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GEOLOGY AND MAGNETITE DEPOSITS OF THE DEAD CREEK AREA, CRANBERRY LAKE QUADRANGLE, NEW YORK

By A. F. Buddington and B. F. Leonard

INTRODUCTION

As part of a program to aid in the development of iron ores in the Eastern States, the Geological Survey, U. S. Department of the Interior, began in 1943 the systematic geologic mapping of the Stark and Cranberry Lake quadrangles, New York. These areas lie within the northwest Adirondack magnetite district. A preliminary report on the work of 1943 has been issued.1/ On the last day (October 19th) of the 1943 field season, while engaged in geologic mapping of the Cranberry Lake quadrangle, B. F. Leonard found a small outcrop of magnetite-bearing gneiss just west of the Dobson trail, about 2½ miles south-southeast of Wanakena (pl. 1). During the field season of 1944 this locality was reexamined. Additional outcrops and float indicate a layer of low-grade iron ore for a length of about 500 feet. Dip-needle readings further indicated a magnetic anomaly of strong intensity over the exposed mineralized zone with substantial extension in each direction. Systematic detailed geologic mapping and reconnaissance dip-needle traverses were therefore undertaken to outline the areas of mineralization and the approximate position and trend of magnetic anomalies (pl. 2). The present report is based on five weeks' field work by the authors. The existence of local areas south of Wanakena where the compass was undependable has long been known to hunters in this region, but to our knowledge the occurrence of outcrops of low-grade ore and of belts of strong magnetic anomaly has not previously been reported.

Summary of results.--Within an area of about 6,800 by 7,600 feet, many exposures of rock show lean mineralization with magnetite, a few outcrops of low-grade ore, and several long lines of magnetic anomaly. Two belts of magnetic anomaly have particularly good characteristics

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1/ Buddington, A. F. and Leonard, B. F., Preliminary report on the eastern part of the northwestern Adirondack magnetite district, New York: Geological Survey, U. S. Department of the Interior, Washington, 1944.

indicative of magnetite ore. One, Dead Creek No. 1, has a length of about 3,800 feet within the +20° isoclinal line (magnetic contour); 2,500 feet of this has values for the dip of +60° and greater. Several outcrops of magnetite gneiss are exposed along 500 feet of one part of the anomaly, and in one section a true thickness of 30 feet of ore (estimated 20-40 percent iron in magnetite as disseminated ore and occasional thin seams of lump ore) may be conservatively inferred, with neither footwall nor hanging wall exposed. The other belt with strong anomalies, Dead Creek No. 2, is about 2,000 feet long within the 20° isoclinal. The belt is compound, 425 to 500 feet wide, and contains several bands of magnetic anomaly. One band showing maximum dip values +60° or greater is about 1,000 feet long. There are two parallel bands of anomaly, each 800-900 feet long within the +30° isoclinal, and another anomaly perhaps 900 feet long within the -30° isoclinal. There are in addition a number of small bands of anomaly of moderate to high intensity. This belt as a whole is bordered on the west by an additional zone, perhaps 200 feet wide, with low (± 10 percent) magnetite impregnation. It is inferred from these data that veins of low-grade magnetite ore with an aggregate length of over 3,500 feet are present along the belts of Dead Creek No. 1 and 2 anomalies.

In addition to these two magnetic anomalies there are several others, generally with low to moderate intensity, which have an aggregate length of over 6,000 feet. Local short sections of these, totaling over a thousand feet, have a high intensity and may indicate additional local magnetite ore shoots.

An aggregate of more than 6,500 lineal feet of magnetic anomaly effectively shows inclinations of 40° or more on the dip needle and deserves further investigation.

LOCATION AND ACCESSIBILITY

The area of mineralization (pl. 1) lies 1½ to 3 miles south-southeast of the village of Wanakena and 6 to 7 miles southeast of the magnetite ore deposits at Benson Mines. The area is shown on the Cranberry Lake topographic sheet of the U. S. Geological Survey. Wanakena is about a mile by macadam road from a main concrete highway (Route 3). The area lies within the Adirondack park and is part of New York State-owned lands. The New York State Conservation Commission maintains two roads which extend from just south of Wanakena to High Falls and Dead Creek Flow, respectively. These are not open to the public for use of vehicles but are available as foot trails. In addition the Conservation Commission keeps open three foot trails which make the area quite accessible. These are the Glasby Creek trail on the east, the Dobson trail through the center, and the Leary trail on the west.

GEOLOGY

Dead Creek syncline.--The bedrock of the area (pls. 1 and 2) consists in general of metasediments with two intercalated sheets of granite gneiss, in large part contaminated with biotite, sillimanite, or garnet. These rocks form a small syncline that is completely surrounded by and lies in a mass of generally uniform hornblende granite gneiss (hg on pls. 1-2), which is the predominant rock of the region. The granite (gg) and metasediments (gm) are of pre-Cambrian age; the metasediments are part of the Grenville series.

The foliation and bedding of the Grenville rocks are parallel. There is, so far as noted, complete parallelism also in the foliation of the Grenville rocks, the intercalated granite sheets, and the surrounding gneissoid granite. The magnetite deposits, insofar as seen, are likewise tabular bodies conformable to the foliation of the rocks in which they occur.

The syncline (pl. 1) is elongated in a generally west-northwesterly direction with the longer axis about 2-1/3 miles long and the shorter axis 1-1/3 to 1-2/3 miles long. The south limb of the fold has been forced over toward the north to form an overturned isoclinal fold with dips generally between 10°-30° to the south (pl. 2). The southeastern part of the south limb of the syncline has been forced northward relative to the extreme western part, with a narrowing of the eastern part of the synclinal structure and a northeastward bend and drag of the formations along the southeast side of Dead Creek. About two-thirds of a mile west-northwest of the summit of Roundtop Mountain the dips, coming south and east along the strike, change successively from 30° E. through vertical to 25° S. as a result of the overturning of the south limb.

Several gentle minor folds are present in the west-central part of the syncline just north and west of the crossing of the Dobson trail and the north branch of Dead Creek. In addition, small isoclinal puckers are found in the Grenville beds and some of the sillimanite granite gneiss.

Most of the rocks in the western part of the syncline have a strong linear structure as a result of the parallel orientation of certain of their minerals with their longer axes striking generally S. 20° to S. 35° E. and plunging gently south-southeast. In some gneisses of the Grenville series a linear structure of similar orientation is given by strong ribbing in the foliation surface, or by elongated pegmatite stringers.

Metasediments of the Grenville series.--The metasediments of the Grenville series comprise biotite gneiss, locally sillimanitic and garnetiferous, feldspathic and scapolitic pyroxenic quartzose gneisses or granulites, pyroxene-scapolite gneisses, and a subordinate amount

of pyroxene skarn. The biotitic gneisses which are interpreted as originating through the metamorphism of shales, commonly have a variable amount of thin granite pegmatite in layers parallel to their foliation and may therefore be called migmatites, or mixed rocks. The quartzose gneisses are thought to be metamorphosed feldspathic or calcareous sandstones. The skarn is the result of recrystallization and hydrothermal replacement of original limestone beds to yield pyroxene aggregates.

Locally the metasediments of the Grenville series carry a little disseminated pyrite and weather rusty brown.

In places throughout the area small granite pegmatite veins contain black tourmaline. Nodules of black tourmaline aggregates are also found locally in the biotite gneisses.

Granite gneiss.--The granite gneiss of the intercalated sheets (shown by symbol gg on pl. 2) is commonly a fine-grained, pink, granulose rock, usually crumbly at the weathered surface. At many places throughout its extent the gneiss carries small partings, schlieren, layers, or laminae of partly granitized biotite or biotite-garnet gneiss of the Grenville series. It is possible that some of the layers of Grenville are sufficiently continuous so that they separate the granite gneiss into discrete sheets and that at least locally these constitute a composite sheet of two or more parts. Outcrops are not sufficiently continuous to permit proof of this possibility.

Microcline (occasionally another potash feldspar) is by far the most abundant feldspar in the granite gneiss of the intercalated sheets, whereas microperthite preponderates in the hornblende granite gneiss (shown by symbol hg on pl. 2), the country rock surrounding the syncline. Hornblende has not been observed in the granite gneiss of the intercalated sheets, except where the granite gneiss is associated with pyroxene gneisses of the Grenville series. Biotite, garnet, or sillimanite occur in much of the microcline granite gneiss; in places they are abundant. These minerals have been derived, it is thought, from portions of metasediments of the Grenville series incorporated in the granite magma. The sillimanite occurs as small, elongate bundles of fibers whose parallel orientation defines the linear structure. Locally the sillimanite is sufficiently concentrated to form small, flattened, elongated, fibrous discs or platy lenses, which appear as projecting white fins on a weathered surface. Small red garnets are present at many places within the granite gneiss and are especially noticeable in the sheets forming the north limb of the eastern part of the syncline. Garnet is conspicuously more abundant than sillimanite southeast of Dead Creek, in the granite gneiss of the north limb of the syncline, but the relative amount of sillimanite is much greater northwest of Dead Creek. In contrast, the granite gneiss of the south limb of the syncline, southeast of Dead Creek, contains little or no garnet or sillimanite.

Superposition of rock layers.--The superposition of rock layers in the syncline is given below:

Superposition of rock layers in Dead Creek syncline

Rock Layers	Thickness in feet		
	Western part	Eastern part	
		North limb	South limb
Metasediments (including pyroxene skarn) and mixed rocks of the Grenville series.			
Granite gneiss, in part sillimanitic or garnetiferous. The two major anomalies lie within this unit.	+ 575	± 400	150 to 225
Metasediments and mixed rocks of the Grenville series.	175-275	± 150	± 50
Granite gneiss, in part sillimantic or garnetiferous.	350-425	± 225	300 to 400
Metasediments (including subordinate pyroxene skarn) and mixed rocks of the Grenville series.	± 200	± 125	± 50 - 100
Hornblende granite gneiss; major country rock.			

It will be noted that the aggregate thickness of the two granite gneiss sheets northwest of Dead Creek is 925 to 1,000 feet, whereas the aggregate thickness southeast of Dead Creek is only 450 to 625 feet. The greater thickness of granite gneiss in the west, resulting in additional strength, may have buttressed the western part of the syncline against squeezing, thus permitting it to retain a greater north-south width. The Grenville rocks likewise are thicker on the northwest than on the southeast. This may be in part the result of differential flow toward the keel of the syncline.

MAGNETIC ANOMALIES AND MAGNETITE MINERALIZATION

Introduction.--There are many outcrops in the western half of the Dead Creek syncline that show a distinct but relatively low percent of magnetite, although there are only a very few that carry as much as 20 percent of magnetite or that are located along zones of intense magnetic anomaly. Any ore veins that are present, therefore, can be delineated only by a systematic survey for magnetic anomalies. Much of the area of the syncline, especially the central and western part, yields low magnetic anomalies. The entire valley of Dead Creek and the lowland between its headwaters and the Leary Trail fail to show any but minor anomalies. This low ground is almost completely covered with surficial material unknown thickness. The presence of overburden may partially account for the low readings here.

Dip-needle values of less than 20° were found (in all cases where outcrops were available for observation) to be directly over rock carrying magnetite in relatively small quantities or overrocks of too low grade to be considered ore. Only lines of anomaly with readings of intensity of 20° or greater are therefore shown on the map (pl. 2). This is a reconnaissance map based on pace and compass traverses supplemented by rough picket lines across the strong anomalies. The traverses across all anomalies except No. 5 range from 100 to 500 feet apart and are commonly 200-300 feet apart. Alternate interpretations might have been made in connecting the lower magnetic readings, but it is believed that the map gives a generally correct picture of the moderate to strong anomalies and affords a basis for planning the future detailed magnetic survey which would be necessary before undertaking further prospecting.

The magnetite deposits indicated by Dead Creek magnetic anomalies Nos. 1, 2, 5, and 6 occur within sheets of granitic gneiss intercalated in beds of the Grenville series. This is the same mode of occurrence as that of the magnetite deposits drilled at Jarvis Bridge (1½ miles east of Newton Falls) and at the Parish property (6½ miles east of Degrasse). In all three places the granite gneiss is intrusive into a bed of biotite gneiss of the Grenville series, in part garnetiferous or sillimanitic, which in turn occurs within a series of pyroxenic gneisses. The ore-bearing granite gneiss in all three places has microcline as the predominant feldspar and is contaminated with biotite, sillimanite, or garnet incorporated from the Grenville beds. The Parish and Jarvis Bridge deposits appear, from the drilling results, to be more or less uniform, tabular, low-grade ore bodies. The magnetite deposits indicated by Dead Creek anomalies Nos. 1 and 2 may be expected to be similar.

The country rock underlying Dead Creek anomalies No. 3 and No. 4 is uncertain; No. 7 is in the contact zone between granite gneiss and Grenville, and No. 8 is in the Grenville. There is too little evidence now at hand to predict what the nature of these deposits may be. At anomaly No. 7, magnetite was seen to occur in thin sills of granite gneiss, in feldspathic quartzose gneiss of the Grenville, and in pyroxene skarn.

Dead Creek anomaly No. 1.--Dead Creek anomaly No. 1 is located near the Dobson trail 0.6 mile northeast of the summit of Roundtop Mountain. It is 3,800 feet long within the +20° isoclinal. Of this, 2,500 feet is effectively within the 60° isoclinal and yields values up to 90° or more, both positive and negative. The width of the anomaly with intensity greater than 20° ranges from 100 to 440 feet. There is a strong negative anomaly along the north border. The south part of this negative anomaly was observed to be directly over ore in one section. Very high negative readings are also found locally within the general zone of positive anomalies and in two places were observed likewise to be directly over ore. The strike of the anomaly appears to be conformable with the trend of the geologic formations, except at the east end. Here the anomaly turns south and transects the strike of the foliation and the different belts of rock. No indications of magnetite adequate to cause the magnitude of this part of the anomaly were seen in the several outcrops within its area. It is possible that this part of the anomaly marks the trace of the east edge of the magnetite ore body where it dips south beneath the surface. A rather uniform low positive (about 10°) anomaly extends for over a thousand feet continuously to the south of the main anomaly and may in part be due to gently dipping ore beneath this area.

The only bedrock exposed within the belt of the intense anomaly is low-grade ore which crops out on the Dobson trail and may be traced by several exposures and float for a distance of over 500 feet to the west-northwest. At one place a true thickness of about 30 feet of ore (estimated 20-40 percent iron in magnetite, with occasional thin seams and layers of lump ore) may be conservatively inferred with neither hanging wall nor footwall exposed.

The ore vein and the anomaly lie within a sheet of granite gneiss intercalated in gneisses of the Grenville series. The granite gneiss sheet is about 150 to 225 feet thick here, and the ore occurs in the uppermost part of the sheet. The ore-bearing zone is actually the lower part of the granite sheet if its proper stratigraphic position is considered, for the sheet is overturned. The dip probably averages about 25° S.

Dead Creek anomaly No. 2.--Dead Creek anomaly No. 2 lies on the south slope of the hill northwest of Dead Creek, about 1,300-1,800 feet west of the Dobson trail. A line of low anomaly can be traced from the west side of Dead Creek, opposite the end of Dead Creek anomaly No. 1, to the belt of Dead Creek anomaly No. 2. The evidence, however, is thought not to be sufficiently conclusive to warrant treating No. 1 and No. 2 as parts of the same anomaly, though they may be. If the latter is true, the dip of the ore-bearing rock may be expected to change from gentle southeast (east of Dead Creek) through vertical (a short distance northwest of Dead Creek) to 30°-40° E. (where the strike is north). Dead Creek anomaly No. 2 is not a single, simple anomaly but a belt of anomalies. The belt within which values of inclination for the major anomalies are 20° or greater is about 2,000 feet long, with a width of 425 to 500 feet.

The band of most intense anomaly within this belt is about 950 feet long and effectively within the 60° isoclinal. The width within the 20° isoclinal for this anomaly is 100 to 175 feet. Parallel to this anomaly on the west is another anomaly 800 feet long effectively within the 30° isoclinal and about 75 feet wide within the + 10° contour. Again to the west there is a parallel band of equally intense magnetic anomaly 900 feet long and 100-175 feet wide within the + 10° isoclinal. To the north of these last two anomalies there is a belt of negative anomaly 1,700 feet long within the -20° isoclinal and with a substantial length within a -40° isoclinal. There are in addition a number of small localized anomalies of moderate to strong intensity. The band of moderate negative anomaly is probably due to low-grade magnetite mineralization beneath.

No bedrock was observed within the bands of moderate to strong positive anomaly. At one place in the hanging-wall zone, several boulders of lump ore were seen, and at another place an outcrop exposed several feet of low-grade magnetite ore. One outcrop of low-grade magnetite ore was observed in a local zone of moderate negative anomaly.

West of the belt of anomalies under discussion, along the east side of a small creek valley, there is a belt of magnetite-bearing sillimanitic granite gneiss about 200 feet or more wide and 1,000 feet long with a number of good exposures. The gneiss carries disseminated magnetite, together with magnetite-bearing quartz veins or feldspathic quartz veins, and magnetite-bearing granite pegmatite seams. The percent of magnetite varies from 5 to 20 but in general probably is about 10 percent. Low negative dip-needle readings (-10°) are commonly obtained in this zone.

The magnetite-bearing outcrops and the belt of anomalies all lie within the same sheet of granite gneiss as that which carries Dead Creek anomaly No. 1. The sheet of granite gneiss, however, is much thicker (± 575 feet) in the vicinity of anomaly No. 2 and usually carries some sillimanite. Locally thin layers and schlieren of biotite gneiss are present. The foliation and anomalies strike about true north, and the structure dips 30°- 40° E. There may be a true thickness of 350-400 feet of gneiss here, carrying magnetite (in part lean impregnations, in part low-grade ore) interleaved with some barren layers, for a length of 1,800 feet or more.

Dead Creek anomaly No. 3.--Just west of the head of Dead Creek is a zone of low to moderate magnetic anomaly. The zone is about 400 feet wide and perhaps 700 feet long. There are not outcrops; hence the nature and significance of the anomaly can be evaluated only after detailed work has been done.

Dead Creek anomaly No. 4.--On a gentle rise within a swampy area in the outermost part of the southwest bend of the syncline is a narrow belt of anomaly about 650 feet long with maximum inclination rather consistently between +30° and +40° but occasionally reaching 60°. The width within the +15° contour is in general probably less than 100 feet. There are no outcrops.

Dead Creek anomaly No. 5.--In the lower granite sheet in the western part of the syncline is an anomaly which, on one traverse, showed several high readings. These, however, do not appear to extend very far. Outcrops along this general band show both pink sillimanitic granite gneiss and biotitic migmatite. Some of the layers are rusty-weathering pyritic gneiss.

Dead Creek anomaly No. 6.--In the northern part of the lower granite sheet, about a quarter to half a mile east of the Dobson trail, is a narrow band of magnetic anomaly about 1,750 feet long which has moderate to high intensity. All but the northwestern 600 feet of this anomaly has a width within the 10° isoclinal of only 50 to 60 feet. The greatest intensity is at the northwestern part, where the anomaly is about 100 feet wide within the ±10° isoclinal. Only one outcrop was seen within this anomaly. It is near the northwest end and consists of sillimanitic granite gneiss with about 20-30 percent magnetite by volume as disseminated grains, discs, and lumps.

Some 400 feet northeast is another narrow anomaly, several hundred feet long but of only low to moderate intensity.

Dead Creek anomaly No. 7.--East of the Dobson trail a magnetic anomaly is located on the north border of the lower granite sheet in the contact zone between granite gneiss and metasediments of the Grenville series. The zone of anomalies is shown on the map for a length of 1,100 feet. Outcrops showing magnetite mineralization indicate an extension of the mineralized zone for another thousand feet southeast. The anomaly will have to be surveyed in detail to evaluate its significance. Outcrops of granite interlayered with pyroxene skarn and with gneiss of the Grenville series, in part pyritic, form the edge of the hill south of the mapped anomaly. Layers in which the content of magnetite varies from lean impregnations to low-grade or medium-grade mineralization are visible in skarn and gneiss of the Grenville and in granite gneiss. No outcrop, however, exposes sufficient width to permit determination of the thickness of the mineralized zone or the relative amount of lean to barren rock in the zone. The maximum dip-needle values for the most part appear to be of moderate intensity.

Dead Creek anomaly No. 8.--A little over a third of a mile northeast of Benchmark 1901 on the Dobson trail, a compound magnetic anomaly 200-400 feet wide and 700-800 feet long is present. Parts of the anomaly are of high intensity. Only one outcrop was noted within the area of the anomaly. It comprises coarse green pyroxene skarn and rusty-weathering, pyritic quartzose gneiss. The gneiss in part carries thin layers, veinlets, and disseminations of magnetite. Outcrops bordering the anomaly are of skarn, locally garnetiferous, and quartzose feldspathic gneisses, locally pyroxenic. A little pink granite is present, but the dominant country rock belongs to the Grenville series. An outcrop on the border of the anomaly is in part garnet-pyroxene skarn with low-grade magnetite mineralization. Locally there is abundant float of rusty gneiss with lean to low-grade magnetite mineralization.