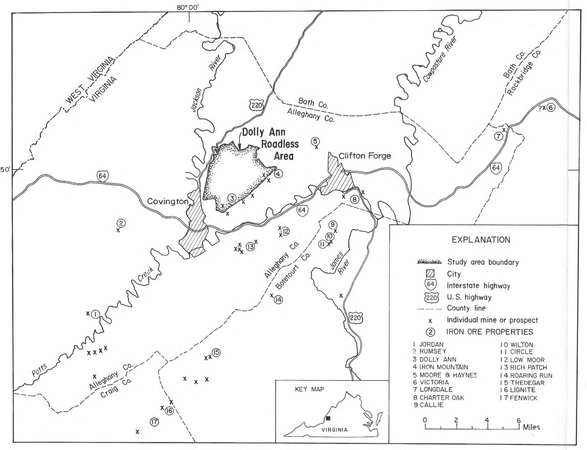

Figure 1.--Index map of Dolly Ann Roadless Area showing localities of nearby iron-ore properties.

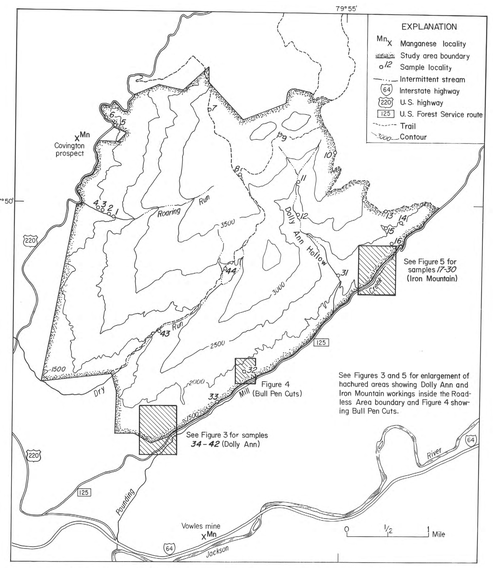

Figure 2.--Sample localities, manganese prospects, and iron-mine localities.

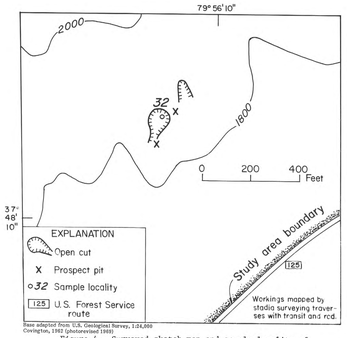

Figure 4.--Surveyed sketch map and sample locality of Bull Pen Cuts.

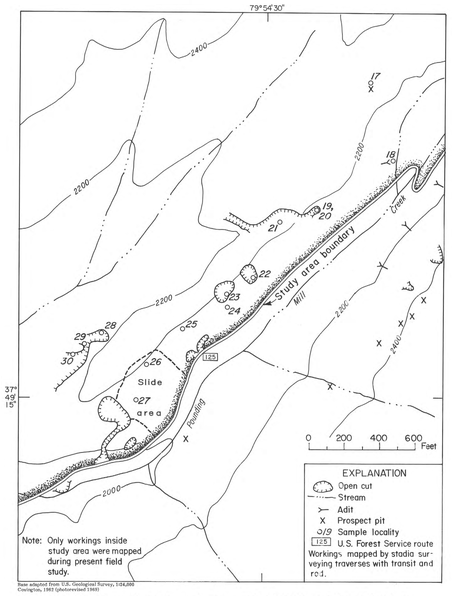

Figure 5.--Surveyed sketch map showing sample localities and the northwestern workings of the Iron Mountain Mine.

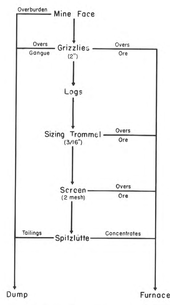

Figure 6.--Flow chart showing beneficiation of iron ore from mines in and near the Dolly Ann Roadless Area.

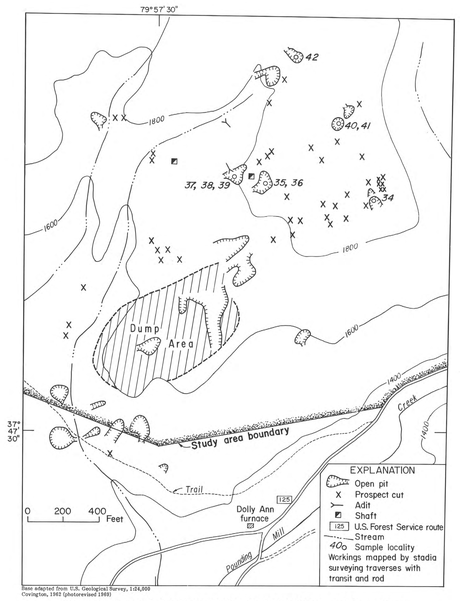

Figure 3.--Surveyed sketch map showing sample localities and the northern workings of the Dolly Ann Mine.

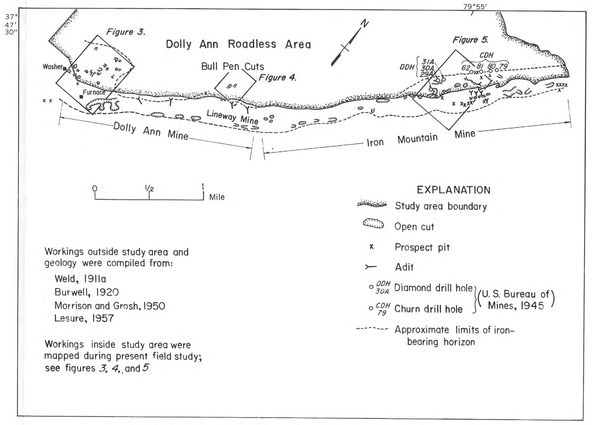

Figure 7.--Abandoned workings of the Dolly Ann and Iron Mountain Mines in and adjacent to the Dolly Ann Roadless Area.

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 mine and prospect mapping survey of the Dolly Ann Roadless Area (08-171) in the George Washington National Forest, Alleghany County, Virginia. Dolly Ann Roadless 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.

INTRODUCTION

The Dolly Ann Roadless Area comprises 7,900 acres (3,200 ha) in the George Washington National Forest in west-central Virginia. The study area is in central Alleghany County, northeast of Covington, Va. (fig. 1). U.S. Forest Service Route 125 and U.S. Highway 220 furnish vehicular access to the edges of the area, and several foot trails provide access to the interior and peripheral regions.

The study area is in the Valley and Ridge physiographic province. Topography is rugged and is typified by high ridges having fairly steep slopes. Altitudes range from 4,072 ft (1,241 m) at Big Knob in the northern part of the study area, to 1,400 ft (427 m) in Dry Run and Pounding Mill Creek at the southern boundary. Major stream drainages include Roaring Run, Dry Run, and Dolly Ann Hollow.

Folded and faulted sedimentary rocks of middle Paleozoic age characterize the Dolly Ann Roadless Area; formations range in age from Middle Ordovician to Middle Devonian (Lesure, 1981). Upper Ordovician through Middle Silurian formations constitute bedrock for most of the study area, capping the major ridges and knobs. Accumulations of residual iron deposits occurs in Lower Devonian formations along the southern and eastern borders of the study area (Lesure and Jones, 1983).

PRESENT INVESTIGATION

The U.S. Bureau of Mines field investigation was conducted in the spring of 1980. Workings of the Dolly Ann and Iron Mountain iron mines were mapped and sampled. A total of 26 large open cuts, three adits, 46 prospect pits and trenches, and two shafts were examined in the study area. Channel cuts were made to expose and sample the iron-bearing horizon. Nineteen samples collected from the old workings were analyzed (table 1). Additional samples included sandstone (three of which were from the hematitic Rose Hill Formation), shale, and clay. Sample localities are shown in figures 2, 3, 4, and 5.

Samples were analyzed spectrographically for 42 elements by TSL Laboratories, Ltd., Spokane, Wash. Additional tests for selected elements were performed by means of atomic absorption methods, colorimetry, fluorometry, and induction-coupled plasma.

PREVIOUS INVESTIGATIONS

In the early 1900s, several investigations related to the mining districts in and near the study area were conducted by consulting engineers and geologists. Many of their reports, although unpublished, provide valuable information concerning the local iron deposits. Weld (1911a, 1911b, 1913a, 1915, and 1926) carried out extensive geologic explorations in the vicinity of the study area, including the Iron Mountain and Dolly Ann mining tracts. These informal reports, and those of Withrow (1910) and Burwell (1920), dealt mainly with estimates of resources and the geology of the iron ore zone.

With the advent of World War II, the U.S. Bureau of Mines began geologic investigations of the Virginia iron ores to provide essential information on vital minerals. These studies resulted in several War Minerals Reports (U.S. Bureau of Mines, 1943, 1944a, 1944b, and 1945), assessing domestic minerals based upon the fieldwork of the Bureau and data from other sources. Bureau of Mines Project 962 was conducted in 1943 and 1944 to determine reserves of iron ore as part of the strategic minerals program. Parts of the Dolly Ann Roadless Area were included in the project. Project work was extensive, involving the drilling of 163 holes, the digging of numerous prospect pits, trenches, and tunnels, the collecting of over 1,300 samples, and surveying and mapping of the iron-rich beds. This work culminated in a Bureau of Mines report by Morrison and Grosh (1950). Additional, unpublished articles written during the war include the "Oriskany Report" by Merrill (1943) and a report of iron ore properties by Moomaw (1944).

Other published studies concerning mineral resources near the Dolly Ann Roadless Area include Holden (1907), Stose and Miser (1922), Gooch (1954), and Lesure (1957).

HISTORY OF IRON MINING

The Dolly Ann Roadless Area is in the northwestern part of the Clifton Forge iron district, a region of abandoned iron mines and associated furnaces (fig. 1). Iron production in the district began prior to 1800 (Bruce, 1931, p. 454), and was increased with construction of local charcoal furnaces. Replacement of these furnaces with more efficient coke-burning ovens allowed production to peak during the period from 1880 to 1920 when most mines in the district were in operation (table 2). By 1925, all mining had ceased.

Mining operations usually began as open-pit workings along the ore outcrop, and developed into underground workings as near-surface ores were exhausted. The underground mining method used was longwall retreat, with chutes and drifts dug for removal of ore to haulage levels. Ore was first transported to washers and furnaces by wagon; eventually, railroads and trams were used, as mines were developed in more remote locations.

The ore at some mines required only hand sorting at the mine face prior to smelting. Grizzlies (iron or steel bars) were used at other mines to separate ore requiring beneficiation from that which could be sent directly to the furnace. Ore requiring beneficiation was sent to washing facilities, which served several mines. The washing unit consisted of steel logs, trommels, and screens. This system took advantage of the friable and unconsolidated properties of the gangue, mostly sand and clay, allowing it to be removed while retaining the washed ore. Some washers were additionally equipped with a series of pointed boxes used to separate mineral-bearing slurries for recovery of fine-grained minerals; these were known as spitzlutten or spitzkasten (fig. 6).

Iron has been mined along a syncline paralleling Pounding Mill Creek, and abandoned workings are distributed on both sides of the syncline for a distance of 4.5 mi (7.2 km) along the southeastern boundary of the study area (fig. 7). Most of the workings are outside the roadless area. Those parts of the Dolly Ann and Iron Mountain Mines within the study area, mainly surface operations, were mapped in detail during this study (figs. 3 and 5). Two isolated pits, referred to as the Bull Pen Cuts, are located inside the study area along the same geologic trend (fig. 2).

Mining in the Dolly Ann area commenced in 1848 (Lesley, 1859, p. 71-72), and was accelerated following acquisition of leases by the Low Moor Iron Company in 1893. Ore from the mines was originally smelted at the local Dolly Ann charcoal furnace (fig. 3); later the ore was shipped to the company's Covington furnace. Company records listed the combined total iron ore production from the Dolly Ann and Iron Mountain Mines between 1893 and 1921 as 897,239 tons (Low Moor Iron Company of Virginia, 1923). Production figures from individual workings within the study area are not available.

DOLLY ANN MINE

During the investigation, 18 open cuts of varying size, numerous prospect pits, trenches, and adits were mapped at the Dolly Ann Mine within the study area (fig. 3); all workings are presently overgrown. The largest cut is about 300 ft (91.4 m) long, 200 ft (61 m) wide, and 40 ft (12.2 m) deep. Most of the cuts are about 50 to 150 ft (15.2 to 45.7 m) in diameter and 20 to 30 ft (6.1 to 9.1 m) deep (fig. 3).

Although abundant masses of the ferruginous Ridgeley Sandstone hanging wall are present in the old open cuts of the area, little iron-enriched material is exposed in the presumed ore zone. Seven samples of iron were collected from scarce outcrops and from channels dug into abandoned pits to expose the ore zone; nine dump samples were gathered where in-place rock was not available (table 1). Iron mineralization at the mines consists of limonite and goethite intermixed with sand. In general this mixture is porous and sometimes friable, although it is hard and compact in certain zones.

IRON MOUNTAIN MINE

Eight overgrown cuts and one adit were mapped within the study area at the Iron Mountain Mine (fig. 5). Some of the open cuts are elongated along strike, the longest being about 500 ft (152.4 m) long. Smaller pits are 100 to 200 ft (30.5 to 61 m) in diameter and about 20 to 30 ft (6.1 to 9.1 m) deep.

Sampling at the Iron Mountain Mine was conducted in a manner similar to that at the Dolly Ann Mine; limited outcrops, dump material, and hand-dug channels yielded 11 iron-rich samples. The iron-enriched zone at Iron Mountain is better exposed than the zone at the Dolly Ann Mine and the ore appears harder and less porous, although analyses show slightly lower iron content (table 1).

BULL PEN CUTS

Weld (1911b) mapped two open cuts, known as the Bull Pen Cuts, about 1 mi (1.6 km) northeast of the Dolly Ann Mine (fig. 4). The larger cut is about 75 ft (22.9 m) in diameter and 20 to 25 ft (6.1 to 7.6 m) deep. Although the Bull Pen Cuts are on strike with the Dolly Ann and Iron Mountain Mines, the iron at this location is found in an isolated pocket in Lower Devonian beds, apparently the result of a flexure fold. The Bull Pen Cuts probably were worked concurrently with the two adjacent mines. The Lineway Mine, located about one-quarter mi (0.4 km) east of the Bull Pen Cuts outside of the study area (fig. 7), consisted of underground workings in the Oriskany ore-bearing horizon.

LIMONITE DEPOSITS

The syncline paralleling Pounding Mill Creek provides a favorable geologic setting for deposition of Oriskany-type deposits; the Dolly Ann Mine, Bull Pen Cuts, and Iron Mountain Mine are situated along this syncline (fig. 7). However, iron ore exposures are limited to these three occurrences in the study area; excluding Bull Pen Cuts, there is no evidence of mining between the Dolly Ann and Iron Mountain Mines: geologic data and the literature suggest that no ore exists along this zone inside the study area (fig. 7). Resources for the study area (centered around Dolly Ann and Iron Mountain Mines) have been determined based on data collected during the present study (Jones and others, 1982; Lesure and Jones, 1983) and data generated by the U.S. Bureau of Mines (U.S. Bureau of Mines, 1943, 1944b, and 1945; Morrison and Grosh, 1950).

MANGANESE

Although there is no evidence of manganese mining in the study area, two nearby localities have produced limited quantities of manganese.

The Covington prospect is about one-quarter mi (0.4 km) west of the study area boundary, off U.S. Highway 220 (fig. 2). The prospect could not be found, but according to Stose and Miser (1922, p. 104-106), workings consisted of a cut and a short tunnel (adit) in the Ridgeley (Oriskany) Sandstone, near its contact with the Romney Shale. Production was insignificant, with only about 100 lb having been mined.

The Vowles Mine, an abandoned manganiferous-iron mine, is about 1.5 mi (2.4 km) south of the study area (fig. 2). Four adits and several drifts were dug to remove the ore, which ranged in thickness from 18 in. (45.7 cm) to 6 ft (1.8 m). Approximately 400 tons of ore had been removed prior to 1890, and in 1917 and 1918, about 21 carloads of manganiferous-iron ore were shipped to local furnaces. Analysis of the ore mined in 1918 averaged 36 percent iron, 11 percent manganese, and 10 percent silica (Stose and Miser, 1922, p. 107-108).

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Table 1.--*Partial chemical analyses of iron-rich rock samples from Dolly Ann Roadless Area*

[Analyses performed by TSL Laboratories, Ltd., Spokane, Wash. Iron and manganese determined by atomic absorption; silica and phosphorus determined by colorimetric analysis. Symbols used: *, in-place sample; **, ore-dump sample; F, float sample]

Sample number	Thickness (feet)	Fe	P	Si	Mn
				(percent)	
Dolly Ann Mine					
VDA-35**		40.0	0.27	14.1	0.02
36*	1.8	58.8	.68	1.4	.21
37**		44.0	.48	11.0	.06
38*	4.0	58.0	.94	.47	.08
39**		48.3	.15	7.1	.09
41*	4.7	50.1	.17	4.9	.30
42**		47.6	.33	9.2	.05
Iron Mountain Mine					
VDA-37*	3.0	44.0	2.81	5.6	.06
19* (upper half)	13.8	53.9	.55	3.5	.20
20* (lower half)	13.8	48.0	.61	4.5	.18
21**		48.0	.73	6.6	.10
23*	3.8	44.0	.59	6.6	3.79
24**		40.0	.35	13.0	.14
25*	5.8	49.7	.44	2.6	.74
27*	7.2	40.0	.59	11.0	1.40
28**		44.0	.54	8.0	.08
29*	3.0	44.0	.96	4.0	.06
30*	4.0	56.1	.96	4.0	.16
Bull Pen Cuts					
VDA-32*	3.8	26.0	.98	21.5	.04
Rose Hill Formation					
VDA- 3*		20.0	.21	36.7	.04
9F		20.0	.09	30.1	.02
44F		16.8	.31	32.2	.006

Table 2.--*Iron-ore production for properties in the Clifton Forge iron district*

Property (mines)	Tonnage (long tons) Produced	Reserves remaining	Recorded years for iron production	Iron-ore analysis (%)	References
1. Jordan (includes 16 minable ore bodies; largest ones are shown in fig. 1)	330,000	175,000	1906-1920	43.81	Low Moor Iron Company of Va.(1923); Weld (1912a)
2. Rumsey	90,180	NA	1900-1903	NA	Low Moor Iron Company of Va.(1923)
3. Dolly Ann	897,239	Exhausted	1848-1921	44.32	Low Moor Iron Company of Va.(1923); Merrill (1943)
4. Iron Mountain	(3 and 4 combined)	350,000 open pit 100,000 underground	1893-1900	43.27	Same as Dolly Ann
5. Moore and Haynes	900	NA	1906-1908	NA	Weld (1912b)
6. Victoria	NA	Probably exhausted	NA	NA	Merrill (1943)
7. Longdale	101,432	Exhausted	1914-1919	48.20	Low Moor Iron Company of Va.(1923)
8. Charter Oak (Alexander, Merry Hill) (Iron Gate)	NA (Oriskany ore) NA (Clinton ore)	NA NA	Early 1890's Early 1890's	NA 46.5 (Clinton ore)	Weld (1912c); Harder (1909)
9. Callie	164,287	some underground 115,000	1882-1914	46.10	Merrill (1943); Lesure (1957); Weld (1912d)
10. Wilton	632,086	some underground 37,000	1882-1914	42.00	Weld (1912d); Lesure (1957)
11. Circle	129,936	Exhausted	1895-1916	NA	Lesure (1957); Merrill (1943)
12. Low Moor (Low Moor Mine) (Horse Mountain Mine)	967,640 (Oriskany) 85,000 (Clinton)	Exhausted NA	1875-1898 NA	46.52 50.90	Weld (1911b); Merrill (1943); Harder (1909)
13. Rich Patch	396,709	125,000	1891-1923	41.16	Weld (1911c); Merrill (1943); Lesure (1957)
14. Roaring Run	NA	100,000	1864-1865	NA	Hotchkiss (1882); Weld (1913b); Bruce (1931); Lesure (1957)
15. Tredegar (Grace and "O" Mines)	NA	NA	1860-1906	37.10 (average)	Morrison and Grosh (1950); Lesure (1957)
16. Lignite	over 1,000,000	975,000 open pit 250,000 underground	1896-1923	45.88	Merrill (1942, 1943)
17. Fenwick	938,560	1,000,000	1875-1923	44.13	Low Moor Iron Company of Va.(1923); Morrison and Grosh (1950)

NA = Not available

MAPS SHOWING MINES, PROSPECTS, AND MINERAL LOCALITIES IN AND NEAR THE DOLLY ANN ROADLESS AREA, ALLEGHANY COUNTY, VIRGINIA

By
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1986

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