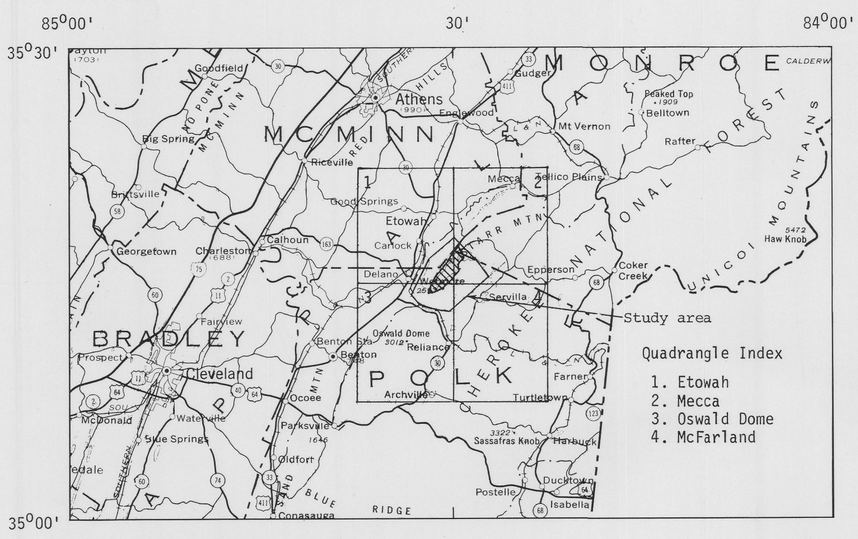


Base from U.S. Geological Survey
Tennessee State map, 1977

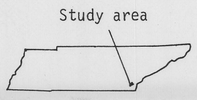


Figure 1.--Index map showing location of Gee Creek Wilderness (striped) and surrounding study area.

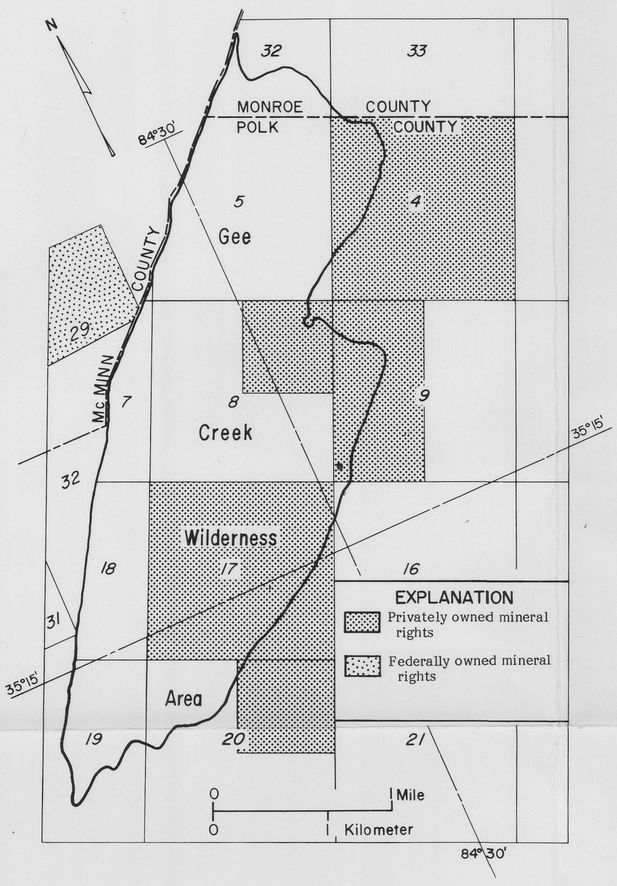
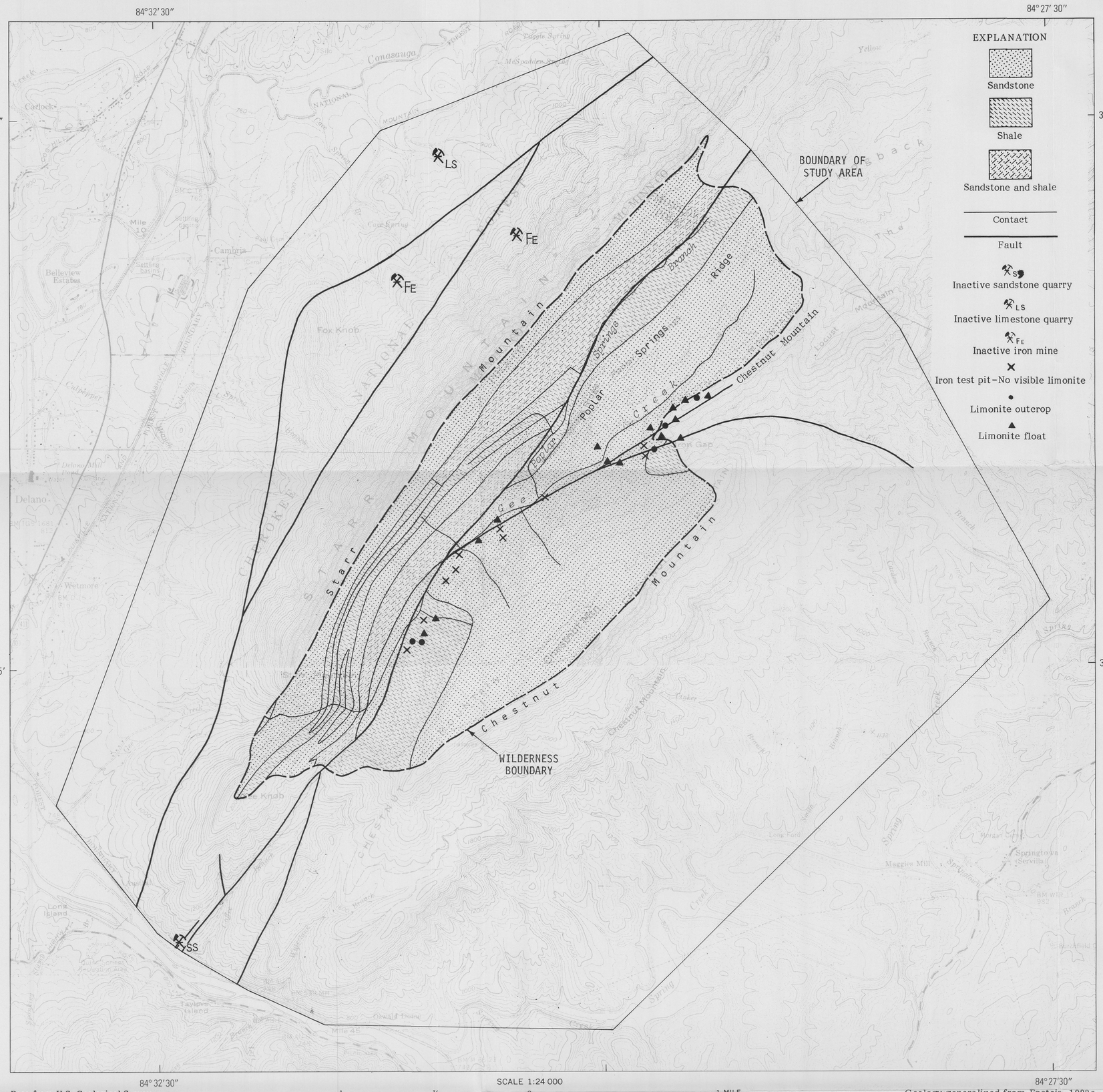


Figure 2.--Mineral rights in the Gee Creek Wilderness and vicinity. Surface rights owned by the U.S. Government. The part of lot 29 with stippling is not in USFS land.



Base from U.S. Geological Survey
Etowah, Oswald Dome, 1967; Mecca, McFarland, 1957

SCALE 1:24 000
1 ½ 0 1 MILE
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 10 FEET

Geology generalized from Epstein, 1983a

Figure 3.--Location of inactive iron mines and prospects, inactive sandstone and limestone quarries, and the distribution of sandstone and shale, as well as faults, in the Gee Creek Wilderness and surrounding area.

MINERAL RESOURCE POTENTIAL MAP OF THE GEE CREEK WILDERNESS, POLK AND MONROE COUNTIES, TENNESSEE

By

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1983

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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 mineral resource survey of the Gee Creek Wilderness, Cherokee National Forest, Polk and Monroe Counties, Tenn., which was established as a wilderness by Public Law 93-622, January 3, 1975.

SUMMARY

The major rock types in the Gee Creek Wilderness and vicinity consist of sandstone, shale, and conglomerate of the Chilhowee Group of Cambrian and Cambrian(?) age. Faulting appears to have controlled the location of minor subeconomic iron deposits (fig. 3), but no potential mineral resources were detected by the present survey. Shales, useful for brick or lightweight aggregate, and sandstone, useful for crushed stone or sand, have little economic interest because these rock types are common throughout the region and are found elsewhere closer to potential markets. The possibility of natural gas occurring in untested rocks structurally beneath the Chilhowee strata cannot be discounted.

INTRODUCTION

The Gee Creek Wilderness is in the Cherokee National Forest, Polk and Monroe Counties, southeastern Tennessee (fig. 1). The wilderness lies about 4 mi (6 km) southeast of Etowah, and about 20 mi (32 km) northeast of Cleveland, Tenn. Gee Creek, which drains the wilderness, parallels Starr and Chestnut Mountains, and cuts through the deep gap at the southwest end of Starr Mountain where it flows to the Hiwassee River.

This report summarizes the results of an investigation of the mineral resource potential of the Gee Creek Wilderness. In addition, details of the geology are discussed by Epstein (1983a), geochemical data are presented by Epstein (1983b), and information on iron mines and prospects and evaluation of nonmetallic deposits are given by Gazdik and Behum (1983).

LAND AND MINERAL OWNERSHIP

In 1916, the U.S. Government purchased a large block of land from the Ocoee Timber Company for inclusion in the Cherokee National Forest. Mineral ownership and the right to mine these minerals were retained in perpetuity by the company on 1,920 acres (77 hectares) of the 1916-purchase land. Nearly half the encumbered land is included in the Gee Creek Wilderness (fig. 2). There are no other outstanding surface or mineral rights within the wilderness boundary.

GEOLOGY

The Gee Creek Wilderness lies at the westernmost limit of the Blue Ridge physiographic province. About 2,000 feet (600 m) of sandstone, siltstone, and shale of Cambrian, Cambrian(?), and Ordovician age are exposed in the wilderness (Epstein, 1983a). These comprise four formations of the Chilhowee Group, which are, from youngest to oldest, Hesse Sandstone and Murray Shale (Cambrian) and Nebo Sandstone and Nichols Shale (Cambrian?). In the immediate surrounding area a greater thickness of rock, including additional conglomerate and limestone, is exposed. These make up the underlying Cochran Conglomerate (Cambrian?) of the Chilhowee Group, the Sandsuck Shale of Proterozoic Z age, the overlying Knox Dolomite of Cambrian and Ordovician age, and the Conasauga Shale of Cambrian age. Quaternary alluvium is found along many of the streams and Quaternary landslide deposits are found along several of the steeper slopes.

The wilderness is in an open syncline that has been broken by the Gee Creek fault, a low-angle thrust with a displacement of at least 2,000 ft (610 m). Subsidiary folds and faults are common. These rocks of the Blue Ridge province are thrust for many miles along the Great Smoky fault over the folded and faulted rocks of the Valley and Ridge province. Further stratigraphic and structural information on the geology of the Gee Creek Wilderness and vicinity is given in Epstein (1983a).

GEOCHEMICAL SURVEY

The reconnaissance geochemical survey of the Gee Creek Wilderness included the collection of 26 rock, 26 soil, and 61 bulk stream-sediment samples (Epstein, 1983b). These were analyzed for 34 elements, among which are the more common metals that potentially could occur in economic concentrations.

The analytical results indicate that no well-defined anomalous areas are apparent in the Gee Creek Wilderness. The quantities of all elements in the analyses, including those for copper, lead, and zinc, for example, have a normal distribution (Epstein, 1983b, fig. 3), and do not exceed amounts present in average sedimentary rocks (Turekian and Wedepohl, 1961; Pettijohn, 1963). Many of the elements have slightly higher concentrations in the southwest part of the wilderness (Epstein, 1983b, figs. 4, 5, and 6). These higher concentrations apparently are related to proximity to several faults (see fig. 3), a factor which also controls the location of small iron deposits (Gazdik and Behum, 1983).

MINERAL RESOURCES

There are no known mineral resources of high economic potential in the Gee Creek Wilderness. Iron ore was formerly prospected along Gee Creek, but has little current economic interest. Shale, which shows suitability for brick or lightweight aggregate, and sandstone, which could be utilized for crushed stone or sand, are also found closer to potential markets, so they too have little economic interest. Limestone was formerly quarried one mile (1.6 km) northwest of the wilderness. The possibility of natural gas from carbonate rocks of the Valley and Ridge province below the Great Smoky fault underlying the wilderness cannot be discounted. Figure 3 shows the location of these subeconomic resources.

Iron

Deposits of iron oxides have been mined west of the wilderness boundary (fig. 3), and two prospects, the Gee Creek and Wetmore prospects, have been described within the wilderness. Other prospects and limonite occurrences are also common (Gazdik and Behum, 1983). The limonite occurs as hard, lumpy, vesicular boulderlike masses with an irregular red, yellow, and black mottling on fresh surfaces. It is surrounded by red and yellow clayey soil. Voids are filled with a loose yellow sandy material, or less commonly, manganese oxide. Primary detrimental factors cited were small size, inaccessibility, and high phosphorous content. Field studies conducted for the present investigation (Gazdik and Behum, 1983) corroborated these earlier findings. Analyses of random chip samples from the Gee Creek prospect, for example, indicate that the limonite, although high in iron, has a phosphorous content too high to be acceptable in the present iron market. The abundance of limonite float suggests that iron concentrations may be common along the Gee Creek and Iron Gap faults. The thickness and areal extent has not been determined for any of these deposits. If they are of greater size or extent than now presumed, they may have some value as a resource for the future.

Sandstone

Sandstones from the Hesse and Nebo Sandstones are well exposed and hold up prominant ridges in the wilderness and vicinity (fig. 3). Neutron activation analyses (Gazdik and Behum, 1983, table 2) and microscopic examinations (Epstein, 1983b, fig. 5) indicate that, except for a few scattered beds, the silica content is too low and impurities of iron, feldspar, and mica are too high to be acceptable for glass making. In addition, sandstones in the wilderness are generally too well cemented to crush to the uniformity of grain size required for glass sand. Only one sample (GC-6, table 2, Gazdik and Behum, 1983) represents an outcrop of equigranular friable sandstone that, with beneficiation, might meet glass sand requirements. Quartzite was quarried many years ago from a locality along the Hiwassee River southeast of the wilderness by the Tennessee Copper Company as fluxstone for use in their Ducktown smelters (Carter, 1968). This quarry is now abandoned. Much of the sandstone in the Gee Creek Wilderness could be crushed to produce sand, and the harder, better-cemented sandstones could be processed for road metal. However, these rock types are common near potential markets and there is no foreseeable reason to use those within the wilderness boundary.

Shale

Shales are common in the Gee Creek Wilderness (fig. 3) in the Nichols and Murray Shales. The ceramic properties and bloating characteristics were tested for two samples (GC-9 and GC-21, table 3, Gazdik and Behum, 1983). Both proved suitable for structural clay products. Sample GC-21 could be used for building or floor brick and fires satisfactorily for these at 1100°-1200°C.; sample GC-9 is suitable for building brick at kiln temperatures of 1000°-1100°C. The latter sample bloated with good pore structure at 1200°-1250°C., and would be useful in lightweight aggregate. The shales in the wilderness have little development potential, however, because the same shale formations, presumably with similar ceramic characteristics, are found extensively outside the wilderness in areas closer to major markets.

Oil and Gas

The rocks of the Chilhowee Group exposed in the Gee Creek Wilderness appear to have reached too high a level of thermal maturity to be candidates for oil and gas potential. However, these rocks have been thrust along the Great Smoky fault over carbonate rocks of Cambrian and Ordovician age which have maturity values with potential for gas production (see Harris and others, 1978). Gas has been produced from Ordovician carbonate rocks to the west in Tennessee (for example, Van Den Berg and others, 1978). Thus, while the limestones and dolomites underlying the Great Smoky fault beneath the Gee Creek Wilderness offer little potential for oil, it is possible that natural gas might be found in the carbonate rocks below the rocks explored at the surface. Geophysical exploration would be necessary to determine the local structures at depth to properly evalute the potential for gas.

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