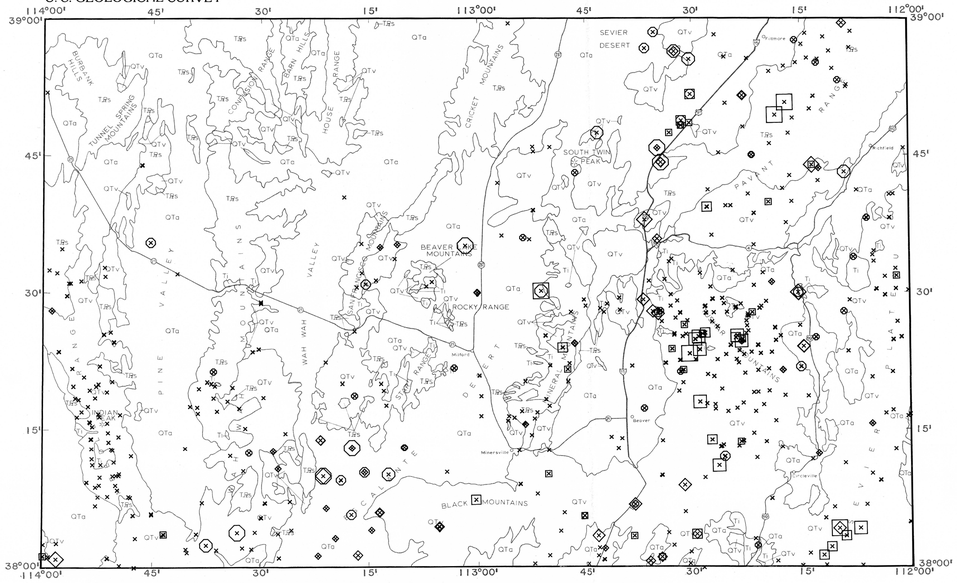
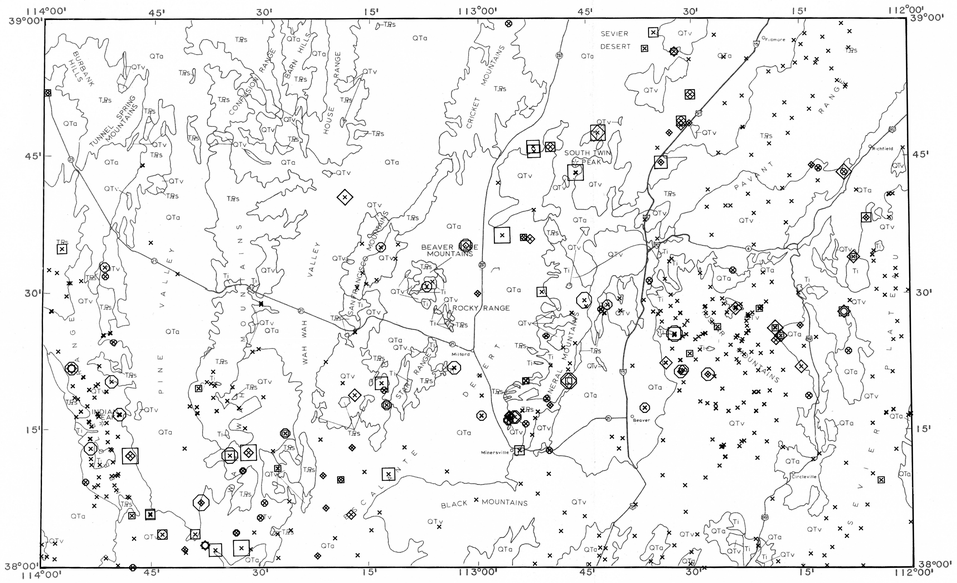
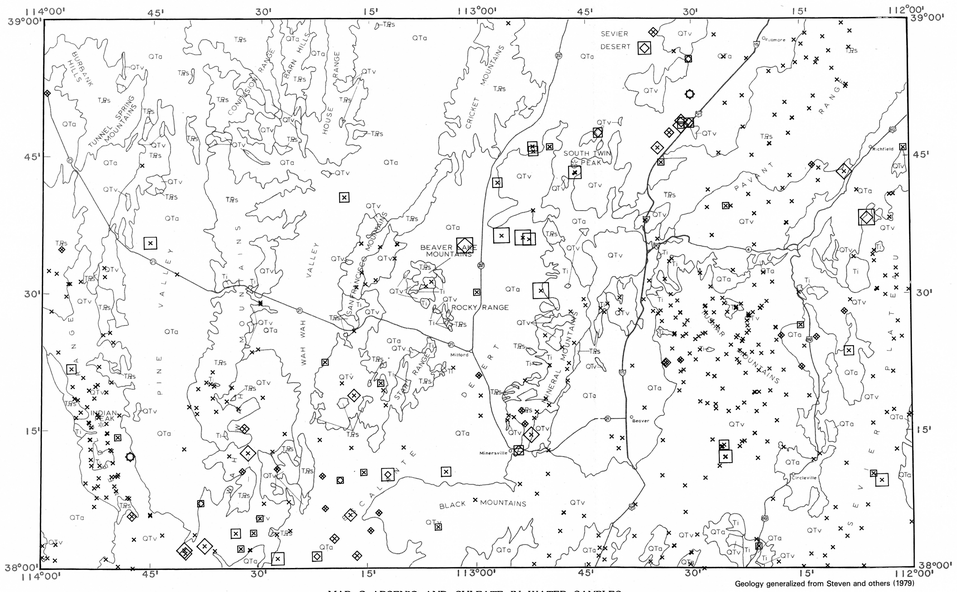


MAP A.–pH, COPPER, AND ZINC IN WATER SAMPLES



MAP B.–FLUORIDE, URANIUM, AND MOLYBDENUM IN WATER SAMPLES



MAP C.–ARSENIC AND SULFATE IN WATER SAMPLES

Geology generalized from Steven and others (1979)

SCALE 1:500,000

0 10 20 MILES
0 10 20 30 KILOMETERS

DESCRIPTION OF MAP UNITS

Note: The following explanation is for the geologic base map printed in gray

QTa	SURFICIAL DEPOSITS (QUARTERNARY AND TERTIARY)
QTv	VOLCANIC ROCKS (QUARTERNARY AND TERTIARY)
Ti	IGNEOUS ROCKS (TERTIARY)
TP_2s	SEDIMENTARY ROCKS (TERTIARY TO PALEOZOIC)

EXPLANATION FOR MAP A

pH	Copper	Zinc	SAMPLE LOCALITIES AND VALUES
□	○	◇	Strongly anomalous
□	○	◇	Moderately strong anomalous
□	○	◇	Moderately anomalous
□	○	◇	Weakly anomalous
×	×	×	Sample locality--Those without symbols are not anomalous

EXPLANATION FOR MAP B

Fluoride	Uranium	Molybdenum	SAMPLE LOCALITIES AND VALUES
□	○	◇	Strongly anomalous
□	○	◇	Moderately strong anomalous
□	○	◇	Moderately anomalous
□	○	◇	Weakly anomalous
×	×	×	Sample locality--Those without symbols are not anomalous

EXPLANATION FOR MAP C

Arsenic	Sulfate	SAMPLE LOCALITIES AND VALUES
□	◇	Strongly anomalous
□	◇	Moderately strong anomalous
□	◇	Moderately anomalous
□	◇	Weakly anomalous
×	×	Sample locality--Those without symbols are not anomalous

INTRODUCTION

These maps show the regional distribution of copper, zinc, arsenic, molybdenum, uranium, fluoride, sulfate, and pH in surface and ground water from the Richfield 1° x 2° quadrangle. This study supplements (Miller and others, 1984a-j) the regional drainage geochemical study done for the Richfield quadrangle under the U.S. Geological Survey's Conterminous United States Mineral Assessment Program (CUSMAP). Regional sampling was designed to define broad geochemical patterns and trends which can be used, along with geologic and geophysical data, to assess the mineral resource potential of the Richfield quadrangle. Analytical data used in compiling this report were published previously (McHugh and others, 1981).

The Richfield quadrangle in west-central Utah covers the eastern part of the Pioche-Marysvale igneous and mineral belt that extends from the vicinity of Pioche in southeastern Nevada, east-northeastward for 250 km into central Utah. The western two-thirds of the Richfield quadrangle is in the Basin and Range Province, and the eastern third in the High Plateaus of Utah subprovince of the Colorado Plateau.

Bedrock in the northern part of the Richfield quadrangle consists predominantly of latest Precambrian 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 in late Cenozoic time broke the bedrock terrane into a series of north-trending fault blocks; the uplifted mountain areas were deeply eroded and the resulting debris 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.

COLLECTION OF SAMPLES

Water samples were collected throughout the Richfield quadrangle during summer, 1978. Samples were obtained from 486 localities; 142 samples were of stream water and 344 samples were of ground water from springs and wells. The samples were collected in acid-rinsed polyethylene bottles. At each locality, a 60-mL sample was collected, filtered through a 0.45-µm filter, and acidified with reagent-grade concentrated nitric acid to a pH of less than 2. An additional 500-mL sample was collected but not filtered or acidified. Samples were collected by W. R. Miller, J. B. McHugh, G. K. Lee, J. F. Guadagnoli, L. DiGuardia, J. D. Tucker, and R. E. Tucker.

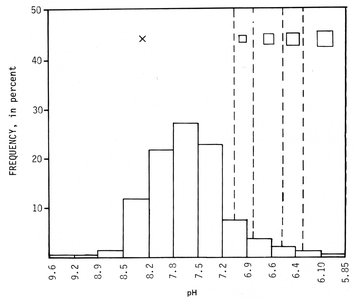
ANALYTICAL PROCEDURES

The pH of the sample was measured on the day of collection. The other analyses were made at U.S. Geological Survey laboratory in Denver, Colo. Copper, zinc, molybdenum, arsenic, and uranium values were determined from the filtered and acidified sample. Sulfate and fluoride were determined from the untreated sample.

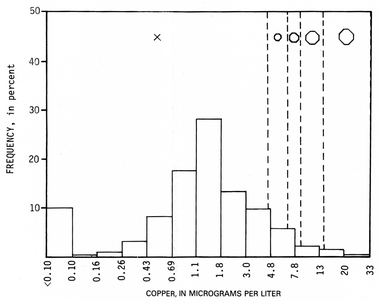
Samples were analyzed for copper, zinc, molybdenum, and arsenic by flameless atomic-absorption spectrophotometry (Perkin-Elmer Corporation, 1977). Uranium was determined by a fluorimetric method (McHugh, 1979). Sulfate and fluoride were determined by ion chromatography (Fishman and Pyen, 1979).

GENERATION OF MAPS

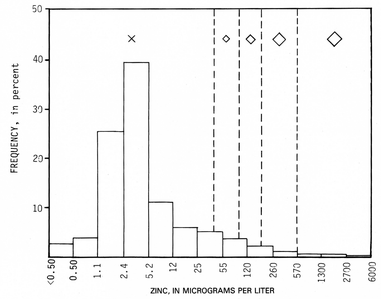
Maps showing anomalous values of the elements analyzed for in the samples, and histograms for each element, were prepared using the U.S. Geological Survey's STATPAC computer programs (VanTrump and Miesch, 1976). The 90th percentile level was considered the threshold of anomalous element values. Samples having higher percentile levels were divided into four classes ranging from strongly to weakly anomalous (see histograms). Strongly anomalous values are the 99th percentile, moderately strong anomalous values are the 97.5th percentile, moderately anomalous values are the 95th percentile, and weakly anomalous values are the 90th percentile.



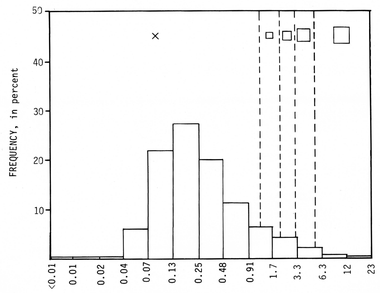
HISTOGRAM SHOWING pH IN WATER SAMPLES



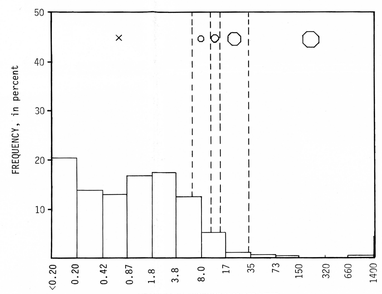
HISTOGRAM SHOWING COPPER CONCENTRATION IN WATER SAMPLES



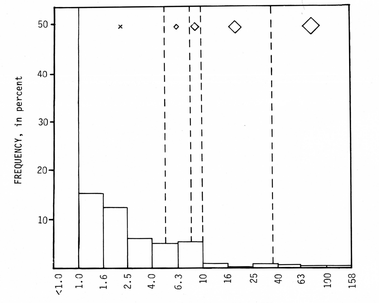
HISTOGRAM SHOWING ZINC CONCENTRATION IN WATER SAMPLES



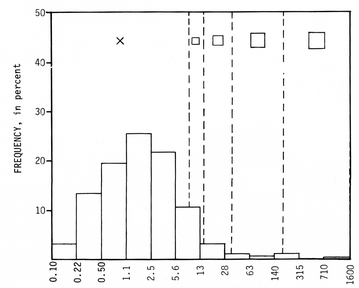
HISTOGRAM SHOWING FLUORIDE CONCENTRATION IN WATER SAMPLES



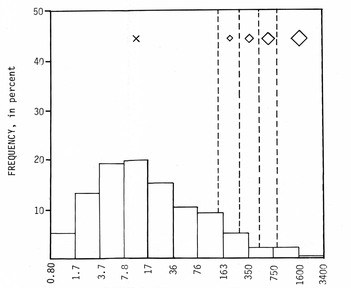
HISTOGRAM SHOWING URANIUM CONCENTRATION IN WATER SAMPLES



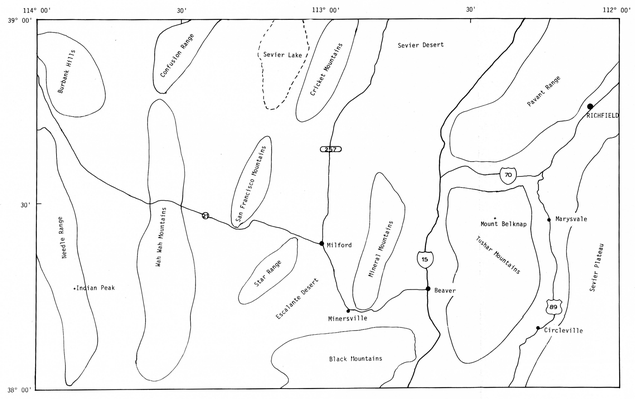
HISTOGRAM SHOWING MOLYBDENUM CONCENTRATION IN WATER SAMPLES



HISTOGRAM SHOWING ARSENIC CONCENTRATION IN WATER SAMPLES



HISTOGRAM SHOWING SULFATE CONCENTRATION IN WATER SAMPLES



INDEX MAP SHOWING TOWNS, ROADS, AND MAJOR GEOGRAPHIC FEATURES IN THE RICHFIELD QUADRANGLE

LOCATION MAP

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_____1984b, 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.

_____1984c, 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.

_____1984d, Distribution of zinc in heavy-mineral concentrates, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1246-K, scale 1:500,000.

_____1984e, Distribution of tungsten in heavy-mineral concentrates, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1246-J, scale 1:500,000.

_____1984f, Distribution of arsenic in heavy-mineral concentrates, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1246-B, scale 1:500,000.

_____1984g, Distribution of bismuth in heavy-mineral concentrates, Richfield 1° x 2° quadrangle, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1246-E, scale 1:500,000.

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This map is part of a folio of maps of the Richfield 1° x 2° quadrangle, Utah, prepared under the Conterminous United States Mineral Assessment Program (CUSMAP).

MAPS SHOWING DISTRIBUTION OF pH, COPPER, ZINC, FLUORIDE, URANIUM, MOLYBDENUM, ARSENIC, AND SULFATE IN WATER, RICHFIELD 1° X 2° QUADRANGLE, UTAH

By
J. B. McHugh, W. R. Miller, and W. H. Ficklin

1984

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