DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1582-A
PAMPHLET ACCOMPANIES MAP

MAP SHOWING GEOLOGY AND MINERAL RESOURCE POTENTIAL OF THE OH-BE-JOYFUL WILDERNESS STUDY AREA, GUNNISON COUNTY, COLORADO

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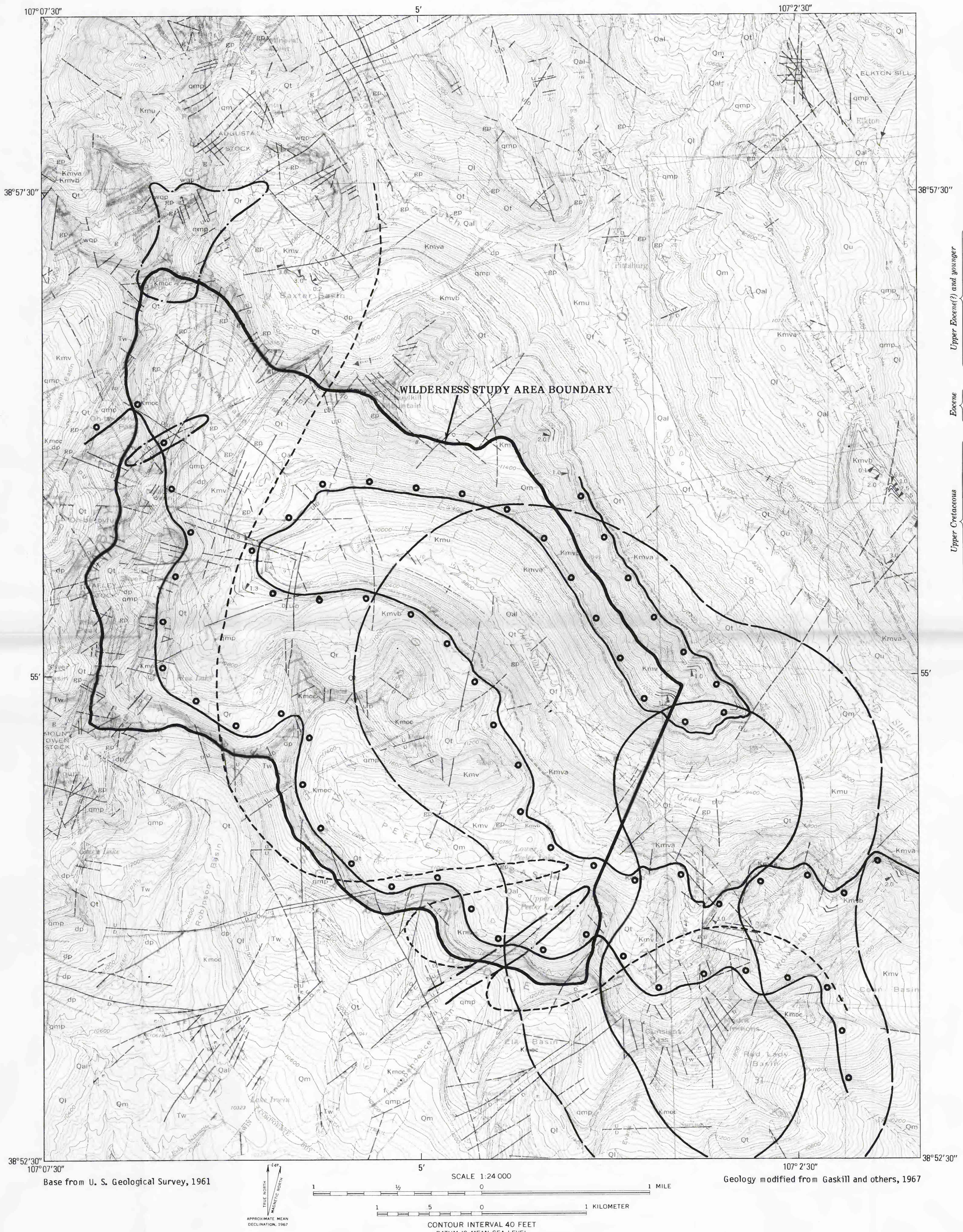
DESCRIPTION OF MAP UNITS

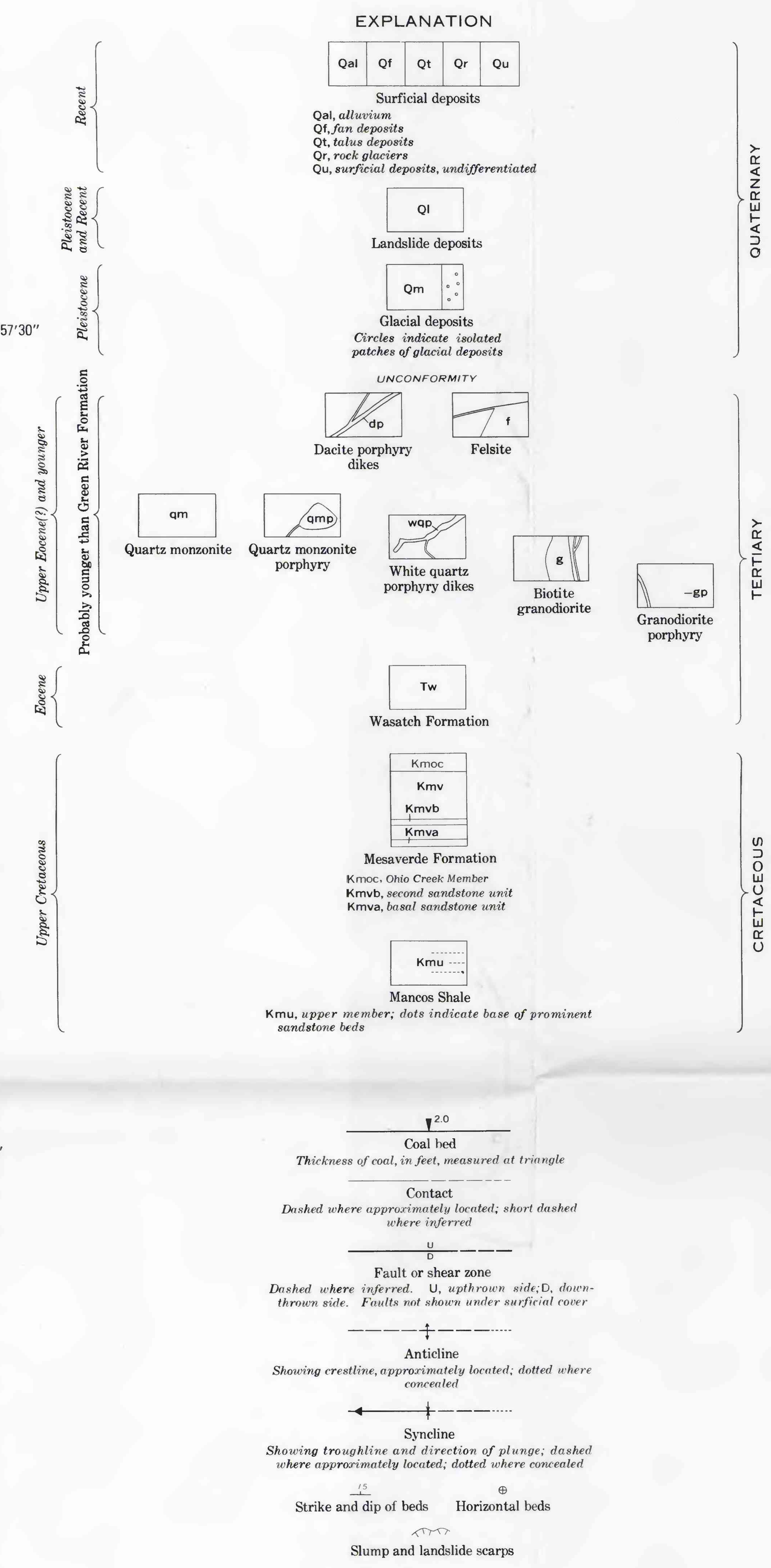
SURFICIAL DEPOSITS—

- **Qal** Alluvial deposits—stream and pond deposits of silt, sand, gravel, and cobbles.
- **Qf** Alluvial fans—includes alluvial cone deposits.
- **Qt** Talus deposits—talus cones, aprons, and scree slopes.
- **Qr** Rock glaciers—includes active and inactive rubble streams and attendant talus deposits.
- **Qu** Surficial deposits, undifferentiated—includes slope-wash, talus, glacial, landslide, and bog deposits.
- **Ql** LANDSLIDE DEPOSITS— landslide and slump blocks.
- **Qm** GLACIAL DEPOSITS— ground moraine, morainal ridges, and dissected till remnants.
- **dp** DACITE PORPHYRY DIKES— gray to green porphyritic dikes that contain phenocrysts of hornblende, plagioclase, and biotite in a microcrystalline matrix of plagioclase, quartz, alkalic feldspar, and augite. Cut quartz monzonite porphyry and granodiorite porphyry dikes in Ruby Range. Similar dikes cut Miocene(?) volcanic rocks southwest of map area.
- **f** FELSITE— white to light-gray altered quartz and feldspar rock rich in pyrite. Ferromagnesian minerals leached. Forms small breccia plug and dike in Redwell Basin.
- **qm** QUARTZ MONZONITE—light-gray fine- to medium-grained rock containing quartz, plagioclase, alkalic feldspar, biotite, and hornblende. Ranges in composition from quartz diorite to quartz monzonite. Gradational into quartz monzonite porphyry. Forms Paradise stock and part of Augusta stock.
- **qmp** QUARTZ MONZONITE PORPHYRY—light-gray porphyritic rock that contains large orthoclase and quartz phenocrysts and smaller plagioclase, biotite, and hornblende phenocrysts in a microcrystalline to fine-grained matrix of quartz and alkalic feldspar. Includes rocks intermediate in composition between quartz monzonite porphyry and granodiorite porphyry. Forms dikes, sills, laccoliths, and stocks.
- **wqp** WHITE QUARTZ PORPHYRY DIKES— white dense porphyritic dikes with euhedral phenocrysts of quartz and altered feldspar in a sericitized groundmass. Probably equivalent to granite porphyry of Treasure Mountain dome. Cuts granodiorite porphyry and is cut by quartz monzonite of Augusta stock.
- **g** BIOTITE GRANODIORITE— medium- to fine-grained granular rock that contains plagioclase, quartz, alkalic feldspar, biotite, hornblende, and small pyroxene crystals. Ranges in composition from quartz diorite to granodiorite. Forms early border phase of Mount Owen and Augusta stocks and dikes. Cut by other igneous rocks.
- **gp** GRANODIORITE PORPHYRY—light-gray porphyritic rock that contains zoned plagioclase, hornblende, and biotite phenocrysts in a microcrystalline matrix of quartz, plagioclase, and alkalic feldspar. Forms dikes and sills. Includes altered and chloritized dikes and sills adjacent to the stocks of the Ruby Range.
- **Tw** WASATCH FORMATION (about 1,700 ft; top eroded)—varicolored fine- to very coarse-grained lenticular and evenly bedded sandstone, siltstone, and mudstone; thick lenses of conglomerate and conglomeratic feldspathic sandstone in basal part. Generally metamorphosed to quartzite, argillite, and silty and argillaceous hornfels. Conglomerates are well cemented and are mainly andesitic, dacitic, gneissic, and granitic pebbles in very coarse angular argillaceous matrix, but include lenses of varicolored chert, quartz, quartzite, and fragmented mudstone pebbles. Lower part of formation may be Paleocene in age.
- **Kmv** MESAVERDE FORMATION (1,600 to 1,800 ft)—interbedded sandstone, shale, coal, and carbonaceous shale.
- **Kmoc** Ohio Creek Member (about 400 ft) — upper part: light-gray to white friable medium-grained feldspathic conglomeratic sandstone. Pebbles are mainly chert, quartzite, and quartz, but a few igneous rock pebbles were found. Middle part: interbedded sandstone, siltstone, shale, and carbonaceous shale. Basal part: very thick and massive beds of light-gray to white feldspathic sandstone that locally contains pebble lenses and scattered pebbles like those in the upper unit; includes subordinate interbeds of sandy siltstone, silty shale, and carbonaceous shale.
- **Kmvb** Second sandstone unit (50-100 ft)—medium-gray to white thick-bedded massive fine- to medium-grained sandstone separated from basal sandstone unit (Kmva) by about 200 feet of dark-gray marine shale.
- **Kmva** Basal sandstone unit (12-50 ft)—medium-gray to white generally thick-bedded and massive fine- to very fine-grained sandstone. Intertongues with upper member of Mancos Shale. Probably equivalent to Rollins Sandstone Member of Mesaverde Formation at type locality.

MANCOS SHALE (about 4,400 ft):

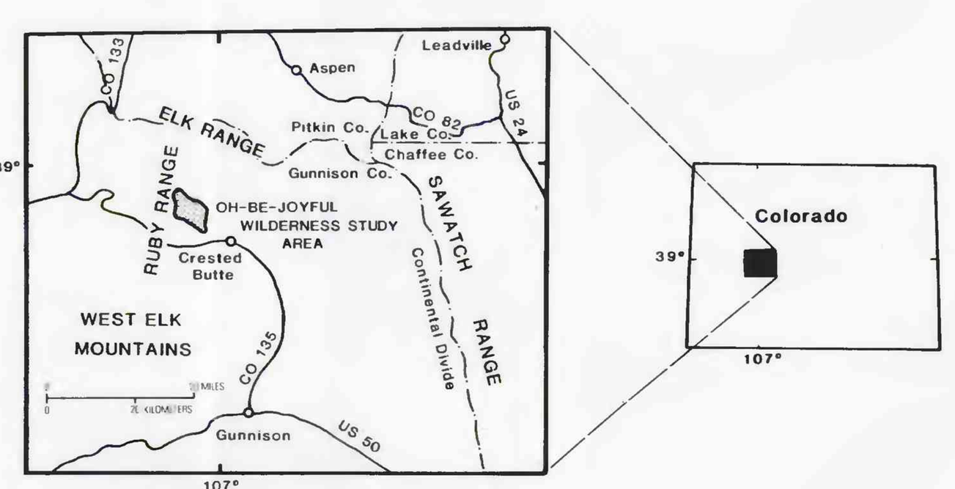
- **Kmu** Upper member (about 4,100 ft)—mainly dark-gray laminated well-indurated silty marine shale. Contains interbeds of silty sandstone, sandy limestone, and carbonaceous shale in transition zone immediately below the Mesaverde Formation. Lower 700 feet is gray calcareous shale of Niobrara age. Locally metamorphosed to hornfels.





EXPLANATION

- Approximate boundary of study area
- Area having high mineral resource potential for stockwork molybdenum deposits
- Area having moderate mineral resource potential for stockwork molybdenum deposits
- Area having high mineral resource potential for silver-zinc-lead vein deposits
- Area having moderate mineral resource potential for silver-zinc-lead vein deposits
- Area having high mineral resource potential for coal deposits



INDEX MAP SHOWING LOCATION OF STUDY AREA

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 resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geological and mineral resource potential survey of the Oh-Be-Joyful Wilderness Study Area in the Gunnison National Forest, Gunnison County, Colorado. The Oh-Be-Joyful Wilderness Study Area was established by Public Law 96-560, December 22, 1980; the area had been classified as non-wilderness during the Second Roadless Area Review and Evaluation (RARE II) by the U. S. Forest Service, January 1979.

MINERAL RESOURCE POTENTIAL SUMMARY

Two areas immediately southeast of the Oh-Be-Joyful Wilderness Study Area contain resources of molybdenum. Another locality, partly within the study area along the eastern boundary, contains molybdenum mineralization of unknown extent at depth. These three areas have high mineral resource potential for molybdenum in stockwork deposits. In addition, the northwestern part and most of the eastern half of the study area have moderate mineral resource potential for molybdenum in stockwork deposits. Three areas that are entirely or partly within the study area, two of which contain resources of silver, zinc, and lead, have high mineral resource potential for those commodities. Also, the western part and a small area in the southern part of the study area have moderate mineral resource potential for silver, zinc, and lead. More than half the study area contains inferred coal resources and has high mineral resource potential for coal.

GEOLOGIC SETTING

The study area lies on the east flank of the Ruby Range, a high, north-south-trending ridge that connects the Elk Range and the West Elk Mountains (index map). It is separated on the east from the Sawatch Range by Taylor Park, a large intermontane basin. The west flank of the Ruby Range adjoins the Colorado Plateau.

The study area is underlain primarily by Cretaceous and Tertiary sedimentary rocks that are cut by a complex series of Oligocene and Miocene intrusive rocks, ranging in composition from diorite to granite. The oldest exposed rocks are the upper part of the Mancos Shale. This is overlain by the Mesaverde Formation, a series of alternating sandstones, shales, and conglomerates. The shaly portion of the Mesaverde contains six known coal beds up to 3 ft (1 m) thick in the study area. The overlying lower Tertiary Wasatch Formation consists of shales, marine and continental sandstones, and conglomerates.

The Tertiary intrusive rocks are of two distinct suites. The older, of Oligocene age, is primarily of intermediate composition, ranging in silica content from 64 to 68 percent. These rocks generally have fine-grained, hypabyssal textures and occur chiefly as a group of stocks and dikes that form the core of the Ruby Range. They also form a volumetrically less important series of sills that crop out throughout the study area.

The younger suite of igneous rocks is expressed at the surface only by a felsite plug and associated dikes in Redwell Basin, immediately southeast of the study area, and at depth by a series of granites and granite porphyries. The granites contain more than 70 percent silica and are the source of the Redwell Basin and Mt. Emmons stockwork molybdenite deposits.

In the central part of the study area, compilation of a structure contour map of the base of the Mesaverde Formation revealed a dome with about 200 ft (61 m) of closure (fig. 1). Similar doming is present, though more difficult to demonstrate at the map scale, over the Mt. Emmons and Redwell Basin molybdenite deposits. The dome in the central part of the study area may lie above another concealed granitic intrusion.

The study area is broken by numerous normal faults that trend primarily northeast and northwest. Some of the faults are mineralized and contain epithermal vein deposits, and some contain intermediate-composition dikes; the faults are generally of small displacement.

MINES AND PROSPECTS

The Oh-Be-Joyful Wilderness Study Area adjoins the northern edge of the Crested Butte coal mining district and is entirely within the Ruby mining district. A subdistrict of the Ruby, the Irwin silver district, is centered about 1 mi (1.6 km) southwest of the study area.

Mining began in the region in 1874 in the Irwin district, when it was still part of the Ute Indian Reservation. Snowslides in 1882 and 1884 shut down several mines that were never reopened. By 1890, the silver-mining era had ended, because of low silver prices, snowslides, underground flooding, and, in some cases, ore depletion. Production figures for the early period are unavailable or incomplete.

Data for the period 1901-1969 indicate that the part of the Ruby district considered in this report produced about 24,000 oz (746,000 g) of gold, 5.2 million oz (162 million g) of silver, 6.6 million lb (3.0 million kg) of copper, 30.9 million lb (14.0 million kg) of lead, 55.2 million lb (25.0 million kg) of zinc, and a few pounds of cadmium. Between 1884 and 1954, the coal mines within 4 mi (6 km) of the study area produced about 3 million tons (2.7 million metric tons [t]) of coal.

The study area contained five patented mining claims and had about 4,800 acres (19 km^2) of unpatented claims as of March 1982. Oil and gas leases covered about 4,700 acres (19 km^2) as of January 1979, although no drilling for oil or gas had been conducted as of September 1981.

Inferred coal resources within the study area, in beds 1 to 3 ft (0.3 to 1 m) thick, are 12 million tons (10.9 million t). The indicated silver-zinc-lead resource within the area is about 10,000 tons (9,070 t), averaging about 0.6 oz/ton (21 g/t) silver, 1.4 percent zinc, and 1.0 percent lead. The inferred silver-zinc-lead resource is about 400,000 tons (363,000 t) of a similar grade.

STOCKWORK MOLYBDENITE DEPOSITS

Two known stockwork molybdenite deposits, Mt. Emmons and Redwell Basin, are immediately southeast of the study area. Potential for three more such deposits exists within and adjacent to the study area.

Just north of the Redwell Basin deposit is an area of hornfels, minor veining, and associated hydrothermal alteration (fig. 1). Mineral zonation on the Independence vein (fig. 2) suggests higher lead and zinc concentrations near this area. Exploration drilling by Climax Molybdenum Co. has disclosed appropriate high-silica intrusions and some molybdenite mineralization at depth. On the basis of this information, the area has high potential for stockwork molybdenite deposits.

Upstream (northwest) from the potential deposit described above, there is moderate potential for the occurrence of a fourth molybdenite deposit. A small amount of hornfels and veining lies in the center of a structural dome that is probably due to a silicic intrusion at depth (fig. 1).

In the northwest corner of the study area, near Richmond Mountain, moderate potential exists for a fifth molybdenite deposit. A number of veins appear to intersect in this area (fig. 2), and although exposures do not permit the study of zonation in the veins, the radial pattern suggests an intrusive center. Alteration and veining associated with the older intermediate-composition rocks in this area makes discernment of possible later effects problematical.

SILVER-ZINC-LEAD VEIN DEPOSITS

Indicated resources of silver, zinc, and lead are present within the study area in the Independence and Ruby No. 1 veins, and these areas have high potential for the occurrence of silver-bearing base-metal vein deposits. High potential is also present under Richmond Mountain, based on the large number of possibly intersecting veins, past production, and scattered high silver assays. Elsewhere in the study area, mineralized structures have moderate potential for silver, zinc, and lead in an elongate band flanking the Ruby Range intrusives and on the margins of the Irwin district.

COAL DEPOSITS

Coal is found in the study area in beds 0.5 to 3 ft (0.15 to 0.9 m) thick in the Mesaverde Formation. Most coal beds are in the stratigraphic sequence above the second sandstone unit above the base (fig. 3). The area that is stratigraphically above the second sandstone unit and that is not deeply buried by overlying formations has high potential for coal resources. This includes about two-thirds of the study area.

REFERENCE CITED

Gaskill, D. L., Godwin, L. H., and Mutschler, F. E., 1967, Geologic map of the Oh-Be-Joyful Quadrangle, Gunnison county, Colorado: U. S. Geological Survey Geologic Quadrangle Map GQ-578, scale 1:24,000.

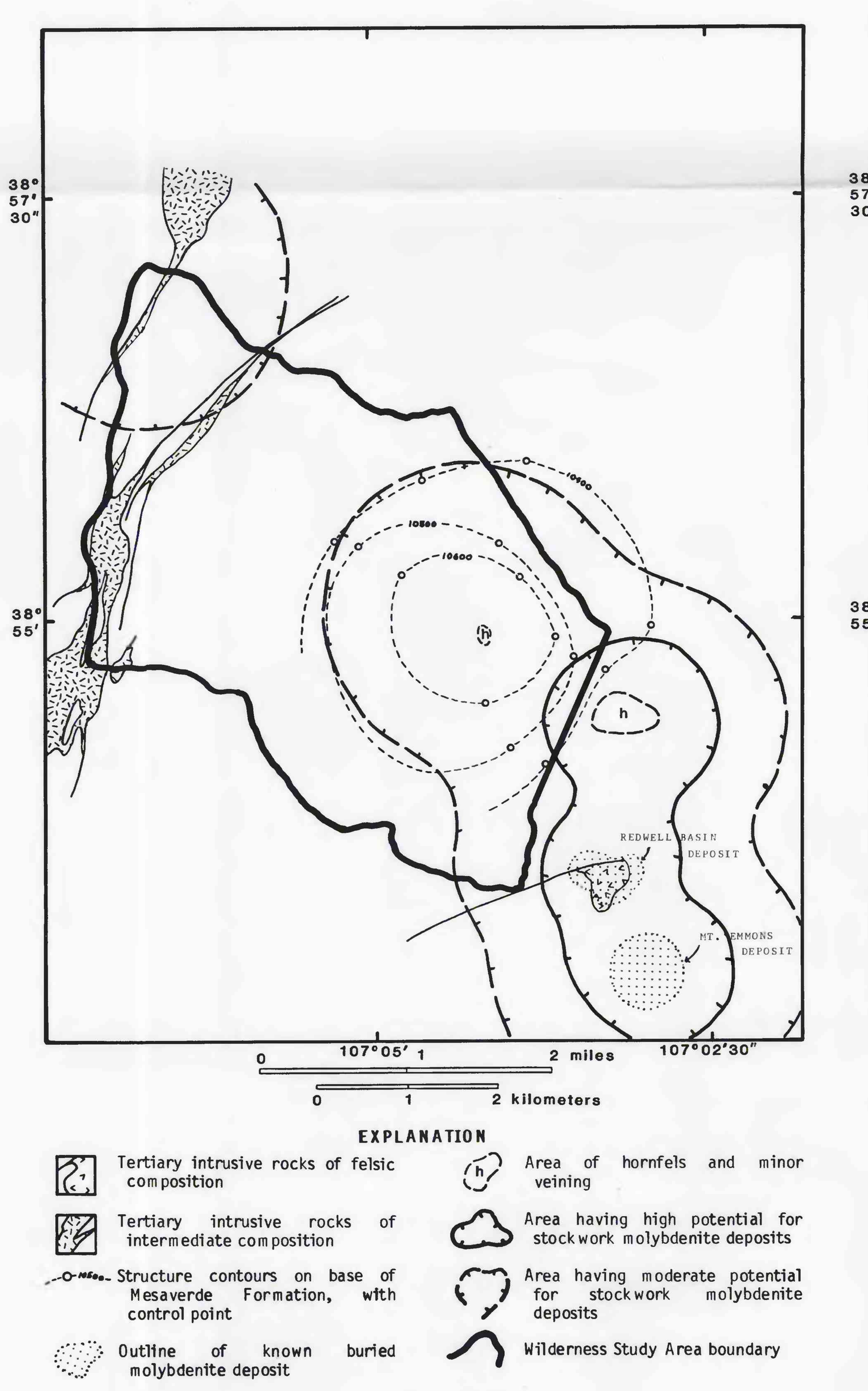


Figure 1.--Stockwork molybdenite potential.

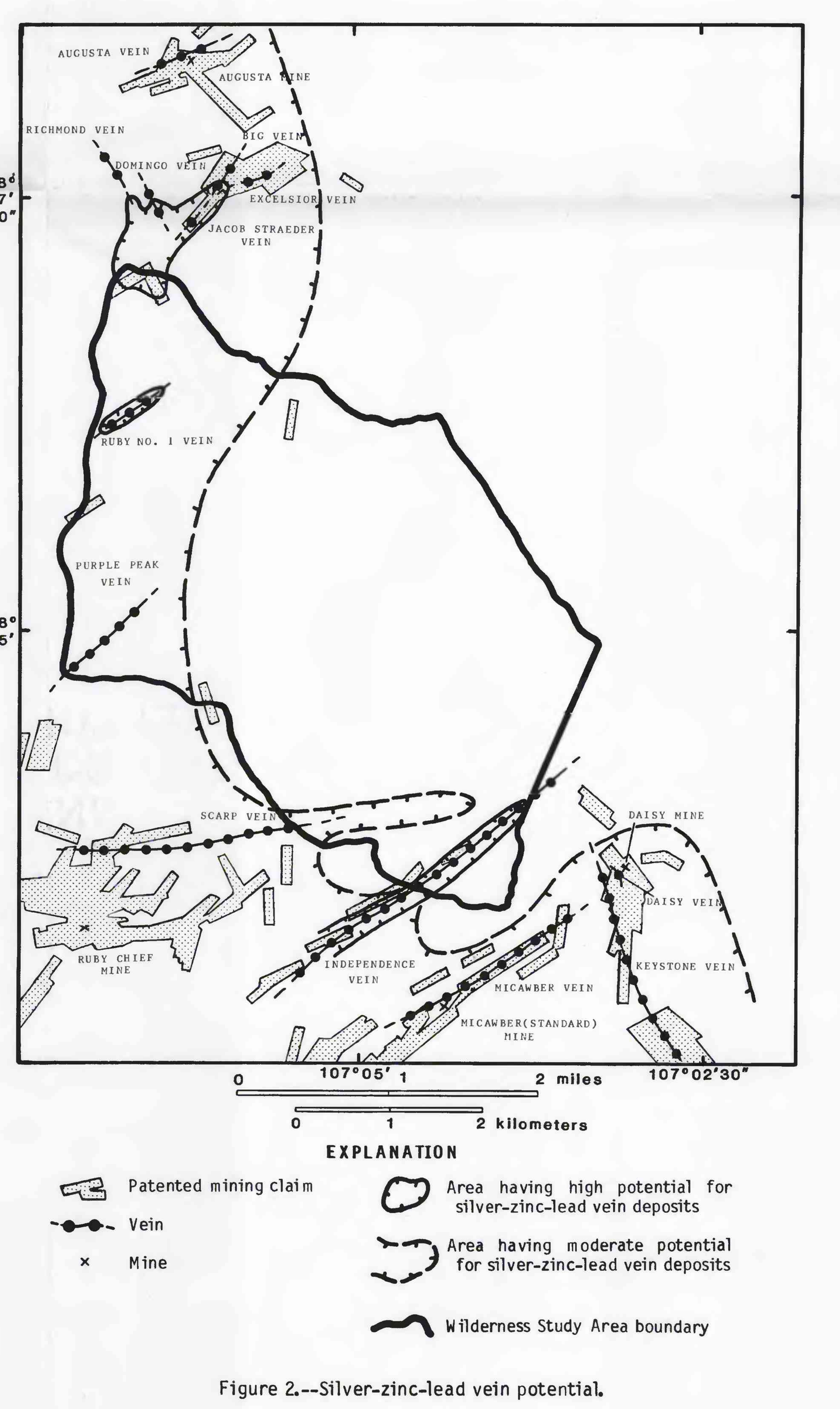


Figure 2.--Silver-zinc-lead vein potential.

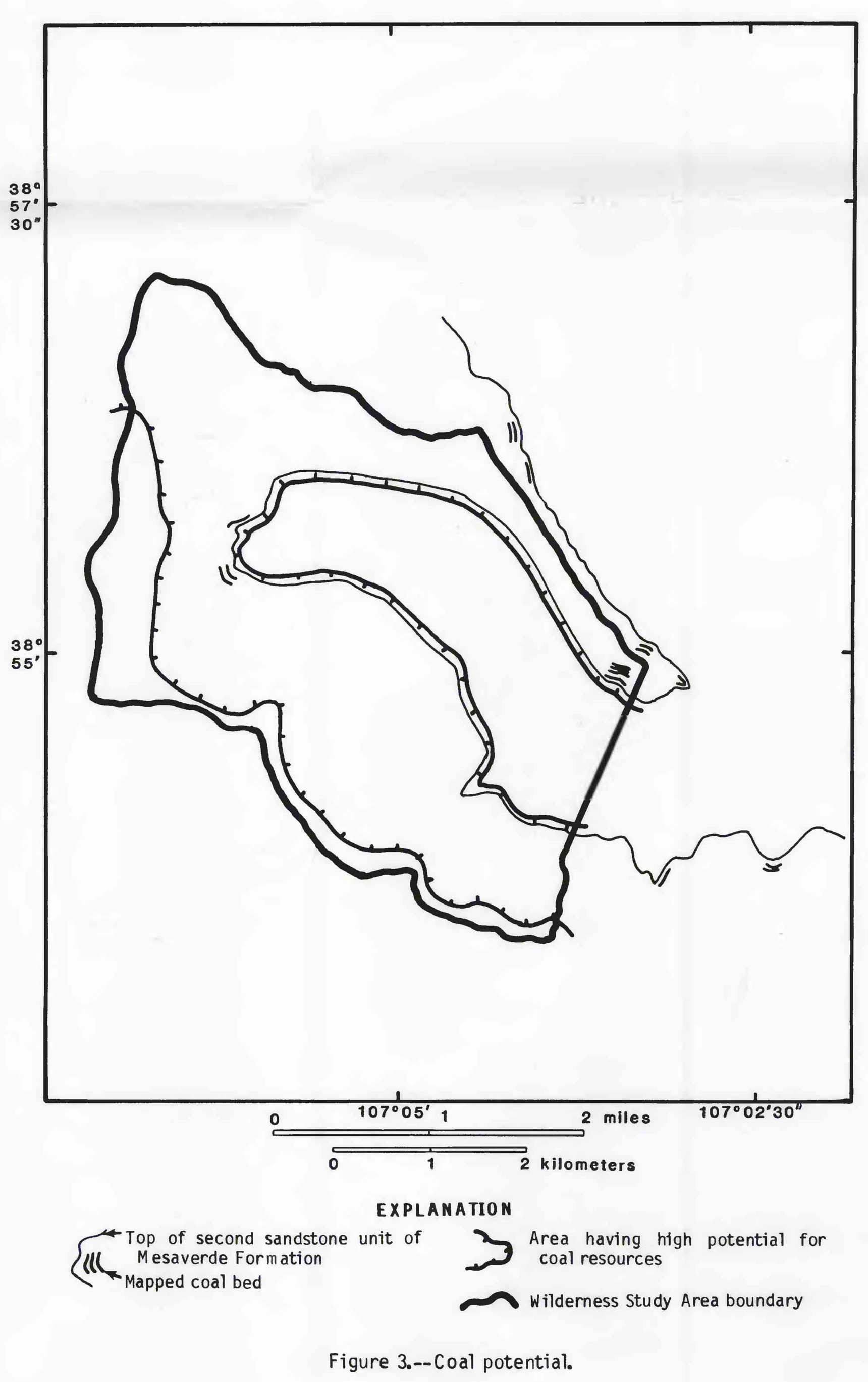


Figure 3.--Coal potential.

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