

BALD MOUNTAIN

Hill, J. M., Notes on some Mining Districts in Eastern Nevada
U.S.G.S. Bull. 648, pp. 152-161, 1916

BALD MOUNTAIN DISTRICT
Location and Accessibility

Bald Mountain district (No. 22, fig. 1, p. 18) is in a pass between North and South Bald mountains, the former peak being 7 miles south of Ruby Pass (formerly called Hastings Pass) and 12 miles south-southwest of old Fort Kirby, a station on the Overland Stage route at the south end of Ruby Lake. (See Pl. I.) The center of the district is about 6 miles south of latitude 40° and 4 miles west of longitude $115^{\circ} 30'$. (See fig. 14) It is at the south end of the Humboldt, or, as it is now called, the Ruby Range.

Joy post office, in Water Canyon, is served biweekly from Eureka, 56 miles southwest of the camp. Freight is usually brought into this country from Elko or Halleck on the Southern Pacific, about 80 miles north of Joy, though some supplies are obtained from Currie, CherryCreek, and Ely on the Nevada Northern Railway, 40 to 50 miles to the east.

Economic Conditions

Springs are not numerous in the district, though water rises in Water Canyon above Joy, below the Copper Basin mine on the east side of the divide and in a number of small seeps at various places in the gulches north of Joy. Most of the shallow shafts, particularly in the area of intrusive rock near Joy, are under water, and it would seem that a fair water supply could be obtained by pumping from any of them. Wood is fairly abundant and some of the pinon trees in the vicinity are of sufficient size for mining timbers. It is said that good timber can be obtained a few miles southwest of the mines.

There are no mills in the district, and the long freight haul has greatly hindered development. In September, 1913, very little work was being done.

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The mine workings at the Copper Basin, probably the most extensive at any one place, could not be entered.

Topography

The low hills in which the Bald Mountain district is situated form the southern end of the Ruby Range. A low, even-crested divide continues southward for several miles to the White Pine Range. From Huntington Valley on the west side the mountains rise in a gradual even slope to Bald Mountain. The northeast flank of that peak appears to be more abrupt, but eastward a moderately high plateau country extends for some distance, joining the south end of the Ruby Hills southeast and east of Ruby Lake. (See Pl. I.)

Barometric readings give the elevation of Joy as 7,400, South Bald Mountain as 9,000, Bald Mountains as about 9,400 feet, and Copper Basin Pass as approximately 7,800 feet above sea level.

Geology Dominant Rocks

As pointed out by Hague,¹ Ruby Range south of Harrison (Ruby) Pass consists "of a single series of limestones conformably underlain by quartzites, the latter appearing along the western base, while the entire summit and eastern face presents only heavy massive limestone," which Hague considered of Devonian or Carboniferous age. On the atlas accompanying his report, west half of Sheet IV, Bald Mountain is shown as intrusive granite. During the brief visit on which this report is based only the vicinity of the mines was studied, yet it seems that the "granite" occupies a comparatively small area south of Bald Mountain. (See fig. 14.)

Sedimentary Rocks

From the few data obtained relative to the stratigraphic and structural geology, it would appear that Bald Mountain is a low anticline, whose western limb has been eroded so that the older beds are exposed on the western flank.

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The thin bed of vitreous white quartzite mapped by the geologists of the Fortieth Parallel Survey along the eastern side of the mountain is believed to correspond to the Ordovician Eureka quartzite of the Eureka district, which is 50 miles southwest of Joy in the Diamond Range across Huntington Valley. The underlying light-colored limestones forming the main body of Bald Mountain are considered to be the equivalent of the upper part of the Ordovician Pogonip limestone.² The lower part of the limestones overlying the supposed Eureka quartzite is believed to be the equivalent of the Lone Mountain limestone.

The main body of the "granite" stock has been intruded in this limestone along a fault striking N. 60° W., which is best seen at the Copper Basin workings. This fault separates the light-colored limestone on the north from a body of dark-gray to black fine-grained rough-textured dolomitic limestones which form most of South Bald Mountain, where they are interbedded with some dark quartzites and brownish shales. The latter are seen in the south fork of Water Canyon about three-quarters of a mile south of Joy. This series is considered to be equivalent to the lower part of the Pogonip limestone.

Huntington Valley is deeply filled with partly consolidated, horizontally bedded sands, which toward the mountains grade into fine sandy conglomerates that dip gently toward the valley. Deep washes are cut into these beds, which are described by King³ as the Humboldt formation and are thought by him to be of Pliocene age. The long even sloping ridges of the Humboldt and the larger canyon bottoms are masked by accumulations of recent gravels and wash.

That part of Ruby Valley shown on figure 14 is underlain by fine sands and silts which are in part lake and in part fluvial deposits.

Igneous Rocks

The "granite" is not conspicuous, for it weathers easily and is eroded more rapidly than the sedimentary rocks. It is clearly an intrusive rock, as

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is shown by the numerous offshoots from the stock and by the contact metamorphism of the adjacent sediments. It was surely formed after the deposition of the Ordovician beds and before that of the late gravels. Its age can not be proved more nearly, but its similarity to igneous rocks at many other places in Nevada whose age is more clearly demonstrated makes it probable that it is late Cretaceous or early Tertiary.

This rock consists of orthoclase, oligoclase-andesine, quartz, microcline, and biotite, with common though not abundant accessory apatite and magnetite. It is a quartz monzonite and even in the center of the stock usually has a porphyritic texture. In the coarser facies the feldspars, usually orthoclase, are the largest phenocrysts, though some quartz grains are of phenocrystic size. The ground-mass is inequigranular and few of the constituent minerals have crystal faces. The marginal facies of the stock are somewhat finer grained than the center, yet as a whole the rocks vary little in texture. The small offshoot dikes have a microgranular ground-mass studded with quartz orthoclase, and biotite phenocrysts.

Aplite is not abundant, though some small dikes free from dark minerals were noted northeast of Joy. The only basic dike seen was a highly altered dike 10 to 18 inches wide, which the thin section shows to be made up of orthoclase, actinolite, and biotite, with some large quartz phenocrysts.

Alteration of the Rocks

The intrusion of this quartz monzonite porphyry has not caused much metamorphism of the surrounding rocks. The lighter-colored limestones north of Water Canyon have suffered more than the dark dolomitic limestones south of the stock. Where the metamorphism is greatest in the limestone there is a zone of light-greenish lime silicate rock from 20 to 40 feet wide. Some of the shales in the central part of the south fork of Water Canyon have been

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altered to hornstones.

Along the veins in the quartz monzonite porphyry narrow belts of bleached rock have resulted from the development of calcite and sericite in the feldspars and the alteration of the biotite to masses of chlorite and carbonates. Most of the quartz and apatite crystals in these altered zones have remained unaltered. At the Oddie tunnel this type of alteration is further advanced than at any other place seen in the district. In a belt about 40 feet wide and of undetermined length the quartz monzonite porphyry is altered to a soft white mass which still retains the texture of the original rock. It consists of sericite, calcite, and kaolinite set with little-altered quartz crystals. Some pyrite is disseminated throughout this body and occasional stains of iron oxide and copper carbonates give it somewhat the appearance of the leached portions of some of the "porphyry copper" deposits.

Ore Deposits History

So far as could be learned, the earliest discoveries in the Bald Mountain district were the silver deposits about 4 miles southeast of Joy. The State mineralogist of Nevada⁴ says that the Nevada claim was located August 20, 1869. He describes the mine as being between two peaks 8 miles south of the Overland Stage Road, in the vicinity of two mineral belts, one of free metal 600 yards wide and 4 miles long east of the south peak, and one of the base metal 500 yards wide and 2 miles long near the summit of the south peak. He adds that the ore of the Nevada claim carries iron, antimony, lead, and a trace of copper, besides silver chloride that gives it a value of \$128 a ton. Between \$16,000 and \$20,000 is said to have been taken from the surface works in this deposit.

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It seems probable that some of the ore bodies at Water Canyon were known in the early days, but it appears doubtful if they were worked much before 1876. The Copper Basin and the old shaft on the Carbonate group were probably exploited in the late seventies or early eighties.

The camp is still in the prospecting stage, and little real development has been done, owing in part to the great distance to mills or transportation. At the Copper Basin property there has been more concentrated work than at any other place in the district, and it is reported that during 1905 and 1906 some copper carbonate ore was shipped from the ground.

Types of Deposits

So far as development shows all ore deposits of the Bald Mountain district are closely connected with the intrusion of the quartz monzonite porphyry. Ores occur in veins in the igneous rock, as replacements in limestone, and in small bodies associated with the lime silicate contact minerals. So far as could be determined, none of these types are strongly mineralized.

Veins in igneous rocks. In the main stock east of Joy a large number of small white quartz veins cut the quartz monzonite porphyry, usually parallel to a well-defined nearly vertical sheeting that strikes N. 20° E. Some veins strike N. 60° W. to east-west and dip south. The veins are for the most part frozen to the walls, which have been sericitized for short distances on both sides of the quartz. The metallization of these veins is not strong. The principal metallic mineral is pyrite, some of which is cupriferous, although stibnite and marcasite are commonly present in minor quantities. These minerals are more abundant near the walls of the vein and are also seen in the altered wall rocks adjacent to the vein. The central parts of the veins are composed of white quartz, and vugs lined with druses of clear quartz crystals are common. Gold is said to be the only valuable

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constituent of the veins. Sulphides are found at the surface and as the water table is very near the surface there is little hope of finding better-grade ores with depth.

Deposits in limestone. In the limestone areas several deposits of oxidized copper ores occur, either as replacements along simple fractures which usually trend N. 20° E. or N. 60° W., or in zones of brecciation following the same general courses. Their chief value is in copper, though gold and silver are said to be present in varying amounts. The ores are limonitic but contain chrysocolla, malachite, copper pitch ore, and occasionally cuprite and pyrolusite. So far as known no copper sulphides have been found in any of the workings in deposits of this type. In the massive limestones the replacement rarely extends for more than 8 inches from the fissure along which the solutions moved, but where the ores occur in zones of brecciated limestone mineralization may extend over 30 to 40 feet.

Contact-metamorphic deposits. On the western side of the main stock some copper carbonates were noted in a very small mass of lime silicate rock. A few pits have been sunk.

Placers

The gravels of Water Canyon are said to be auriferous for about 4 miles west of Joy and have been worked to some extent about half a mile west of the settlement, but no washing was under way in September, 1913. Pay dirt 18 to 24 inches thick is said to rest on bedrock and to have an overburden of 6 to 13 feet of wash, in which a little gold is irregularly distributed. The gold is said to be rather coarse, and nuggets worth from \$2.50 to \$10 have been found. The present water supply is not sufficient to wash these gravels, but they might be worked by dry processes.

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The Properties

Anna tunnel (No. 1, fig. 14) The Anna tunnel in the south fork of Water Canyon about a mile east-southeast of Joy is owned by W. A. Smith. It runs N. 20° E. for 60 feet on a fracture in quartz monzonite porphyry, along which there has been some movement. No quartz is shown by this work, but the iron-stained bleached country rock on either side of the fissure is said to carry a little gold.

Carbonate group (No. 2, fig. 14) The Carbonate group of seven claims on the east side of South Bald Mountain belongs to August Munter and Jacob Mayer, of Joy. The No. 1 tunnel is an irregular incline 100 feet long that reaches a depth of about 30 feet along a vertical fracture that strikes N. 25° E. in fine-grained, nearly black dolomite interbedded with quartzite. The wall rocks from 8 to 12 inches on either side of the fissure have been replaced to a small extent by copper carbonates. The small pockets of ore are irregularly distributed, and the mineralization does not appear to be strong.

The Carbonate claim, an old abandoned patent, is in a saddle which marks a zone of faulting that trends N. 25° E. The old shaft is caved at the mouth. What ore remains on the dump is a mixture of limonite and copper carbonate. The zone of brecciated limestone 50 feet wide is all more or less iron stained and shows copper carbonates at several pits. Northeast of the shaft some obscure croppings of quartz monzonite porphyry appear on the line of this fault.

Copper Basin group (No. 3, fig. 14) The Copper Basin group of 25 claims covers the divide at the head of the south fork of Water Canyon. It is the property of Simonson & Hannon, of Skelton, Nevada, but is known as the Scaggs property. The development, which was inaccessible at the time of visit, consists of two crosscut tunnels driven to the ore zone from

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the main gulch east of the divide and a large open cut with shaft on the divide. The ore makes along a breccia zone of light-colored limestone and quartzite, which strikes N. 60° W. and is thought to mark the largest fault in the camp. Some of the material on the dump is a very highly altered quartz monzonite porphyry impregnated with copper carbonates. The ore on the dumps consists of limonite, copper pitch ore, chrysocolla, malachite, and pyrolusite, and seems to be entirely a replacement of the brecciated rock. It is said that small shipments of ore were made from this property in 1905-6, which carried better than 4 per cent copper and \$11 in gold a ton. On the surface the altered and somewhat mineralized zone seems to be about 20 feet wide, but it is said that underground good ore was found throughout a width of 40 feet.

Copper King group (No. 4, fig. 14) The Copper King group of nine claims owned by Robert Raftize, of Joy, is $1\frac{1}{2}$ miles northwest of the camp. Development work in shallow shafts and tunnels has been done on several claims. One shaft 50 feet deep to water is in a nearly vertical, north-striking 50 foot zone of crushed iron-stained limestone that carries irregular pockets of limonitic gold-copper ore. A small exposure of porphyry is near the shaft, and about one-fourth mile to the northwest there is a dike-like mass of jasperoidal breccia, striking N. 50° E., which in some places is stained with copper carbonates. At the east end of this breccia a north-south dike of much-altered quartz monzonite porphyry carries a little pyrite.

Gold King group The Gold King claims (No. 5, fig. 14), 21 in number, controlled by Munter, Mayer, and Ziege, of Joy, Nevada, cover the central portion of Water Canyon in the quartz monzonite porphyry area.

A number of shallow workings have been sunk on different small quartz veins. The Gold King No. 1 incline one-half mile east of Joy is 30 feet deep on a vein that strikes N. 29° W. and dips 75° WSW. Two to three inches

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of white quartz is frozen to the walls, which are sericitized for a few inches on either side. The quartz looks rather barren, though occasionally small bunches of pyrite and marcasite are seen. Some black quartz, lining vugs, proves to be an intergrowth of stibnite and quartz. The owners say that gold tellurides have been determined in this ore. No telluride minerals were noted by the writer, but traces of tellurium were found by qualitative chemical tests in some of the material collected by him.

The Essex tunnel, just across the gulch from the Gold King incline, runs S. 20° E. for 146 feet along a series of subparallel quartz veins 4 to 6 inches wide. Two rather persistent quartz stringers about 18 inches apart are the most mineralized. The quartz monzonite porphyry between them is sericitized and contains some disseminated pyrite and is said to assay \$19 a ton in gold. Postmineral movement along the hanging wall of this vein is evidenced by grooves which dip 50° to 65° S.

A tunnel one-half mile northeast of Joy runs due east for 166 feet through quartz monzonite along two slip planes, which dip steeply south and are a fraction of an inch to 2 feet apart. The wall rock is slightly altered along them, and a little pyrite is seen in the softened bleached quartz monzonite. On the hill east of the tunnel mouth there are a number of white quartz veins that strike N. 20° E.

A mile northwest of Joy a short tunnel follows a vein that strikes N. 40° W. and dips 85° SW. and is 10 to 16 inches wide. Stibnite and pyrite are sparingly distributed in the otherwise barren white quartz.

The western claims of the Copper King group are on the contact of the limestone and the quartzite, which is marked by a zone of light

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greenish-gray lime silicate rocks. Some jasperoid has been developed outside of the contact zone, and a few small irregular pockets of copper carbonate ores are present within it.

Mountain View group (No. 6, fig. 14) The Mountain View group west of the Copper Basin consists of seven claims owned by J. W. West, of Joy. A number of prospect pits have opened small bodies of copper carbonate ore near fractures in a dark-blue crystalline dolomite. At the time of visit, Mr. West was starting to sink a shaft which was to be equipped with a whim.

Oddie tunnel (No. 7, fig. 14) The Oddie tunnel is the principal development on the Blue Bell group of 20 claims belonging to August Munter, Jacob Mayer, and Max Ziege, of Joy. It is in the south fork of Water Canyon, a little over a mile east-southeast of Joy. The tunnel runs N. 61° E. for 120 feet through iron-stained sericitized quartz monzonite porphyry. Its last 40 feet is in a zone of intensely altered rock in which there is a minor amount of disseminated pyrite and some small barren quartz veinlets. This mass of highly sericitized and calcitized quartz monzonite porphyry is approximately 40 feet wide on the surface. So far as noted underground it does not carry copper minerals, but on the surface at the east side of the zone a little copper carbonate ore is shown in some shallow workings. It may represent the leached croppings of a mineralized mass of porphyry.

Redbird group (No. 8, fig. 14) The Redbird group of six claims, the property of J. G. Merritt, is in Water Canyon, one-fourth mile west of Joy. A 40-foot breccia of limestone and white quartzite, heavily iron stained and in places containing small irregular pockets of copper carbonate ore, strikes N. 40° W. and dips 20° SW. Numerous open cuts

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shallow shafts, and tunnels have been driven into the mass over a distance of 300 feet. The bottom of one shaft 25 feet deep has reached what seems to be very much altered monzonite porphyry.

Crown Point mine. The Crown Point mine, about 4 miles southeast of South Bald Mountain, was not visited. It is said to have been worked in 1876. The rich silver ores are said to occur in small pockets irregularly distributed through a width of 20 feet in the vicinity of a vertical fissure trending N. 60° W. and cutting fossiliferous limestone. Parallel to this vein there is said to be a porphyry dike which in places forms the southwest wall of the ore. Stibnite and gray copper are present in some of the ore seen at Joy, though most of it is a soft copper-stained material carrying silver, probably in the form of silver chloride.

Other prospects. Mr. Albert Dees has a group of six claims about 4 miles north of Joy on the northwest side of Bald Mountain. Some good stibnite ore reported to have come from this property was seen in the settlement. It is said that the ores occur in rather small irregular pockets in limestone and that little development has as yet been done on any of the claims.

A group of eight claims on the south side of South Bald Mountain, controlled by G. Brant and Max Arnold, of Hilton, Nevada, is reported to have small bodies of copper carbonate ore irregularly distributed along fissures in the dark dolomitic limestone.

Notes;

1. Hague, Arnold, U. S. Geol. Expl. 40th Par. Rept., vol. 2, pp. 528-532, 1877.
2. Hague, Arnold, Geology of the Eureka district, Nevada: U. S. Geol. Survey Mon. 20, pp. 48-57, 1902.
3. King, Clarence, U. S. Geol. Expl. 40th Par. Rept., vol. 1, p. 438,

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1878.

4. White, A. F., State Mineralogist of Nevada Third Biennial Rept., for 1869-70, p. 78, (1871)

Lincoln, F. C., Mining districts and Mineral Resources of Nevada
Reno, 1923, pp. 241-2

The Bald Mountain district is situated in the neighborhood of Joy post office in the pass between Bald Mountain and South Bald Mountain at the south end of the Ruby Range. The approximate elevation is 7,400 feet; Bald Mountain 9,400 feet and South Bald Mountain 9,000 feet. Eureka...is 40 miles southwest of Joy.

The district was discovered by G. H. Foreman and others in 1869. The most important mine was the Nevada which is credited with a production of some \$20,000 worth of silver chloride ore. The Copper Basin property was opened in the late seventies and shipped a little copper carbonate ore in 1905-6. Tungston ore was discovered in the district prior to 1917.

The country rocks of the Bald Mountain district are Paleozoic limestones with some quartzite which have been intruded by quartz-monzonite porphyry. Bald Mountain is a low anticline composed of Ordovician sedimentary rocks and with its west flank eroded. The main mass of the mountain is composed of upper Pogonip limestone, with the overlying Eureka quartzite and Lone Mountain limestone appearing on the east. A fault striking N. 60° W. occurs in the pass to the south and South Bald Mountain is made up of lower Pogonip limestone. The main body of the quartz monzonite porphyry stock has been intruded into the Pogonip limestone along this fault. Veins of gold bearing quartz carrying pyrite, stibnite, and chalcopyrite (cp) are present in the quartz monzonite porphyry; replacement copper ores occur in the limestone; and copper and tungsten are found in contact metamorphic zones.

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Hess, F. L., and Larsen, E. S. Contact Metamorphic Tungsten Deposits of the U. S. U.S.G.S. Bull. 725-D, pp. 306-7, 1921

The Bald Mountain district is in the south end of the Ruby Range, in White Pine County, about Joy post office. The district was described by Hill (¹⁶Op. cit., pp. 152-161.) before the discovery of tungsten, and the tungsten deposits were examined by E. S. Larsen in the summer of 1917. The following description is partly abstracted from Hill's report and partly the result of the later examination:

The rocks of the district are chiefly Paleozoic sediments, mostly limestones but with some quartzites. The sediments are intruded by a body of granite porphyry about 4 miles long and $1\frac{1}{2}$ miles wide at its southern part but narrower to the north. The district has been prospected for many years, and veins of gold-bearing quartz carrying pyrite, stibnite, and chalcopryrite are present in the granite porphyry, replacement copper ores occur in the limestone, and copper and tungsten have been found in the contact-metamorphic zones.

The deposits a little north of Joy post office do not appear to be large or of high grade. They are irregular and in part lie along the contact and in part follow the bedding of the limestone. The contact rock is made up chiefly of garnet and diopside, with quartz, carbonates, mica, and amphibole. Limonite stains are abundant, and there are probably considerable quantities of sulphides in depth. The granite near the contact is also somewhat altered.

The prospects a little west of Joy, on the south side of Water Canyon, are along a part of the granite and limestone contact where there is on the limestone side about 15 feet of garnet-diopside-quartz tactite that is low in scheelite but on the granite side 7 feet of altered granite near the contact that carries more scheelite.

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Section of prospects west of Joy, Nevada

	Feet
Granite, little altered but grading into next band.	
Altered granite, now mostly quartz; decomposed feldspar, chlorite, calcite, epidote, titanite, pyrite, actinolite and scheelite	1
Dike of lamprophyre	2
Mostly albite, more or less decomposed, and diopside, more or less quartz, calcite, brown garnet, green hornblende, chlorite, titanite, and scheelite	6
Garnet-diopside rock.	

This zone pans rather well in scheelite; a part of the scheelite is disseminated through the rock, but a part lies along seams and fractures. There was nothing to show any considerable continuity for this ore.