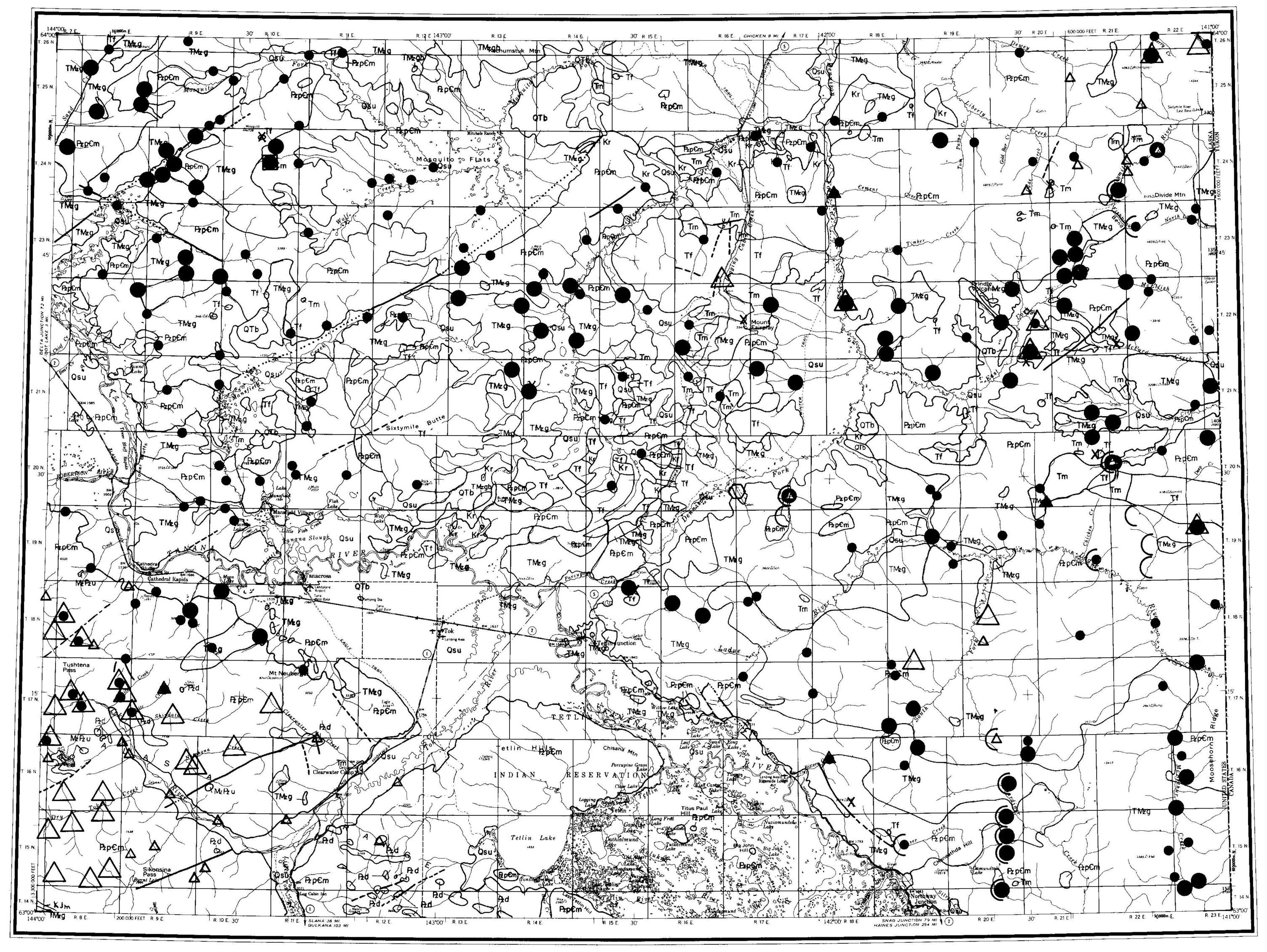
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE TANACROSS QUADRANGLE, ALASKA
MAP MF-767 D
SHEET 1 OF 2

TRIPP AND OTHERS – GEOCHEMICAL MAP,
HEAVY-MINERAL CONCENTRATES



EXPLANATION OF SYMBOLS

pyrite, trace amounts (1-6 grains)

pyrite, moderate to large amounts (>6 grains)

scheelite, trace amounts (1-6 grains)

scheelite, moderate amounts (>6 grains)

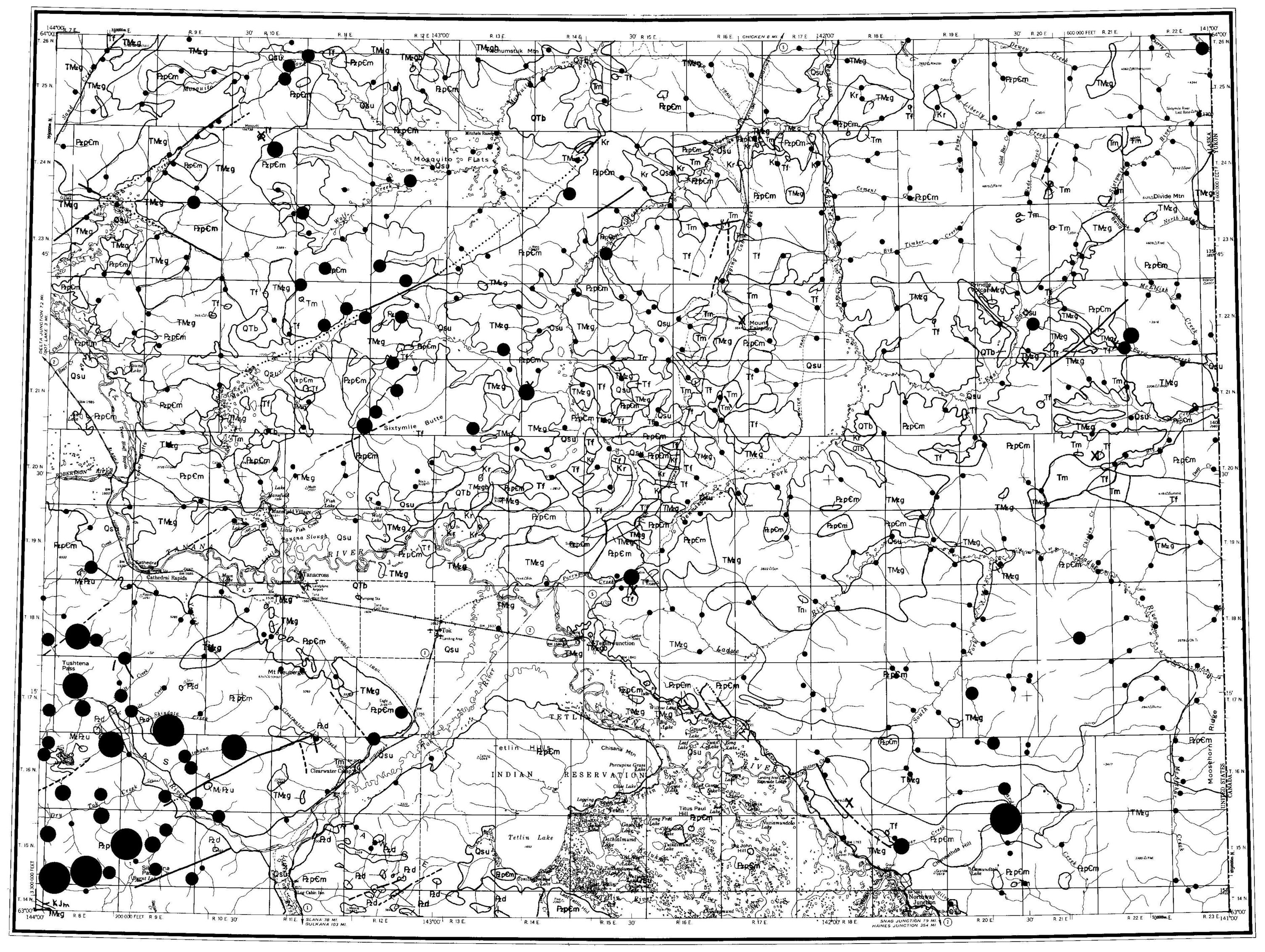
pyrite and scheelite both present

flourite, trace amounts (4 grains)

malachite, trace amounts

cassiterite, moderate amounts (>12 grains)

A. Distribution and abundance of selected ore-related minerals in the nonmagnetic concentrate



EXPLANATION OF SYMBOLS

Lead in parts per million

1,000

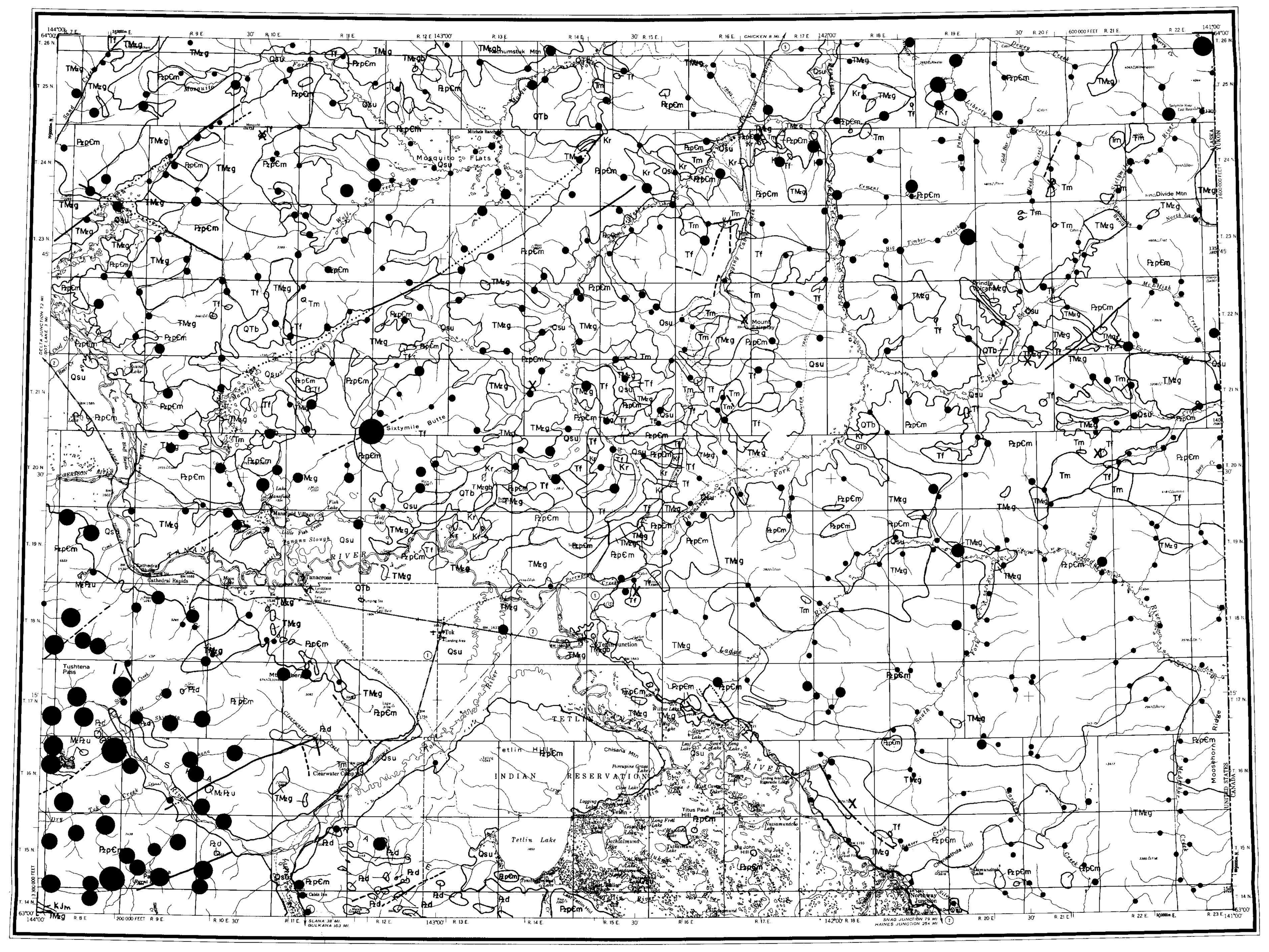
500

300

150

≤70

C. Distribution and abundance of lead in the nonmagnetic concentrate



EXPLANATION OF SYMBOLS

Copper in parts per million

500

300

200

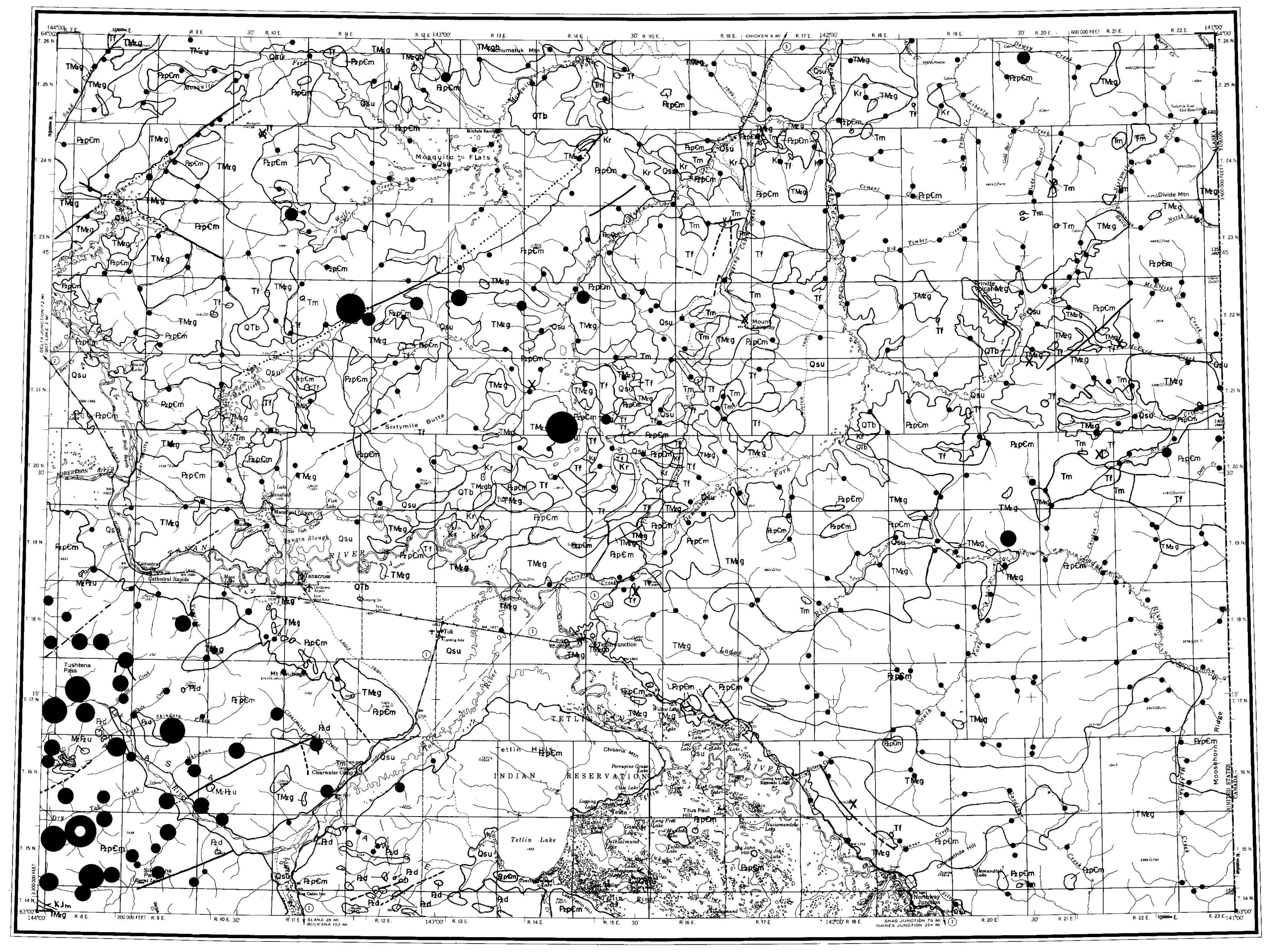
150

100

70

<70

B. Distribution and abundance of copper in the magnetic concentrate



EXPLANATION OF SYMBOLS

Copper in parts per million

3,000

1,000

700

500

300

200

150

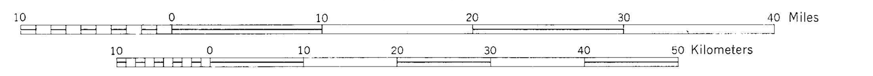
100

≤70

D. Distribution and abundance of copper in the nonmagnetic concentrate

BASE FROM U. S. GEOLOGICAL SURVEY, 1:250,000, TANACROSS QUADRANGLE, 1964

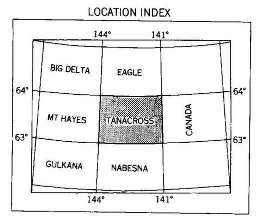
Scale 1:500,000
1 inch equals approximately 8 miles



QUADRANGLE LOCATION

MAPS SHOWING MINERALOGICAL AND GEOCHEMICAL DATA FOR HEAVY-MINERAL CONCENTRATES IN THE TANACROSS QUADRANGLE, ALASKA

LOCATION INDEX



BY

R. B. TRIPP, G. C. CURTIN, G. W. DAY, R. C. KARLSON, AND S. P. MARSH

1976

BACKGROUND INFORMATION RELATING TO THIS MAP IS PUBLISHED AS U.S. GEOLOGICAL SURVEY CIRCULAR 734, AVAILABLE FREE OF CHARGE FROM THE U.S. GEOLOGICAL SURVEY, RESTON, VA. 22092

DISCUSSION

Introduction

This series of maps shows the following data for heavy-mineral concentrates: distribution and abundance of selected ore-related minerals, distribution and abundance of copper in the magnetic fraction, and distribution and abundance of lead, copper, tin, beryllium, tungsten, and bismuth in the nonmagnetic fraction. The data are plotted on base maps showing generalized geology, base metal prospects in the Yukon-Tanana Upland, and the drainage pattern. The distribution and abundance of selected ore-related minerals (fig. A) were obtained by microscopic examination of the heavy-mineral concentrates. The number of mineral grains observed is shown in the map explanation. Figures B through H are geochemical maps showing the distribution and abundance of metals as determined by six-step semi-quantitative emission spectrography. The geochemical map symbols show sample sites and the actual values for the element in the sample as determined by spectrography. An explanation of sampling, preparation, and analytical procedures is given in Circular 734 which accompanies this folio. Complete analytical data for geochemical samples collected by the U.S. Geological Survey in the Tanacross quadrangle are available in an open-file report (O'Leary and others, 1976).

Mineralogy

A mineralogic map (fig. A) shows the distribution and abundance of pyrite, scheelite-powellite, and cassiterite in the nonmagnetic fraction of heavy-mineral concentrates. One occurrence each of fluorite and malachite in quartz is also shown on the map. Although high lead, beryllium, and bismuth values were determined by spectrographic analyses of the nonmagnetic fraction of the concentrates (figs. C, F, and H) no lead, beryllium, or bismuth minerals were identified microscopically at a magnification of 50 X.

The most significant observations of pyrite are in the Alaska Range, where the pyrite is confined primarily to the phyllite and schist unit (Foster, 1970). This pyrite contains as much as 2 percent copper, and trace amounts of chalcopyrite were observed in samples from several of the sites. The sulfides in the Alaska Range are probably derived from numerous small fissure veins and shear zones in the greenschist facies metamorphic rocks.

In the Yukon-Tanana Upland, the maturely dissected terrain north of the Tanana River, scattered sites contain trace to moderate amounts of pyrite. Pyrite and traces of chalcopyrite were observed in at least two samples from tributaries of the East Fork of the Dennison River T. 22 N., R. 20 E. These sulfides may reflect the presence of at least one porphyry copper occurrence. The scattered pyrite-bearing samples in the northeastern part of the quadrangle probably reflect additional occurrences of mineralized rock.

In the Yukon-Tanana Upland, samples bearing scheelite form a belt that trends generally west from the east-central to the northwestern part of the quadrangle. Moderate to large amounts of scheelite were observed in samples collected within this belt in the east-central part of the quadrangle in a region with several porphyry copper prospects. In the central part of the quadrangle, samples contain trace to large amounts of scheelite and trace amounts of powellite (the molybdenum analog of scheelite). In the northwestern part of the quadrangle, moderate amounts of scheelite and trace amounts of powellite were observed in the samples. In these two areas, molybdenum was also found in other sample media (Curtin, Day, Carten, Marsh, and Tripp, 1976).

Two other notable trends of scheelite are present within the upland in the southeastern part of the quadrangle. A strong north-south trend occurs east of Cheneathda Hill (T. 15 and 16 N., R. 20 E.), and a similar trend occurs along the west flank of Moosehorn Ridge in the southeast corner of the quadrangle. In the western part of the quadrangle, a large cluster of samples west of Sixtymile Butte contains trace amounts of scheelite-powellite minerals. The trend indicated by this cluster of samples appears to extend into the Alaska Range in the southwestern part of the quadrangle.

Because several samples containing large amounts of scheelite in the east-central part of the quadrangle are associated with porphyry copper occurrences, scheelite-rich samples in other parts of the quadrangle may indicate additional porphyry copper occurrences.

The scheelite typically occurs as cloudy-white grains that fluoresce bright bluish-white under short-wave ultraviolet light. The powellite is distinguished under short-wave ultraviolet light by characteristic cream to yellowish-white fluorescence. X-ray diffraction was used to confirm the identity of the minerals.

Cassiterite occurs in association with scheelite east of Cheneathda Hill in the southeastern part of the quadrangle. Cassiterite also occurs at five sites in the east-central part of the quadrangle (T. 19, 20 N.; R. 21, 22 E.), but here it is not everywhere associated with scheelite. The cassiterite is associated in part, however, with high beryllium and molybdenum values in other sample media (Curtin, Day, Marsh, and Tripp, 1976; Curtin, Day, Carten, Marsh, and Tripp, 1976). Cassiterite was also observed in samples collected from two tributaries to the Sixtymile River in the northeast part of the quadrangle (T. 23 and 24 N., R. 22 and 21 E.) and from tributaries to the Dennison Fork near the center of the quadrangle (T. 20 N., R. 17 E.). All of the above-mentioned sites warrant further study to determine the significance of the occurrence of the cassiterite. The cassiterite appears as splendent black complex crystals to blackish-brown hackly grains.

The single observation of fluorite was made in a sample collected from a tributary to the Dennison Fork in T. 20 N., R. 17 E.

Copper in Magnetic Heavy-mineral Concentrates

Figure B shows the distribution of copper in the fraction magnetic at 0.2 amps on the Frantz Isodynamic Separator[1/], that is, magnetite and its alteration products, ilmenite, hematite, and trace amounts of amphibole and pyroxene minerals. Much of the copper in this fraction is in the crystal lattice of the magnetite.

Magnetite that is associated with base metal deposits commonly contains anomalous amounts of copper, lead, zinc, cobalt, and nickel. The magnetic heavy-mineral concentrates from the Alaska Range reflect the distribution and abundance of copper, which is also found in the nonmagnetic heavy-mineral concentrate (fig. D). The magnetite from the Alaska Range is fresh and probably reflects the original copper content. Much of the magnetite from the Yukon-Tanana Upland also shows little alteration. However, altered magnetite observed in concentrates from the head waters of McCord Creek (T. 22 N., R. 21 to 22 E.) indicates that some copper may have been removed from the magnetite during alteration and consequently does not reflect the known porphyry copper occurrence.

The background values for copper in the upland are around 70 ppm. Anomalous copper concentrations occur in the following areas: Bedrock Creek in the extreme northeast corner of the quadrangle (300 ppm), the west edge of Sixtymile Butte (500 ppm), and several sites in the Liberty Creek drainage (T. 25 N., R. 19 E.). Anomalous amounts of zinc occur in the magnetic fraction in samples collected in the Liberty Creek drainage, and anomalous cobalt and nickel values (1000 and 700 ppm, respectively) were determined in the magnetic fraction from the Sixtymile Butte site.

In the Alaska Range, the copper values increase sharply from about 150 ppm at the mountain front to 500 ppm in the southwest corner of the quadrangle. Little or no sulfides were observed at 50 X magnification, suggesting that the copper values are inherent within the magnetite. Samples collected from the Clearwater drainage and that area of mountain front adjacent to the Glenn Highway did not contain sufficient amounts of the magnetic fraction for analysis. The absence of magnetite and related minerals in the heavy-mineral concentrates indicates that the bedrock in this area contains abnormally small amounts of these minerals.

Nonmagnetic Heavy-mineral Concentrates

Figures C through H show the distribution of lead, copper, tin, beryllium, tungsten, and bismuth in the nonmagnetic fraction (greater than 0.6 amps on the Frantz Isodynamic Separator) of heavy-mineral concentrates. This fraction generally contains--in order of relative abundance--muscovite, sphene, zircon, apatite, rutile, anatase, tourmaline, and cassiterite.

Lead

Lead minerals are found primarily in the nonmagnetic fraction of the heavy-mineral concentrates. In the Yukon-Tanana Upland part of the Tanacross quadrangle, the background values of lead are less than 70 ppm. A north-south trend of anomalous lead values (as much as 1000 ppm) in the southeastern part of the quadrangle coincides with a cassiterite-scheelite trend that is shown on figures A, E, and G. Lead values of 150-300 ppm are found in the headwaters of McCord Creek near the east edge of the map area (T. 22 N., R. 21, 22 E.), and also at a site about 12 km west of the McCord Creek sites. These high values reflect the presence of at least two porphyry copper occurrences in T. 22 N., R. 20, 21 E. In the western part of the quadrangle, the cluster of anomalous lead values north of Sixtymile Butte apparently reflects weakly mineralized rock, although mineralization was observed only in a small altered and mineralized intrusive porphyry body in T. 24 N., R. 10 E. Single anomalous lead values are associated with altered and mineralized zones in granitic rocks in T. 21 N., R. 14 E. and T. 18 N., R. 15 E. Other scattered anomalous lead values may reflect the presence of additional mineralized areas.

The highest lead values are found in the Alaska Range and are principally associated with the small mineralized veins and alteration zones within the light-colored phyllites and greenstones (phyllite and schist unit of Foster, 1970). At most of these sites, silver values ranging from 1 to 10 ppm were associated with the anomalous lead values.

Copper

Figure D shows the distribution of copper in the nonmagnetic fraction of the heavy-mineral concentrate. Anomalous copper values in this fraction in the Yukon-Tanana Upland are on a tributary to the Ladue River in T. 19 N., R. 20 E., T. 21 N., R. 14 E., and the east-west trend north of Sixtymile Butte from R. 14 E. to R. 11 E. As with lead, the highest copper values are in the Alaska Range and are probably associated with the mineralized veins occurring primarily in the light-colored phyllites (phyllite and schist unit of Foster, 1970).

Tin

Figure E shows the distribution of tin in the nonmagnetic fraction of heavy-mineral concentrates. In the Yukon-Tanana Upland, there are four strongly anomalous areas and six weak to moderately anomalous areas. A notable anomalous trend in the southeastern part of the quadrangle east of Cheneathda Hill (T. 15 N. to T. 16 N., R. 20 E.) coincides with anomalous bismuth, lead, and tungsten values. The west half of T. 19 N., R. 22 E., the east half of T. 19 N., R. 21 E., and the west half of T. 20 N., R. 22 E. contain another strongly anomalous trend. Concentrates from at least two tributaries to the Dennison Fork in T. 19 N., R. 17 E., and T. 20 N., R. 17 E. contain 1000 ppm tin. Two strongly anomalous tin values are in concentrates from the Divide Mountain drainage in T. 23 N., R. 22 E. The following locations contain weak to moderately strong tin values: a tributary to the Ladue River in T. 19 N., R. 19 E.; tributaries to the East Fork in T. 22 N., R. 19 E.; T. 22 N., R. 14 E.; T. 24 N., R. 16 E.; T. 25 N., R. 10 E.; and T. 25 N., R. 11 E., northwest of Mosquito Flats. Anomalous values of silver (100 ppm), bismuth (150 ppm), lead (100 ppm), and yttrium (1000 ppm) occur at the latter site. The source of the tin is predominantly cassiterite, which was observed in most of these samples.

Beryllium

Figure F shows the distribution of beryllium in the nonmagnetic fraction of heavy-mineral concentrates. The anomalous beryllium values in concentrates from the eastern part of the quadrangle roughly correlate with anomalous beryllium values in two other sample media--the oxide residue (oxalic-acid-leachable fraction) of stream sediment and the ash of aquatic mosses (Curtin, Day, Marsh, and Tripp, 1976). Other high beryllium values outline a granitic body in the Alaska Range and isolated occurrences of anomalous beryllium values are found in T. 24 N., R. 22 E., in the tributary to the Ladue River in T. 19 N., R. 22 E., at the northern extension of the Cheneathda Hill tin-tungsten trend in T. 17 N., R. 20 E., and T. 25 N., R. 10 E. In the east-central part of the quadrangle (T. 22 N., R. 20, 21 E.), beryllium is associated with at least two porphyry copper occurrences. The anomalous beryllium values in other parts of the quadrangle may outline additional occurrences of mineralized rock.

Tungsten

Figure G shows the distribution of tungsten in the nonmagnetic fraction of heavy-mineral concentrates. Scheelite-powellite minerals have been observed in the zone of high values trending east-west across the east half of the quadrangle. This suggests skarn-type deposits (Singer, oral commun., 1976) but alternatively and more probably, there may be additional copper porphyry occurrences similar to those in the east-central part of the quadrangle, particularly in the McCord Creek-Big Creek area, near Prindle Volcano, and west across the Dennison Fork to T. 21 N. and T. 22 N., R. 17 E. The presence of anomalous tungsten in the northwest part of the quadrangle suggests mineralization similar to that in the east half of the quadrangle.

Two other anomalous tungsten zones trend north-south in the southeastern part of the quadrangle. One trend is coincident with a tin, lead, and bismuth highs (figs. E, C, H) in nonmagnetic concentrates collected in T. 15 and 16 N., R. 20 E., and the other is along the west flank of Moosehorn Ridge in the extreme southeastern part of the quadrangle. A strong tungsten anomaly in the Alaska Range in T. 18 N., R. 9 E., and R. 10 E. is similar to that in the east-central part of the quadrangle in that it is associated with high beryllium values.

Bismuth

Figure H shows the distribution of bismuth in the nonmagnetic fraction of concentrates. In the Yukon-Tanana Upland, anomalous bismuth values correlate with high tungsten and beryllium values (figs. G, F) in the east-central part of the quadrangle. High bismuth and tungsten values also roughly correlate with each other in the northeast part of the quadrangle. Anomalous bismuth in T. 16 N., R. 10 E. correlates with high lead and tin values (figs. C, E) in nonmagnetic fraction of heavy-mineral concentrates. The anomalous bismuth values in the east-central part of the quadrangle are associated with at least two porphyry copper occurrences. The other high bismuth values in the quadrangle suggest the presence of mineralized rock. No significant bismuth anomalies were found in the Alaska Range.

[1/] The use of trade names is for descriptive purposes only and does not constitute endorsement of these products by the U.S. Geological Survey.

REFERENCES CITED

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EXPLANATION OF MAP UNITS CAN BE FOUND ON SHEET 2

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