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GEOLOGY AND MINERAL EXPLORATION IN THE ABSAROKA MOUNTAINS, NORTHWEST WYOMING.

by

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General Geology of the Absaroka Mountains

The Absaroka Mountains occupy an area of approximately 8,000 square miles with elevations varying from 6,500 feet to 13,140 feet. Approximately one-half of it is classified as wilderness or primitive area. The mountain range is a broadly dissected plateau of dominantly horizontal to gently inclined volcanic rocks that has been greatly eroded and deeply entrenched by a series of canyons varying between 2,000 to 5,000 feet in depth. This area, which is often designated the Absaroka volcanic field, is bounded on the north by the Beartooth Range where the volcanic rocks abutt against the Precambrian rocks, on the east by the Bighorn Basin, on the south by the eroded margin of volcanic rocks, and on the west by the younger eruptions of rhyolite and basalt in Yellowstone National Park. At one time the volcanic rocks undoubtedly extended farther to the east into and probably across the Bighorn Basin.

Major volcanic activity began approximately 50 million years ago, and continued until approximately 20 million years ago. Minor volcanism continued until geologically recent times. As many as six different volcanic units were first

recognized and mapped in the Absarokas. These have been grouped under two major epochs of volcanism described as the Early and Late series of volcanic breccias and basalt flows. From a generalized standpoint, the northern one-half of the range is dominantly underlain by actual igneous rock, while the southern half is dominantly underlain by sedimentary rocks of volcanic composition. There are some major exceptions in the southern part, where actual igneous rocks such as andesite flows and breccias are present in local areas such as Kirwin and Stinkingwater. These rocks, however, can be observed grading into volcanic sandstones and conglomerates.

The volcanic rocks vary in thickness from several hundred feet at the edge of the field to as much as 6,500 feet in the center or interior. Some observers feel that by adding the maximum thicknesses of each unit, the total over-all thickness of the volcanic rocks would range between 11,000 to 13,000 feet.

During the time required for the deposition of these volcanic rocks, volcanism was spasmodic. There were periods of erosion and local folding and faulting. As a result, much of the actual igneous material became reworked by streams and transported as landslides, forming the volcanic sandstones and conglomerates that are seen today. There were several sources for these igneous rocks. The basalt flows originated by molten lava rising up through local fissures or cracks in the earth and flowing out on the surface of the ground. Many of the presently exposed igneous intrusive bodies were the sites of old volcanic vents. Ancient volcanoes in the Yellowstone and the northern Absaroka area probably provided much of the pyroclastic material that was later reworked and deposited.

At least two stages of glaciation occurred in the Absaroka area, but these evidently were not as widespread nor as intense as those in the Wind River area.

Mineralized Areas in the Absaroka Mountains

There are four known mineralized areas in the Absaroka Range. From north to south, these are the Sunlight area, the Eagle Creek area, the Stinking-water or Needle Creek area, and the Kirwin area. The Cooke City area, located just north of the Wyoming-Montana line would be considered a fifth area, since some of the mineralization occurs in Wyoming as well as in the Absaroka volcanic rocks.

The Cooke City, or New World mining district became active in the early 1870's, and production has continued intermittently until the present time. The mineralization is composed of iron-copper-gold veins and lead-silver-zinc veins. Although most of the mineralization occurs in Montana, some of the lead-silver-zinc mine workings, particularly on Republic Mountain extend into Wyoming.

The mineralization in the Sunlight area occurs in the glacial cirque basins and on the ridges at the headwaters of various branches of Sunlight and Sulphur Creeks and the North Fork of the Shoshone River. These deposits are associated with an intrusive and volcanic center which consists of a small igneous stock, several plugs, and hundreds of radially arranged dikes, all intruding the Early Basic Breccia. Iron, copper, lead, silver, and gold minerals occur in small irregular veins in fault zones and along dike contacts in volcanic rocks. The mineralization was first discovered in about 1893, and numerous attempts have

been made to develop these deposits without success. The total production of ore from this area probably did not exceed 30 or 40 tons.

Several surficial sulfur deposits occur about 5 miles east of the Sunlight mineralized area. The sulfur cements surficial debris and also incrusts fractures in bleached volcanic rocks. The largest deposit is slightly more than two acres in size; however, most of the deposits are less than one-half acre in size. These deposits have been known for more than 60 years and various attempts have been made to exploit them. Although their economic value is questionable at this time, the area might prove worthy of exploration for mercury.

The Eagle Creek mineralized area is located about 12 miles upstream from the junction of Eagle Creek with the North Fork of the Shoshone River. The mine workings here consist of 725-foot tunnel, a caved shaft, and several prospect pits. These were driven to intersect gold-bearing veins which occur in volcanic rocks associated with a small intrusive body of igneous rock. No gold can be observed in the mineralized rock specimens; however, traces of lead, zinc, and copper minerals can be observed in veins within the tunnel.

The Needle Creek or Stinkingwater mineralized area is located near the confluence of Needle Creek with the South Fork of the Shoshone River. The mine workings here consist of several tunnels and prospect pits; some which were reportedly financed by Buffalo Bill Cody during the early 1900's. The mineralization lies in and adjacent to a large granodiorite stock that has intruded 5,000 feet of volcanic rock. Pyrite, chalcopyrite, and molybdenite

occur in a highly fractured and silicified zone in an area adjacent to Needle Creek and at the base of the southwest slope of Needle Mountain. Narrow veins containing pyrite, lead, zinc, silver, and copper minerals crop out on Crater Mountain.

Several mining companies have done some exploratory drilling here in the past several years, but no information on this has been released to the public.

Mineralization was discovered in the Kirwin area sometime during the 1890's. Early miners in the area drove approximately 7500 feet of mine workings, but little production resulted from this. The rocks exposed in this area consist dominantly of andesite flows and breccias that have been intruded by several plug-like bodies and numerous dikes. Although this area was locally famous for gold, it has more significance because of the presence of copper and molybdenum. The mineralization is of two types: pyrite-copper-molybdenum veins in altered rock on Bald Mountain, and lead-silver-zinc-copper veins that occur elsewhere in the district.

At this point the close proximity of a number of oil and gas fields to the Absaroka volcanic rocks should be mentioned. Most of these are anticlinal structures of somewhat similar trend that produce largely from upper Paleozoic rocks. One of the fields closest to the volcanics is the Fourbear anticline whose producing horizons lie between 2,800 to more than 4,000 feet below the land surface. It is interesting to note that the deep test here penetrated a rhyolite plug.

Mineral and Petroleum Exploration

For the past eighteen years, the Wyoming Geological Survey has been carrying out a long range program of studying the geology and mineral deposits of the Absaroka Range. Because of the general inaccessibility and ruggedness of the terrain, detailed mapping can be done only on foot. It is slow work.

For a number of years now, a number of mining and petroleum companies have conducted exploration in the Absaroka Range. Some of these companies have utilized our data in this exploration. The question might be asked what are they looking for besides headaches. To answer this question, let us retrace a bit and take a look at Kirwin. The target - copper and molybdenum in altered rock on Bald Mountain which would lend itself easily to an open pit operation. For the last 7 summers, this deposit has been diamond drilled by one of the nation's major mining companies. As a result, American Metal Climax Company (AMAX) will have completed exploration work this year in what is hoped to be a commercially exploitable copper ore body.

The petroleum companies too are interested in possible oil and gas structures that may be concealed beneath the cover of the volcanic rocks. There has been extensive seismic exploration in this area, and some drilling as well. Most of these holes are dry, but a few have had petroleum shows.

Conclusion

In conclusion then, let us summarize the favorable and unfavorable factors for mineral and petroleum exploration in the Absaroka Range. First of all, it is a well known fact that many large metallic mineral deposits are usually

located in areas of structural complexity and igneous activity. This, of course, is in essence, true of the Precambrian areas, however the mineral deposits in some of these areas in Wyoming may only represent the roots of such deposits because of their long history of erosion. On the other hand, some of the mineral deposits in the Absarokas may not even be exposed because of their youth and lack of erosion. Buried intrusives are considered to be good exploration targets for mineralization. Some are known to be present in the Absarokas, and others may yet be found. From the petroleum geologists' standpoint, the volcanics may cover potential oil and gas structures in the older rocks.

Mining companies have always been interested in locating additional copper and molybdenum deposits. Recent discoveries of copper and molybdenum in altered and fractured andesites at Rio Blanco, Chile, and at Safford, Arizona, would suggest that the Absaroka andesites are good targets. Further, rising consumption of silver has stimulated the opening of old mines as well as the exploration for additional deposits. Many of the Absaroka deposits contain good silver values, and would appear to warrant further exploration.

Apart from its ruggedness and general inaccessibility, the major drawback to mineral and petroleum exploration in the Absaroka Range is the existence of large wilderness areas. With certain exceptions, the chore of mapping and inventorying the mineral resources of these wilderness areas will fall upon the U.S. Geological Survey in cooperation with the Wyoming Geological Survey. This will involve a great deal of time and manpower. In this respect, I am glad to be able to say that the Wyoming Geological Survey has a 13 year head start on part of these studies.