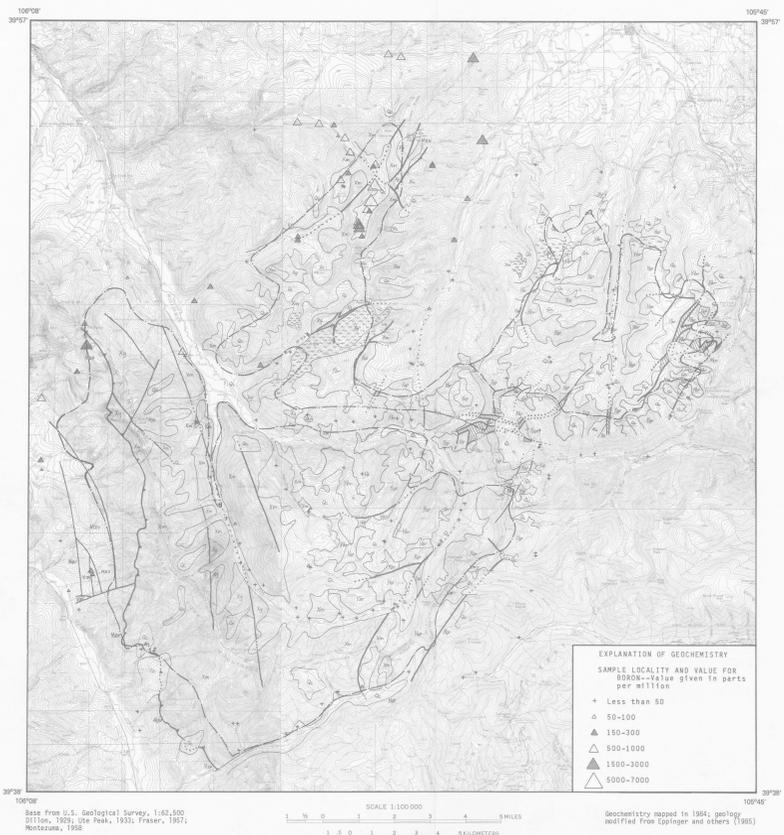


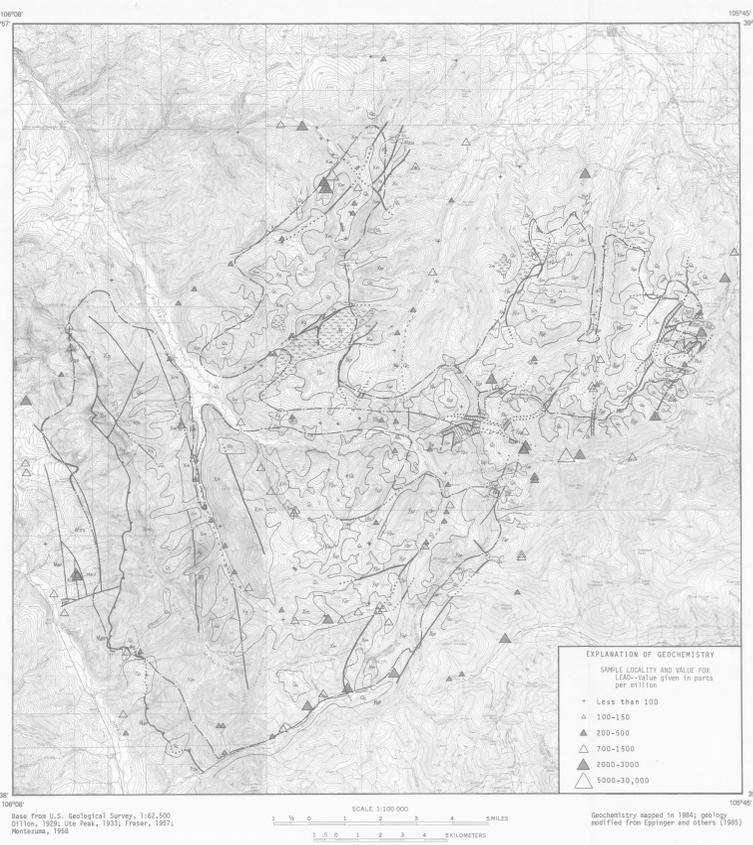
MAP A. BARIUM IN HEAVY-MINERAL CONCENTRATES



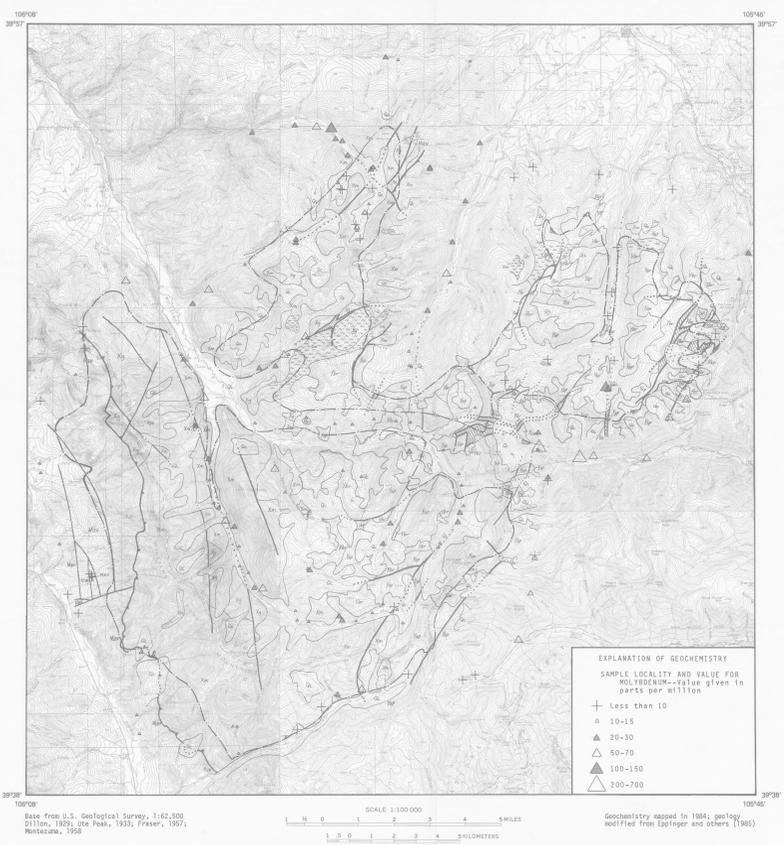
MAP B. BORON IN HEAVY-MINERAL CONCENTRATES



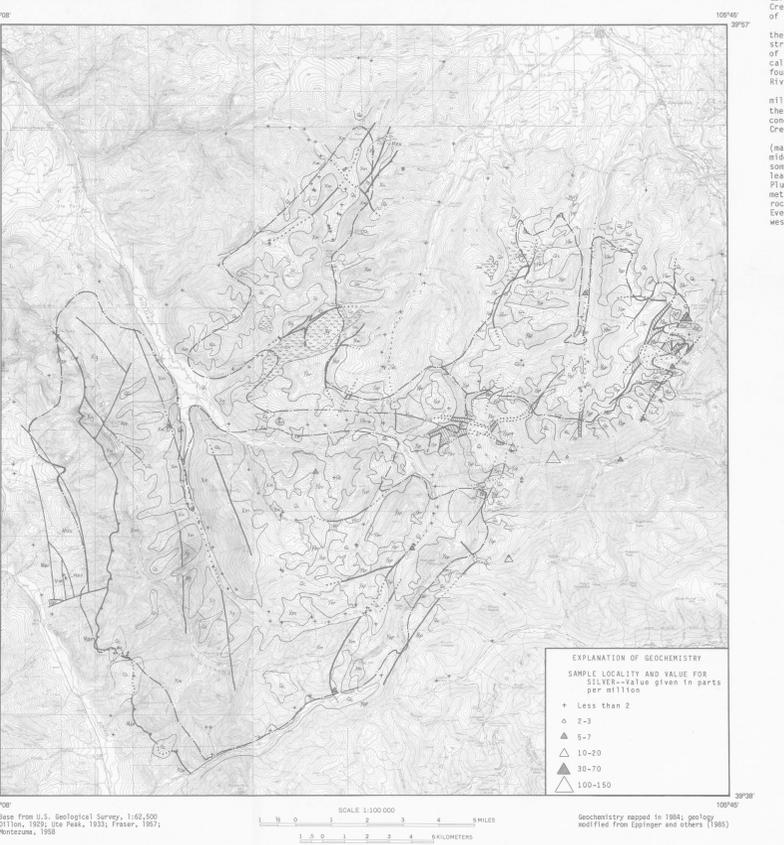
MAP C. COPPER IN HEAVY-MINERAL CONCENTRATES



MAP D. LEAD IN HEAVY-MINERAL CONCENTRATES



MAP E. MOLYBDENUM IN HEAVY-MINERAL CONCENTRATES



MAP F. SILVER IN HEAVY-MINERAL CONCENTRATES

EXPLANATION OF GEOLOGIC MAP
[Shown in gray on all maps]

CORRELATION OF MAP UNITS
Unconformity } QUATERNARY
Unconformity } CRETACEOUS AND JURASSIC
Unconformity } MIDDLE PROTEROZOIC

DESCRIPTION OF MAP UNITS
Qc SURFICIAL DEPOSITS (QUATERNARY)--Cover unit composed of undifferentiated glacial drift, alluvium, colluvium, landslide, and slumped ground
Mzu UNDIFFERENTIATED SEDIMENTARY ROCKS (CRETACEOUS AND JURASSIC)--Units include Pierre Shale, Niobrara Formation, Benton Shale, Dakota Sandstone, and Morrison Formation
Ysp SILVER PLUME GRANITE (MIDDLE PROTEROZOIC)--Biotite-muscovite-quartz monzonite with trachytoid texture formed by melted igneous phenocrysts, but locally granular. About 1.4 b. y. old
Ybr MIXED ROCKS (MIDDLE PROTEROZOIC)--Composed of Silver Plume Granite and one or more of the older metamorphic rocks.
Xg BOULDER CREEK BRANODIORITE (EARLY PROTEROZOIC)--Ranges from gneissic biotite-quartz monzonite to quartz diorite. About 1.2 b. y. old
Xn UNDIFFERENTIATED METAMORPHIC ROCKS (EARLY PROTEROZOIC)--Includes sillimanite, kyanite, hornblende, and calc-silicate gneisses

CONTACT--Approximately located
FAULT OR SHEAR ZONE--Approximately located. Zones of shattered rock and/or abundant gouge, usually altered. Dotted where concealed
THRUST FAULT--Approximately located, dotted where concealed, sawtooth on upper plate
CATACLASTIC ROCK AND (OR) MYLONITE
STUDY OR ROADLESS AREA BOUNDARY

STUDIES RELATED TO WILDERNESS
The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Vasequez Peak Wilderness Study Area, the Williams Fork and St. Louis Peak Roadless Areas (02114), and the St. Louis Peak Further Planning Area (F2314) in the Arapaho National Forest, Clear Creek, Grand, and Summit Counties, Colorado. The roadless areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

INTRODUCTION
Presented herein are geochemical maps showing the distribution and abundance of ten elements (silver, boron, barium, copper, molybdenum, lead, tin, thorium, tungsten, and zinc) in the nonmagnetic fraction of heavy-mineral concentrates from stream sediments collected in the Williams Fork Roadless Area, St. Louis Peak Roadless Area, and Vasequez Peak Wilderness Study Area. Similar reports describe studies made on the southern part of the study area (Barton, 1985) and heavy-mineral concentrates from ridge-top soil samples and stream sediments from the head of the Keyser basin (Barton, 1985).
The geochemical data on which all of these reports are based are published in Barton and Turner (1984). Included in that report are latitude and longitude, the analytical results for 31 sample locations, and a detailed description of the analytical techniques used. The geochemical data on which all of these reports are based are published in Barton and Turner (1984). Included in that report are latitude and longitude, the analytical results for 31 sample locations, and a detailed description of the analytical techniques used.

RESULTS AND DISCUSSION
High barium concentrations are found in two regions (map A). One region is at the western edge of the study area in tributaries of the Blue River where Mesozoic sedimentary rocks contain faults paralleling the Williams Range thrust fault's second region in the southeastern part of the study area where high values are found in Second Creek, Hoop Creek, West Fork Clear Creek, Bobtail Creek, Butler Gulch, Moods Creek, Herman Gulch, and Clear Creek. A second region of high values is found in the calcic metamorphic rocks in tributaries of the Blue River along the western edge of the study area.
Anomalous concentrations of copper, 100-1,000 ppm (parts per million) are found in Silver Plume Granite in the southeastern part of the study area from Red Mountain southwest (map C). These concentrations are found in samples collected from West Fork Clear Creek, Clear Creek, and upper Straight Creek.
With a few exceptions, lead is found throughout the study area (map D). Areas deficient in lead (less than 100 ppm) exist in the middle reaches of Williams Fork, Keyser Creek, and Vasequez Creek, and in some tributaries of St. Louis Creek. Anomalous high concentrations of lead are found in the eastern part of the study area both in Silver Plume Granite and the mixed-rock unit of Silver Plume Granite and older metamorphic rocks. High values of lead are also found in metamorphic rock along Straight Creek, the south and middle forks of Williams Fork, Celyn Creek, and in the faulted Mesozoic sedimentary rocks near the western boundary of the study area.

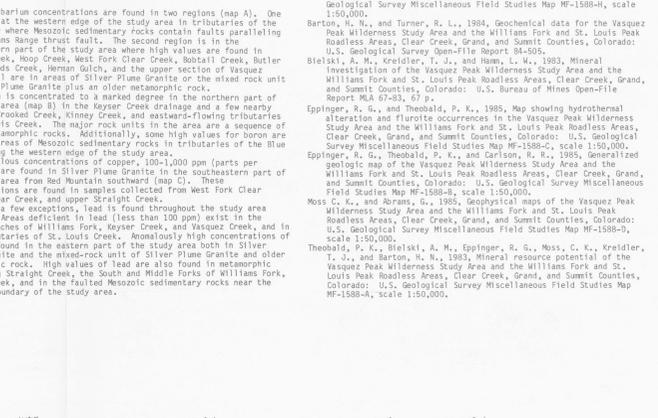
REFERENCES
Barton, H. N., 1985, Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridge-top and ridge-flank soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-I, scale 1:50,000.
Barton, H. N., 1985, Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates derived from stream sediments and ridge soils from the Keyser basin in the St. Louis Peak Roadless Area, Grand County, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-H, scale 1:50,000.
Barton, H. N., and Turner, R. L., 1984, Geochemical data for the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Open-File Report 84-505.
Bieliski, A. M., Kreidler, T. J., and Hahn, L. W., 1983, Mineral investigation of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Bureau of Mines Open-File Report MIA 67-83, 67 p.
Eppinger, R. G., and Theobald, P. R., 1985, Map showing hydrothermal alteration and fluorite occurrences in the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-C, scale 1:50,000.
Eppinger, R. G., Theobald, P. R., and Carlson, R. A., 1985, Generalized geologic map of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-B, scale 1:50,000.
Hahn, L. W., and Hahn, G., 1985, Geophysical maps of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-D, scale 1:50,000.
Theobald, P. R., Bieliski, A. M., Eppinger, R. G., Moss, C. K., Kreidler, T. J., and Barton, H. N., 1983, Mineral resource potential of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-A, scale 1:50,000.

STUDIES RELATED TO WILDERNESS
The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral values, if any, that may be present. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geochemical survey of the Vasequez Peak Wilderness Study Area, the Williams Fork and St. Louis Peak Roadless Areas (02114), and the St. Louis Peak Further Planning Area (F2314) in the Arapaho National Forest, Clear Creek, Grand, and Summit Counties, Colorado. The roadless areas were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

INTRODUCTION
Presented herein are geochemical maps showing the distribution and abundance of ten elements (silver, boron, barium, copper, molybdenum, lead, tin, thorium, tungsten, and zinc) in the nonmagnetic fraction of heavy-mineral concentrates from stream sediments collected in the Williams Fork Roadless Area, St. Louis Peak Roadless Area, and Vasequez Peak Wilderness Study Area. Similar reports describe studies made on the southern part of the study area (Barton, 1985) and heavy-mineral concentrates from ridge-top soil samples and stream sediments from the head of the Keyser basin (Barton, 1985).
The geochemical data on which all of these reports are based are published in Barton and Turner (1984). Included in that report are latitude and longitude, the analytical results for 31 sample locations, and a detailed description of the analytical techniques used. The geochemical data on which all of these reports are based are published in Barton and Turner (1984). Included in that report are latitude and longitude, the analytical results for 31 sample locations, and a detailed description of the analytical techniques used.

RESULTS AND DISCUSSION
High barium concentrations are found in two regions (map A). One region is at the western edge of the study area in tributaries of the Blue River where Mesozoic sedimentary rocks contain faults paralleling the Williams Range thrust fault's second region in the southeastern part of the study area where high values are found in Second Creek, Hoop Creek, West Fork Clear Creek, Bobtail Creek, Butler Gulch, Moods Creek, Herman Gulch, and Clear Creek. A second region of high values is found in the calcic metamorphic rocks in tributaries of the Blue River along the western edge of the study area.
Anomalous concentrations of copper, 100-1,000 ppm (parts per million) are found in Silver Plume Granite in the southeastern part of the study area from Red Mountain southwest (map C). These concentrations are found in samples collected from West Fork Clear Creek, Clear Creek, and upper Straight Creek.
With a few exceptions, lead is found throughout the study area (map D). Areas deficient in lead (less than 100 ppm) exist in the middle reaches of Williams Fork, Keyser Creek, and Vasequez Creek, and in some tributaries of St. Louis Creek. Anomalous high concentrations of lead are found in the eastern part of the study area both in Silver Plume Granite and the mixed-rock unit of Silver Plume Granite and older metamorphic rocks. High values of lead are also found in metamorphic rock along Straight Creek, the south and middle forks of Williams Fork, Celyn Creek, and in the faulted Mesozoic sedimentary rocks near the western boundary of the study area.

REFERENCES
Barton, H. N., 1985, Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridge-top and ridge-flank soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-I, scale 1:50,000.
Barton, H. N., 1985, Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates derived from stream sediments and ridge soils from the Keyser basin in the St. Louis Peak Roadless Area, Grand County, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-H, scale 1:50,000.
Barton, H. N., and Turner, R. L., 1984, Geochemical data for the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Open-File Report 84-505.
Bieliski, A. M., Kreidler, T. J., and Hahn, L. W., 1983, Mineral investigation of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Bureau of Mines Open-File Report MIA 67-83, 67 p.
Eppinger, R. G., and Theobald, P. R., 1985, Map showing hydrothermal alteration and fluorite occurrences in the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-C, scale 1:50,000.
Eppinger, R. G., Theobald, P. R., and Carlson, R. A., 1985, Generalized geologic map of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-B, scale 1:50,000.
Hahn, L. W., and Hahn, G., 1985, Geophysical maps of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-D, scale 1:50,000.
Theobald, P. R., Bieliski, A. M., Eppinger, R. G., Moss, C. K., Kreidler, T. J., and Barton, H. N., 1983, Mineral resource potential of the Vasequez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit Counties, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1588-A, scale 1:50,000.



GEOCHEMICAL MAPS SHOWING THE DISTRIBUTION AND ABUNDANCE OF SELECTED ELEMENTS IN HEAVY-MINERAL CONCENTRATES OF STREAM SEDIMENTS FROM THE VASQUEZ PEAK WILDERNESS STUDY AREA AND THE WILLIAMS FORK AND ST. LOUIS PEAK ROADLESS AREAS, CLEAR CREEK, GRAND, AND SUMMIT COUNTIES, COLORADO

By
H. N. Barton
1985