

INTRODUCTION

Mining and smelting of iron ore in Alabama, northeastern Georgia, and eastern Tennessee date almost to Revolutionary War days, but substantial production in the Southeast was not attained until after 1850. Numerous furnaces were erected in the region, especially in and near Birmingham, Ala., which is still the principal iron and steel-making center of the area. Locally mined iron ore formed the principal fuel of the furnaces, and much of the ore was mined from red beds of Silurian age. These red beds are an abundant resource of iron ore, and they account for a large part of the total production of the Southeastern United States. Exhaustion of near-surface ore, which was easily mined and the best grade, combined with improved transportation and economies of large-scale operations elsewhere, forced most of the furnaces to shut down (Dept. of the Interior, 1935, production statistics and tables 4-9).

Geological studies have determined the lithology and approximate extent of the red iron-ore beds of Silurian age in the Southeast. Detailed investigations have been made by private companies and government agencies. Most of this work has been in the Birmingham, Ala., district, and the remainder of the region has had relatively little study in recent years.

This report is restricted to the red iron-ore beds of Silurian age in the Southeastern United States exclusive of the Birmingham district (fig. 1). It is based on published and unpublished reports and other data. Of special interest are reports by McCallie (1908), Burchard (1913), and Burchard and Andrews (1947) because they contain chemical analyses, locations of prospects and mines, and some discussion of origin. Many organizations and individuals cooperated in this effort and their assistance is gratefully acknowledged.

In Georgia, Captain Garland Payne, Director, and Dr. Vernon Hurst, of the Georgia State Department of Mines, Mining, and Geology; Dr. A. S. Furman, State Geologist; Dr. Arthur Allen and Professor James Martin of the Department of Geology of Emory University; and Messrs. Abernathy and Jay, who furnished a description of the mines on Dretschler Mountain.

In Alabama, Messrs. Arthur J. and Charles S. Blair, geologists at Birmingham; Dr. Walter B. Jones, Director of the Geological Survey of Alabama; and Mr. H. D. Palliser of the Department of Geology at the University of Alabama. In Tennessee, Stuart W. Maher, Herbert A. Tiedeman, and Robert C. Mills of the Tennessee Department of Conservation, Division of Geology in Knoxville; Dr. George E. Swingle, Department of Geology at the University of Tennessee; B. C. Monymaker and J. M. Kellers, who furnished the Tennessee Valley Authority at Knoxville; and Charles Wilson, miner and quarryman at Rockwood.

RED IRON-ORE BEDS

The red iron ore in the Southeast are sedimentary strata comprising iron oxides, varying amounts of calcium carbonate (CaCO₃), quartz (SiO₂), alumina (Al₂O₃) in clay; and minor amounts of other material, especially phosphorus and manganese. Hematite (Fe₂O₃) is the principal iron oxide. The most important red beds were deposited in Silurian time, when iron oxides were deposited in many places from southern New York State to central Alabama. The name Clinton, which is commonly applied to these beds from New York State. Iron-bearing rocks of Silurian age are in the Red Mountain formation in Alabama and the Rockwood formation in Tennessee. Both formation names are used for the rocks containing the red iron-ore beds of Silurian age in Georgia, but Red Mountain formation is the preferred name (Butts and Gildersleeve, 1948, p. 35-38).

The hard, unweathered rock of the red iron-ore beds is generally compact and is a dark red, commonly speckled white and brown with calcium carbonate and limonite respectively. The unweathered rock that is used for iron ore is mostly in the form of oolites (fasciculate particles) or casts of crinoid stems, bryozoa, and corals. Weathered red rock is derived from the hard red beds by leaching of the calcium carbonate. The weathered beds vary from a friable, unconsolidated material to a rather hard compact mass. The transition zone between the unweathered beds and weathered beds ranges from a few inches to a foot or more in thickness. Iron content of both the unweathered and the weathered beds is widely and the iron ore from these beds are classified as hard and soft, respectively, on the basis of their iron content.

Chemical analyses of the ore beds (McCallie, 1908, p. 80-143; Burchard, 1913, p. 76-134; Haseltine, 1924, p. 214-216; McMaster, 1946, p. 6; Burchard and Andrews, 1947, p. 53-537) have been assembled on sheets 1 and 2. Analyses of weathered and unweathered beds are more numerous on the sheets because mining along outcrops to shallow depths was extensive. Actually, more analyses of unweathered red beds—the hard ore—are available, but they are concentrated in small areas where the unweathered beds were mined. Most of the analyses for hard ore on sheets 1 and 2 are averages or ranges of many analyses from separate mines. These analyses are significant because they represent the bulk of the iron-bearing material. Iron content of the unweathered red beds ranges from as much as 47.7 percent (McCallie, 1908, p. 91) to less than 20 percent. Iron content of the weathered red beds ranges from 39.2 percent (Haseltine, 1924, p. 210) to far below acceptable ore grade, which is generally between 35 and 40 percent. A general difference in composition between hard and soft ore is indicated in table 1; the analyses are from Burchard (1913, p. 76), who sampled a section that extends from hard unweathered ore into soft weathered ore near the surface.

Table 1. Analyses of hard, semihard, and soft "Rockwood" iron ore from Chamberlain, Tenn., after Burchard (1913, p. 76).

	Hard	Semihard	Soft, near dividing line	Soft
Fe	37.22	37.22	32.55	30.79
SiO ₂	5.00	2.92	7.63	7.82
Al ₂ O ₃	2.82	2.07	3.64	4.31
CaCO ₃	44.40	24.50	3.00	0.70
P	0.44	0.57	0.74	0.53
H ₂ O	4.72	5.32	8.15	3.38

* Recalculated from CaO.

The best of the unweathered red ore that was mined in Alabama near Ed and Hs on sheet 1; in Georgia near D3, B4, D5, C2, G3, and G4 on sheet 1; in Tennessee near F1 and F2 on sheet 2 averaged approximately 37 percent iron. The hard ore in the remainder of the mined areas averaged about 26 percent iron. Possibly 30 percent iron is a reasonable average for all the hard ore in mined localities. Analyses of 187 samples of weathered red ore from mined areas in the region averaged 31.7 percent iron. However, practically all the weathered beds suitable for iron ore have been removed by mining operations. Red beds of Silurian age at some places contain less than 20 percent iron and are generally very siliceous and (or) have a high calcium carbonate content.

The red ore beds of Silurian age range from less than an inch to as much as 80 feet in thickness; however, except in the Birmingham, Ala., district, they are at best only a few feet thick. Commonly, where a section contains several red one beds, they are separated by lenses or layers of shale or sandstone, or both; these range widely in thickness. Single one beds thicken and thin along both the strike and dip of the formation and generally cannot be traced continuously for great distances.

Generally only one ore bed was thick enough to be workable, but locally three separate beds were mined. The principal ore bed was no more than 55 inches thick (near southeast end of line D-D', sheet 2) except in a few places such as Greasy Cove, near Gadsden, Ala., where it was 90 inches thick (Burchard, 1933, p. 5). Generally, where the principal bed was less than 18 inches thick and the total thickness of red beds was less than 24 inches, only strip mining was used, and that only to the economic limit controlled by thickness of ore and the type and thickness of overburden. Thickness of the principal iron-ore bed, the total ore in a section, and the total ore-bearing section are shown at many places on sheets 1 and 2.

The aggregate thickness of red beds of ore grade ranges from less than 12 inches to 77 inches (sheets 1 and 2). Locally thicker sections were reported in Greasy Cove, Ala. (Burchard, 1933, p. 5) and 1.6 mile southeast of the Chamberlain mine in Tennessee (Burchard, 1913, p. 127). The red ore in an ore-bearing section ranges from nearly 100 percent to less than 20 percent of the section. Where less than 20 percent of the section, the iron-bearing beds are generally thin and separated by relatively thick beds of shale or sandstone, or both. Most of the iron ore mined has come from thick sections of the red beds found at: (1) Gadsden, Attalla, Fort Payne, Battelle, Greasy Cove, and Tucker Ridge, Ala.; (2) Blaine Pinn, Batelle, Bronco, Dretschler Mountain, and in Lookout Valley, Ga.; and (3) Rockwood, Cardiff, Hartman, Dayton, Inman, La Pollette, Echoes, and the Chamberlain-Bernardville deposit, Tenn.

Distribution.—The red iron ore of Silurian age were deposited as flat-lying beds in a shallow sea that covered the region at that time. Later deformation that built the Appalachian Mountains folded the beds and broke them by faults. Post-folding erosion has removed most of the rocks of Silurian age from the anticlines, so that generally the ferruginous beds occur only in synclines. The part of the region studied that is known or believed to contain these beds is indicated on sheets 1 and 2. The total area is approximately 4,000 square miles of which about 2,700 square miles are on sheet 1 and 2,000 square miles are on sheet 2. Cross sections along lines indicated on sheets 1 and 2 show an interpretation of the geologic structure of the area and the possible subsurface position of the red iron-ore beds.

Depths of these beds beneath the surface—as much as 3,850 feet (section B-B') in the center of the synclines—are based on thicknesses of the overlying rocks as interpreted almost entirely from descriptions of outcrops. Few drill holes have penetrated the red beds more than half a mile down from the outcrop; however, a drill hole near Pine Knot, Ky., just north of the Tennessee-Kentucky boundary (sheet 2, J1) is reported to have penetrated 72 inches of iron ore of Silurian age at a depth of 1,200 feet (Burchard, 1913, p. 143). McCallie (1908), Burchard (1913), Burchard and Andrews (1947), Butts and Gildersleeve (1948), and Rodgers (1933) indicate that the Red Mountain formation of Alabama and Georgia and the contemporaneous Rockwood formation of Tennessee are composed largely of greenish and brownish shales, some calcareous and some silty. The remainder is sandstone, thin lenses of siltstone, locally limestone, and more or less lenticular and nonconformable red beds that contain fossil and oolitic iron ore. The formation is thinnest along the northwest side of the area and thickens along the southeast side. Also, more fine-grained sediment and chemical precipitates are along the northwest side than along the southeast side, where the rock is mostly shale, sandstone, and other clastic sediments. The thickest iron ore of Silurian age are in the midsection between the northwest and southeast sides for the entire length of the area studied (see sheets 1 and 2). This seems to be the zone of change from nearly all clastic sediments to finer grained sediments and more chemical precipitates.

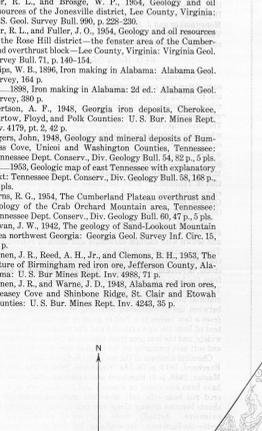
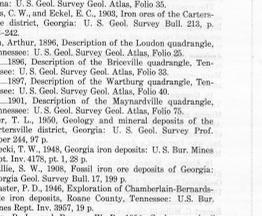
The most important areas for iron resources in the region studied are Blount Mountain, Chandler Mountain, Sand Mountain, Lookout and Poplar Mountains (sheet 1); Walden Ridge, Cumberland Mountain, Pine Mountain, and Cumberland Plateau (sheet 2)—a total area of about 4,000 square miles. A few minor deposits are south and east of the major areas. Considerable red iron ore has been mined from some of the minor deposits such as Tucker Ridge, Ala.; Dretschler Mountain, Ga.; and the Chamberlain-Bernardville deposit and the Echoes area, Tenn.

Approximately 700 square miles of the 4,000 square miles has some potential for a resource of iron ore (Dept. of the Interior, 1935, fig. 14). This possible resource is distributed in a narrow northeast-trending area that extends from about 30 miles southwest of Gadsden, Ala., to Cumberland Gap, Va.—a distance of approximately 250 miles. The wide distribution and relative thinness of the iron-bearing beds greatly reduce the value of the red beds of Silurian age as a source of iron.

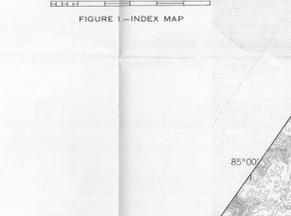
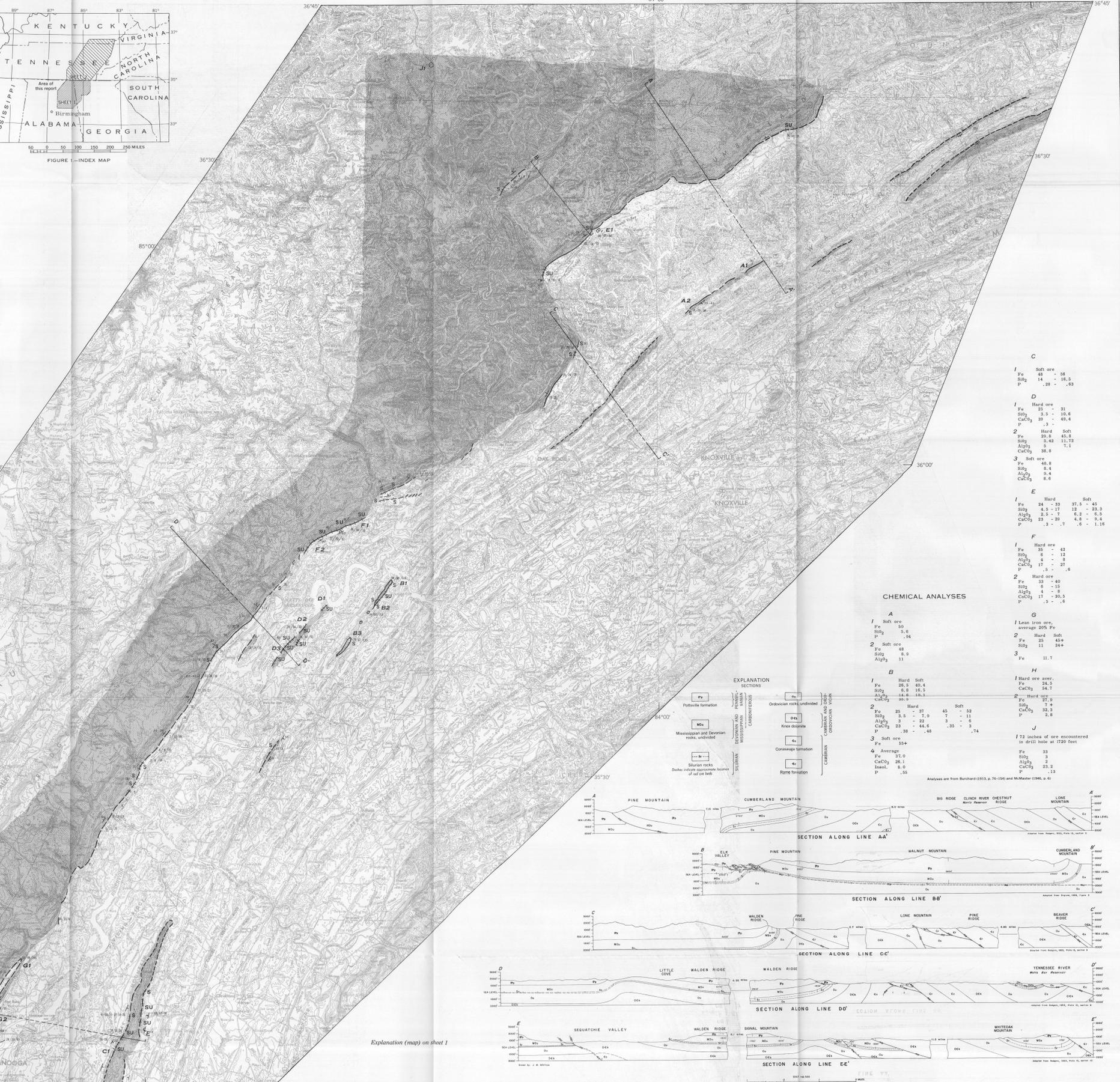
SELECTED REFERENCES

Bondel, F. A. J., and Lasky, S. G., 1956, Mineral reserves and mineral resources: Econ. Geology, v. 51, no. 7, p. 489-497.
Bowles, Edgar, 1941, The geology and mineral resources of Cherokee County, Alabama: Alabama Geol. Survey Circ. 54, 28 p.
Burchard, E. F., 1905, Tonnage estimates of Clinton iron ore in the Chattanooga region of Tennessee, Georgia, and Alabama: U. S. Geol. Survey Bull. 389, p. 169-187.
—, 1913, The red iron ore of east Tennessee: Tennessee State Geol. Survey Bull. 16, 271 p.
—, 1914, Preliminary report on the red iron ore of east Tennessee, northeast Alabama, and northwest Georgia: U. S. Geol. Survey Bull. 349, p. 279-328.
—, 1927, The brown iron ores of west middle Tennessee: Tennessee State Geol. Survey Bull. 54, 179 p.
—, 1933, Iron in the Red Mountain formation in Greasy Cove, Alabama: U. S. Geol. Survey Circ. 4, 49 p.
Burchard, E. F., and Andrews, T. G., 1947, Iron ore outcrops of the Red Mountain formation in northeast Alabama: Alabama Geol. Survey Spec. Rept. 10, 371 p.
Burchard, E. F., and others, 1934, The brown iron ores of the Western Highland Rim, Tennessee: Tennessee State Dept. Edu., Div. Geology Bull. 39, 227 p.
Butts, Charles, and Gildersleeve, Benjamin, 1948, Geology and mineral resources of the Paleozoic area in northwest Georgia: Georgia Geol. Survey Bull. 54, 179 p.
Campbell, M. R., 1894, Description of the Battelle quadrangle, Kentucky-Virginia-Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 12.
Chamberlain, Marrow, 1942, A brief history of the pig iron industry of east Tennessee, Chattanooga, Tenn., 29 p.
Chapman, H. H., 1933, The iron and steel industries of the South: Alabama Univ. Press, 427 p.
Dept. of the Interior, 1935, Review of Southeastern iron ores exclusive of the Birmingham district, with emphasis on the Silurian hard red ore. Dept. of the Interior open-file report, 37 p., 4 figs., 11 tables.
Eckel, E. C., 1936, The Clinton or red ore of northern Alabama: U. S. Geol. Survey Bull. 285, p. 172-173.
Englund, K. J., 1937, Geology and coal resources of the Prosser quadrangle, Scott and Campbell Counties, Tennessee: U. S. Geol. Survey Coal Inv. Map C-39.
—, 1939, Geology and coal resources of the Floydville range, Campbell County, Tennessee: U. S. Geol. Survey Coal Inv. Map C-40.
Feeley, J. C., 1940, Re-opening and developing a small red-iron-ore mine, Gadsden, Alabama: U. S. Bur. Mines Inf. Circ. 7499, 29 p.
Freeman, L. C., 1951, Regional aspects of Silurian and Devonian subsurface stratigraphy in Kentucky: Am. Assoc. Petroleum Geologists Bull., v. 35, no. 1, p. 1-51.
Gildersleeve, Benjamin, 1946, Minerals and structural materials of the Chattanooga Reservoir area, Tennessee Valley Authority, Regional Products Div., Rept. 3, 20 p., 1 map.

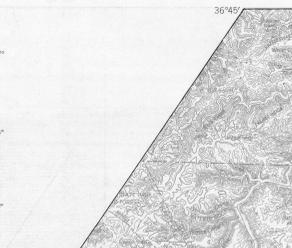
1946, Minerals and structural materials of the Hales Bar and Chickamauga Reservoir areas, Tennessee Valley Authority, Regional Products Div., Rept. 4, 24 p., 2 maps.
Haseltine, R. H., 1924, Iron ore deposits of Georgia: Georgia Geol. Survey Bull. 41, 222 p.
Hayes, C. W., 1932, Report on the geology of northeastern Alabama and adjacent portions of Georgia and Tennessee: Alabama Geol. Survey Bull. 4, 85 p.
—, 1934, Description of the Kingwood quadrangle, Georgia-Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 2.
—, 1934, Description of the Kingston quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 4.
—, 1934, Description of the Chattanooga quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 5.
—, 1934, Description of the Stevenson quadrangle, Alabama-Georgia-Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 19.
—, 1934, Description of the Cleveland quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 20.
—, 1934, Description of the Knoxville quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 21.
—, 1936, Description of the Goldsboro quadrangle, Alabama: U. S. Geol. Survey Geol. Atlas, Folio 35.
Hayes, C. W., and Eckel, E. C., 1933, Iron ore of the Cartersville district, Georgia: U. S. Geol. Survey Bull. 213, p. 233-242.
Keith, Arthur, 1936, Description of the London quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 25.
—, 1936, Description of the Beville quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 33.
—, 1937, Description of the Warburg quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 40.
—, 1937, Description of the Maynardville quadrangle, Tennessee: U. S. Geol. Survey Geol. Atlas, Folio 75.
Keeler, T. L., 1850, Geology and mineral deposits of the Cartersville district, Georgia: U. S. Geol. Survey Prof. Paper 24, 47 p.
Lewicki, T. W., 1943, Georgia iron deposits: U. S. Bur. Mines Rept. Inv. 4175, pt. 1, 29 p.
McCallie, S. W., 1908, Possibilities iron ore deposits of Georgia: Georgia Geol. Survey Bull. 17, 199 p.
McMaster, F. D., 1946, Exploration of Chamberlain-Bernardville iron deposits, Roane County, Tennessee: U. S. Bur. Mines Rept. Inv. 4857, 19 p.
Miller, R. L., and Broege, W. P., 1954, Geology and oil resources of the Jonesville district, Lee County, Virginia: U. S. Geol. Survey Bull. 900, p. 229-230.
Miller, R. L., and Fuller, J. O., 1954, Geology and oil resources of the Rose Hill district—the former area of the Cumberland overthrust block—Lee County, Virginia: Virginia Geol. Survey Bull. 71, p. 140-154.
Phillips, W. R., 1936, Iron making in Alabama: 2d ed.: Alabama Geol. Survey, 340 p.
Robertson, A. F., 1943, Georgia iron deposits, Cherokee, Bartow, Polk, and Folk Counties: U. S. Bur. Mines Rept. Inv. 4170, pt. 2, 42 p.
Rodgers, John, 1948, Geology and mineral deposits of Hamaps Cove, Union and Washington Counties, Tennessee: Tennessee Dept. Conserv., Div. Geology Bull. 84, 82 p., 3 pls.
—, 1950, Geologic map of east Tennessee with explanatory text: Tennessee Dept. Conserv., Div. Geology Bull. 58, 168 p., 3 pls.
Stearns, R. G., 1954, The Cumberland Plateau overthrust and geology of the Crab Orchard Mountain area, Tennessee: Tennessee Dept. Conserv., Div. Geology Bull. 87, p. 5, pls.
Sullivan, J. W., 1942, The geology of Sand-Loxout Mountain area northwest Georgia: Georgia Geol. Survey Inf. Circ. 15, 38 p.
Thomson, J. R., Reed, A. H., Jr., and Clemons, B. H., 1935, The future of Birmingham red iron ore, Jefferson County, Alabama: U. S. Bur. Mines Rept. Inv. 4985, 71 p.
Thomson, J. R., and Warme, J. D., 1945, Alabama red iron ore, Greasy Cove and Shiloh Ridge, St. Clair and Etowah Counties: U. S. Bur. Mines Rept. Inv. 4243, 35 p.



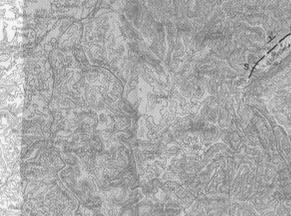
1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.



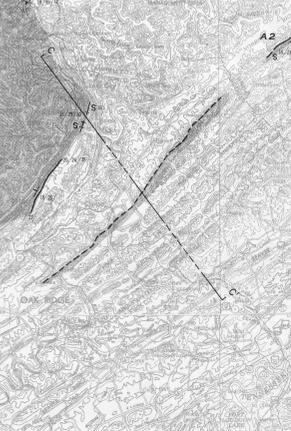
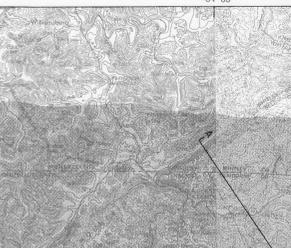
1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.



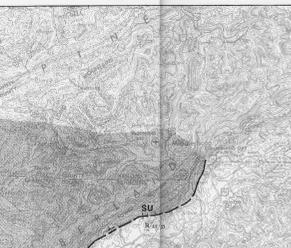
1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.



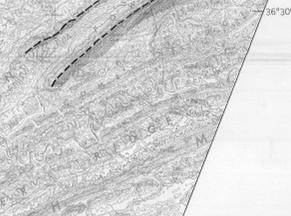
1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.



1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.



1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.



1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.



1944-55 MAGNETIC DECLINATION VARIES FROM 2°30' EAST TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP AND FROM 0°10' WESTERLY TO 0°10' WESTERLY FOR THE WEST SIDE OF THE MAP. CHANGE VARIES FROM 0°10' WESTERLY FOR THE WEST SIDE TO 0°10' WESTERLY FOR THE EAST SIDE OF THE MAP.

CHEMICAL ANALYSES

Section	Sample	Fe	SiO ₂	Al ₂ O ₃	CaCO ₃	P
I Soft ore	1	46	06	12	18.5	0.5
	2	28	03	08	03	0.3
	3	28	03	08	03	0.3
D Hard ore	1	31	10	06	06	0.4
	2	31	10	06	06	0.4
	3	31	10	06	06	0.4
H Hard ore	1	33	07	07	07	0.4
	2	33	07	07	07	0.4
	3	33	07	07	07	0.4
F Hard ore	1	42	03	03	03	0.3
	2	42	03	03	03	0.3
	3	42	03	03	03	0.3
G Lean iron ore, average 30% Fe	1	45	03	03	03	0.3
	2	45	03	03	03	0.3
	3	45	03	03	03	0.3

EXPLANATION

Symbol	Description
PP	Pittsburg formation
MS	Mississippi and Devonian rocks, undivided
MS	Silurian rocks
MS	Quakes include approximate horizon of iron ore beds
MS	Rockwood formation
MS	Chamberlain formation
MS	Cumberland Mountain
MS	Walden Ridge
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echoes
MS	Chamberlain-Bernardville deposit
MS	Chattanooga
MS	Lookout Valley
MS	Blaine Pinn
MS	Bronco
MS	Dretschler Mountain
MS	Inman
MS	La Pollette
MS	Echo