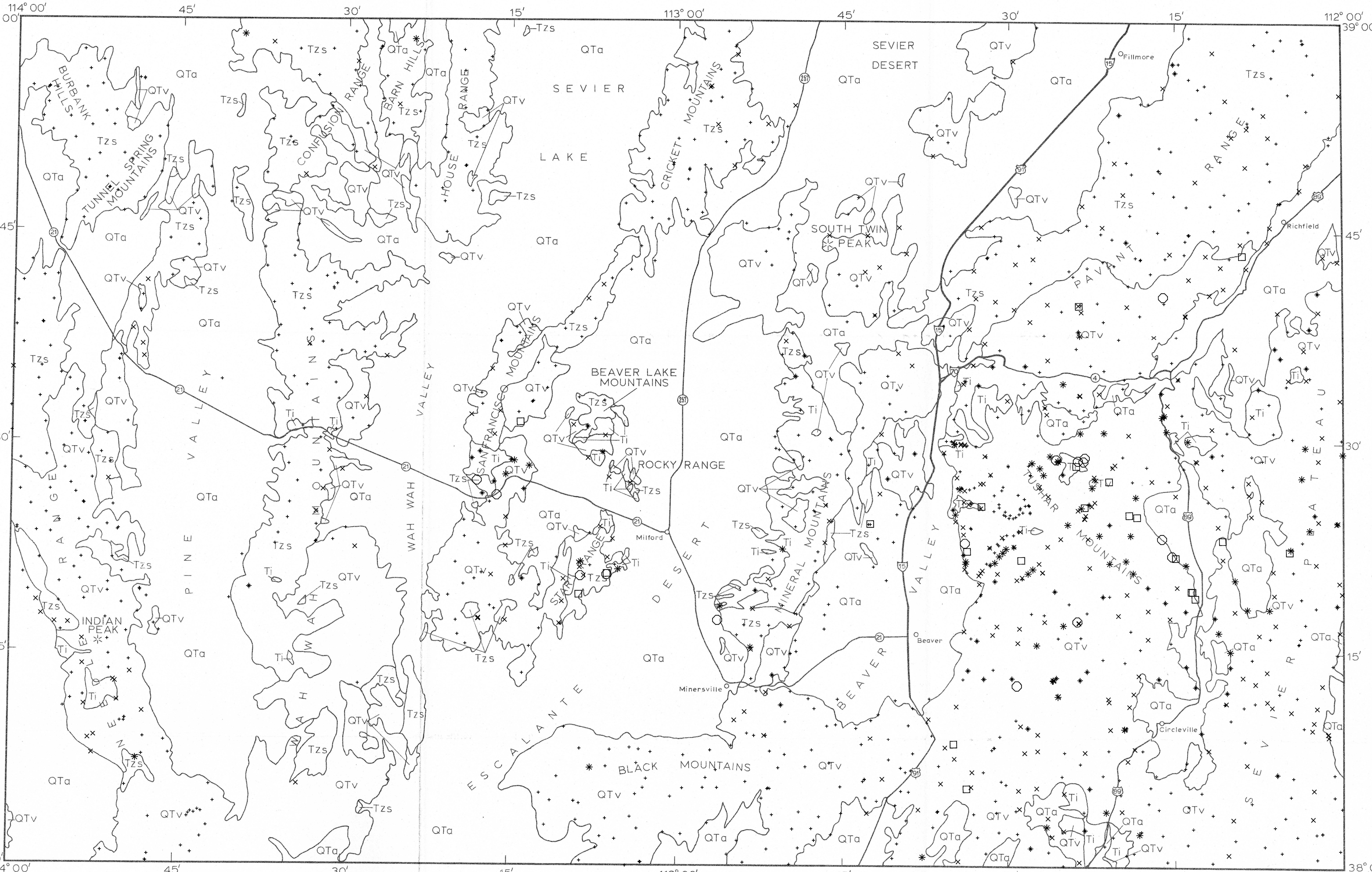
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-2138-D
FOLIO OF THE RICHFIELD 1° X 2° QUADRANGLE, UTAH



Geology generalized from Steven and others (1978)

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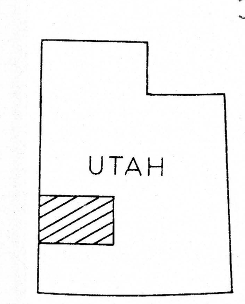

INDEX MAP

MAP SHOWING DISTRIBUTION OF GOLD IN STREAM-SEDIMENT SAMPLES, RICHFIELD 1° X 2° QUADRANGLE, UTAH

By
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1990

INTRODUCTION

This map of the Richfield 1° x 2° quadrangle, Utah, shows the regional distribution of gold in the less-than-0.180 mm (minus-80-mesh) fraction of stream sediments. It is part of a folio of maps of the Richfield 1° x 2° quadrangle prepared under the Conterminous United States Mineral Assessment Program (CUSMAP). Other published geochemical maps in this folio are listed in the Selected References of this report.

The Richfield quadrangle, located in west-central Utah, includes the eastern part of the Pioche-Marysvale igneous and mineral belt, which extends from the vicinity of Pioche in southeastern Nevada east-northeastward for 155 mi into central Utah. The western two-thirds of the Richfield quadrangle is part of the Basin-Range Province, and the eastern third is part of the High Plateaus subprovince of the Colorado Plateau.

The bedrock of the northern part of the Richfield quadrangle consists predominantly of Proterozoic and Paleozoic sedimentary strata that were thrust eastward during the Sevier orogeny in Cretaceous time onto an autochthon of Mesozoic sedimentary rocks in the eastern part of the quadrangle. The southern part of the quadrangle is largely underlain by Oligocene and younger volcanic rocks and related intrusions. Extensional tectonism during the late Cenozoic broke the bedrock terrain into a series of north-trending fault blocks; the uplifted mountain areas were eroded to various degrees and the resulting debris was deposited in the adjacent basins. Most of the mineral deposits in the Pioche-Marysvale mineral belt were formed during igneous activity in middle and late Cenozoic time. A more complete description of the geology and a mineral-resource appraisal of the Richfield 1° x 2° quadrangle appears in Steven and Morris (1984 and 1987).

The regional sampling program was designed to define broad geochemical patterns and trends, which (along with geological and geophysical data) can be utilized to assess the mineral-resource potential of this quadrangle. Reconnaissance geochemical surveys are valuable tools in mineral exploration, especially when used in conjunction with data obtained from other earth science disciplines. However, identifying specific exploration targets generally involves additional, more detailed investigations.

SAMPLE COLLECTION AND PREPARATION

Stream-sediment samples were collected at 1,445 sites throughout the Richfield quadrangle in 1978. These samples were analyzed for 31 elements (Motooka and others, 1979). Gold content was determined only down to a lower limit of 10 ppm, which is too high to meet current requirements for gold exploration by private industry. Most of these samples were resubmitted for analysis using a lower gold-detection limit of 1 ppb. A group of samples from sites located mainly in the southern Wah Wah Mountains were not included on the map.

The sample sites are located along small, normally unbranched or first-order stream drainages ranging from 1 to 2 miles in length and whose courses are 2 to 12 feet wide. Sample density is about 1 sample per 3 square miles within the bedrock areas (excluding the southern Wah Wah Mountains). Alluvium-filled intermountain basins were not sampled. Each sample is a composite of material collected at four or five places across and along the active channel, usually within 30 feet of each other. Generally about 1 to 2 pounds of bulk sediments were collected. Geochemical sampling was conducted by G.K. Lee, W.R. Miller, J.B. McHugh, R.E. Tucker, J.D. Tucker, and J.F. Guadagnoli.

The less-than-0.180 mm fraction of stream sediments was prepared by drying the bulk sediment and sieving through a minus 80-mesh screen. This fraction was pulverized in a vertical ceramic-plate mill to a powder of less-than-0.105 mm and was then analyzed.

ANALYTICAL PROCEDURES

Gold content (1 ppb lower detection limit) was determined by using graphite furnace atomic-absorption spectrophotometry (GFAAS). A 10-gram sample was roasted at 600 °C for 1 hour and then digested in a 0.5 percent-Br^2 hydrobromic acid solution. Gold was then extracted into methyl isobutyl ketone (MIBK) for GFAAS determinations. The method and a listing of the analytical data is described in McHugh and Miller (1990). The accuracy of the gold-content determination was checked using standard reference samples. Gold concentrations determined by using this method generally fell within 20 percent of the accepted values of the standards. In addition, thirteen samples were chosen at random and analyzed four times each for gold in order to check precision. The results appear in McHugh and Miller (1990) and in some cases display considerable variation. One possibility for this variation is the "nugget effect," which reflects the fortuitous presence or absence of a particle of gold within a given 10-gram sample used for the determination. Use of larger samples for analyses would lessen this problem. The results of individual gold determinations should be used with caution because of the possibility of wide analytical variation, particularly at low-level gold concentrations.

GENERATION OF MAPS

A computer-generated point-plot map for gold in the less-than-0.180 mm fraction of stream sediments was prepared using the computer-mapping programs of the U.S. Geological Survey's STATPAC system (VanTrump and Miesch, 1977). Gold concentrations ranged from < 1 to 350 ppb with a geometric mean of 1.79 ppb. Approximately 96 percent of the total population contains detectable gold values (1 ppb or greater). These values are divided into five classifications that reflect different degrees of anomalous departures from an arbitrarily chosen background value of 1 ppb gold. Each classification is represented by a symbol and is shown on the histogram for gold. The strongest anomaly classification represents one percent of the total population, followed by less anomalous classifications at the 2.5, 5, 10, and 25 percentile of the total population.

DISCUSSION

Most of the higher gold concentrations shown on the map are associated with known mining districts in the southern San Francisco Mountains, Star Range, southern Mineral Mountains, and Tushar Mountains (see Steven and Morris, 1984, for a discussion of the known mining districts). In addition to the known mining districts, higher concentrations of gold are also widely distributed in the eastern part of the Richfield quadrangle, which contains Oligocene and Miocene volcanic rocks. Most gold anomalies are associated with major igneous features such as intrusions and caldera structures. However, one belt of anomalies located along the eastern margin of Beaver Valley and another located along the eastern margin of the Tushar Mountains are associated with range-front faults (see Miller and McHugh, 1989a and b, for discussions of gold mineralization related to volcanism in the Richfield quadrangle). This study does not attempt to relate individual anomalies to specific sites and geology because it is concerned only with regional trends and patterns. Follow-up work on gold anomalies related to specific areas is currently being conducted and the results of these studies will be made available in the future.

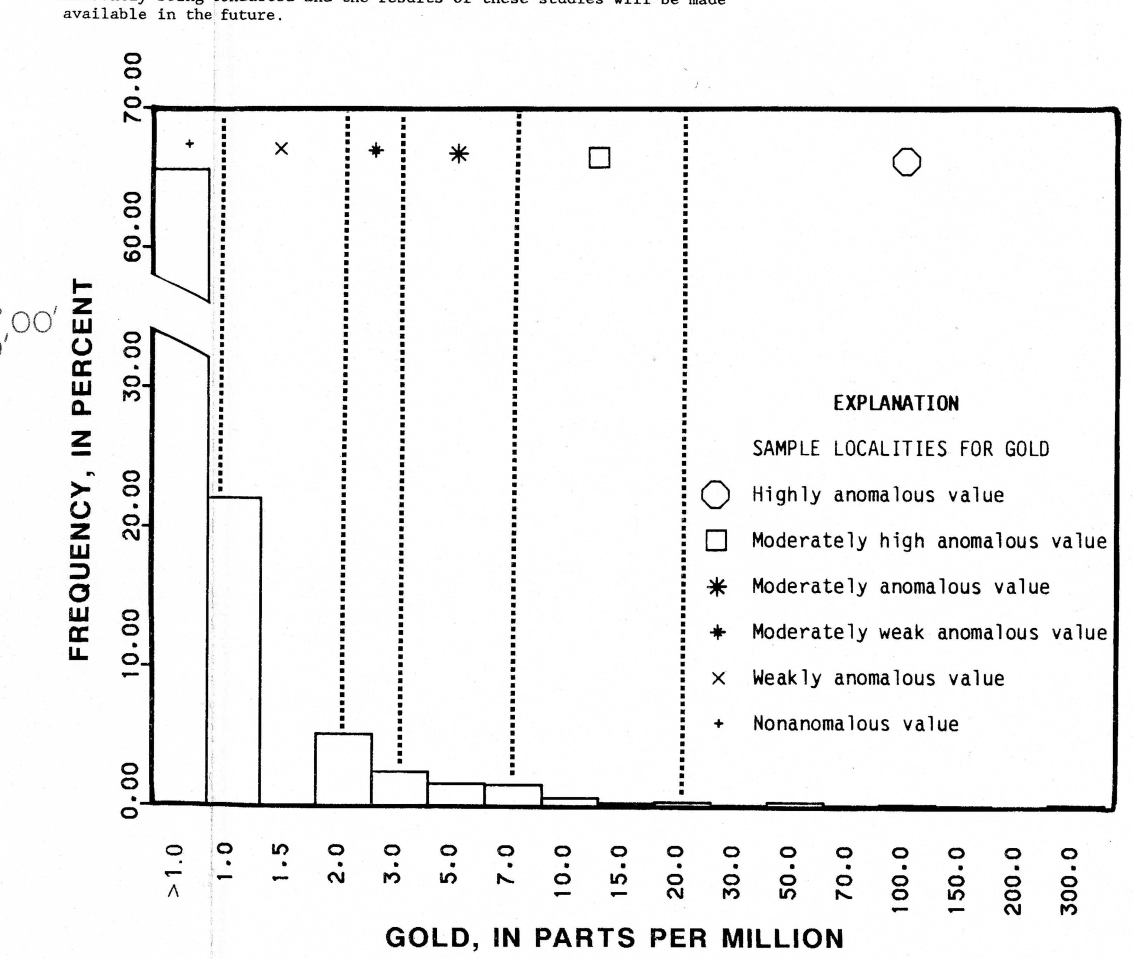

Figure 1.--Histogram showing concentrations of gold in stream-sediment samples collected from the Richfield 1° x 2° quadrangle, Utah. Number of samples, 1,412.

LIST OF MAP UNITS

QTa	Surficial deposits, undivided (Quaternary and Tertiary)
QTv	Volcanic rocks, undivided (Quaternary and Tertiary)
Ti	Intrusive igneous rocks, undivided (Tertiary)
Tzs	Sedimentary rocks, undivided (Tertiary to Late Proterozoic)
———	Contact

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