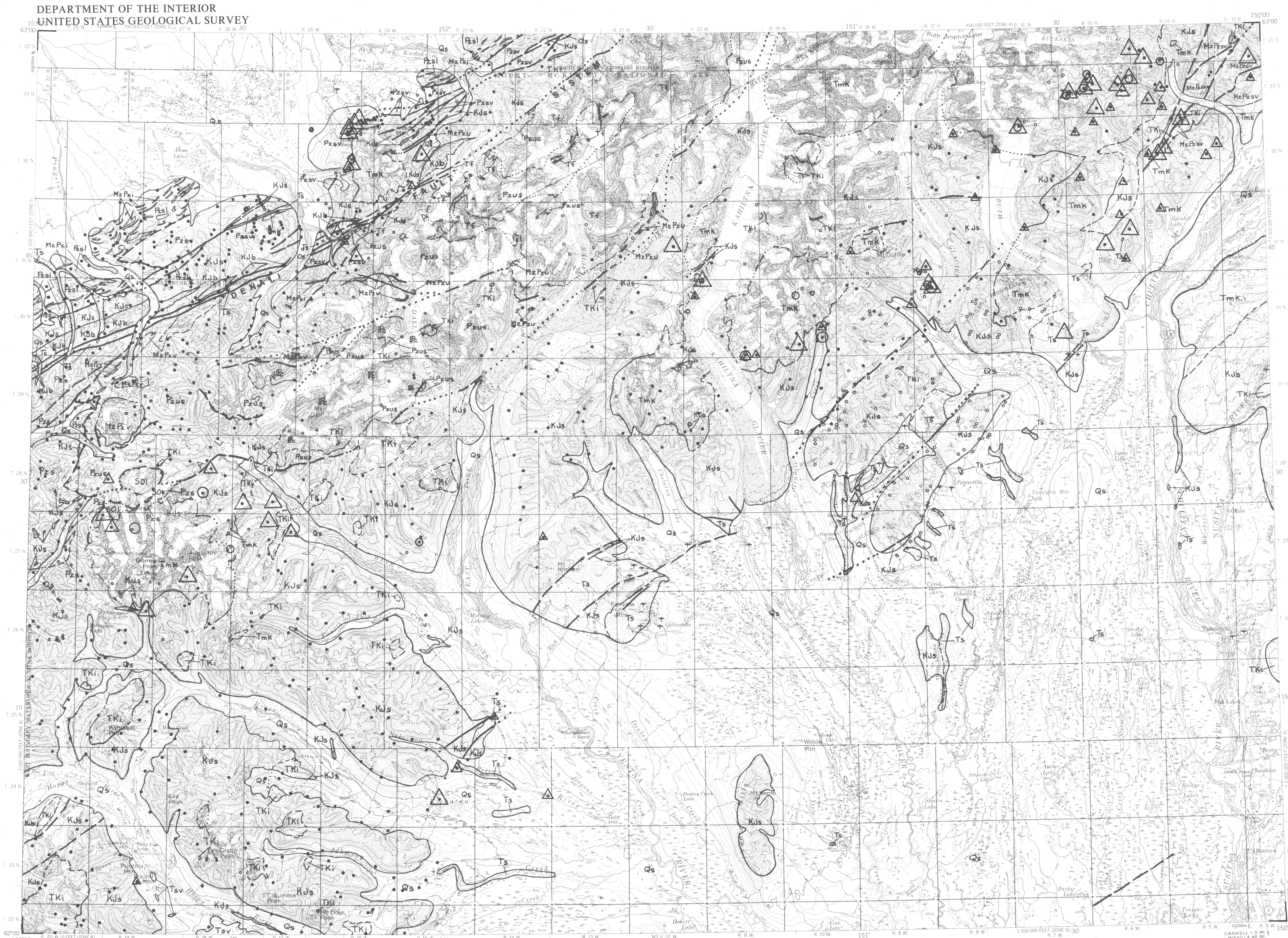
[redacted]

MISCELLANEOUS FIELD STUDIES MAP
MF-870 F
FOLIO OF THE TALKEETNA QUAD., ALASKA
SHEET 1 OF 2

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY



Base from U.S. Geological Survey, 1958

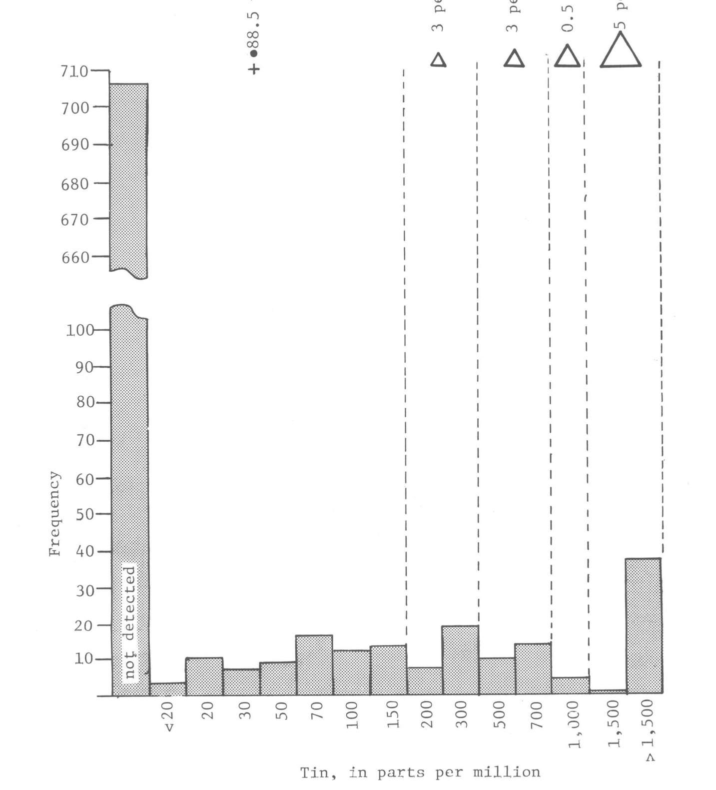
Geology generalized from Reed and Nelson, 1977

GEOCHEMICAL AND GENERALIZED MAP SHOWING DISTRIBUTION AND ABUNDANCE OF TIN

SCALE 1:250 000

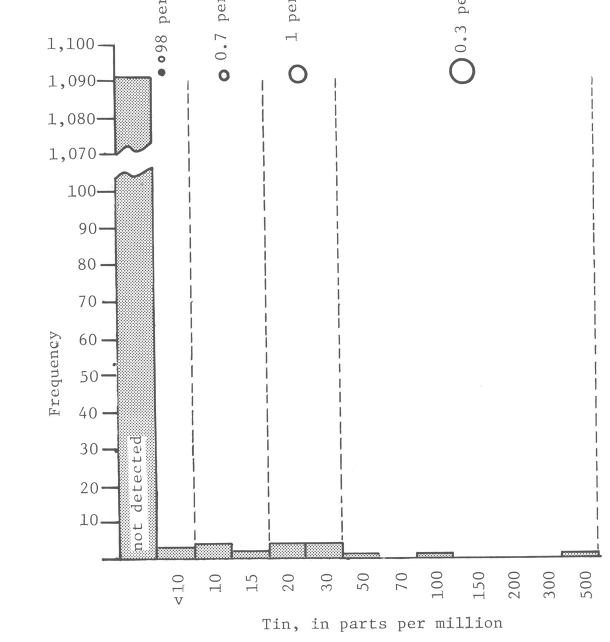
5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS



Tin, in parts per million

TIN CONTENT IN MONMAGNETIC HEAVY-MINERAL CONCENTRATES--Number of samples, 819.



Tin, in parts per million

TIN CONTENT IN MINUS 80 MESH STREAM SEDIMENT--Number of samples, 1,119.

EXPLANATION FOR GENERALIZED GEOLOGIC MAP

(Geology generalized from Reed and Nelson (1977))

CORRELATION OF MAP UNITS

SURFICIAL DEPOSITS

Qs } QUATERNARY

SEDIMENTARY AND VOLCANIC ROCKS

Ts, Tsv } TERTIARY

KJs, KJb } Lower Cretaceous and (or) Jurassic } CRETACEOUS AND (OR) JURASSIC

MzPzv, MzPzsv } MESOZOIC AND (OR) UPPER PALEOZOIC

Pb } PENNSYLVANIAN

Pzsk } UPPER PALEOZOIC

Pzs } PALEOZOIC

SDl } SILURIAN AND ORDOVICIAN

Pzsl, Pzsv } LOWER PALEOZOIC

INTRUSIVE AND ULTRAMAFIC ROCKS

Tf Middle Tertiary; Tmk Lower Tertiary } TERTIARY

TKi Lower Tertiary and (or) Upper Cretaceous } TERTIARY AND (OR) CRETACEOUS

MzPzi, MzPzu } MESOZOIC AND (OR) PALEOZOIC

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qs UNCONSOLIDATED SEDIMENTARY DEPOSITS

SEDIMENTARY AND VOLCANIC ROCKS

Ts CONTINENTAL SEDIMENTARY ROCKS--Includes Kenai Group

Tsv SEDIMENTARY AND VOLCANIC ROCKS, UNDIVIDED

KJs MARINE SEDIMENTARY ROCKS, UNDIVIDED

KJb PILLOW BASALT

MzPzv MAFIC VOLCANIC ROCKS, UNDIVIDED

MzPzsv SEDIMENTARY AND VOLCANIC ROCKS, UNDIVIDED

Pb LIMESTONE-CHERT CONGLOMERATE

Pzsk SEDIMENTARY ROCKS (FLYSCH), UNDIVIDED

Pzs SEDIMENTARY ROCKS, UNDIVIDED--Chiefly limestone

SDl HORNFELSED LIMESTONE, CHERT, AND SHALE

Pzsl SHALE AND LIMESTONE

Pzsv METAMORPHOSED SEDIMENTARY AND VOLCANIC ROCKS, UNDIVIDED

INTRUSIVE AND ULTRAMAFIC ROCKS

Tf GRANODIORITE OF FORAKER PLUTON

Tmk McKINLEY SEQUENCE Chiefly quartz monzonite and granite

TKi INTRUSIVE ROCKS, UNDIVIDED--Chiefly granodiorite and quartz diorite

MzPzi INTRUSIVE ROCKS, UNDIVIDED

MzPzu ULTRAMAFIC ROCKS, UNDIVIDED

GEOLOGIC SYMBOLS

Contact, dashed where approximately located, dotted where concealed

Fault, dashed where approximately located, dotted where concealed

Thrust or high-angle reverse fault; sawteeth on upper plate

EXPLANATION FOR GEOCHEMICAL SYMBOLS

SAMPLE SITES

Anomalous values--Size of symbol denotes percentage and is explained on histograms
- ○ Stream sediment or glacial debris
- △ Nonmagnetic heavy-mineral concentrate

Background values
- ∘ Stream sediment or glacial debris
- • Stream sediment and nonmagnetic heavy-mineral concentrate
- + Nonmagnetic heavy-mineral concentrate

DISCUSSION

These geochemical maps show some results of reconnaissance geochemical studies made in the Talkeetna quadrangle, Alaska in 1975 and 1976 as part of the Alaska Mineral Resource Assessment Program. The three maps show the distribution of tin, beryllium, and tungsten in 943 -80 mesh stream sediment and glacial debris samples and in 819 nonmagnetic heavy-mineral concentrates from stream sediment. The maps also show tin, beryllium, and tungsten results for 70 stream sediment samples collected by Reed and Elliot (1970) in the western part of the quadrangle and in 106 stream sediment samples collected by Clark and Hawley (1968) in the central part of the quadrangle (Dutch Hills and Peters Hills area). All these data are plotted on base maps showing the topography, generalized geology, and sample sites. The sample sites are represented by small open and closed circles and by small crosses; the small open circles denote sites where only stream sediment or glacial debris was collected, the closed circles denote sites where both stream sediments and heavy-mineral concentrates were collected, and the small crosses denote sites where only heavy-mineral concentrates were collected. Anomalous tin, beryllium and tungsten values, as defined on the accompanying histograms, are shown as follows: large circles represent anomalous values in stream sediments and large triangles represent anomalous values in nonmagnetic heavy-mineral concentrates. Sample site symbols that do not coincide with either the large open circles or triangles represent sites at which the samples contained less than anomalous amounts of tin, beryllium, and tungsten as defined on the histograms. Additional data for tungsten are shown on the mineralogical map of gold and scheelite (Tripp and others, unpub. map, 1978).

Description of sample media

In most places, stream sediments and heavy-mineral concentrates were collected from the active channels of swift mountain streams draining areas ranging from about 5 to 10 km^2. The sediment in most of these streams ranges in size from fine sand to pebbles and cobbles. A -80 mesh fraction of this sediment was used as the stream-sediment sample, whereas a coarser, -20 mesh (0.8 mm) fraction was used for the heavy-mineral concentrate sample. In addition to the stream sediments, glacial debris from lateral and medial moraines of valley glaciers was collected at 109 sites and the -80 mesh fraction was analyzed. For the purposes of this study analytical data from the glacial debris samples were combined with those from stream sediment because statistical analyses of the analytical data showed that these two media are chemically similar. The stream sediments, glacial debris, and heavy-mineral concentrates are composed mainly of detrital material that has been mechanically introduced into a stream or moraine from the bedrock and colluvium within a particular drainage basin. The composition of stream sediment and glacial debris approximates that of the weathering rock and soil material within the basin. Further, all the sample types can reflect the presence of mineralized rock in the drainage basin upstream. The heavy-mineral concentrates are especially useful for determining the distribution of certain heavy metals and resistate minerals such as gold, cassiterite, and scheelite.

Preparation and analysis of samples

Stream-sediment and glacial debris samples were air dried and sieved through a -80 mesh (0.2 mm) screen. A split of the -80 mesh material was analized for the 30 elements including tin, beryllium, and tungsten by the semiquantitative spectrographic method of Grimes and Marranzino (1968).

The heavy-mineral concentrates were preliminarily prepared in the field by panning to remove most of the light minerals. The panned samples were sieved through a 20 mesh (0.8 mm) screen in the laboratory and the -20 mesh fraction was further separated with bromoform (specific gravity, 2.86) to remove the remaining light-mineral grains. Initially, magnetite and other strongly magnetic heavy minerals were removed from the heavy mineral fraction by use of a hand magnet. The remaining heavy minerals were passed through a Frantz Isodynamic Separator[1] and a nonmagnetic fraction was obtained at a setting of 0.6 amperes. A split of this fraction was pulverized and analyzed by the semiquantitative spectrographic method used for analyzing the stream sediment and glacial debris (Grimes and Marranzino, 1968). The remaining split of the nonmagnetic fraction was examined under the microscope for its mineralogical composition. Although a pure nonmagnetic fraction cannot be obtained owing to the presence of locked polymineralic grains, the nonmagnetic concentrates contain mainly muscovite, sphene, zircon, apatite, rutile, anatase, and tourmaline. Ore minerals such as gold, sulfides, scheelite, and cassiterite are also found in this fraction. Analytical data for stream sediment, glacial debris, and nonmagnetic heavy-mineral concentrates are available in U.S. Geological Survey Open-File Rept. 78-143 (O'Leary and others, 1978).

[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.

Distribution and nature of anomalies

The distribution of anomalous tin and beryllium values in stream sediments, glacial debris, and heavy-mineral concentrates is primarily restricted to areas within and near the granitic plutons of the McKinley sequence. Anomalous tungsten values are more widely distributed, but are mainly associated with acid to intermediate plutonic rocks.

The anomalous tin values are of interest because they outline targets for possible economic tin deposits. High tin values in heavy-mineral concentrate samples collected near a known tin deposit (Reed and others, 1978, Table 1, no. 8) in T. 33 N., R. 15 W. suggest that tin mineralization occurs for at least 5 km west of the deposit (T. 32 N., R. 16 W.). Other, equally high, tin values are present in stream sediment and heavy-mineral concentrate samples collected within and near the granitic rocks of the McKinley sequence elsewhere in the quadrangle, particularly those in the northeast part and in the Cathedral Spires area in the western part. It is possible that the high tin values indicate a tin resource associated with these granitic rocks.

Anomalous amounts of tin also occur mainly in heavy-mineral concentrates in the following areas:
1. Tributaries to Ripsnorter Creek (T. 31 N., R. 16 W.).
2. Tributaries to the Kichatna and Nakochna Rivers in the vicinity of Nin Ridge (T. 24 N., R. 14 and 15 W.).
3. South of Mount Goldie in the eastern part of the quadrangle (T. 30 and 31 N., R. 8 and 9 W.)

The two tin occurrences in the Ripsnorter Creek drainage are probably derived from the pluton of the McKinley sequence (Tmk) to the northeast. The source for the one high tin value to the south is unknown. It is unlikely, however, that it is related to the hornblende-bearing granodiorite of the Foraker pluton present about 3 km to the north.

High tin values in the vicinity of Nin Ridge are not associated with a known local source such as a granitic body of the McKinley sequence. However, the anomalous values may be derived from a concealed source and, therefore, merit further investigation. In this area the tin occurs with anomalous amounts of gold and silver (Curtin, Karlson, and others, 1978).

The anomalous tin occurrences south of Mount Goldie are associated with high bismuth, tungsten, gold, lead, and silver values in stream sediments and heavy-mineral concentrates (Curtin, Karlson, and others, 1978, b-d). This metal suite possibly reflects the presence of mineralized quartz veins similar to those of the Rocky Cummins prospect (Clark and Hawley, 1968, p. 49). Analyses of samples collected by Clark and Hawley (1968) showed minor amounts of gold, silver, arsenic, bismuth, and tin in all or most of the samples.

High beryllium values in stream sediments most likely reflect the presence of beryl and related beryllium minerals in greisens which occur in the granitic plutons of the McKinley sequence. Greisen boulders from the pluton of the McKinley sequence north of Ripsnorter Creek (T. 32 N., R. 15 and 16 W.) contain as much as 20 volume percent beryl (Reed and others, 1977). The presence of anomalously high beryllium values in the heavy-mineral concentrates suggests that heavier beryllium minerals such as helvite, chrysoberyl, euclase, are also weathering from the granites.

Tungsten occurs in anomalous amounts in and around the granitic rocks of the McKinley sequence, notably the pluton in the northwest part of the quadrangle, and is probably genetically related to tin and beryllium. Tungsten also occurs with gold, silver, copper, lead, molybdenum, and other metals in the area between the East and West Forks of the Yentna River (T. 28 and 29 N., R. 15 and 16 W.) and with gold and silver at several localities in the southwest part of the quadrangle (Curtin, Karlson, and others, 1978, c, d.) In these areas the metals are spacially and presumably genetically related to granodiorite and quartz diorite plutons which intrude mainly marine sedimentary rocks. Mineralogical examination showed that scheelite was the primary source of the high tungsten values in the heavy-mineral concentrates (Tripp and others, 1978).

REFERENCES

Clark, A. L., and Hawley, C. C., 1968, Reconnaissance geology, mineral occurrences, and geochemical anomalies of the Yentna district, Alaska: U.S. Geol. Survey open-file report, 86 p.

Curtin, G. C., Cooley, E. F., O'Leary, R. M., Karlson, R. C., McDanal, S. K., 1978, Spectrographic and chemical analyses of bulk heavy-mineral concentrates from the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Open-File Rept. 78-146, 26 p.

Curtin, G. C., Karlson, R. C., Day, G. W., O'Leary, R. M., and Tripp, R. B., 1978, Geochemical maps showing distribution and abundance of selected elements in the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Open-File Rept. 78-301.

Curtin, G. C., Karlson, R. C., O'Leary, R. M., Day, G. W., and McDougal, C. M., 1978, Geochemical and generalized geologic maps showing the distribution and abundance of copper, lead, zinc, and molybdenum in the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-870 G.

Curtin, G. C., Karlson, R. C., O'Leary, R. M., Day, G. W., and McDanal, S. K., 1978, Geochemical and generalized geologic maps showing the distribution and abundance of gold and silver in the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-870 E.

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geol. Survey Circ. 591, 6 p.

O'Leary, R. M., Day, G. W., Cooley, E. F., Curtin, G. C., and McDougal, C. M., 1978, Spectrographic and chemical analyses of stream sediment, glacial debris, and nonmagnetic heavy-mineral concentrate samples from the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Open-File Rept. 78-143, 138 p.

Reed, B. L., and Elliot, R. L., 1970, Reconnaissance geologic map, anslyses of bedrock and stream sediment samples, and an aeromagnetic map of parts of the southern Alaska range: U.S. Geol. Survey open-file report, 145 p.

Reed, B. L., and Nelson, S. W., 1977, Geologic map of the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-870 A.

Reed, B. L., Nelson, S. W., Curtin, G. C., and Singer, D. L., 1978, Mineral resources map of the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies MAP MF-870 D.

Ward, F. N., Nakagawa, H. M., Harms, T. F., and Van Sickle, G. H., 1969, Atomic-absorption methods of analysis useful in geochemical exploration: U.S. Geol. Survey Bull. 1289, 45 p.

GEOCHEMICAL AND GENERALIZED GEOLOGIC MAPS SHOWING DISTRIBUTION AND ABUNDANCE OF TIN, TUNGSTEN, AND BERYLLIUM IN THE TALKEETNA QUADRANGLE, ALASKA

By

G. C. Curtin, R. C. Karlson, R. B. Tripp, and G. W. Day

1978

This map is one of a series, all bearing the number MF-870. Background information relating to this map is published as U.S. Geological Survey Circular 775, available free of charge from the U.S. Geological Survey, Reston, VA. 22092

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1978

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