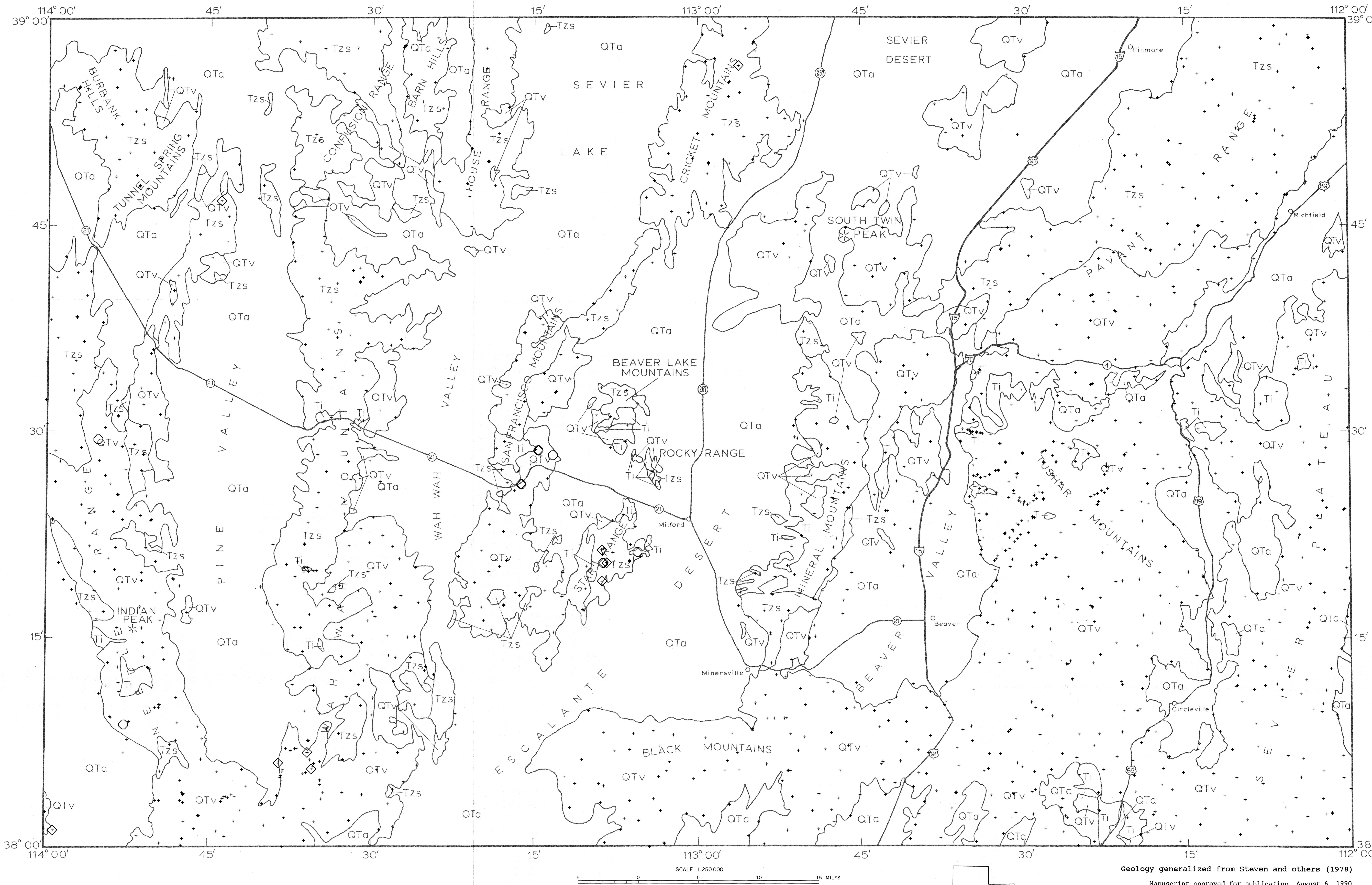
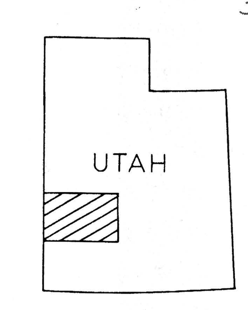
MAP MF-2137-A

FOLIO OF THE RICHFIELD 1° X 2° QUADRANGLE, UTAH





Geology generalized from Steven and others (1978)

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MAP SHOWING DISTRIBUTION OF CADMIUM AND ANTIMONY IN THE NONMAGNETIC FRACTION OF HEAVY-MINERAL CONCENTRATES, RICHFIELD 1° X 2° QUADRANGLE, UTAH

By
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INTRODUCTION

This map of the Richfield 1° x 2° quadrangle shows the regional distribution of cadmium and antimony in the nonmagnetic fraction of drainage-sediment samples. It is part of a folio of maps of the Richfield 1° x 2° quadrangle, Utah, prepared under the Conterminous United States Mineral Assessment Program. Other published geochemical maps in this folio are listed in the references (this publication).

The Richfield quadrangle is located in west-central Utah and 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 miles into central Utah. The western two-thirds of the Richfield quadrangle is part of the Basin and Range province, whereas the eastern third is part of the High Plateaus of Utah, a subprovince of the Colorado Plateau.

Bedrock in the northern part of the Richfield quadrangle consists predominantly of Late Proterozoic and Paleozoic sedimentary strata that were thrust eastward during the Sevier orogeny in Cretaceous time onto an autochthon of Mesozoic sedimentary rocks located 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 in late Cenozoic time 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 mineral deposits in the Pioche-Marysvale mineral belt were formed as a result of igneous activity in middle and late Cenozoic time. A more complete description of the geology and a mineral-resource appraisal of the Richfield quadrangle appears in Steven and Morris (1984 and 1987).

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

SAMPLE COLLECTION AND PREPARATION

Drainage-sediment samples were collected at 1,566 sites throughout the Richfield quadrangle. The sample sites are located along small, normally unbranched or first-order stream drainages that range from 1 to 2 miles in length and whose stream courses are 2 to 12 feet wide. Sample density within the bedrock areas is one sample per 3 square miles. Intermountain basins containing sediments were not sampled. Each sample is a composite of material collected at four or five sites (usually within 30 feet of each other) across and along the active channel. About 8 pounds of bulk sediments were collected at each site. The geochemical sampling was conducted by G.K. Lee, W.R. Miller, J.B. McHugh, R.E. Tucker, J.D. Tucker, and J.F. Guadagnoli.

Each drainage-sediment sample was first panned to eliminate clay minerals and the common rock-forming minerals, such as quartz, feldspar, and calcite. Most of the drainages that were sampled were dry, so each of the samples was panned (using a gold pan) either at the field laboratory in Milford, Utah or at the U.S. Geological Survey laboratory in Golden, Colorado. The panned concentrates were dried and sieved to minus-18 mesh (less than 1 mm), the magnetite grains were removed with a hand magnet. The remaining concentrate was separated into light and heavy fractions by using a heavy-liquid (bromoform: sp gr 2.68) mineral-separation technique. The light fraction, which contained mainly minerals such as quartz, feldspar, and calcite, was discarded. The remaining heavy-mineral fraction was separated electromagnetically using a Frantz isodynamic separator (forward- and side-angle settings of 15° and a current setting of 0.2 amperes). The resultant magnetic fraction was discarded and the remaining fraction was again separated into nonmagnetic and magnetic fractions at a setting of 0.6 amperes. The resultant nonmagnetic fraction was then hand ground to a powder (less than 149 microns) and analyzed. Sample preparation was conducted by J.D. Tucker and R.E. Tucker.

GEOCHEMICAL IMPLICATIONS OF THE NONMAGNETIC FRACTION

The nonmagnetic fraction of heavy-mineral concentrates derived from stream sediments contains accessory minerals, such as zircon, and primary and secondary minerals containing metals. Anomalous concentrations of cadmium and antimony in the nonmagnetic fraction of heavy-mineral concentrates generally indicate surface or near-surface sources for cadmium and antimony in the drainage basin. Anomalous concentrations of cadmium and antimony in the concentrates is usually due to the presence of primary minerals, such as sphalerite and stibnite and secondary minerals such as iron and manganese oxides.

ANALYTICAL PROCEDURES

For this study, cadmium and antimony concentrations were determined by a 6-step dc-arc optical-emission spectrographic method. The results of the analyses appear in Motooka and others (1979). All values are reported within a framework made up of six steps per order of magnitude (1, 0.7, 0.5, 0.3, 0.2, 0.15, or multiples of 10 of these numbers), and represent approx- imate geometric midpoints of the concentration ranges. The precision is within one adjoining reporting interval on either side of the reported value 83 percent of the time, and within two adjoining intervals 96 percent of the time (Motooka and Grimes, 1976).

GENERATION OF MAPS

A computer-generated point-plot map for cadmium and antimony in the nonmagnetic fraction of heavy-mineral concentrates was prepared using the computerized map-generation programs within the U.S. Geological Survey's STATPAC system (VanTrump and Miesch, 1977). Cadmium concentrations ranged from less than 50 to 700 ppm. Fewer than one percent of the samples contained detectable concentrations of cadmium (more than 50 ppm). All detectable concentrations of cadmium are very anomalous and are represented by a symbol on the histogram (fig. 1). Values for antimony ranged from less than 150 to 10,000 ppm. Fewer than one percent of the samples contained detectable concentrations of antimony (more than 150 ppm). All detectable concentrations are considered very anomalous and represented by a symbol on the histogram (fig. 2).

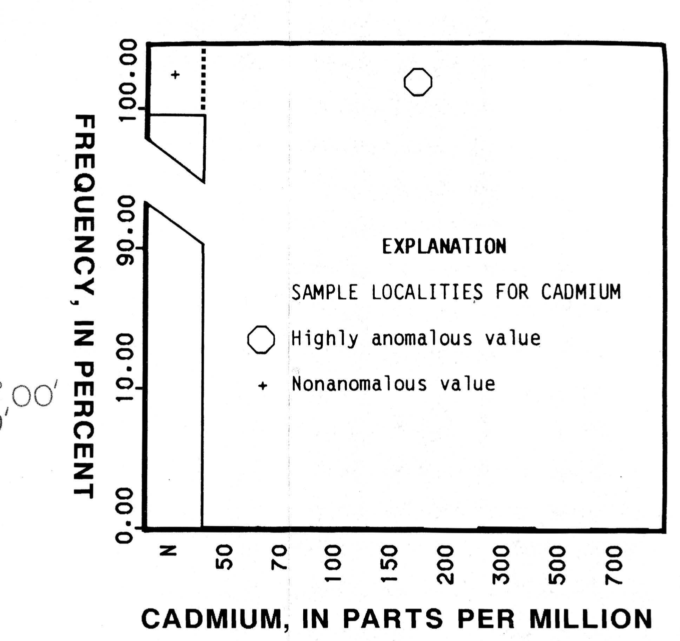

Figure 1.--Histogram showing cadmium concentrations in the nonmagnetic fraction of heavy-mineral concentrates from the Richfield 1° x 2° quadrangle, Utah. Number of samples, 1,566; N, not detected at 50 ppm.

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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_______1985, Maps showing distribution of copper in heavy-mineral concentrates, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1246-F, scale 1:500,000.

_______1985, Maps showing distribution of lead in heavy-mineral concentrates, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1246-G, scale 1:500,000.

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_______1990, Map showing the distribution of silver in the nonmagnetic fraction of heavy-mineral concentrates, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2137-B, scale 1:250,000.

_______1990, Map showing the distribution of barium in stream-sediment samples, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2138-A, scale 1:250,000.

_______1990, Map showing the distributions of bismuth and cadmium in stream-sediment samples, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2138-B, scale 1:250,000.

_______1990, Map showing the distribution of copper in stream-sediment samples, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2138-C, scale 1:250,000.

_______1990, Map showing the distribution of molybdenum in stream-sediment samples, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2138-F, scale 1:250,000.

_______1990, Map showing the distribution of lead in stream-sediment samples, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2138-E, scale 1:250,000.

_______1990, Map showing the distribution of silver in stream-sediment samples, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2138-G, scale 1:250,000.

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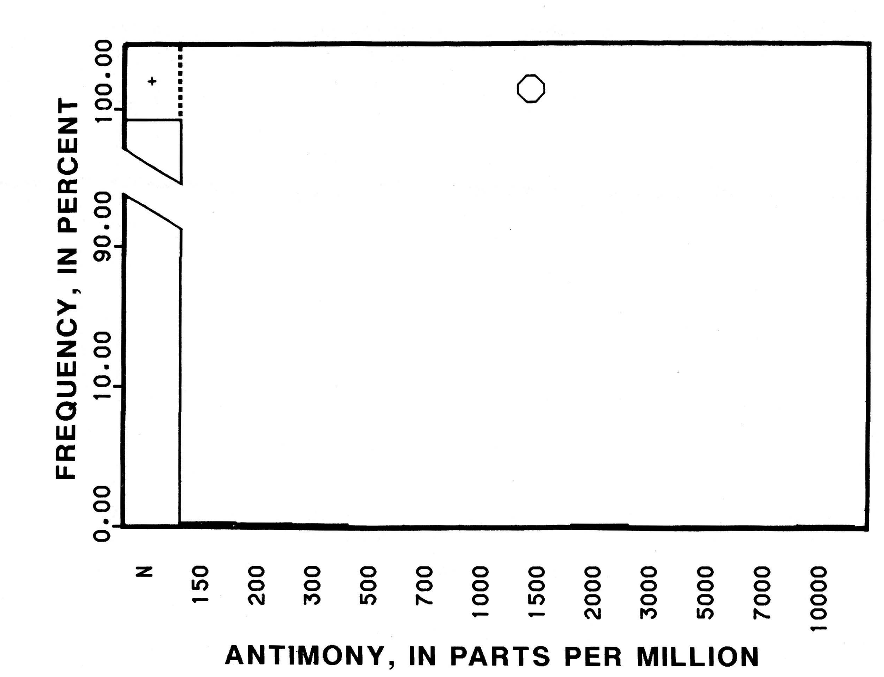

EXPLANATION

SAMPLE LOCALITIES FOR ANTIMONY

○ Highly anomalous value

+ Nonanomalous value

Figure 2.--Histogram showing antimony concentrations in the nonmagnetic fraction of heavy-mineral concentrates from the Richfield 1° x 2° quadrangle, Utah. Number of samples, 1,566; N, not detected at 150 ppm.

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