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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

BULLETIN 430—E

ADVANCE CHAPTER FROM
CONTRIBUTIONS TO ECONOMIC GEOLOGY
(SHORT PAPERS AND PRELIMINARY REPORTS)

1909

PART I.—METALS AND NONMETALS, EXCEPT FUELS

IRON AND MANGANESE

BY E. C. HARDER, J. L. RICH, A. C. SPENCER,
AND SIDNEY PAIGE



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IRON ORES NEAR DAYTON, NEVADA.

By E. C. HARDER.

LOCATION.

Dayton is a small village in eastern Lyon County, Nev., on the Carson and Colorado branch of the Southern Pacific Railroad. (See fig. 3.) It is best reached by the Virginia and Truckee Railway from Reno by way of Carson and Mound House. The village is on Carson River at the upper (southwest) end of a broad, flat desert, just below the point where the river runs out of the canyon below and east of Carson.

Two groups of iron-ore deposits are found near Dayton—a small one about 2 miles to the southwest, between the railroad and the river, and a large one about 12 miles to the northeast, on the boundary of Lyon and Storey counties. Only the latter is of commercial importance in the steel industry, but the ore from the former might be used in a small way as fluxing material.

DEPOSITS NORTHEAST OF DAYTON.

General distribution.—The iron ores northeast of Dayton are in an area of gently rolling hills which form the northeastern continuation of the flat desert area below Dayton. Northeast of the deposits there is another desert area with alkali flats, and beyond are other rolling hills. This generally low belt bounded on the northwest and southeast by mountain ranges is known as the Fortymile Desert. In the mountains to the northeast is the famous old Comstock lode, with Virginia City and Gold Hill high up on the slope.

The iron-ore deposits are near the northwest border of the desert belt. Outcrops of ore are distributed over an area roughly one-fourth of a mile wide and half a mile long (see fig. 4), the longer diameter being approximately north and south. At the south end of the area there is a hill rising about 75 or 100 feet above the surrounding area. Its crest is about 900 feet long and 200 feet wide and trends about N. 45° W. Iron-ore outcrops form the crest and extend some dis-

tance down the slopes. The northeast slope and the southeast slope below the iron-ore outcrops consist of a soda granite; the southwest slope is covered with rock débris. Below the iron ore on the northwest slope there is soda granite and crystalline limestone. South of the hill is a large area of horizontal conglomeratic limestone, probably a calcareous tufa, which in most of the area overlies soda granite. North of the hill is a broad, gently undulating flat extending for a mile or more, covered with float but showing a few ore and rock

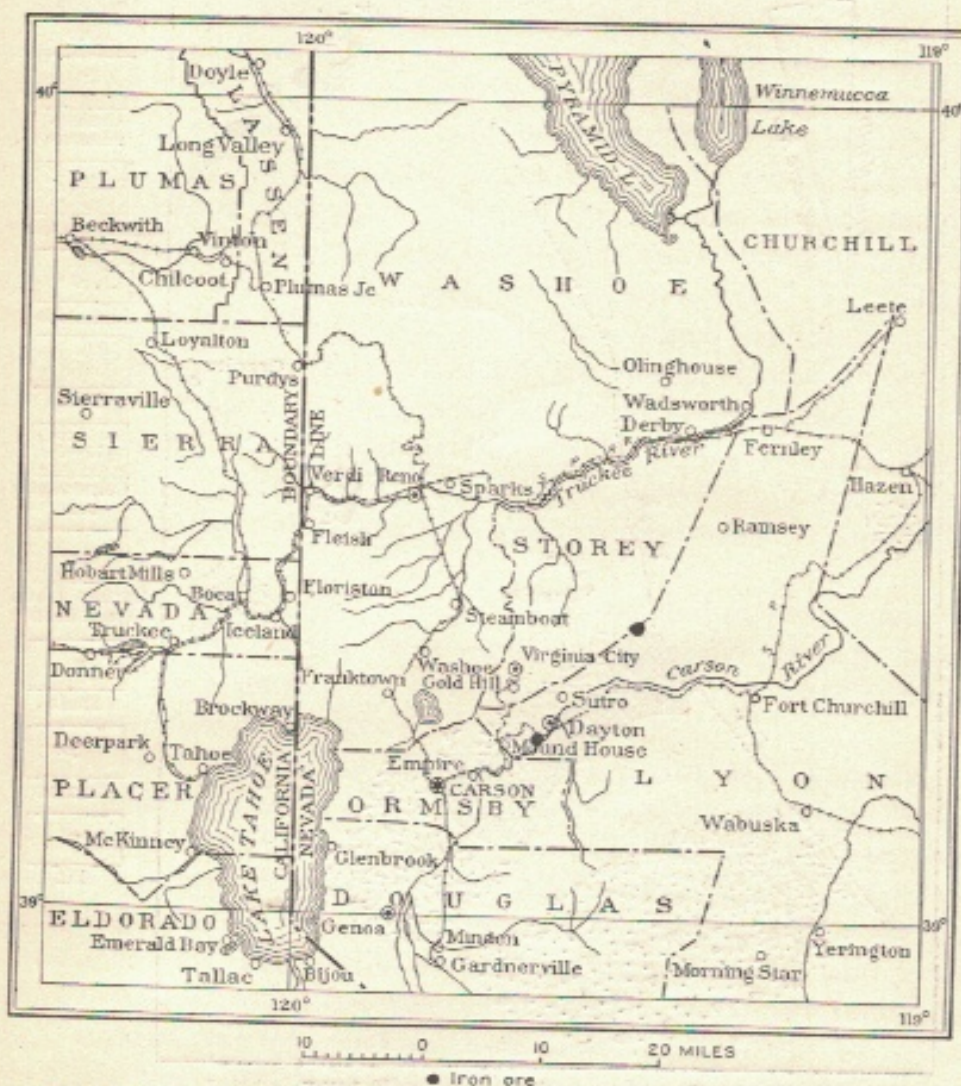


FIGURE 3.—Map of a portion of western Nevada, showing location of iron ores near Dayton.

outcrops here and there. The principal ore outcrops in this flat are about half a mile northeast of the ore hill. They consist of three masses arranged along a line about N. 60° W., and near them occur several outcrops of limestone and pits in soda granite. About 150 yards northwest of these outcrops, just west of a road that comes through the area from Dayton, there is a small knoll on which iron ore and soda granite outcrop. Two other ore outcrops lie close

together about two-thirds of the distance from the three ore outcrops at the north end of the area to the main ore hill. A short distance southeast of these there is a low ridge on which granite and shale outcrop. No other outcrops occur within the iron-ore area.

A number of pits have been sunk on the flat north of the ore hill, but only three of them have struck bed rock, the others being in

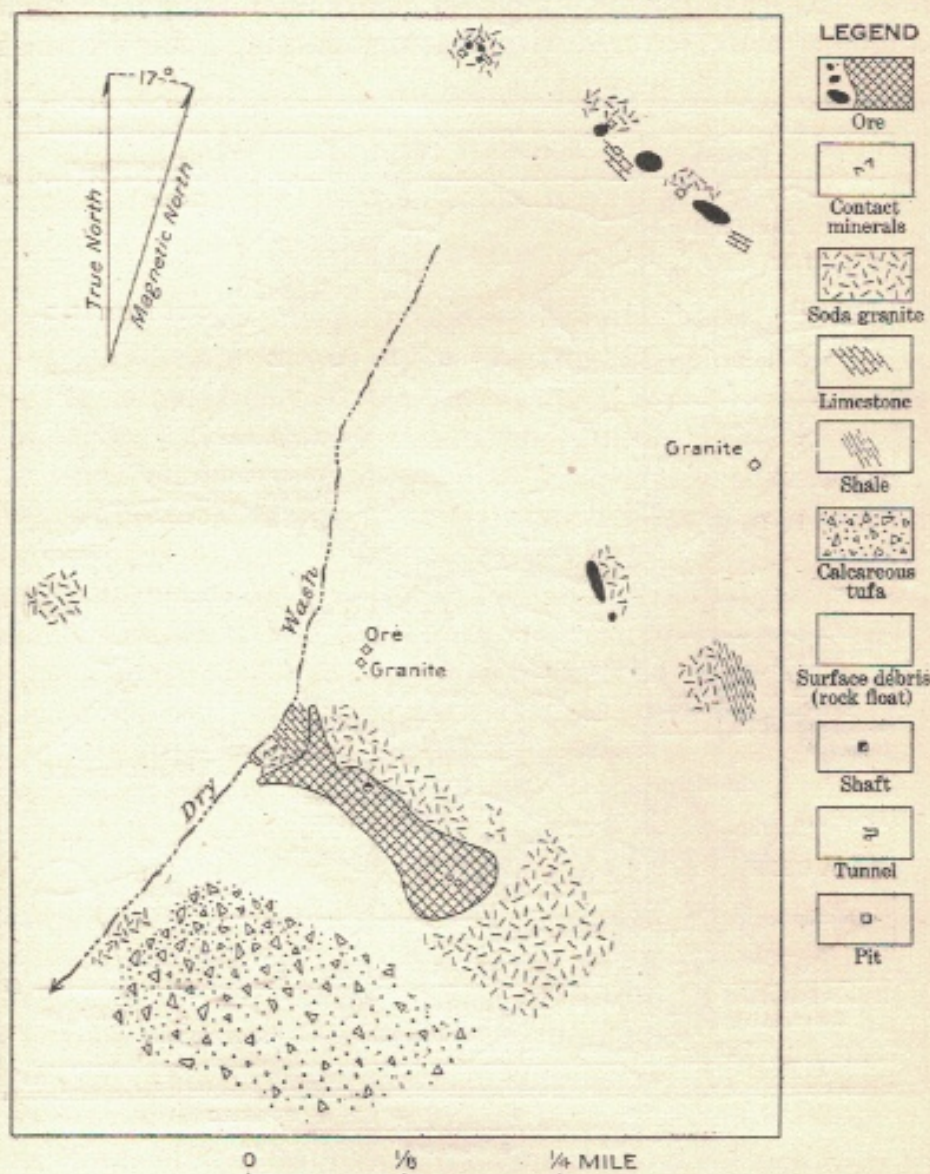


FIGURE 4.—Sketch of iron-ore area northeast of Dayton, Nev.

float to a depth of 10 or 20 feet. Of the pits which struck bed rock, one, a short distance southeast of the three ore outcrops at the north end of the area, reaches soda granite; of the other two, which are close together a short distance north of the ore hill, one reaches ore and the other soda granite. There are several tunnels and pits on the iron-ore hill.

From the distribution of ore and rock as shown by outcrops and pits it appears probable that the area is composed largely of soda granite, in part aplite, in which there are local masses of limestone and iron ore. Where the relation of the ore to the rocks is clear it is seen that the ore occurs at the contact of the limestone and granite. The soda granite has also broken into the limestone and ore masses in irregular intrusions. Metamorphic minerals, including garnet and epidote with a little albite, are developed locally.

Character of the rocks and ores.—The soda granite or aplite is a light-colored, medium-grained rock varying slightly in appearance in different parts of the area, because of the varying amount of dark mineral present. It is composed largely of orthoclase and quartz, in which are embedded larger crystals of albite and albite-oligoclase. Minor quantities of green hornblende, biotite, epidote, and chlorite occur. Locally the ferromagnesian minerals are almost absent and the rock is yellowish white and aplitic. The chlorite is derived from the alteration of the biotite, which has locally almost entirely disappeared. The feldspars are much altered to epidote and kaolin. Apatite and magnetite are accessory minerals.

The limestone where fresh is thoroughly crystalline and blue or white in color. Near the ore and granite, however, it has suffered some decomposition and is stained yellow or brownish. No bedding is apparent.

The calcareous tufa has a pronounced bedded structure and lies nearly flat. Some of the beds consist of massive though porous limestone; others contain an abundance of rock fragments and sand grains in a calcareous matrix.

The ore is a mixture of hematite, magnetite, and limonite, the hematite being the most abundant in the surface outcrops, though both magnetite and limonite occur with it and locally the magnetite is more abundant than the hematite. The ore is dull, hard, and somewhat porous at the surface; with increasing depth it becomes soft and granular and contains an abundance of calcite and locally gypsum (selenite) along fissures. The soft ore is largely magnetite. Garnet, quartz, calcite, epidote, and albite are present at several places along the contacts of ore and granite or limestone and granite. Epidote occurs in veins and masses cutting garnet. Albite is found in the epidote in such positions as to indicate that the latter is an alteration product of it. Here and there in the garnet masses are small veins of unaltered albite.

Occurrence of the ores.—The outcrops of ore on the hill at the south end of the iron-ore area occupy a space about 1,000 feet long and from 200 to 500 feet wide. Within this area there are one or two tongues of granite and the float between the outcrops may cover limestone or other granite bodies. The surface ore on the crest is

hard and massive, though slightly porous in places. One shaft and several pits have been sunk into it. The pits have not passed through the hard ore, but the shaft goes into a soft, bluish, granular mixture of magnetite and calcite at a depth of less than 20 feet. Much selenite occurs with this soft ore.

On the northwest slope of the hill erosion has been very rapid because of an arroyo at the base; hence much of the hard surface ore has been removed and a soft granular mixture of magnetite and calcite similar to that in the pit on the crest of the hill is exposed in places. Here, also, selenite is abundant in cavities and along fissures. Some porous, hard, low-grade ore, with considerable impurities consisting largely of unreplaced siliceous rock, outcrops on the lower slope, but most of the ore outcropping on the upper slope is hard and massive, though mixed irregularly with it is the blue granular ore already mentioned. A mass of yellowish, somewhat altered crystalline limestone occurs near the base of the slope southwest of the low-grade ore exposures, and southwest of the limestone lie soda granite and contact rock, the granite occurring between the contact rock and the ore of the upper slope.

The contact rock consists of a mixture of epidote, garnet, and albite. The garnet was formed first, and the epidote occurs in it in veins and irregular masses. The garnet is reddish brown in color and is probably andradite. The epidote contains remnants of albite, of which it is probably an alteration product. Some veins of little-altered albite occur.

The granite near the base of the hill contains an abundance of biotite and is greenish gray in color. At other localities on the hill it is usually grayish white and contains biotite sparingly. A long tunnel entirely in dark granite is just above the wash at the base of the hill.

The three ore outcrops near the north end of the iron-ore area lie in a line about N. 60° W. The northwesternmost one is about 50 feet in diameter. Just north of it is a shallow test pit in granite and yellowish crystalline limestone. In this pit schistose granite occurs next to the ore, then limestone, and north of this blocky granite. Fragments of contact rock consisting largely of epidote, quartz, and calcite was found near the pit and probably came out of it. About 120 feet to the southeast is the second ore outcrop, approximately 100 feet in diameter. Between the first and second outcrops is an exposure of fresh blue and white crystalline limestone with nearly vertical north-south banding. A test pit has been sunk into it. The second ore outcrop is surrounded by float. The third ore outcrop is about 150 feet southeast of the second and is about 130 feet long and 60 feet wide. Between it and the second outcrop is a pit in fissured, blocky granite, and southeast of it is a small exposure of blue crystalline limestone

banded in a northwest-southeast direction. The ore in all three outcrops is largely hematite, hard and massive, and of high grade.

On the knoll near the road there are several pits in iron ore and granite covering an area about 75 feet in diameter. The ore and rock are irregularly distributed, and no definite relation is apparent between them.

Of the two ore outcrops in the flat the one to the north is the larger, being 15 to 30 feet wide and 130 feet long. It trends approximately N. 15° W. and dips steeply to the west. East of it is granite; to the west is float. This ore is of very poor quality, being intermixed with much country rock, unaltered or only partly replaced by iron. The granite is stained and impregnated with iron oxide. One trench cuts across the ore band and a pit has been sunk at the contact of ore and granite. The other ore outcrop is about 25 feet in diameter, has a pit in the center, and is surrounded by float.

Origin and economic importance of ores.—From their occurrence the ores northeast of Dayton appear to be contact deposits formed during or after the intrusion of the granite into the limestone. This view is strengthened by the presence of minerals characteristic of intrusive contacts. The ores are probably partial replacements of the limestone, some of the original limestone being still present as local masses in the vicinity of the ore or occurring in the recrystallized form of calcite within the ore. The surface ore has been enriched and concentrated by the removal of calcite and probably by the deposition of iron oxides. The selenite may be simply a deposit near the surface from gypsiferous solutions or it may have been derived from the oxidation of pyrite, though this mineral has not been found in the ores.

Most of the surface ore is of high grade. In depth it appears, whenever penetrated, to be strongly impregnated with calcite. Locally enough calcite is present to make the ore self-fluxing, and therefore in reality the presence of calcite does not materially affect the value of the ore. The selenite may be abundant enough in places to necessitate dressing of the ore to reduce the sulphur content. If the ores were smelted in the electric furnace, however, the presence of selenite would not be objectionable. The depth to which the ores may extend is problematic, though the increasing amount of calcite with increasing depth suggests that the ore may become of too low grade to be worked. But the deposits are of sufficient size to be commercially important even if the ore is supposed to be relatively shallow. With a depth of 50 feet the deposit on the hill at the south end of the area would probably yield approximately 1,500,000 tons of ore. The deposits are on low ground and can easily be approached by a railroad either from Dayton or from the Nevada and California branch of the Southern Pacific Railroad to the east.