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OCCURRENCES OF IRON ORE MINERALS IN THE UPPER KNOX DOLOMITE IN SULLIVAN COUNTY, TENNESSEE

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Small deposits of iron ore minerals have long been known to occur in the upper few hundred feet of the Knox Dolomite in Sullivan County, Tennessee. In the days of small bloomery forges and small cold blast charcoal furnaces, these deposits constituted valuable local sources of iron ore. Although they were formerly widely known, the deposits are now so nearly forgotten as to be almost unknown in the communities in which they occur.

There is a paucity of published information on the occurrence of iron ore minerals in the Knox Dolomite in Sullivan County. The history of the mining operations and data on the quantities of ore mined at the several localities are not to be found in geologic literature. The present paper is based on field investigations and reference studies made by the writer in the course of preparation for litigations involving a similar occurrence of iron ore minerals in Washington County, Virginia.

MINERALOGY AND MODE OF OCCURRENCE

The several deposits of iron ore minerals investigated by the writer in both Sullivan County, Tennessee, and Washington County, Virginia, are quite similar in mineralogy and mode of occurrence. All of them are essentially residual deposits which occur in the mantle over some part of the upper 500 feet of the Knox Dolomite. In addition to lumps of ore minerals which occur within the mantle, mining operations have disclosed thick masses of hard ore between the mantle and the underlying bedrock. These masses occupy depressions between steep walls of bedrock, and are of limited lateral extent. The bedrock is mineralized, but the degree of mineralization varies widely from place to place.

The deposits, which have been called "ore banks", are characterized by the same assemblage of minerals. Although the principal gangue materials are chert, residual clay, and country rock, the ore minerals are associated with minor amounts of quartz and other minerals. The principal iron-bearing minerals include hematite, magnetite, brown ore minerals, pyrite and

siderite. The latter minerals are described in the following paragraphs.

1. *Brown iron ore minerals.* The *brown ore* consists of hydrous oxides of iron of brown, yellowish and reddish color. Nearly all of the material is limonite, but there is also a little goethite and possibly other hydrous oxides associated with it. At all of the "banks", brown ore occurs only at the surface and at shallow depths in the residuum. It ranges in character from soft spongy and earthy material of low iron content to hard septate or massive bodies of high iron content. The lumps of ore vary widely in form and size, but most of them seen about the old mines have highly irregular shapes and few of them are as much as a foot on a side.

2. *Hematite-magnetite.* Hematite and magnetite occur at all levels in the residuum and also, though less abundantly, in the upper several feet of bedrock. At the more extensively worked "banks", these minerals were the principal ore minerals. They occur together in intimate intergrowths of widely varying proportions. Some of the hematite is essentially free from magnetite but the latter mineral never occurs alone. The magnetite content of the ore is not apparent megascopically, but can be detected easily by use of a magnet.

The hematite is strikingly different from the bedded Silurian hematites in both appearance and character. In general, it is a dense tough ore ranging in color from a dark liver-color to almost black. Most of it has a pronounced metallic luster and makes a brick-red streak. The hematite-magnetite ore has much the same appearance as the hematite. On the whole, the color is a little darker and the metallic luster is slightly more pronounced but these criteria are not always reliable. Even the most strongly magnetic material contains enough hematite to produce a red streak.

Similar magnetic iron ores which occur in the limestones of the Appalachian Valley of Virginia have been referred to as "limestone magnetite" by Holden (1905, page 193) and Watson (1907, page 422). Boyd (1881, page 120) referred to these ores as "magnetic iron ores or semi-magnetic red ores." The term "hematitic magnetite" has been applied by Bayley (1923, pages 240-252) to ores which occur in crystalline rocks in Carter County, Tennessee, and Watauga County, North Carolina. Neither the term "limestone magnetite" nor the term "hematitic magnetite" is entirely appropriate. The ores to which they have been applied consist of both hematite and magnetite. Hematite is the predominant mineral in the Sullivan County ore, and magnetite of the Cranberry type is predominant in the Carter County ore.

The hematite-magnetite ore has three modes of occurrence in Sullivan County. They are:

Residual lumps. At three "banks" in Sullivan County, lumps of hematite-magnetite ore occur in the residuum over the Knox Dolomite. Individual lumps range from small sub-round bodies with clay-polished surfaces to angular blocks up to a foot or more on a side.

Depression fillings. Thick masses of solid hematite-magnetite ore occur underneath the residuum as fillings in depressions between steep walls of the country rock. These depressions, which contribute to the marked irregularity of the bedrock surface, were formed by the solution of the rock along joints and bedding planes. The masses of ore are as much as 100 feet long, 10 to 20 feet wide, and of undetermined vertical thickness.

Disseminated bodies in bedrock. The upper several feet of bedrock at some of the banks contains disseminated masses of hematite-magnetite. These masses are of highly irregular form and appear to grade into the country rock. Few of them have dimensions of more than a few inches. In some places, the rock contains enough magnetite to attract a compass needle or even a magnet.

Siderite. At all of the "banks", the mineral siderite is associated with both the country rock and the ore minerals. It occurs mainly as disseminated crystals although veinlets also occur especially in the rock.

Pyrite. The bedrock at the several banks is mineralized with pyrite. This mineral is to be found at all of the banks in Sullivan County, although the extent to which the rock is mineralized at depth has not been determined. Deep core borings along the axis of the South Holston Saddle Dam near the Sharp Bank encountered unaltered pyrite in veinlets and in disseminated crystals and blebs. Borings made at the Riverside (Holston) mine in Washington County, Virginia, encountered numerous veins of pyrite several inches thick.

ORIGIN OF THE IRON MINERALS

There is ample field evidence that the brown ore minerals, hematite, magnetite, and siderite at the various banks in Sullivan County, Tennessee, and Washington County, Virginia, are derived from pyrite in the zone of weathering. Unaltered pyrite has been found at all of the banks except one and at the latter bank cubes of limonite, pseudomorphs after pyrite, occur in abundance. Deep core borings near the Sharp Bank and at the Riverside mine have shown that pyrite is the only iron-bearing mineral found below the zone of weathering. At the Riverside mine, a mass of pyrite exposed by the writer's hammer on August 8, 1950, was found on December 1, 1952, to be completely covered by a crust of magnetic oxide an eighth of an inch thick.

The ultimate sources of the pyrite is debatable. Three pos-

sible sources have been considered. It is possible:

1. That the iron sulphide is syngenetic. The occurrence of syngenetic pyrite and marcasite in sedimentary rocks is well known. If the pyrite in the Knox Dolomite at the ore banks is of sedimentary origin, it has been concentrated subsequently by solutions which redeposited it in veins and disseminated masses.
2. That the iron was leached from the Athens Shale and carried downward into the Knox Dolomite and redeposited by meteoric waters. This possibility was considered by Watson (1907, page 461). Chemical analyses of samples of unweathered Athens Shale collected by the writer near the Riverside mine in Washington County, Virginia, show an average iron (Fe) content of 5.46%. Although the shale contains sufficient iron to account for the iron at the ore banks in the Knox Dolomite, there is no proof that it is the source.
3. That the pyrite was deposited by ascending thermal solutions. There are no associated high temperature minerals which prove this mode of origin, but the absence of such minerals does not disprove the hypogene origin. The mineralized rock around the ore banks is locally brecciated and much of the dolomite has a saccharoidal texture, strongly suggestive of recrystallization. The chert at the ore banks is much darker than the typical Knox Dolomite chert. A few hundred feet away from the ore banks along the strike, the strata and the chert present an entirely different appearance.

On basis of its mode of occurrence and other field relations, the writer is inclined to believe that the pyrite is of hypogene origin. This origin is by no means capable of demonstrable proof and may have to be rejected when additional information is developed by deep borings or microscopic study, or both.

HISTORY OF MINING OPERATIONS

The history of iron ore mining in Sullivan County dates from 1800, or even earlier. About 1800, a small bloomery forge was built on Beaver Creek about six miles downstream from Bristol. Other early forges were built in the same part of the county, and some of them may have been built before 1800. By 1855, at least 11 bloomery forges and cold blast charcoal furnaces had been built in the county and 7 of them were still in operation (Lesley, 1859). In some cases, the source of the ore used is not known but nearly all of it came from "banks" not more than a few miles distant. The earliest bloomery forges were operated on brown ore recovered from the residuum of the Knox Dolomite. The absence of recognizable mines in the vicinity of the forges suggests that the ore came from small widely scattered pits within hauling distances.

Sometime between 1800 and 1810, the Crockett mine in Holston Valley was opened to provide ore for the local bloomeries and charcoal furnaces. Other mines in Holston Valley were subsequently opened and, together with the Crockett mine, supplied ore to the nearby bloomeries and furnaces up to the

Civil War and later. On the basis of the records available, iron mining in Sullivan County seems to have reached its peak in the decade between 1840 and 1850, with the Crockett and Sharp mines producing the greater part of the ore. Some ore was mined after the Civil War, but the pre-war importance of iron ore mining in Sullivan County was never regained. According to unconfirmed reports, some ore from Shady Valley in Johnson County was hauled to one of the furnaces before it was finally closed down.

ORE "BANKS"

The more important deposits of iron ore in Sullivan County are in Holston Valley, a broad northeast-southwest trending valley developed on an anticline (Figures 1 and 2). The Knox Dolomite makes up nearly all of the valley floor, although the northwest and southeast margins are underlain by the Lenoir Limestone. The valley walls are in Athens Shale.

Individual iron ore "banks" in Holston Valley are described below.

COWAN (LOWRY) BANK

The Cowan or Lowry bank is located near the southeast margin of Holston Valley 1.15 miles N 62° E of the locality known as Holston Valley; 0.7 mile S 52° W of the south end of the South Holston Saddle Dam; and 7.2 miles S 78° E of the Norfolk and Western-Southern railway station in Bristol, Tennessee-Virginia. It is 1.9 miles N 44° E of the Crockett bank. The old workings are near the top of a hill at and above elevation 1,700 feet and 65 feet or more above the nearby small tributary of Thomas Creek (Figures 1 and 2).

The "bank" consists of an area of cherty and ferruginous residuum several hundred feet long along the strike and a few hundred feet wide. Lumps of brown iron ore are scattered over the surface and through the residuum, and are more concentrated in some areas than others. There is no bedrock exposed at the bank, which is 300 to 350 feet below the top of the Knox Dolomite.

The workings on the property consist of three small pits, two of which have been nearly obliterated by cultivation. The largest pit is now 75 feet long by 50 feet wide and has a maximum depth of 7 feet. A smaller pit a few feet away is about 10 feet across and about a foot deep. The other pit is a shallow cut of small dimensions located about a hundred feet southwest of the other pits.

Safford (1869, page 452) in his description of the Crockett Bank, refers to the Cowan Bank as follows:

> "There is another locality about a mile and a half in the same range to the northeast, not as yet opened, which promises to be valuable."

Fig. 1 Topographic Map of Section of Holston Valley showing the Iron Ore Banks. (TVA Holston Valley Quadrangle Sheet 206 SE)

McCreath (1884, page 71) describes the bank in the following words:

> "About a mile from the Sharp bank, the *Cowan or Lowry bank* shows a small open cut twenty feet in diameter and ten feet deep. An abundant outcrop of rich brown hematite ore shows for several hundred feet all around the open cut. No *red hematite* was seen here, but the developments have not yet been sufficient to test the deposit. Cold Spring Creek, a quarter of a mile distant, would afford a sufficient supply of water for washing."

The development of the property does not seem to have advanced very far beyond the prospecting stage described by McCreath. It is not likely that more than a few tons of ore were ever mined at this locality. The chemical character of the ore is shown by the following partial analysis.

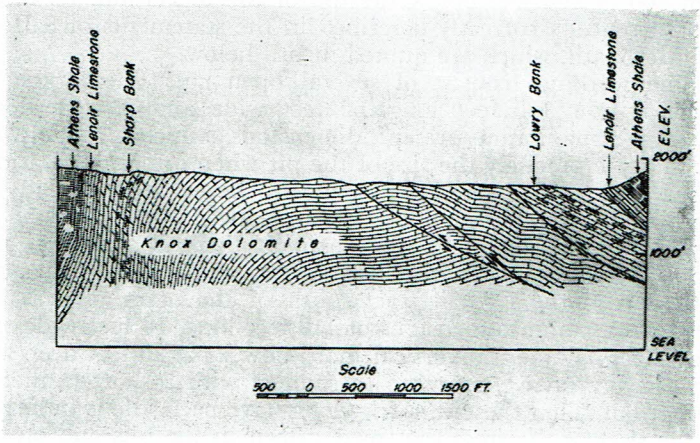

Fig. 2 Vertical Geologic Section across Holston Valley through the Sharp and Lowry (Cowan) Banks.

	I	II
Iron (Fe)	57.625%	53.28%
Silica (SiO_2)	3.710*	6.66
Alumina (Al_2O_3)		2.11
Lime (CaO)		0.18
Magnesia (MgO)		0.07
Sulfur (S)		0.05
Phosphorus (P)	0.029	0.02
Titanium Dioxide (TiO_2)		0.12
Loss on Ignition		13.20

* "Siliceous matter"

I A thirty-two piece sample (McCreath, 1884, page 71)

II Composite sample collected by the writer and analyzed by Southern Testing Laboratories, Inc.

CROCKETT BANK

The Crockett Bank is located on the Pemberton and Offield

properities in the southeastern part of Holston Valley. It is 0.84 mile S 20° W of Holston Valley, 2.2 miles N 10°30' E of South Holston Dam, and 6.4 miles S 63° E of the Norfolk & Western-Southern railway station in Bristol. It is 1.9 miles S 44° W of the Cowan Bank. The larger workings are above elevation 1,620 feet, and more than 40 feet above the channel of Thomas Creek.

Bedrock is exposed in the east wall of the large pit. It consists mainly of thick-bedded dolomite. Much of the rock is brecciated and contains a considerable amount of iron in the form of hematite and magnetite. There is some variation in the structure but in the main the strike is about N 40° E and the dip is about 48° to the southeast.

The ore occurs in the residuum over the Knox Dolomite, from 300 to 400 feet below the top of the formation. Its mode of occurrence is correctly described in the statements of Safford and McCreath, which are quoted in full below.

The workings consist of several open cuts, the largest of which is now 180 feet long, 60 feet wide and 35 feet deep. These are maximum present dimensions, which probably do not indicate precisely the size of the pit when mining operations ceased. There has been some caving of the earth walls and the depth of the pit has obviously been reduced by the inwash of clay. To the northwest of the deep pit there is a shallow pit, two to five feet deep, which has an area of about half an acre. A trench on the Offield tract south of the main pit has the present maximum dimensions of 110 feet long, 16 feet wide and 8 feet deep. There is a vertical shaft, now some 20 feet deep and still actively caving, reported to connect with a short tunnel at the bottom. That these workings long have been idle is indicated by the sizes of the trees that have grown in the pits and on the dumps since mining was discontinued. A "yellow poplar" (*Liriodendron tulipifera*) 54 inches in circumference stands in the larger pit.

Safford (1869, page 452), in discussing the occurrences of *Hard Solid Ore,* makes the following statement on the Crockett bank:

> "Ore, known as the *Crockett Bank,* half a mile southwest of Cowan's is an extensive bank or ridge of red earth, with numerous small blocks of solid hematite scattered through it. Near the surface, it is associated with more or less 'honeycomb' brown ore."

The following description of the bank is quoted from McCreath (1884, pages 72-73):

> "The crockett bank lies about nine miles[1] SSE of Bristol and seven miles from Bushong Switch.[2] It was first opened 75 years ago to supply ore for local forges and furances. The development consists

1. The distances given by McCreath are all in error, and seem to representeither road distances or estimates. The dimensions he gives of the mines appear to be estimates.
2. Bushong Switch is no longer in existence. The writer has been unable to ascertain its exact location.

of an open cut 150 feet long, 80 feet wide and 75 feet deep at the deepest point. At the south end of the bank a shaft, now fallen shut, is said to have been sunk 30 feet in ore-bearing clays in the floor of the open cut, making the ascertained depth of ore material at least 105 feet. The bank has yielded an excellent quality of brown hematite, with wash ore predominating. Iimestone rock shows quite conspicuously on the edge of the deposit, and in this may be seen occasional wedges or lenticular masses of a rich *red hematite*. An abundant outcrop of the same character of ore covers an area of at least a hundred yards square, extending over to the adjoining *Offield property*. The ore occurs generally in small, smooth-polished pieces, often rounded. On the outside the color is almost black, and it is known locally as 'black ore.'. On fresh fracture it shows a dense structure, with more or less of a steel-blue color. This variety was considered too refractory to be smelted in a small cold blast charcoal furnace, and its development has been practically ignored. It occurs in a loose, granular red clay; but it yet remains to be proved whether a solid body of ore exists at this point.

"A small but never-failing stream (Thomas Creek), 150 yards from the cut, affords an ample supply of water for washing purposes."

The iron ore minerals occur in the residuum over the upper part of the Knox Dolomite. Brown iron ore occurs sparingly at the surface around the old workings and in the residuum near the surface. It is a spongy, cellular material in small to sizeable lumps. Hematite-magnetite ore is present through-out the residuum as small bodies of the type described by McCreath in the above quotation. Some of it is very strongly magnetic, indicating a high magnetite content. The chemical character of the ore minerals is indicated by the following analyses.

	1	2	3	4	5
Iron (Fe)	68.68%	67.41%	64.650%	55.650%	60.32%
Silica (SiO_2)	1.60	1.60	2.975*	5.500*	6.60
Alumina (Al_2O_3)	0.27		1.863		0.31
Lime (CaO)	0.46		0.500		0.34
Magnesia (MgO)	0.37		0.317		0.63
Manganese (Mn)		0.11			
Titanium Oxide (TiO_2)	0.08	tr.			0.10
Sulfur (S)	0.02	0.002	0.008	0.144	0.03
Phosphorus (P)	0.30	0.08	0.022	0.020	0.44
Loss on ignition	1.44				0.12

* "Siliceous matter"

1. Hematite-magnetite (one piece analyzed by the Southern Testing Laboratories, Inc.)
2. Hematite-magnetite (analysis by Tennessee Division of Geology)
3. Hematite, analysis of 150-piece sample (McCreath, 1884, page 73)
4. Brown ore, analysis of 105-piece sample (McCreath, 1884, page 73)
5. Brown ore, (composite sample analyzed by the Southern Testing Laboratories, Inc.)

Although mining operations at the Crockett mine appear to have continued for some time subsequent to the time of McCreath's examination, the ore was not completely exhausted. The workings were never extended to the base of the residuum, and large masses of solid hematite-magnetite ore were not found. The volume of usable ore remaining is not known.

SHARP BANK

The Sharp bank is near the northwest margin of Holston Valley, 0.62 mile due south of the Tennessee-Virginia State Line; 1.3 miles N 24° E of Holston Valley and 6.6 miles S 83° E of the Norfolk & Western-Southern railway station in Bristol. Physiographically, the bank is located in a prong of a large sink.

The mine at the Sharp bank is from 240 to 350 feet below the top of the Knox Dolomite. There is but little bedrock now exposed at the mine. Pinnacles of dolomite were encountered in the mining operations and as the pit was deepened these widened and formed walls. The average strike of the rock is about N 48° E and the dip is about 50° to the northwest.

Brown iron ore and lumps of hematite-magnetite ore occur in the residuum. The mine was opened in the ore-bearing residuum and the principal ore at first was brown ore. As mining progressed a solid mass of hematite-magnetite ore was encountered between steep walls of rock. The most of the ore tonnage from the mine came from this material.

Safford (1869, pages 222-223) in his discussion of iron ores in the Knox Group, describes the Sharp bank in the following terms:

> "At another locality, Sharp's bank, in Sullivan County, it occurs in a vein-like nearly vertical mass. Much ore has been taken out, and the opening made, is, at one point, forty feet across. This part, however, is wider than the rest of the vein, and includes a columnar mass of rock, or, as the miner would say, a "horse". The mass of ore is associated with light gray dolomite, of the uppermost part of the Knox Group. The rocks dip at a high angle. The hematite most likely dips with them, not being a true vein intersecting the strata.
> "Other localities of this ore exist in Sullivan County. Hand specimens of magnetite (lodestone) are sometimes found at these localities." (pages 222-223)

In another reference, the same author (page 452) states:

> "About one and a half miles northwest or north of Cowan's, at the Sharp bank, is an interesting vein-like mass of the same compact ore (as that at the Crockett bank) — It appears to dip with the dolomites of the Knox Group. It is capable of affording much good ore."

The Sharp bank is described also by McCreath (1884, pages 70-71). His statement is quoted in full:

> "The *Sharp bank* lies eight and one half miles from Bushong Switch, E.T., Va. & Ga. R.R., and ten miles south east from Bristol. Both red and brown hematite ore have been developed here. An open cut seventy feet in diameter has yielded a good supply of brown hematite, principally wash-ore; and a considerable show of wash-ore may yet be seen on the sides of the bank.
> "A trench about fifty feet long and fifteen feet wide, between nearly vertical ledges of limestone, is said to have developed a bed eight to ten feet thick of solid *red hematite*. But the workings are now filled with water, and no part of the bed can be seen. Thin streaks of ore show in the limestone faces, and occasional pieces may be found lying around the bank."

The workings consist of an open cut made in the steep side of the northeast prong of a large sink, and a smaller pit. The larger pit is 143 feet long, 110 feet wide and 3 to 35 feet deep. In its present deteriorated condition, the total depth of the pit cannot be determined. It is partially filled by clay caved from the high face and washed in by streamlets. A pond of water occupies the unfilled portion of the pit. The smaller pit is 90 feet long, 60 feet wide and has a maximum depth of about 20 feet. Like the larger pit, this opening has deteriorated since mining operations ceased and its original dimensions are not known.

Little is known about the history of mining operations at the Sharp bank. The first mining seems to have been done sometime in the first quarter of the 19th century. Mining operations were undoubtedly intermittent, but the mine was at its peak production from 1850 to 1855 when it supplied ore to at least three furnaces in Sullivan County. At the time of McCreath's examination in 1884, the mine was inactive. Later, it was again active for a short time. A few tons of hematite-magnetite ore were mined but the material was not hauled away. This ore is from the large mass described by Safford and McCreath and is mostly in pieces as large as a man can lift. On basis of the information available the bank was not exhaused. The amount of ore remaining in the thick mass of hematite-magnetite can be determined only by exploration.

The chemical character of the ore at the Sharp bank is indicated by the following analyses:

	I	II	III	IV
Iron (Fe)	65.10%	59.96%	50.92%	65.55%
Silica (SiO_2)	4.12	5.80	9.28	2.970
Alumina (Al_2O_3)	0.36	0.39		
Magnesia (MgO)	0.51	2.22		
Manganese (Mn)			0.16	
Titanium dioxide (TiO_2)	0.12	0.15	tr.	
Sulfur (S)	0.07	0.06	0.004	
Phosphorus (P)	0.43	0.35	0.10	0.026
Loss on ignition	0.89	2.85		

I Hematite-magnetite (one piece analyzed by Southern Testing Laboratories, Inc.)

II Hematite (one piece analyzed by Southern Testing Laboratories, Inc.)

III Hematite-magnetite (Tennessee Division of Geology)

IV Hematite-magnetite (sixty-four piece sample, McCreath, 1884, page 71)

THOMAS (WARD) BANK

The Thomas (Ward) bank is located near the northwest margin of Holston Valley, 0.35 mile N 33° E of Holston Valley School; 3.4 miles S 60° E of the Norfolk and Western-Southern railroad station in Bristol; 1.7 miles N 65° E of Ruthton, and

2.0 miles S 70° W of Holston Valley.

Geologically, the bank is 300 to 380 feet below the top of the Knox Dolomite. The strata strike about N 60° E and dip about 32° to the northwest. Much of the rock is brecciated and contains small amounts of hematite and magnetite.

The workings consist mainly of a trench between walls of bedrock and a few smaller pits. The trench is 116 feet long and varies in width from 20 to 44 feet. In its present deteriorated state, it has a maximum depth of 17 feet, but the average depth is much less. It has been partially filled by the collapse of the residuum between pinnacles of dolomite. A circular pit 28 feet in diameter and 6 feet deep and one or two smaller pits were opened in the mine area to the south of the trench.

The Thomas bank contained both brown ore and hematite-magnetite. There is but little ore to be found on the surface about the mine, none of which is brown ore. Nearly all of the ore seen by the writer consisted of lumps of hematite and silica. Although the country rock contains enough magnetic in places to attract a magnet, there is no good hematite-magnetite ore in evidence a the mine.

Safford (1869) does not specifically mention the Thomas bank, but McCreath (1884, page 72) gives the following description:

> "The *Thomas bank* is situated seven miles S.S.E. of Bristol and five miles from Bushong Switch. It exhibits a cut fifty feet long, twenty feet deep and ten feet wide. A solid bed of *red hematite* is said to have been developed ten feet thick, but a mass of dirt has washed in, completely covering it up. Occasional masses may be seen in the limestone walls, and also loose pieces lying around on the sides of the bank. A considerable amount of rich brown *hematite* ore has been taken from several small pits on the southeast side of the open cut. The ore was used in the old Bushong furnace, two and one-half miles distant, and the mining of the *red hematite* is said to have been abandoned on account of the difficulty of smelting it in a small cold blast charcoal furnace. The ore is very fine-grained, with a steel blue color on a fresh fracture, similar to the Sharp bank, and resembling very much some of the Pilot Knob (Missouri) ore."

The following chemical analyses afford some indication of the chemical character of the ore:

	I	II
Iron (Fe)	65.050%	47.32%
Silica (SiO_2)	2.390*	4.12
Alumina (Al_2O_3)		1.23
Lime (CaO)		8.12
Magnesia (MgO)		4.48
Titanium dioxide (TiO_2)		0.09
Sulfur (S)		0.14
Phosphorus (P)	0.032	0.07
Loss on ignition		12.12

* "Siliceous matter"

I "Red hematite" (37 piece sample, McCreath, 1884, page 72)

II Impure hematite (composite sample analyzed by the Southern Testing Laboratories, Inc.)

The mine at the Thomas bank seems to have been operated for some time subsequent to McCreath's examination. It was reportedly last operated for a short time in the interval between 1905 and 1912. In the absence of local furnaces, all of the ore mined in this latter period reportedly was shipped to a furnace in Pennsylvania. As the quality of the ore did not justify the long haul, mining was soon discontinued. Although there is no evidence that there is any ore left in the bank, the writer received reports that the hematite-magnetite was not mined out.

THE PROSPECT AT ORE BANK

In addition to the iron ore "banks" in Holston Valley, there is a belt of mineralized rock in the Knox Dolomite along the south side of Reedy Creek Valley. This belt is a few hundred feet below the top of the Knox Dolomite and forms a bench which stands 160 to 200 feet above the flood plain of the creek. The village of Ore Bank is situated on this bench and is shown on the Bristol Tennessee-Virginia Quadrangle topographic map, edition of June, 1902, and on the U.S. Geological Survey-Tennessee Valley Authority Indian Spring, Tennessee-Virginia Quadrangle, edition of 1940 (Figure 3).

The strata of the mineralized belt are concealed by a thick residuum of cherty clay. Brown iron ore minerals and associated barite are to be found in the residuum at intervals over a distance of two or three miles. At a few points, prospecting has been done for either iron ore or barite or both.

The Ore Bank iron ore prospect is located at the northwest extremity of the village of Ore Bank. A pit about fifteen feet across and two or three feet deep in the cherty residuum contains a small amount of spongy brown ore in small to sizeable lumps. Small cubes of limonite, pseudomorphs after pyrite, occur in the residuum in the spoil pile and on the surface in nearby bare spots. Barite in lumps and small fragments occurs in the pit and in the spoil pile. The date of the prospecting and the name of the prospector were not learned.

Brown iron ore was encountered in several pits dug in 1935 for barite in residuum over the same strata 1.5 miles northeast of the Ore Bank prospect.

CONCLUSIONS

The bodies of iron ore minerals treated in this paper are of no present commercial value. Three of the four banks in Holston Valley were formerly valuable sources of ore for local furnaces but, because of its refractory character, the ore was none too desirable in spite of its high iron and low phosphorus content. It was difficult to smelt in the small cold blast furnaces in which it was used. The Cowan bank and the bank at Ore

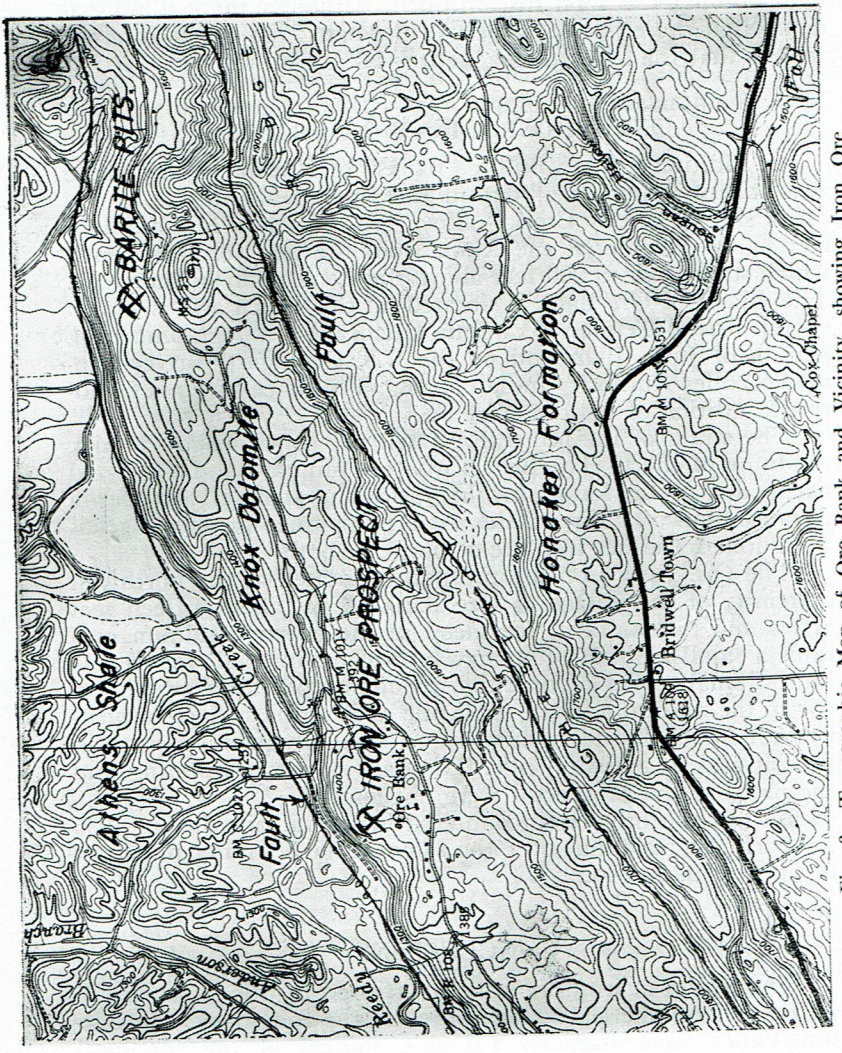

Fig. 3. Topographic Map of Ore Bank and Vicinity, showing Iron Ore and Barite Prospects. (TVA Indian Springs Quadrangle Sheet 197 SW)

Bank were never developed as mining projects. Although the latter bank appears never to have been of any promise, the Cowan bank, in the absence of better sources, might have yielded enough satisfactory ore to keep a small furnace in blast in the days of low labor costs.

The reserves are very small at best. There is little ore to be seen at any of the banks, and at some of them it is difficult to find enough ore to make a good representative composite sample. It is known that the mass of hematite-magnetite ore at the Sharp bank was not completely exhausted and it is likely that there may be a little ore of the same type remaining at the Thomas bank. Residual ore at the Crockett bank was not completely exhausted, and nearly all of the ore at the Cowan bank is still in the ground. The total ore reserves at the known banks and in any similar deposits which might be discovered in the area by magnetometer surveys or other modern prospecting methods are insignificant.

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