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MINERAL RESOURCE POTENTIAL OF THE MT. ELLEN-BLUE HILLS WILDERNESS STUDY AREA AND BULL MOUNTAIN STUDY AREA, GARFIELD AND WAYNE COUNTIES, UTAH

By

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STUDIES RELATED TO WILDERNESS
BUREAU OF LAND MANAGEMENT WILDERNESS STUDY AREAS

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine the 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 mineral survey of the Mt. Ellen-Blue Hills (UT-050-238) Wilderness Study Area, Garfield and Wayne Counties, Utah. This report also contains a mineral survey of the Bull Mountain study area, Garfield and Wayne Counties, Utah, which was formerly designated as the Bull Mountain (UT-050-242) Wilderness Study Area.

MINERAL RESOURCE POTENTIAL SUMMARY STATEMENT

Field and laboratory studies of the Mt. Ellen-Blue Hills Wilderness Study Area and the Bull Mountain study area in Garfield and Wayne Counties, Utah were conducted to determine the resource potential of these lands. The studies indicate that the Mt. Ellen-Blue Hills Wilderness Study Area and the Bull Mountain study area have a low potential for coal, uranium, base metals, and oil and gas resources.

INTRODUCTION

From 1980 to 1983, geoscientists of the U.S. Geological Survey and the U.S. Bureau of Mines conducted field and laboratory studies to evaluate the mineral resource potential of the Mt. Ellen-Blue Hills Wilderness Study Area (WSA) and the Bull Mountain study area (collectively referred to as the study area; fig. 1). The Bull Mountain study area is currently not proposed for wilderness designation and was examined solely by the U.S. Geological Survey. The studies consisted of geologic mapping (Patterson and others, 1985), sedimentologic studies (Peterson, 1980; Dubiel, 1983), geochemical sampling, and a search for prospects and mineralized areas. The U.S. Bureau of Mines researched the mines and prospects and investigated past exploration activity (Gese, 1984a; 1984b) in the Mt. Ellen-Blue Hills WSA.

The Mt. Ellen-Blue Hills WSA and adjacent Bull Mountain study area together cover 70,280 acres of the northern Henry Mountains in Garfield and Wayne Counties, Utah. The Mt. Ellen-Blue Hills WSA covers approximately 58,480 acres in the northern Henry Mountains and adjoining plateaus, northwest to the Fremont River. The Bull Mountain study area covers about 11,800 acres and surrounds Bull Mountain. The high, rugged laccolithic mountains, surrounded by pediment gravel surfaces, rise from intricately dissected, sparsely vegetated plateaus. Elevations range from about 4,800 ft along the Fremont River to 11,522 ft on North Summit Ridge of Mt. Ellen. The Mt. Ellen-Blue Hills WSA and the Bull Mountain study area are located about 20 mi southwest of Hanksville, and about 25 mi northwest of Lake Powell (fig. 1). Both areas are readily accessible from Hanksville by the Sawmill Basin road, which defines the boundary between the two areas-- the Mt. Ellen-Blue Hills WSA on the west and the Bull Mountain study area on the east. The east, south, and west boundaries of the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area also are readily accessible by unimproved dirt roads extending westward from paved State Highway 95, which extends south from Hanksville.

ACKNOWLEDGMENTS

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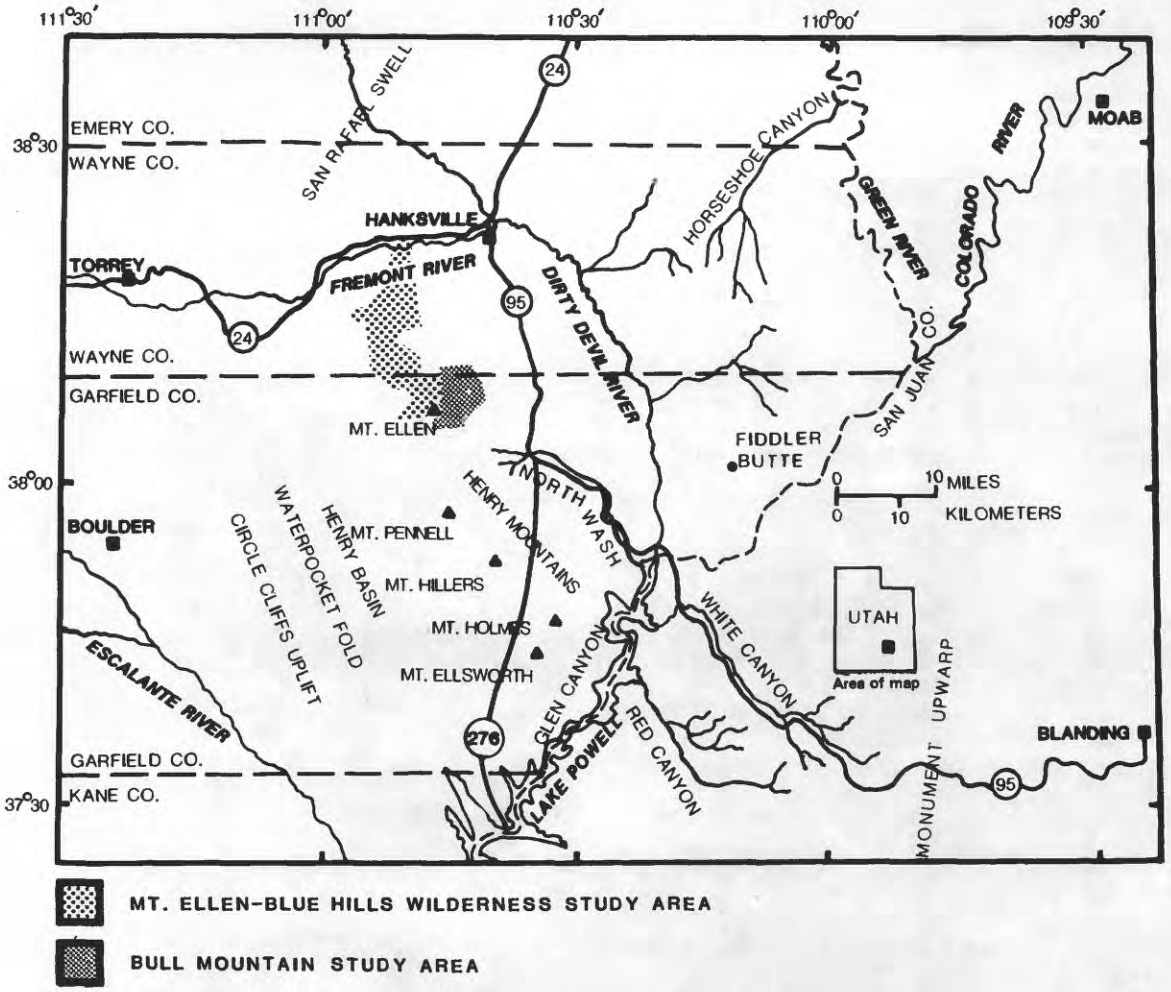

Figure 1.--Map showing location of the Mt. Ellen-Blue Hills Wilderness Study Area and the Bull Mountain study area.

Hammond, Carl Harris, Denise Mruk, Richard Reeves, Mike Rendina, William Thoen, Ann Tirrell, Bruce van Brundt, Shawn Yasataki, and Christine Yee.

GEOLOGY

The Mt. Ellen-Blue Hills WSA and the Bull Mountain study area are located in and adjacent to the northern Henry Mountains, on the northeastern flank of the Henry Basin, a structure about 100 mi long in a north-south dimension and about 50 mi wide. The western side of the asymmetric basin is steep and merges with the adjacent Circle Cliffs uplift to the west. The gently dipping, sedimentary strata on the eastern flank of the basin are interrupted by the intrusive centers of the Henry Mountains and adjoin the western limb of the Monument upwarp, a monoclinal structure. The axis of the Henry basin trends nearly north-south along the west edge of the map area.

The Henry Mountains consist of five distinct intrusive centers (structural domes): Mt. Ellsworth, Mt. Holmes, Mt. Hillers, Mt. Pennell, and Mt. Ellen, extending north-northwest for about 35 mi. The core of each is a separate diorite porphyry stock that is bordered by an irregular zone of shattered sedimentary rock, intricately intruded by the porphyry (fig. 2). The Mt. Ellen intrusive center is surrounded by a cluster of satellitic laccoliths, bysmaliths, and sills; Bull Mountain is one of the largest of these floored intrusive bodies.

Surrounding the intrusive centers are several thousand feet of exposed sedimentary rocks, ranging in age from Late Triassic to Late Cretaceous (fig.2), which are arched into large domes. Mt. Ellen, the largest of the five structural domes composing the Henry Mountains, is 12 - 15 mi in diameter and has a structural relief of nearly 5,000 ft. Superposed on this large dome are smaller anticlinal crenulations that reflect the presence of individual, underlying laccoliths that were intruded radially from the stock into the adjacent sedimentary rocks. The Mt. Ellen stock is located south of the WSA, although the actual summit of Mt. Ellen lies within the WSA.

The age of the igneous intrusions is not known with certainty. The youngest sedimentary rock that is intruded by the stocks is Late Cretaceous in age. Potassium-argon dates of 44 and 48 million years on hornblende from the diorite porphyry of the Bull Mountain bysmalith (Armstrong, 1969) indicate an Eocene age for the intrusion. However, on the basis of their similarity to other intrusive complexes on the Colorado Plateaus, Hunt (1980) believed a mid-Tertiary age for the intrusion of the Henry Mountains laccoliths to be more likely.

GEOCHEMISTRY

A reconnaissance geochemical survey of the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area was conducted during the summers of 1982 and 1983 to contribute to the mineral resource assessment. Geochemical sample media collected comprised stream-sediment samples, heavy-mineral concentrates panned from stream sediments, and rock samples. A total of 126 stream-sediment samples, 124 panned-concentrate samples, and 128 rock samples were analysed using semiquantitative emission spectrography (Grimes and Marranzino, 1968). Mineralogic identifications of the heavy-mineral concentrates also were made. A sample location map and a list of the data are given in Detra and others (1984).

There are several anomalous concentrations of metals in the stream sediments (copper and molybdenum) and panned concentrates (gold, silver, copper, lead, and zinc) from Bromide Basin, which is located just south of the southern boundary of the Mt. Ellen-Blue Hills WSA. Doelling (1972) reported a limited production of 9 tons of copper, 3,000 ounces of silver, and 300 ounces of gold from the Bromide Basin area since 1889. The present geochemical studies do not indicate an extension of the Bromide Basin anomaly north into the Mt. Ellen-Blue Hills WSA. Five to ten miles north of Bromide Basin there are two isolated sample localities with anomalous gold values (HM863 and HM014) that are associated with areas of slightly altered rock. These localities of anomalous samples are widely scattered in the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area, and appear to represent small, localized mineral occurrences rather than an area of mineral resource potential.

MINING DISTRICTS AND MINERALIZED AREAS

Although there are no mining districts within or near the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area, coal, uranium, vanadium, gold, silver, and copper occurrences have been found within or near the study area.

Except for the area near and including Mt. Ellen, the entire Mt. Ellen-Blue Hills WSA and Bull Mountain study area lie within the Henry Mountains coal field (Gese, 1984b). The Emery and Ferron Sandstone Members of the Cretaceous Mancos Shale are important coal-bearing strata that occur within the coal field. These beds are best developed west and south of the study area along the axis of the Henry basin.

For the most part, the coal-bearing Emery Sandstone Member has been eroded from within the study area. The coal-bearing Ferron Sandstone Member, however, intermittently crops out on the northeast edge of the study area (Gese, 1984a). Sections of coal within the Ferron Sandstone Member, measured by Doelling (1972) at 14 locations within the study area, show thin, discontinuous coal seams that range in thicknesses from 0 to 5 ft (Gese, 1984a).

Jet, a gemstone variety of lignite coal, occurs near the top of the Cretaceous Dakota Sandstone approximately 1/2 mi north of the study area in the SE1/4 sec. 22, T. 30 S., R. 10 E. (Gese, 1984b). Jet was produced from this area from 1919 to 1925, however, no jet is known to occur within the study area.

Uranium exploration in the Henry basin has been limited to the uranium- and vanadium-bearing Salt Wash Member of the Jurassic Morrison Formation. Most of the known uranium and vanadium occurrences are east and south of the study area in a north-trending zone known as the Henry Mountains mineral belt. A few scattered uranium and vanadium occurrences are located west of the Henry Mountains in Wayne County.

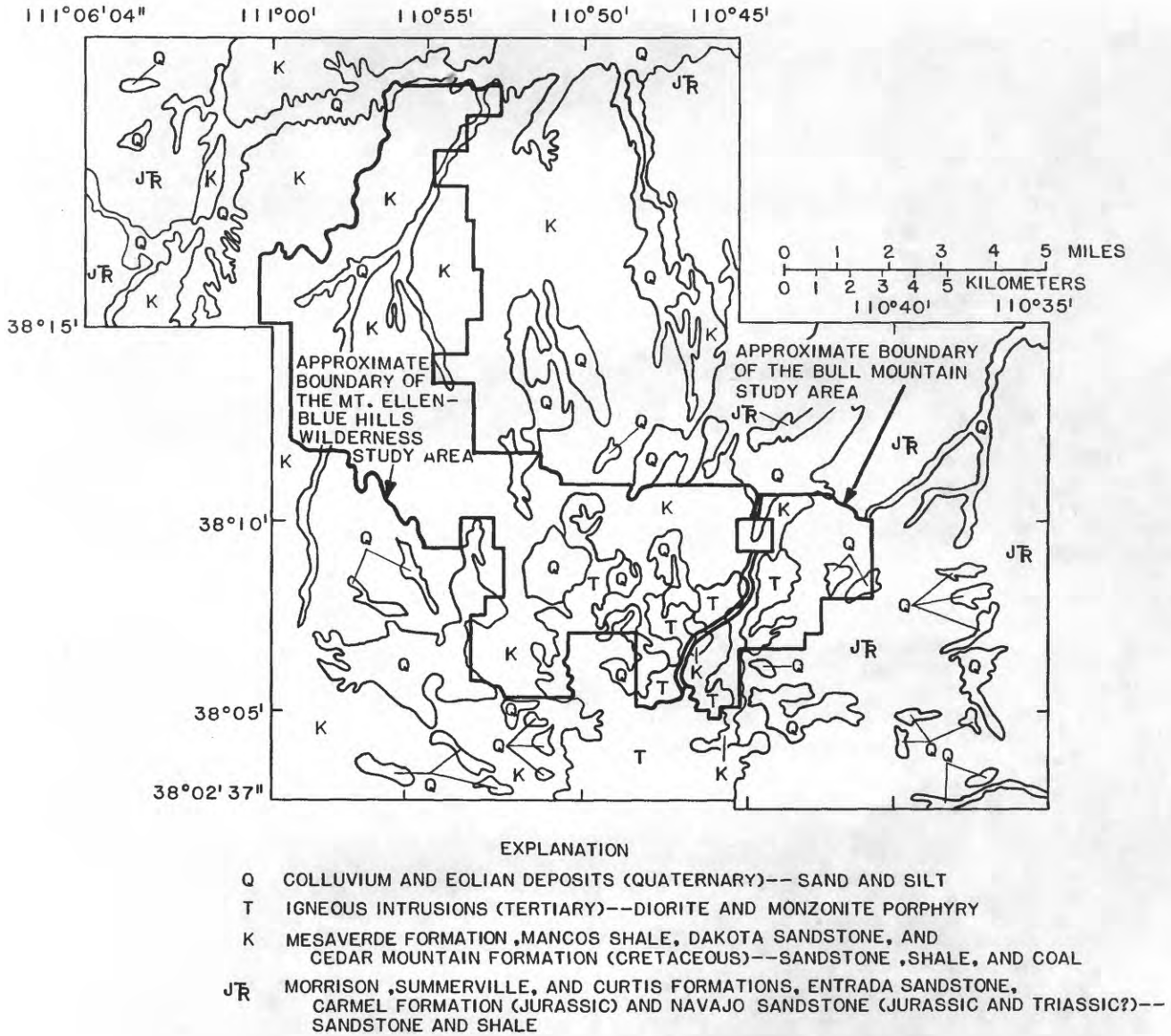

Figure 2.--Generalized geologic map of the Mt. Ellen-Blue Hills Wilderness Study Area and the Bull Mountain study area and vicinity.

Placer gold occurs along both sides of Crescent Creek, which is located on the east side of Mt. Ellen (Gese, 1984a). These placer gold deposits were discovered around 1900 and produced 300-350 ounces of gold from 1914 to the 1940's (Gese, 1984a). At the time of this study, several placer gold operations were active on Crescent Creek in the southeast part of the Mt. Ellen-Blue Hills WSA.

Gold, silver, and copper have been produced from fissure veins in the diorite porphyry stock of Mt. Ellen, located 1 mi south of the study area in Bromide Basin (Gese, 1984a). Approximately 700 ounces of gold, 3,000 ounces of silver, and 9 tons of copper have been produced from the Bromide Basin area since 1889 (Doelling, 1972; Gese, 1984a). Although the gold-bearing structures strike toward the study area, no mineralized fissure veins similar to those in Bromide Basin have been found within the study area.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Evaluation of the mineral resource potential of the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area is based on: (1) investigations of mines and prospects; (2) geochemical investigations; and (3) geologic investigations. One level of potential for the occurrence of mineral resources (low) was defined on the basis of the following criteria. Low mineral resource potential is assigned to areas where geologic and geochemical characteristics define a geologic environment in which the existence of resources is unlikely. The studies indicate that the Mt. Ellen-Blue Hills Wilderness Study Area and the Bull Mountain study area have a low potential for coal, uranium, base metals, and oil and gas resources (fig. 3).

Within the study area, the coal-bearing Ferron Sandstone Member of the Mancos Shale is intermittently exposed along the eastern edge of the Blue Hills and in the area surrounding Table Mountain. However, the discontinuous and thin nature of the coal beds (Doelling, 1972) indicates that the area has a low potential for coal resources.

The known uranium and vanadium occurrences in the area are restricted to fluvial sandstone beds of the Salt Wash Member of the Morrison Formation. Detailed sedimentologic and geochemical studies of the Salt Wash Member in the Henry Basin by Peterson (1980) and Lupe and others (1982) show that uranium mineralization in these sandstone beds occurs where the sandstone beds are overlain or underlain by carbonaceous lacustrine mudstone strata. These studies indicate that the carbonaceous lacustrine mudstones are not present in the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area, and there are no known significant uranium anomalies in the study area. The Upper Triassic Chinle Formation, which lies at depth within the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area, is known to contain uranium deposits in the White Canyon area located southeast of the study area. The uranium deposits of the Chinle Formation are restricted to fluvial sandstone beds of the Shinarump and Monitor Butte Members. Sedimentologic analysis of these fluvial systems (Dubiel, 1983) indicates that they do not underlie the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area (fig. 4). Therefore, the potential for uranium and vanadium resources in the study area is low.

Analyses of stream sediments, panned concentrates from stream sediments, and whole-rock samples were conducted to assess the potential for metallic resources other than uranium and vanadium in the study area. The sparse areas of metallic mineralization in the Henry Mountains are believed to be related to hydrothermal processes associated with the emplacement of the intrusive stocks, around which the laccoliths are clustered. Occurrences of base and precious metals are almost entirely restricted to the stocks and the complexly intruded contact or shattered zones that border them. The stock associated with the Mt. Ellen intrusive center lies one to two miles south of the study area. As noted by Hunt and others (1953, p. 165), the intrusions were nearly devoid of volatiles, temperatures at the time of emplacement were low, and, as a result, contact metamorphism and rock alteration were slight. In addition, there were neither large nor numerous channelways available for mineralizing solutions. The small production of base and precious metals from Bromide Basin came chiefly from local, narrow, northerly trending fissure veins in the Mt. Ellen stock. Locally narrow, iron-stained fissures that in places contain minor copper carbonates have been prospected in the shatter zone around the Mt. Ellen stock, but no production has resulted from these prospects. The shatter zone does not extend into the study area. Within the study area, small areas occur in which intrusive rocks of the laccoliths are stained with iron oxides, probably from the oxidation of pyrite. Geologic and geochemical evidence suggests that the Mt. Ellen-Blue Hills WSA and the Bull Mountain study area have a low potential for base- and precious-metal resources.

The Mt. Ellen-Blue Hills WSA and the Bull Mountain study area have been assessed as having a low potential for oil and gas by Molenaar and others (1983) and Molenaar and Sandberg (1983). Oil and gas leases and lease applications cover most of the study area, but all test holes drilled for oil and gas in the vicinity of the study area have been dry (Gese, 1984a).

Materials that could be used for construction purposes are present in the study area and have economic potential. Sand and gravel are present along major stream courses as terrace and pediment deposits, and most of the formations could be sources of building stone. Gypsum occurrs in beds as much as 40 ft thick at the base of the Salt Wash Member of the Morrison Formation near Bull Mountain. However, larger and more accessible deposits of sand, gravel, and gypsum are available outside the study area and are much closer to potential markets.

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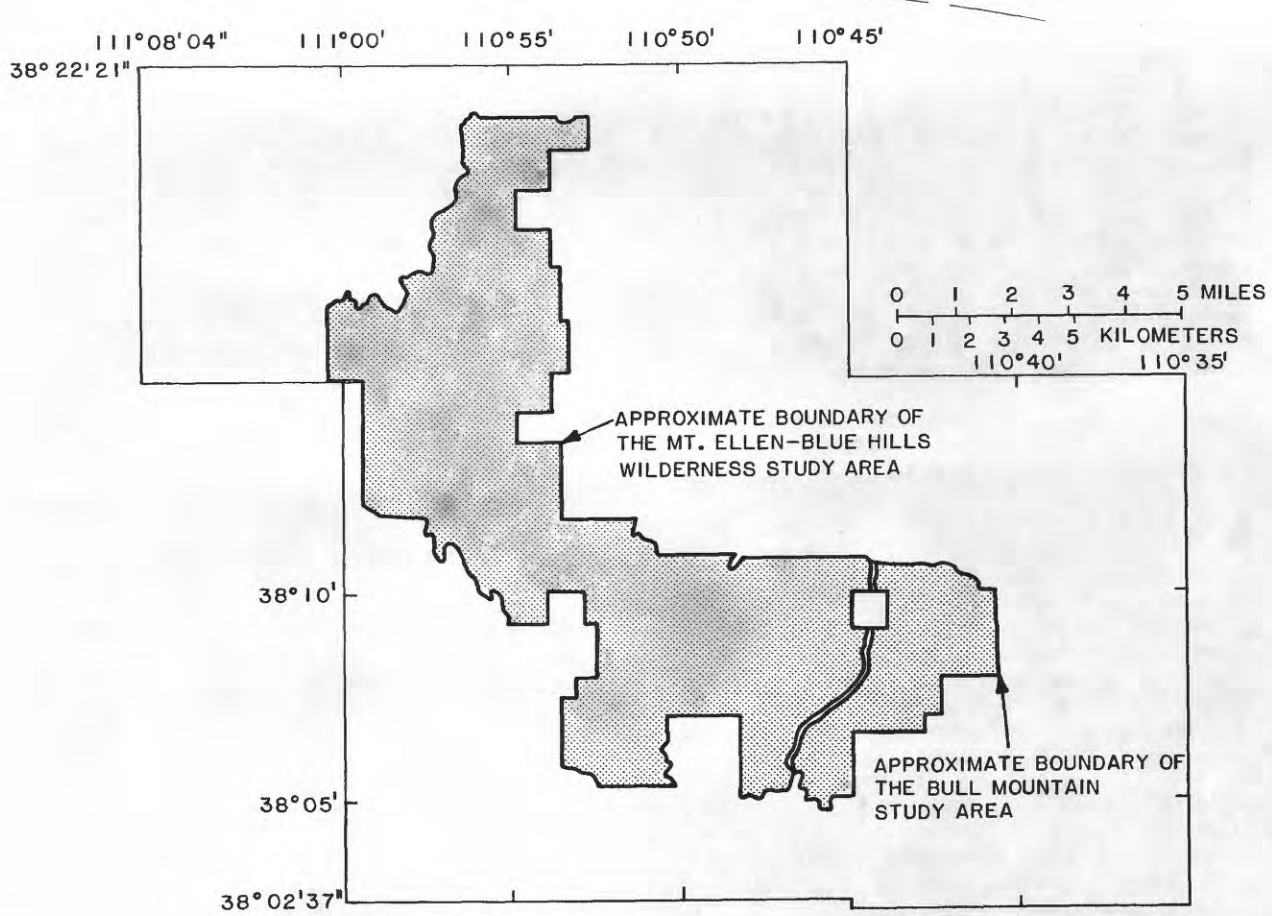

Figure 3.--Map showing areas of low potential (shaded) for coal, uranium and vanadium, base- and precious-metal, and oil and gas resources in the Mt. Ellen-Blue Hills Wilderness Study Area and the Bull Mountain study area.

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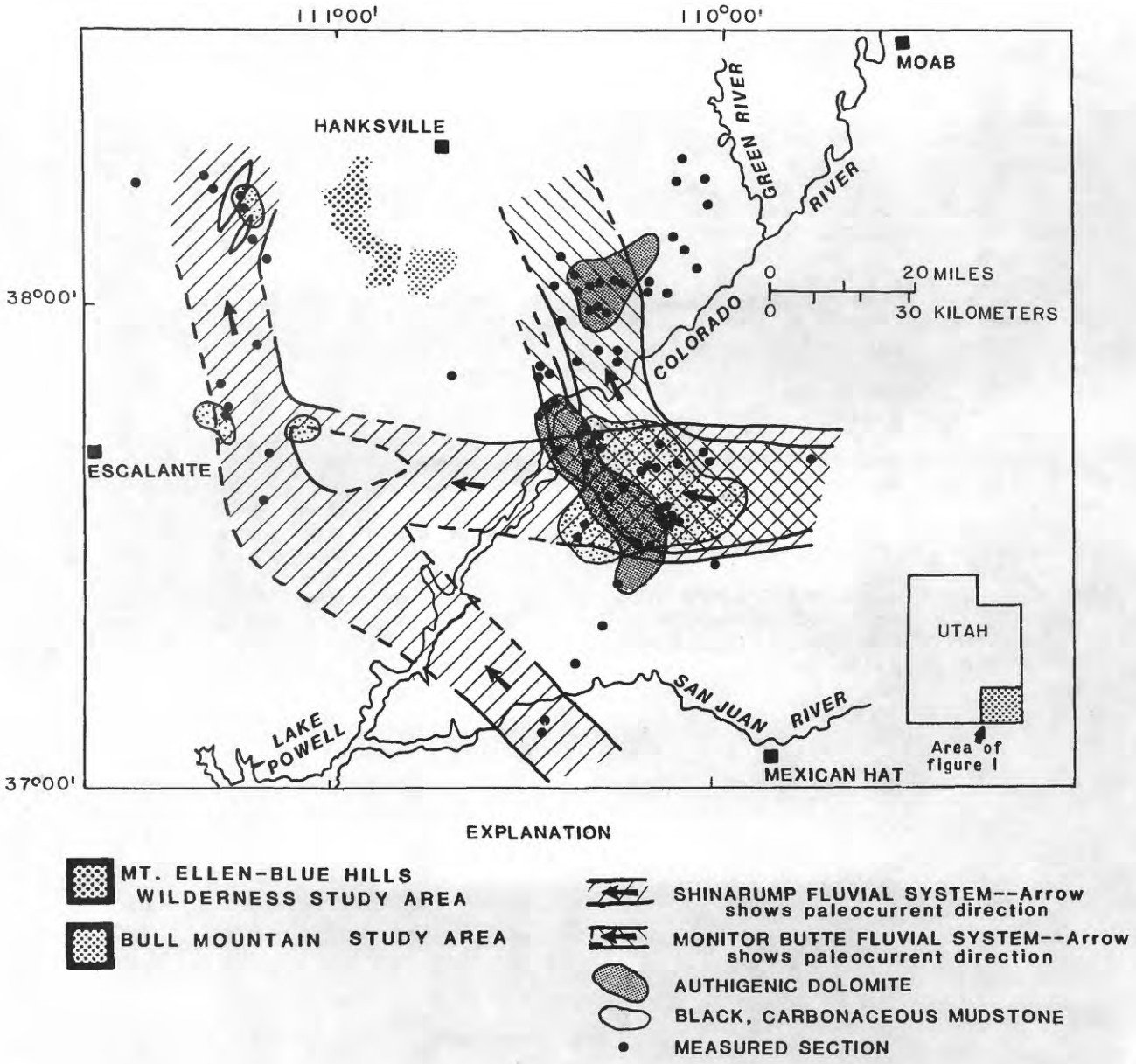

Figure 4.--Map showing distribution of Shinarump and Monitor Butte fluvial systems, authigenic dolomite, and black, carbonaceous mudstone used to evaluate uranium potential in the Mt. Ellen-Blue Hills Wilderness Study Area, and the Bull Mountain study area.