvial fan; poor.
P-7	Cleave Creek	A-5	14	..do	.1	.0003	843	157	0	5.4	Do.
		A-5	15	..do	.1	.0014	935	33	32	28.3	Gravel bar; fair.
		A-5	16	..do	.1	.0004	967	33	0	29.3	Do.
		A-5	17	..do	.1	.0001	882	118	0	7.5	Do.
P-8	Marshall Glacier	A-5	21	..do	.1	.15	909	91	0	10	Gravel bar; good.
P-9	Deserted Glacier	A-5	22	..do	.1	.0005	925	14	61	66.1	Do.
P-10	Heiden Creek	A-5	24	..do	.1	.0005	656	344	0	1.9	Do.
P-11	Bench Creek	A-5	25	..do	.1	.002	895	54	51	16.6	Do.
P-12	Wortmann Creek	A-5	26	..do	.1	.0003	958	42	0	22.8	Do.
P-13	Lowe River	A-5	23	..do	.1	.0004	592	408	0	1.4	Gravel bar; poor.
		A-7	35	..do	.1	.0002	962	38	0	25.3	Do.
P-14	Brown Creek	A-5	27	..do	.1	.0005	855	32	113	26.7	Do
		A-7	34	Pan	.02	.019	NS	NS	NS	NS	Do.
P-15	Dead Creek	A-7	29	Sluice	.1	.0007	964	18	18	53.5	Gravel bar; fair.
P-16	Red Head	A-6	28	Pan	.1	.0002	812	31	157	26.2	Marine, beach; fair.
P-17	Port Fidalgo	A-7	30	Sluice	.1	.0003	989	11	0	89.9	Gravel bar; fair.
		A-7	31	..do	.1	.0007	1,000	0	0	NAp	Do.
		A-7	31	..do	.1	.002	948	41	11	23.1	Do.
		A-7	32	..do	.1	.0002	932	68	0	13.7	Do.
		A-7	33	..do	.1	.0003	965	35	0	27.6	Do.
		A-7	33	..do	.1	.004	855	32	113	26.7	Do.
P-18	Black Bear	A-7	NS	NS	NS	NS	NS	NS	NS	NS	NS.
P-19	Sulfide Gulch	A-7	36	Sluice	.1	.0002	NS	NS	NS	NS	Alluvial fan; poor.
P-20	Solomon Gulch	A-7	37	..do	.1	.0008	940	28	32	33.6	Near bedrock; good.
NAp	Port Fidalgo tributary	A-7	38	..do	.1	.0004	976	16	8	61	Gravel bar; fair.
P-21	Jack Bay tributary	A-7	39	..do	.1	.0012	918	57	25	16.1	Do.
P-22	Silver Lake	A-7	40	..do	.1	.002	477	70	453	6.8	Alluvial fan; good.
P-23	Salmon Creek	A-7	41	..do	.1	.0075	835	165	0	5.1	Do.
P-24	Rainy Day	A-7	NS	NS	NS	NS	NS	NS	NS	NS	NS.
P-25	Mineral Creek	A-7	NS	NS	NS	NS	NS	NS	NS	NS	NS.
P-26	Gold Creek	A-7	42	Sluice	.1	.0005	939	38	23	24.7	Bench; poor.
P-27	McAllister Creek	A-7	43	..do	.1	.001	886	46	68	19.3	Alluvial fan; fair.
P-28	Big Creek	A-7	44	..do	.1	.0005	759	87	154	8.7	Gravel bar; good.
NAp	Anderson Pass	A-7	45	..do	.1	.0003	988	12	0	82.3	Alluvial fan; fair.
P-29	Lake No. 1	A-7	46	..do	.1	.0005	849	151	0	5.6	Do.
P-30	Columbia Glacier	A-7	47	..do	.1	.0005	896	8	96	112	Gravel bar; fair.
P-31	Miners River	A-8	48	..do	.1	.005	455	545	0	.8	Do.
P-32	Coghill River	A-8	49	..do	.1	.0004	NS	NS	NS	NS	Do.
		A-8	50	..do	.1	.0063	799	83	118	9.6	Bedrock; excellent.
		A-8	51	..do	.1	.0011	NS	NS	NS	NS	Gravel bar; fair.
P-33	Unakwik Inlet	A-8	52	..do	.1	.0021	NS	NS	NS	NS	Do.
P-34	Lafayette Glacier	A-8	53	..do	.1	.001	NS	NS	NS	NS	Gravel bar; good.
P-35	Jonah Bay	A-8	54	..do	.1	.0013	NS	NS	NS	NS	Alluvial fan; fair.
P-36	Avery River	A-8	55	..do	.1	.0002	NS	NS	NS	NS	Gravel bar; poor.
		A-8	56	..do	.1	.0083	822	73	105	11.3	Gravel bar; good.
		A-8	56	..do	.1	.0016	NS	NS	NS	NS	Do.
		A-8	56	..do	.1	.0001	NS	NS	NS	NS	Gravel bar; fair.
P-37	Siwash Bay	A-8	57	..do	.1	.0036	NS	NS	NS	NS	Do.
		A-8	57	..do	.1	.0009	NS	NS	NS	NS	Bedrock; poor.
P-38	Eaglek Bay	A-8	58	..do	.1	.001	NS	NS	NS	NS	Gravel bar; fair.
NAp	Mount Doran	A-9	59	..do	.1	.0001	NS	NS	NS	NS	Do.
NAp	Bettles Bay	A-9	60	..do	.1	.0009	NS	NS	NS	NS	Bedrock; fair.
		A-9	60	Pan	.006	.018	NS	NS	NS	NS	Bedrock; good.

See footnotes at end of table.

Table A-1.—Sample results for placers P-1 through P-102—Continued

Placer number[1]	Placer name	Sample location: Figure	Sample location: Site	Sample type	Sample size, yd³	Gold, oz/yd³	Gold composition, ppt: Gold	Gold composition, ppt: Silver	Gold composition, ppt: Base	Ratio, gold to silver	Comments, including sample quality[2]
P-39	Pirate Cove	A-9	61	Sluice	0.1	0.001	NS	NS	NS	NS	Gravel bar; fair.
NAp	Culross Mine	A-9	62	do	.1	.0009	NS	NS	NS	NS	Bedrock; good.
P-40	Billings Creek	A-9	63	Dredge	[5]1	[6].0014	664	157	179	4.2	Do.
P-41	Carmen River, North Fork	A-9	64	Sluice	.1	.0014	NS	NS	NS	NS	Gravel bar; good.
P-42	Twentymile River	A-9	65	do	.1	.0001	NS	NS	NS	NS	Gravel bar; poor.
		A-9	66	do	.1	.0035	839	24	137	35	Gravel bar; fair.
		A-9	66	Pan	.02	.0065	805	NS	NS	NS	Bedrock; good.
		A-9	67	Sluice	.1	.0007	NS	NS	NS	NS	Gravel bar; fair.
		A-9	67	Pan	.012	.0037	871	58	71	15	Bedrock; excellent.
		A-9	68	Sluice	.1	.0005	810	NS	NS	NS	Bedrock; good.
NAp	Raven Creek	A-9	69	do	.1	.0017	NS	NS	NS	NS	Gravel bar; fair.
P-43	Crow Creek	A-9	70	Dredge	[5].67	[6].0003	NS	NS	NS	NS	Gravel bar; poor.
		A-9	71	Sluice	.1	.0013	NS	NS	NS	NS	Gravel bar; fair.
		A-9	72	do	.1	.0042	NS	NS	NS	NS	Bench; good.
		A-9	73	do	.1	.0127	711	154	135	4.6	Bedrock; fair.
		A-9	73	Pan	[5].5	[6].012	744	206	50	3.6	Bedrock; good.
		A-9	73	Sluice	.1	.144	719	209	72	3.4	Bedrock; fair.
		A-9	73	do	.1	.0021	NS	NS	NS	NS	Gravel bar; excellent.
		A-9	74	do	.1	.039	715	206	79	3.5	Bench; good.
		A-9	74	do	.1	1.17	706	248	46	2.8	Bench; bedrock; excellent.
P-44	Winner Creek	A-9	75	do	.1	.0283	716	213	72	3.4	Bench; good.
		A-9	75	Pan	[5]4	[6].002	709	229	63	3.1	Do.
P-45	California Creek	A-9	76	Sluice	.1	.0006	NS	NS	NS	NS	Bench; fair.
		A-9	76	do	.1	.0007	NS	NS	NS	NS	Do.
P-46	Kern Creek	A-9, A-10	[3]	do	.1	[4]	NS	NS	NS	NS	Gravel bar; poor.
P-47	Peterson Creek	A-9, A-10	[3]	do	.1	[4]	NS	NS	NS	NS	Do.
P-48	Sawmill Creek	A-9, A-10	77	Dredge	[5]1	[6].0004	NS	NS	NS	NS	Gravel bar; fair.
		A-9, A-10	77	Pan	.05	.0029	NS	NS	NS	NS	Bedrock; good.
P-49	Seattle Creek	A-9, A-10	78	Sluice	.1	.001	NS	NS	NS	NS	Bench; fair.
		A-9, A-10	78	do	.1	.0048	NS	NS	NS	NS	Do.
		A-9, A-10	79	Dredge	[5]1	[6].0001	NS	NS	NS	NS	Bedrock; fair.
		A-9, A-10	80	do	[5]1	[6].0029	NS	NS	NS	NS	Do.
		A-9, A-10	80	do	[5]1	[6].0048	NS	NS	NS	NS	Bedrock; good.
		A-9, A-10	80	Pan	.01	.0136	NS	NS	NS	NS	Bedrock; excellent.
		A-9, A-10	81	Dredge	[5]1	[6].0014	NS	NS	NS	NS	Bedrock; good.
		A-9, A-10	81	Pan	.02	.0301	735	96	169	7.7	Bedrock; excellent.
		A-9, A-10	82	Dredge	[5]1	[6].0009	NS	NS	NS	NS	Bedrock; good.
P-50	Ingram Creek	A-9, A-10	[3]	Sluice	.1	[4]	NS	NS	NS	NS	Gravel bar; poor.
P-51	Wolverine Creek	A-9, A-10	83	Dredge	[5]1	[6].0036	748	68	184	11	Bedrock; good.
		A-9, A-10	83	do	[5]1	[6].0018	NS	NS	NS	NS	Bedrock; poor.
P-52	Tincan Creek	A-9, A-10	84	do	[5]1	[6].0114	NS	NS	NS	NS	Bedrock; fair.
		A-9, A-10	84	Sluice	.1	.0023	NS	NS	NS	NS	Bedrock; good.
P-53	East Fork and Granite Creeks	A-10	92	do	.1	.001	NS	NS	NS	NS	Gravel bar; fair.
		A-10	93	do	.1	.0005	NS	NS	NS	NS	Bench; fair.
		A-10	127	Pan	.006	.025	NS	NS	NS	NS	Bedrock; good.
		A-10	127	Sluice	.1	.0267	800	106	94	7.5	Gravel bar; good.
		A-10	127	do	.1	.032	789	107	104	7.4	Do.
		A-10	127	Pan	.01	.05	788	108	103	7.3	Bedrock; excellent.
		A-10	127	Sluice	.1	.0035	810	85	105	9.5	Bench; good.
		A-10	127	do	.1	.0032	797	154	49	5.2	Do.
		A-10	127	do	.1	.0019	NS	NS	NS	NS	Bench; fair.
		A-10	127	do	.1	.0082	802	130	68	6.2	Bedrock; good.
		A-10	127	do	[5].4	[6].0042	802	118	80	6.8	Bench; poor.
P-54	Lyon Creek	A-9, A-10	85	Dredge	[5]1	[6].0132	771	100	29	7.7	Bedrock; excellent.
P-55	Taylor Creek	A-9, A-10	86	Sluice	.1	.0011	NS	NS	NS	NS	Gravel bar; fair.
P-56	Bertha Creek	A-9, A-10	87	do	.1	.0129	777	100	123	7.8	Bench; good.
		A-10	88	do	.1	.0006	NS	NS	NS	NS	Gravel bar; fair.
		A-10	88	Dredge	[5].67	[6].0142	773	215	12	3.6	Gravel bar; good.
P-57	Spokane Creek	A-10	89	Sluice	.1	.0001	NS	NS	NS	NS	Bench; fair.
		A-10	90	Dredge	[5]1	[6].0022	NS	NS	NS	NS	Gravel bar; good.
P-58	Pete's Creek	A-10	91	Sluice	.1	.0007	NS	NS	NS	NS	Bench; fair.
P-59	Placer River	A-10	102	do	.1	.0028	752	225	23	3.3	Gravel bar; good.
		A-10	102	do	.1	.0001	NS	NS	NS	NS	Gravel bar; fair.
		A-10	102	Dredge	[5]1	[6].0003	NS	NS	NS	NS	Do.
		A-10	102	do	[5]1	[6].0028	NS	NS	NS	NS	Bedrock; good.
		A-10	103	do	[5]1	[6].0015	NS	NS	NS	NS	Bedrock; fair.
		A-10	104	Sluice	.1	.001	NS	NS	NS	NS	Gravel bar; fair.
		A-10	105	Dredge	[5]1	[6].0001	NS	NS	NS	NS	Gravel bar; poor.
		A-10	106	Sluice	.1	.0009	NS	NS	NS	NS	Gravel bar; fair.
P-60	Bench and Groundhog Creeks	A-10	107	Dredge	[5]1	[6].001	NS	NS	NS	NS	Bedrock; fair.
		A-10	108	do	[5]1	[6].0006	NS	NS	NS	NS	Gravel bar; poor.
		A-10	109	do	[5]1	[6].0042	NS	NS	NS	NS	Gravel bar; fair.
		A-10	109	Sluice	.1	.012	NS	NS	NS	NS	Bedrock; excellent.
		A-10	110	Dredge	[5]1	[6].0001	NS	NS	NS	NS	Bedrock; good.
P-61	Lynx Creek	A-10	95	Sluice	.1	.0013	NS	NS	NS	NS	Alluvial fan; good.
		A-10	95	Dredge	[5]1	[6].0001	NS	NS	NS	NS	Gravel bar; poor.
		A-10	95	do	[5]1	[6].0004	NS	NS	NS	NS	Alluvial fan; fair.
		A-10	96	Sluice	.1	.0036	770	227	3	3.4	Gravel bar; fair.
		A-10	96	do	.1	.0412	846	131	23	6.5	Bedrock; excellent.
		A-10	97	do	.1	.0085	NS	NS	NS	NS	Bench; good.
		A-10	97	do	.1	.0203	829	75	96	11.1	Do.
		A-10	97	do	.1	.0118	NS	NS	NS	NS	Do.
		A-10	97	do	.1	.0163	807	104	89	7.8	Do.
		A-10	97	do	.1	.0741	NS	NS	NS	NS	Do.

See footnotes at end of table.

Table A-1.—Sample results for placers P-1 through P-102—Continued

Placer number[1]	Placer name	Sample location		Sample type	Sample size, yd³	Gold, oz/yd³	Gold composition, ppt			Ratio, gold to silver	Comments, including sample quality[2]
		Figure	Site				Gold	Silver	Base		
P-61	Lynx Creek	A-10	97	Sluice	0.1	0.0298	NS	NS	NS	NS	Bench, bedrock; good.
		A-10	97	do	[5]1.25	[6].0087	NS	NS	NS	NS	Bench; poor.
		A-10	97	Dredge	[5].5	[6].0149	NS	NS	NS	NS	Bedrock; good.
		A-10	98	do	[5].5	[6].0011	NS	NS	NS	NS	Bench; poor.
P-62	Silvertip Creek	A-10	94	Sluice	.1	.0019	780	156	64	5	Gravel bar; fair.
NAp	Center Creek	A-10	99	Dredge	[5]1	[6].0001	NS	NS	NS	NS	Bedrock; good.
	do	A-10	100	do	[5]1	[6].0001	NS	NS	NS	NS	Do.
	do	A-10	101	do	[5]1	[6].0001	NS	NS	NS	NS	Bedrock; poor.
P-63	Mills Creek	A-10	111	do	[5]1	[6].0006	831	43	126	19.3	Bedrock; excellent.
		A-10	112	do	[5]1	[6].0012	828	72	100	11.5	Bedrock; good.
		A-10	113	do	[5].75	[6].0005	854	19	127	45	Bedrock; poor.
		A-10	114	do	[5]1	[6].0001	NS	NS	NS	NS	Do.
		A-10	115	do	[5]1	[6].0554	840	69	91	12.2	Bedrock; excellent.
		A-15	115	Sluice	.1	.0001	NS	NS	NS	NS	Bench; good.
		A-10	115	do	.1	.0035	NS	NS	NS	NS	Do.
		A-10	115	do	.1	.0044	NS	NS	NS	NS	Do.
		A-10	116	do	.1	.0869	834	98	68	8.5	Do.
		A-10	119	do	.1	.0011	NS	NS	NS	NS	Gravel bar; fair.
P-64	Colorado Creek	A-10	117	do	.1	.0002	NS	NS	NS	NS	Do.
		A-10	118	do	.1	.0022	680	278	42	2.4	Mixed gravel and eluvium; good.
P-65	Juneau Creek	A-10	[3]	do	.1	[4]	NS	NS	NS	NS	Bedrock; good.
P-66	Fresno Creek	A-10	121	do	.1	.0006	NS	NS	NS	NS	Gravel bar; poor.
P-67	Canyon Creek	A-10	120	do	.1	.0054	840	96	64	8.8	Bench, bedrock; fair.
		A-10	120	Pan	.05	.014	855	93	52	9.2	Bench, bedrock; good.
		A-10	128	Sluice	.1	.0001	NS	NS	NS	NS	Bench; fair.
		A-10	128	do	.1	.0004	NS	NS	NS	NS	Do.
P-68	Gulch Creek	A-10	122	Dredge	[5]1	[6].0034	810	86	104	9.4	Bedrock; poor.
		A-10	123	do	[5]1	[6].0007	810	53	137	15.3	Bedrock; fair.
		A-10	124	Pan	.025	.0296	761	110	129	6.9	Bedrock; good.
		A-10	125	Dredge	[5]1	[6].0006	786	47	167	16.7	Bedrock; fair.
		A-10	126	Sluice	.1	.0008	NS	NS	NS	NS	Bench; fair.
P-69	Sixmile Creek	A-10	130	Pan	.017	.0214	874	36	90	24.3	Bedrock; good.
		A-10	131	Sluice	.1	.0017	NS	NS	NS	NS	Gravel bar; fair.
		A-10	132	do	.05	.0028	NS	NS	NS	NS	Bench; fair.
		A-10	132	Dredge	[5]1	[6].0182	814	119	67	6.8	Gravel bar; good.
		A-10	132	do	[5]1	[6].002	784	100	116	7.8	Gravel bar; fair.
P-69	Falls Creek	A-10	133	do	[5]1	[6].0002	NS	NS	NS	NS	Bedrock; excellent.
		A-10	134	Sluice	.1	.0003	NS	NS	NS	NS	Gravel bar; fair.
		A-10	135	do	.1	.0073	745	62	193	12	Bedrock; good.
P-70	Bear Creek	A-10	136	do	.1	.0021	697	267	36	2.6	Mixed gravel bar and eluvium; poor.
P-71	Resurrection and Palmer Creeks	A-10	137	Washing plant	1,000	NS	837	117	46	7.2	Gold donated by mine owner.
P-72	Chickaloon River	A-10	138	Sluice	.1	.0006	NS	NS	NS	NS	Gravel bar; fair.
P-73	Falls Creek	A-10	139	Pan	.03	.0042	808	23	169	35.1	Gravel bar; good.
P-74	Quartz Creek	A-10	140	Sluice	.1	.0024	747	144	109	5.2	Bedrock; good.
		A-10	140	do	.1	.034	795	122	83	6.5	Bench, bedrock; good.
		A-10	140	Pan	.0003	4.5	817	97	86	8.4	Tailing from spiral concentrator.
		A-10	141	Pan	.006	.0384	NS	NS	NS	NS	Bedrock; excellent.
		A-10	141	Sluice	.1	.0024	NS	NS	NS	NS	Gravel bar; fair.
NAp	Slate Creek	A-10	142	do	.1	.0048	NS	NS	NS	NS	Eluvial gravel; good.
NAp	Summit Creek	A-10	143	do	.1	.0001	NS	NS	NS	NS	Gravel bar; fair.
P-75	Trail River tributary	A-10	144	Dredge	[5]1	[6].0006	NS	NS	NS	NS	Do.
NAp	Moose Creek	A-10	145	do	[5]1	[6].0001	NS	NS	NS	NS	Bedrock; excellent.
		A-10	146	do	[5]1	[6].0005	NS	NS	NS	NS	Bedrock; fair.
		A-10	146	Sluice	.05	.0003	NS	NS	NS	NS	Bench, bedrock; fair.
P-76	Trail River	A-10	147	do	.1	.0015	NS	NS	NS	NS	Gravel bar; good.
		A-10	148	Dredge	[5]1	[6].0012	NS	NS	NS	NS	Bedrock; good.
		A-10	148	do	[5]1	[6].0007	NS	NS	NS	NS	Bedrock; fair.
P-77	Cotterell Glacier	A-11	149	Sluice	.1	.0005	NS	NS	NS	NS	Gravel bar; fair.
P-78	Taylor Glacier	A-11	150	do	.1	.0044	677	238	85	2.8	Do.
P-79	Claremont Glacier	A-11	151	do	.1	.0013	NS	NS	NS	NS	Do.
P-80	Kings River	A-11	152	do	.1	.0083	812	100	88	8.1	Bedrock; good.
		A-11	152	do	.1	.0014	NS	NS	NS	NS	Gravel bar; fair.
		A-11	152	Dredge	[5]1	[6].0017	827	104	69	8	Bedrock; good.
		A-11	153	Sluice	.1	.0003	NS	NS	NS	NS	Gravel bar; fair.
P-81	Kings River tributary	A-11	154	do	.1	.0035	742	94	164	7.9	Gravel bar; good.
P-82	Wolverine Glacier	A-11	155	do	.1	.0002	NS	NS	NS	NS	Do.
P-83	Snow River	A-12	156	do	.1	.0006	NS	NS	NS	NS	Do.
		A-12	157	Pan	.006	.0464	NS	NS	NS	NS	Bedrock; excellent.
		A-12	157	Dredge	[5].67	[6].0001	NS	NS	NS	NS	Gravel bar; fair.
		A-12	158	Sluice	.1	.0011	NS	NS	NS	NS	Do.
P-84	Grant Lake	A-12	159	Dredge	[5]1	[6].0002	NS	NS	NS	NS	Bedrock; good.
		A-12	160	do	[5]1	[6].0006	779	39	182	20	Do.
P-85	Falls Creek	A-12	161	Sluice	.1	.0022	NS	NS	NS	NS	Gravel bar; fair.
		A-12	162	do	.1	.0027	NS	NS	NS	NS	Eluvial gravel; good.
		A-12	163	Dredge	[5]1	[6].0002	NS	NS	NS	NS	Bedrock; poor.
		A-12	164	Sluice	.1	.0009	NS	NS	NS	NS	Eluvial gravel; fair.
		A-12	165	do	.1	.0077	NS	NS	NS	NS	Active mine cut; good.
P-86	Ptarmigan Creek	A-12	166	do	.1	.0003	NS	NS	NS	NS	Bench; good.
P-87	Victor Creek	A-12	167	do	.1	.0002	NS	NS	NS	NS	Gravel bar; fair.
		A-12	167	do	.1	.0007	NS	NS	NS	NS	Do.
		A-12	168	do	.1	.0043	745	111	144	6.7	Bedrock; good.

See footnotes at end of table.

Table A-1.—Sample results for placers P-1 through P-102—Continued

Placer number[1]	Placer name	Sample location: Figure	Sample location: Site	Sample type	Sample size, yd³	Gold, oz/yd³	Gold composition, ppt: Gold	Gold composition, ppt: Silver	Gold composition, ppt: Base	Ratio, gold to silver	Comments, including sample quality[2]
P-88	Porcupine Creek	A-12	169	Sluice	0.1	0.0008	NS	NS	NS	NS	Gravel bar; fair.
		A-12	169	Pan	.02	.0022	NS	NS	NS	NS	Bedrock; fair.
P-89	Ship Creek	A-12	170	Dredge	[5]1	[6].0002	NS	NS	NS	NS	Bedrock; fair.
		A-12	171	..do	[5]1	[6].0001	NS	NS	NS	NS	Gravel bar; poor.
		A-12	172	..do	[5]1	[6].0081	759	76	165	10	Bedrock; good.
		A-12	172	Sluice	.05	.0304	824	57	119	14.5	Bedrock; excellent.
		A-12	173	..do	.1	.0001	NS	NS	NS	NS	Gravel bar; fair.
P-90	Crescent Creek	A-12	175	..do	.1	.01	770	82	148	9.4	Bench; good.
		A-12	175	..do	.05	.031	770	124	106	6.2	Do.
		A-12	175	..do	.1	.015	818	64	118	12.8	Gravel bar; good.
		A-12	175	Pan	.04	.0135	773	111	116	7	Bedrock; excellent.
P-91	Hargood Creek	A-12	174	Sluice	.1	.0289	804	186	10	4.3	Alluvial fan; good.
		A-12	174	..do	.1	.0036	731	215	54	3.4	Do.
		A-12	174	..do	.1	.0315	764	211	25	3.6	Do.
P-92	Dry Creek	A-12	176	..do	.1	.0005	NS	NS	NS	NS	Gravel bar; fair.
P-93	Kenai River	A-12	177	..do	.1	.0027	826	111	63	7.4	Gravel bar; good.
		A-12	177	Dredge	[5].5	[6].003	NS	NS	NS	NS	Gravel bar; fair.
		A-12	178	Sluice	.1	.0135	814	106	80	7.7	Gravel bar; good.
		A-12	180	..do	.1	.0449	860	80	60	10.8	Gravel bar; excellent.
		A-12	181	..do	.1	.0001	NS	NS	NS	NS	Gravel bar; good.
P-94	Cooper Creek	A-12	179	Sluice	.1	.0018	820	136	44	6	Gravel bar; fair.
		A-12	182	..do	.2	.019	NS	NS	NS	NS	Bench; good.
		A-12	183	Sluice	.1	.0046	NS	NS	NS	NS	Mixed gravel bar and eluvium; fair.
		A-12	184	Dredge	[5].75	[6].0001	770	42	288	18.3	Bedrock; poor.
		A-12	185	Sluice	.1	.01	572	156	272	3.7	Bench; good.
P-95	Stetson Creek	A-12	186	..do	.1	.0043	835	53	112	15.8	Bedrock; good.
P-96	Cooper Lake tributary	A-12	187	..do	.1	.0008	NS	NS	NS	NS	Gravel bar; fair.
P-97	Boulder Creek	A-12	188	..do	.1	.0003	NS	NS	NS	NS	Bench; fair.
P-98	Martin Creek	A-12	189	Dredge	[5]1	[6].0001	808	NS	NS	NS	Bedrock; fair.
		A-12	190	..do	[5]1	[6].0006	806	36	158	22.4	Bedrock; fair.
		A-12	191	..do	[5]1	[6].0278	819	61	120	13.4	Do.
		A-12	191	Sluice	.1	.0106	807	174	19	4.6	Gravel bar; fair.
		A-12	191	Pan	.02	.1537	829	67	104	12.4	Bedrock; excellent.
		A-12	193	Sluice	.1	.0004	NS	NS	NS	NS	Gravel bar; fair.
P-99	Redman Creek	A-12	192	..do	.1	.0003	NS	NS	NS	NS	Do.
P-100	Paradise Creek	A-12	194	..do	.1	.0001	NS	NS	NS	NS	Do.
P-101	Lost Creek	A-12	195	Pan	.02	.0003	NS	NS	NS	NS	Bedrock; good.
P-102	Goat Harbor	A-13	([3])	Sluice	.1	([4])	NS	NS	NS	NS	Gravel bar.

NS Not sampled or not determined.
NAp Not applicable.
[1]From maps in appendix A. Samples with placer numbers are described in appendix B; those without placer numbers are not.
[2]Excellent: Bedrock reached, little water in hole (unless collected by suction dredge). Good location for gold to accumulate. Sample value likely greater than average value of gravels in immediate area.
Good: Bedrock reached, may have water in hole. Fair to good area for gold to accumulate. Sample value likely to be representative of that of gravel in immediate area.
Fair: Bedrock not reached and/or poor location for gold to accumulate. Sample value may be less than that of gravel in immediate area.
Poor: Bedrock not reached and water in hole. Poor location for gold to accumulate. Sample value likely to be less than that of gravel in immediate area.
[3]Sample collected, but gold content too low for analysis. (Location not specifically identified.)
[4]Gold content too low for analysis.
[5]Hour (amount of sample collected in given time).
[6]Ounce per hour.

Legend for Figures A-1 Through A-13

Location of placer deposit and deposit number (numbers used in tables 1 and A-1 and appendix B)

Placer sample site where trace amounts or no visible gold was recovered

Placer sample site where quantity of gold was large enough to be weighed. (Site numbers correspond to those used in "Sample location" column in appendix B.)

Chugach National Forest boundary

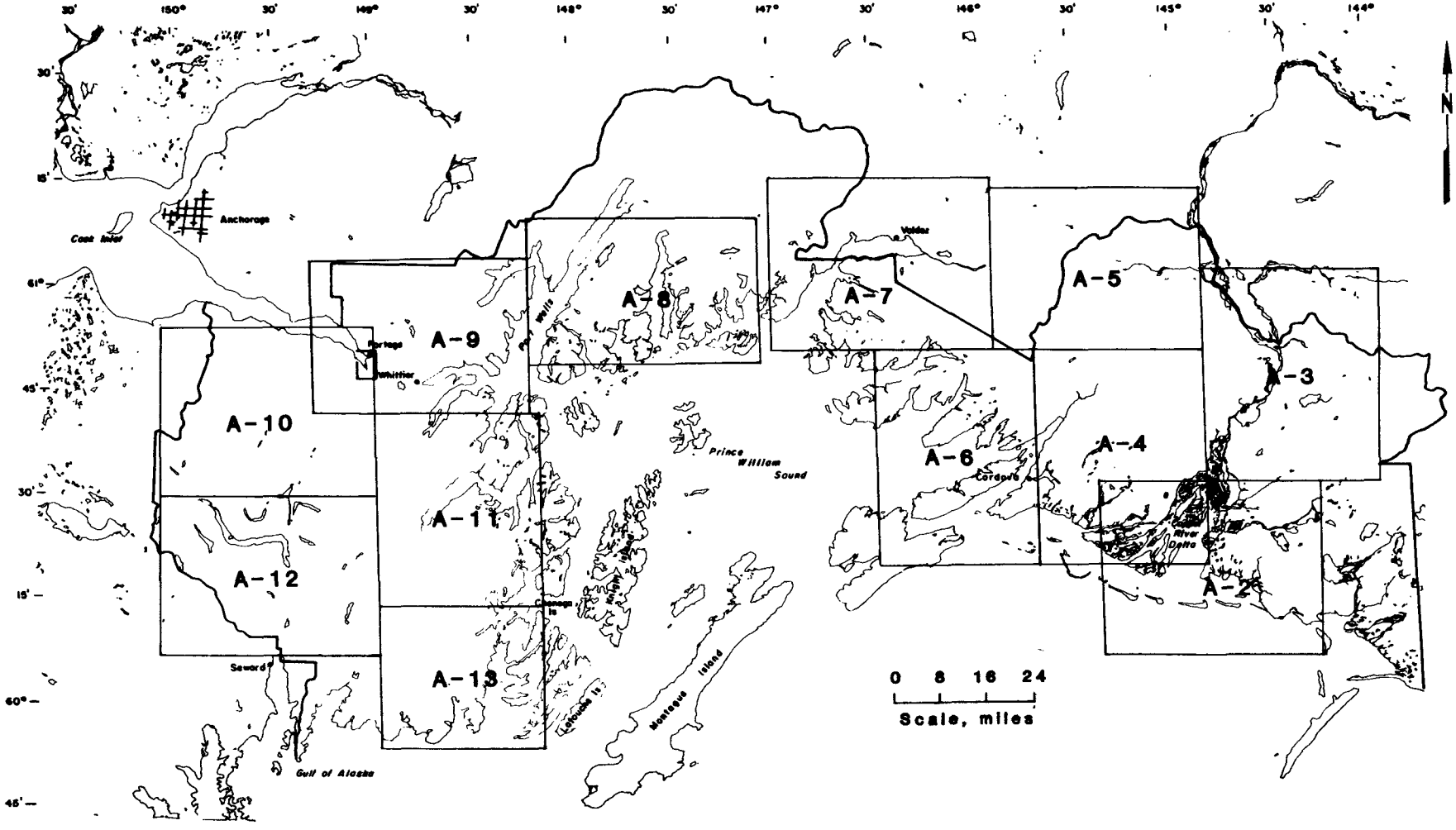


FIGURE A-1. Index map for figures A-2 through A-13.

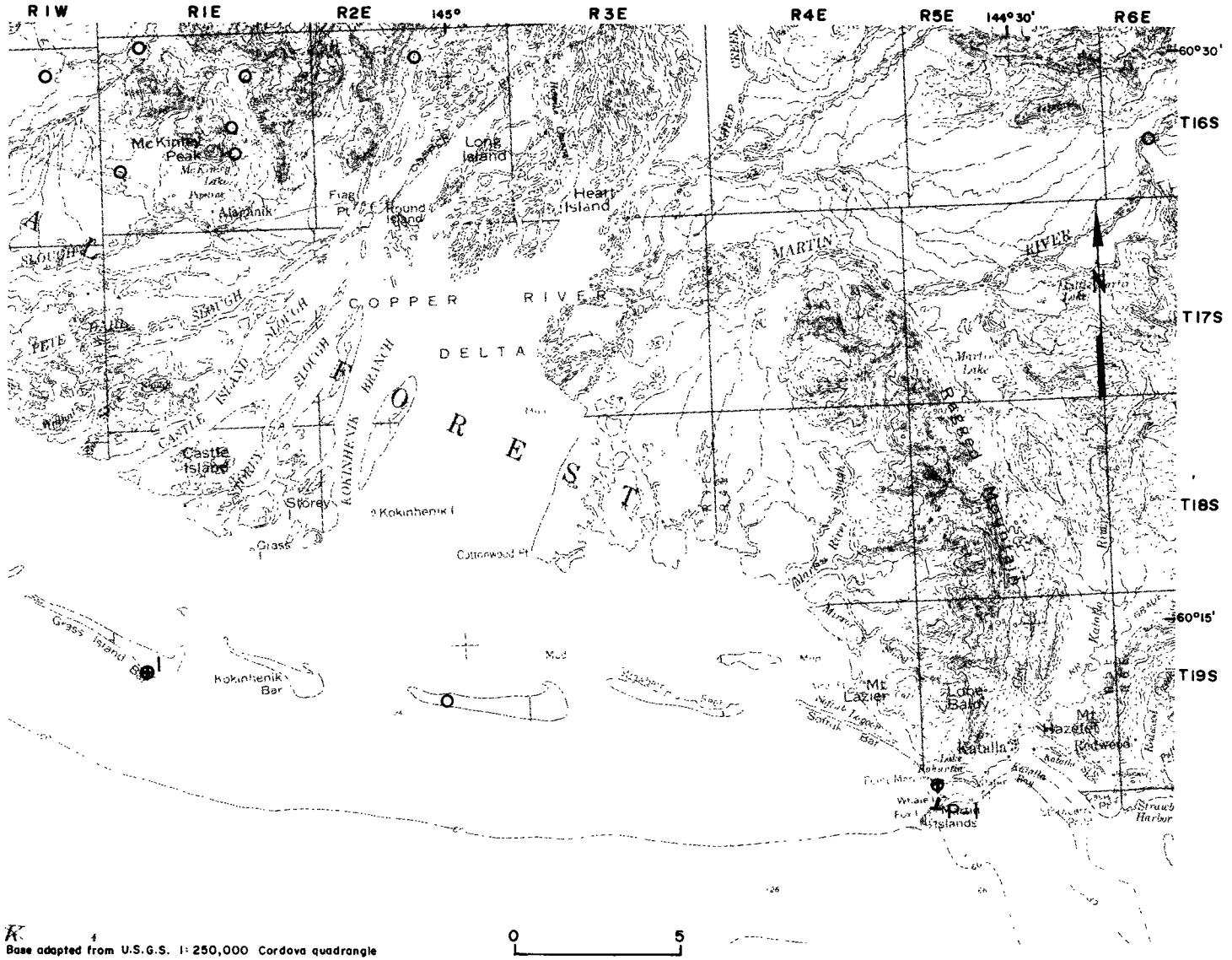
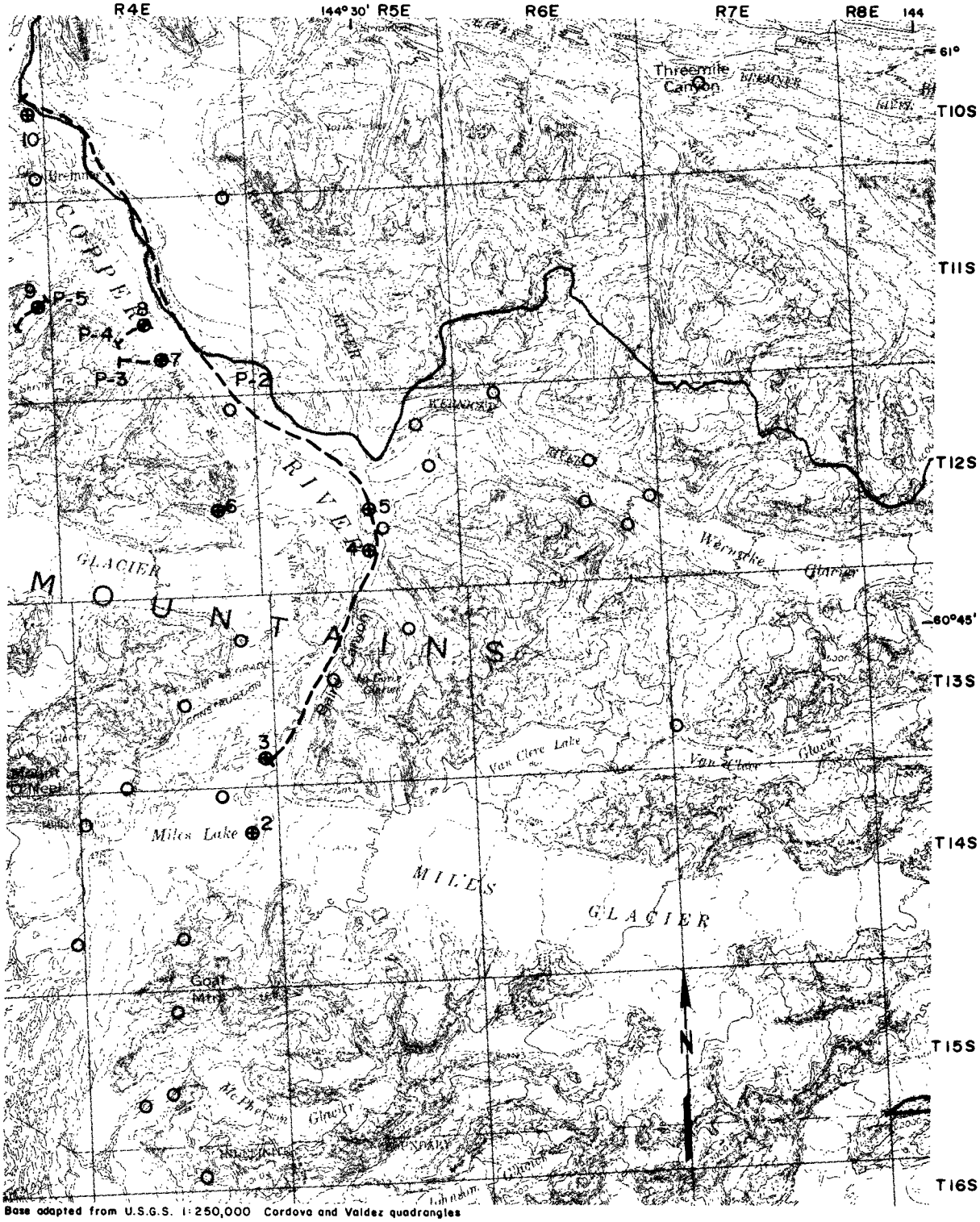
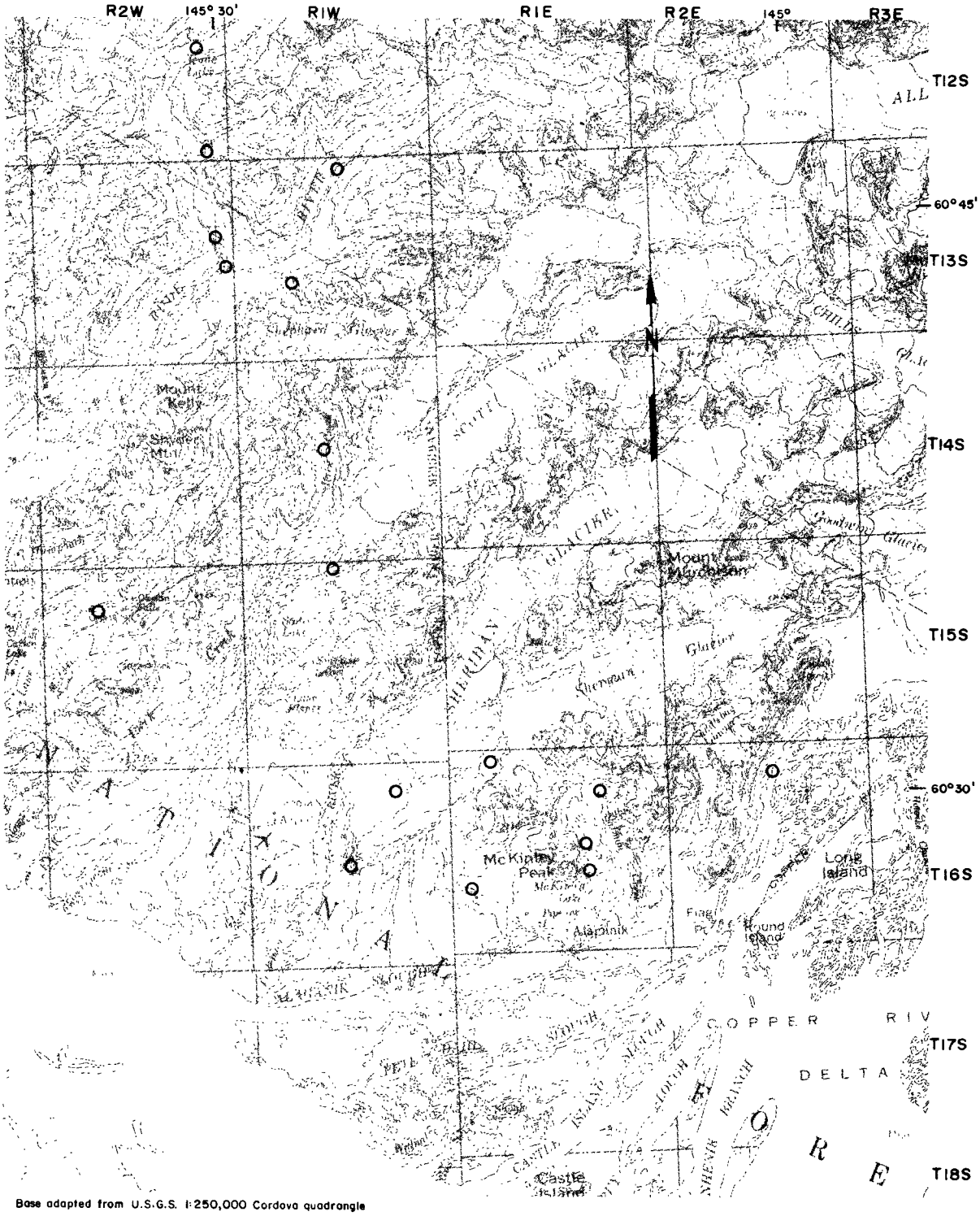


FIGURE A-2. Copper River Delta area.



Base adapted from U.S.G.S. 1:250,000 Cordova and Valdez quadrangles

FIGURE A-3. Copper River area.



Base adapted from U.S.G.S. 1:250,000 Cordova quadrangle

0 5
Scale, miles
Contour interval 200 ft

FIGURE A-4. Scott Glacier area.

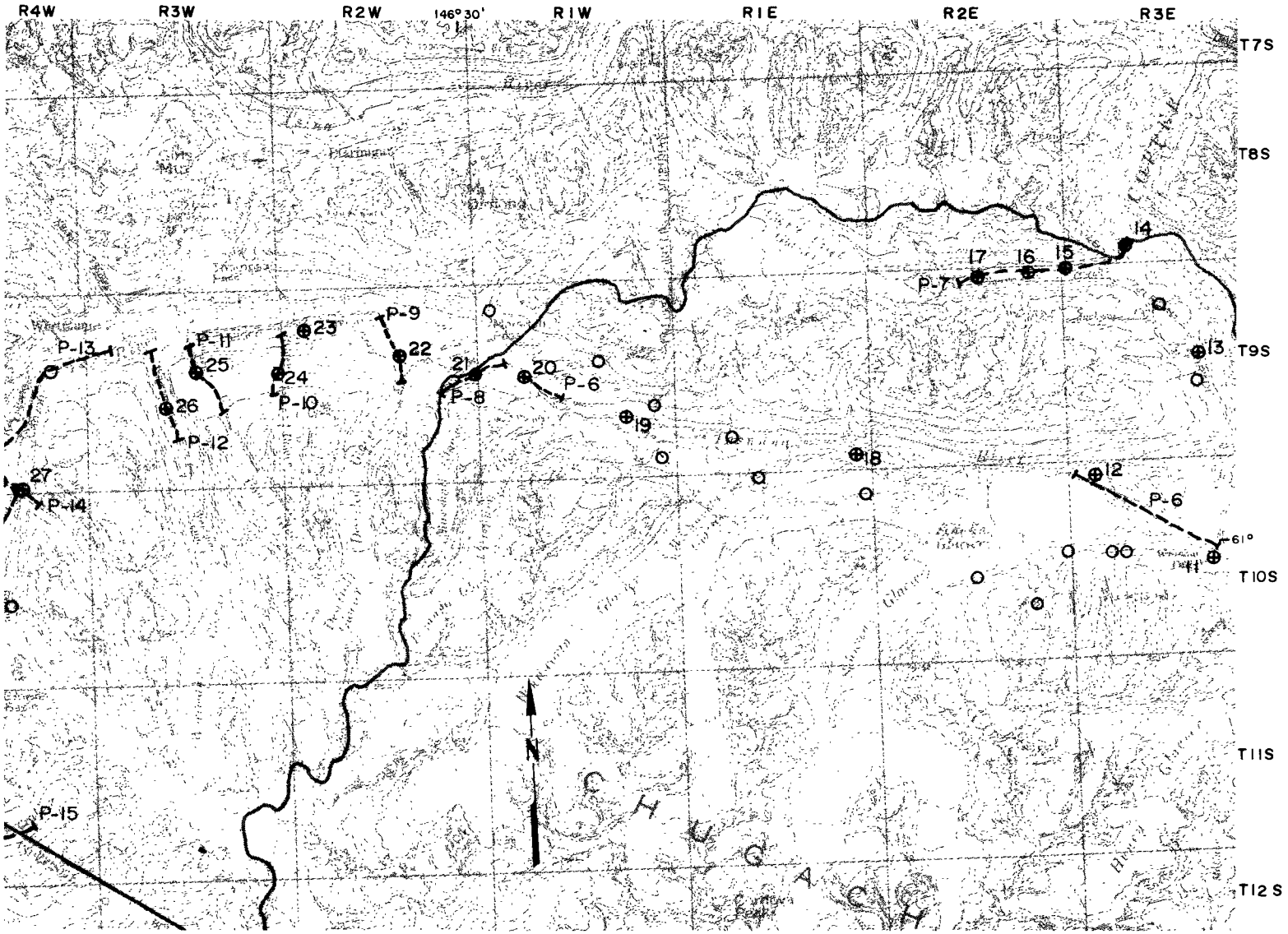


FIGURE A-5. Tasnuna River area.

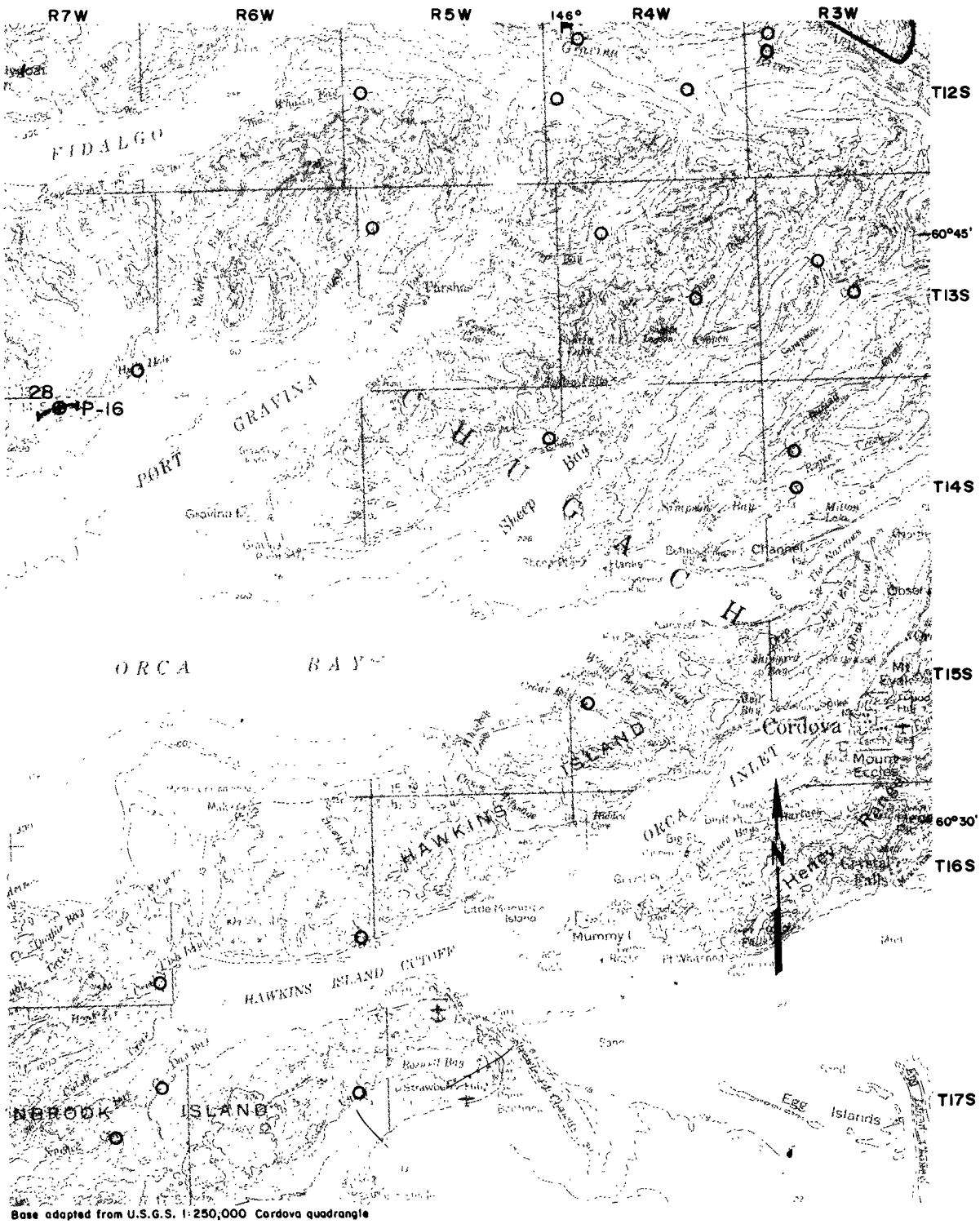


FIGURE A-6. Orca Bay area.

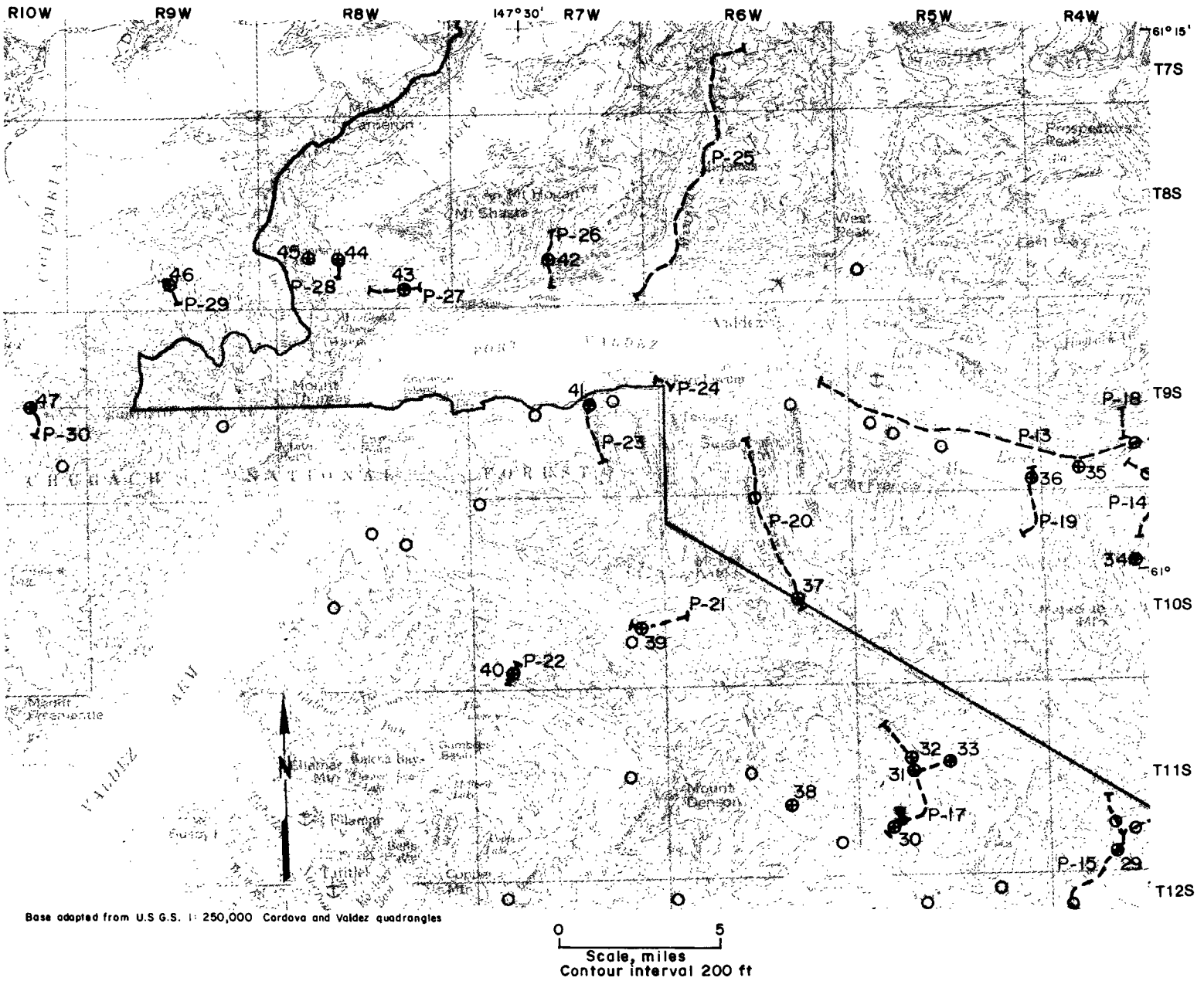


FIGURE A-7. Valdez area.

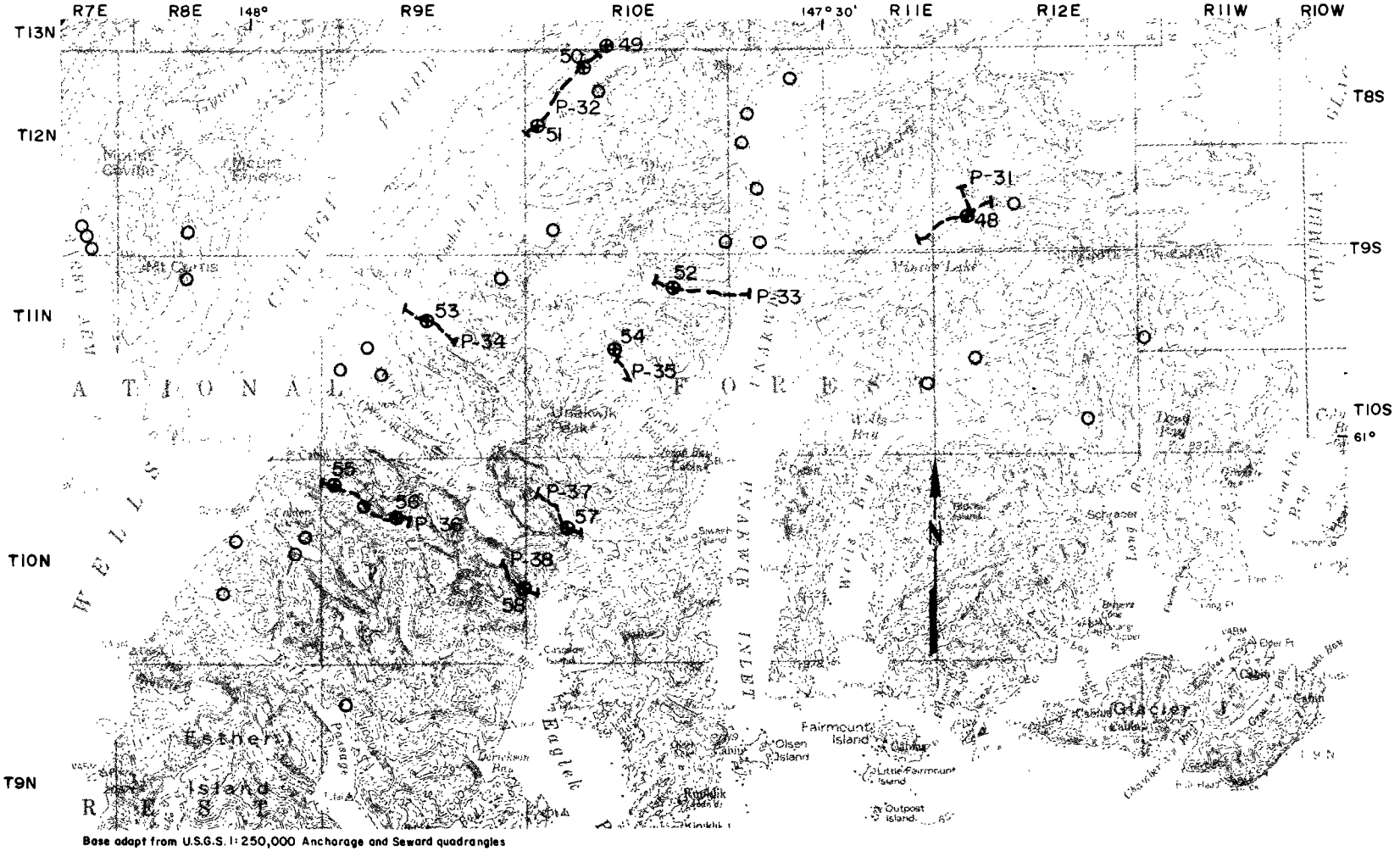


FIGURE A-8. Unakwik Inlet.

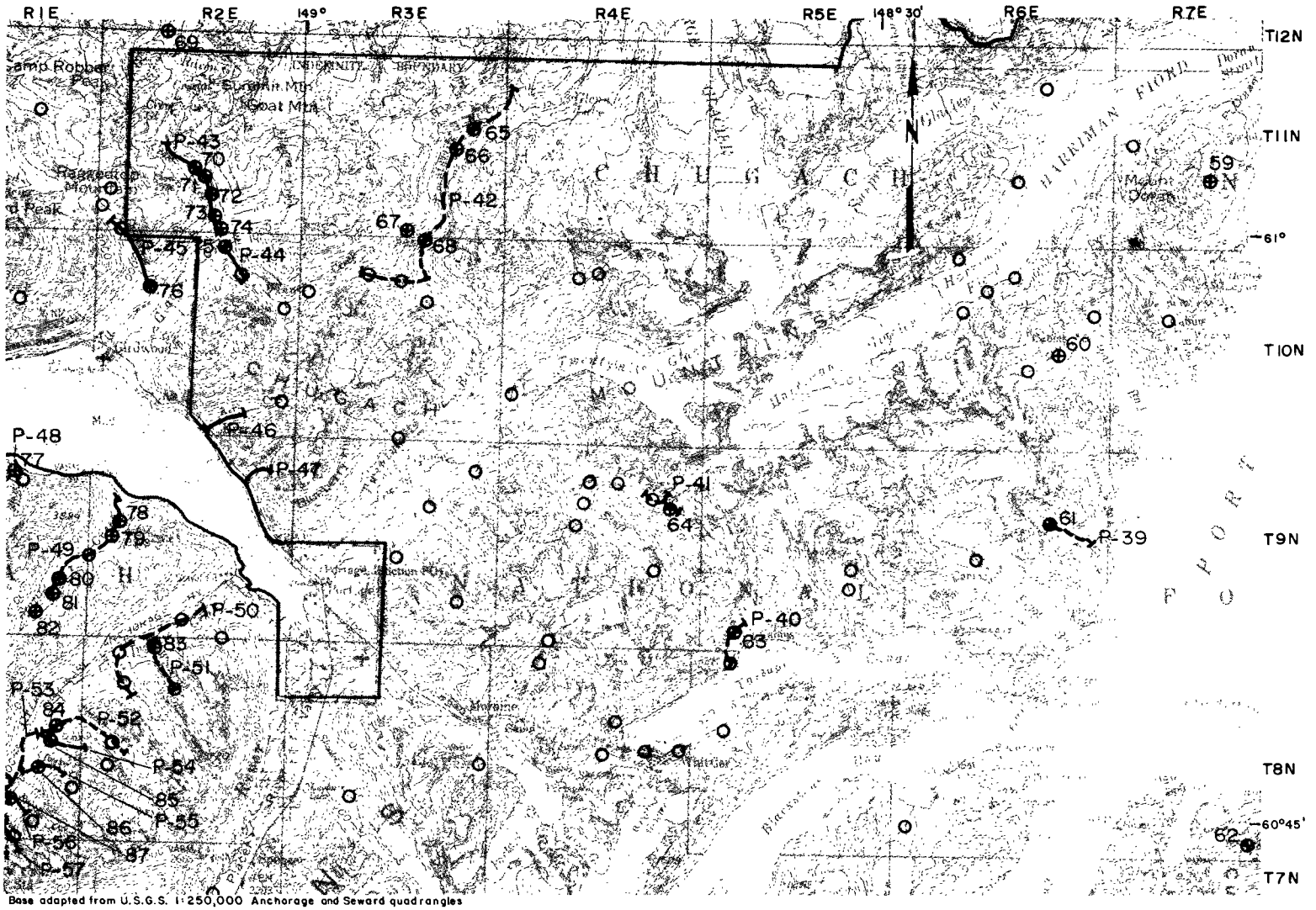


FIGURE A-9. Girdwood-Port Wells area.

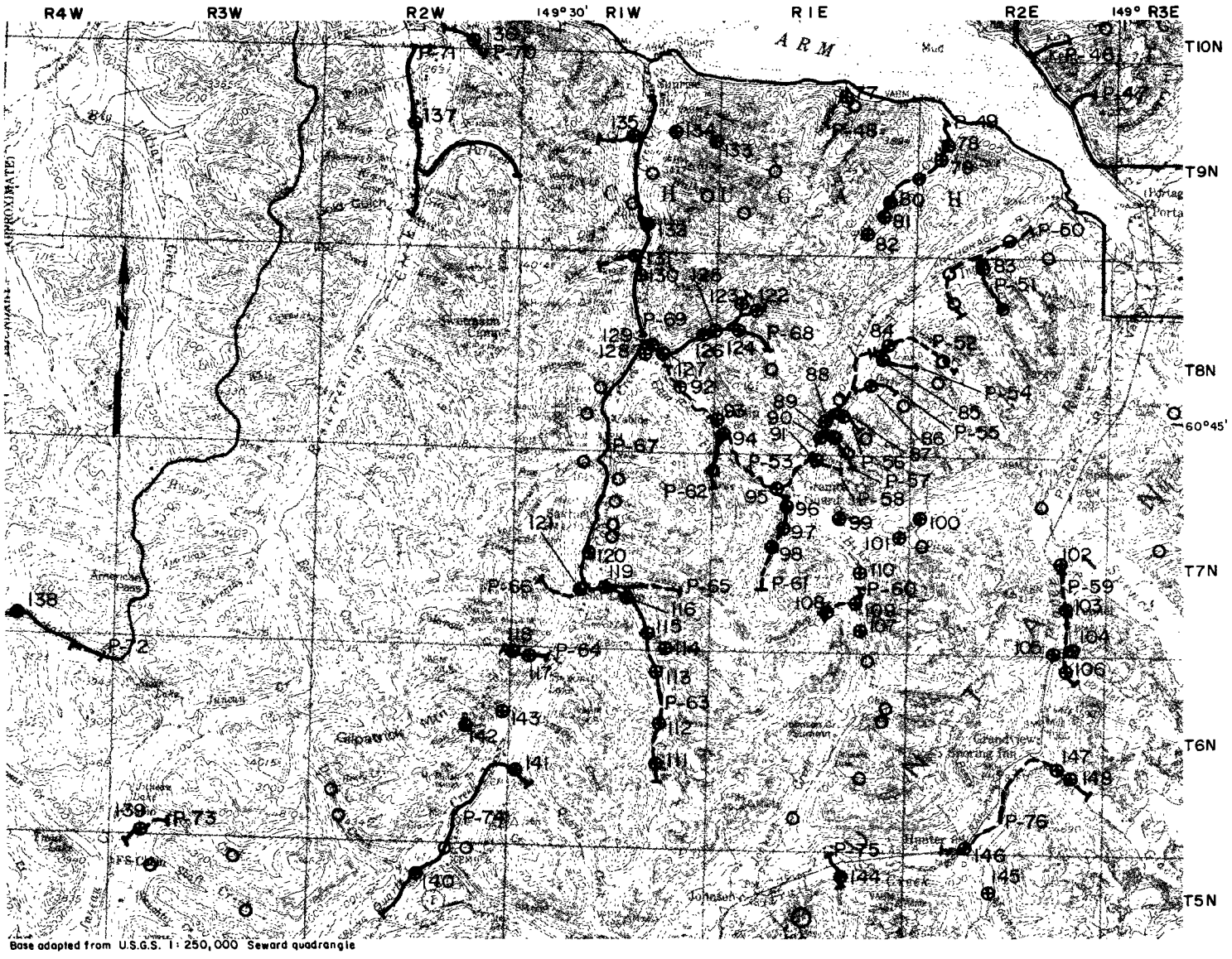


FIGURE A-10. Resurrection Creek-Canyon Creek area.

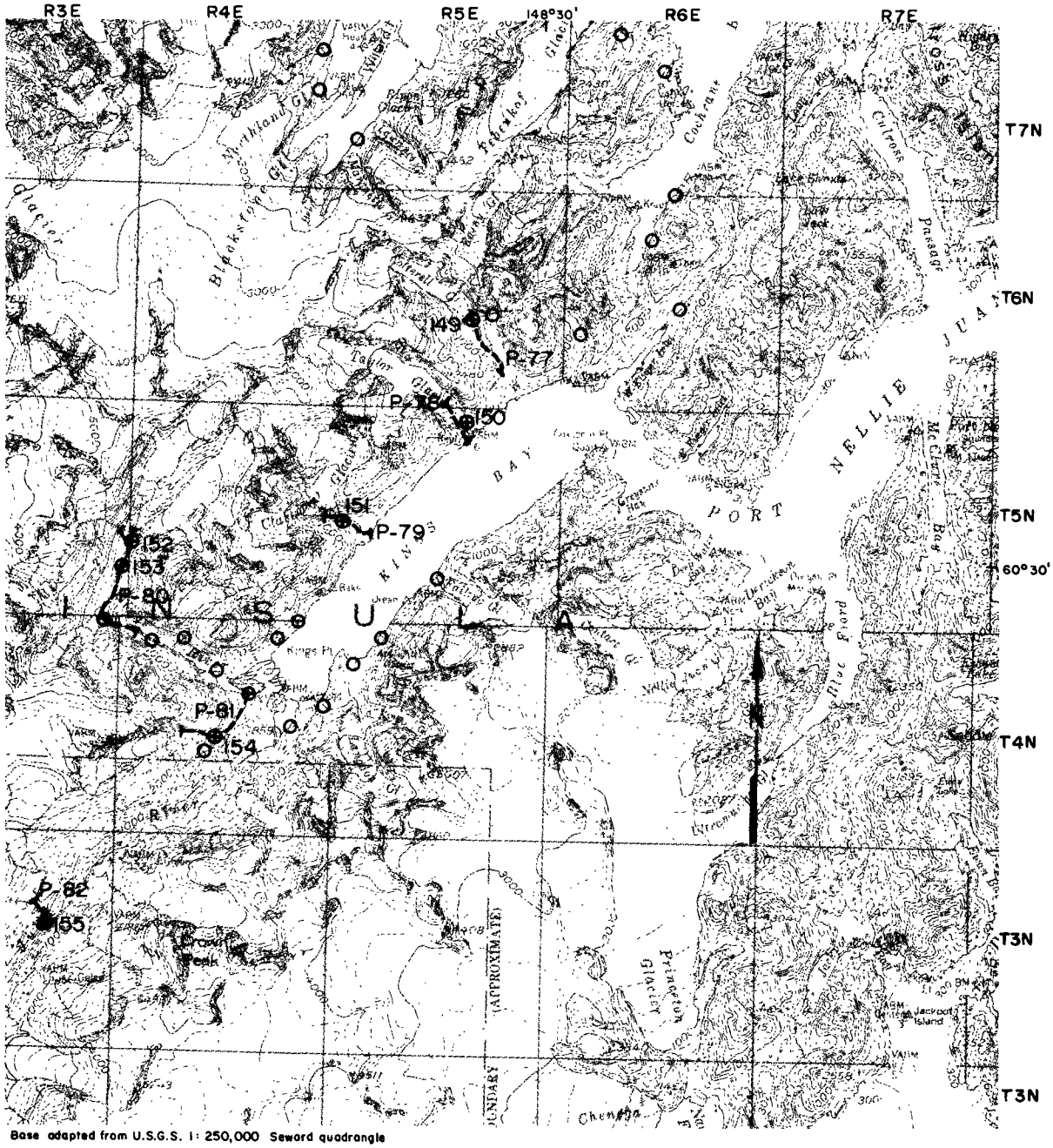


FIGURE A-11. Kings Bay area.

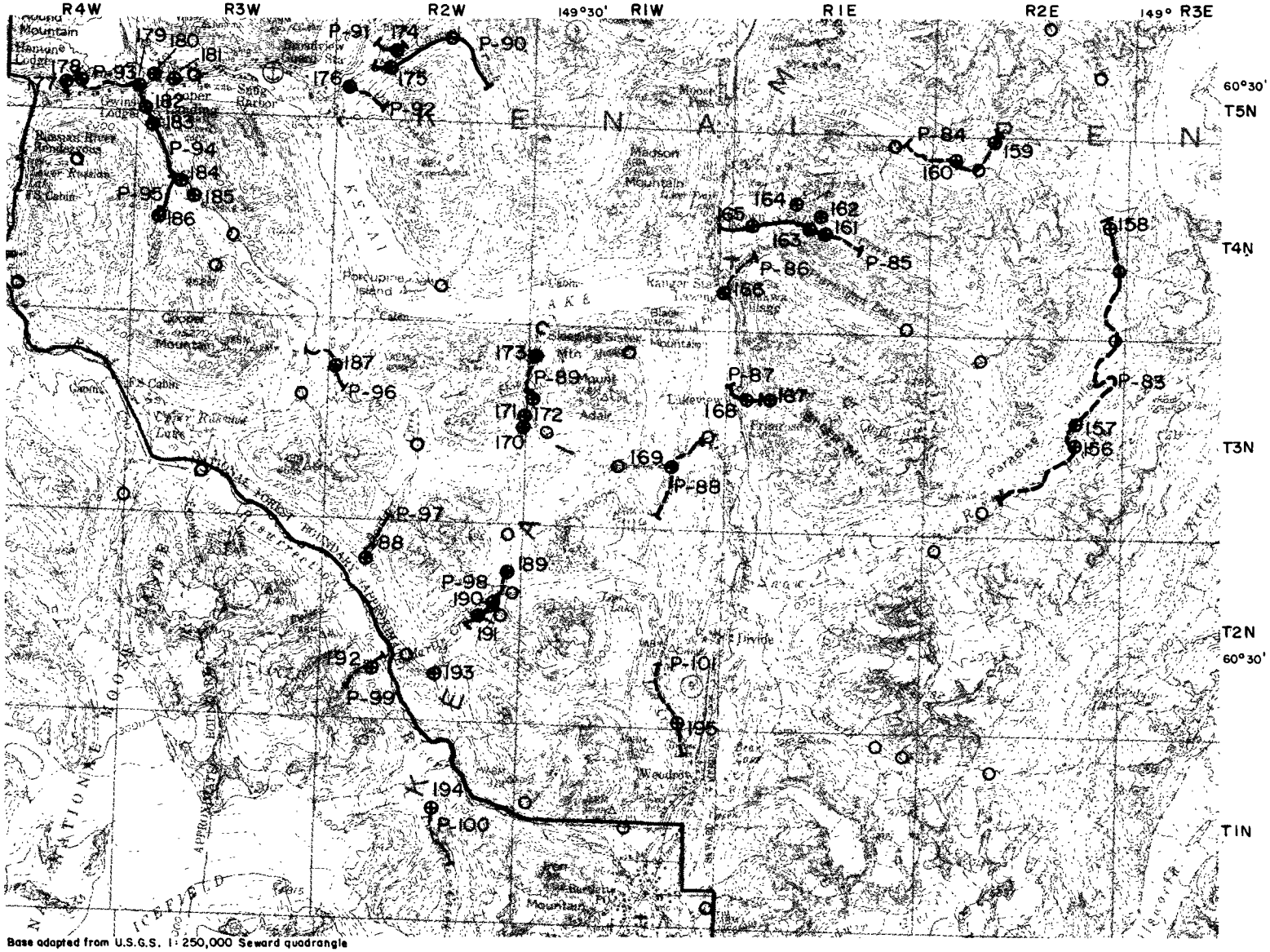


FIGURE A-12. Kenai Lake area.

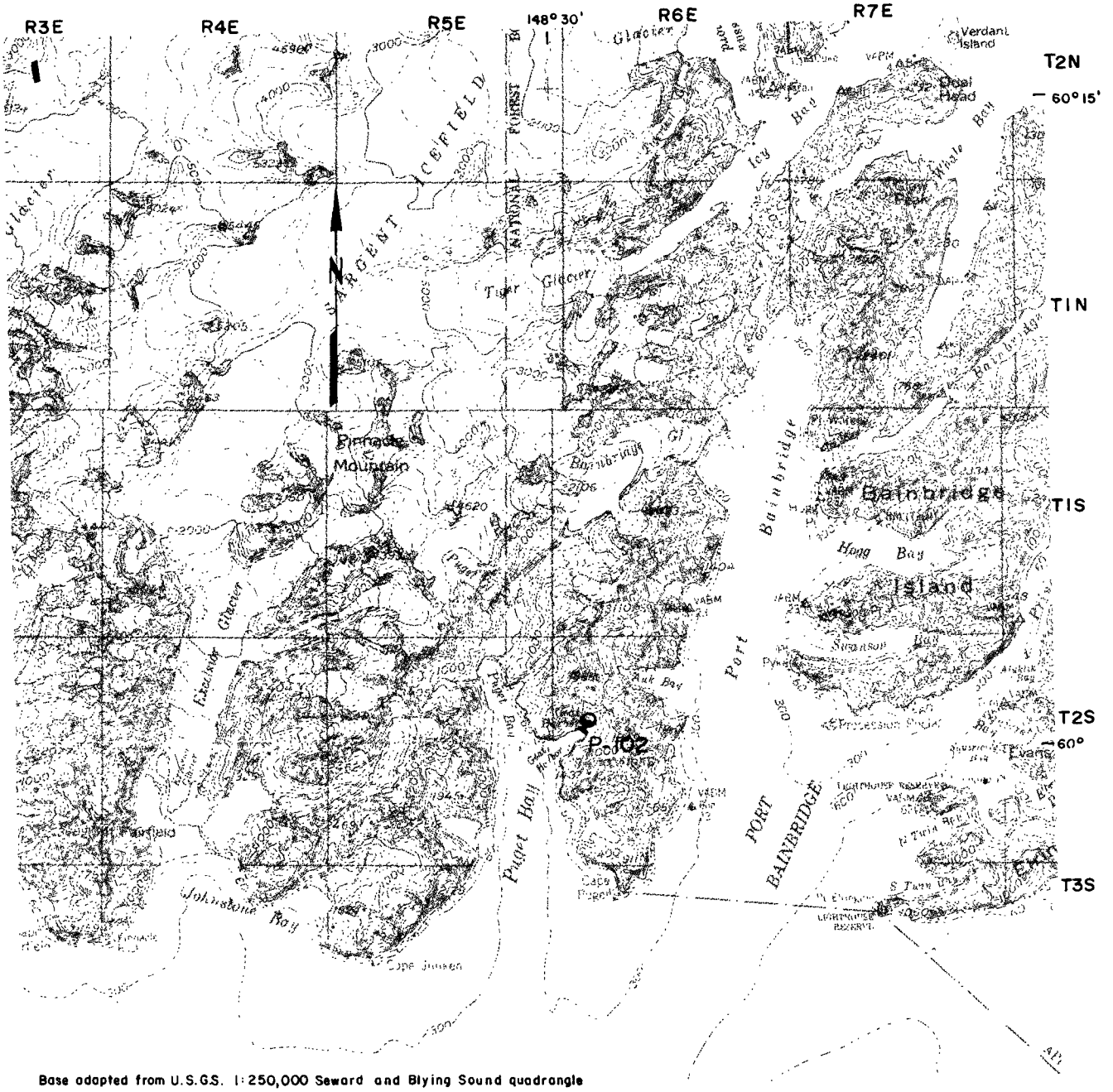


FIGURE A-13. Puget Bay area.

APPENDIX B.—PLACER DEPOSIT DESCRIPTIONS

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-1	Cordova: A-2; sec. 6, T. 20S, R. 5E (CRM).	Low	No data; no reported production.	Beach sands.
P-2	Valdez: A-3; Cordova: C-2, D-2 (CRM).	Moderate	None	Quaternary alluvial sands and gravels in Copper River. Gold concentrations in gravel between Tasnuna River and Miles Lake.
P-3	Cordova: D-2; sec. 27, T. 11S, R. 4E (CRM).	Low	..do	Alluvial and colluvial gravels in drainage that drains metamorphosed sedimentary rocks.
P-4	Cordova: D-2; sec. 22, T. 11S, R. 4E (CRM).	Low	..do	Do.
P-5	Cordova: D-3; sec. 24, T. 11S, R. 3E (CRM).	Low	..do	Alluvial gravels in a drainage that drains metamorphosed sedimentary and volcanic rocks. Shear zone containing quartz, galena, and pyrrhotite crops out in the drainage.
P-6	Valdez: A-3, A-4; T. 10S, R. 3E (CRM).	Moderate	None	Quaternary alluvial gravel derived from metamorphosed sedimentary and volcanic rocks.
P-7	Valdez: A-3; T. 9S, R. 2E (CRM).	..do	..do	Do.
P-8	Valdez: A-4; T. 9S, R. 2W (CRM).	High	..do	Quaternary alluvial gravels derived from metamorphosed sedimentary and volcanic rocks. A 0.025-in-diam flake was recovered from the gravels. 4-ft-wide malachite-stained greenstone crops out on south side of creek.
P-9	Valdez: A-5; T. 9S, R. 2W (CRM).	Low	..do	Quaternary alluvial gravels derived from metamorphosed sedimentary rocks.
P-10	..do	Low	..do	Do.
P-11	Valdez: A-5; T. 9S, R. 3W (CRM).	Moderate	..do	Do.
P-12	..do	Low	Placer gold operation. No reported production.	Quaternary alluvial gravels.
P-13	Valdez: A-5, A-6; T. 9S, R. 5W (CRM).	Low	None	Quaternary alluvial gravels derived from metamorphosed sedimentary rocks. Mineralization consists of fine-grain gold and reported scheelite near mouth of river.
P-14	Valdez: A-5; T. 20S, R. 4W (CRM).	Moderate	..do	Quaternary alluvial gravels derived from metamorphosed sedimentary and volcanic rocks.
P-15	Cordova: D-6; T. 11S, R. 4W (CRM).	Low	..do	Quaternary alluvial gravels contain slate, graywacke, phyllite, greenstone, and andalusite schist cobbles and boulders. 1 pct garnet in concentrate.
P-16	Cordova: C-7; sec. 4, T. 14S, R. 7W (CRM).	Low	No data; no reported production.	1-ft-thick beach sand over sandy pebbly layer. Pebbles are felsic intrusives, greenstones, graywackes, and slates. 10 pct garnet in concentrate.
P-17	Cordova: D-6; T. 11S, R. 5W (CRM).	Moderate	None	Quaternary alluvial gravels consist of slate, graywacke, greenstone, and quartz cobbles and boulders.
P-18	Valdez: A-6; sec. 21, T. 9S, R. 4W (CRM).	Unknown	Placer gold operation. No reported production.	Quaternary alluvial gravels derived from metamorphosed sedimentary rocks.
P-19	Valdez: A-6; T. 9S, R. 5W (CRM).	Low	..do	Quaternary alluvial gravels derived from metamorphosed sedimentary and volcanic rocks. Other minerals present in heavy fraction include garnet, pyrite, chalcopyrite, magnetite, zircon, and scheelite.
P-20	Valdez: A-7; T. 9S, R. 6W (CRM).	Low	..do	Quaternary alluvial gravels derived from metamorphosed sedimentary and volcanic rocks.
P-21	Cordova: D-7; sec. 25, T. 10S, R. 7W (CRM).	Low	None	Do.
P-22	Cordova: D-7; sec. 32, T. 10S, R. 7W (CRM).	Moderate	..do	Do.
P-23	Valdez: A-7; T. 9S, R. 7W (CRM).	..do	..do	Do.
P-24	Valdez: A-7; sec. 18, T. 9S, R. 6W (CRM).	Low	Placer gold operation. No reported production.	Quaternary alluvial and beach gravels.
P-25	Valdez: A-7; T. 8S, R. 6W (CRM).	Moderate	..do	Do.
P-26	Valdez: A-7; T. 8S, R. 7W (CRM).	Low	..do	Quaternary alluvial gravels contain 5 pct clay, and slate, graywacke, and quartz pebbles and cobbles. Gravel is 9 to 50 ft thick.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-27	Valdez: A-7; T. 8S, R. 8W (CRM).	Low	None	Quaternary alluvial gravels derived from metamorphosed sedimentary rocks.
P-28	Valdez: A-8; T. 8S, R. 8W (CRM).	Low	..do	Do.
P-29	Valdez: A-8; T. 8S, R. 9W (CRM).	Low	Placer gold operation. No reported production.	Do.
P-30	Valdez: A-8; T. 9S, R. 10W (CRM).	Low	Placer gold occurrence. No reported production.	Do.
P-31	Anchorage: A-2; sec. 29, T. 12N, R. 12E (SM).	Moderate	None	Do.
P-32	Anchorage: A-2; T. 12N, R. 10E (SM).	Moderate for suction dredging.	No recorded production	Gold is disseminated in thin poorly to moderately sorted alluvial gravels and concentrated on and in slate bedrock exposed in canyon portion of northwest fork of Coghill River. Minor gravel occurs in canyon, but has accumulated above its junction with main fork of the Coghill River. Grades are low to marginal; good possibility of identifying local economic concentrations of gold. Gold up to 1/16 in. in diameter was recovered.
P-33	Anchorage: A-2; T. 11N, R. 10E (SM).	Moderate for small mining operation.	None	Fine gold is disseminated in poorly washed fluvial glacial gravels containing boulders to 5 ft in diameter and moderate clay hardpan. Grade is likely low, but local concentrations of economic significance may exist.
P-34	Anchorage: A-3; T. 11N, R. 9E (SM).	Low	..do	Very fine-grained gold is disseminated in poorly washed fluvial glacial gravels associated with Lafayette Glacier. Large boulders are present. A large volume of gravel occurs along stream.
P-35	Anchorage: A-2; T. 11N, R. 10E (SM).	Low	..do	Fine gold is disseminated in poorly washed fluvial glacial gravels derived from a glacier on north and east flanks of Unakwik Peak. Large boulders are present.
P-36	Seward: D-3; T. 10N, R. 9E (SM).	Moderate for small mining operation.	Possibly some hand placer activity and suction dredging has occurred.	Lower half of Avery River occupies a broad, gentle U-shaped valley filled with considerable alluvium. Middle section flows through a narrow, steep bedrock canyon with little gravel accumulation. Upper section occurs in a broad U-shaped valley with poorly washed fluvial glacial gravels containing highly anomalous concentrations of fine gold, with particles up to 1/8-in. in diameter recovered. Upper gravels contain numerous boulders and considerable clay.
P-37	Seward: D-2; T. 10N, R. 10E (SM).	..do	None	Upper Siwash Creek descends rapidly with little gravel accumulation. Lower section occupies a relatively wide valley with a braided channel and flood plain developed. Gravel contains considerable clay. Anomalous concentrations of fine gold occur at lower end of steep section of creek.
P-38	Seward: D-3; T. 10N, R. 9E (SM).	Low	..do	Uppermost section descends rapidly from its glacial sources, followed by a wide-braided portion about 1-1/2 mile long. Lower section occupies steep, narrow bedrock canyon, below which a braided channel has developed. Very fine gold occurs in gravels accumulating below lower falls.
P-39	Seward: D-4; T. 9N, R. 6E (SM).	Low	..do	Gold is fine with a few small flakes up to 1/16 in. in diameter recovered. Main tributary to Pirate Cove occupies a short U-shaped valley that has a steep gradient in its upper portion and a relatively gentle gradient along middle and lower section. Gravel contains numerous boulders.
P-40	Seward: D-5; T. 9N, R. 5E (SM).	Low	..do	Billings Creek occupies a short, wide, gently sloping U-shaped valley. Central section has a short bedrock canyon, below which are gravel bars containing fine disseminated gold accumulations. Gravels consist of wide variety of metamorphosed sedimentary and granitic clasts and have high clay contents.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-41	Seward: D-5; T. 9N, R. 4E (SM).	Low	None	Upper segment of Carmen River is broad, gently sloping U-shaped valley except in its uppermost forks, which are entrenched in steep-walled bedrock canyons. Little gravel has accumulated in the canyons. Flood plain gravels grade from boulder and clay rich at upper portion to increasingly well-washed sandier sections near Carmen Lake. Gold is present in slightly anomalous concentrations in alluvial gravels of the upper section.
P-42	Anchorage: A-5; T. 11N, R. 3E (SM).	Moderate for small mining operation.	No recorded production	Placer gold is disseminated in poorly to moderately washed glacial fluvial gravels along the upper portions of the Twentymile River. Numerous large boulders are present.
P-43	Ancorage: A-6; T. 11N, R. 2E (SM).	High for small- to medium-size mining operation.	One large and one small hydraulic operation accounted for most production from Crow Creek prior to 1940. Several historic buildings are maintained at the Erickson Gold Mine and numerous mining artifacts occur along the banks of Crow Creek. One mechanized operation mined intermittently in 1981 and 1982. Recreational mining is currently (1985) popular at the Erickson Gold Mine. Total estimated production since 1898 is 42,500 oz. Production since 1979 is estimated to be approximately 400 oz.	Placer gold is found in 4 types of gravels on Crow Creek: high bench gravels, recent stream deposits, glacial gravels, and avalanche debris. Bench deposits are the highest in grade and have historically produced most of the gold. Glacial deposits and avalanche debris are low grade, but may locally contain significant concentrations of gold. Highest grades appear to be associated with old channels in high benches, which likely consist of gravels deposited prior to the glacial advance. Presence of numerous large boulders and cemented gravels may cause mining difficulties. Gold is relatively coarse with 0.025- to 0.05-oz nuggets common and nuggets up to 1 oz occasionally obtained by recreational miners.
P-44	Seward: D-6; T. 10N, R. 2E (SM).	Moderate for small mining operation.	Hand placer operations and a hydraulic operation recovered gold between 1898 and 1917. Hand placer methods and suction dredges have been used sporadically since 1975. Total estimated production, all from lower 1/4 mile of the creek, is 400 oz, of which less than 25 oz has been produced since 1975.	Winner Creek occupies a relatively wide and gentle U-shaped valley along most of its length with a short bedrock canyon and falls near its junction with Glacier Creek. Gravel deposits consist of well-stratified and washed alluvium within channel and bench deposits and also as clay-rich, cemented glacial or fluvial-glacial bench deposits in other locations. Clay-rich gravels contained relatively coarse (3/16-in) gold at 1 sample site.
P-45	Anchorage: A-6 and Seward: D-6; T. 10N, R. 2E (SM).	Low	Hand placer operations worked intermittently between 1898 and 1914. Some hand placer activity has also occurred since 1975. Total estimated production since 1898 is 400 oz.	California Creek occupies a steep, narrow avalanche debris-filled glacial valley with little accumulation of gravel. An alluvial fan at the lower end of the creek contains disseminated fine-grained gold. Middle section of creek occupies a bedrock gorge. Grades are reported to be extremely variable.
P-46	Seward: D-6; T. 10N, R. 2E (SM).	Low	Minor production reported.	Kern Creek occupies a steep, narrow avalanche debris-filled valley with numerous falls and cascades allowing for little accumulation of alluvial gravels until junction with Turnagain Arm.
P-47	Seward: D-6; T. 9N, R. 2E (SM).	Unknown	Test pits are present in lower section of creek. No reported production.	Peterson Creek occupies a very steep recently glaciated valley. Alluvial gravels have accumulated along lower portion of creek.
P-48	Seward: D-6, D-7; T. 9N, R. 1E (SM).	Low	None	Sawmill Creek occupies a short, steep, narrow avalanche debris-filled valley. Very little gravel has accumulated along the channel. Gold occurs in poorly sorted gravels sampled near mouth of the stream.
P-49	Seward: D-6; T. 9N, R. 2E (SM).	Moderate for small mining operation.	A hydraulic pit occurs on the west side of Seattle Creek about 1 mile south of Turnagain Arm. Small amount of hand placering and suction dredging have occurred since 1975. Total estimated production is less than 300 oz.	Seattle Creek occupies a long, narrow U-shaped valley with schist bedrock canyons developed along some sections. Gold occurs throughout the channel gravels, but is concentrated on bedrock and in bedrock fractures. Gold also occurs as disseminated particles up to 3/16 in. in diameter. The bench deposits contain considerable sand, with boulders up to 2 ft in diameter resting upon a 6- to 12-in-thick clay layer.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-50	..do	Low	Evidence of prospecting present, but apparently no early attempts were made to mine the creek. Suction dredging with doubtful success occurred in 1981 and 1982. Total estimated production is less than 25 oz.	Upper Ingram Creek occupies a steep, narrow avalanche debris-filled glacial valley. The middle section is a narrow, steep bedrock canyon with numerous falls and cascades. The lower 2 miles has a narrow flood plain developed. The gravels range from well-washed on the surface to angular blocky boulders mixed with considerable clay near bedrock. Fine-grained gold is disseminated throughout, but is concentrated near bedrock.
P-51	Seward: D-6; T. 8N, R. 2E (SM).	Low for small mechanized mining operation, but moderate for suction dredging.	Evidence of prospecting about 1/2 mile above junction with Ingram Creek. No known production.	Wolverine Creek is main tributary and is similar in configuration to upper Ingram Creek (P-50). Moderately washed gravels have accumulated in favorable sites and contain gold concentrated with tan clay on bedrock. The gold was a mixture of fines, requiring amalgamation to recover, and relatively coarse gold.
P-52	Seward: D-6; T. 8N, R. 1E (SM).	Moderate for small mining operation.	Hand placer operations occurred in 1930's or earlier. Suction dredging has occurred since 1975. Total production is estimated to be less than 100 oz.	Tincan Creek is similar in character to Lyon Creek (P-54) except that its upper valley is broader.
P-53	Seward: D-7, D-6; T. 7N, R. 1E, T. 8N, R. 1W, T. 8N, R. 1E (SM).	..do	Significant production has not occurred along these drainages. Suction dredging has occasionally been attempted without success.	Granite and upper East Fork Creeks occupy a wide valley over most of their lengths with bedrock exposed in a few locations. East Fork Creek occupies a narrow canyon beginning about 3/4 mile below Silvertip Creek. Stream gravels are loose and unconsolidated on surface with increasing clay at depth. Bench deposits occur along portions of these drainages; these deposits are unevaluated except where they were mined at mouth of Bertha Creek.
P-54	Seward: D-6; T. 8N, R. 1E (SM).	..do	Evidence of prospecting present near mouth of canyon. No known production.	Lyon Creek occupies a narrow avalanche-filled glacial trough for most of its length prior to cutting a steep bedrock gorge and flowing onto an alluvial fan that coalesces with fan formed by Tincan Creek (P-52). Alluvial gravels thinly mantle bedrock in lowermost canyon section. Coarse gold (3/16 in diam) was recovered on bedrock.
P-55	..do	Low	None	Taylor Creek is a short drainage similar to Bertha Creek (P-56) and other eastern tributaries to Granite Creek (P-53). Along its lower section it cuts glacial till, believed to be a lateral moraine.
P-56	Seward: D-6, C-6; T. 8N, R. 1E (SM).	High for small mining operation.	Hand placer and hydraulic mining occurred between 1902 and 1904. Recreational mining has been popular on lower Bertha Creek since 1975. A suction dredge operation occurred near the power line in 1981. Total estimated production since 1902 is 750 oz, with less than 75 oz being produced since 1975.	Bertha Creek occupies a U-shaped valley in its upper portion and a steep, narrow canyon cut in glacial debris and bedrock in its middle section, and has formed an alluvial fan along its lower section. Most of the gold has been produced from the alluvial fan. Gravels are poorly to moderately stratified with a high clay and boulder content. Gold appears to be concentrated near bedrock.
P-57	Seward: C-6, C-7; T. 8N, R. 1E (SM).	Moderate for small mining operation.	No commercial mining has occurred. Evidence of prospecting is present along lower portions. Recreational mining, including suction dredging, has occurred in recent years. Total production is less than 25 oz.	Spokane Creek occupies a U-shaped valley in its upper portion, a steep V-shaped bedrock canyon in its middle portion, and an alluvial fan in its lower section. Little stream-washed gravel has accumulated except on the fan, where the gravel is moderately stratified and composed of considerable slate fragments with increasing clay content on bedrock. Gold appears to be concentrated on bedrock.
P-58	Seward: C-6, C-7; T. 7N, R. 1E (SM).	Low	Similar to Spokane Creek (P-57).	Similar to Spokane Creek (P-57).
P-59	Seward: C-6; T. 7N, R. 2E (SM).	Moderate for small mining operation.	Minor production from recent suction dredging. Total estimated production is less than 25 oz.	Upper portion of Placer River occupies a steep valley, much of which is filled with avalanche debris and till. A deep bedrock gorge extends from 1 mile above its confluence with Spencer Glacier valley. From there, the river occupies a broad U-shaped glacial trough with a 3/4- to 1-1/2-mile-wide flood plain. Auriferous gravels occur from the terminus of Bartlett Glacier to at least Spencer Glacier valley, but tend to be low in volume except at the mouth of the canyon. Gravels contain numerous large boulders and extensive clay. Gold is fine grained, although particles up to 3/16 in. in diameter were recovered.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-60	Seward: C-6, C-7; T. 7N, R. 1E (SM).	..do	Some evidence of suction dredging and hand placering exists in junction area. Total estimated production is less than 25 oz.	Groundhog Creek occupies a steep, narrow avalanche debris-filled glacial valley and has a V-shaped bedrock gorge characterized by numerous falls and cascades for a 1/2-mile stretch above Bench Creek. Small amounts of gold-bearing alluvial gravels have accumulated at the junction of Groundhog and Bench Creeks. Gold is disseminated throughout gravels, but concentrated on bedrock. Particles up to 3/16-in. in diameter were recovered.
P-61	Seward: C-7; T. 7N, R. 1E (SM).	High for small mining operations.	Pick and shovel operations occurred between 1897 and 1904. Hydraulic operations began in 1915 and mined bench deposits sporadically until 1980. Total production is 7,500 oz, with less than 100 oz produced since 1975.	Lynx Creek occupies a steep, narrow canyon cut in glacial till and bedrock; contains poorly washed glacial-fluvial gravels. Terraces mantled with avalanche debris extend along most of the creek. A well-formed alluvial fan has formed between the canyon mouth and its junction with Bench Creek. The auriferous bench deposits consist of poorly stratified and washed, partially cemented gravels in excess of 15 ft thick resting on bedrock. The alluvial fan consists of well-stratified and washed gravels containing fine-grained particles of disseminated gold near the surface.
P-62	..do	..do	Pick and shovel operations occurred between 1897 and 1904. A small hydraulic operation was attempted in 1911. Small mechanized operations have mined sporadically since 1950 and suction dredges since 1975. Total estimated production is 650 oz. 100 to 150 oz is estimated to have been recovered since 1975.	Upper portion of Silvertip Creek occupies a steep, narrow bedrock canyon partially filled with avalanche debris. Lower sections occupy a slightly wider channel with bedrock near surface covered by poorly washed and stratified clay-rich gravels containing gold. Lowermost section occupies an alluvial fan consisting of moderately well-stratified and washed gravels.
P-63	Seward: C-7; T. 6N, R. 1W, T. 7N, R. 1W (SM).	High for small- to medium-size mining operation.	Hydraulic operations began in Mills Creek, about 1/2 mile above Juneau Creek, in 1938. 1 hydraulic or small mechanized operation has mined intermittently since that time. Total estimated production is 4,000 oz, although no records are available.	High-grade alluvial deposits occur in and along current channel and narrow flood plain of Mills Creek; lower grade deposits occur on benches. Gravels are poorly to moderately sorted and contain considerable clay. Gold is concentrated close to and in bedrock associated with a tan, sticky clay that fills bedrock fractures. Gold particles are relatively coarse compared to those from other drainages on the Kenai Peninsula. Flakes and small gold nuggets weighing up to 0.05 oz are common in Mills Creek gravels below Timberline Creek. Only fine-grain gold has been collected above junction of Timberline Creek. Production grades in the channel gravels are estimated to average 0.0125 to 0.015 oz/yd^3 Au.
P-64	Seward: C-7; T. 6N, R. 1W (SM).	Moderate for small mining operation.	A small mechanized operation mined sporadically on Colorado Creek between 1977 and 1982 with little success. Total estimated production is less than 50 oz.	Colorado Creek occupies a steep, narrow avalanche debris-filled glacial valley with a bedrock gorge developed near its lower end and a well-developed alluvial fan near its terminus. Gravels are poorly stratified and contain considerable clay. Gold is disseminated throughout the gravels with minor concentration on bedrock. Gold is generally fine, although small nuggets up to 3/8-in. in diameter have been recovered. Production grades of approximately 0.0015 oz/yd^3 Au were reported.
P-65	Seward: C-7; T. 7N, R. 1W (SM).	Low	A single hydraulic operation apparently mined the bench deposit in the 1950's. Some exploration work including excavation of a large prospect pit has occurred recently. No records of production are available.	Juneau Creek occupies a narrow, avalanche debris-filled glacial valley. A thick bench deposit consisting of glacial till and poorly washed glacial-fluvial gravels occurs just above the junction of Juneau and Mills Creeks. A pay streak is reported to occur near the top of an old hydraulic cut in the bench. Gravels are tightly cemented by clay and contain clay lenses and layers. Bedrock channel is believed to be very deep and covered with thick avalanche deposits and/or poorly washed gravels.
P-66	..do	Low	None	Fresno Creek occupies a steep, narrow avalanche debris-filled glacial valley with a bedrock canyon along much of its course. Little gravel has accumulated along the stream. Find-grained gold is sparsely disseminated throughout the poorly washed gravels.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-67	Seward: C-7, D-7; T. 7N, R. 1W, T. 8N, R. 1W (SM).	High for small mining operation.	Considerable hand placer and hydraulic placer mining occurred on Canyon Creek, especially at its junction with Mills Creek between 1895 and 1940. Several small mechanized and hydraulic operations mined intermittently during 1955-61 and 1977-78. From 1970 to 1984, suction dredging accounted for 200 to 300 oz of production per year. Total estimated production is 37,700 oz since 1895.	Canyon Creek occupies a bedrock canyon deeply cut into a broader U-shaped glacial valley. Placer gold occurs in alluvial gravels associated with current channel of Canyon Creek and in bench gravels at elevations up to 100 ft above present stream level. The bench gravels are locally compacted and cemented and contain considerable clay. Channel gravels are low in volume, but reported to be of high grade. Gold is flaky with recovery of particles up to 3/16 in. in diameter common.
P-68	Seward: D-7; T. 8N, R. 1W (SM).	Moderate for small mining operation, but high for suction dredging.	Hydraulic and hand placer operations on lower Gulch Creek and on east side of East Fork Creek accounted for most production prior to 1917. Suction dredging has become popular along most of Gulch Creek in the past 3 yr. Total estimated production is 2,250 oz, of which up to 250 oz has been produced since 1975.	Gulch Creek and lower East Fork Creek occupy narrow bedrock canyons along most of their length and contain thin discontinuous high-grade gravel deposits. At least one abandoned channel on Gulch Creek was mined in the early 1900's, and others may occur along lower Gulch Creek and East Fork Creek. Channel gravels range from loose and sandy on surface to clay cemented with boulders of up to 5 ft or more in diameter on bedrock. Fine-grained gold is disseminated throughout the gravels, but the pay streak occurs on and in bedrock fractures accompanied by a sticky tan clay. Relatively coarse gold, up to 5-oz nuggets, has reportedly been recovered from Gulch Creek.
P-69	Seward: D-7; T. 8N, R. 1W, T. 9N, R. 1W (SM).	Moderate for small- to medium-size operation.	Several small operations produced gold from Sixmile Creek between 1897 and 1917. Prospecting, drilling, and limited hydraulic mining occurred in the 1930's. The gravels just below Canyon Creek have been tested, but the results are unknown. Several small suction dredge operations have been present in the last 5 yr. Total estimated production since 1897 is 1,750 oz, of which less than 150 oz has been produced since 1975.	Sixmile Creek occupies a relatively broad alluvial-filled valley with local development of bedrock canyons along its channel. Alluvial terraces, partially covered with avalanche debris, parallel the stream channel. Gold is fine grained, with nuggets coarser than 1/4 in. in diameter rarely recovered. Flood plain deposits appear to be relatively thick, with depths to bedrock in excess of 70-ft reported near junction with Canyon Creek. Small auriferous alluvial fan deposits are associated with several western tributaries of Sixmile Creek, including Alder, Cub, and Old Woman Creeks.
P-70	Seward: D-7; T. 10N, R. 2W (SM).	High for small mining operation.	Mining began in 1894 on Bear Creek. Early mining was restricted to pick and shovel operations with hydraulic mining becoming more prevalent by 1904. Mechanized operations have been mining intermittently since 1975. Total estimated production since 1894 is 5,500 oz, of which 1,000 to 1,500 oz have been produced since 1975.	Bear Creek occupies a steep, narrow valley for most of its length and is filled with avalanche and glacial debris containing large boulders. Lower portion of Bear Creek rests upon an alluvial fan consisting of better sorted and washed gravels. Gold is coarse, with nuggets up 10 oz reportedly recovered. Gold is less pure than gold obtained from most Kenai Peninsula streams.
P-71	Seward: D-7, D-8; T. 9N, R. 2W (SM).	High for small- to medium-size mining operation.	Operations began on Resurrection and lower Palmer Creeks in 1888. Extensive hydraulic and hand placer mining began in 1895 and continued intermittently until 1950. Mechanized mining replaced hydraulic mining in 1960. Considerable recreational mining currently occurs on Resurrection Creek below Palmer Creek. Limited production has occurred from Resurrection Creek above Palmer Creek. Little mining has occurred on Palmer Creek above the lower canyon area. However, evidence of prospecting is evident up to Bonanza Creek. Total estimated production since 1895 is 26,800 oz. Approximately 2,000 to 3,000 oz has been produced since 1975.	Alluvial gravels occupy a flood plain 1,000 ft wide along Resurrection Creek below Palmer Creek. High bench deposits flank the flood plain along both sides. Gravels average 7 ft thick and typically rest upon a tan-yellow clay hardpan with streaks of blue clay present. Gold is disseminated throughout the gravels, but is concentrated on the clay hardpan and on bedrock in the few locations where it is exposed. The auriferous gravels are moderately well washed and contain boulders generally less than 3 ft in diameter. Production grades of 0.01 oz/yd^3 Au are typically reported for several operations, although higher grades occur locally. Upper Palmer Creek flows through a broad valley filled in with avalanche and glacial debris, including large boulders. Lower Palmer Creek occupies a narrow canyon cut partly in bedrock and partly in gravel terraces associated with Ressurrection Creek.
P-72	Seward: C-8; T. 6N, R. 4W (SM).	Low	None	The upper section of the Chickaloon River occupies a narrow, steep-sided avalanche debris-filled valley. Alluvial gravel samples contained no large boulders and a moderate to low clay content. Gold is very fine grained.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-73	Seward: C-8; T. 6N, R. 3W (SM).	Low	Small prospect pit was located near canyon mouth. No production known.	The upper portion of Falls Creek occupies a relatively broad U-shaped valley containing little alluvial gravel. The middle section descends through a steep bedrock-walled canyon and empties out onto an alluvial fan at its junction with Juneau Creek valley.
P-74	Seward: C-7, C-8; T. 6N, R. 1W, T. 6N, R. 2W (SM).	High for small mining operations for 1-1/4 miles above Devils Creek and moderate for remainder of creek.	Some prospecting indicated by pits and trenches occurred in early 1900 and from 1950 to 1960. Total estimated production is less than 25 oz from upper Quartz Creek. A hand placer and hydraulic operation mined bench deposits about 1/3 mile above Devils Creek between 1904 and 1915. Several hand placer and suction dredge operations and 1 small mechanized operation have mined mostly in and just above the canyon section since 1971. Total estimated production is 800 oz, of which up to 400 oz have been produced since 1975.	Upper Quartz Creek occupies a steep, narrow avalanche debris-filled valley partially cut into bedrock. An alluvial fan has developed between the mouth of the canyon and Seward Highway. Alluvial fan deposits are poorly washed and stratified with fine gold disseminated throughout and concentrated on bedrock. Gold up to 1/8 in. in diameter was recovered. The remainder of Quartz Creek occupies a broader, more gentle valley with a bedrock canyon formed along a 1/2-mile stretch above Devils Creek. High-grade channel deposits and bench deposits have been successfully mined in the canyon section. Production grades of 0.015 oz/yd^3 Au are typical. Bench gravels are locally stratified and typically compacted. They have a high clay content. Boulders of up to 3 ft in diameter are common. Gold is mostly of the flake variety, with nuggets coarser than 1/4 in. in diameter rarely present.
P-75	Seward: C-6; T. 5N, R. 2E (SM).	Low	None	The creek occupies a very steep, narrow bedrock canyon with gravel accumulations only near its junction with Trail Creek valley. Gravels are unconsolidated, poorly sorted with numerous boulders, and have a high clay content. Gold is disseminated throughout.
P-76	Seward: C-6; T. 6N, R. 2E (SM).	Low	..do	Trail Creek occupies a relatively wide, U-shaped valley and has a well-developed flood plain along most of its length. Upper Trail Creek has narrow bedrock-walled canyons containing coarse gravels with numerous boulders. Alluvium generally has a high clay content, but becomes increasingly well-washed and sorted downstream. Fine-grained gold is distributed throughout the gravels for several miles below Trail Glacier. Some concentration appears to occur on bedrock. Grades tend to decrease downstream. Gold up to 1/8-in. in diameter was recovered, amalgamation was required to recover much of the gold from the samples.
P-77	Seward: C-5; T. 6N, R. 5E (SM).	Low	..do	Cotterell Glacier Creek occupies a relatively broad glacial valley with a flood plain developed along most of its course. Gravel is somewhat compacted, with a high clay and boulder content. Gold is fine and requires amalgamation to recover.
P-78	Seward: C-5; T. 5N, R. 5E (SM).	Moderate for small mining operation.	..do	Taylor Glacier Creek occupies a very short, broad valley with a braided channel containing compacted gravels with high clay and boulder contents. Gold up 1/8 in. in diameter was recovered.
P-79	Seward: C-5; T. 5N, R. 5E (SM).	Low	..do	Claremont Glacier Creek occupies a short, steep, narrow glaciated valley in its upper section, with a braided alluvial channel along its lower portion. The gravel is compacted with a high clay and boulder content. The gold is fine and requires amalgamation to separate from concentrate.
P-80	Seward: B-5, C-5; T. 4N, R. 4E (SM).	Moderate for small to large mining operation.	..do	Kings River is fed by 2 short, steep gold-bearing headwater tributaries. Below their junction, the river flows through a gently sloping valley with a 1/4- to 1/2-mile-wide flood plain. The gravels contain considerable clay with coarse angular bedrock boulders in the upper section that become better sorted, less compacted, and finer grained as Kings Bay is approached. Coarse gold, up to 3/16 in. in diameter, was recovered in the upper section of the stream. Fine-grain gold was found in surface gravels up to 5 miles from the headwaters.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-81	Seward: B-5; T. 4N, R. 4E (SM).	Moderate for suction dredging.	..do	This tributary occupies a short steep, narrow bedrock canyon in its upper section. The remainder has a narrow flood plain consisting of clay-rich gravels which contain anomalous gold values. The gold recovered was up to 1/8 in. in diameter.
P-82	Seward: B-6; T. 3N, R. 3E (SM).	Low	..do	Wolverine Creek descends through a short, narrow bedrock canyon with minor gravel accumulating until near its junction with the Nellie Juan River. Gravels contain considerable clay, numerous boulders, and small amount of fine gold and sulfides.
P-83	Seward: B-6, B-7; T. 4N, R. 2E, T. 3N, R. 2E, T. 2N, R. 1E (SM).	Moderate to medium- to large-size mining operation.	..do	Snow River occupies a long, wide glacial valley with a well-developed flood plain. Gravel contains considerable clay and very fine-grain gold dispersed throughout. Best values are obtained below bedrock canyons above lower Paradise Lake.
P-84	Seward: B-6; T. 4N, R. 2E (SM).	Low	..do	Headwaters of Grant Lake occupy a wide valley with some flood plain development along portions of its channel, interspersed with bedrock canyons. Gravels contain considerable clay and locally contain fine-grain gold concentration on bedrock.
P-85	Seward: B-6, B-7; T. 4N, R. 1E (SM).	Moderate for small mining operation, but high for suction dredging.	Drilling and prospect pits were dug in early 1900's and 1950's on alluvial fan. Small mechanized operation worked alluvial gravels near mouth of lower canyon in 1980, without significant success. Suction dredging has occurred in the canyon since 1977. Total production is estimated to be less than 300 oz.	Falls Creek descends in a series of steps. The uppermost section descends rapidly along a bedrock canyon and is followed by a gentle portion with a narrow flood plain. A second canyon area begins just below the Falls Creek Mine and continues to within 1 mile of its junction with the Trail River. Anomalous amounts of gold have been identified in silty gravels 1/2 mile above the Falls Creek Mine and in alluvial fan gravels below the lower canyon. Coarse gold has reportedly been recovered by suction dredges in the lower canyon. Grade recovered by a mechanized operation near the mouth of the lower canyon was reported to be about 0.002 oz/yd^3 Au.
P-86	Seward: B-7; T. 4N, R. 1E (SM).	Low	Small prospect pits were identified near junction with Kenai Lake. No reported production.	Below Ptarmigan Lake, the creek occupies a broad, heavily forested valley with a gradient of less than 100 ft/mile. Alluvial bench gravels are exposed along the lower section of the creek.
P-87	Seward: B-6, B-7, T. 3N, R. 1E (SM).	Moderate for small mining operation.	Prospecting on lower section of Victor Creek reported between 1900 and 1916, when a shaft was sunk, and again during the 1950's. Some suction dredging since 1977. Total production is estimated to be less than 50 oz.	Victor Creek occupies a steep, narrow, bedrock-walled avalanche-debris filled valley along most of its length. A narrow flood plain and alluvial fan have developed along lower 1/2- to 3/4-mile section. Gravels contain considerable clay and large boulders. Fine gold has been recovered in samples. Coarser gold has reportedly been recovered.
P-88	Seward: B-7; T. 3N, R. 1W (SM).	Low	Minor suction dredging since 1975. Total estimated production is less than 25 oz.	Porcupine Creek occupies a deep, narrow, steep bedrock-walled canyon along most of its course, with a narrow flood plain and alluvial fan developed along its lower portion. Gravel bars and channel deposits accumulated in the canyon in favorable locations. These contain fine-grained gold.
P-89	..do	Moderate for small mining operation.	Some evidence of prospecting exists on lower end of Ship Creek. Limited suction dredging occurred in 1982. Total estimated production is less than 25 oz.	Most of Ship Creek occupies a very narrow, steep avalanche debris-filled bedrock valley. A short, narrow flood plain and alluvial fan have formed at its lower end near Kenai Lake. Gravel is poorly sorted with abundant slate fragments and some hard-packed clay near bedrock. Coarse gold (3/16 in) was identified on the east fork of the stream 3/4 mile above large western tributary.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-90	Seward: B-7, B-8, C-7, C-8; T. 5N, R. 2W (SM).	High for small mining operation.	Evidence of early hand mining exists. A small mechanized operation has worked the lower end of Crescent Creek since 1978. Numerous prospect pits have been dug on the alluvial fan below the lower canyon of Cresent Creek. Suction dredging has been tried with some success on upper Crescent Creek. Total estimated production is 450 oz, of which up to 300 oz has been produced since 1975.	Crescent Creek occupies a steep, narrow avalanche debris-filled valley. The creek descends in a series of steps with auriferous gravels deposited below each drop. The gravels are clay-rich with numerous boulders up to 3 ft in diameter. Gold is disseminated throughout the gravels, but concentrated on bedrock. Bench gravels contain anomalous gold values. Gold occurs as flakes and is fine grain in the lower part of the creek, but nuggety and coarse in the upper section. Production grades of 0.015 oz/yd^3 Au are estimated.
P-91	Seward: C-7, C-8; T. 5N, R. 2W. (SM).	..do	An old hydraulic excavation is present on the alluvial fan just south of Crescent Creek trail head. A small mechanized operation tested the alluvial fan and bench gravels in 1981 and 1982. Total estimated production is less than 350 oz, of which up to 150 oz has been produced since 1980.	Hargood Creek (name given by present mine owner) occupies an abandoned channel in a narrow valley; this channel is possibly related to an earlier Quartz Creek channel. A broad alluvial fan has developed near the mouth of the valley and extends to Quartz Creek valley, by which it is truncated. Gold is concentrated in distributary channels within the fan and occurs along certain horizons within each channel. Bench gravels are also present. Gold occurs as flakes, with little gold coarser than 3/16 in present.
P-92	Seward: B-7, B-8; T. 5N, R. 2W (SM).	Low	Very minor prospecting and no significant production has occurred.	Dry Creek occupies a steep, narrow avalanche debris-filled valley. The lower end cuts through alluvial gravels believed to be associated with a higher level of Quartz Creek. These bench gravels contain anomalously high gold values.
P-93	Seward: B-8; T. 5N, R. 4W (SM).	Moderate for medium- to large-size mining operation below Cooper Creek.	Doroshin prospected the area in 1851 (*16*). A small bucket-liné dredge operated during 1911 and 1912. Prospecting using bulldozers and drilling occurred between 1935 and 1956. Recreational panning has occurred recently. Total estimated production is less than 200 oz.	This stretch of the Kenai River has a well-developed flood plain containing considerable quantities of moderately sorted and stratified alluvium. Gold is disseminated throughout the gravels and is sometimes found in high concentrations near the heads of river bars during periods of low water. Overall grades are believed to be low. Production grades in 1911 and 1912 were reported to be 0.004 oz/yd^3 Au.
P-94	Seward: B-8; T. 4N, R. 3W (SM).	High for small mining operation.	Bench and alluvial fan gravels at mouth of Cooper Creek were worked by pick and shovel and later by hydraulic mining techniques between 1899 and 1917. Only minor production has occurred since, in the form of recreational mining, including suction dredging. Total estimated production is 1,100 oz, of which less than 50 oz has been produced since 1975.	Cooper Creek occupies a very narrow bedrock-walled gorge nearly to its junction with the Kenai River. An alluvial fan has been deposited along the last 1/2-mile section of the creek. Auriferous alluvium associated with Cooper Creek locally forms bench deposits 60 ft above the current creek level. Gold occurs as flakes, with some of it up to 3/16 in. in diameter. Nuggets up to 0.025 oz have been recovered.
P-95	..do	Moderate for small mining operation.	Hydraulic mining of the alluvial fan deposits occurred in the 1950's. Suction dredging has occurred near the junction of Stetson and Cooper Creeks. Total estimated production is 300 oz, of which up to 100 oz has been produced since 1975.	Stetson Creek occupies a very steep, narrow avalanche debris-filled valley, with a bedrock gorge developed along its lower section. Gravel deposits below several sets of falls are reported to contain abundant coarse gold. Alluvial fan gravels deposited during an earlier and higher stage of Stetson Creek remain well above current creek level near its junction with Cooper Creek. Auriferous alluvial fan gravels are at least 50 ft thick, moderately stratified, and have high clay contents.
P-96	Seward: B-8; T. 3N, R. 3W (SM).	Low	Minor suction dredging has occurred since 1980. No records of production are available.	This creek occupies a steep, narrow rock gorge along its upper 2 miles. Alluvial gravels have accumulated along the stream course for approximately 1-1/2 miles prior to its junction with Cooper Lake.
P-97	Seward: B-8; T. 2N, R. 2W (SM).	Low	None	Upper Boulder Creek occupies a moderately steep bedrock canyon along its upper section before entering an extremely steep, narrow section 2-1/2-miles above its junction with the Resurrection River. 1 mile above the junction, it levels out, and alluvial gravels have accumulated. Glacial benches are locally present.

See footnotes at end of table.

Placer number[1]	Deposit location[2]	Mineral development potential	Workings and production[3]	Summary of mineralization
P-98	Seward: A-7, A-8, B-7; T. 2N, R. 2W (SM).	Moderate for mechanized small mining operation, but high for suction dredging.	Minor prospecting has occurred along the lower section of Martin Creek. No known production.	Upper Martin Creek occupies a moderately steep, narrow, shallow bedrock gorge, with small amounts of gravel accumulating below plunge pools. Middle section, beginning about 1/2 to 3/4 mile below junction with Mt. Ascension tributary, occupies a steep, narrow, deep bedrock gorge with numerous falls and little accumulation of gravel. Narrow flood plain has developed beginning about 1-1/2 mile above its junction with the Resurrection River. Coarse gold (up to 1/4 in) was recovered in gravels resting on and in bedrock fractures located just below Mt. Ascension tributary. Significant gold was not located elsewhere along drainage.
P-99	Seward: A-8; T. 2N, R. 2W (SM).	Low	None	Redman Creek occupies a short, narrow, very steep bedrock gorge for most of its length. Alluvial gravels have accumulated near its junction with the Resurrection River.
P-100	Seward: A-7; T. 1N, R. 2W (SM).	Low	..do	Upper Paradise Creek occupies a broad, gentle, glaciated U-shaped valley. Middle Paradise Creek occupies a very steep bedrock canyon. The lower portion for nearly 2 miles above its junction with the Resurrection River is braided with extensive alluvial gravels.
P-101	Seward: A-7, B-7; T. 2N, R. 1W (SM).	Low	Several lode prospects and occurrences were located. Prospect pits were identified along lower section. No reported production.	Lost Creek occupies a narrow, moderately steep bedrock canyon for most of its length. Several lode gold occurrences are exposed in the canyon. Little gravel has accumulated except along the lower 1/2 mile of the creek.
P-102	Seward: A-5; sec. 618, T. 2S, R. 6E (SM).	Low	No data	Quaternary alluvial sand and gravels consist of graywacke with some disseminated pyrite and small quartz veins.

[1]Sample name, map location, individual sample data, and gold composition are given in table A-1.
[2]Information includes quadrangle name from U.S. Geological Survey 1:63,360-scale quadrangle maps (e.g., Cordova); location on map (e.g., A-2); and section, township, and range information for the Copper River (CRM) and Seward (SM) meridians.
[3]Production figures are estimates only through 1982.

APPENDIX C.—SUMMARY OF PLACER GOLD DEPOSIT TYPES

The following is a summary of the 5 major types of placer gold deposits found in the Chugach National Forest in Alaska. The five major types are alluvial, bench, eluvial, glacial, and marine deposits, with alluvial deposits further subdivided by fluvial environment. The following sections characterize each deposit type by size, grade, gold characteristics, production history, and future potential.

In these sections, three sizes are described:

SMALL—<100,000 yd^3.
MEDIUM—100,000-1 million yd^3.
LARGE—>1 million yd^3.

In addition, three basic grades are described:

LOW—<0.005 oz/yd^3 Au.
MEDIUM—0.005-0.02 oz/yd^3 Au.
HIGH—>0.02 oz/yd^3 Au.

ALLUVIAL PLACERS

Alluvial placers are gravel deposits resulting from the depositional and sorting processes of existing streams. They include gravel bars, channel deposits, floodplain deposits, and alluvial fans.

Gravel Bars

Gravel bars contain loose, sandy, moderately sorted gravel; pay streaks are often discontinuous and are confined to near-surface accumulations of flood gold.[1]

[1]Flood gold consists of small (<0.04 in diam), very thin flakes that are readily transported by streams during flood conditions. The gold is commonly deposited near the surface and at the head of gravel bars. Values commonly do not persist at depth.

Size: SMALL. Typical bars may contain up to 10,000 yd^3.

Grade: LOW to HIGH. Up to 0.14 oz/yd^3 Au has been recovered from samples. Production grades of 0.01 to 0.02 oz/yd^3 Au have been reported.

Gold characteristics: Gold is typically fine grained (<0.04 in diam) and flaky; it readily floats on water.

Production history: Gravel bars have been mined with small, mechanized equipment on Mills (P-63), Canyon (P-67), Sixmile (P-69), Resurrection (P-71), and Crescent (P-90) Creeks.

Future potential: Deposits have been identified on most streams having previous production history and also on the Trail (P-76), Kings (P-80), Snow (P-83), and Kenai (P-93) Rivers. Large suction dredges (>8 in) might have success mining these deposits. Highly efficient gold recovery techniques will be needed to adequately recover the gold, because of its size and shape.

Channel Deposits

Channel deposits are stratified, loose, sandy, actively migrating gravels resting on moderately consolidated clay-bearing gravels with angular bedrock fragments and boulders on bedrock.

Size: VERY SMALL. Deposits are small and discontinous. High-grade pockets typically contain <100 yd^3.

Grade: HIGH. For suction dredges, production grades of 0.05 to 0.5 oz/yd^3 Au are not unusual.

Gold characteristics: Gold is fine-grained near the surface with increasing size and weight on bedrock. Coarse flakes and nuggets up to 1/2 oz or more may be recovered within the clayey consolidated layer and from bedrock fractures.

Production history: Suction dredges have been successfully used to mine these deposits on Crow (P-43), Bertha (P-56), Mills (P-63), Canyon (P-67), Gulch (P-68), Sixmile (P-69), Resurrection (P-71), and Cooper (P-94) Creeks, and several other drainages on the Kenai Peninsula. Recoveries of 1/4 oz to several ounces per day have been reported depending upon dredge size, water conditions, and grade.

Future potential: Suction dredging will continue on previously mined drainages. Additional areas could include the Avery (P-36), Placer (P-59), Trail (P-76), and Kings (P-80) Rivers and Seattle (P-49), Falls (P-85), Ship (P-89), Crescent (P-90), and Martin (P-98) Creeks.

Flood Plain Deposits

Flood plain deposits tend to consist of poorly sorted, moderately consolidated, stratified gravels containing a significant clay-silt matrix resting directly on bedrock or, as at portions of Resurrection Creek (P-71), upon clay hardpan.

Size: SMALL to LARGE (depending upon drainage). More than 1 million yd^3 of gravel occurs along the Trail (P-76), Kings (P-80), Snow (P-83), and Kenai (P-93) Rivers and on Crow (P-43), Sixmile (P-69), and Resurrection (P-71) Creeks.

Grade: MEDIUM. These deposits have variable grades; the highest grades occur in previous channels. Production grades of 0.008 to 0.02 oz/yd^3 Au have been reported.

Gold characteristics: Gold is mostly fine-grained and flaky with some coarsening to be expected on bedrock. Nuggets up to 1/2 oz or more have been recovered from a few streams.

Production history: A significant portion (approximately 50 pct) of the total placer gold production from the Kenai Peninsula has come from this type of deposit. Mines have been located on Crow (P-43), Mills (P-63), Canyon (P-67), Sixmile (P-69), Bear (P-70), Resurrection (P-71), Crescent (P-90), and other creeks. Historically these deposits were first mined by pick and shovel, followed by hydraulic techniques and most recently by mechanized methods.

Future potential: Continued placer mining can be anticipated on the historically mined drainages. New and/or additional operations mining flood plain deposits could be developed upon the Avery (P-36), Placer (P-59), Trail (P-76), and Kings (P-80) Rivers and on Billings (P-40) and Seattle (P-49) Creeks should gold prices rise significantly. Mining will require using mechanized equipment with refined recovery techniques capable of efficiently recovering <60-mesh gold.

Alluvial Fan Deposits

Alluvial fans develop where relatively steeply sloping streams suddenly develop more gradual gradients. Such deposits on the Kenai Peninsula consist of fanlike patterns of poorly sorted, unconsolidated gravels with a moderate to high clay content.

Size: SMALL to MEDIUM. Typical alluvial fans consist of 250,000 yd^3 or less. Larger fans containing in excess of 1 million yd^3 occur at the mouth of Lynx (P-61), Silvertip (P-62), and Bear (P-70) Creeks.

Grade: LOW to MEDIUM. Production grades of 0.01 to 0.02 oz/yd^3 Au have been reported from Hargood Creek (P-91), but Bureau sampling indicates grades are generally <0.005 oz/yd^3 Au at most deposits.

Gold characteristics: Gold is generally fine-grained and flaky with particles >0.08 in rare. The gold occurs in distributary channels and is commonly present from surface to bedrock.

Production history: Limited amounts of gold have been produced from this type of deposit. Production has occurred from alluvial fans at Bertha Creek (P-56), and more recently from Hargood Creek (P-91). Portions of the bench deposits on Lower Crow Creek (P-43) appear to be alluvial fan deposits but have been classified as bench deposits.

Future potential: Alluvial fans previously mined may be mined in the future. Fans needing further evaluation occur on Lynx (P-61), Silvertip (P-62), Bear (P-70), and Ship (P-89) Creeks and possibly several other drainages on the Kenai Peninsula. The tendency for gold to occur in channels within the fan deposits must be considered for proper evaluation.

BENCH DEPOSITS

Bench deposits are deposited by streams at higher elevations within present valleys prior to formation of the more deeply eroded active stream channels of today. Some of these deposits, which include abandoned channels, were apparently deposited during interglacial periods prior to the most recent advance. Gravels tend to be poorly to moderately well stratified, poorly sorted, and moderately well consolidated. Benches occur at levels of a few feet to more than 150 ft above current streams. Bench gravels are often covered by avalanche debris.

Size: SMALL to LARGE. Benches containing in excess of 1 million yd^3 have been identified on several drainages including Canyon (P-67), Sixmile (P-69), and Resurrection (P-71) Creeks. Significant (>200,000 yd^3) volumes of bench gravel also occur on Crow (P-43), Winner (P-44,) Seattle (P-49), Lynx (P-61), Mills (P-63), Quartz (P-74), Hargood (P-91), and Stetson (P-95) Creeks.

Grade: LOW to HIGH. Bench gravels tend to be lower in grade than many of the adjacent alluvial gravels, but have been conducive to mining using relatively high-volume low-cost hydraulic methods. Production grades from 0.005 to 0.04 oz/yd^3 Au have been reported. Lower grades are likely for the bulk of the deposits identified. Samples collected from East Fork (P-53) and Canyon (P-67) Creek benches contain from 0.004 to 0.016 oz/yd^3 Au.

Gold characteristics: Gold is generally less than 0.1-in. in diameter and flaky, with local exceptions, such as on Crow (P-43) Creek where nuggets up to 1 oz have been recovered.

Production history: Bench deposits have supplied a significant portion (up to 40 pct) of the total placer gold production from the Kenai Peninsula. The majority came from 2 drainages: Crow

(P-43) Creek and the junction area of Mills (P-63) and Canyon (P-67) Creeks. Additional production has come from East Fork (P-53), Lynx (P-61), Gulch (P-68), Sixmile (P-69), Resurrection (P-71), Quartz (P-74), Cooper (P-94), and Stetson (P-95) Creeks.

Future potential: Future mining of bench deposits may occur on historically mined drainages. Hydraulic mining will likely be replaced by mechanized methods for larger deposits. Small high-grade deposits may be mined using pumps to supply water.

ELUVIAL DEPOSITS

Eluvial deposits are produced by the concentration of heavy minerals due to the winnowing action of gravity and downhill creep. They occur as irregular sheets of angular rock fragments and soil-mantling hillside slopes below gold-bearing quartz veins.

Size: No data.

Grade: LOW. Economic concentrations have not yet been located in the CNF.

Gold characteristics: Gold is reported to be rough, nuggety, and fine-grained. Coarse gold (>0.1 in) has not been identified.

Production history: None. The Grant Lake Development Co. sampled for eluvial placer potential below the Case Mine near Grant Lake, but could not identify economic concentrations.

Future potential: Exploration activity possibly followed by mining, if warranted, might be anticipated on slopes below exposed gold-bearing quartz veins such as those occurring on the north side of Falls (P-85) Creek, on the steep slopes between Summit and Slate Creeks, the Crow Pass area near Girdwood, and along Palmer (P-71) Creek near Hope.

GLACIAL DEPOSITS

Glacial deposits consist mostly of till or very poorly washed, largely unstratified gravels containing abundant clay and angular rock fragments. These deposits often form steep cut banks up to 200 ft high where they have been eroded by subsequent stream action, as at the mouths of Juneau (P-65) and Palmer (P-71) Creeks.

Size: SMALL to LARGE. May exceed 1 million yd^3, however, volume estimates were not made.

Grade: LOW. Economic concentrations have not been identified. However, these deposits may be a source of gold that can be reworked and concentrated into alluvial placers.

Gold characteristics: Gold is disseminated throughout these deposits and is best described as being of the flour variety (i.e., very fine-grained and thin).

Production history: Minor production may have come from what are believed to be mostly till deposits near the mouth of Juneau (P-65) Creek. Alluvial placers produced below areas where streams have eroded large recessional moraines, such as at the junctions of Palmer and Resurrection (P-71) and Mills and Canyon (P-67) Creeks, have been previously discussed.

Future potential: Some potential for exploration or mining of glacial placers may exist along portions of Crow (P-43), lower Juneau (P-65), and Palmer (P-71) Creeks.

MARINE DEPOSITS

Marine deposits are loose, well-sorted, stratified sands and gravels.

Size: LARGE. May exceed several million cubic yards.

Grade: LOW. Samples collected contained from a trace to 0.002 oz/yd^3 Au.

Gold characteristics: Gold is very fine-grained and flaky.

Production history: None.

Future potential: Large, very low-grade deposits are present at the mouth of the Copper River and on some beaches along the northern Prince William Sound coast. These deposits currently cannot be mined profitably.