

TUNGSTEN-RICH PORPHYRY MOLYBDENUM OCCURRENCE AT BEAR MOUNTAIN, NORTHEAST ALASKA *

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ABSTRACT

Molybdenum and tungsten porphyry mineralization occurs near Bear Mountain in northeast Alaska within a regional zone of small domes and intrusions. This zone can be traced 80 km to the west and easterly into Canada.

A 50-ha (approximately 100 acres) mineralized area, defined by soil samples containing greater than 300 ppm Mo and 500 ppm W, is underlain by an altered complex of probable rhyolite porphyry dikes. The complex has intruded upper Paleozoic metasedimentary rocks.

Surface exposures of rubble and limited outcrop are extensively leached; molybdenum occurs as molybdite oxides and tungsten occurs in both ferberite and huebnerite end members of the wolframite series. There is an apparent zonation from an upper tungsten-topaz zone capped by massive silica to a lower oxidized molybdenum-rich zone. A lead-rich halo surrounds the complex.

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REGIONALLY METAMORPHOSED, CALC-SILICATE-HOSTED DEPOSITS OF THE BROOKS RANGE, NORTHERN ALASKA *

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ABSTRACT

Three distinctly different calc-silicate-ore suites in the Brooks Range, northern Alaska, show contrasting geologic and metallogenic associations. Both host rocks and plutonic rocks are of Devonian age and all lithologies were subjected to a major Late Jurassic-Early Cretaceous regional metamorphic event.

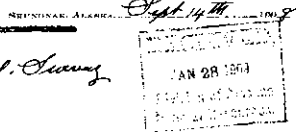
One calc-silicate suite is associated with peraluminous, high initial $^{87}\text{Sr}/^{86}\text{Sr}$, presumably S-type granites and is characterized by anomalous Sn contents, stanniferous grandite and subcalcic garnets with crosscutting amphibole-clinzoisite, and a distinctive boron-rich mineral association. These skarns resemble the Sn-bearing skarns of the Seward Peninsula, except that they have low cassiterite contents and show only limited greisen alteration. The noneconomic nature of the Brooks Range Sn skarns may be related to relatively deep levels of exposure. The second calc-silicate suite is associated with generally metaluminous, presumably I-type, quartz-sericite-pyrite-altered granite and granodiorite stocks and isolated fault slivers. This suite contains high Cu and Ag, variable Pb and Zn, and low Sn; is characterized by andraditic garnet, diopsidic pyroxene, and bornite-chalcopryrite, cut by epidote, actinolite, and pyrite veinlets; and generally resembles a continental margin, porphyry copper-related skarn. The third calc-silicate suite, the so-called "gnurgle gneiss," represents a regionally metamorphosed metalliferous chemical sediment and is not related to igneous-metasomatic processes. This suite is characterized by well-developed mineral foliation, generally low metal contents, lack of sulfide veining and retrograde alteration, and combination of metal ratios and calc-silicate mineral compositions not commonly observed in skarn deposits.

Although all of the skarns are variably layered (e.g., contain magnetite "ribbon rock") and all the associated igneous rocks are foliated, the metasomatic skarns are distinguished from the metamorphic calc-silicate rocks by the absence of foliation, in addition to the systematic differences in both calc-silicate and ore minerals, compositions, and textures. The metasomatic skarns are virtually unaffected by the regional deformation, presumably due to the highly competent nature of garnet-rich rocks. Metamorphism of the metasomatic skarns is evidenced, however, by the development of moderate temperature, reequilibrated sulfide assemblages, including idaite-chalcopryrite±covellite and digenite-chalcopryrite, and by local semipenetrative cleavages. The characteristics of these metamorphosed skarns and calc-silicate rocks and the fact that they can be distinguished despite the regional metamorphic effects may be used in deciphering other complex metamorphic-metasomatic ore districts.

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LEWIS LLOYD
QUARTZ AND PLACER GOLD MINING

United States Geological Survey
Dear Sirs



In reading your annual Report on Progress of Investigations of minerals of Alaska, I notice that the Department does not know much of anything about the Noatak-Kobuk mining district in your report of 1906. You make mention of a piece of copper float found some where on the Kobuk, and as I am a pioneer of this place & know this country some as to its minerals, I take the liberty to write you a brief report of this place to the best of my ability. I return you the map from Bulletin 345, 1907, which I have marked with copper mines, copper lode prospects, gold lode prospects, & producing gold placers, together with photographs of some of the mining development work in progress. You will notice my field of work or prospecting is from 154° W. to 158° W. and from about the Arctic Circle to about 68° north in marking the map I find space too small for my markings, so will give it in writing, so the Department will better understand.

Shungnak, Alaska, September 14, 1908

United States Geological Survey.

Dear Sirs:

In reading your annual report on Progress of Investigations of minerals of Alaska, I notice that the Department does not know much of anything about the Noatak-Kobuk mining district. In your report of 1906 you make mention of a piece of copper float found somewhere on the Kobuk, and as I am a pioneer of this place and know this country some as to its minerals, I take the liberty to write you a brief report of this place to the best of my ability. I return you the map from Bulletin 345, 1907, which I have marked thus: Copper mines, copper lode prospects, gold lode prospects, producing gold placers, together with photographs of some of the mining development work in progress. You will notice my field of work or prospecting is from 154° W. to 158° W. and from about the Arctic Circle to about 68° N. In marking the map I find space too small for my markings, so will give it in writing, so the Department will better understand.

I changed the map a little or added some streams at the head of Noatak and Allenkakat or Alatna headwaters. I found coarse gold, winter of '98, at head of Noatak like punkin seeds and same assayed 19-20 per ounce. Worked there one summer, and the returns were not enough for a paying placer. At that point the formation granite, slates, lime schists, greenstones, etc. Copper float in the streams and lode deposits in the hills around the head of Alatna, Noatak, and Kobuk. Silver ore at head of Noatak and native copper found in one of the streams at the head of the Noatak, and as we cross the divide between the head of Moneyluck River and Noatak on Noatak side between Read River portage and Moneyluck River portage there is an immense body or bed which carries some silver. Half way down

Moneyluck River, towards Kobuk, I find lots of copper float and lode matter in place, also coal near same place, and between Read River and Moneyluck copper float is found in most of the streams, and between that river and Kogoluktuk River there is copper deposits in place, and along the Kogoluktuk up to its headwaters is a continuation of different kinds of minerals in place. Iron takes an important place towards the head of Kogoluktuk River; formations principally granite, slates, schists, shales, trap, greenstone, conglomerate, limestone, etc. Black and brown hematite found in a streams and gold prospects everywhere. At the headwaters of Kogoluktuk there is a sulphur hot spring, and across the divide on the Noatak side there are immense deposits of copper ore, and a stream with native copper in it. Dahl Creek is about six miles west of Kogoluktuk and a tributary of the Kobuk. There is placer mining done there every season and lots of nuggets taken from that creek. I am working No. 1. Below it pays from ten to fifteen dollars per day to the shovel or man. Some ground goes as low as six dollars per day per man and some won't go four dollars to the box length. But paying placer digging goes on every year, and the largest nugget found on Dahl Creek this season weighed over fifty dollars. There are several placer mines worked on Dahl Creek every season. At the head of Dahl Creek we find free milling quartz. It is under development at present and don't know much more than what the surface indications show us -- a slaty schist with quartz stringers running all through it carrying free gold. A very likely place between there and Ruby Creek, a tributary of the Shungnak River, for some good free milling rock to be found. Riley Creek, a tributary to the Kogoluktuk River; its head is near the head of Dahl Creek. There is a paying placer mine there this season. The gold not ????? as it is oxidized from the quartz. It's evidently from above mentioned stringers.

Ruby Creek has a copper mine under development. Ore body in place. Contact veins about 300 feet wide. Capping gossan about 2 and 3 feet thick. Some places gold found on the creek; none in paying quantities as yet. The copper mine shaft at Ruby Creek mine is down 65 feet. The ore improves in copper and gold value in depth. Refer to photos and samples of above mine. Aurora Mountain situated between the headwaters of Cosmos Creek and Ruby Creek and at the head of Cosmos Creek there is a large body of copper ore under development, the ore being mostly bornite and chalcopyrite. On the surface there is quantities of copper carbonates from the decomposition of the bornite and chalcopyrite. Assay returns by Thomas Price and Sons, Analytical Chemists of San Francisco, from a picked sample of bornite and of chalcopyrite give the following returns for surface prospects. Bornite ore: Gold per ton, .04, value at \$20.64 = \$0.82, Silver, troy oz. per ton, 1.4, value at 65 cts. = \$0.91. Total gold and silver value, \$1.73. Copper percentage, 58.4%. Sample of Chalcopyrite: Gold, troy oz. per ton, .01, value \$0.20. Silver, trace. Copper, 28.44%. The development work consists of a tunnel being driven into the side of the mountain at a depth of about 150 feet. The tunnel is now about 70 feet into the mountain, and from the surface prospects it will be a fine mine. It is a contact lead, from the surface indications. There are also immense iron deposits near Aurora Mountain and galena and lead deposits, and on the Shungnak there is paying placers in operation every season. They get nuggets of native copper and silver along with the placer gold in the boxes. Assays of copper ore from Ruby: 11.71% copper. Assays of samples from Kogoluktuk River: Copper, 5.59%; lead, 13.56¢, gold and silver, value \$1.24. Another from Noatak side from Kogoluktuk River: Copper, 9.81%; lead, 27.73%. Considerable interest is now given towards the jade, which I think will develop very rapidly, as we have some fine samples of good commercial jade here. There is also lots of asbestos here, and graphite in place. You will excuse all bad spelling, as I am not a college man, and anything that I can do for the good of the Department I am at your services.

I remain, yours truly,
Lewis Lloyd