UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Mineral Resource Potential of the Flint Mill Roadless Area, Carter and Johnson Counties, Tennessee

By

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1974) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Flint Mill Roadless Area, Cherokee National Forest, Carter and Johnson Counties, Tenn. The area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

MINERAL RESOURCE POTENTIAL
SUMMARY STATEMENT

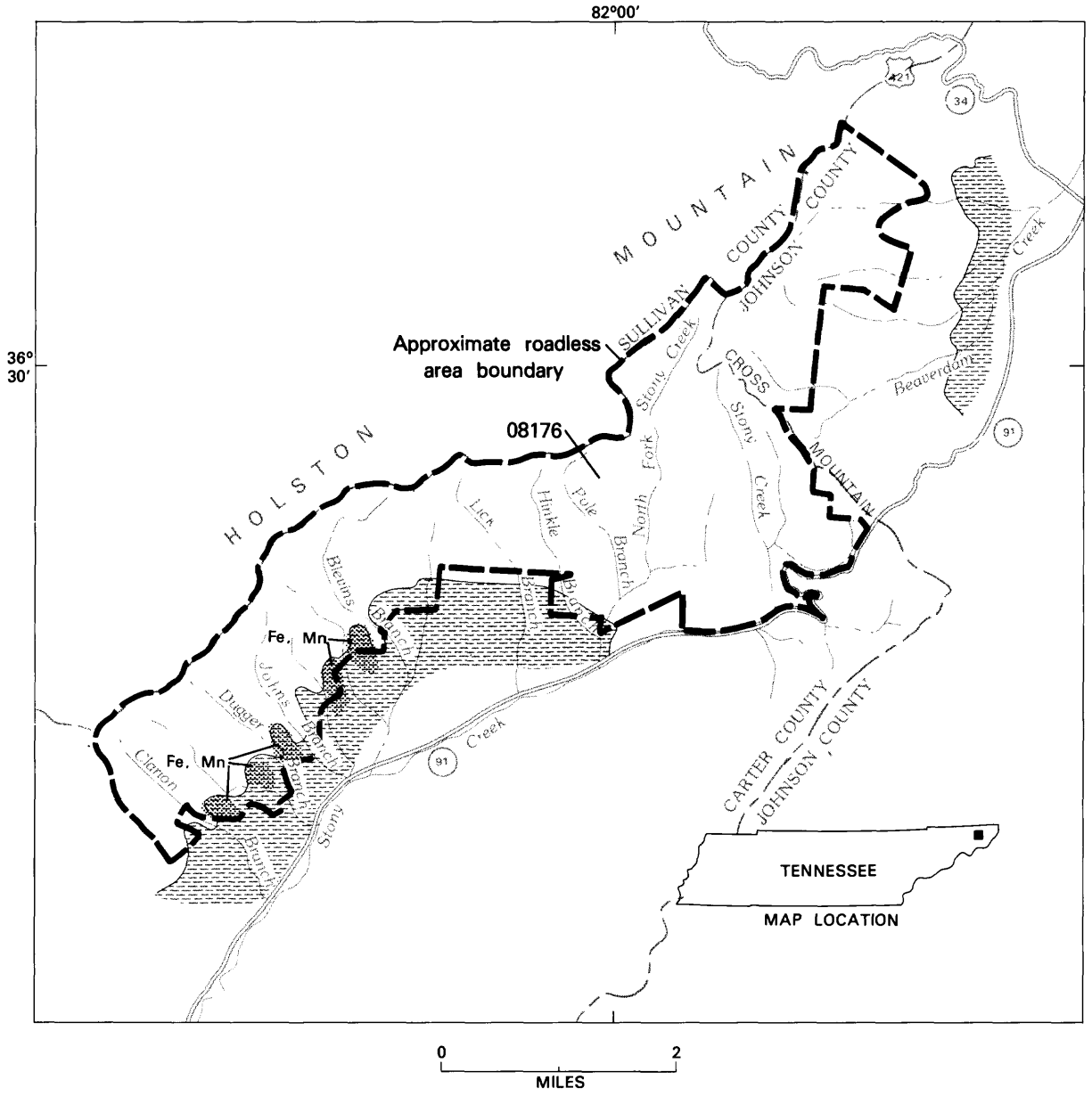
The Flint Mill Roadless Area is in the Cherokee National Forest, Carter and Johnson Counties, Tenn. Folded sedimentary rocks, predominantly sandstone, shales, and carbonate rocks of early Paleozoic age underlie the study area; clays have weathered from the carbonate rocks.

Mines and prospects for manganese and iron are found inside the roadless area within the northern portion of the Stony Creek mining district, which has been inactive since 1962. The low grade and discontinuity of these deposits render them noncompetitive with more extensive and higher grade sources available elsewhere. Similar deposits in the Shady Valley mining district northeast of the Stony Creek district are not within the roadless area. All surface rights and 55 percent of the mineral rights are Federally owned; the remaining 45 percent are privately owned.

Geochemical surveys showed notable values of cobalt, lead, zinc, copper, and tin, but it is highly unlikely that significant deposits of these metals are present in the roadless area. Bauxite, phosphate rock, pyrite, and barite have been noted in the vicinity, but were not observed in the roadless area. Carbonate rock may be present at depth, but the thick overburden reduces the possibility for profitable mining. Clay and shale are suitable for use as structural clay products, however, abundant sources are available elsewhere outside of the roadless area. A low potential for oil and gas exists, but more information is necessary for an accurate evaluation.

INTRODUCTION

Flint Mill Roadless Area comprises 7,166 acres (2,900 ha) in Cherokee National Forest in northeastern Tennessee. The roadless area is in Carter and Johnson Counties, about 8 mi (12.9 km) northeast of Elizabethton, Tenn. (fig. 1). State Highway 91 parallels the southern boundary of the roadless area and determines part of the southeastern boundary. Forest Service routes 56 and



EXPLANATION

Geologic terrane with low potential for iron or manganese

Fe Iron

Mn Manganese

Shady Dolomite (Cambrian)

Contact

Figure 1.--Index map and areas of mineral resource potential, Flint Mill Roadless Area, Carter and Johnson Counties, Tenn.

202 allow access to the western portion of the roadless area. Unimproved secondary roads and foot trails provide additional access.

The roadless area occupies the southern slope of Holston Mountain. Topography is rugged with high ridges and fairly steep slopes. Elevations range from 4,140 ft (1,262 m) at Holston High Knob, at the western edge of the roadless area, to 2,180 ft (665 m) in creeks near the southern corner of the area. Cross Mountain, a ridge that extends southeast from Holston Mountain, separates two drainage basins east of the roadless area. Stony Creek, flowing southwest, drains the southwestern three-fourths of the area whereas Beaverdam Creek, flowing northeast, drains the northeastern one-fourth. These streams and their tributaries have dissected an ancient land surface--the Harrisburg or Valley Floor Peneplain--leaving remnants of it on the divides between tributary valleys and around the heads of the main streams.

Previous studies

Early reports on mineral occurrences and resources found in northeastern Tennessee include Killebrew (1881), Willis (1886), Safford and Killebrew (1900), Garrison (1904), Jarvis (1912), and Purdue (1916). More recent maps outlining mineral resources were prepared by Hardeman and Miller (1959) and Miller and others (1970).

A comprehensive report on geology and mineral deposits pertaining to the roadless area was published by King and Ferguson (1960). General geologic information in and near Flint Mill Roadless Area has been supplied by Keith (1907), Rodgers (1953), and Hardeman (1966).

Detailed reports about iron and manganese mining and related geology in and near the roadless area are King and others (1944, 1960), Robertson and Dempsey (1949), and Maher (1964). These reports contain references to many older reports.

Present study

A geochemical survey based on stream sediments was made in 1980 by K. A. Duttweiler, J. W. Whitlow, and W. R. Griffitts of the U.S. Geological Survey; samples were analyzed for 31 elements by emission spectrography by E. F. Cooley and D. F. Siems, also of the U.S. Geological Survey (Duttweiler and others, 1983).

The known mineral deposits in and near the roadless area were studied in 1981 by J. G. Jones, M. L. Chatman, and M. L. Dunn, Jr., of the U.S. Bureau of Mines (Jones, 1982). Abandoned iron and manganese mines and prospects were examined and sampled. The samples were analyzed spectrographically for 42 elements by TSL Laboratories, Ltd., Spokane, Wash. Clay and silty shale samples were submitted to the U.S. Bureau of Mines Tuscaloosa Research Center, Tuscaloosa, Ala., for preliminary evaluation of ceramic properties and bloating characteristics.

Surface and mineral ownership

The Federal Government owns all surface rights and about 55 percent of the mineral rights in Flint Mill Roadless Area; mineral rights for 45 percent

of the roadless area are privately owned. Applications for oil and gas leases cover about 4,400 acres (1,780 ha) in the roadless area. As of May 1983, no leases have been issued; one application covering 700 acres (283 ha) has been rejected.

GEOLOGY

The Flint Mill Roadless Area is near the eastern edge of the folded Appalachian Mountains and is thus underlain by folded and faulted sedimentary rocks of Paleozoic age. The sedimentary rocks include the thick Chilhowee Group of clastic rocks of Early Cambrian age, overlain by the carbonate and shaly rocks of the Shady Dolomite of Cambrian age (fig. 1, table 1). The northeasterly trending synclinal structure of the roadless area is cut by the easterly trending Cross Mountain fault.

The Shady Dolomite has been thoroughly weathered along the southeastern flank of Holston Mountain. In many places the carbonate minerals have been removed entirely to leave a mass of light-brown or tan sticky clay, locally sandy. Manganese and iron ores occur as concretionary lumps in the clay. These remanents are on divides or terraces at the heads of Stony and Beaverdam Creeks. Many of the bodies of residuum with high manganese and iron content have already been mined.

The report by King and Ferguson (1960) has supplied much of the information about the geology of the area; that report should be consulted for further details.

MINING DISTRICTS AND MINERALIZED AREAS

Iron mining in the region began prior to 1800 (Penrose, 1891) and continued sporadically until 1910. Peak production took place in the late 1800's and early 1900's. Genetically related manganese was produced in the late 1800's; production accelerated during war time efforts in the 1900's and continued into the 1950's under government price supports; no production was reported after 1962 (Floyd, 1965).

Iron and manganese oxides were mined along the southern boundary of the Flint Mill Roadless Area (fig. 2) by open-cut methods. Most sites were originally investigated for iron and later for manganese (King and others, 1944). The mineralized area on the southeastern side of Holston Mountain, part of the Stony Creek mining district, contains oxide concentrations in thick residual clays that developed on the Shady Dolomite (Jones, in press).

Small low-grade manganese and iron deposits represent the most significant mineral resource in the Flint Mill Roadless Area and the potential for undiscovered resources of these commodities in the roadless area is low (fig. 1). Metallic and nonmetallic minerals also occur in the vicinity of the roadless area. There is a possibility of oil and gas accumulation at depth.

Manganese

Manganese deposits are found in a discontinuous belt along the Shady Dolomite-Erwin Formation contact in and near the roadless area. Most of the deposits are small and are confined to spurs on the mountain slope. Thick ore

zones with a high manganese content are discontinuous, and the more promising deposits have been largely mined out. Average manganese content of the ores was 31 percent (Reichert, 1942), and values probably do not exceed 35 percent (Stose and Schrader, 1923).

Table 1.--Summary of the geologic units in the Flint Mill Roadless Area (modified from King and Ferguson, 1960)

Age	Name	Thickness in feet	Lithologic character
Quaternary	Alluvium	0-50	Clay, sand, and gravel on flood plains.
Tertiary(?)	Residuum	0-100	Residual clay with concretions of manganese and iron oxides.
Lower Cambrian	Shady Dolomite	1,150	Dolomite.
	Erwin Formation	1,200-1,400	Quartzite with interbedded shale.
	Hampton Formation	500-1,400	Shale with interbedded quartzite.
	Unicoi Formation	2,000-5,000	Thick-bedded quartzite with arkosic and conglomeratic units.

Only about 3 percent of the acreage inside the boundary of the roadless area has the proper environment for manganese deposits. The Erwin Formation is reported to contain manganese as a cement in parts of Stony Creek Valley (King and Ferguson, 1960), but no production has been reported.

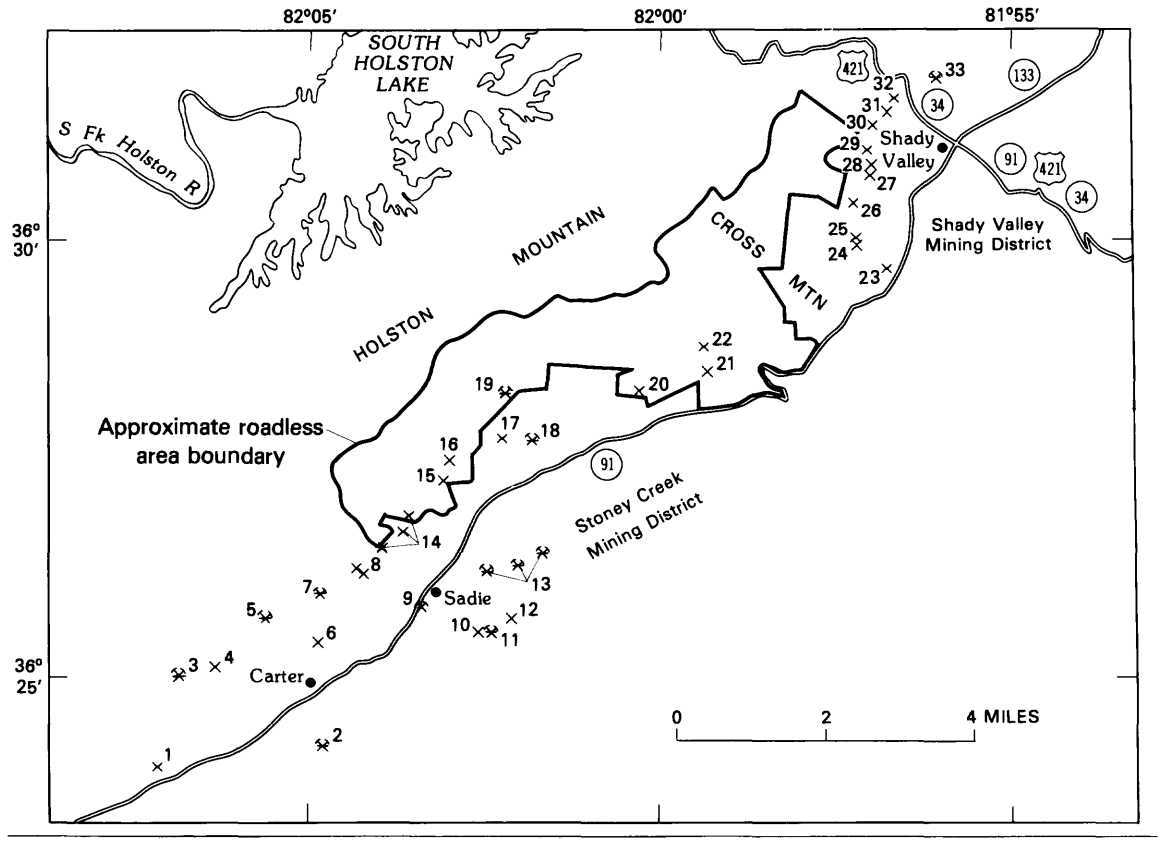
Iron

Many of the manganese mines in the Stony Creek and Shady Valley mining districts originated as iron prospects. Iron deposition was under the same controls. Small concentrations are found in residual Shady Dolomite clays and are areally small. Production of iron in northeast Tennessee ended in 1910.

A number of iron mines and prospects have been identified in the Shady Dolomite, but commercial-sized ore bodies are rare. Three prospect sites in the roadless area have moderate concentrations of iron: Blevins mine, Dugger Branch prospects, and southern Old Road Ridge prospects. The deposits are small, the percentage of iron does not exceed 42 percent, and phosphorous values are high (Jones, in press). Low grade and small tonnages(?) of iron ore reduce possibilities for its commercial production.

Other metallic minerals

Cobalt, lead, zinc, copper, and tin have been found in anomalous concentrations in one or more of the geochemical samples collected near manganese mines. Copper and tin in the samples may come from the Precambrian metamorphic and igneous rocks to the east. Possibly they are recycled from detritus in sediments of the Erwin Quartzite, and have an ultimate source in



EXPLANATION

Mines and Prospects

⚒ Abandoned mine

× Abandoned prospect

Mn, manganese; Fe, iron; Py, pyrite; Ls, limestone, dolomite

1. Griffith prospect--Fe
2. Taylor ore bank--Fe
3. Bearwallow mine--Mn
4. Bitte Ridge mine--Mn
5. Middle Ridge mine--Mn
6. Taylor prospect--Mn
7. Taylor Ridge mine--Mn, Fe
8. Lipps Ridge prospects--Mn
9. Helenmode mine--Py
10. Hatcher prospect--Mn
11. Hatcher mine--Py
12. Grindstaff prospect--Fe
13. Hodge ore banks--Fe
14. Little Marklin and Clarion Branch prospects--Fe, Mn
15. Dugger Branch prospects--Fe, Mn
16. Johns Branch prospects--Fe, Mn
17. Jess Heatherly prospect--Mn
18. Stoutson Quarry--La
19. Blevins mine--Mn
20. Upper Hinkle Branch prospects--Fe, Mn
21. Southern Old Road Ridge prospects--Fe
22. Northern Old Road Ridge prospects--Fe
23. Blackburn prospect--Mn
24. Hopper prospect--Mn
25. Osborn prospect--Mn
26. Wright prospect--Mn
27. Maxwell prospect--Fe
28. Scott prospect--Mn
29. Cole prospect--Mn
30. Nell prospect--Mn
31. King prospect--Fe, Mn
32. Walker prospect--Fe, Mn
33. Bentley mine--Fe, Mn

Figure 2.--Mines and prospects in and near Flint Mill Roadless Area, Carter and Johnson Counties, Tenn.

the Precambrian rocks. Lead and zinc are widespread in lower Paleozoic carbonate sedimentary rocks of the region and are being mined from large ore deposits 35 mi (56 km) southwest of the roadless area. Possibly small amounts of lead and zinc were deposited in or near the roadless area and have been concentrated along with the manganese during weathering. Lithiophorite, a black oxide, reported from several places in the Appalachian Mountains, commonly contains cobalt as a major component, so it may be the host of the cobalt found in our samples collected during the study. Only two samples measured a significantly detectable level, but both were found outside of the roadless area boundary (Jones, 1982). None of these metals are likely to be present in large enough tonnage or at high enough concentrations to constitute mineral resources.

High values of copper, zinc, lead, and barium found sporadically in this area and other roadless areas in eastern Tennessee suggest that the rocks of the Chilhowee Group may contain "red bed" type copper deposits. The general types of rocks in the group are compatible with the inference.

Nonmetallic minerals

Analyses of clay and shale samples indicate suitability for use as structural clay products; but abundant sources are available elsewhere in this region. Bauxite, phosphates, pyrite, and barite have been noted in the region, but were not observed in the roadless area. Unweathered carbonate rock may be present under the eastern part of the roadless area, but it is overlain by thick residual clay, reducing the possibility for commercial stone production.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Only about 3 percent of the acreage inside the boundary of the roadless area has the proper environment for manganese deposits and the most favorable areas have already been explored. The Erwin Formation is reported to contain manganese as a cement in parts of Stony Creek Valley (King and Ferguson, 1960), but no production has been reported. The roadless area can be classed as one with low potential for manganese deposits.

Iron

Iron deposits are subject to the same general conditions as manganese deposits and are of low-grade, high phosphorous content, and small size. They might yield iron oxides for use as paint pigment, but are unlikely to yield iron ore.

Nonmetallic minerals

Clay and shale that can be used to make brick and tile are in the roadless area but the deposits are smaller than others that are closer to markets.

Petroleum

Recent structural studies, based mainly on seismic traverses (Cook and others, 1979, 1980), suggest that oil or gas may have accumulated at depth under the southern Appalachian Mountains, of which this roadless area is a part.

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