UNITED STATES DEPARTMENT OF THE INTERIOR
Douglas McKay, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

GEOLOGICAL SURVEY CIRCULAR 248

PRELIMINARY SUMMARY OF RECONNAISSANCE FOR URANIUM AND THORIUM IN ALASKA, 1952

By Helmuth Wedow, Jr. and others

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Washington, D. C., 1953
Free on application to the Geological Survey, Washington 25, D. C.

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ABSTRACT

Reconnaissance for uranium and thorium in Alaska during 1952 was centered chiefly in parts of the lower Yukon-Kuskokwim region and northeastern, east-central, south-central, and southeastern Alaska.

Reconnaissance in the northern part of Prince of Wales Island and parts of adjacent islands in southeastern Alaska found that the radioactive carbonate-hematite veins in the vicinity of Salmon Bay are probably limited in areal extent to the Prince of Wales Island coast from near Exchange Cove to Point Colpoys. The veins seem to be almost entirely thorium-bearing at the surface and range from less than 1 inch to about 2 feet in thickness. They contain a maximum of about 0.1 percent equivalent uranium and an average of about 0.03 percent equivalent uranium. Investigations in the Hyder area and the Taku Harbor-Point Astley district failed to locate significant concentrations of uranium minerals.

No uraniferous lodes were discovered in the Koyukuk-Chandalar region, nor was the source of the monazite, previously reported in the placer concentrates from the Chandalar mining district, located.

The source of the uranothorianite in the placers at Gold Bench on the South Fork of the Koyukuk River was not found during a brief reconnaissance, but a placer concentrate was obtained that contains 0.18 percent equivalent uranium. It is about ten times more radioactive than concentrates previously available from the area.

Reconnaissance for possible lode concentrations of uranium minerals in the vicinity of reported fluorite occurrences in the Hope Creek and Miller House-Circle Hot Springs areas of the Circle quadrangle and in the Fortymile district, east-central Alaska, found 0.055 percent equivalent uranium in a float fragment of ferruginous breccia in the Hope Creek area; analysis of samples obtained in the vicinity of the other fluorite occurrences showed a maximum of only 0.005 percent equivalent uranium. Examination of silver-lead and molybdenum occurrences and of a reported nickel prospect in the eastern Alaska Range revealed no radioactivity in excess of 0.004 percent equivalent uranium. Samples taken during radiometric reconnaissances at a zeunerite-bearing copper lode in the Russian Mountains and two molybdenum lodes along the lower Yukon River in the lower Yukon-Kuskokwim region contain no more than 0.004 percent equivalent uranium.

Radiometric tests in the Nelchina area and Prince William Sound, south-central Alaska, and in the York tin district, Seward Peninsula, by Geological Survey parties conducting other investigations found no new occurrences of rocks or ore deposits containing significant quantities of radioactive minerals.

INTRODUCTION

The major objective of the Geological Survey's Alaskan uranium and thorium reconnaissance program is the discovery of high-grade uranium deposits. The appraisal in 1950-51 of Alaskan uranium possibilities (Wedow and others, 1951) led to the reconnaissance, in 1951-52 of many deposits considered favorable for the occurrence of uranium because they contain mineral assemblages characteristic of uranium deposits elsewhere in the world. The results of the work done in 1951 have been reported by White and others, (1952); West and White, (1952); White and West, (1952); West, (1952); and Houston (1952). The major investigations conducted in 1952 were centered largely in the lower Yukon-Kuskokwim region and in northeastern, east-central, and southeastern Alaska (pl. 1). This program was carried out on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission. Radiometric tests also were made by regular Geological Survey parties working in the York tin district, the Nelchina area, and Prince William Sound (pl. 1).

The radiometric tests conducted during the 1952 examinations were made with standard commercial models of portable survey meters modified to accept a variety of probes (Wedow, 1951). For traversing on foot, the survey meters with 2- by 20-inch gamma probes were mounted on packboards; for spot work on outcrops 6-inch beta probes were used in place of the 2- by 20-inch gamma probes. Carborne or airborne (with light planes and helicopters) traversing incidental to transportation to and from the areas of interest was accomplished with probes consisting of three to six 2- by 40-inch gamma tubes.

Helicopter and light-plane support for the work in the lower Yukon-Kuskokwim region was furnished by the U. S. Army, 30th Engineer Base Topographic Battalion, Forward Echelon Headquarters, at Unalakleet. Similar helicopter support for a part of the work in the Circle quadrangle was obtained from the Topographic Division of the Geological Survey. Arthur E. Glover, Territorial Department of Mines assayer-engineer at Ketchikan, spent a few days with the party investigating the Salmon Bay radioactive carbonate-hematite veins in southeastern Alaska.

Preliminary results of the investigations made in 1952 are described briefly below. All equivalent uranium analyses were made in the Fairbanks Radioactivity Testing Laboratory of the Geological Survey at the campus of the University of Alaska at College.

DESCRIPTIONS OF INVESTIGATIONS

Lower Yukon-Kuskokwim region

By W. S. West

Reconnaissance in the lower Yukon-Kuskokwim region consisted of the radiometric examination of a zeunerite occurrence in the Russian Mountains (no. 1, pl. 1) and molybdenite occurrences in the Marshall area (no. 2, pl. 1) and in the southern Kaiyuh Mountains (no. 3, pl. 1). A proposed investigation of a silver-lead deposit in the northern Kaiyuh Mountains could not be made because of inadequate transportation facilities. These examinations were made from mid-July to mid-August by W. S. West, geologist, and G. M. Haselton, field assistant. Data on the localities examined in the lower Yukon-Kuskokwim region are summarized in table 1.

Russian Mountains. —Mineralogic studies in 1948 by Moxham (1950) disclosed traces of zeunerite in a concentrate from a copper-bearing vein in the Russian Mountains. The maximum equivalent uranium content of samples, collected during 1952, in this area is 0.004 percent. These samples were found in the quartz monzonite country rock. Ice completely closed the adit of the Konechney prospect, which contains the zeunerite-bearing copper ore; all other openings on this property were covered by rock slides or were caved. Old ore and tailings piles near the workings on the Konechney prospect were searched for radioactive materials, but none were found.

Marshall area. —Negative results were obtained in radiometric tests on copper-lead-molybdenum lodes in the Marshall area. Samples collected show only 0.001 percent or less equivalent uranium.

Southern Kaiyuh Mountains. —The McLead molybdenite prospect in the southern Kaiyuh Mountains consists of quartz veins containing iron and molybdenum minerals that cut rhyolite porphyry. The vein material contains less than 0.001 percent equivalent uranium; the rhyolite porphyry contains 0.003 percent equivalent uranium.

Koyukuk-Chandalar region

By A. E. Nelson

In late August, A. E. Nelson, geologist, and R. G. Smith, field assistant, briefly examined the localities of two previously reported (White, 1952, pp. 8-12) placer occurrences of radioactive minerals in the Koyukuk-Chandalar region. They attempted to locate the bedrock sources of the minerals or, if this was not possible in the limited time available, to duplicate the radioactive placer concentrates. These localities are at Gold Bench on the South Fork of the Koyukuk River (no. 4b, pl. 1) and in the Chandalar mining district (no. 4a, pl. 1). In addition, airborne radiometric traverses in light planes, coincidental to flying for other purposes, were made over the areas surrounding the two localities as well as over a number of intermediate localities showing large gossan zones, which might be the surface expression of significant zones of mineral deposits or alteration. No radioactivity anomalies were discovered in the course of the airborne traversing; however, much of the area in the drainage of the South Fork of the Koyukuk River upstream from Gold Bench has a widespread cover of overburden and vegetation (tundra, moss, and muck) that renders radiometric surveying with the equipment available (see "Introduction") ineffective. Summary data on the Gold Bench area and the Chandalar mining district are given in table 2. The results of the ground examinations in the two areas are discussed briefly below.

Chandalar mining district. —No radioactivity in excess of 0.001 percent equivalent uranium was found at any mining properties or localities examined in the Chandalar mining district. The mineralized zones, in which the lode deposits occur, do not contain large concentrations of metallic minerals and no radioactive minerals were found in them.

The source of the placer monazite previously reported (White, 1952, table 4) in the district was not found. Preliminary radiometric examination of concentrates taken from placers in 1952 did not reveal even traces of the radioactivity that was previously reported (White, 1952, table 4) in samples from the district.

Gold Bench area. —Radiometric traverses on the ground at Gold Bench, a placer-gold mining camp on the South Fork of the Koyukuk River, revealed no significant radioactivity. However, one placer concentrate obtained in 1952 has approximately 0.18 percent equivalent uranium. Laboratory studies to date indicate that the chief radioactive mineral is uranothorianite. This verifies the statement made by White (1952, p. 8 and table 3) that the radioactivity of an older placer concentrate from Gold Bench is due to "traces of uranium-bearing thorianite(?)." The source of the gold mined from the gravels at Gold Bench is unknown; however, Maddren (1913, p. 106) suggests that the source area of the gold is in the mountains on the south side of the South Fork of the Koyukuk River.

As hematite and traces of bismuth, copper, lead, tin, and tungsten minerals are associated with uranothorianite at Gold Bench it is likely that the radioactive minerals have been derived from a metalliferous lode source, possibly a vein, in the drainage area above Gold Bench. Considering the widespread cover of tundra and muck in this area, the most feasible way to search for the source lode of the uranothorianite would be by the radiometric testing of placer concentrates, similar to that used by West and Matzko (1952) on the eastern Seward Peninsula. Special emphasis should be given to the gravels of short tributaries draining the hills along the southeast side of the South Fork.

Circle quadrangle

By W. S. West and J. J. Matzko

Fluorite has been reported in the Hope Creek area (no. 5a, pl. 1) (Prindle, 1910, p. 208) and the Miller House-Circle Hot Springs area (no. 5b, pl. 1) (White and Tolbert, 1952) of the Circle quadrangle. The localities of these occurrences were examined for the possibilities of lode concentrations of uranium during the summer of 1952 by W. S. West, geologist, and G. M. Haselton, field assistant. Part of the work in the Miller House-Circle Hot Springs area was done by J. J. Matzko, geologist, and Fred Freitag, field assistant. A preliminary summary of the data on these two areas is given in table 3 and discussed briefly below.

Hope Creek area. —No evidence could be found of the reported quartz-pyrite-fluorite veins in the Hope Creek area. No bedrock (granite, dikes, and veins) in the area contains more than 0.004 percent equivalent uranium, although a float fragment of iron-stained, limonite-cemented "breccia" in granite talus between Hope and American Creeks contains 0.055 percent equivalent uranium. Until final laboratory tests have been completed, it is presumed that the radioactive elements in this sample are an impurity in the limonite.

Miller House-Circle Hot Springs area. —Search for lode concentrations of uraniferous fluorite or attendant concentrations of other uranium minerals in the Miller House-Circle Hot Springs area was unsuccessful. The maximum equivalent uranium content of samples collected was 0.005 percent. Fluorite, previously reported in granitic bedrock only on Deadwood Creek, was identified in vugs of granitic rock on Portage Creek. Preliminary laboratory studies have isolated a nonfluorescent, yellow-green, uranium mineral (not listed in table 3) from a sample of granitic bedrock from Portage Creek, but it has not yet been identified. As previously reported (White and Tolbert, 1952) placer concentrates from gravels on this creek contain in the 0.0X range of percent equivalent uranium. A water sample from Portage Creek contains 40.2×10^{-7} percent uranium. This is a relatively high concentration as the average uranium content of sea water is 1.1×10^{-7} percent (Koczy, 1951) and thus may indicate the significance of using a water-sampling technique to locate possible lode concentrations of uranium in this area. Such a technique, or one other than straight radiometric traversing,

Table 1.--Preliminary data on localities examined in the lower Yukon-Kuskokwim region during 1952

Locality	Geology	Mineralogy	Radioactivity of samples in percent eU[1]
Russian Mountains (no. 1, pl. 1).	Graywacke and slate of Cretaceous age intruded by quartz monzonite of Tertiary age; basalt of Tertiary age and Quaternary alluvium, glacial deposits, alluvium, and glacial outwash; ore deposits are fissure veins and breccia filling in quartz monzonite.	Bedrock: quartz monzonite------------ Vein material: arsenopyrite, chalcopyrite, pyrite, malachite, chrysocolla, limonite, hematite, arsenic compounds, quartz, and zeunerite.	0.004 .002 or less
Marshall area (no. 2, pl. 1).	Greenstone of Late Carboniferous age and argillites, sandstone, quartzites, and conglomerates of Upper Cretaceous age intruded by soda granite, quartz diorite, diorite, and dacite of Tertiary or early Mesozoic age; ore deposits are quartz veins in Upper Cretaceous sedimentary rocks.	Bedrock: soda granite---------------- Bedrock: diorite-------------------- Bedrock: mineralized sediments-------- Vein material: pyrite, galena, chalcopyrite, molybdenite, gold, magnetite, anglesite, wulfenite, malachite, quartz, and calcite.	.001 .001 < .001 < .001
Southern Kaiyuh Mountains (no. 3, pl. 1).	Rhyolite porphyry and quartz veins of Mesozoic age.	Bedrock: rhyolite porphyry----------- Vein material: molybdenite, molybdite, pyrite, limonite, hematite, and quartz.	.003 < .001

[1] Equivalent uranium.

Table 2.--Preliminary data on localities examined in the Koyukuk-Chandalar region during 1952

Locality	Geology	Mineralogy	Radioactivity of samples in percent eU[1]
Chandalar mining district (locality 4a, pl. 1).	Schist of early Paleozoic age intruded by granitic gneiss of Silurian or Devonian age; several zones of metallic mineral-bearing quartz veins occur in the district and are probably related genetically to the granitic intrusive.	Ore minerals in veins: sphalerite, arsenopyrite, galena, stibnite, pyrite, chalcopyrite, gold, and silver. Placer concentrates: minerals in concentrates include hematite, pyrite, arsenopyrite, monazite, scheelite, galena, chalcopyrite, and gold (White, 1952, table 4).	0.001 .001 or less

Gold Bench area (locality 4b, pl. 1).	Chert, slate, greenstone, tuff, and diabase of early Paleozoic age occur in the area around Gold Bench, which is a deposit of stream gravels overlying a thick series of unconsolidated wash deposits.	Placer concentrates: magnetite, garnet, hematite, zircon, sphene, pyrite, scheelite, galena, chalcopyrite, rutile, cinnabar, cassiterite, bismuthinite, gold, and thorianite(?) (White, 1952, table 3)	.18

[1] Equivalent uranium.

Table 3.--Preliminary data on localities examined in the Circle quadrangle during 1952

Locality	Geology	Mineralogy	Radioactivity of samples in percent eU[1]
Hope Creek area (5a, pl. 1).	Pre-Cambrian Birch Creek schist intruded by granite and dikes of Tertiary age; Quaternary alluvium.	Bedrock: granite, some of which is reported to contain tourmaline and fluorite.	0.004 or less
		Iron-stained "breccia" float in granite talus: contains goethite, zircon, tourmaline, quartz, and feldspar.	.055
		Granitic dikes in granite------------	.004 or less
		Quartz veins in granite--------------	.002
		Quartz-tourmaline vein in granite-----	.002
Miller House-Circle Hot Springs area (5b, pl. 1).	Pre-Cambrian Birch Creek schist intruded by granitic rocks and dikes of Mesozoic(?) age; Quaternary alluvium.	Bedrock: granite contains zircon, sphene, apatite, fluorite, allanite, malachite, muscovite, biotite, chlorite, magnetite, hematite, ilmenite, altered zircon, pyrite, galena, anatase, and rutile as accessory minerals.	.005 or less
		Dikes in granite---------------------	.004 or less
		Iron-stained veins in granite---------	.005 or less
		Placer concentrates: contains garnet, sphene, topaz, scheelite, allanite, ilmenite, hematite, magnetite, pyrite, wolframite, cassiterite, arsenopyrite, zircon, tourmaline, fluorite, chalcopyrite, limonite, galena, and gold.	.01 or less

[1] Equivalent uranium.

is necessary in this area because of a widespread cover of disintegrated bedrock and vegetation.

Eastern Alaska Range

By A. E. Nelson

Copper- and silver-bearing lodes and molybdenite occurrences in the Slana-Nabesna district (no. 6b, pl. 1) and highly oxidized gold- and silver-bearing galena pyrite veins and molybdenite occurrences in the Chisana district (no. 6a, pl. 1) of the eastern Alaska Range were examined radiometrically during late June, July, and early August 1952. The reconnaissance was conducted by A. E. Nelson, geologist, and R. G. Smith, field assistant. Data on the localities investigated are summarized in table 4.

At all the localities indicated in table 4 radiometric traverses were made in the accessible parts of mines, over ore dumps, prospect pits and cuts, as well as over outcrops of mineralized zones and the adjacent country rocks. None of the traversing indicated any appreciable radioactivity. Routine check samples collected included: channel samples of veins and other types of ore bodies, zones of alteration, spot samples from ore dumps, placer concentrates, and samples of different lithologic types. The maximum equivalent uranium content of any of the samples collected was 0.004 percent. The more radioactive rocks were mostly granitic types wherein the radioactivity is apparently in the accessory minerals.

Because of high, swift water in the glacial Nabesna River, the Orange Hill locality was inaccessible with the transportation equipment available at the time of this investigation. The reconnaissance of the locality was limited therefore to an airborne radiometric traverse over exposures of ore-bearing zones and adjacent bedrock incidental to flying to the Chisana district. No anomalous radioactivity was noted in the course of this traverse.

Southeastern Alaska

By J. R. Houston, R. S. Velikanje, R. G. Bates, and Helmuth Wedow, Jr.

Reconnaissance for uranium in southeastern Alaska during the summer of 1952 was concentrated mainly in the northern part of Prince of Wales Island (no. 8, pl. 1; fig. 1) where reconnaissance studies were made to determine the areal extent and geologic relationships of radioactive carbonate-hematite veins examined briefly in 1951 (Houston, 1952). In the determination of the areal extent of these veins a number of localities on parts of islands adjacent to Prince of Wales Island were examined because mineral deposits there contained mineral assemblages similar to known uranium deposits elsewhere (Wedow and others, 1951).

In addition, brief examinations were made in the Hyder area (no. 9, pl. 1; fig. 1), where samples containing pitchblende(?) taken by the Territorial Department of Mines from the Canyon vein on the Mountain View property were reported to contain as much as 0.7 percent equivalent uranium oxide; and in the Taku Harbor-Point Astley district (no. 7, pl. 1; fig. 1) of a native silver-bearing copper deposit at Point Astley and pitchblende deposits (originally reported to the U. S. Bureau of Mines) in the Taku Harbor-Limestone Inlet-Port Snettisham area.

The field party engaged in these reconnaissance investigations included J. R. Houston and R. S. Velikanje, geologists, and E. D. Michael, field assistant. R. G. Bates and Helmuth Wedow, geologists, assisted in part of the Prince of Wales Island work and the examinations in the Taku Harbor-Point Astley district. The party was in the field from early July to late September.

Data on the various localities visited are summarized in table 5. Brief statements on specific areas are given below.

Taku Harbor-Point Astley district. —Search for the reported pitchblende occurrences at Taku Harbor, Limestone Inlet and Port Snettisham (locality A, fig. 1) was unsuccessful; in fact, no metallic minerals were observed except at the Taku Harbor locality where pyrite and arsenopyrite occur in a breccia zone and disseminated in the adjacent country rock. The maximum equivalent uranium content of samples collected was 0.003 percent.

Examination of the silver-copper lode at Point Astley (locality B, fig. 1) found a 10- to 15-foot thick zone in which a variety of metallic minerals occur in lenticular replacement veins parallel to the schistosity of the country rock. A portion of this zone ranging from 1- to 2-feet in thickness is slightly radioactive and contains 0.006 percent equivalent uranium.

Hyder area. —Search for "high-grade" concentrations of pitchblende(?)-bearing material in the Canyon vein on the Fish Creek group, Mountain View property (locality N, fig. 1) was unsuccessful. No samples taken in 1952 from this vein contain more than 0.004 percent equivalent uranium. However, at the southeast end of the drift on the Gray Copper vein a sample was collected that contains 0.035 percent equivalent uranium. The radioactivity in this sample is apparently associated with molybdenite. Although no primary uranium mineral has yet been positively identified in samples collected by the Geological Survey in the Hyder area, certain fracture surfaces in veins and mineralized dikes are coated thinly with an unidentified yellow uranium sulfate.

Northern Prince of Wales Island and vicinity. — In the Salmon Bay area (locality C, fig. 1) (Houston, 1952) on the northeast coast of Prince of Wales Island are many steeply dipping carbonate-hematite veins with north to northwest trends that contain small amounts of thorite and monazite. The country rock adjacent to many of these veins is hematitically altered and in some places is also radioactive. The more radioactive veins range from less than 1 inch to as much as 2 feet in thickness. Although the maximum equivalent uranium content of channel samples collected is 0.095 percent, the average content of the radioactive veins is about 0.03 percent equivalent uranium. The highest uranium content of any samples so far analyzed for this element is 0.003 percent.

The most radioactive sample from the area is one obtained by a prospector near the entrance to Salmon Bay; it consists of hematitically altered wall

Table 4.--Preliminary data on localities examined in the eastern Alaska Range during 1952

Locality	Geology	Mineralogy	Radioactivity of samples (percent eU)[1]
	Chisana district (no. 6a, pl. 1)		
Bonanza Creek and vicinity.	Permian volcanic and Devonian sedimentary rocks intruded by granodiorite; many dikes, sills, and small irregular igneous bodies occur throughout the district.	Galena, pyrite, silver, and gold occur in veins; gold, silver, copper, cinnabar, molybdenite, and galena have been recovered from placer operations.	< 0.004
	Slana-Nabesna district (no. 6b, pl. 1)		
Nabesna mine area---------	Metamorphosed limestone (tactite) of Permian age intruded by quartz diorite; a suite of contact minerals is developed in the tactite; the principal ore in the mine occurs in veins of pyrite and calcite, with minor amounts of chalcopyrite, sphalerite, and galena, found as replacements in fractures and along the contact zones between the limestone and quartz diorite.	Chalcopyrite, sphalerite, galena, magnetite, pyrrhotite, arsenopyrite, stibnite, pyrite, and gold plus contact minerals such as andradite, vesuvianite, epidote, specularite, wollastonite, spinel, magnetite, brookite, and others.	< .001
Orange Hill---------------	Permian lava flows, greenstones, and metamorphosed limestone intruded by quartz diorite; dikes of alaskite cut the quartz diorite as well as the sedimentary rocks and are intruded by dacite and andesite dikes.	Ore minerals: chalcopyrite, magnetite, hematite, pyrrhotite, pyrite, bornite, sphalerite, molybdenite, tetrahedrite, and gypsum.	No anomalous radioactivity noted during airborne traverse.
Rock Creek----------------	Molybdenite-bearing pegmatite vein in syenite gneiss; molybdenite occurs as blebs and tiny veinlets.	Molybdenite--------------------------	< .004
Indian group--------------	Quartz diorite with wide variation in texture, at most places it is coarsely granular with large feldspar phenocrysts; a series of nearly vertical fracture planes striking almost due east appear to control the localization of the quartz veins containing the metallic minerals.	Silver-bearing galena, chalcopyrite, tetrahedrite, malachite, and azurite in a quartz-calcite gangue.	.004 or less

Table 4.--Preliminary data on localities examined in the eastern Alaska Range during 1952--Continued

Locality	Geology	Mineralogy	Radioactivity of samples (percent eU)[1]
Silver Creek	Diorite cut by a northwest-trending fault or shear zone about 100 feet wide; the rock in the fracture zone has been altered to a rather soft material; several quartz veins containing sparse amounts of the metallic minerals occur in this zone.	Tetrahedrite, silver-bearing galena, and gold.	< 0.001
Mineral Point	Argillite between two limestone bodies is cut by a shear zone trending N. 65° W. and has been altered to a reddish yellow material; this altered zone has been reported to contain traces of nickel.	Copper, nickel(?), gold, and silver.	< .001

[1] Equivalent uranium.

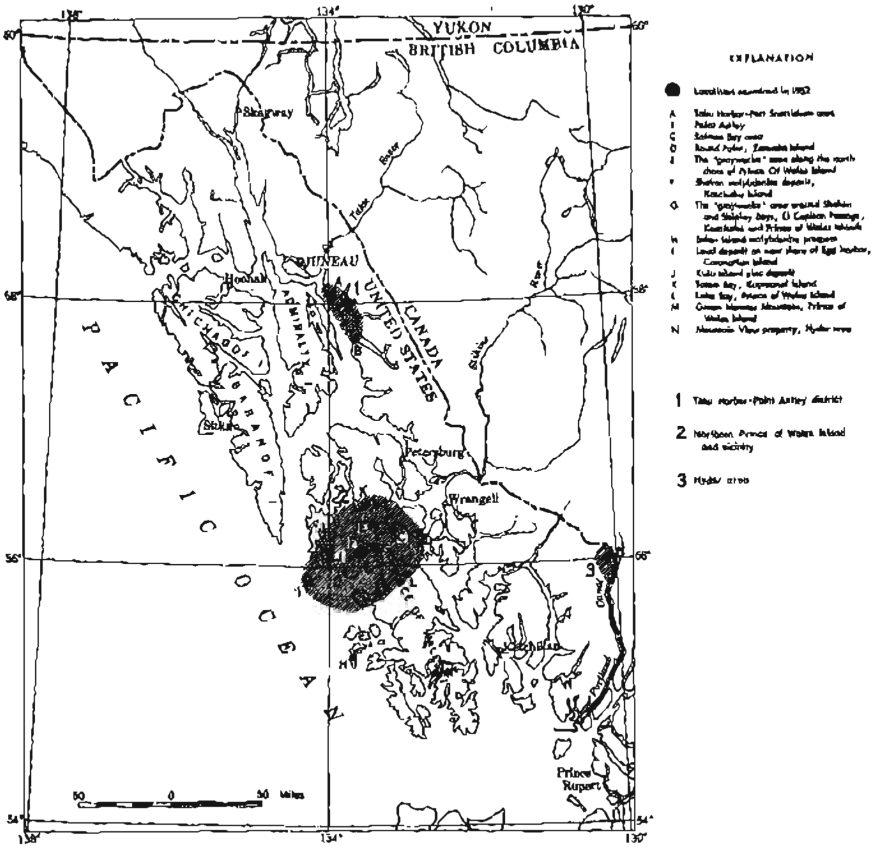

Figure 1.--Map of southeastern Alaska showing localities examined in 1952.

rock and contains 0.13 percent equivalent uranium, but only 0.002 percent uranium. Search for the site of this sample was unsuccessful; it is probable that the site is exposed only at extremely low tides.

The occurrence of the radioactive veins apparently is limited to the northeast coast of Prince of Wales Island from about 3 miles north of Exchange Cove to the vicinity of Point Colpoys, a distance of about 7 miles. One slightly anomalous locality, however, was discovered by prospectors on West Island, 4 miles southeast of Exchange Cove. On the other hand, the hematitic alteration of country rock adjacent to fractures with trends similar to those occupied by the radioactive veins apparently has a much wider distribution, along the northeast coast of Prince of Wales Island northward from Whale Passage to Point Colpoys, a distance of about 18 miles. No continuation of the hematitically altered zones or radioactive veins was noted to the north of Prince of Wales Island on the shore of Totem Bay (locality K, fig. 1), Kupreanof Island.

In addition to the radioactive veins, wider, essentially nonradioactive, carbonate veins were also found in the Salmon Bay area. These veins contained small amounts of the rare-earth fluocarbonates, such as parisite and bastnaesite. Five chip-channel samples across what was apparently the highest-grade parisite vein averaged 0.79 percent combined rare-earth oxides; one high-grade grab sample contained as much as 5.0 percent rare-earth oxides. Traces of rare earths were also found in the radioactive veins.

Because the formation of the radioactive veins may have been related to the emplacement of the Shakan batholith to the west of the Salmon Bay area, several areas west and northwest of the batholith with country rock of same age and type as that at Salmon Bay were also investigated for radioactivity (localities E and G, fig. 1). It was found that the radioactivity of rocks in these areas probably does not exceed 0.001 percent equivalent uranium. Various mineral deposits lying west and southwest of the Shakan batholith, such as the molybdenite occurrences at Shakan (locality F, fig. 1) and on Baker Island (locality H, fig. 1), were also examined radiometrically. No samples collected from these localities contain more than 0.004 percent equivalent uranium.

Brief field tests were made in the vicinity of a small granitic stock at Round Point on Zarembo Island (locality D, fig. 1), 18 miles east of Salmon Bay, and at a copper prospect at Lake Bay (locality L, fig. 1), 25 miles south of Salmon Bay. At these localities, also, the maximum equivalent uranium content of various types of rocks and ores does not exceed 0.004 percent. A brief reconnaissance of copper prospects at Green Monster Mountain (locality M, fig. 1), also on Prince of Wales Island, found no radioactivity in excess of 0.001 percent equivalent uranium.

It is concluded from the results of the above mentioned radiometric studies that the areal extent of the radioactive carbonate-hematitic veins is limited to the "graywacke" area along the northeast coast of

Table 5.--Preliminary data on localities examined in southeastern Alaska during 1952

Locality	Geology	Mineralogy	Maximum radioactivity of samples in percent eU[1]
Taku Harbor-Point Astley district			
Taku Harbor-Port Snettisham area (locality A, fig. 1).	Green schist, phyllite, and limestone of Paleozoic(?) age intruded by quartz diorite of Late Jurassic or Early Cretaceous age.	Pyrite and arsenopyrite in breccia zone and disseminated in adjacent country rock.	< 0.001 in sample of mineralized zone; 0.003 in sample of quartz diorite.
Point Astley (locality B, fig. 1).	Lenticular replacement veins parallel to the schistosity of chlorite-sericite schist of Paleozoic(?) age.	Pyrite, sphalerite, bornite, pyrrhotite, galena, and covellite(?) in a quartz-carbonate gangue.	.006
Northern Prince of Wales Island and vicinity			
Salmon Bay area (locality C, fig. 1).	Narrow steeply-dipping fissure veins cutting graywacke, sandstone, shale, and limestone breccia of Silurian age; lamprophyre dikes and alkalic dikes of Tertiary(?) age low in quartz are associated with the veins.	Red hematite, specular hematite, magnetite, pyrite, marcasite, chalcopyrite, thorite, monazite, zircon, parisite, and bastnaesite in a gangue of dolomite-ankerite, alkali feldspar, chert, quartz, chalcedony, chlorite, epidote, sericite, kaolinite, purple fluorite, green and white muscovite, apatite, topaz, and garnet.	.095 (prospector's sample assayed 0.13)
Round Point, Zarembo Island (locality D, fig. 1).	Graywacke of Cretaceous age intruded by granite of Late Jurassic or Early Cretaceous age.	Narrow epidote veinlets; accessory magnetite in granite.	.004
The "graywacke" area along the north shore of Prince of Wales Island (locality E, fig. 1).	Limestone, argillaceous limestone, and graywacke of Silurian age, cut by many mafic dikes, a few felsic dikes, and a few small carbonate veins of Tertiary(?) age.	Calcite----------------------------------	.001
Shakan molybdenite deposit, Kosciusko Island (locality F, fig. 1).	Irregular, vein-like deposit in diorite of Late Jurassic or Early Cretaceous age near the contact of the diorite with graywacke of Silurian age; the ore occurs in irregular pods and vuggy lenses and stringers in a brecciated zone about 4 feet wide.	Molybdenite, pyrite, pyrrhotite, chalcopyrite, sphalerite, "limonite," molybdite, and chalcanthite in a gangue of quartz, adularia, epidote, hornblende, clay materials, and diorite breccia.	.004

The "graywacke" area around Shakan and Shipley Bays, El Capitan Passage, and Edna Bay, Kosciusko Island and Prince of Wales Island (locality G, fig. 1).	Limestone, argillaceous limestone, argillite, shale, and graywacke of Silurian age cut by a few small, barren, carbonate veins and some mafic dikes; a small dioritic batholith of Late Jurassic or Early Cretaceous age intrudes the sedimentary rocks in the eastern part of the area.	No significant metallic minerals, traces of molybdenite, chalcopyrite, pyrite, galena, calcite, iron oxides, epidote, garnet, chlorite, and actinolite.	.001
Baker Island molybdenite prospect (locality H, fig. 1).	Silicified quartz diorite of Late Jurassic or Early Cretaceous age cut by many narrow quartz veinlets carrying thin films and small grains of molybdenite.	Molybdenite, pyrite, pyrrhotite, molybdite, and iron oxides in a quartz gangue.	.001
Lead deposits on the west shore of Egg Harbor, Coronation Island (locality I, fig. 1).	Irregular replacement deposits along small fractures in limestone of Paleozoic age; very little mineralization in evidence.	Galena, sphalerite, iron oxides, cerrusite, smithsonite, and hydrozincite in a gangue of carbonate and clay minerals.	< .003
Kuiu Island zinc deposits (locality J, fig. 1).	Well-indurated graywacke of early Paleozoic age, argillite, chert, and hornfels intruded by small, irregular bodies of hornblende diorite of Late Jurassic or Early Cretaceous age; felsic and mafic dikes of Tertiary(?) age also intrude the sedimentary rocks; metallic minerals occur in narrow, discontinuous veinlets 1-3 inches wide.	Sphalerite, galena, pyrite, pyrrhotite, and "limonite" in a quartz-carbonate gangue.	.001
Totem Bay, Kupreanof Island (locality K, fig. 1).	Tertiary andesite and andesite tuff cut by a few basalt dikes. Narrow altered zones along barren fractures show very slight radioactivity.	No metallic minerals observed-------------	.003
Lake Bay, Prince of Wales Island (locality L, fig. 1).	A breccia vein 5-15 feet wide and probably at least 1/2 mile long cutting dark-gray graywacke and argillite of Ordovician age.	Pyrite, chalcopyrite, sphalerite, secondary copper minerals, and iron oxides in a quartz-carbonate gangue.	.001
Green Monster Mountain, Prince of Wales Island (locality M, fig. 1).	Limestone of early Paleozoic age with some green schist intruded by a quartz diorite stock of Late Jurassic or Early Cretaceous age; the ore occurs in small, irregular masses and veins near the contact.	Magnetite, chalcopyrite, pyrite, pyrrhotite, molybdenite, malachite, and iron oxides in a gangue of epidote, diopside, garnet, actinolite, tremolite, chlorite, calcite, quartz, spinel, and phlogopite.	< .001

Table 5.--Preliminary data on localities examined in southeastern Alaska during 1952--Continued

Locality	Geology	Mineralogy	Maximum radioactivity of samples in percent eU[1]
Hyder area			
Mountain View property (locality N, fig. 1).	Graywacke, argillite, slate, tuff, quartzite, and limestone of Jurassic age intruded by granodiorite and quartz monzonite of Late Jurassic or Early Cretaceous age; ore occurs in mesothermal fissure veins.	Pyrite, pyrrhotite, galena, sphalerite, chalcopyrite, scheelite, molybdenite, tetrahedrite, pyrargyrite, gold, and "limonite" in a gangue of milky quartz, calcite, barite, sericite, and chlorite.	0.035

[1] Equivalent uranium.

Prince of Wales Island between Exchange Cove and Point Colpoys. It is not likely that the area extends very far inland to the west as the graywacke is succeeded in that direction by massive limestones that are less radioactive than the graywacke. Some structural control governing the emplacement of the veins is evident, but specific conclusions must await further analysis of field data.

Minor reconnaissance projects

By Helmuth Wedow, Jr., P. L. Killeen, F. A. Stejer, Arthur Grantz, and J. J. Matzko

York tin district. —Concentrates obtained from the exploratory drilling for tin placers in the Cape Creek drainage area of the Cape Mountain area, York tin district (no. 10, pl. 1), Seward Peninsula, by the Zenda Mining Company under U. S. Defense Minerals Exploration Administration auspices showed no appreciable radioactivity, in contrast to similar drilling samples obtained in the past from tin placers on other creeks (Pauline and Goodwin Gulches) in the area (Bates and Wedow, 1953, p. 6).

Radiometric tests by a regular Survey party under P. L. Killeen at new localities in the Lost River area, particularly in new workings at the Lost River tin mine, did not reveal any rock more radioactive than that found in 1951 (White and West, 1952).

Since the cessation of the exploration by the United States Smelting, Refining, and Mining Company in September 1951, no additional prospecting has been done at the Brooks Mountain zeunerite claims (West and White, 1952) owned by George Hellerich and associates.

Prince William Sound. —A Geological Survey party, led by F. A. Stejer, investigating copper and pyrite deposits on Latouche Island conducted a brief general reconnaissance of the Prince William Sound region (no. 11, pl. 1) in late June 1952 as an introductory phase of its investigations. In the course of this reconnaissance radiometric tests were made of various types of lodes, granitic masses, and contact zones, including those mentioned by Wedow and others (1951, p. 110).

No appreciable radioactivity was noted in the course of the field tests in Prince William Sound. Representative samples of the various types of lode deposits all contain less than 0.001 percent equivalent uranium. Most of the samples from granitic bodies and adjacent contact zones contain 0.001 percent or less equivalent uranium. The maximum equivalent uranium content of any samples collected in this region is 0.003 percent and is in samples of granitic rock from Ester Island and Trap Bay; it is presumed that this minor amount of radioactivity is in such common accessory minerals as zircon and sphene.

Radiometric tests were made also at the occurrences of hematite on Hinchinbrook Island (Wedow and others, 1951, p. 110; Grant and Higgins, 1910, p. 79) about 40 miles southwest of Cordova (pl. 1). The field tests showed essentially no radioactivity; representative samples submitted for analysis contained only as much as 0.003 percent equivalent uranium.

Nelchina area. —Geologic mapping and stratigraphic studies were conducted by a regular Survey party under Arthur Grantz in the Nelchina area (no. 12, pl. 1) during the summer of 1952. In the course of this work radiometric tests were made of many rocks of different lithologies and ages. These include sedimentary rocks of Jurassic age, the Nelchina limestone and Matanuska formation of Cretaceous age, pre-Cretaceous volcanic rocks, and volcanics and intrusives of Tertiary age. None of the field radiometric tests gave survey meter readings of as much as twice background. Radiometric analyses of 10 representative samples, the only ones thus far submitted by Grantz, show only 0.001 percent or less equivalent uranium.

Fortymile fluorite occurrences. —During the summer of 1952 two fluorite occurrences in the Fortymile district (no. 13, pl. 1), east-central Alaska, were brought to the attention of the Geological Survey by the Territorial Department of Mines. These are the first-reported occurrences of fluorite in the district. Specimens of the fluorite range from colorless through pale green to purple. Although the few specimens in the collection of the Territorial Department of Mines at Fairbanks showed no appreciable radioactivity, the common association of uranium with fluorite, particularly the purple variety, prompted reconnaissance appraisal of the occurrences to détermine whether concentrations of uranium might occur within the fluorite deposits or in their vicinities. The reconnaissance was made by J. J. Matzko, geologist, and Fred Freitag, field assistant, in late August. One of the fluorite prospects is a short distance northeast of Chicken near the new Taylor Highway; the other is also near the highway in the vicinity of Jack Wade.

Field radiometric tests at the locality near Chicken showed no anomalous radioactivity; the maximum equivalent uranium content of representative samples taken at this site does not exceed 0.003 percent. The locality near Jack Wade could not be examined because the prospect shaft in which the fluorite had been found was completely filled with debris from caving.

SUMMARY AND CONCLUSIONS

The preliminary results of reconnaissance investigations for uranium and thorium in Alaska during 1952 are summarized in table 6. The table shows the locality (district, area, prospect, and reported occurrence); the chief type of deposit examined or sought for; and the maximum amount of radioactivity in samples collected at each locality. Only the uranothorianite at Gold Bench in the Koyukuk-Chandalar region, the occurrence of uranium in the Circle-Hot Springs area, and, possibly, the radioactive carbonate-hematite veins on Prince of Wales Island in southeastern Alaska warrant further consideration. All the other localities investigated in 1952 have apparently no potential for the occurrence of high-grade uranium ores unless more detailed information, such as the discovery of new criteria suggesting the occurrence of such ores, or the results of private prospecting, alters this conclusion.

The association of uranothorianite with hematite and traces of bismuth, copper, lead, tin, and tungsten minerals in placers at Gold Bench on the South Fork of the Koyukuk River in northeastern Alaska suggests

Table 6.--Preliminary summary of results on reconnaissance for uranium and thorium in Alaska during 1952

Locality	Chief types of deposits examined, sought for, or reported	Maximum radioactivity of samples (Percent eU[1])	Maximum radioactivity of samples (Percent U[2])
Russian Mountains	Zeunerite-bearing copper lode	0.004	---
Marshall area	Molybdenum-copper-lead lode	.001	---
Southern Kaiyuh Mountains	Molybdenum lode	.003	---
Chandalar mining district	Metalliferous veins and sources of monazite in placers	.001	---
Gold Bench area	Source of uranothorianite in placers	.18	---
Hope Creek area	Quartz-pyrite-fluorite veins	.055	---
Miller House-Circle Hot Springs area	Fluorite occurrences	.01	---
Chisana district	Copper, silver, and molybdenum lodes	.004	---
Slana-Nabesna district	Copper, silver, and molybdenum lodes	.004	---
Taku Harbor-Port Snettisham area	Reported pitchblende(?) lodes	.003	---
Point Astley	Silver-copper lode	.006	---
Hyder area	Pitchblende(?) in veins	.035	---
Northern part of Prince of Wales Island and vicinity.	Radioactive hematite-carbonate veins and silver, lead, zinc, copper, and molybdenum lodes.	.095	.003
York tin district	Radioactive minerals in tin placers at Cape Mountain and at Lost River tin mine (lode).	.005(est)	---
Prince William Sound	Copper and gold lodes, hematite occurrences, and various granitic masses and adjacent contact zones.	.003	---
Nelchina area	Rocks and ores of different ages and types	.001	---
Fortymile district	Reported fluorite occurrences	.003	---

[1] Equivalent uranium; analyses made in the Fairbanks Radioactivity Testing Laboratory.
[2] Uranium; analysis made in the Trace Elements Section Washington Laboratory.

a nearby lode source, possible a vein, for these minerals. Because the drainage area of the South Fork above Gold Bench has a widespread cover of disintegrated rock and tundra, it is believed that the most satisfactory method for locating such a possible lode source would be the radiometric testing of concentrates from the placers of streams tributary to the South Fork. As the source of the gold in the placers is thought to be in the hills south of the South Fork, particular emphasis should be given to the tributary streams draining those hills.

Because the average radioactivity of the carbonate-hematite veins in the vicinity of Salmon Bay on Prince of Wales Island in southeastern Alaska is only about 0.03 percent equivalent uranium at the surface and appears to be due almost entirely to thorium, it is concluded tentatively that the area does not have commercial possibilities for high-grade uranium deposits. However, further exploration in the area, probably by the drilling of the largest, most radioactive vein, would determine whether leaching may have reduced the over-all grade of the veins at the surface, or whether the mineral composition of the veins changes at depth with a possible increase in the uranium content.

The relatively high uranium content of a water sample from Portage Creek in the Miller House-Circle Hot Springs area may indicate the desirability of using a water-sampling technique in the search for possible lode sources of uranium in this area. Such sampling, or the use of techniques other than radiometric traversing, is needed in this area because the widespread cover of mantle rock, soil, and vegetation effectively absorbs much of the radiation from the underlying rocks.

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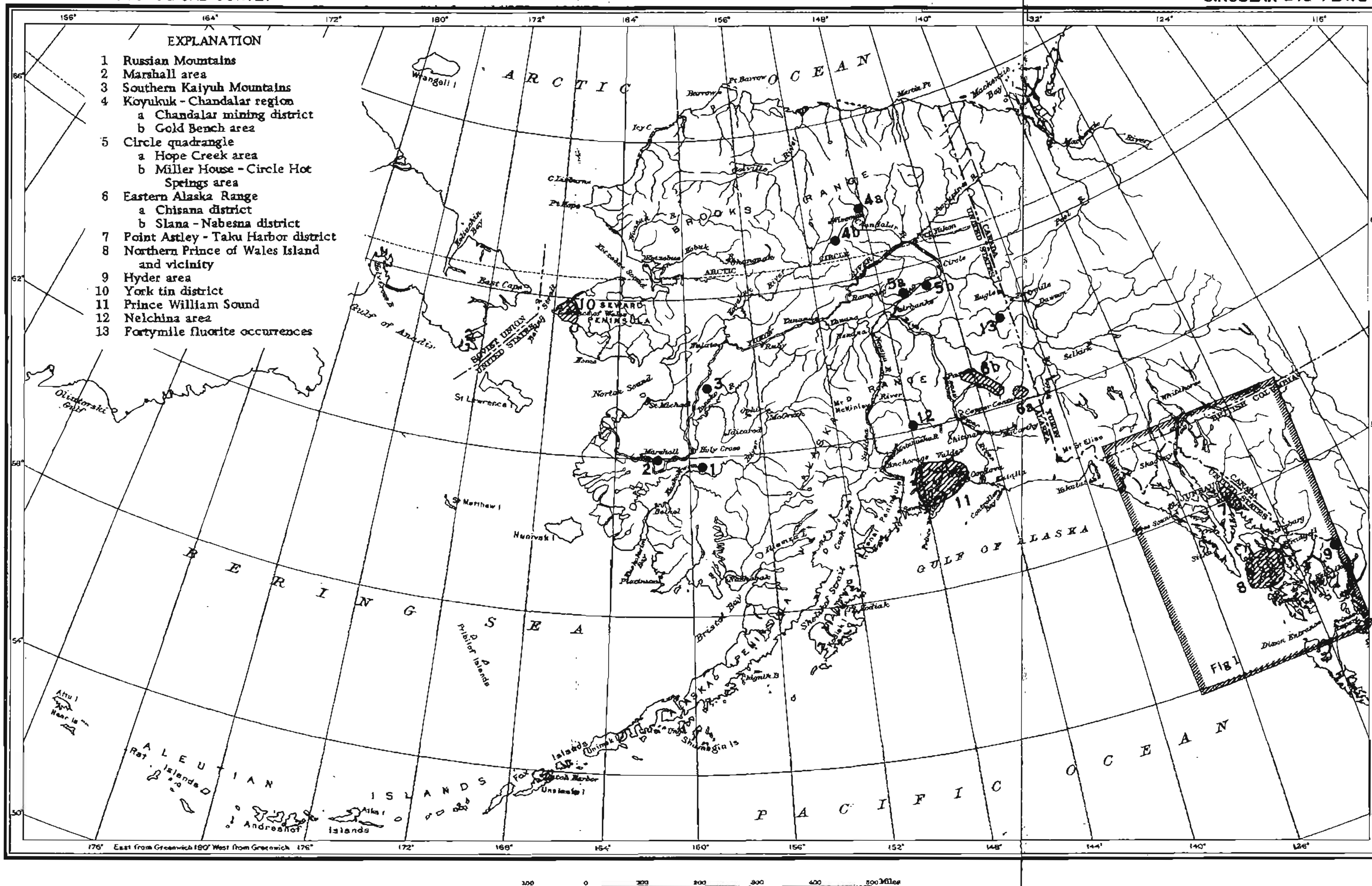

MAP OF ALASKA SHOWING LOCATIONS OF DISTRICTS, AREAS, AND PROSPECTS EXAMINED IN 1952