

GEOLOGICAL SURVEY CIRCULAR 207



RECONNAISSANCE FOR  
RADIOACTIVE DEPOSITS IN THE  
SOUTHERN COOK INLET REGION  
ALASKA, 1949

By Robert M. Moxham and Arthur E. Nelson



UNITED STATES DEPARTMENT OF THE INTERIOR

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# RECONNAISSANCE FOR RADIOACTIVE DEPOSITS IN THE SOUTHERN COOK INLET REGION ALASKA, 1949

## PART 1. -- ILLIAMNA LAKE-LAKE CLARK REGION

### ABSTRACT

Reconnaissance for radioactive deposits in the Iliamna Lake-Lake Clark region undertaken in 1949 included the examination of two silver-lead occurrences and five copper deposits, one of which had been reported earlier to contain uranium; the radiometric testing of numerous concentrates from gravels of streams draining the more inaccessible areas; and about 310 miles of radiometric traversing with portable survey meters. The maximum equivalent uranium content of any material tested did not exceed 0.009 percent.

### INTRODUCTION

One of the principal mineralized areas in southwestern Alaska is in the Alaska Range south of Lake Clark. Mining exploration and development flourished until about 1925 but gradually dwindled chiefly because of transportation difficulties. However, in recent years, roads connecting Iliamna Lake with tidewater and with Lake Clark have been built and two new airfields constructed. The improved transportation facilities have resulted in renewed interest in mining in this area. Exploration and development are being undertaken at several prospects by both private interests and the U. S. Bureau of Mines.

Most of the mining properties in this region are valued for their copper content although some contain silver, lead, gold, or hematite, or combinations of these metals in potential commercial quantities. A yellow mineral, identified as a possible uranium compound, was reported some years ago to occur at the McNeil prospect, 30 miles south of Iliamna Lake.

The information concerning the McNeil property and the occurrence of silver, lead, and hematite at other prospects in this region seemed to warrant a field investigation of the metaliferous deposits of the Iliamna Lake-Lake Clark region. The party, consisting of R. M. Moxham and A. E. Nelson, geologists, and J. C. Whitaker and Henry Bender, camp assistants, was in the field from mid-July through August 1949. This investigation was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

### GEOGRAPHY

The Iliamna Lake-Lake Clark region of southwestern Alaska is situated at the northern extremity of the Alaska Peninsula (pl. 1). The center of the area is about 200 miles southwest of Anchorage. Iliamna, on the north shore of Iliamna Lake near the mouth of the Newhalen River (pl. 1), is the principal center of population and source of supplies. Transportation is chiefly by air. One bush pilot, located at Tanalian Point on Lake Clark, has a permanent base in the area, and transient planes are usually available for local transportation from Iliamna. Three commercial airlines offer service to Iliamna from Anchorage and the Bristol Bay area. Most light freight is brought in by air; heavier items are either transported by barge from Bristol Bay or shipped to Iliamna Bay and trucked across the mountains to Pile Bay at the east end of Iliamna Lake. Two airstrips are located in the region, one at Iliamna, the other at Tanalian Point. Both will accommodate multiengine aircraft.

### GEOLOGY

The brief description of the geology of the Iliamna Lake-Lake Clark region given below has been summarized from a report by Capps.<sup>1</sup>

A group of highly metamorphosed gneisses, schists, and quartzites that crop out east of Pile Bay and near the north end of Lake Clark are thought to be the oldest rocks in this region. They are undoubtedly pre-Triassic and probably are mainly early Paleozoic and in part pre-Cambrian in age. Crystalline limestone and calcareous schists overlie the early Paleozoic rocks, and, although they are nonfossiliferous, they are probably of Paleozoic age. Late Paleozoic or Mesozoic slates, locally interbedded with chert, crop out at the head of Iliamna Bay and northeast of Lake Clark. Late Paleozoic or Triassic greenstones occur in the area extending from the east end of Iliamna Lake to the head of Lake Clark. The greenstones include tuff, porphyry, banded aphanitic rock, amphibolite, and pyroxenite. Limestones of Late Triassic age crop out in two small areas: one on the north shore of Iliamna Lake at Chekok Bay, the other east of Pile Bay. A group of lavas, tuffs, and associated sedimentary rocks probably of Early Jurassic age occur throughout the

<sup>1</sup>Capps, S. R., 1935, The southern Alaska range: U. S. Geol. Survey Bull. 862, pp. 35-97.

Iliamna Lake-Lake Clark region. The composition of the lavas ranges from basalt to rhyolite. They are interbedded with tuffs and a few beds of argillite, graywacke, and limestone. A narrow belt of argillite, slate, and graywacke, probably of Cretaceous age, crops out in the vicinity of Kontrashibuna Lake. Lava flows and tuffs of Tertiary age occur along the south shores of Iliamna Lake and near the south end of Lake Clark. Mesozoic granitic rocks of the Coast Range batholith form the core of the Aleutian Range. They crop out in a belt trending southwestward and lying between Lakes Iliamna and Clark and Cook Inlet to the east. In general the rock is a gray coarse-grained granite; in some localities a gneissic character is exhibited. Vast areas, particularly in the western part of the region, are covered by Pleistocene and Recent glacial deposits and outwash and alluvial deposits of present streams.

### RADIOACTIVITY INVESTIGATIONS

The field studies made during 1949 included the investigation of four copper prospects, one copper-iron prospect, two silver-lead prospects, ore from a molybdenum prospect, and one placer-gold mine; 14 placer samples were collected; and about 240 miles of radiometric surveys were made by boat, 40 miles by truck, and 30 miles on foot.

A standard make of a portable survey meter, modified to accept a probe consisting of four 1- by 18-inch gamma tubes connected in parallel, was used in all radiometric traversing. Individual tests at outcrops were made with a 6-inch beta tube. At some localities rock and ore samples were taken for laboratory checks against field observations. Concentrates were collected from surface gravels of streams draining several different areas to determine if radioactive minerals are being eroded from the different rock types known to occur in the more inaccessible parts of watersheds, for which time was not available to permit direct observation.

The rock and ore samples were crushed, and the equivalent uranium content of the unconcentrated material determined in the laboratory; the equivalent uranium content of the heavy mineral fractions (those greater than 3.3 specific gravity) of both rock and placer samples was also determined. Results of these studies are shown in tables 1 and 2: table 1 gives the data on rock and ore samples collected; table 2 gives the data on concentrates from surface gravels of streams draining the relatively more inaccessible areas of the region.

### Copper prospects

**McNeil claims.** --Claims staked by Charles McNeil are located near the mouth of Crevice Creek, a western tributary of the middle fork of Paint River (sample locality 15, pl. 1). The prospect is about 15 miles west of McNeil Cove on Kamishak Bay and was accessible by wagon road in former years. Copper sulfides with a calcite and epidote gangue have been deposited along the contact between the Paleozoic gneiss and schist and granitic intrusive rocks.

A few prospect pits and a tunnel were dug but they are insufficient to determine the size of the ore

body. About 1922, approximately 10 tons of ore was shipped to the Tacoma smelter. According to Mather,<sup>2</sup> assay returns gave \$2.50 in gold, 15 ounces of silver, and 17.55 percent copper per ton.

Three mineralized zones on the McNeil property in the valley of Crevice Creek were examined. No radiation anomalies were noted. The yellow color of the altered limestones, which apparently was the material McNeil thought to be uranium bearing, is due to epidote. Two representative samples of the mineralized rock from the northernmost (sample 15) and southernmost (sample 16) outcrops contain 0.001 and 0.002 percent equivalent uranium, respectively. The heavy mineral fraction in sample 16 contains 0.009 percent equivalent uranium; as sodium fluoride bead tests for uranium were negative, this radioactivity is ascribed to thorium.

**Dutton claims.** --The claims of the Dutton Mining and Development Co. are located in the valley of Silver Creek (sample location 28, pl. 1), about 8 miles southwest of the village of Pile Bay. The veins have been injected along the contact between the Triassic limestone and a greenstone. The mineralized zone, about 200 feet in width, consists of an aggregate of epidote and calcite interlaced with quartz veinlets. Chalcopyrite was the only copper mineral observed. Extensive development work was carried out from 1902 to 1905, but no ore is known to have been shipped, and no development work has been undertaken since that time.

Only 30 feet of the adit at the Dutton copper property was accessible, but dump material from the underground workings was examined. No radioactivity was detected. A caved tunnel a short distance north and prospect pits south of the Dutton adit were also checked, with negative results.

**Copper King claims.** --Another area of copper deposits has been found near the head of Iliamna Bay. Several trenches and pits have been excavated on the Copper King claim, located a few hundred yards south of the Iliamna Bay-Pile Bay road, about  $1\frac{1}{2}$  miles west of the head of Iliamna Bay. (See pl. 1.) Small masses of garnet- and magnetite-bearing rock impregnated with chalcopyrite occur along the contact between the granite and greenstone. The claims have been abandoned for many years. No radiation anomalies were detected at or in the immediate vicinity of the Copper King claims.

**Millet claims.** --The Millet copper claims (sample location 14, pl. 1) are located on the north shore of Iliamna Lake, 13 miles east of Iliamna. Copper sulfides and calcite gangue have cemented a shattered limestone in a zone about 20 to 40 feet wide, which has been traced some 3,500 feet horizontally. Development has been carried on sporadically since the discovery of the lode about 1902, but no ore has been shipped. During 1949 a drilling and trenching program was being conducted by the U. S. Bureau of Mines.

The prospect trenches of the Bureau of Mines and dump material at the head of a flooded shaft were examined radiometrically. A traverse also was made along the strike of the mineralized zone. No

<sup>2</sup>Mather, K. F., 1925, Mineral resources of the Kamishak Bay region (Alaska): U. S. Geol. Survey Bull. 773-D, p. 174.



Table 1.--Data on rock and ore samples from the Iliamna Lake-Lake Clark region

Sample no.		Percent equivalent uranium		Concentration ratio	Description and location
Field	File	Unconcentrated	Heavy-mineral fraction <sup>1</sup>		
49AMx7	3773-L	0.002	0.001	2:1	Thompson claims, Kijik River, south prospect; vein material, arsenopyrite, galena, sphalerite.
8	3773-L	.000	.000	1:1	Thompson claims, Kijik River, north prospect; vein material, arsenopyrite, galena, sphalerite.
9	3774-L	.001	.003	60:1	South shore Iliamna Lake; tuff.
14	3779-L	.000	.000	5:1	Millet claims, north shore Iliamna Lake; copper ore.
15	3780-L	.001	.003	400:1	McNeil claims, Paint River; copper ore.
16	3781-L	.002	.009	6,100:1	Do.
20	3785	.000	.000	2:1	Kasna Creek; copper ore, float.
21	3786-L	.000	.000	2:1	Do.
22	3787-L	.000	.000	1:1	Do.
25	3790-L	.002	.003	45:1	Thompson claims, Kijik River, upper prospect; molybdenite-bearing granite.
27	3792-L	.000	.000	1:1	Duryea claims, Silver Creek; silver ore.
28	3793-L	.000	.000	1:1	Dutton claims, Silver Creek; copper ore.

<sup>1</sup>that greater than 3.3 specific gravity.

Table 2.--Data on concentrates obtained from gravels of streams in the Iliamna Lake-Lake Clark region

Sample no.		Percent equivalent uranium Heavy-mineral fraction <sup>1</sup>	Location
Field	File		
49AMx10	3775	0.001	Dennis Creek.
11	3776	.000	Pile Bay tributary.
12	3777	.002	Pile River.
13	3778	.001	Pile Bay tributary.
17	3782	.007	East shore, Lake Clark.
18	3783	.004	Kijik River.
19	3784	.001	Lake Clark tributary near Tanalian Point.
26	3791	.001	Tanalian River.
29	3794	.001	Little Lake Clark, south tributary.
30	3795	.003	Do.
31	3796	.005	Chokotonk River.
32	3797	.000	Hatchet Creek.
33	3798	.003	Portage Creek.

<sup>1</sup>that greater than 3.3 specific gravity.

anomalous radiation was noted at any locality on this property.

#### Copper-iron prospect

**Kasna Creek claims.** -- A group of claims has been staked on the east side of Kasna Creek, about 2 miles from its mouth on Kontrashibuna Lake (sample locations 20-22, pl. 1). Several parallel mineralized zones carrying hematite, chalcopyrite, and gangue minerals have been found in the limestone country rock. Very little development work had been done before 1949, at which time the U. S. Bureau of Mines began an exploration program. The trenches made by the Bureau on the westernmost of three parallel zones of mineralization provided excellent exposures, and numerous outcrops of ore occur in the two more easterly zones. Radiometric tests gave negative results.

#### Silver-lead prospects

**Duryea claims.** -- The Duryea claims (sample location 27, pl. 1) are about 1 mile north of the Dutton prospect. The ore body, valued chiefly for its silver content, is located along the same contact between limestone and greenstone as the Dutton copper deposit. Silver-bearing galena occurs with sphalerite and pyrite as fracture fillings in the brecciated limestone. Capps<sup>3</sup> states that in 1909 the owner reported assays up to 196 ounces of silver, \$20 in gold, 35 to 50 percent lead, and 15 to 20 percent zinc per ton. Extensive underground and surface development work has been done in the past, but no ore is known to have been shipped. As underground workings are now caved and flooded, only dump material was tested. No radioactive material was found.

**Thompson claims.** -- Recently a silver-lead prospect has been staked in the valleys of two parallel western tributaries of the Kijik River, about 7 miles northwest of Kijik (sample locations 7, 8, pl. 1). Arsenopyrite and a little galena, chalcopyrite, and pyrite in a gangue of calcite and rhodochrosite have been deposited in a shear zone in the granite country rock. Very thin veinlets carrying pyrite and a few grains of chalcopyrite have been injected along numerous parallel joints in a zone about 200 yards wide. Radio-

metric tests were made at several prospect pits on the silver-lead claims, and radiometric surveys were made throughout the general area in which these claims are located. The radioactivity at this locality averages about double the normal background for the region. The detailed examination, however, of the silver-lead showings and other sulfide-bearing veinlets in the mineralized zone revealed no concentration of radioactive material. The higher readings are thought to have been caused by radioactive minerals sparsely distributed through a large mass of granite country rock rather than from local concentrations of radioactive minerals.

#### Molybdenite prospect

**Thompson claim.** -- Samples of molybdenite-bearing granitic float from a claim near the top of the Kijik Mountain (sample location 25, pl. 1) above the silver-lead prospect were donated by Mr. Joe Thompson, the owner. None gave any indication of radioactivity.

#### Placers and nonmetalliferous rocks

With the exception of the Upper Cretaceous argillites and slates, some lithologic variety of every unit described under "Geology" (p. 1) was found at some point during the 310 miles of radiometric traversing. None is significantly radioactive, and the placer samples in this area contain no radioactive minerals of interest.

#### SUMMARY AND CONCLUSION

In the course of the 1949 reconnaissance in the Iliamna Lake-Lake Clark region all the accessible lode prospects in the area were examined. These included five copper prospects, one of which contains considerable amounts of hematite, and two silver-lead prospects. No concentration of radioactive material was found at any of the prospects. In addition, samples of molybdenite-bearing granitic rock were tested radiometrically, with negative results. Concentrates from gravels of streams draining the more inaccessible areas of the region were also tested and showed no appreciable radioactivity. From the data gathered in the course of this reconnaissance it seems unlikely that deposits of high-grade uranium ores occur in association with the metalliferous lodes of the Iliamna Lake-Lake Clark region.

<sup>3</sup>Capps, S. R., op. cit., pp. 93-94.

## PART 2. -- JAKOLOF BAY AREA

### ABSTRACT

As a result of inquiries by prospectors in 1948 concerning radioactive ores in the vicinity of Jakolof Bay on the Kenai Peninsula in southern Alaska, the Geological Survey conducted a brief investigation there during 1949. No radioactive material was found. Possibly a chromite stock pile in this locality was mistaken for pitchblende.

### INTRODUCTION

During the summer of 1948 prospectors were reported to have made inquiries at the Fairbanks Office of the Territorial Department of Mines concerning the legality of staking claims for radioactive ores on a "government reserve" at Jakolof Bay, on the Kenai Peninsula, 6 miles east of Seldovia.

The Survey party conducting investigations in the Iliamna Lake-Lake Clark region (see part 1 of this report) spent about one week making a radiometric reconnaissance of the Jakolof Bay area (fig. 1) in late June and early July 1949.

### GEOLOGY AND MINING

The geology of the Jakolof Bay area has been described in a general way in reports by Martin, Johnson, and Grant,<sup>4</sup> Gill,<sup>5</sup> and Guild.<sup>6</sup>

<sup>4</sup>Martin, G. C., Johnson, B. L., and Grant, U. S., 1915, *Geology and mineral resources of Kenai Peninsula, Alaska*: U. S. Geol. Survey Bull. 587.

<sup>5</sup>Gill, A. C., 1922, *Chromite of Kenai Peninsula, Alaska*: U. S. Geol. Survey Bull. 742.

<sup>6</sup>Guild, P. W., 1942, *Chromite deposits of Kenai Peninsula, Alaska*: U. S. Geol. Survey Bull. 931-G, pp. 139-175.

The rocks in the vicinity of Jakolof Bay consist chiefly of highly metamorphosed graywacke and slate, and minor amounts of limestone and basic igneous material. These strata are probably Triassic in age. Many small acidic dikes, probably late Mesozoic in age, intrude the Triassic rocks.

According to Rutledge,<sup>7</sup> the only mining in the vicinity of Jakolof Bay has been at the chromite deposits on Red Mountain where some chrome ore was produced during 1942-44.

### RADIOACTIVITY INVESTIGATIONS

Detailed radiometric traverses were made on foot on the Government-owned mill site on Jakolof Bay, where tests included examination of a stock pile of chromite from the deposits at Red Mountain. No radiation anomalies were detected. Additional traverses were made by boat along the shores of Jakolof Bay and the southwest shore of Tutka Bay (fig. 1), also with negative results.

Samples of the Mesozoic graywacke and an acidic dike were collected; and four placer concentrates were panned from the gravels of streams draining the mountain on the southwest side of Jakolof Bay. No significant amount of radioactive minerals was found in any of the samples. Results of the laboratory studies of the samples are shown in table 3.

### CONCLUSION

No radioactive materials of any consequence occur in the immediate vicinity of Jakolof Bay.

<sup>7</sup>Rutledge, F. A., 1946, *Exploration of Red Mountain chromite deposits, Kenai Peninsula, Alaska*: U. S. Bur. Mines Rept. Inv. 3885.

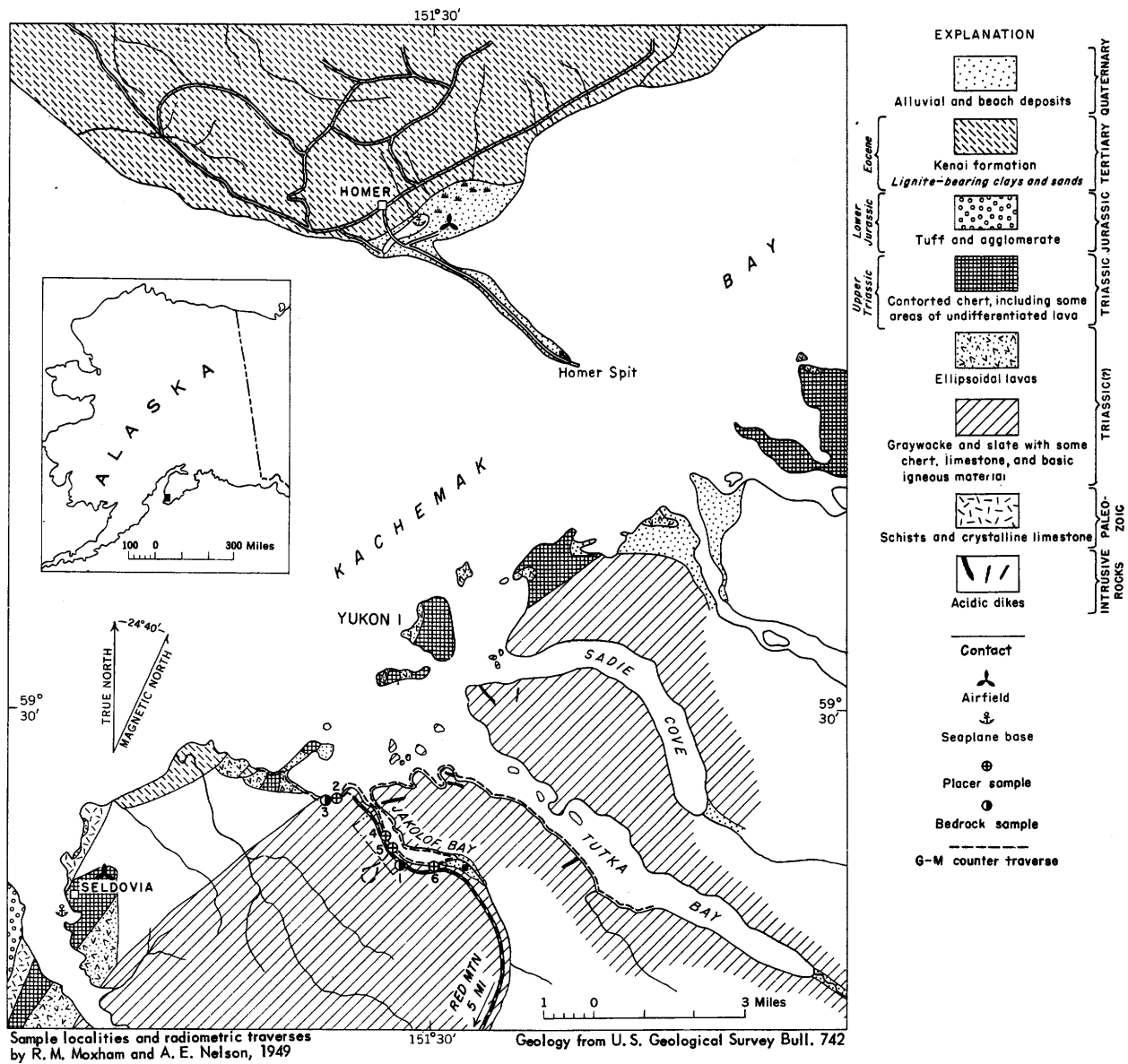


Figure 1.--Geologic map of Jakolof Bay area, Alaska.

Table 3.--Data on samples collected in the Jakolof Bay area

Sample no.		Percent equivalent uranium		Concentration ratio	Description and location
Field	ATE file	Unconcentrated sample	Heavy-mineral fraction (greater than 3.3 sp.gr)		
1	3766-L	0.000	0.002	23:1	Graywacke, south shore of Jakolof Bay.
2	3767	---	.001	--	Concentrate from surface gravel, first stream west of Jakolof Bay.
3	3768-L	.001	.006	374:1	Acidic dike west of location of sample 2.
4	3769	---	.007	---	Concentrate from surface gravel, west tributary of Jakolof Bay.
5	3770	---	.001	---	Do.
6	3771	---	.003	---	Do.

