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# MINERAL RESOURCE POTENTIAL MAP OF THE CHANCHELULLA ROADLESS AREA, TRINITY COUNTY, CALIFORNIA

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## STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under considertion for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Chanchelulla Roadless Area (5220), Trinity National Forest, Trinity County, California. The Chanchelulla Roadless Area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

## SUMMARY

Based on mineral surveys in 1980, 1981, 1982, 1983, the Chanchelulla Roadless Area has an inferred subeconomic resource of about 7,200 tons containing 0.084 oz gold per ton, 0.84 oz silver per ton, and accessory copper at the Chanchelulla prospect. The area has a low potential for other metallic resources although the potential for platinum group metals associated with sulfides in an amphibolite zone warrants more detailed study. In addition a more detailed study of the magnetite vein at the Iron Chief prospect would provide evidence on the possible presence of pocket gold. The area has a low potential for limestone resources, and no evidence of a potential for other nonmetallic resources. There is a low potential for mineral springs and there is no evidence of a potential for energy resources in the roadless area.

## INTRODUCTION

The Chanchelulla Roadless Area is in the Klamath Mountains geologic province about eight miles southeast of Hayfork, California (fig. 1) and encompasses an area of 11,900 acres. Altitude above sea level ranges from 2850 ft along East Fork Hayfork Creek on the northwest, to 6399 ft at Chanchelulla Peak, near the center of the roadless area. Chanchelulla Peak dominates an area characterized by brush-covered ridges and heavily forested valleys. California State Highway 3 borders the area on the west, and trails from U.S. Forest Service roads provide access to the north, east, and south boundaries.

The Chanchelulla Roadless Area is included on the geologic map of parts of Chanchelulla Peak, Dubakella Mountain, Black Rock Mountain and Yolla Bolly 15-minute quadrangles by Wright (1981). Our study includes more detailed geologic mapping in the roadless area and the collection of stream-sediment and rock samples in the summers of 1980 and 1981 by the U.S. Geological Survey. Forty-seven of the reconnaissance rock and stream-sediment samples were analyzed for 31 elements. Limestone samples were collected and examined for fossil content.

The U.S. Bureau of Mines Western Field Operations Center searched published literature as well as records of the U.S. Bureau of Mines, Trinity County, U.S. Bureau of Land Management, and U.S. Forest Service for data concerning mineral deposits, claims, leases, production and mining activity in the area. The Bureau of Mines conducted field work in the summer of 1982 that involved sampling of rocks and stream gravels, searching for prospects and claims, and mapping the workings and mineralized zones in the study area. Because of the ruggedness of the terrain and the dense vegetation, some workings may have been overlooked.

Reexamination of the roadless area by the U.S. Geological Survey personnel in the summer of 1983 revealed more information concerning the geology and mineral resource potential (N. J Page, F. Gray, B. Moring, oral comm., 1983).

## GEOLOGIC SETTING

The Chanchelulla Peak Roadless Area is located within the western Paleozoic and Triassic belt, one of several lithic belts that constitute the Klamath Mountains geologic province (fig. 2). These imbricate arcuate lithic belts (convex side facing west) are thought to represent eastward dipping thrust slices of oceanic crust and island arcs that were accreted to the continental margin by plate tectonic processes during Mesozoic time (Irwin, 1977). The rocks of the western Paleozoic and Triassic belt are west of and underthrust the central metamorphic belt, and are in turn underthrust by the rocks of the western Jurassic belt on the west. The western Paleozoic and Triassic belt extends 190 mi north-south and ranges 25 to 50 mi in width. The southern part of the belt has been subdivided into three terranes. The central terrane is the Hayfork, the rocks of which thrust under the North Fork terrane on the east and are in turn underthrust by the rocks of the Rattlesnake Creek terrane on the west.

The Hayfork terrane is the most extensive of the three terranes in the western Paleozoic and Triassic belt. It extends north-south approximately 125 miles (Donato and others, 1981) and ranges 9 to 15 mi in width. The southern part of the Hayfork terrane of Irwin (1977) has been split into the western Hayfork terrane and the eastern Hayfork terrane by Wright (1981). The boundary between the two terranes is a thrust fault with the western Hayfork rocks thrust under the rocks of the eastern Hayfork. The western Hayfork terrane contains four units and is equivalent to the Hayfork Bally Meta-andesite and part of the middle Hayfork unit of Irwin (1977). The eastern Hayfork terrane is equivalent to part of the middle Hayfork and upper Hayfork units of Irwin (1977). The Ironside Mountain batholith intrudes the westernmost part of the western Hayfork terrane, and in the south the batholith is bounded by a fault on the west where the rocks of the Rattlesnake Creek terrane underthrust the batholith. In the north the batholith is underthrust by the rocks of the western Jurassic belt.

Most of the Chanchelulla Roadless Area is underlain by rocks of the Wildwood pluton (fig. 3) (Chanchelulla Peak pluton of Wright, 1981), a part of the Ironside Mountain batholith. The remainder of the roadless area is underlain by rocks of the eastern Hayfork terrane.

The Wildwood pluton is a concentrically zoned ultramafic-mafic complex that is probably Middle Jurassic in age. The core is predominantly clinopyroxene-rich ultramafic rocks with an inner core mostly consisting of dunite, wehrlite, and olivine clinopyroxenite, and an outer core primarily consisting of hornblende-olivine clinopyroxenite. The outer zone consists mainly of pyroxene gabbro and pyroxene diorite. Ultramafic and mafic dikes intrude the Wildwood pluton, but only the mafic dikes intrude the country rock adjacent to the pluton. The relationship between the inner core, the outer zone, and the dikes indicate that the

Wildwood pluton is a single intrusion. The concentric zonal distribution is interpreted to have been caused by diapiric rise of the cumulate ultramafic floor into a more differentiated, higher part of the intrusion (Wright, 1981).

The field examination in the summer of 1983 revealed that an amphibolite zone approximately 100 ft wide exists between the inner and outer zones on at least the south, west, and southeast sides of the Wildwood pluton and may extend all the way around the inner zone. Sulfide mineralization was present to some degree in the amphibolite zone everywhere outcrops were visited. (N. J Page, F. Gray, B. Moring, oral comm. 1983)

The eastern Hayfork terrane is an allochthonous, highly disrupted and deformed, weakly metamorphosed sedimentary unit. The main lithologic types are chert and argillite, quartzose sandstone and argillite, and polymictic conglomerate enclosed in a sheared argillaceous matrix. Exotic blocks of metachert, mica schist, quartzofeldspathic schist, and greenstone are present. Large exotic limestone masses occur only near the tectonic boundary with the western Hayfork terrane (Wright, 1981).

The age of the eastern Hayfork terrane is derived from paleontological information. The most recent information indicates that foraminifera from limestone in the eastern Hayfork terrane are Late Permian (early Djulfian). These foraminifera are the youngest Permian Tethyan fauna in terranes along western North America, and may be the youngest Permian fauna in the Western Hemisphere (Nestell and others, 1981).

The interpretation by Wright (1981) is that the eastern Hayfork terrane was deposited on deep oceanic basement as young as Permian in age, was rafted by sea floor spreading processes into a convergent plate setting, and was accreted to the continent as a melange wedge during Mesozoic time.

## GEOCHEMISTRY

Stream sediments from streams draining the Chanchelulla Roadless Area were sampled, and samples of the various rocks in the area were collected. Samples from all mines and prospects were collected and the analyses were used to check for mineralized rock that may still be present. The rock sample analyses were used to establish background values to compare with the stream sediment and mine and prospect values that were examined within their geologic setting and evaluated for their significance.

The 47 rock and stream-sediment samples collected by the Geological Survey were analyzed for 31 elements using a six-step semiquantitative emission spectrographic method. Most of the samples were also analyzed by fire assay for platinum-group metals and gold. Analytical results are shown in Table 1.

The U.S. Bureau of Mines collected 19 rock chip samples, including 8 limestone samples from the Potato Creek prospect (loc. B, fig. 3) and 11 placer samples.

Threshold values (table 1) for 24 elements were defined at two standard deviations above the mean of the values of the rock and stream-sediment samples, and values above the thresholds are considered anomalous (Lepeltier, 1969). Threshold values for rock samples are highly subjective because mineralized samples were included. Ten elements (silver, cobalt, chromium, copper, nickel, lead, zinc, gold, platinum, and palladium) are of particular importance.

Rock sample 12 (table 1; fig. 3) is mineralized vein material from the Chanchelulla Prospect (loc. A, fig. 3) and contains silver, copper, and zinc as do similar USBM samples taken from this prospect. Sample 28 (table 1; fig. 3) is a mineralized rock sample anomalously high in copper and palladium, however the mineralization appears to be very localized. Three rock samples (23, 39, 43, table 1; fig. 3) contain anomalous nickel and one sample (43), anomalous cobalt, but this is not significant because nickel and cobalt in ultramafic rocks are tightly locked up in the mineral structure. Rock sample 31 shows an anomalously high copper value because it contains a higher percentage of copper-bearing minerals, but it is not considered significant because the mineralization appears to be localized. Rock samples 21 and 23 are anomalously high in chromium due to a somewhat higher proportion of chromite, but there is not enough chromite present to be significant. Rock samples 22, 28, and 40 contain the most platinum or palladium (table 1) of the rocks sampled in the roadless area. These values are not much higher than the lowest background values reported by Wright and Fleischer (1965) for mafic or ultramafic rocks.

Stream-sediment sample 3 (table 1; fig. 3) appears to be anomalously high in zinc, but the anomaly is due to the fact that there are no detectable zinc values in the other stream-sediment samples. Stream-sediment sample 8 is slightly high in copper, but doesn't appear to be significant. Stream-sediment sample 9 is slightly anomalous in chromium, platinum, and palladium. This is not significant for chromium because chromite is highly resistant to and is concentrated by weathering processes. However, there is some significance to the presence of platinum and palladium in stream-sediment sample 9.

## MINING ACTIVITY

Mining activity in the region surrounding the Chanchelulla Roadless Area dates from 1848, following the discovery of gold at Reading Bar (fig. 1) on the Trinity River, about 11 miles to the north. This discovery prompted prospecting in the streams of the Trinity River drainage close to the study area and by 1852 most of the major placer deposits had been located. Placer deposits were initially mined by small-scale techniques and hydraulic methods through the late 1800's, and until fairly recently, by dredging (O'Brien, 1965). An estimated $35,000,000 in placer gold has been recovered from the entire Trinity River System since mining began (Clark, 1970). However, it has been estimated that 20 to 30 percent of the gold produced was not recorded (Hotz and others, 1972).

In 1894, the Midas mine was discovered in Harrison Gulch, 3 mi south of the study area. Gold and silver production from this property exceeded $4,000,000 between 1896 and 1939 (Averill, 1939) making it one of the largest lode gold producers in Shasta County. The Moly Gibson prospect, 2 mi south of the roadless area was developed by over 1,000 ft of underground workings in 1933. Both the Midas mine and Moly Gibson prospect were inactive in 1982.

Between 1937 and 1941, gold was dredged from the High Channel prospect, (loc.D, fig. 3) just north of the study area. More than 700 oz of gold and 50 oz of silver have been recovered from this prospect.

The first mining activity in the roadless area was the location of the Blue Jay claim by W. G. Summmer and John Diller in 1897, near the site of the Iron Chief prospect (loc. C, fig. 3). At the Iron Chief prospect there are workings uphill and on strike to the southwest from an outcrop of a magnetite vein. The workings are about 60 ft uphill from the magnetite outcrop and consist of an adit about 60 ft long that strikes southeast and ends at a shaft that has caved from above. There may be more underground workings that are inaccessable. Uphill from the adit and shaft are about seven prospect pits on strike with the magnetite vein, the last one about 500 ft from the magnetite outcrop. A U.S. Forest Service forest boundary marker (roadless area boundary) is between the adit and the magnetite outcrop, about 25 ft uphill from the magnetite outcrop. (additional info N. J Page, F. Gray, B. Moring, oral comm., 1983).

According to local sources $18,000 in gold was taken from a pocket in the magnetite where the workings are located. There were no records found to substantiate this information, nor were there any records found to indicate whether these workings are related to the Blue Jay claim, although the location descriptions are quite similar.

On the east side of the roadless area is the Chanchelulla prospect (loc. A, Fig. 3) which was discovered in 1929. Gold and silver minerals are found in a quartz vein which averages 1.5 ft thick. Recorded production from the Chanchelulla prospect consists of 1 oz of gold and 14 oz of silver in 1958.

## MINERAL RESOURCES

The Potato Creek limestone prospect (loc. B, fig. 3) contains approximately 13 million tons of limestone. However The limestone bodies are too far from present and anticipated markets. In addition, there are other limestone bodies throughout this region, some of which are closer to main roads.

Deer Lick Springs, just east of the Chanchelulla Roadless Area, is a group of mineral springs that are developed as therapeutic baths. There are three other undeveloped mineral springs just north of Deer Lick Springs (loc. E, F, G, fig. 3) along Brown's Creek, two of which are inside the roadless area. The potential for development of these three springs is quite low because the volume of flow is low and the well-developed therapeutic baths at Deer Lick Springs meets present the demand.

Placer gold has been recovered from the gravels of the East Fork of Hayfork Creek just north of the roadless area, notably from the High Channel prospect (loc. D, fig. 3). Placer gold has also been recovered from many places along the Hayfork Creek. A portion of Hayfork Creek runs through the western most part of the roadless area. However this portion is a steep-walled, narrow canyon that contains small amounts of sand and gravel. Small, portable, underwater suction-dredge operations may recover small amounts of gold from the sand and gravels that are present. Geochemical analyses of stream-sediment samples from streams that drain from the roadless area into Hayfork Creek and East Fork of Hayfork Creek do not show significant amounts of gold. This indicates that the placer gold recovered from Hayfork Creek was probably derived from sources outside the roadless area. Geochemical analyses of stream sediment samples from the other streams that drain the roadless area indicate that no significant amounts of placer gold are present.

Lode gold and silver are present in a quartz vein inside the roadless area at the Chanchelulla prospect (loc. A, fig. 3). The prospect was discovered in 1929 and produced 1 oz. of gold and 14 oz. of silver in 1958. Inferred subeconomic resources of over 7,200 tons are estimated from this quartz vein which is 1.5 ft thick, 480 ft northwest-southeast along strike and 120 ft down dip. Only 240 feet of the quartz vein is exposed at the surface. An additional 120 ft in both directions along strike and down dip were inferred for the estimate. The quartz vein contains 0.084 oz. gold per ton, 0.84 oz. silver per ton, and accessory copper. The gold and silver content appears to be persistent throughout the quartz vein. Copper values are low, but might be recovered as a coproduct.

No other quartz veins similar to the one at Chanchelulla prospect were found in the roadless area despite extensive prospecting of the region since the 1850's. This almost eliminates the possibility of finding additional surface lode gold-silver deposits within the roadless area.

Chromium, nickel, and cobalt show fairly high background levels throughout the Chanchelulla Roadless Area because they are common minor elements in mafic and ultramafic rocks. Some stream-sediment values for these elements are above background levels, but in themselves are not significant because chromium, nickel and cobalt minerals are highly resistant to, and are concentrated by, weathering processes. There are no significant laterites to serve as a source for nickel or cobalt, nor are there any significant concentrations of chromite in the roadless area.

Platinum-group elements also are common minor elements in some mafic and ultramafic rocks. Some rocks and stream-sediment sample analyses from the roadless area show the presence of small amounts of platinum-group elements. Small amounts of platinum-group elements have been recovered from the East Fork of Hayfork Creek, and a few small grains have been recovered from Hayfork Creek in the vicinity of the roadless area. None of the stream-sediment samples from streams that drain from the roadless area into the Hayfork and East Fork of Hayfork Creeks contain platinum-group elements, indicating that the platinum-group elements recovered from the Hayfork Creek and East Fork of Hayfork Creek probably were derived from other sources.

Platinum-group elements were found in stream-sediment sample analyses from streams that drain the southeastern and eastern parts of the roadless area, but these values do not exceed or only slightly exceed normal background values in ultramafic or mafic rocks (Wright and Fleischer, 1962). One rock analysis at location 28 (fig. 3) shows a slightly anomalous value for palladium in an area of slight copper mineralization. The area of mineralization is small and quite localized, and probably represents a minor mobilization and a minor concentration of palladium.

There is some significance however, to the presence of platinum and palladium in sample 9, a grab-stream-sediment sample. It is uncommon to find platinum or palladium in stream-sediment-grab samples (N. J Page, oral comm., 1983). Sample 9 is from a drainage area that is underlain by some of the sulfide-bearing amphibolite, which indicates that the platinum rock samples are probably associated with the sulfides as in rock sample 28 and prospect pit J (fig 3). Additional rock samples were collected in the summer of 1983 visit to the roadless area, but analyses are not yet complete (N. J Page, F, Gray, B. Moring, oral comm., 1983).

Magnetite occurs at the Iron Chief prospect (loc. C, fig. 3), in a prospect pit in a saddle east of Chanchelulla Peak (loc. H, fig. 3) and on the north slope of Chanchelulla Peak (loc. I, fig. 3). None of these locations contain enough magnetite to be a significant resource.

Two of the three rock samples (40, 41, 42) taken from the workings at the Iron Chief have insignificant amounts of platinum and gold and probably indicate that the pocket is mined out. However, the reports of gold being taken from a pocket in the magnetite are, in part, substantiated by the presence of the workings and could mean that additional pockets may be present. Apparently, an attempt to trace the extent of the magnetite vein was made, as indicated by the prospect pits upslope and on strike with the vein. It is conceivable that other pockets may be present, but there are no indications that they exist.

## Further Studies

Based on the work in the summer of 1983, the resource potential for platinum is uncertain. Additional detailed mapping and rock sampling would determine the extent of the amphibolite zone, the extent of sulfide mineralization, and the extent of the association of sulfides and the platinum-group metals.

A detailed petrologic and magnetometer study of the magnetite vein at the Iron Chief prospect would help determine the extent of the vein and its genetic relationship to the surrounding rocks. Also, detailed study of this area could shed more light on the occurrence of pocket gold.

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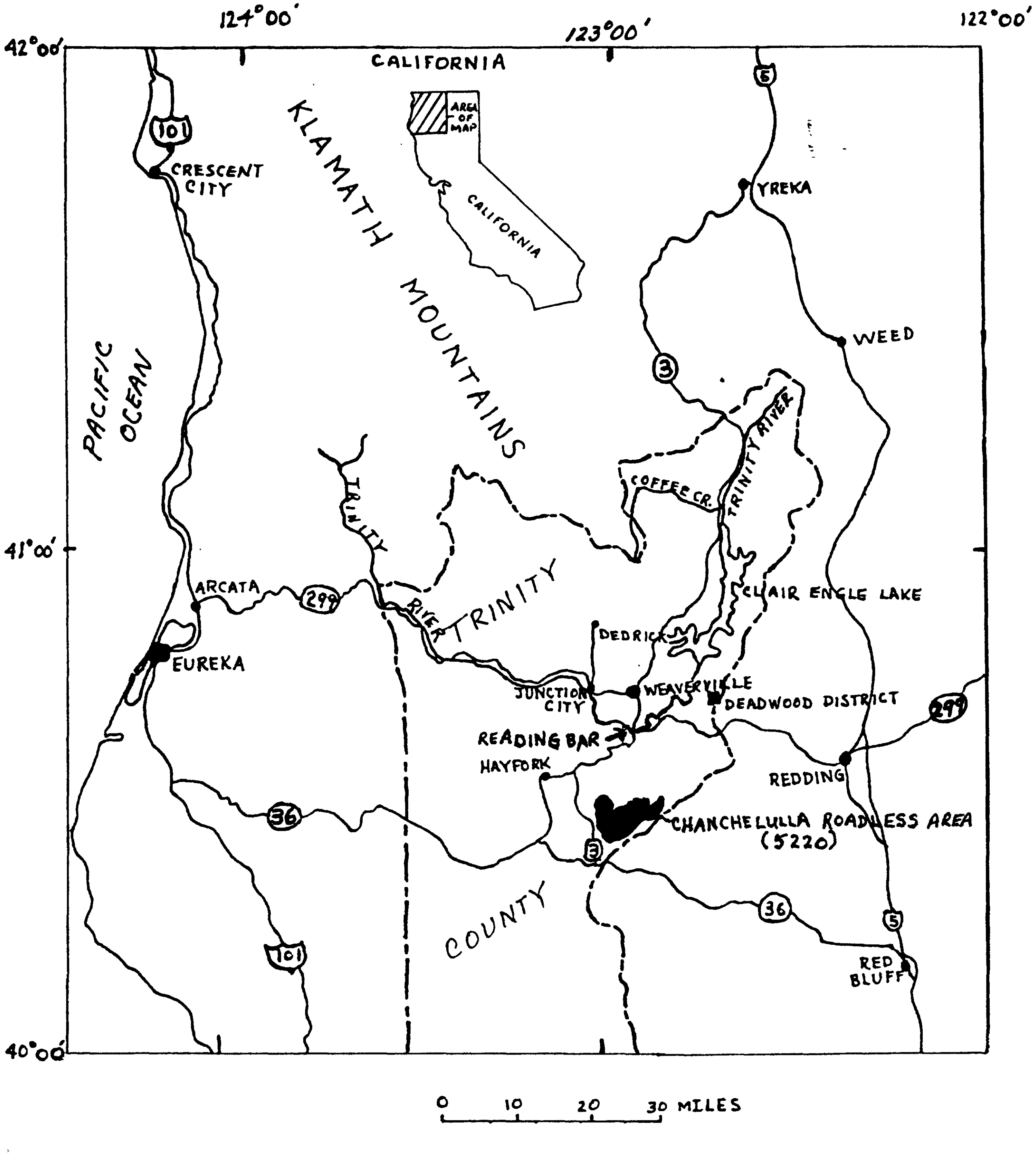


Figure 1.--Location of the Chanchelulla Roadless Area in the Klamath Mountains, Trinity County, California.

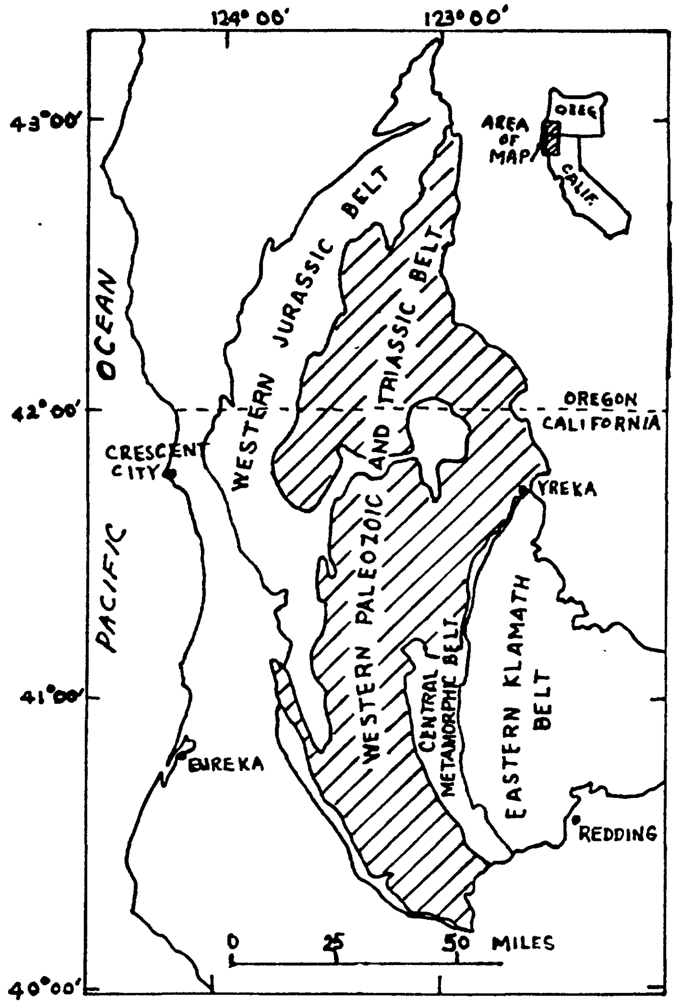


Figure 2.-- Generalized map showing the lithic belts of the Klamath Mountains geologic province, California and Oregon (after Irwin, 1977).

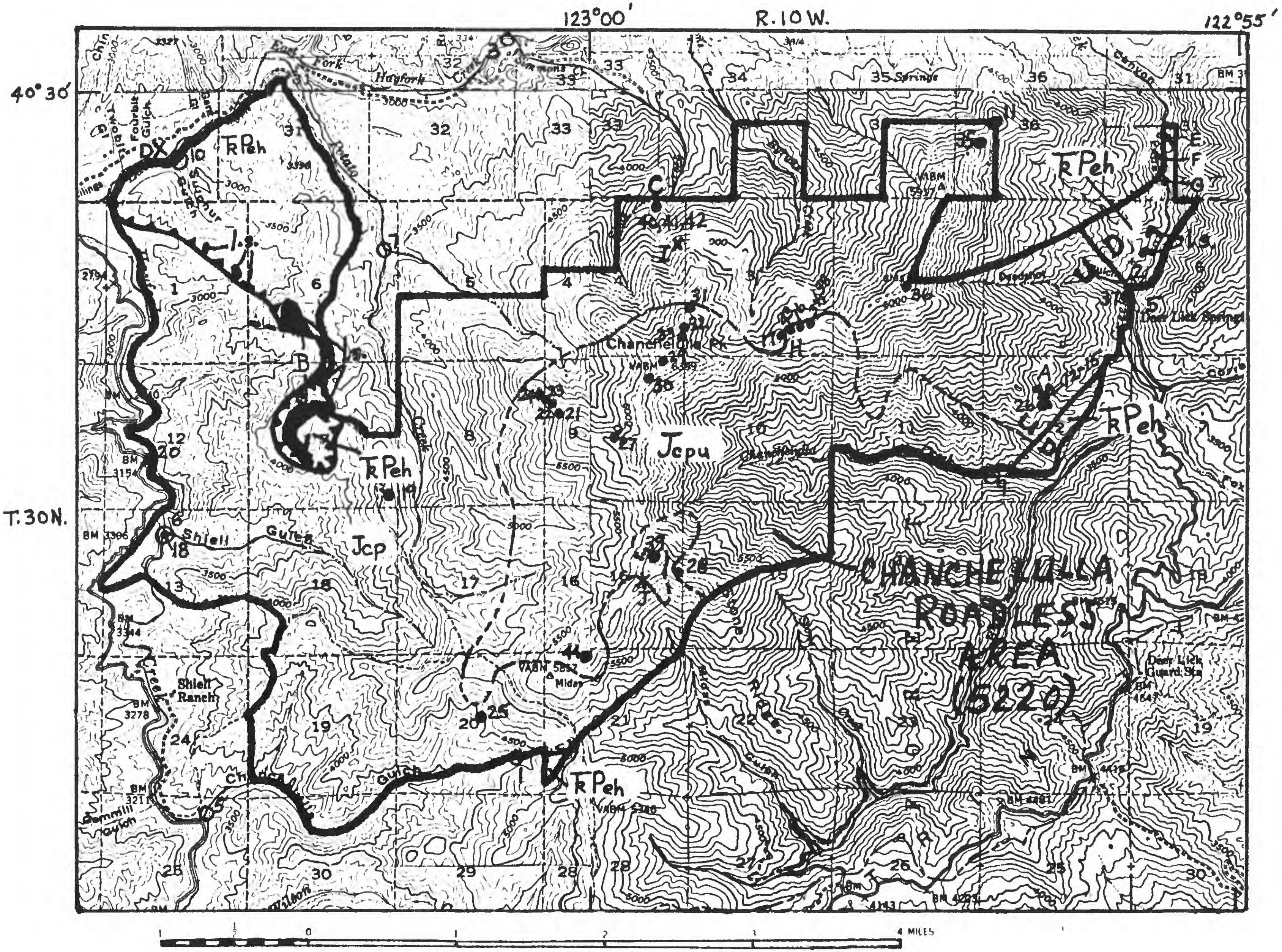


Figure 3.-- Mineral resource potential and geologic map of the Chanchelulla Roadless Area. Geology modified from Wright (1981). Base maps from U.S. Geological Survey, Dubakella Mountain (1954), Hayfork (1951), Weaverville (1950), and Chanchelulla Peak (1951) 15-minute quadrangles.

EXPLANATION FOR FIGURE 3

| | |
|---|---|
| | WILDWOOD PLUTON (JURASSIC): |
| Jcp | PREDOMINANTLY BIOTITE HORNBLENDE GABBRO |
| Jcpu | PREDOMINANTLY BIOTITE OLIVINE CLINOPYROXENITE |
| T Peh / l.s. | EASTERN HAYFORK TERRANE (PERMIAN? AND TRIASSIC)-Chert, argillite, quartzose sandstone, limestone (l.s.), and tuff |
| | CHANCHELULLA ROADLESS AREA BOUNDARY |
| U / D | HIGH ANGLE FAULT--U is upthrown side; D is downthrown side |
| | THRUST FAULT --teeth on upper plate |
| | CONTACT--dashed where aproximately located |
| o9 | STREAM-SEDIMENT SAMPLE--location and number (refer to table 1) |
| ●24 | ROCK SAMPLE--location and number (refer to table 1) |
| ⚒A | CHANCHELULLA PROSPECT--location and letter |
| B | POTATO CREEK PROSPECT |
| C | IRON CHIEF PROSPECT |
| xD | HIGH CHANNEL PROSPECT--location and letter |
| ●E | MINERAL SPRING--location and letter |
| ●F | MINERAL SPRING--location and letter |
| ●G | MINERAL SPRING--location and letter |
| H | MAGNETITE PROSPECT PIT |
| xI | MAGNETITE OUTCROPS--location and letter |
| xJ | IRON-OXIDE-STAINED PROSPECT PIT--location and letter |

Table 1.--Analyses of rock and stream-sediment samples from Chanchelulla Roadless Area, Trinity County, California (see figure 3 for locations of samples).

| METHOD | SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSIS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FIRE ASSAY | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNITS | percent | | | | parts per million (ppm) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ELEMENTS | Fe | Mg | Ca | Ti | Mn | Ag | As | Au | B | Ba | Be | Bi | Cd | Co | Cr | Cu | La | Mo | Nb | Ni | Pb | Sb | Sc | Sn | Sr | Th | V | W | Y | Zn | Zr | Au | Pt | Pd | Rh | Ru | Ir | |
| Lower Limit of Determination | .05 | .02 | .05 | .002 | 10 | .5 | 200 | 10 | 10 | 20 | 1 | 10 | 20 | 5 | 10 | 5 | 20 | 5 | 20 | 5 | 10 | 100 | 5 | 10 | 100 | 100 | 10 | 50 | 10 | 200 | 10 | .001 | .005 | .001 | .002 | .1 | .05 | |
| STREAM SEDIMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Threshold[1] | 10 | 5 | 5 | 1 | 1500 | .8 | | | 100 | 1100 | .7 | | | 60 | 1700 | 250 | 25 | | | 170 | 35 | | 70 | | 600 | | 600 | | 32 | 150 | 100 | .007 | .04 | .015 | | | | |
| Sample No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 1 | 1 | .2 | 1000 | .5 | N | N | 30 | 500 | L | 10 | 20 | 20 | 200 | 100 | 20 | N | N | 70 | 20 | N | 30 | N | 200 | N | 150 | N | 20 | N | 70 | N | N | .001 | N | N | N | |
| 2 | 7 | 2 | 3 | .7 | 1500 | N | N | N | 50 | 300 | N | N | N | 50 | 150 | 100 | N | N | N | 20 | 10 | N | 50 | N | 500 | N | 500 | N | 20 | N | 30 | N | N | N | N | N | N | x |
| 3 | 5 | 2 | 1.5 | .5 | 1000 | .5 | N | N | 100 | 1000 | L | N | N | 30 | 300 | 150 | 20 | N | L | 70 | 30 | N | 20 | N | 200 | N | 200 | N | 30 | 200 | 50 | N | N | N | N | N | N | x |
| 4 | 7 | 2 | 2 | .7 | 1000 | .5 | N | N | 70 | 1000 | L | N | N | 20 | 500 | 100 | L | L | L | 70 | 30 | N | 20 | N | 300 | N | 200 | N | 30 | N | 100 | .005 | N | N | N | N | N | x |
| 5 | 7 | 2 | 2 | 1 | 1000 | N | N | N | 30 | 500 | N | N | N | 30 | 200 | 100 | 20 | N | N | 50 | 15 | N | 30 | N | 500 | N | 500 | N | 20 | L | 50 | N | N | N | N | N | N | x |
| 6 | 7 | 2 | 2 | .7 | 1000 | N | N | N | 20 | 200 | N | N | N | 30 | 200 | 50 | N | N | N | 30 | 15 | N | 30 | N | 500 | N | 500 | N | 20 | N | 30 | N | N | N | N | N | N | x |
| 7 | 5 | 3 | 5 | .5 | 1000 | N | N | N | 30 | 300 | N | N | N | 30 | 1000 | 70 | N | N | N | 100 | 20 | N | 50 | N | 300 | N | 200 | N | 20 | N | 30 | N | N | N | N | N | N | x |
| 8 | 7 | 2 | 2 | .5 | 1000 | .5 | N | N | 15 | 500 | L | N | N | 50 | 700 | 300 | L | N | N | 100 | 20 | N | 50 | N | 300 | N | 300 | N | 20 | N | 70 | .001 | N | .001 | N | N | N | |
| 9 | 5 | 7 | 5 | .15 | 1000 | N | N | N | 15 | 50 | N | N | N | 50 | 2000 | 70 | N | N | N | 150 | L | N | 70 | N | 100 | N | 150 | N | 10 | N | 15 | .007 | .05 | .02 | N | N | N | |
| 10 | 3 | 2 | 2 | .5 | 700 | .7 | N | N | 70 | 500 | 1 | N | N | 20 | 500 | 70 | L | N | N | 150 | 20 | N | 30 | N | 200 | N | 100 | N | 20 | N | 70 | - | - | - | - | - | - | |
| ROCKS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Threshold[1] | 15 | 7 | 6 | 1 | 1600 | 25 | | | 60 | 830 | .4 | | | 110 | 1700 | 800 | 40 | | | 250 | 25 | | 85 | | 800 | | 900 | | 35 | 600 | 60 | .01 | .01 | .04 | | | | |
| Sample No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | .7 | .7 | 1 | .1 | 300 | L | N | N | 10 | 700 | 1 | N | N | L | 20 | L | N | N | N | 10 | 15 | N | 5 | N | 300 | N | 20 | N | L | N | 30 | - | - | - | - | - | - | |
| 12 | .7 | .2 | .2 | .01 | 100 | 70 | N | N | 10 | 100 | L | L | 50 | N | 15 | 1500 | N | 5 | N | 7 | 20 | N | 5 | N | N | N | 10 | N | N | 1500 | 10 | - | - | - | - | - | - | |
| 13 | 2 | 5 | 5 | .07 | 700 | L | N | N | L | L | N | N | N | 30 | 1000 | 5 | N | N | N | 70 | 10 | N | 50 | N | 200 | N | 70 | N | 10 | N | L | - | - | - | - | - | - | |
| 14 | 7 | 2 | 3 | .5 | 1000 | .5 | N | N | 15 | 1000 | N | N | N | 30 | 50 | 150 | 30 | N | N | 10 | 20 | N | 30 | N | 500 | N | 200 | N | 50 | L | 15 | - | - | - | - | - | - | |
| 15 | 2 | 1 | .15 | .2 | 300 | L | N | N | 50 | 500 | L | N | N | 10 | 50 | 100 | L | N | N | 15 | 20 | N | 7 | N | 300 | N | 100 | N | 10 | N | 50 | - | - | - | - | - | - | |
| 16 | 7 | 5 | 1 | .05 | 700 | L | N | N | 50 | L | N | N | N | 100 | 500 | 5 | N | N | N | 200 | N | N | 30 | N | N | N | 50 | N | N | L | N | N | N | N | N | N | N | |
| 17 | 5 | 2 | 3 | .2 | 1000 | N | N | N | 15 | 500 | N | N | N | 30 | 50 | 20 | N | N | N | 30 | 15 | N | 30 | N | 500 | N | 200 | N | 15 | N | 15 | N | N | N | N | N | N | |
| 18 | 5 | 2 | 3 | .5 | 700 | N | N | N | 30 | 200 | N | N | N | 30 | 70 | 50 | N | N | N | 20 | L | N | 50 | N | 500 | N | 300 | N | 20 | N | 10 | N | N | N | N | N | N | |
| 19 | 7 | 2 | 3 | .5 | 700 | N | N | N | 15 | 150 | N | N | N | 50 | 30 | 20 | N | N | N | 30 | 10 | N | 50 | N | 700 | N | 500 | N | 15 | N | 10 | .005 | .005 | .005 | N | N | N | |
| 20 | 7 | 2 | 3 | .5 | 1000 | N | N | N | 15 | 500 | N | N | N | 50 | 30 | 30 | N | N | N | 20 | 10 | N | 30 | N | 700 | N | 500 | N | 20 | N | 15 | N | N | N | N | N | N | |
| 21 | 2 | 5 | 5 | .05 | 500 | N | N | N | 10 | N | N | N | N | 30 | 2000 | L | N | N | N | 150 | L | N | 50 | N | 100 | N | 50 | N | L | N | N | N | N | N | N | N | N | |
| 22 | 5 | 5 | 5 | .15 | 1000 | .5 | N | N | L | L | N | N | N | 100 | 1500 | 700 | N | N | N | 200 | L | N | 70 | N | L | N | 200 | N | 20 | N | 15 | .03 | .02 | .02 | N | N | N | |
| 23 | 5 | 5 | 5 | .1 | 1000 | N | N | N | L | N | N | N | N | 50 | 2000 | 100 | N | N | N | 300 | N | N | 70 | N | L | N | 200 | N | 10 | N | L | .005 | N | .015 | N | N | N | |
| 24 | 5 | 2 | 5 | .2 | 1000 | N | N | N | 15 | 70 | N | N | N | 30 | 100 | 100 | N | N | N | 20 | L | N | 50 | N | 500 | N | 500 | N | 10 | N | N | N | N | N | N | N | N | |
| 25 | 5 | 5 | 5 | .15 | 1000 | L | N | N | 15 | 300 | N | N | N | 30 | 1000 | 100 | N | N | N | 100 | 15 | N | 70 | N | 200 | N | 200 | N | 15 | N | 20 | N | N | N | N | N | N | |
| 26 | 5 | 2 | 3 | .3 | 1000 | .5 | N | N | 15 | 500 | L | N | N | 20 | 200 | 100 | N | N | N | 50 | 20 | N | 20 | N | 500 | N | 200 | N | 15 | N | 50 | .002 | N | .003 | N | N | N | |
| 27 | 5 | 5 | 3 | .5 | 1000 | L | N | N | 10 | 200 | N | N | N | 30 | 1000 | 70 | N | N | N | 150 | 15 | N | 20 | N | 300 | N | 200 | N | 20 | N | 50 | .001 | N | .001 | N | N | N | |
| 28 | 5 | 5 | 5 | .15 | 1000 | 2 | N | N | 10 | N | N | N | N | 50 | 1500 | 1000 | N | N | N | 200 | 10 | N | 70 | N | L | N | 150 | N | 15 | N | 15 | .01 | N | .1 | N | N | N | |
| 29 | 5 | 2 | 3 | .5 | 1000 | N | N | N | L | 500 | N | N | N | 30 | 150 | 50 | N | N | N | 30 | 10 | N | 30 | N | 500 | N | 200 | N | 20 | N | 30 | .001 | N | .001 | N | N | N | |
| 30 | 5 | 3 | 5 | .5 | 1000 | N | N | N | 10 | 300 | N | N | N | 70 | 500 | 30 | N | N | N | 70 | N | N | 50 | N | 500 | N | 500 | N | 20 | L | 30 | N | N | .001 | N | N | N | |
| 31 | 5 | 5 | 5 | .15 | 700 | 1 | N | N | L | N | N | N | N | 50 | 700 | 1000 | N | N | N | 100 | 10 | N | 100 | N | 100 | N | 200 | N | 10 | N | 10 | .005 | N | .001 | N | N | N | |
| 32 | 5 | 2 | 3 | .2 | 1000 | N | N | N | 20 | 700 | N | N | N | 30 | 150 | 70 | 70 | N | N | 50 | 15 | N | 30 | N | 700 | N | 200 | N | 20 | N | 50 | N | N | N | N | N | N | |
| 33 | 5 | 3 | 2 | .5 | 1000 | N | N | N | 20 | 700 | N | N | N | 30 | 500 | 50 | 50 | N | N | 100 | 10 | N | 50 | N | 500 | N | 200 | N | 30 | N | 50 | N | N | N | N | N | N | |
| 34 | 5 | 2 | 2 | .3 | 1500 | N | N | N | 50 | 300 | N | N | N | 50 | 100 | 10 | N | N | N | 20 | L | N | 50 | N | 500 | N | 300 | N | 20 | N | 15 | N | N | N | N | N | N | |
| 35 | 5 | 2 | 3 | .2 | 1000 | L | N | N | 15 | 300 | N | N | N | 30 | 70 | 100 | N | N | N | 20 | 10 | N | 50 | N | 500 | N | 200 | N | 15 | N | 10 | N | N | N | N | N | N | |
| 36 | 5 | 2 | 3 | .3 | 1500 | N | N | N | 20 | 500 | N | N | N | 30 | 50 | 50 | N | N | N | 15 | 10 | N | 50 | N | 500 | N | 300 | N | 15 | N | 10 | N | N | N | N | N | N | |
| 37 | 5 | 1.5 | 2 | .5 | 1000 | N | N | N | 10 | 700 | N | N | N | 20 | 50 | 70 | 50 | N | N | 10 | 15 | N | 30 | N | 500 | N | 200 | N | 20 | N | 70 | N | N | .001 | N | N | N | |
| 38 | 7 | 5 | 3 | .07 | 1000 | N | N | N | 100 | N | N | N | N | 70 | 1000 | 5 | N | N | N | 150 | L | N | 70 | N | N | N | 70 | N | L | N | N | N | N | N | N | N | N | |
| 39 | 10 | 7 | 2 | .05 | 1500 | N | N | N | 50 | N | N | N | N | 100 | 1500 | 7 | N | N | N | 300 | N | N | 30 | N | N | N | 50 | N | N | N | N | N | N | N | N | N | N | |
| 40 | 20 | .7 | L | 1 | 1500 | N | N | N | N | N | N | N | N | 100 | 700 | L | N | N | N | 70 | N | N | 10 | N | N | N | 1500 | N | 10 | 500 | N | N | .03 | N | N | N | N | x5 |
| 41 | 7 | 2 | 2 | .5 | 1500 | N | N | N | 10 | 200 | N | N | N | 30 | 50 | 10 | N | N | N | 15 | L | N | 30 | N | 500 | N | 300 | N | 15 | N | L | N | N | N | N | N | N | |
| 42 | 20 | 2 | 1 | 1 | 1000 | N | N | N | N | 20 | N | N | N | 100 | 200 | L | N | N | N | 50 | N | N | 30 | N | N | N | 1500 | N | L | 300 | N | .007 | N | N | N | N | N | x3 |
| 43 | 15 | 7 | L | .02 | 1000 | N | N | N | 15 | N | N | N | N | 150 | 200 | L | N | N | N | 300 | N | N | 10 | N | N | N | 15 | N | N | N | L | N | N | N | N | N | N | |
| 44 | 5 | 5 | 3 | .15 | 1000 | N | N | N | 10 | 20 | N | N | N | 50 | 1500 | 15 | N | N | N | 100 | N | N | 70 | N | 100 | N | 150 | N | 15 | N | 10 | .001 | N | N | N | N | N | |
| 45 | 5 | 2 | 2 | .3 | 1000 | L | N | N | 20 | 100 | L | N | N | 20 | 70 | 150 | 50 | N | N | 30 | 20 | N | 20 | N | 500 | N | 200 | N | 30 | N | 70 | .001 | N | N | N | N | N | |
| 46 | 5 | 2 | 3 | .5 | 1000 | L | N | N | 15 | 200 | L | N | N | 30 | 150 | 150 | L | N | N | 50 | L | N | 30 | N | 500 | N | 200 | N | 30 | N | 30 | .001 | N | N | N | N | N | |
| 47 | 2 | 2 | 1.5 | .2 | 700 | N | N | N | 30 | 700 | L | N | N | 15 | 70 | 20 | N | N | N | 20 | 15 | N | 10 | N | 300 | N | 70 | N | 10 | N | 50 | N | N | N | N | N | N | |

1 = Only those elements of possible economic potential or their usefulness as indicators of undiscovered mineral deposits.

N = Not detected at limit of determination.
L = Detected, but below limit of determination.
- = Not looked for.
* = Multiplier for limit of detection for those samples less than 15 grams.