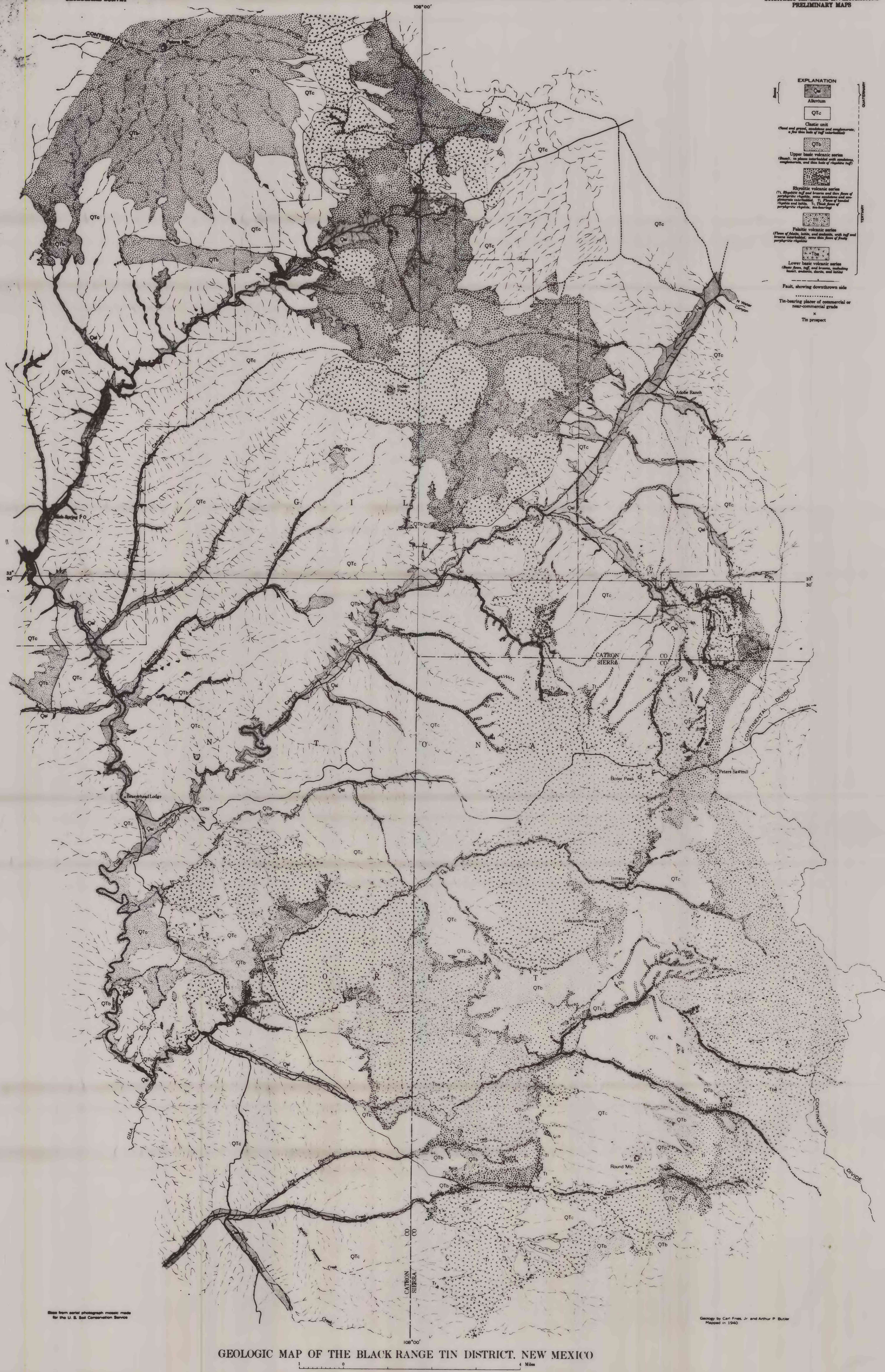
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STRATEGIC MINERALS INVESTIGATIONS
PRELIMINARY MAPS



EXPLANATION

Alluvium

QTc — Clastic unit (Sand and gravel, sandstone and conglomerate, a few thin beds of tuff interbedded)

QTb — Upper basic volcanic series (Basalt, in places interbedded with sandstone, conglomerate, and thin beds of rhyolitic tuff)

Tf, Tr, Tl — Rhyolitic volcanic series (Tf, Rhyolitic tuff and breccia and thin flows of porphyritic rhyolite, some sandstone and conglomerate interbedded. Tr, Flows of banded rhyolite and latite. Tr, Thick flows of porphyritic rhyolite, tin-bearing)

Tfl — Felsitic volcanic series (Flows of felsite, latite, and andesite, with tuff and breccia interbedded. Some thin flows of finely porphyritic rhyolite)

Tba — Lower basic volcanic series (Basic flows, tuff, and breccia, including basalt, andesite, dacite, and latite)

QUATERNARY

TERTIARY

Fault, showing downthrown side

Tin-bearing placer of commercial or near-commercial grade

Tin prospect

Base from aerial photograph mosaic made for the U. S. Soil Conservation Service

Geology by Carl Fries, Jr. and Arthur P. Butler
Mapped in 1940

GEOLOGIC MAP OF THE BLACK RANGE TIN DISTRICT, NEW MEXICO

1 0 4 Miles

GENERAL FEATURES OF THE DEPOSITS

By Carl Fries, Jr.

The rocks in the Black Range tin district, as mapped, are divided into six units. The four lower units are predominantly of volcanic origin and comprise lava flows, tuff, and breccia, which range in composition from basaltic to rhyolitic. The sum of their maximum thicknesses exceeds 5,000 feet, but the greatest aggregate thickness at any one place was probably considerably less than that, for there is much interfingering of these volcanic units. The two upper units are dominantly waterlaid deposits derived from the volcanic rocks. Their aggregate thickness in the area mapped is more than 800 feet, and in places it may be as much as 1,000 feet.

The units are separated from each other by pronounced erosional unconformities, and there are many minor unconformities within the units. The rocks are partly altered but are not metamorphosed in the usual sense of the word. Although in large areas they appear to have been slightly tilted, they are not folded, and at most places where they dip at angles of less than 35° their dips are clearly initial, conforming roughly with the eroded slopes on which the beds were deposited or the lavas poured out. The steep dip of the sheeting in the lavas at certain places merely indicates the direction of flow at those places just before the lava solidified. Some small faults have been found, and others are doubtless concealed by alluvium or earlier gravel. The largest displacement observed along any fault is about 250 feet. The present basinlike structure of the separate areas within this district is probably a result of faulting.

The oldest rocks exposed in the tin district are probably underlain by Paleozoic sedimentary rocks, for the Abo sandstone, of Permian age, crops out west of Chloride, a few miles east of the area mapped. The volcanic rocks are undoubtedly Tertiary in large part, and they may all be Tertiary. Part of the clastic unit (QTc) also may be Tertiary, as this unit seems to correspond to what is known as the Gila conglomerate, of late Tertiary and Quaternary age, in western New Mexico and eastern Arizona.

The six units are described below in order of age.

Lower basic volcanic series

The rocks of the lower basic volcanic series (Tba) are dominantly basaltic and andesitic lavas, with some flows of dacite and latite. The lavas are interbedded with tuff, breccia, and waterlaid clastic sediments that also have the composition of basic to intermediate volcanic rocks. Most of the flows and the layers of breccia are dark gray, green, blue-green, or purplish, but some are light-colored. The base of the series does not crop out in this district, but the part exposed has a maximum thickness of about 1,000 feet. The entire series is altered, and its most altered rocks contain abundant pyrite.

Felsitic volcanic series

The rocks of the felsitic volcanic series (Tfl) are mainly lavas, which are generally whitish or pinkish in color and largely felsitic in texture. Most of the lava flows are fine-grained porphyritic rhyolite, but a few are andesite and latite. Tuff, breccia, and waterlaid clastic sediments are interbedded with the flows in a few places. All the clastic and pyroclastic rocks are well cemented, but they generally appear fresher than the light-colored tuff and breccia of the lower basic volcanic series (Tba). The thickness of the series in the tin district ranges from 50 to about 700 feet.

Rhyolitic volcanic series

The rhyolitic volcanic series (Tr) is almost entirely confined to the west side of the Continental Divide. It occupies large areas widely distributed through the tin district, but it is best exposed along Diamond Creek. The maximum thickness of the series is now about 1,800 feet, but it must once have been much greater, for rhyolite debris is abundant in the overlying clastic unit (QTc). In a few places the rhyolitic series is absent and the clastic unit lies directly on the felsitic rocks (Tfl).

The series comprises tuff, breccia, some sandstone and conglomerate, thick flows of porphyritic rhyolite (Tr), and thin flows of latite and banded rhyolite (Tl). The porphyritic rhyolite, which contains most of the tin-bearing veins in the district, is dominant in the lower part of the series; the latite and banded rhyolite are dominant in the upper part. The rhyolite flows are light gray to reddish brown, and the latite is dark gray. The tuff, breccia, and clastic beds are mostly light-colored, largely pale yellow or reddish, and are so much alike that it has not been possible to map them separately. They are interfingered with the flows and pinch out in many places, as along Diamond Creek. The clastic rocks are comparatively fresh, and unlike those of the felsitic series (Tfl) they are poorly consolidated.

The porphyritic rhyolite (Tr) is fairly uniform in general appearance throughout the area mapped, but it shows minor differences in texture and in the relative abundance of the constituent minerals. These differences, together with the diverse attitudes of the flow layers, are believed to indicate that the lava was extruded from several centers. Certain areas of rhyolite in which the sheeting is persistently steep are thought to mark the location of vents. One of the vents may be underneath the rhyolite that crops out along Diamond Creek, another between Seventyfour Draw and Stiver Creek, and a third in the large area between Alexander Canyon and Squaw Creek. The rhyolite between Beaver, Indian, Taylor, and Whitetail Creeks appears to have been extruded from another set of vents nearby. The flows between Squaw Creek and Corduroy Canyon presumably had a separate source; those near the north edge of the map and those in the vicinity of Hardcastle Creek probably were extruded from vents beneath them. No conjecture is offered regarding the source of the thin flat-lying flows that are exposed near Indian Peak, between Corduroy and Railroad Canyons; these flows overlie nearly horizontal beds of rhyolite tuff, which in turn overlie the rhyolite flows farther north and farther south.

Upper basic volcanic series

The upper basic volcanic series (QTb) consists mainly of basaltic lava flows, with which thin beds of rhyolitic tuff and waterlaid sandstone and conglomerate are interbedded in a few places. The basalt is best exposed in Pelona Mountain, where it is at least 1,500 feet thick, and in Beaver Creek Canyon. The upper 1,500 feet of Black Mountain, which is on the west side of Beaver Creek and west of the area mapped, appears to consist wholly of basalt. The basalt was probably extruded in part from beneath Pelona Mountain and in part from beneath Black Mountain.

Clastic unit

Clastic beds are exposed over the greater part of the area mapped. The clastic unit (QTc) comprises beds of three distinct types, which are not differentiated on the map. Thin-bedded tuff occurs near the base in a few places, notably along Beaver Creek north of Beaverhead. The greater part of the unit consists of waterlaid, poorly sorted, moderately well cemented gravel, containing a large percentage of tuff eroded from the volcanic series. The uppermost beds, which are mostly unconsolidated, consist mainly of water-worn fragments of volcanic rock, with very little tuff.

All of these rudely bedded, water-deposited clastic sediments were undoubtedly deposited during the same general period of time. The areas in which the beds were deposited were presumably interconnected by drainage-ways during most of that time, as the unit contains no fine-grained lake-bed sediments, such as are generally formed in closed basins. There are a few erosional unconformities within the unit. Some faults cut the lower beds but apparently do not affect the upper beds, indicating that the faulting occurred within the period during which this unit was being deposited.

The clastic unit contains a little cassiterite (tin oxide) but not enough to make it workable as placer ground.

Before the present valleys and gullies were formed, the rocks in the area shown on the map were eroded, for the most part, to a nearly flat surface with a gentle slope to the west. A few hills, however, such as Miller Peak and the Indian Peaks, rise above this surface. In some places the upland plain has a cover of gravel a few inches to about 5 feet thick, which has not been shown on the map. The age of this gravel is between that of the clastic unit (QTc) and that of the alluvium (Qal).

Alluvium

Alluvium (Qal) covers the bottoms of all the valleys in the district but is shown on the map only where it is more than about 4 feet thick. The greatest thickness of alluvium observed is about 35 feet, but it may be as much as 50 feet in a few places. The material varies greatly in character from place to place, but in general it is fairly coarse, and boulders as much as 3 feet in diameter are common at some localities. Nearly all the placer tin mined from the district has come from this recently deposited alluvium.

Mineral deposits

Tin-bearing veins.--Nearly all the tin-bearing veins known to occur in this district are in the porphyritic facies (Tr) of the rhyolitic volcanic series (Tt). A few veinlets of limonitic gossan have been found in the felsite volcanics (Tfl), for example north of Scales Creek, but they contain little tin. The veins in the porphyritic rhyolite are mainly stringers that consist predominantly of specularite (iron oxide) and cassiterite (tin oxide); the proportion of cassiterite ranges from a few percent to as much as 30 percent, the average being about 20 or 25 percent. The veins also contain a little magnetite, together with minor quantities of the silicon dioxides cristobalite and tridymite and of fluorite, chalcedony, opal, quartz, and zeolites.[1] The veins are all small, most of them ranging in size from thin films 1 or 2 feet long to tabular bodies an inch thick and 20 to 30 feet long. A few of the larger veins include lenses 2 to 8 inches thick and 1 to 4 feet long.

Tin placers.--Placer deposits of tin occur sparingly in the uppermost gravels of the clastic unit (QTc), for example, in the vicinity of Boiler Peak. Larger quantities are found in the alluvial deposits (Qal) of the stream valleys and in the residual soil and slope wash at higher levels than the stream deposits. The placers are mostly near the outcrops of the tin-bearing veins in the rhyolite, as on Squaw Creek and Hardcastle Creek, but some of them are near the outcrops of tin-bearing gravels in the clastic unit, from which they have been reconcentrated.

Other possible mineral deposits.--Some beds of kaolinized tuff (Tba) that occur north of Turkey Run, near the west edge of the area mapped, have been prospected as a possible source of kaolin, and two small excavations have been made nearby in rock that is said to be kaolin-bearing.

Suggestions for prospecting

Search for tin-bearing veins may safely be confined to the porphyritic rhyolite. Placer tin, being derived primarily from these veins, is most likely to be found in slope wash on porphyritic rhyolite, and in alluvium near outcrops of that rock. Flat erosion surfaces of rhyolite and shallow draws on those surfaces appear to offer the greatest promise. The known placers are shallow and of small volume, and any others found will probably be of the same character. The work done thus far has indicated that the grade of the placer gravel decreases as its thickness increases. The clastic unit and the deepest alluvial deposits have not been explored to any great extent, but such exploration would be costly and seems unlikely to result in the finding of tin in commercial quantities. Small tin-bearing veinlets will probably be uncovered in mining placer deposits in the residual soil and slope wash on the rhyolite, but if these veinlets are not large enough at the surface to warrant mining it does not seem advisable to follow them far downward.

1/ Fries, Carl, Jr., Tin deposits of the Black Range, Catron and Sierra Counties, N. Mex.: U. S. Geol. Survey Bull. 922-M, p. 364, 1940.