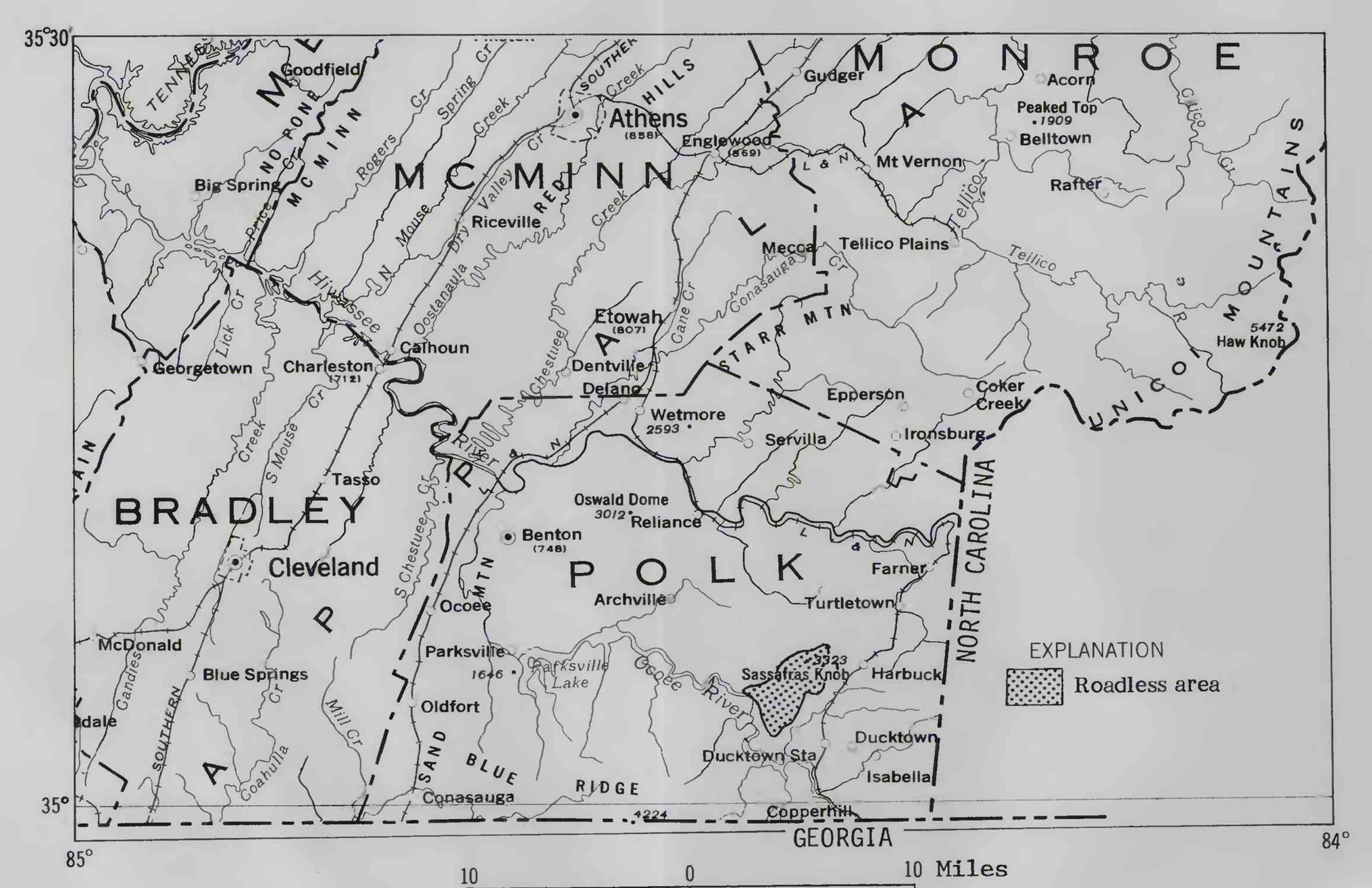
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1338-C
PAMPHLET ACCOMPANIES MAP



Index map

EXPLANATION

Locality of soil sample containing—

- × No gold
- ■ Detectable gold
- ■ Anomalous gold by definition of Force and Siems (in press)

Locality of rock sample containing—

- ◉ No gold
- ● Detectable gold
- ● Anomalous gold by definition of Force and Siems (in press)

Drainage basin and locality (marked by dot) of stream-sediment sample containing—

- No gold
- Detectable gold
- Anomalous gold by definition of Force and Siems (in press)

Drainage basin and locality (marked by intersection of arrow with basin outline) of pan-concentrate sample containing—

- No gold
- Detectable gold

Lower member, Boyd Gap Formation

Figure 1.—Distribution of gold-bearing samples from the Little Frog Roadless Area and vicinity.

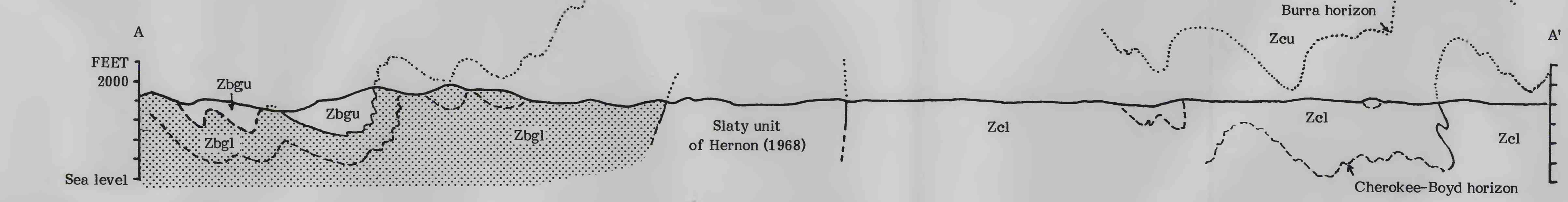
Base from Tennessee Valley Authority
and U.S. Geological Survey
Ducktown, 1957 (Photorevised 1974)

Geology of the Little Frog Roadless Area from Force (1981) modified along its eastern boundary to include more recent field work by Force for this report. Geology in the southeastern part of the map area from Hernon (1968), with subdivision of the Copperhill Formation and tracing of fold axes by Force and M. P. Foose from information on Hernon's original field sheets. Cross-section (A-A') includes information from Hernon's section C-C'.

UTM GRID AND 1974 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



EXPLANATION

- **Zbgu** Upper member, Boyd Gap Formation—Mostly feldspathic metasandstone and gray slate
- **Zbgl** Lower member, Boyd Gap Formation—Mostly graphitic metagraywacke
- **Zcu** Upper member, Copperhill Formation as used by Hernon (1968)—Mixed metasedimentary rocks
- **Zcl** Lower member, Copperhill Formation as used by Hernon (1968)—Mixed metasedimentary rocks including sulfide horizons, blue-black schist, and staurolite schist
- **—3000—** Projected depth, in feet, to slaty unit rocks of Hernon (1968), assuming structural concordance of this unit with Great Smoky Group rocks (see pamphlet, fig. 3a.)
- Contact or marker unit—Dashed where approximate or traced from aerial photographs; dotted (in cross section only) where projected above ground
- Fault
- Fold axis, showing direction of plunge—Dashed where approximately located. Paired arrows show facing directions of limbs
- × Prospect pit
- Quarry
- **Burra** Surface trace of sulfide ore body—Dashed where inferred. In cross section is dotted where projected above ground

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 potential survey of the Little Frog Roadless Area in the Cherokee National Forest, Polk County, Tenn. The Little Frog Roadless Area (08-277) 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.

SUMMARY

The Little Frog Roadless Area contains 4,800 acres of steep-sloped wooded country in the Blue Ridge Mountains immediately west of the Ducktown (Copper Basin) mining district in southeastern Tennessee. Its southern boundary is the Ocoee River gorge.

The rocks in the roadless area belong to two members of the Boyd Gap Formation, part of the Great Smoky Group of Late Proterozoic age. All the rocks are metamorphosed at low grades and deformed to step-shaped folds. A geochemical survey and examination of the remains of extremely sparse prospecting activity revealed no indication of mineralization in the exposed rocks.

A surface tangent to all folds dips northwest at a small angle. Thus, rocks of the Copper Basin which crop out just east of the roadless area may be present at depth in it. If so, the roadless area has a low potential for buried massive sulfide deposits. No other resource occurrence is likely, with the possible exception of an unknown potential for natural gas at great depth.

INTRODUCTION

The Little Frog Roadless Area comprises 4,800 acres of the Cherokee National Forest in Polk County, Tenn. The steep hills of the area are a southern extension of the Great Smoky Mountains in the Blue Ridge physiographic province. The roadless area is heavily forested and contains locally thick undergrowth. Rock exposure is poor except in streambeds and along U.S. Highway 64.

The Ducktown (Copper Basin) mining district forms an intermontane basin immediately southeast of the study area. Massive sulfide deposits there have been mined since 1847.

GEOLOGIC SETTING

The rocks of the study area are slates and metasandstones of the Boyd Gap Formation, named by Wiener and Merschat (1978b) for a roadcut exposure at the southern end of the study area. The formation is part of the Great Smoky Group of the Ocoee Supergroup and consists of Late Proterozoic-age clastic sedimentary rocks, partly coarse-grained, that probably originated as turbidites in a marine rift basin. Two members were mapped in the area (Force, 1981), a lower member more than 600 ft thick consisting of dark slate and metagraywacke containing graphite and sulfides, and an upper member more than 1,350 ft thick, which changes from graded beds about 3 ft thick near the base to massive gritty meta-arkosic sandstone containing calcareous concretions and interbedded with gray slate and slate-boulder conglomerate. The lower member is exposed adjacent to the river gorge, in the crests of anticlines.

The rocks are deformed into asymmetric step-shaped folds; however, a surface tangent to all the folds of the contact between members dips gently northwest. The rocks have been metamorphosed to the biotite zone of the greenschist facies.

To the east, the rocks of the Ducktown mining district are somewhat similar except for having higher metamorphic grades, tighter folds, and important sulfide deposits. They may underlie the study area at depth; the nature of the contact is discussed in the accompanying pamphlet.

PROSPECTING ACTIVITY

The Federal Government owns all surface and mineral rights in the study area. The Government has no record of any application for prospecting permits or mining permits for land in the study area, nor is there any record of historic mining activity. During the field examination one prospect pit was found just outside the study area boundary.

GEOCHEMICAL SURVEY

One hundred twenty-seven samples of rock, soil, and stream sediment taken from the study area were analyzed for 31 elements (Force and Siems, in press). No anomalies believed to be of significance and no patterns of elemental enrichment were found. The sulfide-rich lower member of the Boyd Gap Formation has no unusual metal content.

The geochemical data from the study area were compared with similar data from areas having the type of mineralization thought most likely to occur at Little Frog, namely massive sulfides present in the Ducktown district and the Fontana-Hazel Creek areas (Force and Siems, in press). These deposits contain concentrations of copper, lead, and zinc. The study area had essentially no comparable enrichment, with the possible exception of gold and silver; samples from the Little Frog Roadless Area have even lower metal values than those for similar nearby study areas also thought to be lacking in significant sulfide resources (Slack and others, 1982; Gair, 1982).

ASSESSMENT OF KNOWN MINERAL OCCURRENCES

Base-metal sulfides

Graphitic rocks of the lower member of the Boyd Gap Formation contain as much as 10 percent sulfides, mostly pyrite and pyrrhotite. Wiener and Merschat (1978a) record the presence of minor chalcopyrite and sphalerite in these rocks. Our analyses show, however, that the sum of copper, nickel, lead, and zinc values in these rocks is too low to be of interest and in fact is not higher than those of other rocks with less sulfide (Force and Siems, in press). No base-metal enrichment was observed in samples from the one prospect pit just outside the study area. Therefore, we judge the exposed rock sequence to have little indication of base-metal resources.

Gold and silver

Localities of samples containing detectable gold are shown in figure 1 (compiled from Force and Siems (in press), including appendix by G. C. Gazdik). Eight are considered anomalous. The highest concentration, excluding quartz veins, is 0.25 parts per million (ppm) gold. No orderly distribution by location or geology is apparent. Similarly, nine anomalous silver concentrations (10 ppm the highest) show no orderly distribution. Gold and silver values from the rock samples taken in the study area suggest a low potential for commercial deposits in the bedrock in the area. Streams within the study area do not have flood plains large enough to suggest a resource potential for placer gold.

Stone

A small quarry is located along Kimsey Highway in meta-arkose just north of the study area boundary. Presumably, the quarry was opened during construction of the adjacent road and has been abandoned for some time. Similar meta-arkose is common both inside and outside the study area.

Ceramic tests on samples of phyllite, slate, and clay from the Ocoee Supergroup collected by Gazdik for previous mineral resource studies of the Big Frog Wilderness Study Area (Slack and others, 1982) and Cohutta Wilderness (Gair, 1982) showed only a low potential for structural clay products. Poor bloating characteristics make these rocks unsuitable for lightweight aggregate.

Because of the extensive occurrence of Ocoee rocks outside the study area and their limited usefulness, there is no foreseeable demand for stone from the roadless area.

GEOLOGIC INFERENCES OF RESOURCE POTENTIAL

Preceding data show a lack of significant mineral resources in the rocks exposed in the Little Frog Roadless Area. However, if the sequence of rocks in the roadless area structurally overlies rocks of the Copper Basin and deeper gas-bearing sedimentary rocks, the roadless area has a low potential for the occurrence of base metals in massive sulfide deposits and an unknown potential for natural gas.

Base metals

Rocks of the study area appear to be separated by at least one structure from the massive-sulfide-bearing Copperhill Formation (as used by Hernon, 1968) of the Ducktown district (map). If these structures are approximately concordant to folded bedding in Great Smoky Group rocks of the study area (cross-section), then the Copperhill Formation is present at depth. Further documentation and alternative possibilities are presented in the accompanying pamphlet.

Natural gas

Recent seismic studies (Cook and others, 1979) indicate that the southern Blue Ridge is composed of a 5,000- to 45,000-ft thickness of metamorphic rocks in thrust contact over a sequence of younger sedimentary rocks 3,000 to 15,000 ft thick. These sedimentary rocks have an unknown potential for hydrocarbons. The depths at which they occur and their implied degree of metamorphism suggest that any hydrocarbons present would be in the form of natural gas and not oil (Cook and others, 1979, p. 566). Until deep drilling is done in the roadless area, no reasonable estimate of the gas potential can be made.

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MINERAL RESOURCE POTENTIAL MAP OF THE LITTLE FROG ROADLESS AREA, POLK COUNTY, TENNESSEE

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