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KODIAK ISLAND AND VINCINITY, ALASKA GEOLOGY AND MINERAL RESOURCES

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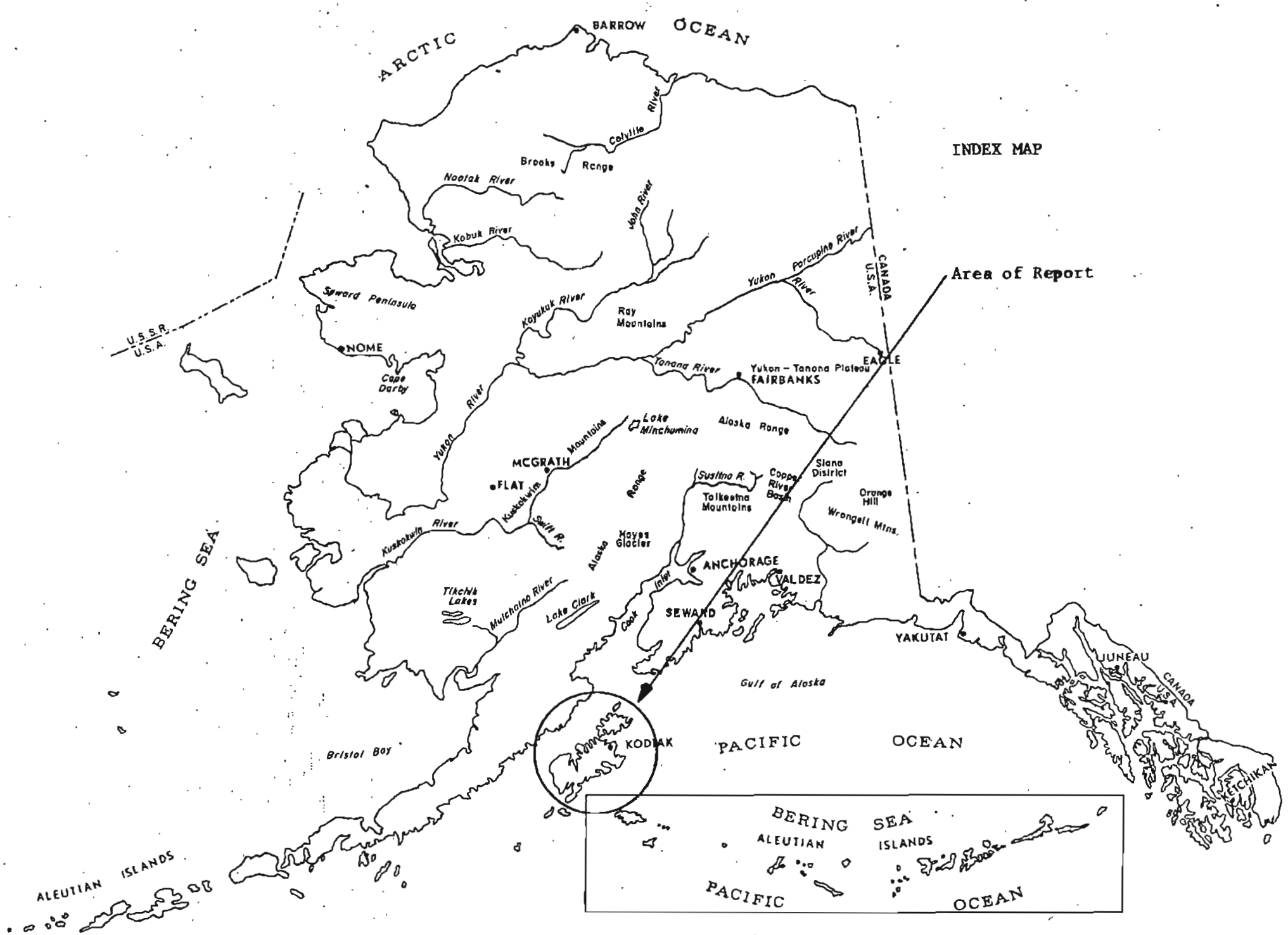
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CANADA
U.S.A.
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FAIRBANKS
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ABSTRACT

Exploration for minerals on Kodiak Island and the associated smaller islands has been sporadic and limited to areas of easy access. As noted on the geologic map, nearly all the mineral claims and areas of related activity are geographically located near water passages and the interior portions of the islands are relatively unexplored.

The Kodiak Island group is geologically a continuation of the Kenai Peninsula and the Kenai Mountains with similar northeast structural trends. Kodiak Island has a central axial core of early Tertiary granodiorite that extends the length of the island. Numerous smaller intrusions of similar chemical compositions and texture have been mapped throughout the island suggesting that nearly all the island is underlain at depth by an intrusive mass.

The most prevalent sedimentary covering is a sequence of Cretaceous slates and graywackes. A major thrust separates the Cretaceous from Triassic-Jurassic sediments on the west side of Kodiak Island. A down-faulted belt of Tertiary sediments lies east of a large normal fault in the eastern part of the island.

Although no commercial metallic deposits have been discovered in the island group, the potential is present in the form of adequate intrusive units and widespread host rocks.

INTRODUCTION

This report describes the geology and mineral resources of Kodiak Island and associated smaller islands. Afognak Island to the north of Kodiak Island has not been included because of lack of recent geological information. This group of islands lie along the western border of the Gulf of Alaska and is separated from the Alaskan Peninsula by the Shelikof Strait. The group as mapped covers an area of about 4200 square miles.

Previous investigations include a brief visit in 1895 by Becker and Dall who examined gold lode deposits and coal and lignite resources. Martin in 1912 visited and compiled a reconnaissance geologic map of parts of Kodiak Island. Maddren examined the beach placers on the southwest side of the island in 1917. Stephen Capps has published (1937) the most comprehensive geologic study of Kodiak Island to date. An open file geologic map by George W. Moore (1967) is much more detailed, but the text is as yet unpublished. In addition, detailed examinations were made of a tungsten deposit on Kodiak Island by Seitz in 1963, and Rose and Richter (1967) studied the geology and completed a study of stream sediment geochemistry of Anton Larson Bay and vicinity, Kodiak Island.

The main objective of this report is to demonstrate that the requirements for ore deposition, igneous intrusives and associated host rocks, are present over nearly all of Kodiak Island and that density of mineralized areas should be as great in the unexplored areas as the easily accessible areas.

TOPOGRAPHY AND DRAINAGE

The topography or present surface configuration of the Kodiak group of islands is predominantly due to the effect of Pleistocene glaciation. The intricate coastline is the result of deeply gouged bays caused by ice flowing seaward from a central ice mass. The rugged axial core of Kodiak Island shows the result of glacial sculpturing with steepened ridges and glacial cirques. Much of the rock material removed from the islands has apparently been deposited in the surrounding water, but thick glacial tills have filled the intervalleys and form sea cliffs on the west side of Kodiak Island.

Drainage systems are poorly developed with the streams draining small areas. The numerous ponds and small lakes are the result of glacial excavating and ponding behind moraines.

GEOLOGY

The most recent mapping by Moore (1967) has separated the main island of Kodiak into three different belts of bedded rock.

The eastern belt is composed of Tertiary sediments separated from a sequence of Cretaceous rock by a northeast-trending normal fault and these sediments in turn are separated from older Triassic-Jurassic rocks by a northeast-trending thrust fault in the west. All three groups have been intruded by granodiorite masses. The youngest rocks intruded are the volcanic and marine sediments of Paleocene-Eocene age and based on this relationship the intrusives are considered early Tertiary.

A continuation of the structural trends to the northeast and an examination of comparative lithologies suggest that the geology of Kodiak Island is a continuation of the Kenai Mountains and Kenai Peninsula.

STRATIGRAPHY

Greenstone - Schist Group

Early mapping by Capps (1937) was of a reconnaissance nature. In his mapping he recognized an older greenstone - schist group of rocks which included several lithic subgroups including little-altered basic lavas, and moderately to highly metamorphosed sedimentary rocks. The only known occurrences of massive limestone is in this group and was noted about two miles north of the entrance to Uyak Bay. Moore (1967) has mapped this group of sediments as late Triassic - early Jurassic volcanic and marine sedimentary rocks.

Slate - Graywacke Group

The slate - graywacke group of rocks mapped in part by Capps (1937) is the most prevalent rock exposed on Kodiak Island and has been dated as Cretaceous by Moore (1967). This group of rocks is composed mainly of dark gray, brittle slate, argillite, and graywacke with minor discontinuous lenses of conglomerate and slightly altered tuff.

TERTIARY ROCKS

The sediments to the east of the major northeast trending normal fault extending from Kalsin Bay to Portage Bay and probably beyond to the south have been dated as Tertiary (Moore, 1967).

This group of sediments includes the entire Tertiary sequence from Paleocene to Pliocene and includes both marine and continental sediments. The Tertiary rocks include shales, sandstones, and conglomerates. The sandstones consist of subangular to rounded grains of predominantly quartz with minor feldspar, chert and other rock types. The conglomerates contain pebbles of chert, graywacke, limestone and granitic rocks.

QUATERNARY ROCKS

Quaternary deposits consist of glacial till and glaciofluvial outwash. These are unsorted sediments that cover extensive areas in the western part

of Kodiak Island and form deposits at the heads of the bays representing material from melting glaciers.

INTRUSIVE ROCKS

An elongate granodiorite mass occupies the axial core of Kodiak Island and is continuous from Kizhuyak Bay on the north to Alitak Bay on the south. Petrographic examination of samples from this granodiorite mass shows that the texture is coarse to medium grained, consisting of quartz and light colored plagioclase feldspars with common darker minerals, predominantly biotite mica. The smaller intrusives are similar both in texture and chemical composition to the large granodiorite mass and represent satellite intrusives or genetically related rock masses. This relationship has led Capps (1937, p. 156) to believe that much of the Kodiak Island group is underlain by a large granodiorite mass.

Numerous dikes and sills that have similar chemical properties to the intrusives, but are of finer grained texture, were noted and mapped by Capps (1937, p. 157). These are usually associated with the intrusive bodies, but some occur without a direct relationship. Quartz veins are associated with these acidic dikes and sills, and sometimes carry sulfides.

Moore (1967) has mapped several ultramafic intrusives near the West Coast between Middle Cape North to Uganik Bay.

The minor quantities of platinum and chromite recovered from the beach placers were probably derived from the ultramafic bodies.

STRUCTURE

A normal fault of large displacement extends from Kaisin Bay in the north to Portage Bay at the south end of Kodiak Island and probably continues on through Alitak Bay and to the west of Tugidak Island. The east side of this fault is the downfaulted block bringing Tertiary sediments against Cretaceous sediments. Strike-Dip control indicates the Tertiary sediments in general are monoclinal with northwest dips. Tightly folded and overturned Tertiary structures were mapped along the eastern headlands.

Moore (1967) mapped an overthrust fault along the entire west side of the Kodiak Island group. This fault separates the surface Cretaceous outcrops from the Triassic-Jurassic volcanic and marine sediments (the greenstone and schist complex of Capps, 1937).

Several east-west trending faults were mapped by Moore (1967) in the central part of Kodiak Island and represent local stress adjustments.

MINERAL DEPOSITS

Placer Deposits: Gold placer deposits occur along the beaches in the north from Miners Point to Broken Point; along the south beaches of Strawberry Islands (not in the mapped area); from Rocky Point to Bear Point; along Bumble Bay (Red River) on the west side of the island and an attempt was made to work beach sands near Cape Alitak. The gold concentrations are believed to be the result of wave and current action on auriferous tills and quaternary gravels that form the sea cliffs along the coast. A direct genetic relationship between the placer gold and the gravels and tills has not been established since gold has not been found in these sediments. Maddren (1919) estimated that the maximum amount of gold extracted from the beach sands was $150,000. Capps (1937, p. 171) estimates, following direct communications with men involved in mining the placers, that this value is low.

The ultimate source of the placer gold was probably from quartz veins in the Cretaceous slates and graywackes of the interior part of the island.

Very minor quantities of platinum and chromite were recovered with the placer gold and the probable source of these metals is the ultramafic intrusives.

Lode Deposits: The gold lode deposits are associated with the quartz diorite intrusives and with dikes and sills that are probably related at depth to the intrusives. The host rocks are generally the slates and graywackes of Cretaceous age.

Capps (1937) has described in some detail the locations where some exploration work was completed in mineralized areas. His descriptions have been condensed and are described below (the areas have been numbered for easy map locating):

1. Barling Bay Prospects: Three distinct quartz veins known as the Brown Bear, Old Harbor, and Silver Queen lodes are located on a group of claims staked in 1933 and 1934. Minor open cuts and pits and a 40' tunnel constitute the development/prospecting work done on these lodes. The country rocks are slate and graywacke. The vein at its widest point shows nearly 15 feet of shattered and crushed quartz containing specks and bunches of sulfides, mainly arsenopyrite and pyrite.

2. Kizhuyak Lode: A system of quartz veins carrying sulfides and showing a conspicuous rusty color from oxidation of the sulfide. Development and exploration includes a 33' adit and several cuts. The major vein in the system shows 36 inches of white vein quartz that in places is heavily mineralized with mainly pyrite and arsenopyrite. Grab samples assayed 0.14 ounces of gold and 0.74 ounces of silver to the ton.

3. Women's Bay Lode: This lode is a quartz vein cutting diorite at least 600 feet along strike with a thickness from 12 to 14 feet. The vein consists for the most part of white quartz. The bulk of the quartz shows little mineralization and most of the sulfides were introduced

along with a second generation of quartz. Assays indicate the general tenor of the ore to be low. The development/exploration consisted of a 22 foot shaft and an adit 152 feet long. In 1934 both the adit and the shaft were caved and partially water filled.

4. Whale Island Prospect: Prospect consisted of a quartz vein cutting Mesozoic slates and graywacke. Development work consisted of a shaft now filled with water and the ruins of an arrastre. Gold values of the ore were said to be too low for commercial production.

5. Dry Spruce Island Prospect: System of discontinuous quartz veins with an 18 inch maximum thickness for one individual vein. The vein material shows little mineralization. Development work consists of a 30 or 40 foot shaft and a 92 foot adit.

6. Baumann & Strickler Mine: Vein cuts Mesozoic slates and graywackes. As exposed the vein consisted of two to eight inches of quartz bordered both above and below by a reddish gouge an inch or two thick. Free visible gold was noted in many samples. Development work consisted of only a few open cuts in 1934.

7. Brenneman Prospect: Vein said to reach a maximum of 2 - 1/2 feet in a 60' adit. Also said to carry visible free gold.

8. Moyle Prospect: Contact of diorite with dense contact metamorphic phase of the slate-graywacke series. No definitive vein, but consisted of bunches and stringers of quartz. Development work has consisted of three short adits.

9. Amok Gold Mining Co.: Gold-bearing quartz veins cutting black slate having a well-defined cleavage. Principal veins average three feet thick, with a maximum of five feet and are composed of quartz with minor pyrite. Development work consists of an adit 210 feet long, a shaft 130 feet deep, two drifts of 130 and 50 feet in length, and some surface trenching. An estimated $8,000 in gold is reported to have been produced from this prospect (Berg & Cobb, 1967, p. 83).

10. Uyak Bay Prospects: Consists of several small prospects. The country rock is schist or slate cut by quartz veins with a thickness of a few inches to about six feet. Predominate minerals are arsenopyrite and pyrite. Only a small amount of surface work has been done.

All of the prospects briefly outlined above are near water and their discovery is associated with their accessibility. Very little prospecting has been undertaken in the interior of Kodiak Island and especially along the flanks of the central granite diorite intrusive where mineralization would be expected and where the possibility of commercial ore deposits appear favorable.

In addition to the areas described by Capps (1937), all other mineral claims have been plotted on the geologic map with the commodities listed if known.

None of the attempts to mine lodes have been commercially successful, with the possible exception of the Amok claim at Uyak Bay which produced an estimated $8,000 (Berg & Cobb, 1967, p. 83). Other assays of quartz vein material have yielded gold values as high as $12.00/ton, but the average values are much lower.

Scheelite (tungsten ore) was found disseminated as fine grains and veinlets in quartzitic zones in graywacke near the head of Anton Larson Bay about 10 miles north of the town of Kodiak. Rose and Richter (1967) and Seitz, (U. S. Geological Survey 1963) concluded that these deposits are not commercial.

A copper prospect located on the northwestern side of Sitkalidak Island was examined by the U. S. Bureau of Mines in 1944 (Berg & Cobb, p. 88). The predominate sulfides noted were pyrite, pyrrhotite and chalcopyrite. Sampling yielded assays ranging from 0.09 percent copper to 5.52 percent. The U. S. Bureau of Mines in 1944 concluded the deposit was not commercial at that time (Berg & Cobb, 1967, p. 88).

Thin beds of coal have been reported in Tertiary sediments in the eastern Part of Kodiak and on Sitkinak Island. None of the coal exposed in surface outcrops has sufficient reserves to be considered commercial.

CONCLUSIONS

1. The geological conditions necessary for ore emplacement are present throughout the Kodiak Island Group. Especially favorable are the large number of intrusive masses and the associated dikes. The lithology of the host rocks is not as favorable, especially for larger replacement ore bodies which are usually associated with limestones or associated calcareous rocks.

2. The concentration of claims along the easily accessible areas related to water transport suggests that nearly all prospecting has been confined to these areas and that less than 20% of Kodiak Island has been adequately prospected.

3. The gold placers along the west and north shores of Kodiak Island are of localized interest. The gold concentrations are dependent on storm wave and current activity and there is doubt that similar conditions exist very far offshore. This lessens the probability of offshore gold placers.

4. The oil potential of the Shelikof Straits is almost unknown, although it is believed that a thin marine Tertiary section is present. The water depth of 600' and severe winds and waves may prevent drilling in the near future.

5. The most optimistic area for oil production is offshore east and southeast of Kodiak Island in the Gulf of Alaska and along a trend to the south of Kodiak Island.

6. No economic coal or lignite deposits have been discovered in the Tertiary sediments.

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