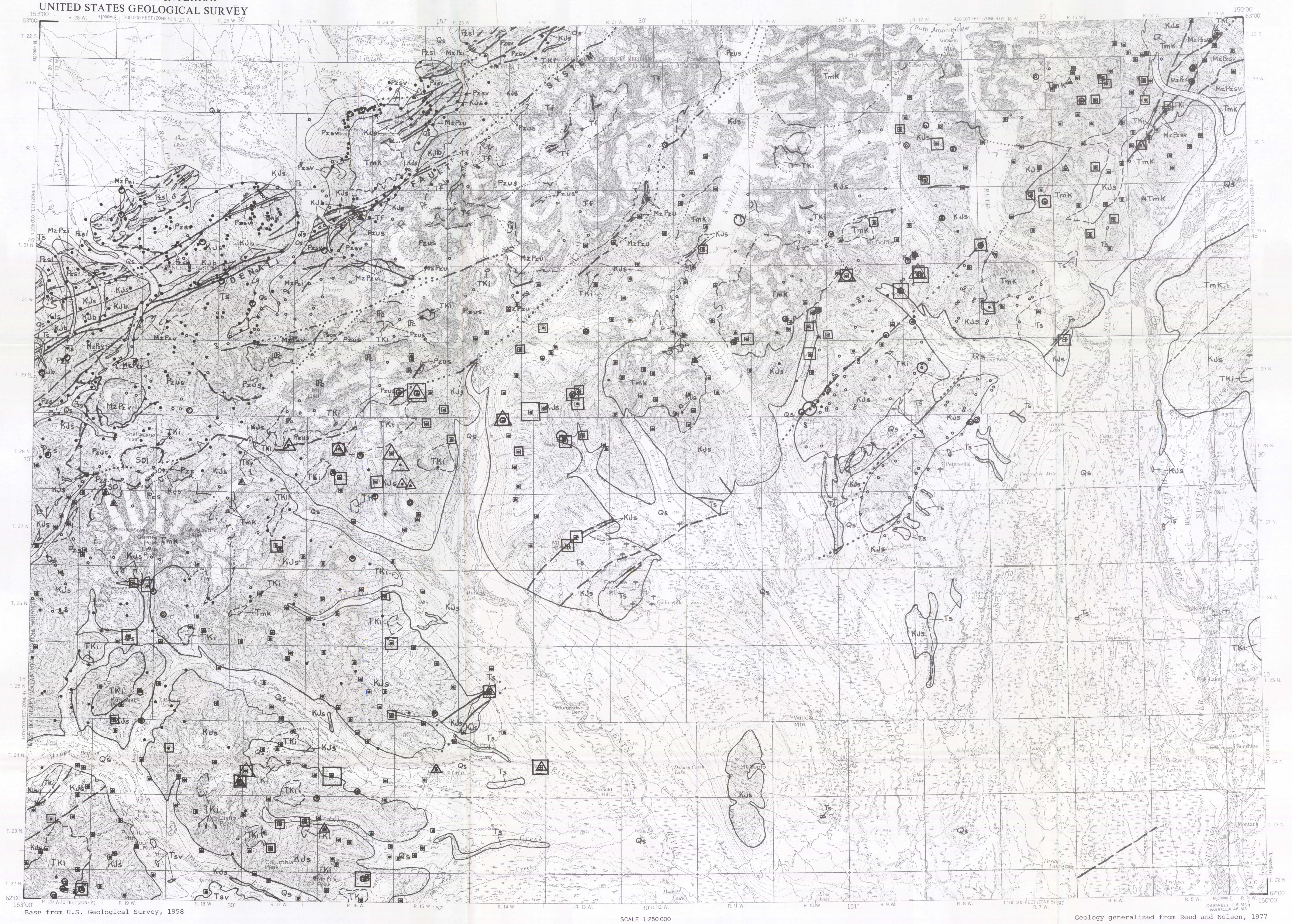
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

[redacted]

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



Base from U.S. Geological Survey, 1958

SCALE 1:250 000

Geology generalized from Reed and Nelson, 1977

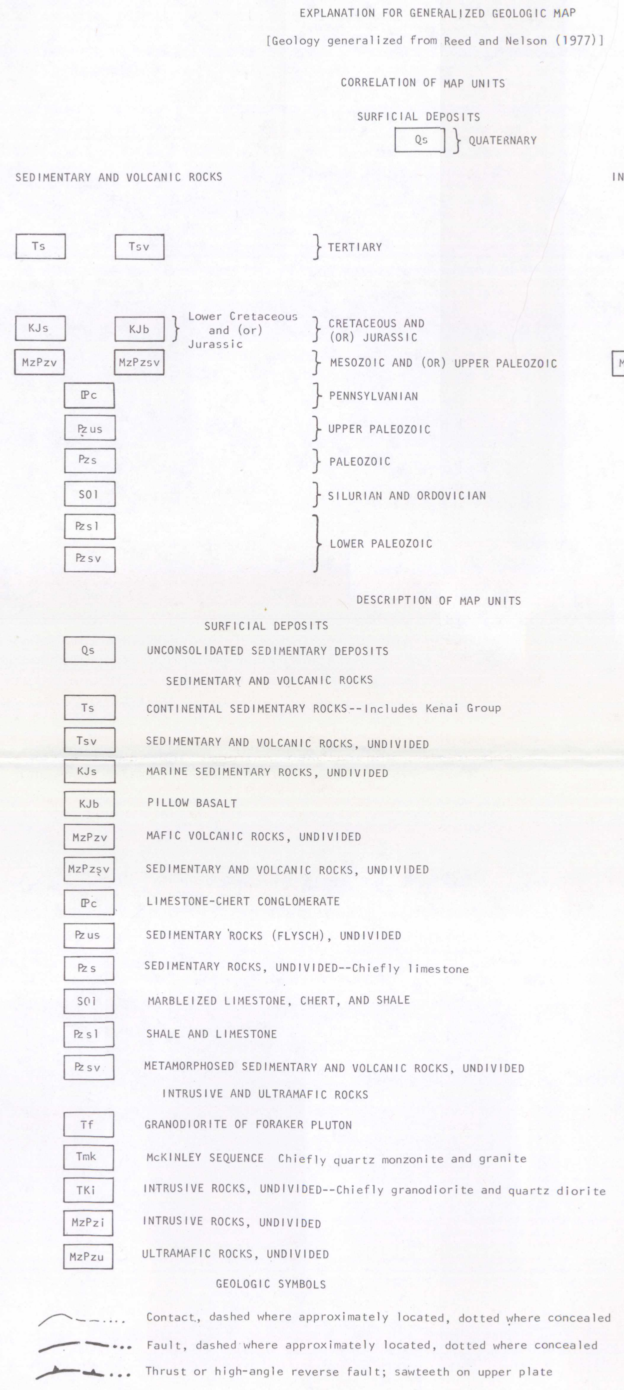
GEOCHEMICAL AND GENERALIZED GEOLOGIC MAP SHOWING DISTRIBUTON AND ABUNDANCE OF GOLD

GEOCHEMICAL AND GENERALIZED GEOLOGIC MAPS SHOWING DISTRIBUTION AND ABUNDANCE OF GOLD AND SILVER IN THE TALKEETNA QUADRANGLE, ALASKA

By

G. C. Curtin, R. C. Karlson, R. M., O'Leary, G. W. Day, and S. K. McDanal

1978



EXPLANATION FOR GEOCHEMICAL SYMBOLS

SAMPLE SITES

Anomalous values--Size of symbol denotes percentage and is explained on histograms

○ Stream sediment of glacial debris

△ Nonmagnetic heavy-mineral concentrate

□ Bulk heavy-mineral concentrate

Background values

∘ Stream sediment or glacial debris

• Stream sediment and nonmagnetic heavy-mineral concentrate

⊡ Stream sediment, bulk heavy-mineral concentrate, and nonmagnetic heavy-mineral concentrate

+ Nonmagnetic heavy-mineral concentrate

⊞ Nonmagnetic heavy-mineral concentrate and bulk 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 two maps show the distribution of gold in 721 and of silver in 943 -80 mesh stream sediment and glacial debris samples and in 819 nonmagnetic heavy-mineral concentrates from stream sediment which were collected during 1975-1976. Gold and silver results from 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) are shown. The distribution of gold values in 387 bulk heavy-mineral concentrates are also shown on the gold map. All of 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. Data from a nonmagnetic fraction of these heavy-mineral concentrates are shown on both maps. In addition, the small squares on the gold map at sites along the south flank of the Alaska Range denote sites where a bulk heavy-mineral concentrate fraction was obtained and analyzed for gold. Anomalous gold and silver values, as defined on the accompanying histograms, are shown as follows: large circles represent anomalous gold and silver values in stream sediments; large triangles represent anomalous gold and silver values in nonmagnetic heavy-mineral concentrates; and large squares represent anomalous gold values in bulk heavy-mineral concentrates. Sample site symbols that do not coincide with either the large open circles, squares, or triangles represent sites at which the samples contained less than anomalous amounts of gold and silver as defined on the histograms. Additional gold data are shown on the mineralogical map of gold and scheelite (Tripp and others, unpub. map, 1978).

Gold is especially difficult to determine in geologic materials because when the sample is pulverized during preparation, gold grains do not break down into smaller particles which are distributed evenly throughout the sample, as do the other grains. If a sample of stream sediment, glacial debris, or heavy-mineral concentrate contains only one or two flakes of gold, there is a possibility that the analytical results will give either an erroneously high or low value, depending on the presence or absence of gold particles in the sample split that is analyzed. In order to minimize this problem and to define chemically the distribution of gold occurrences as completely as possible, a bulk heavy-mineral concentrate fraction was analyzed for gold in addition to the nonmagnetic heavy-mineral concentrate fraction and stream sediment. The bulk concentrate fraction was separated from heavy-mineral concentrate samples collected at 387 sites along the south flank of the Alaska Range. The two types of heavy-mineral concentrate samples for which gold values are shown are as follows: (1) the nonmagnetic concentrate fraction (triangles) which constitutes all minerals that are nonmagnetic at 0.6 amperes on the Frantz Isodynamic Separator[1], and (2) the bulk fraction (squares) from which only the magnetite has been removed.

[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.

Description of sample media

In most places, stream sediment and heavy-mineral concentrates were collected from the active channels of swift mountain streams draining areas ranging from about 5 to 10 km². 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 samples. 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 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 which has been mechanically introduced into a stream or moraine from the bedrock and colluvium within a particular drainage basin. The composition of the 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 analyzed for 30 elements, including silver, by the semiquantitative spectrographic method of Grimes and Marranzino (1968). Another split of the -80 mesh material was analyzed for gold by atomic absorption (Ward and others, 1969).

The heavy-mineral concentrates were initially 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 387 bulk concentrate samples from the south flank of the Alaska Range, that contained enough material were split into two fractions; a bulk concentrate and a fraction for further processing.

The bulk fraction was analyzed for 30 elements by semiquantitative emission spectrography (Grimes and Marranzino, 1968). In addition, this fraction was analyzed for gold by atomic absorption (Ward and others, 1969). The analytical results for this concentrate fraction are available in U.S. Geological Survey Open-File Rept. 78-146 (Curtin, Karlson, and others, 1978). The remaining fraction from these samples and all bulk samples that were too small to be split were passed through a Frantz Isodynamic Separator and a nonmagnetic fraction was obtained at a setting of 0.6 amperes. 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. The bulk heavy mineral fraction contains, in addition to these minerals, amphiboles, pyroxene, biotite, and garnet. A split of this fraction was pulverized and analyzed for 30 elements including silver and gold 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.

Distribution and nature of geochemical anomalies

The most notable characteristic of gold and silver distribution is the clustering of strongly anomalous gold and silver values in areas where granite and quartz monzonite plutons of the McKinley sequence (Tmk) and the granodiorite and quartz diorite plutons (TKi) intrude the Jurassic and(or) Cretaceous marine sediments (KJs) on the southern flank of the Alaska Range. In contrast, only one weakly anomalous gold value was detected in samples collected on north flank of the range. Specific localities where clusters of strongly anomalous gold values occur with high silver values are as follows: (1) north Distin Peak (T. 24 N., R. 17 W.) in the southwest part of the quadrangle; (2) Cascade Creek and the surrounding area between the East and West Forks of the Yentna River; (3) the area between the East Fork of the Yentna River and the north part of Sunflower basin (T. 28 and 29 N., R. 13 and 14 W.); and (4) several sites south of Mount Goldie in the eastern part of the quadrangle (T. 30 and 31 N., R. 8-10 W.). Gold was observed in the field in pan concentrates and under the microscope in the nonmagnetic heavy-mineral concentrates in all these areas.

The high gold values in the Mount Goldie area are probably derived from low grade gold-quartz veins similar to that of the Rocky Cummins prospect in T. 30 N., R. 8 W. (Clark and Hawley, 1968, p. 49). Similarly, the gold values in the area between the East and West Forks of the Yentna River, the area north of Distin Peak, and the area east of the East Fork of the Yentna River probably reflect gold that has weathered from quartz veins. In the last mentioned area, no intrusive rocks are exposed. A magnetic low, however, suggests the presence of a concealed intrusive body (Reed and others, 1978, area 13B).

The majority of silver occurrences in the quadrangle most likely reflect silver that is alloyed with gold. The silver content of ten gold samples collected from various localities in the quadrangle ranged from 6 to 35 percent. Scattered high silver values in stream sediments from the northwest part of the quadrangle reflect the high silver content of the carbonaceous shales (Pzsl) in this area (Reed and others, 1978, Table 2, footnote 6).

The striking association of gold with the Jurassic and(or) Cretaceous sediments (KJs) along the south flank of the Alaska Range demonstrates that this terrane warrants further exploration for gold. The data further demonstrate that the most promising areas are those listed above as well as other areas where the sediments have been intruded by the Tertiary plutons. Strongly anomalous arsenic and cobalt values correlate closely with the high gold and silver values along the south flank of the Alaska Range (Curtin, Karlson, 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., and McDanal, S. K., 1978, Spectrographic and chemical analyses of bulk heavy-mineral concentrates from 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.

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

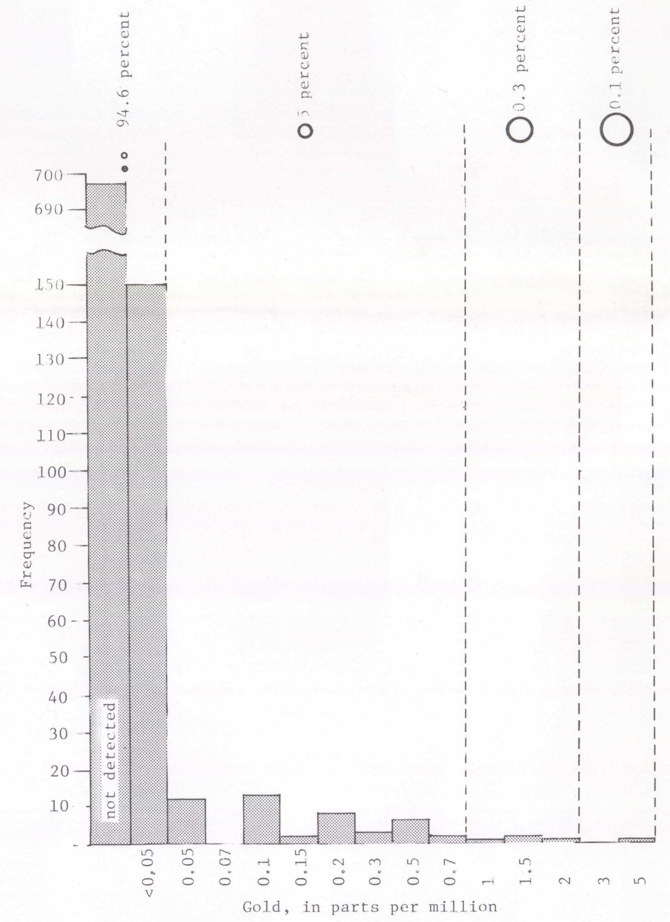
O'Leary, R. M., Day, G. W., Cooley, E. F., Curtin, G. C., and McDougal, C. M., 1978, Spectrographic and chemical analyses of stream sediment, glacial debris, and non-magnetic heavy-mineral concentrate samples from the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Open-File Rept. 78-143, 138 p.

Reed, B. L., and Elliot, R. L., 1970, Reconnaissance geologic map, analyses 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.

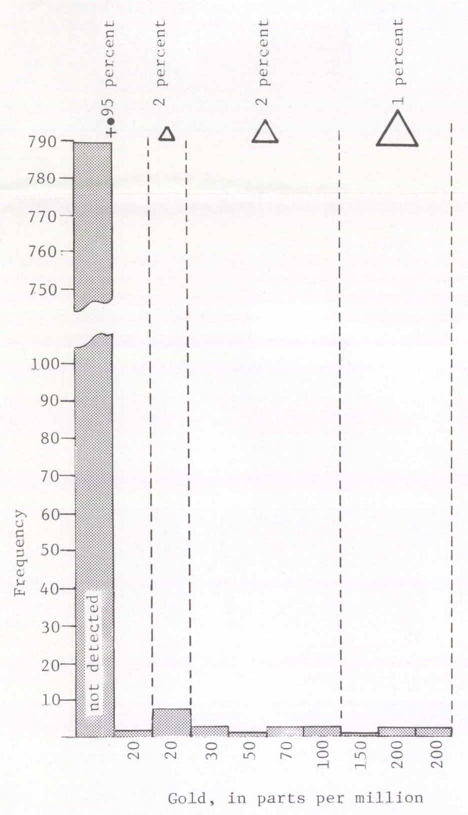
Reed, B. L., and Nelson, S. W., 1977, Geologic map of the Talkeetna quadrangle, Alaska: U.S. Geol. Survey Misc. Field Studies Map MF-870 A.

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

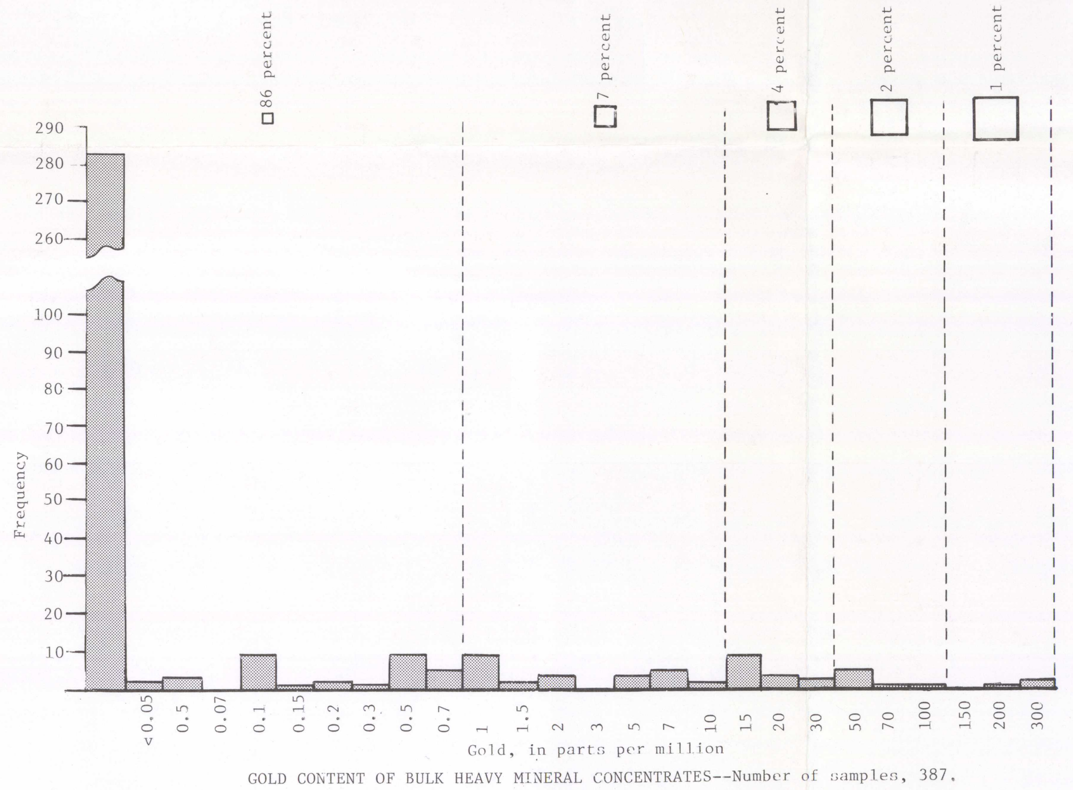
Ward, F. N., Nakagawa, H. M., Harms, T. F., and Van Sickle, G. H., 1969, Atomic-absorption methods of analysis useful in geochemical exploration: U.S. Geol. Survey Bull. 1289, 45 p.



GOLD CONTENT OF MINUS 80 MESH STREAM SEDIMENT AND GLACIAL DEBRIS--Number of samples, 897.



GOLD CONTENT OF NONMAGNETIC HEAVY MINERAL CONCENTRATES--Number of samples, 819.



GOLD CONTENT OF BULK HEAVY MINERAL CONCENTRATES--Number of samples, 387.

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

For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225