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PRELIMINARY GEOLOGIC MAP OF PART OF THE BOKAN MOUNTAIN URANIUM-THORIUM AREA, ALASKA

By

E. M. MacKevett, Jr.

This report concerns work done chiefly on behalf of the U. S. Atomic Energy Commission and is published with the permission of the Commission.

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CONTENTS

ILLUSTRATIONS

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INTRODUCTION

The accompanying map is being released in a preliminary and somewhat generalized form in order to expedite its availability to prospectors, mining companies, and others interested in the area. The map, based on field mapping by the writer, assisted by A. L. Kimball, during the summer of 1956, shows part of the Bokan Mountain uranium-thorium area on the southern part of Prince of Wales Island about 35 miles southwest of Ketchikan, Alaska. It was prepared in connection with work done chiefly on behalf of the U. S. Atomic Energy Commission. Uranium prospecting in this area was stimulated by the discovery of the Ross-Adams lode in May, 1955, and since then, many claims have been located. Many of the prospects are shown on the map.

GEOLOGY

The Bokan Mountain area is underlain chiefly by rocks of the Coast Range batholith and by metamorphosed sedimentary and volcanic rocks. The principal rock units are delineated on the map, but some other rocks consisting mainly of abundant mafic dikes and pegmatite and aplite dikes are not shown. Of the numerous fractures only those that appear to be strong faults are shown. Data on the lesser fractures and other structural elements, as well as on other geological aspects of the area, will be given in a future publication.

The oldest rocks in the area probably are the metamorphosed volcanic rocks (Pv) that are well exposed adjacent to parts of the South Arm of Moira Sound. These light- to dark-gray rocks mainly represent a layered volcanic sequence. They are commonly porphyritic with medium-grained feldspar phenocrysts in a very fine-grained groundmass that commonly is altered. The rocks are chiefly of intermediate compositions and probably range from quartz latite to andesite.

Another old unit, questionably of Early Paleozoic age, consisting largely of black slate and hornfels, forms a crudely arcuate outcrop pattern. This unit, shown by the symbol Psl, is locally chiastolite-bearing and in places graphitic.

A heterogeneous dioritic unit (d) probably represents the oldest Cretaceous (?) batholithic rocks in the area. It crops out abundantly near the West Arm of Kendrick Bay and less extensively elsewhere. Its constituent rocks are chiefly hornblende quartz diorite and hornblende diorite that are fine or medium grained and, generally, altered.

The next younger rocks, gd, are the dominant batholithic rocks in the area. They consist mainly of medium-grained quartz monzonite and granodiorite that commonly contain more than 5 percent of biotite. Salients of these rocks cut the dioritic unit.

The youngest batholithic rock consists of sodium-rich granite, gr, and occupies a small stock or boss about 3 square miles in outcrop area that is centered near Bokan Mountain. This rock is characterized by a high quartz content, albite, both microcline and sodian adularia, acmite, and a sodic amphibole, probably arfvedsonite. It apparently has had a complex history as indicated by its range in texture and two stages of formation of its constituent quartz and potassium feldspar. Locally the granite is porphyritic with coarse- or medium-grained phenocrysts, prevailingly quartz, in a fine- or medium-grained groundmass. Other textural variants are seriate porphyritic, hypautomorphic granular, and cataclastic. The granite contains abnormal quantities of certain minor elements, notably uranium, thorium, yttrium, lanthanum, niobium, and cerium and other rare earths. These elements, along with the sodium, may have been concentrated by fractionization in a late stage of the batholith magma.

The dikes consist of pegmatite, aplite, and darker colored fine-grained rocks believed to be of andesitic to basaltic composition. The pegmatites and aplites are late-stage affiliates of the sodium-rich granite and cut all other crystalline rocks. They are sodium rich, generally granite in composition, and enriched in the same minor elements as the sodium-rich granite. The volcanic dikes haven't been studied. They are most abundant and best exposed in dioritic terranes, although a few of them cut sodium-rich granite.

ORE DEPOSITS

The uranium and thorium deposits are genetically related to the sodium-rich granite, and they occur in greater abundance in or near the granite. Three types of uranium and thorium deposits are known in the area. The first is represented by the Ross-Adams lode, apparently a unique deposit. This high-grade deposit is crudely fusiform and appears to be due both to concentration of accessory urano-thorite and uranoan thorianite in the sodium-rich granite magma, and also probably to deposition of these minerals from hydrothermal solutions in numerous veinlets. The gangue minerals are abundant hematite and calcite, and lesser amounts of quartz, fluorite, pyrite, limonite, and a chlorite-like mineral. Minor amounts of several secondary uranium minerals occur in the surficial parts of the deposit.

Deposits consisting of sporadically disseminated complex uranium and/or thorium minerals in pegmatites constitute the second type of deposit. Brannerite, identified by the U. S. Geological Survey, was found in one pegmatite, and further study will probably reveal similar minerals in many of the pegmatites. The pegmatites locally contain abundant zircon and magnetite, and they commonly have a content of minor elements similar to that of the granite.

A third type of deposit occurs as fracture fillings, principally in faults cutting the granite. These deposits are generally thorium rich and commonly contain abundant hematite, limonite, and some secondary manganese minerals--all of which tend to obscure the details of the deposits. As yet the radioactive minerals haven't been identified in these deposits. Fluorite is a common minor constituent, and in one deposit is the dominant mineral. Some mineralized fractures are along dike contacts or within pegmatite or volcanic dikes.

SUGGESTIONS FOR PROSPECTING

Probably the best chance for successful prospecting lies in finding other deposits similar to the Ross-Adams lode. This deposit is in the sodium-rich granite fairly close to its contact; probably the most favorable areas for prospecting are the peripheral parts of the granite and the adjacent rocks.

Some of the other deposits may prove to be economically valuable after further exploration, and undoubtedly deposits of these types--pegmatite and fissure filling--remain to be found in the area.