DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE SEWARD AND BLYING SOUND QUADRANGLES, ALASKA
MAP MF– 880B
SHEET 2 OF 2
Tysdal-Placer deposits

SUMMARY OF PLACER GOLD OF THE SEWARD AND BLYING SOUND QUADRANGLES, ALASKA

This section briefly describes the gold placers of the Seward and Blying Sound quadrangles, reviews the existing literature, and summarizes the geology of the placers. The formation of the placers of each drainage system is discussed separately using four main criteria: source of gold, process of concentrating gold, stream transport across bedrock, and stream velocity.

Placer gold was first recovered from stream gravels of the Seward quadrangle about 1850 by P. P. Doroshin, a mining engineer employed by the Russian-American Company. He obtained a few ounces of gold from gravels of two streams that flow into the Kenai River below Kenai Lake (Moffit, 1906, p. 8). Placer gold was found on Palmer Creek near Hope in about 1888, and on several nearby creeks in 1894 and 1895, precipitating a rush of miners to the region in 1896 (Moffit, 1906, p. 8, 9, 33). Prospecting subsequently was carried on throughout the Seward and Blying Sound quadrangles, but production of placer gold was confined to the western part of the Seward quadrangle; hence, the map shows only the pertinent area of these quadrangles. Most of the gold was recovered from stream and bench gravels in the western part of the Turnagain Arm drainage system, the most productive gravels from Mills, Canyon, Bear, Resurrection, and Crow Creeks. Only a small amount of gold was recovered from gravels of the Kenai River drainage system, chiefly from Cooper Creek, and almost no production was recorded from the Resurrection River or its tributaries. (Resurrection River and Resurrection Creek are two different streams.)

Recovery of the gold was effected initially with sluice boxes and later by hydraulic mining methods (Martin and others, 1915, p. 186). Dredges were installed on Resurrection and Sixmile Creeks but never were operated successfully because of many large boulders, thin gravel deposits, and low gold tenor (Paige and Knopf, 1907, p. 119-120; Brooks, 1916, p. 55; Tuck, 1933, p. 523-527). Dredging also proved unsuccessful on the Kenai River for the same reasons (Martin and others, 1915, p. 186-187).

PRODUCTION

Production of placer gold came entirely from the Seward quadrangle, which yielded nearly all of the placer gold recovered from the entire Kenai Peninsula and much of the gold recovered from the drainages of streams that flow southward into Turnagain Arm. No certain estimate of the total placer gold produced from the Seward quadrangle is possible because no accurate estimates of annual production are available for most of the years from 1900 through 1910 (Martin and others, 1915, p. 183). Crude estimates (Moffit, 1906, p. 33; Martin and others, 1915, p. 184; Smith, 1934, p. 96) have been made for these years, however, and production figures exist for most other years. My compilation shows that total gold production through 1959 for the Seward quadrangle was about 108,000 troy ounces. This figure compares with 96,500 troy ounces reported by Koschmann and Bergendahl (1968) for the Kenai Peninsula and the south-flowing streams north of Turnagain Arm in the Seward quadrangle and a small area in the southwestern part of the Anchorage quadrangle. (Their data were imcomplete for the years 1931 through 1945.) Cobb (1973) recorded production of between 100,000 and 105,000 troy ounces of gold from the Kenai Peninsula and a few thousand ounces from the south-flowing drainage north of Turnagain Arm.

The maximum annual production from the quadrangle was reached in 1897, and most of the placer gold was won during the first 10 years of mining (fig. 1). Production was in a general decline between 1905 and the start of World War II, but spurts of increased production occurred in the years just prior to and after World War I and in the early to mid-1930's. Production was nil, or almost so, from the start of World War II until about 1973 when increases in the price of gold rekindled interest in placer mining. No production data were available for the years after 1972, but some idea of activity can be gained from the claim maps of the U.S. Bureau of Mines (1973a, b).[1] These maps show about 265 sites for placer claims in the map area, and the KARDEX (1976a, b)[1] listed more than 160 of these as active (assessment work was done) in 1975. Another report (Carnes, 1976) showed only 12 placer operations that actively produced gold in 1975. These mines, shown by triangles on the map, largely coincide with stream segments that historically yielded gold. Three exceptions, near the head of Quartz Creek and between Lynx and Silvertip Creeks, probably were not large producers. The largest mining operations in 1975 were along Resurrection Creek.

BEDROCK

The bedrock units of the map area are described only briefly here because a companion report (Tysdal and Case, in press) contains an extensive description of them. Bedrock in areas of gold placer deposits is chiefly sandstone, siltstone, and mudstone of turbidite origin. These strata, which are part of the Valdez Group of Upper Cretaceous age, contain metamorphic minerals indicative of the lower part of the greenschist facies. The rocks were subjected to intense deformation, folded isoclinally, and faulted. The strata later were intruded by Oligocene granite in the Port Wells area (Lanphere, 1966), by Eocene felsic dikes in the Hope district (Silberman, oral commun., 1977), and by plugs and pipes of quartz diorite and associated felsic dikes at the headwaters of Crow Creek (Park, 1933) in the Anchorage quadrangle a few kilometers north of Turnagain Arm. Gold-bearing quartz veins occupy fracture zones in the sedimentary and igneous rocks (Johnson, 1914; Martin and others, 1915; Tuck, 1933; Tysdal, 1977).

GLACIATION

A brief glacial history of the region is summarized from Karlstrom's (1964) extensive report that dealt with glaciation of the Kenai Lowland (to the west) and adjacent mountains. Once gold particles were freed from bedrock, they became widely scattered constituents of the unconsolidated glacial debris of the quadrangle. As glacial ice melted, glaciofluvial processes concentrated the gold particles into placers.

During the Pleistocene, the Kenai Mountains underwent at least five major glaciations: Mount Susitna (more than 150,000 years ago), Caribou Hills (as much as 130,000 to 150,000 years ago; D. H. Hopkins, oral commun., 1974), Eklutna (about 42,000 to 60,000 years ago), Knik (about 15,000 to 22,000 years ago), and Naptowne (about 10,000 to 14,000 years ago) (Hopkins, 1974, table 1). The distribution of moraines of different ages suggests that the main topographic and climatic elements that control the present distribution of glacial ice in the region were nearly the same for most of the Pleistocene (Karlstrom, 1974).

The distribution of glacial debris of different ages (not shown on map) suggests that each succeeding glaciation was less extensive than the preceding one. Mount Susitna drift and erratic material are preserved only locally at high elevations south of Turnagain Arm and north of the Chickaloon River. Eklutna debris forms lateral moraines at elevations of 300 to 600 m near the mouth of Turnagain Arm and at progressively higher elevations eastward; south of the arm, Eklutna material forms continuous moraines along the western front of the mountains as far south as the Chickaloon River and intermittently farther south. Knik moraines are present along the western front of the mountains and extend well onto the lowlands beyond. Naptowne moraines occupy the same general areas but were not quite so extensive. During the Knik and Naptowne Glaciations, the western two-thirds of the Turnagain Arm drainage system was not predominantly covered by ice (Karlstrom, 1964, pl. I), whereas the remainder of the map area was covered. A marine transgression between these two glaciations deposited the Bootlegger Cove Clay, a sequence of clay, silt, and sand along Turnagain Arm and in the lowlands to the west (Schmoll and others, 1972; Schmoll, oral commun., 1977). Holocene glaciation is represented in the map area by local moraines of the Alaskan Glaciation, present near the town of Tunnel in the upper reaches of the Placer River drainage

FORMATION OF STREAM PLACER DEPOSITS

The formation of stream placer deposits of gold in the Seward quadrangle is discussed in terms of four main criteria, described by Jenkins (1935) in an extensive report on the characteristics of placer deposits.

1. A decrease in stream velocity: Gold is deposited when the stream velocity decreases, either by a change in the stream gradient or by a change in the volume of water.

2. Flowage of the stream over bedrock or false bedrock: The irregular surface of the bedrock acts as a sluice box to trap the gold (Tuck, 1968), and excessive erosive power is required to dislodge the gold particles. Clayey false bedrock also is excellent in its ability to hold gold particles (Jenkins and Wright, 1934). In the Seward quadrangle, slate and sandstone form the bedrock of most placer deposits, but clayey false bedrock underlies some deposits (table 1).

3. A long period of time for decomposition and erosion of the source rocks and for reworking of the detritus by streams to concentrate the gold: The time available for these processes to operate in the Seward quadrangle was dependent largely on climatic factors that differed widely across the quadrangle. The climatic regime of the Pleistocene and early Holocene was probably much the same as it is today, although its severity waxed and waned (Karlstrom, 1964). As indicated in the brief section on glaciation, the western part of the Turnagain Arm drainage system was consistently the least severely glaciated; hence, the time available for the above processes to operate decreased away from this area toward the high areas that today hold glacial icefields.

4. A source of gold: Gold in most of the placer deposits of the world was deposited not far from its original source (Jenkins, 1935), and this is true for the deposits of the Seward quadrangle.

All of these conditions are met in several areas of the Turnagain Arm drainage system and, locally, in the Kenai River drainage system, but only some of them are met in the Resurrection River and Port Wells-Passage Canal drainage systems.

Turnagain Arm drainage system

The major placer gold deposits of the Turnagain Arm drainage system and of the Seward quadrangle were from six streams (Crow, Bear, Resurrection, Sixmile, Mills, and Canyon Creeks and East Fork) that have estimated production of more than $1 million worth of gold (at $130 per troy ounce, 7,692 troy ounces) (table 1). Two other streams (Gulch and Lynx Creeks) also may belong in this production category and are considered in this section.

Velocity of stream and flowage across bedrock

The gold placers of all eight streams were near the outlet of a drainage basin and were deposited where there is a decrease in the stream gradient. In six of the eight streams, the placers occurred immediately above the junction of the placer-bearing stream with another stream, whereas the placers of two streams (Resurrection Creek and the uppermost part of Sixmile Creek) were immediately below the junction of two streams. Gold from placers upstream of the junction of two streams was generally coarser than that from placers below the junction, correlating with water velocity.

The placer gold-producing segments of all the streams, except for the uppermost part of Sixmile Creek, flow across bedrock of slate and sandstone or, locally, false bedrock of glacial clay. The uppermost part of Sixmile Creek is a trap for sediment from Canyon Creek and East Fork and contained fine particles of gold. The lower two-thirds of Sixmile Creek flows mainly across bedrock but yielded little gold.

Decomposition, erosion, and reworking of sediments

The processes of decomposition and erosion of gold-bearing rock and the concentration of placer gold should have been most effective in areas that underwent these processes for the longest length of time. From the patterns of glaciation described previously, it is evident that the western two-thirds of the Turnagain Arm drainage system underwent less extensive glaciation during glacial maxima than other parts of the map area, and it follows that the ice in this drainage system most likely melted before ice elsewhere in the quadrangle. The glacial melt waters began reworking glacial outwash material earlier than in other parts of the map area and the ridges were exposed to processes of decomposition and erosion sooner.

Glacial outwash gravels in the drainage of Resurrection Creek may have been reworked for as long as 14,000 years. At the mouth of Resurrection Creek, the gravels overlie the Bootlegger Cove Clay (Kachadoorian and others, 1977), a unit deposited during a marine transgression between the Knik and Naptowne Glaciations. Marine fossils from the clay near Anchorage yielded radiocarbon dates of about 14,000 years before present (B.P.) (Schmoll and others, 1972), and the same fauna occur in the correlatable clay at the mouth of Resurrection Creek (Schmoll, oral commun., 1977). The overlying outwash gravels probably were laid down not less than 12,000 years ago. They are partly overlain by a lake deposit formed when Resurrection Creek was dammed temporarily by a glacier in Turnagain Arm, and a radiocarbon date of 12,000 years B.P. was obtained from the top of a moraine near Anchorage that correlated with this short-lived glacial advance (Kachadoorian and others, 1977). A similar length of time for reworking of outwash deposits along Sixmile Creek may be assumed because correlatable lake beds overlie outwash deposits there (Kachadoorian and others, 1977).

Source of gold

Two ideas exist concerning the bedrock source of the gold, which subsequently was dispersed in the glacial debris and later concentrated into placers by glaciofluvial processes: (1) the gold was derived locally from decomposed quartz veins, favored by Moffit (1906), Martin, Johnson, and Grant (1915), and this writer; or (2) the gold was freed from rock transported into the stream drainages by glaciers, suggested by a few miners (Moffit, 1906). In this section of the report, an association of placer deposits with lode gold mines and prospects in a source area is shown for Crow and Bear Creeks and is most probable for Resurrection and Canyon Creeks and the uppermost part of Sixmile Creek. Mills, Lynx, and Gulch Creeks have no lode mines in their drainage basins.

Quartz veins

Quartz veins are widespread in the Turnagain Arm drainage system and all of the gold lodes of the quadrangle are in quartz veins. Lode gold mines occur in the source area for five of the eight placer stream segments under discussion. The association of Crow and Bear Creek placer deposits with lode mines is well established, as discussed in the following section. The placer gold of Resurrection Creek was found mainly adjacent to the mouth of Palmer Creek, downstream for a few kilometers, and probably originated from lode mines and other quartz veins in the Palmer Creek drainage. Canyon Creek gold may have been derived partly from rocks in the Mills Creek drainage, which has no lode mines, but also partly from lode gold terrane west of the Seward Highway, from the rocks near Fresno and Colorado Creeks, and perhaps Summit and even Slate Creeks, depending on the position of early drainage courses. The placer gold of the upper part of Sixmile Creek also, therefore, may be associated with lode deposits.

Mills, Lynx, and Gulch Creeks have no gold lode mines in their drainage basins. Not much is known about rocks of the Gulch Creek drainage, but Mills and Lynx Creeks flow across slate and sandstone country rock that is cut by abundant quartz veins that may carry gold. A large part of this area is drained by Mills Creek, which was one of the richest gold placer streams of the district. The gold was most probably derived from veins that were broken down, allowing the gold to be concentrated by streams.

[1]The two publications listed here are used in conjunction with one another. The U.S. Bureau of Mines references, 1973a and 1973b, are maps of the Seward and Blying Sound quadrangles, respectively, showing the locations of mining claims These maps were updated in 1976 and thus are current through 1975. They show only a number for each claim or block of claims and must be used in conjunction with KARDEX, 1976a and 1976b, which are Alaska mineral property reference files for the Seward and Blying Sound quadrangles, respectively. These files, available to the public, are maintained by the Alaska Division of Geological and Geophysical Surveys in Fairbanks and are computer listings of data for each of the numbered claims shown on the maps of the U.S. Bureau of Mines. The files used here were generated in January of 1976 and are current through 1975.

Local drainage basin

A source of gold within the same basin as occupied by a stream placer is demonstrable for some placer gold deposits. Placer gold from Bear Creek is associated with native silver that was more abundant than in any other placer deposit of the Turnagain Arm drainage system (Martin and others, 1915). The fineness of the gold is less (0.740 to 0.761, table 1) than that from any other placer south of Turnagain Arm (Becker, 1898, p. 81; Martin and others, 1915, p. 185), reflecting the high tenor of silver. The Coon and Plowman prospect (locality 9 on map of Tysdal, 1978) near the head of Bear Creek was staked originally as a silver lode (Tuck, 1933, p. 507), and "several other prospects reported valuable for their silver content" were located along Bear Creek (Martin and others, 1915, p. 179).

The placer gold of Crow Creek has the same physical characteristics as the gold of lode mines at the head of Crow Creek (Park, 1933, p. 404). Fineness of the placer gold commonly ranges between 0.720 and 0.730 (table 1), which corresponds with the 25 percent by weight of silver reported (Park, 1933, p. 408) for free gold of the lodes. Native silver was observed in the lodes (Martin and others, 1915, p. 134) and also in the placer deposits (Moffit, 1906, p. 42). Quartz diorite of the placers is like that which crops out near the head of Crow Creek, and pay gravel is associated everywhere with the quartz diorite (Park, 1933, p. 404). No source for quartz diorite is known in neighboring areas.

The placers of Lynx Creek yielded both gold and native copper. The only known vein of copper sulfide in the Turnagain Arm drainage system is in the headwaters of Lynx Creek (Tuck, 1933; Tysdal, 1978) described by Paige and Knopf (1907, p. 124-125). No native copper was reported at this copper prospect, but native copper probably formed as an alteration product of the copper lode (Moffit, 1905). Pyrrhotite-impregnated diabase boulders occur in the stream gravels (Martin and others, 1915).

Glacial transport

In the early part of the century, it was suggested by some miners who worked streams in the Turnagain Arm drainage system that glaciers transported gold-bearing rock into the stream drainages and the gold later was freed and reworked into placers (Moffit, 1906, p. 45). The idea probably came about because granite clasts in stream gravels on the south side of the arm have no source in the country rock of the same drainages. The argument is largely discounted in the preceding sections, which show local basin sources for some gold and a spatial association of lode mines and placer deposits. Nevertheless, some small amount of gold could have been glacially transported, and its possible sources are discussed.

Granitic clasts are in the gravels of Resurrection, Bear, Palmer, Sixmile, Gulch, and Canyon Creeks and East Fork. They increase in abundance northward from East Fork to Turnagain Arm, and the clasts of Resurrection Creek are larger than those to the east (Moffit, 1906, p. 24). Granitic clasts occur in gravels of Crow, California, and Winner Creeks north of Turnagain Arm, derived from intrusions at the head of Crow Creek. The clasts south of the arm probably came from the same source (Moffit, 1906), moved on glaciers across the arm, and were reworked by streams.

Glaciers flowed south from the Matanuska Valley (north of the quadrangle) along the western front of the Chugach Mountains and could have supplied gold-bearing rock. Eklutna moraines overlie bedrock on the western slopes of the mountains in the northwestern part of the Seward quadrangle (Karlstrom, 1964), and my observations show that they contain granite of types found in the Talkeetna Mountains and conglomerate of the Chickaloon Formation of the Matanuska Valley. The granites in the streams on the south side of Turnagain Arm could be reworked from glacial debris transported into the drainages by ice that moved eastward up the arm. Granite clasts of the Eklutna moraines are pink, unlike the gray granites of the stream gravels. The remainder of the clasts of the stream gravels are described as slate and sandstone of local origin (Moffit, 1906), but a source in the Matanuska Valley or Talkeetna Mountains would have contributed rock types foreign to the Chugach terrane.

There is no immediate source for the granite south of Turnagain Arm. The nearest outcrop is near the Harding Icefield, immediately to the west of the Seward quadrangle, about 90 km south-southwest of Hope. Glaciers flowed north and west from the icefield during Naptowne time but, according to maps of Karlstrom (1964), did not expand into the drainage system of Turnagain Arm. In addition, the number of granitic clasts in the gravels decreases southward, opposite to what should be observed. No outcrop source exists to the east within the reaches of westward-flowing glaciers, and the increased number and size of the clasts are opposite to what would be expected.

Kenai River drainage system

In the eastern part of the Kenai River drainage system, a minor amount of placer gold was recovered from the flood plain of the lower part of Falls Creek, the benches along the lower segment of the stream, and at the mouth of the canyon (Martin and others, 1915). Several mines that produced abundant gold occur in the eastern part of the drainage system, but the streams are short and generally contain only a small amount of gravel that has undergone little reworking. Glaciers retreated from the area not long ago, and unreworked morainic material is present in some drainages (Johnson, 1912, p. 168).

In the northwestern part of the drainage system, some gold was produced from Quartz Creek, which flows across a bedrock floor. Lode mines that produced gold occur near Slate, Summit, and Colorado Creeks, which drain into Quartz Creek and probably supplied the gold. Bench gravels are thin, only 4 to 6 m thick, and the area had an extended period of time for reworking of the gravels.

Streams west of Kenai Lake yielded much of the gold recovered from the Kenai River drainage system, most of it from Stetson and Cooper Creeks, and a minor amount from the Kenai River (Moffit, 1906; Martin and others, 1915). No gold lode prospects or mines are known in the headwaters of Stetson and Cooper Creeks, but pan concentrates of stream sediments from several creeks in the general area gave gold values of 70 to more than 500 parts per million (Tripp and others, 1978), values commonly found in known lode gold districts of the Seward quadrangle.

Gravels along the lower 1 km of Cooper Creek and downstream along the Kenai River are deltaic deposits, as much as 60 m thick, formed at the margin of a glacial lake (Martin and others, 1915). These sediments were not reworked, except for the volume of them removed during downcutting by the present streams. Sediments along the upper reaches of Cooper Creek, upstream from the rock canyon cut by the creek, and along Stetson Creek are both morainal and glaciofluvial in origin. They are thinner, overlie bedrock, and are richer in gold (Johnson, 1912), but none was subjected to extensive reworking.

Resurrection River drainage system

The only record of placer gold production from the Resurrection River drainage system is a statement by Smith (1926, p. 12) that less than $5,000 worth of gold (gold valued at $20.67 per troy ounce) was recovered in 1924. Two lode gold prospects were located on the south side of the Resurrection River in 1900 (U.S. Bureau of Mines, 1973a, and KARDEX, 1976a), but no record of production is known. Gold values of 300 to more than 500 parts per million were detected in pan concentrates of stream sediments from the western part of the drainage system (Tripp and others, 1978), and in the Seward quadrangle, such values generally are restricted to districts of known lode gold deposits. The drainage system is considered to have only marginal interest for placer mining because the area is just emerging from beneath ice cover or was exposed only a relatively short time ago; the Resurrection River valley is clogged with glaciofluvial gravels, but the stream has not reworked gravels over an extended period of time, it does not flow across bedrock, and tributary streams generally do not contain much sedimentary debris.

Port Wells--Passage Canal drainage system

No significant amount of placer gold was produced from active stream or bench gravels in the Port Wells-Passage Canal drainage system even though gold-bearing quartz veins, as well as several lode gold mines, exist throughout the area. Gold-bearing stream gravels were discovered on Billings Creek north of Whittier in 1896 (Johnson, 1914), and semiquantitative spectrographic analyses of pan concentrates of stream sediments reveal gold in gravels throughout the district (Tripp and others, 1978). There is, however, no record of placer production or significant activity in the drainage basin, and only a few claims were recorded. Ice still covers part of the area, and the remainder of the drainage system was exhumed only recently from beneath ice. The streams are short, many of them contain little gravel and (or) drain into deep fiords, and the glaciofluvial material has not undergone extensive reworking to concentrate gold.

BEACH PLACER DEPOSITS

No productive beach placer deposits are known in the map area. The beach placer at Sniper's Point (A) near the mouth of Sixmile Creek has not been worked (Johnson, 1912, p. 161; Martin and others, 1915, p. 187). The placer deposits of Harris Bay (B) and Johnstone Bay (C) were listed as active claims in 1975 (U.S. Bureau of Mines, 1973b, and KARDEX, 1976b), but nothing is known about production.

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Table 1.--Summary description and characteristics of gold placers.

Drainage	Map number and name	Location, map coordinates	Resources: Au	Resources: Ag	Resources: Cu	Fineness of gold[1] (number samples)	Production: Estimate[2]	Production: From bench gravels	Production: From stream gravels	Production: From "old channel" in bench gravels	Production: From fossil stream channel in bedrock	Bedrock: Bedrock in stream bottom	Bedrock: False bedrock in stream bottom	Bedrock: Granitic clasts in stream gravels	Summary description	Principal references
Turnagain Arm drainage	1 Indian Creek	T. 10 N., R. 1 W.	X				1		X			X	X		Worked ground is an open cut, 4.5 to 6 m deep, extending 80 m inland from beach, excavated by sluicing; section consists of 3.5 to 4.5 m of well-rounded gravel with a few boulders, overlain by 0.6 m of "mucky soil;" slate bedrock occurs at the bottom of cut 50 m from the beach; abundant black sand with some gold reported.	Capps (1916, p. 187).
	2 California Creek	T. 10 N., R. 2 E.	X				1		X					X	Creek flows in narrow, steep-walled canyon; stream gravels consist of slate, graywacke, and some granite; some gold obtained, but drilling and test pits indicate occurrences are erratic.	Moffit (1906, p. 43), Park (1933, p. 406).
	3. Crow Creek	---Do.---	X	X	X	0.721-.731 (6)	3				X	X	X	X	Only important gold-producing stream on the north side of Turnagain Arm; placer operations located about 1 km above junction of Crow Creek with Glacier Creek; the bedrock floor of slate, sandstone, and conglomerate was deeply cut by a major stream channel that subsequently was filled with gravel during a complex history of glacial events; fill was firmly cemented water-laid pebbly clays, horizontally bedded, with a few boulders; fill was overlain by layered sandy and gravelly beds; the richest gold placers found on the rough floor of the channel, and gold penetrated as much as 0.6 m into cracks of the channel floor; this fossil channel largely was mined out, and work was undertaken on shallower subsidiary channels; some placer mining of bench deposits also took place. Gold is medium to coarse and bright yellow.	Moffit (1905, p. 92, 97), Johnson (1912, p. 139-141, 160-161, 171-173), Capps (1916, p. 174-186), Smith (1933, p. 30), Park (1933, p. 398-405).
	4 Winner Creek	---Do.---	X				1	X	X					X	Stream gravels contain slate, sandstone, and, in lower segment of creek, quartz diorite; creek has yielded only small amount of gold; some bench gravels mined.	Moffit (1906, p. 43), Capps (1916, p. 186), Park (1933, p. 405-406).
	5 Kern Creek	---Do.---	X				1		X						Some gold produced but not sufficient to warrant mining.	Capps (1916, p. 186-187).
	6 Peterson Creek	---Do.---	X				1		X						Has yielded some placer gold.	Capps (1916, p. 186).
	7 Ingram Creek	T. 8 N., R. 2 E.	X				1		X						Only small amount of gold obtained.	Capps (1916, p. 43).
	8 Seattle Creek	T. 9 N., R. 2 E.	X				1		X						Much work done but only small amount of gold obtained.	Moffit (1906, p. 43).
	9 Sawmill Creek	T. 9 N., R. 1 E.	X				1		X						Much work done but only a small quantity of gold produced.	---------Do.---------
	10 Bear Creek	T. 9-10 N., R. 2 W.	X	X	X	.761 (1)	3		X			X	X	X	Gravels, distributed irregularly along stream, are composed of slate, sandstone, and a few granite boulders; in two places about 10 m of unsorted and unstratified sediments present, consisting of coarse angular blocks mixed with sands and clay; stratified sands and clay underlie surface wash locally; the best pay was obtained on bedrock, "which is sometimes a glacial clay." Gold is coarse, slightly worn, flattened, generally bright yellow.	Becker (1898, p. 81-82), Moffit (1905, p. 91-98; 1906, p. 36, 46-47), Tuck (1933, p. 521-526).
	11 Resurrection Creek	T. 9 N., R. 2 W.	X			.817-.826 (9)	3	X	X			X	X	X	Gold production mainly from junction of Palmer Creek to Turnagain Arm; just below junction, stream flat is about 300 m wide, flanked by high gravel benches; bedrock crops out locally; gold-bearing stream-laid creek gravels with little clayey matrix average about 2 m thick; they consist of sandstone, slate, minor conglomerate, and granite, with clasts as much as 1 m across; but locally much larger; the gravels rest on a false bedrock of horizontally bedded yellowish clay with some streaks of blue clay; gold is obtained mainly from on top of the clay; the clay rests on older glaciofluvial gravel that was not generally productive; mining of bench gravels yielded little gold. Gold is smooth, bright yellow, or whitish.	Moffit (1906, p. 34-35), Johnson (1912, p. 170-171), Tuck (1933, p. 521-526).
	12 Palmer Creek	---Do.---	X	X			1 or 2		X			X		X	Mining took place in the lower 2 km of the stream, which is cut deeply into bedrock except near its junction with Resurrection Creek; gravels composed of slate, graywacke, and a few granite boulders; the lower gravels are partly stratified; stream gravels yielded about $1 per yd^3 ($20.67 per troy ounce), "but 30-40 percent of gold is from bedrock." Gold is coarse, usually flattened and smooth; most is bright yellow but some is whitish.	Moffit (1905, p. 95-96; 1906, p. 35-36).
	13 Sixmile Creek	T. 8-9 N., R. 1 W.	X			.828-.839 (4)	3	X	X	X		X		X	Creek flows in a broad, flat-bottomed valley in its upper half, cuts into bedrock for about 5 km, then broadens into a wider valley floored by rock for about the final 5 km. The uppermost part is dumping ground for materials carried by Canyon Creek and East Fork, which merge to form Sixmile Creek; the dumped materials yielded the major gold production of the stream; stream gravels of lowermost part of Sixmile Creek contain muds from Turnagain Arm and yielded little gold; some production came from high bench gravels, which contain several old channels, mainly along the lower 5 km of the stream. Gold is fine.	Moffit (1906, p. 37-38), Smith (1933, p. 30), Tuck (1933, p. 523-527).
	14 East Fork	T. 8 N., R. 1 W.	X				2		X			X		X	East Fork, worked mainly between Gulch Creek and Sixmile Creek, flows through a shallow rock-walled canyon cut in slate and sandstone; has yielded a moderate amount of gold.	Moffit (1906, p. 39).
	15 Gulch Creek	---Do.---	X			.829-.833 (3)	2 or 3	X	X		X	X		X	On a low bench near junction with East Fork, gravels 3 to 5 m thick were mined; gravels rest on bedrock, are composed of pebbles and boulders of slate, sandstone, and granite and have a clayey cement; upstream a kilometer or so, upper bench gravels were mined; these deposits are in an old channel cut in slate and sandstone and consist of horizontally stratified gravels with a clayey to sandy clay matrix, locally compact; production also reported from the gravels in the lower part of Gulch Creek. Gold is flat, smooth, and medium coarse to coarse; nuggets have been found.	Moffit (1906, p. 37-40), Johnson (1912, p. 160-161), Johnson (1919, p. 176).
	16 Canyon Creek	T. 7-8 N., R. 1 W.	X			.831-.839 (9)	3	X	X	X		X	X	X	Canyon Creek has incised a canyon as much as 60 m deep through bench gravels and into bedrock of slate and sandstone; chief production came from above clay "bedrock," but gold also found in stream gravels; some pockets were very rich; bench gravels are rounded and well stratified, consisting of slate, sandstone, and some granite; these gravels locally are cemented by iron-oxide. Gold is coarse; slightly worn nuggets have been found; gold from bench gravels is flaky.	Becker (1898, p. 82), Moffit (1905, p. 93-96; 1906, p. 37-38), Tuck (1933, p. 521-527).
	17 Blue Gulch	T. 7 N., R. 1 W.	X				1		X						Gravels at head of gulch were sluiced, yielding some gold.	Smith (1932, p. 30).
	18 Mills Creek	---Do.---	X			.849-.861 (4)	3	X	X		X	X	X		Most productive stream in Seward quadrangle, with most gold obtained from channel gravels in the lowermost 1.5 km of the stream, between Juneau Creek and Canyon Creek; stream gravels are chiefly slate, sandstone, and conglomerate and a few limestone pebbles; stream, bordered by bench gravels on one side and bedrock on the other, has barely cut into underlying bedrock; at mouth of Juneau Creek, gold was recovered from an old channel filled with gravels; the lower part of gravels cemented with iron oxide and rests on blue clay; best pay was obtained on top of the blue clay; only small amount of gold recovered from high bench gravels. Gold is flattened, generally coarse, with some nuggets present; gold from clay is fine with striations on some nuggets from on top of clay.	Moffit (1905, p. 96-97; 1906, p. 37-39), Martin, Johnson, and Grant (1915, p. 182-188, 204-205), Tuck (1933, p. 521-527).
	19 Silvertip Creek	T. 7-8 N., R. 1 E.	X				1		X						Shallow creek gravels in lower stretch of stream worked, but little gold obtained.	Moffit (1906, p. 40), Johnson (1912, p. 169-170).
	20 Lynx Creek	T. 7 N., R. 1 E.	X		X	.822-.835 (4)	2 or 3	X	X			X			Thick gravel deposits, mainly slate, sandstone, and minor diabase, extend from the mouth of Lynx Creek well up into the narrow stream valley; channel gravels 1 to 2 km above the mouth were worked in the early part of the century, but bench gravels as much as 30 m above the creek were worked in later years; no definite channel was found in the bench gravels. The gold is coarse with nuggets worth $60-$70 ($20.67 per troy ounce) found.	Moffit (1905, p. 99; 1906, p. 40), Martin, Johnson, and Grant (1915, p. 207-208), Tuck (1933, p. 524-527).
	21 Bertha Creek	T. 8 N., R. 1 E.	X				1		X						At the mouth of Bertha Creek, 2.5 to 3 m of coarse gravel and boulders overlain by about 1.5 m of finer material; the gold comes from the coarse material, averaging about $0.15 per yd^3 (gold $20.67 per troy ounce); bedrock is not exposed. Gold is fine, bright yellow, and smooth.	Moffit (1906, p. 40).
Kenai River drainage	22 Falls Creek	T. 4 N., R. 1 E.	X				1	X	X			X			Creek flows in a steep-sided narrow valley and contains angular stream gravels derived from the adjacent slate and sandstone bedrock; the amount of gold in Falls Creek within the canyon is very small; some gold has been recovered from low benches along the lower part of the stream and at the canyon mouth; between Kenai and Lower Trail Lakes, the gravels along Falls Creek are composed of morainic, fluvioglacial material, and recent outwash fan deposits from Falls Creek; twenty holes (11.25-cm casing) drilled in these gravels in 1911 showed bedrock at depths of 3 to 7 m and found no definite paystreaks.	Moffit (1906, p. 44), Johnson, 1912, p. 168), Martin, Johnson, and Grant (1915, p. 202).
	23 Quartz Creek	T. 5 N., R. 2 W.	X			.810-.821 (6)	1	X	X			X			Near Devils Creek, Quartz Creek flows on slate and sandstone bedrock overlain by creek gravels that carried coarse gold and yielded good pay; small gravel-covered benches lie at different elevations on the valley sides; bench gravels of rounded slate and sandstone, 4.5 to 6.5 m thick, yielded $0.26 to $.32 per yd^3 ($20.67 per troy ounce).	Johnson (1912, p. 167-168).
	24 Stetson Creek	T. 4 N., R. 3 W.	X			.855 (1)	1 or 2	X?	X?						Mining successfully carried out (probably on both stream and bench gravels). Gold is coarse with nuggets worth as much as $41 ($20.67 per troy ounce) reported.	Moffit (1906, p. 44), Martin, Johnson, and Grant (1915, p. 199-201), Henderson (1943, p. 224).
	25 Cooper Creek	---Do.---	X			.841-.849 (6)	--do--	X	X				X		Creek flows through a rock canyon for most of its 15-km length; in its lower 1 km, however, it cuts sands, clays, and gravels of a delta formed by glacial processes. Gold content of the delta bench gravels is generally low; but above the mouth of rock canyon, richer bench deposits of morainal and fluvioglacial origin, lying on bedrock, contain both coarse and fine gold; largest nugget was worth $3.80 ($20.67 per troy ounce). Creek gravels in canyon were richer than those of wide flat at lower end of stream; gravels of flat are 2.5 to 3 m thick and overlie false bedrock of fine sand and sandy clay with some lenses of pebbly gravel; pebbles consist of slate, sandstone, some boulders of conglomerate, and a few boulders of felsic dike rock; gravels average $0.30 to $.50 per yd^3 ($20.67 per yd^3 ($20.67 per troy ounce). Gold is small, flat, heavy, and not flaky.	Johnson (1912, p. 160-167).
	26 Kenai River	T. 5 N., R. 3-4 W.	X				1	X	X						Gold production mainly from the segment of river between Cooper and Juneau Creeks where the Kenai River is incised about 60 m into delta deposits formed by glacial processes; only small amount of gold obtained from the delta deposits; gold in stream gravels yielded values ranging from about $0.25 to $17.50 per yd^3 ($20.67 per troy ounce) but averages only a few cents per yd^3. Gold is mainly fine, light, and flaky, but coarser gold also present.	Mendenhall (1900, p. 321), Johnson (1912, p. 160-165), Tuck (1933, p. 524).
Other drainages	27 Resurrection River	T. 2 N., R. 2 W.	X				1		X?						Small amount of gold produced in 1924.	Summarized from Smith (1926, p. 12).
	28 Billings Creek	T. 9 N., R. 5 E.	X				1		X						Creek drains an area underlain by slate, graywacke, and granite, and yielded some gold.	Johnson (1914, p. 214).
Beach placers	A Snipers Point	T. 10 N., R. 1 W.	X				---								Placer not productive.	Johnson (1912, p. 161), Martin, Johnson, and Grant (1915, p. 187).
	B Harris Bay	T. 5 S., R. 3 W.	X				---								Beach placer?	U.S. Bureau of Mines (1973b), KARDEX (1976b).
	C Johnstone Bay	T. 2 S., R. 4 E.	X				---								Beach placer deposits	---------------Do.-------------

[1]Data from Smith (1941; unpub. data, 1938); Martin, Johnson, and Grant (1915).

[2]1 Estimated production values at less than $100,000 (gold at $130 per troy ounce).
2 Estimated production valued at $100,000-$1,000,000 (gold at $130 per troy ounce).
3 Estimated production valued at greater than $1,000,000 (gold at $130 per troy ounce).

MAP SHOWING PLACER DEPOSITS OF THE SEWARD AND BLYING SOUND QUADRANGLES, ALASKA

BY
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1978