DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TO ACCOMPANY MAP MR-51

IRON IN THE UNITED STATES
(Exclusive of Alaska and Hawaii)

By

M. S. Carr, P. W. Guild, and W. B. Wright

INTRODUCTION

The iron-ore deposits in the United States (exclusive of Alaska and Hawaii) are shown on the accompanying map; many iron-bearing deposits that are of lesser or only potential value are also shown. Because these deposits range widely in extent, two general categories of symbols are used, each of which is subdivided as explained below. The first category is for deposits of such restricted extent that they can be represented by a "spot"; the second is for deposits which, although not necessarily extremely large in terms of volume or tonnage, are either continuous (or essentially so) or clustered in reasonably well-defined districts of numerous small occurrences.

Iron is a common element in the earth's crust, being second only to aluminum among the metals. It has been concentrated by a number of natural processes into deposits of different genetic types which reflect, to some degree, their histories in their shapes, habits, and mineralogy. There is no concensus among geologists on the exact origin of all deposits nor complete agreement on a genetic classification, but a generalized subdivision has been made based on these characteristics. The shapes of the symbols indicate the types to which the deposits are assigned.

Size categories for deposits of restricted extent are shown by the size of symbol; both past production, if any, and estimated resources were included in determining size. The limits 200,000, 5,000,000, and 50,000,000 long tons of ore are intended to show order of magnitude only; the authors make no pretense of absolute accuracy in them. The relative importance of extensive deposits of bedded ores is suggested by solid and dashed lines and by two sizes of mine symbols. Areas of extensive though not necessarily important brown ore and iron-carbonate deposits are indicated by stippled patterns.

Many deposits are numbered by State on the map and identified by number in the index. The index also gives the geographic coordinates and brief geologic descriptions. Both published sources and data in the files of the Geological Survey were used in compiling the map; one or more references to published descriptions are cited in the index. More information on the numerous deposits which are not identified on this map can be found in reports on individual States or districts in the references cited.

Iron, and steel derived from it, is used in far larger amounts than any other metal, and its price is markedly lower than those of the others. Consequently, to be economically significant today, iron ore deposits must be large and either high grade with generally 50 percent or more metallic iron or capable of being concentrated or beneficiated to at least this grade. Furthermore, the size and complexity of modern furnaces, plus the increasingly stringent standards for high-quality products, make uniformity of feed extremely desirable. As a result, very many deposits that were formerly mined to supply local mills, and others that would have been worked had they been near a market, are of little or no interest now. Conversely, the development of techniques to beneficiate low-grade materials to uniformly high-grade products has led to the mining of deposits that until very recently were of no commercial interest.

Iron combines with oxygen, carbon dioxide, sulfur, and silica in a number of ore minerals. The oxides, hematite (Fe_2O_3) and magnetite (Fe_3O_4), and various hydroxides which may be grouped as "limonite" ($Fe_2O_3.nH_2O$)are by far the most common and important. Some siderite ($FeCO_3$) is mined, but more commonly only the near-surface materials now altered to limonite are used. Sulfides such as pyrite (FeS_2), marcasite (FeS_2), and pyrrhotite (FeS_1-x) yield iron oxide or hydroxide through natural weathering or as a byproduct of roasting for their sulfur content. Many silicates contain iron. Chamosite (a complex iron-magnesium-aluminum hydrated silicate) is the only one that has been used directly as an ore, principally in Europe; however, very large deposits of "limonite" have been derived from silicates by leaching, oxidation, and hydration.

SEDIMENTARY DEPOSITS

Sedimentary beds of iron-bearing minerals mixed with greater or lesser amounts of ordinary rock-forming minerals (such as quartz, clay, and calcite) have been deposited under specialized conditions. These ferruginous beds may extend for very long distances and have thicknesses measured in hundreds of feet; they constitute by far the largest concentrations of iron known. Normally they are too low grade to be smelted directly.

For reasons still not clearly understood, although probably related to the composition of the primitive atmosphere and perhaps to the evolution of plants, most of the major "iron-formations" were deposited 1½ to 2½ billion years ago in Precambrian time. Subsequent geologic events have altered (metamorphosed) them in various ways, creating new minerals, changing their grain size, and otherwise notably affecting their amenability to concentration to ore-grade materials by either natural or artificial methods. In the Lake Superior region, where the largest Precambrian iron-formations of the United States are situated, long-continued leaching of the nonferruginous minerals at or near the surface and downward concentration of the iron produced numerous deposits of "direct-shipping" ores that constituted our major supply for many decades. Many plants have been constructed in recent years to beneficiate the unweathered lower grade material, and others are under construction. Magnetic methods are used on the magnetite-bearing material (taconite), and flotation or other processes on the nonmagnetic hematite-bearing material (commonly called jaspilite or, in places, semitaconite) to produce concentrates containing 63 percent or more iron that are ordinarily pelletized for shipment and use. The Mesabi district (range) in Minnesota is our largest resource and is undergoing the greatest development.

Additional areas of Precambrian metamorphosed sedimentary iron-formation occur in widely scattered areas in South Dakota, Wyoming, Montana, and Arizona. At present only one, at Atlantic City, Wyo., has been developed for mining, but in aggregate these deposits constitute a large resource for future needs. Some deposits in New York and New Jersey have been attributed to this origin by various geologists, although this is strongly disputed by others. If the deposits were originally sedimentary, the primary features have been strongly masked by deformation, metamorphism, and igneous activity.

Iron sedimentation occurred at various times and places during the Paleozoic Era. In Silurian time thin but very widespread ferruginous beds containing oolitic and fossiliferous hematite were deposited from New York to Alabama. In general, they are not sufficiently thick or rich to constitute ore, but in places, particularly in the Birmingham district, Alabama, they have been mined extensively. These "red" or "Clinton" ores, as they are usually called, contain rather large amounts of calcite, in contrast to most Precambrian sedimentary ores, and where unweathered require little or no limestone to flux the silica. This self-fluxing characteristic and the geographic advantages of nearby fuel, any additional limestone needed, and a large market have enabled ores averaging less than 40 percent iron to be smelted. Leaching of the hard carbonate ores produced near-surface soft ores ranging up to nearly 60 percent iron. These furnished much of the furnace feed in earlier days, but they are now essentially exhausted; use of the hard ores is also declining rapidly under competition from better ores brought in from elsewhere.

Lenses and nodules of iron carbonate, which may be in part altered to limonite, are abundant in rocks of later Paleozoic, chiefly Pennsylvanian, age in western Pennsylvania, Ohio, and adjacent states. Although some ore was mined in the 19th century, the deposits have no importance today. Similar deposits of Cretaceous age in the Atlantic Coastal Plain were also formerly mined in Maryland. Sideritic ores in eastern Texas are believed to have been derived from glauconite (a hydrous silicate of iron and potassium) deposited in early Tertiary strata; as the siderite is itself secondary and closely associated with limonite these ores are included with the brown ores on the map. Reserves are considerable and the ores are being actively mined.

Erosion, mechanical transportation, and deposition of iron minerals, generally magnetite and hematite, have formed deposits of black sands that in a few places are large and rich enough to be exploited. Examples range in age from Precambrian to the present; many of the deposits contain considerable titanium and a few have chromium and nickel as well, showing their derivation from mafic or ultramafic igneous rocks.

DEPOSITS WITH IGNEOUS AFFILIATIONS

Many iron ore deposits occur in igneous rocks or are closely associated with them spatially; others are crosscutting veins or irregular replacements in sedimentary rocks, indicating that the iron was introduced after deposition of the enclosing rocks. These have been divided into two groups, (1) massive deposits with little or no titanium and (2) titaniferous magnetite.

The first group comprises many types, lumped together on the map for simplicity, that may have little or nothing in common or, indeed, may have originally been sedimentary. Many of the largest and richest massive deposits are replacements of limestone by magnetite or, less commonly, specular hematite, at or near contacts with intrusive rocks. Dark, iron-rich silicate minerals, predominantly pyroxene and garnet, form an assemblage with the iron oxides commonly called "skarn." Sulfides of iron, copper, and other minerals may be present in greater or lesser amount. Examples are the Hanover-Fierro deposits, New Mexico, Eagle Mountain and Shasta, California, Iron Springs, Utah, Running Wolf, Montana, and many others. Most massive deposits are associated with moderately granitic rocks; but the Cornwall, Grace, and smaller deposits in Pennsylvania occur at the contact of Triassic diabase with lower Paleozoic limestone and dolomite. The ore minerals are ordinarily much coarser than in the taconites; hand sorting and magnetic cobbing can produce shipping-grade products. In recent years, however, the advantages of the very high grade pellets have caused a shift toward fine grinding and concentrating of these ores also.

In a few places, notably in Missouri and Nevada, iron oxides have replaced or formed breccia fillings in volcanic rocks and associated porphyritic hypabyssal intrusive rocks. The presence of apatite, scapolite, fluorite, and other minerals with volatile components suggests that these deposits have at least some genetic affiliations; specific features differ considerably, however, and the relationship is probably not close.

Iron sulfides and carbonates related to igneous and (or) hydrothermal processes are known in many places. However, as the commercial ores derived from them are nearly always the result of subsequent near-surface oxidation and hydration, these deposits have been shown as brown ores on the map. Examples are the deposits at Red Cliff-Battle Mountain, Colo., Cartersville, Ga., and Ducktown, Tenn.

Iron deposits associated with gabbro, anorthosite, pyroxenite, and related rocks ordinarily have some titanium, which may be in the iron mineral itself, usually magnetite, or as one or more separate mineral phases, usually ilmenite or ulvospinel. Up to about 1 percent vanadium is ordinarily also present. Titanium is a deleterious element in the blast furnace, and its presence has long deferred use of these ores for production of iron and steel. In places, however, notably at Lake Sanford, N. Y., the ore contains enough titanium and is sufficiently coarse-grained to enable titanium- and iron-rich fractions to be separated. The vanadium concentrates with the iron but is not recovered commercially in the United States. Other large deposits are at Iron Mountain, Wyo.; Iron Mine Hill, R. I.; and in the San Gabriel Mountains, Calif.; and numerous smaller deposits occur along and near the base of the Duluth Gabbro Complex in northeasternmost Minnesota.

Small magnetite bodies are associated with nepheline syenite and related silica-deficient mafic igneous rocks at Magnet Cove, Ark., and Cebolla Creek, Colo. Titanium minerals accompanying them include rutile and brookite; the occurrences differ from the preceding type by having appreciable niobium as well as vanadium. All deposits known in the United States are too small and low grade to have any present commercial value, however.

RESIDUAL ORES

Near-surface solution of silica, carbon dioxide, sulfur, and other constituents and their removal by ground water has concentrated iron into many deposits, which are here lumped together as brown ores. The iron may simply remain behind, or it may move in solution also and reprecipitate, generally as one or more hydrous oxides of the limonite type, although under special conditions hematite may form. The process has been operative over much of geologic time, and examples are known which date from late Precambrian to Recent. The source of the iron compounds may be obvious, as for the soft ores of the Mesabi Range, the laterites of Oregon and Washington, the gossans at Ducktown, Tenn., and elsewhere, or the brown ores of eastern Texas. On the other hand, very numerous deposits in the Appalachian region occurring on the Cambrian and Ordovician strata (the so-called valley ores) or the Devonian Oriskany Formation (the mountain ores) probably collected iron from widespread, very lean sources that have not been definitely identified. The deposits apparently owed their localization to topographic position during the erosion cycle under which they formed.

The Gulf Coastal Plain and vicinity is the locus of by far the greatest accumulation of brown ores; these formed on Paleozoic rocks at or near the overlap of Cretaceous strata, on the Cretaceous, and particularly on lower Tertiary formations such as the Clayton Formation in Georgia and Alabama, and the Weches Greensand in Texas. Brown ores formed also on Cambrian and Ordovician rocks on the Ozark Plateau surface in southern Missouri and northern Arkansas, in the Arbuckle Mountains of Oklahoma, and in Fillmore County, Minn.

The brown ores were among the first to be exploited, and large quantities of ore are still obtained from them. Individual deposits are generally small, however, and few lend themselves readily to large-scale mechanized mining. This, together with the fact that the largest and most accessible deposits have been largely depleted, dictates a decreasing future importance for these ores.

OTHER DEPOSITS

Two types of deposits, bog ores and "filled sink" deposits, have been distinguished from the foregoing as "unspecified." Neither is of economic significance today, though each has been productive in earlier times. Though quite different in appearance, there is a certain tenuous genetic relationship, for each seems to have formed by transportation in, and deposition from ground waters in a terrestrial environment.

Bog ores are accumulations of limonite in present-day swampy areas where drainage from areas of iron-bearing rocks furnishes solutions from which hydrous iron oxides accumulate with such matter as decaying organic material and clay. Most deposits are small and low grade; the principal ones shown are in western South Dakota.

The "filled-sink" deposits occur on the Ozark Plateau in central Missouri, where masses of up to about a million tons of hematite and limonite occur in large sink-hole structures in Lower Ordovician carbonate rocks, chiefly the Gasconade Dolomite. The iron was derived from overlying sediments of Pennsylvanian age, carried down in underground channels, and precipitated in sink structures as the sulfides marcasite and pyrite by sulfur-bearing waters below the water table. Subsequent uplift and oxidation altered the sulfides to the oxides. Pyrites have been mined from the downward extensions of many of the structures.

INDEX

Locality	Lat N.	Long W.
ALABAMA		
1. Russellville district. Irregular masses of brown ore overlying Bangor Limestone (Mississippian) at contact with Tuscaloosa Group (Cretaceous). Burchard, 1960.	34°24′–34°36′	87°35′–88°05′
2. Northeastern Alabama. Beds and lenses of "Clinton" hematite in Red Mountain Formation (Silurian). Thoenen and Warne, 1948; Whitlow, 1962.	33°45′–35°00′	85°29′–86°30′
3. Birmingham district. Beds and lenses of "Clinton" hematite in Red Mountain Formation (Silurian). Burchard and Butts, 1910; Pallister and Burchard, 1953; Thoenen and others, 1953.	33°17′–33°47′	86°25′–87°02′
4. Eastern Alabama. Irregular deposits of brown ore in Paleozoic rocks overlain by Tuscaloosa Group (Cretaceous). Burchard, 1938; Brown, Andrew, 1948.	33°00′–34°10′	85°25′–86°44′
5. Bucksville area. Beds and lenses of "Clinton" hematite in Red Mountain Formation (Silurian). Reed, A. H., 1953.	33°04′–33°21′	87°04′–87°21′
6. Woodstock area. Upper Cretaceous to Recent replacement deposits of brown ore overlying Cambrian and Ordovician calcareous rocks; some "Clinton" hematite in Red Mountain Formation (Silurian). Brown, Andrew, 1948; Pallister and Burchard, 1953; Reed, A. H., 1953.	33°03′–33°17′	86°55′–87°14′
7. Talladega area. Bedded metamorphosed specular hematite and magnetite in Cambrian(?) quartzites and phyllites. Smith, 1907; Julihn and Moon, 1945; Reed, D. F., 1949; Pallister and Burchard, 1953.	33°11′–33°17′	86°13′–86°15′
8. Southern Alabama. Brown ore replacement deposits in sand and clay matrix, chiefly in Clayton Formation (Tertiary). Morgan, 1937; Burchard, 1938; Pallister and Burchard, 1953; Hastings and Smith, 1964.	31°08′–31°58′	85°10′–86°42′

Locality	Lat N.	Long W.
ARIZONA		
1. Mineral Hill. Massive hematite and specularite replacement deposits, somewhat cupriferous, in Paleozoic metasedimentary rocks. Harrer, 1964a.	34°14′	114°01′
2. New Planet. Massive hematite and specularite in Paleozoic limestone and schist overlying Precambrian gneiss. Cummings, 1946; Harrer, 1964a.	34°15′	113°58′
3. Seligman-Cowden. Massive hematite lenses in Redwall Limestone (Mississippian) along andesite intrusives contact. Harrer, 1964a.	35°06′	112°53′
4. United Verde. Gossan ore derived from Precambrian sulfide deposits; some specular hematite in veins. Lindgren, 1926; Harrer, 1964a.	34°45′	112°07′
5. Black Hills. Bedded magnetite and hematite (jaspilite), manganiferous in part, in Grapevine Gulch Formation (Precambrian). Harrer, 1964a.	34°34′–34°40′	112°06′–112°10′
6. Black Canyon area (Cleator-Crown King). Bedded magnetite and hematite (taconite), with some manganiferous units, in schist of Yavapai Series (Precambrian). Harrer, 1964a.	33°59′–34°33′	112°09′–112°25′
7. Pikes Peak. Bedded hematite and magnetite (taconite?) in greenstone and schist of Yavapai Series (Precambrian). Farnham and Havens, 1957; Harrer, 1964a.	33°51′	112°25′
8. Apache (Canyon Creek). Bedded hematite (taconite?) at contact of Chediski Sandstone Member of Troy Quartzite (Precambrian) with Mescal Limestone (Precambrian). Harrer, 1964a.	34°01′–34°12′	110°41′–110°46′
9. Zimmerman-Asbestos Points. Massive magnetite replacement deposits in Mescal Limestone (Precambrian). Harrer, 1964a.	33°45′	110°57′
10. Omega mine. Black sand magnetite placer deposit. American Metal Market, 1960; Harrer, 1964a.	32°50′	111°05′

Locality	Lat N.	Long W.
ARKANSAS		
1. Northeastern Arkansas. Scattered brown ore deposits in Ordovician sandstone and chert. Penrose, 1892; Brown, 1953.	36°04′–36°30′	91°10′–91°41′
2. Magnet Cove. Residual fragments of magnetite derived from decomposed nepheline syenite (Cretaceous); some lodestone. Penrose, 1892; Brown, 1953; Erickson and Blade, 1956.	34°27′	92°51′
3. Rison anomaly. Magnetite-bearing peridotite body intrusive into Paleozoic rocks below Coastal Plain sedimentary rocks. Metal Mining and Processing, 1964.	33°58′	92°13′
CALIFORNIA		
1. Hirz Mountain (Jennings). Replacement deposits of magnetite, some hematite, in Nosoni Formation (Permian) and McCloud Limestone (Permian) intruded by Mesozoic quartz diorite. Lamey, 1948, pt. J.	40°54′	122°14′
2. Shasta-California. Replacement deposits of magnetite in McCloud Limestone (Permian) intruded by Mesozoic quartz diorite. Lamey, 1948, pt. K.	40°47′	122°18′
3. Minarets (Iron Mountain). Replacement deposit of magnetite in metavolcanic rocks of unknown age. Trask and Simons, 1948.	37°36′	119°10′
4. Kingston Range. Replacement deposits of magnetite, some martite and hematite, mainly in Pahrump Series (Precambrian) intruded by Kingston Range Monzonite Porphyry (Upper Cretaceous or lower Tertiary). Hewett, 1948.	35°46′	115°55′
5. Iron Mountain-Iron King (Silver Lake). Replacement deposits of magnetite, some hematite, in Tertiary(?) limestone breccia. Lamey, 1948, pt. C.	35°23′	116°18′
6. Cave Canyon. Replacement deposits of magnetite and hematite mainly in Precambrian(?) limestone intruded by diorite porphry. Lamey, 1948, pt. E.	35°04′	116°20′
7. Old Dad Mountain. Replacement deposits of magnetite and hematite closely associated with monzonite, metamorphosed limestone and quartzite of unknown age(s). Lamey, 1948, pt. D.	35°10′	115°52′
8. Vulcan. Replacement deposits of magnetite and hematite in lower Paleozoic limestone near monzonite contacts. Lamey, 1948, pt. F; Severy, 1948.	34°52′	115°35′
9. San Gabriel Mountains. Titaniferous magnetite mainly in pyroxenite facies of Upper Jurassic(?) gabbro-anorthosite. Oakeshott, 1948.	34°22′	118°18′
10. Iron Mountain (Bessemer, Lava Bed). Replacement deposits of magnetite at contact between dolomite and granitic intrusives of unknown age(s). Lamey, 1948, pt. B.	34°39′	116°35′
11. Iron Hat (Ironclad). Replacement deposits of magnetite and hematite chiefly in Paleozoic limestone near granite contacts. Lamey, 1948, pt. G.	34°37′	115°38′
12. Eagle Mountains. Massive magnetite and hematite deposits in contact-metamorphosed sedimentary rocks of unknown age. Hadley, 1948.	33°55′	115°35′
COLORADO		
1. Red Cliff-Battle Mountain (Gilman). Manganiferous brown ore with siderite in Leadville Limestone (Mississippian). Harrer and Tesch, 1959; Brown and Reeves, 1964.	39°29′	106°22′
2. Taylor Peak. Massive magnetite in Leadville Limestone (Mississippian) and Weber Sandstone (Pennsylvanian and Permian) near contact with Tertiary diorite. Harder, 1909a; Harrer and Tesch, 1959; Brown and Reeves, 1964.	39°01′	106°48′
3. Calumet mine. Massive magnetite principally in Leadville Limestone (Mississippian) near contact with Tertiary intrusive. Harrer and Tesch, 1959; Brown and Reeves, 1964.	38°39′	105°58′

Locality	Lat N.	Long W.
COLORADO—Continued		
4. Cebolla Creek (Iron Hill, Powderhorn). Titaniferous magnetite mainly in Precambrian(?) pyroxenite; some hematite and brown ore in carbonate-rich rocks (carbonatite). Singewald, 1912; Harrer and Tesch, 1959; Brown and Reeves, 1964.	38°18′	107°05′
5. Orient-Bennett. Brown ore with some hematite and specularite in Leadville Limestone (Mississippian). Stone, 1934; Harrer and Tesch, 1959; Brown and Reeves, 1964.	38°13′	105°51′
GEORGIA		
1. Northwestern Georgia. Beds and lenses of "Clinton" hematite in Red Mountain Formation (Silurian). Haseltine, 1924; Whitlow, 1962.	34°17′- 35°00′	85°00′- 85°35′
2. Northwestern Georgia. Scattered deposits of brown ore in Paleozoic sedimentary rocks, mainly Knox Dolomite (Upper Cambrian and Lower Ordovician) and Weisner Quartzite (Cambrian). Lewiecki, 1948; Robertson, 1948; Pallister and Burchard, 1953.	33°39′- 34°58′	84°00′- 85°24′
3. Cartersville area. Brown ore from weathered pyrite deposits in metasedimentary rocks of the Rome and Weisner Formations (Cambrian); siliceous, specular hematite beds in Shady Dolomite (Cambrian). Kesler, 1950.	34°05′- 34°12′	84°38′- 84°50′
4. Southwestern Georgia. Scattered brown ore deposits in Clayton Formation (Paleocene) overlying Providence Sand (Upper Cretaceous). Furcron, 1956; Furcron and Ray, 1957.	31°43′- 32°28′	83°28′- 85°06′
IDAHO		
1. Clearwater district. Replacement veins of massive magnetite with some brown ore in metasedimentary rocks (Belt Series of Precambrian age) near border zone of Idaho batholith. Asher, 1964.	45°52′- 46°39′	115°37′- 115°59′
2. Poison, McKim, and Little Sawmill Creeks area. Replacement veins of specular hematite with minor magnetite in Belt phyllites and quartzites (Precambrian). Asher, 1964.	44°48′- 44°50′	113°35′- 113°59′

Locality	Lat N.	Long W.
3. Iron Mountain district. Replacement deposits of magnetite and specularite in Permian marbles and greenstones intruded by quartz diorite; some hematite derived from sulfides. Mackin, 1953; Asher, 1964.	44°32′	117°00′
INDIANA		
1. West-central and southern Indiana. Scattered areas of iron-carbonate deposits in shales overlying Carboniferous coal-bearing formations. Shannon, 1907.	38°33′- 40°10′	85°33′- 87°30′
IOWA		
1. Waukon. Residual brown ore deposit overlying Prosser Member of Galena Dolomite (Ordovician). Julihn and Moon, 1945; Pesonen, 1949.	42°23′	91°30′
KENTUCKY		
1. Northeastern Kentucky. Iron-carbonate deposits of Pennsylvanian age. Hayes, 1909.	38°15′- 38°45′	82°36′- 83°13′
2. Rose Run iron area. Beds and lenses of hematite and chamosite (Clinton-type) in Brassfield Formation (Silurian);	38°09′	83°37′
oolitic iron carbonates and brown ores in Boyle Limestone (Devonian) (Preston ore bank); minor iron-carbonate concretions in Bedford and Sunbury Shales (Devonian and Mississippian). Julihn and Moon, 1945; Muir, 1950.	38°08′	83°33′
3. Western Kentucky. Brown ore deposits probably formed in basal gravels of Tuscaloosa Formation (Cretaceous) on post-Mississippian limestone erosion surface. Nelson and Wood, 1949.	36°40′- 37°16′	87°58′- 88°17′
LOUISIANA		
1. Northwestern and north-central Louisiana. Brown ore veins and ledges, derived from weathering of sideritic glauconite in Cook Mountain and Cockfield Formations (Eocene). Burchard, 1915; Durham, 1964.	32°24′- 33°00′	92°38′- 94°04′

Locality	Lat N.	Long W.
MAINE		
1. Aroostook County, northern district. Bedded hematite lenses with some brown ore in manganiferous units in Silurian slate. Miller, 1947; Pavlides 1962.	46°38′-46°58′	68°05′-68°18′
2. Aroostook County, Maple Mountain-Hovey Mountain area. Bedded hematite lenses in manganiferous units in Silurian slate; some magnetite-bearing carbonate lenses. Pavlides, 1962.	46°23′	68°00′
3. Aroostook County, southern district. Bedded magnetite and hematite lenses with some siderite in manganiferous units in Silurian(?) slate. Miller, 1947; Pavlides, 1962.	46°01′-46°12′	67°48′-68°01′
4. Katahdin. Residual gossan ore derived from underlying sulfide ore enclosed in gabbroic intrusives in Silurian(?) sedimentary rocks. Miller, 1945.	45°27′	69°12′
MARYLAND		
1. Western Maryland. Iron-carbonate deposits of Pennsylvanian age. Singewald, 1911.	39°32′-39°43′	78°51′-79°01′
2. Evitts, Tussey, and Wills Mountains. Beds of "Clinton" hematite in Rose Hill Formation (Silurian); replacement deposits of Oriskany brown ore at Romney Shale and Helderberg Limestone (Devonian) contacts. Singewald, 1911; deWitt and Colton, 1964.	39°33′-39°43′	78°33′-78°50′
3. Catoctin Mountain. Brown ore with some magnetite in Loudoun Formation (Cambrian?). Singewald, 1911.	39°30′	77°28′
4. Chestnut Hills ore banks. Brown ore deposits in contact zone of crystalline limestones of Piedmont Province (Cambrian?) with schistose volcanic rocks. Singewald, 1911.	39°41′	76°53′
5. Tolley ore bank. Brown ore in Cockeysville Marble (lower Paleozoic?), probably derived from now-eroded overlying Wissahickon Schist (lower Paleozoic?). Singewald, 1911.	39°35′	76°32′
6. Springfield mine. Massive specular hematite vein in Precambrian schist. Singewald, 1911.	39°24′	76°57′

Locality	Lat N.	Long W.
7. Coastal Plain. Iron-carbonate deposits in Arundel Formation (Upper Cretaceous). Singewald, 1911.	38°56′-39°28′	76°15′-77°00′
MASSACHUSETTS		
1. Berkshire area. Brown ore deposits probably oxidized from underlying siderite along Stockbridge Limestone (Cambrian and Ordovician) contact with overlying "Berkshire Schist" (Cambrian? to Ordovician). Newland, 1936; Chute, 1945.	42°06′-42°35′	73°07′-73°24′
MICHIGAN		
1. Gogebic range, east. Bedded hematite (jaspilite), with some magnetite and iron carbonates, in Ironwood Iron-Formation (Animikie). Irving and Van Hise, 1892; Leith and others, 1935; Dutton, 1955; Carr and Dutton, 1959.	46°27′-46°29′	89°40′-90°10′
2. Marquette range. Bedded hematite (jaspilite) and brown ore, with some specularite, magnetite, and iron carbonates, in Negaunee Iron-Formation and Bijiki Iron-Formation Member of Michigamme Slate (Animikie). Van Hise and Bayley, 1897; Leith and others, 1935; Boyum, 1964; Case and Gair, 1965.	46°26′-46°35′	87°31′-88°14′
3. Gwinn district (Swanzy area). Bedded hematite (jaspilite) and brown ore, with some specularite, magnetite, and iron carbonates, in Negaunee Iron-Formation (Animikie). Leith and others, 1935; Boyum, 1964; Case and Gair, 1965.	46°14′-46°17′	87°23′-87°31′
4. Iron River-Crystal Falls district. Bedded hematite, with some brown ore and iron carbonates, in Riverton Iron-Formation (Animikie). Clements and Smyth, 1899; Leith and others, 1935; James, 1954; 1958; Bayley, 1959; James and others 1959; Dutton and Linebaugh, 1960.	45°57′-46°07′	88°19′-88°43′
5. Felch Trough district. Bedded hematite and magnetite in Vulcan Iron-Formation (Animikie). Leith and others, 1935; James, 1954; 1958; Dutton and Linebaugh, 1960; James and others, 1961.	45°57′-46°01′	87°46′-88°06′

Locality	Lat N.	Long W.
MICHIGAN—Continued		
6. Menominee district. Bedded hematite and magnetite in Vulcan Iron-Formation (Animikie). Bayley, 1904; Leith and others, 1935; James, 1954; 1958; Dutton and Linebaugh, 1960.	45°45'-45°51'	87°45'-88°06'
MINNESOTA		
1. Gunflint range. Bedded magnetite-bearing (taconite) Gunflint Iron-Formation (Animikie). Van Hise and Leith, 1911; Grout and others, 1959.	48°04'-48°06'	90°46'-91°04'
2. Duluth Gabbro Complex. Titaniferous magnetite in gabbroic intrusions (Keweenawan). Grout and others, 1959; Taylor, 1964.	47°48'-48°05'	90°10'-91°42'
3. Vermilion range. Bedded hematite (jaspilite) in Soudan Iron-Formation (lower Precambrian); some magnetite bodies. Clements, 1903; Grout, 1926; Henderson and Meuschke, 1952b.	47°48'-47°59'	91°30'-92°18'
4. Mesabi range. Bedded hematite, brown ore, and magnetite (taconite) in Biwabik Iron-Formation (Animikie). Leith, 1903; Gruner, 1946; 1954; Henderson and Meuschke, 1952a; 1952c; White, 1954.	47°03'-47°44'	91°50'-93°50'
5. Cuyuna range. Bedded hematite, brown ore, and magnetite (taconite), mostly manganiferous, in Trommald and Rabbit Lake Formations (middle Precambrian) in Cuyuna district; in Biwabik Iron-Formation and Virginia Argillite (Animikie) in Emily district. Grout and Wolff, 1955; Schmidt, 1963.	46°04'-46°46'	93°25'-94°48'
6. Fillmore County. Residual brown ore deposits, derived from Paleozoic carbonate rocks, in Windrow Formation (Cretaceous or Tertiary). Sloan, 1964.	43°37'	92°25'
MISSISSIPPI		
1. North-central Mississippi. Scattered deposits of brown ore, derived from carbonate rocks, with some siderite and hematite, in lower Tertiary strata. Vestal, 1951; 1954; Attaya, 1952.	33°20'-34°43'	89°01'-89°39'

Locality	Lat N.	Long W.
MISSOURI		
1. Central Missouri. Residual brown ore deposits in Cambrian clay, chert, and sand. Crane, 1912; Clark and Muilenburg, 1954.	38°06'-38°16'	92°20'-93°40'
2. Filled sink (Central) district. Hematite filling sink holes, chiefly localized at contact of Gasconade and Roubidoux Dolomites (Lower Ordovician). Crane, 1912; Dupuy and Ballinger, 1949.	37°25'-38°26'	90°57'-92°13'
3. Bourbon. Massive magnetite and some hematite in Precambrian rhyolite porphyry. McMillan, 1946; Searight and others, 1954.	38°09'	91°15'
4. Pea Ridge. Massive magnetite and hematite in Precambrian porphyry. Dempsey and Meuschke, 1951; Engineering and Mining Journal, 1957; Frommer and Fine, 1960.	38°07'	91°03'
5. Boss. Magnetite with copper in Precambrian rocks. Kisvarsanyi, 1965; Weigel, 1965.	37°39'	91°10'
6. Iron Mountain. Massive specular hematite with some magnetite in Precambrian andesite porphyry. Pettit and others, 1957; Ridge, 1957; Murphy and Mejia, 1961.	37°42'	90°38'
7. Pilot Knob. Specular hematite in Precambrian pyroclastic rocks. Crane, 1912; Johnson, 1961.	37°37'	90°37'
8. Southeast Missouri. Residual brown ore in Cambrian clay, chert, and sand. Crane, 1912; Ballinger and Pesonen, 1948; Bishop, 1952; Clark and Muilenburg, 1954.	36°30'-37°34'	89°54'-92°19'
MONTANA		
1. Blackfoot Indian Reservation. Bedded titaniferous magnetite in Horsethief and Virgelle Sandstones (Upper Cretaceous). Stebinger, 1914; Geach, 1963.	48°15'-48°57'	112°48'-113°14'
2. Choteau. Bedded titaniferous magnetite in Horsethief and Virgelle Sandstones (Upper Cretaceous). Wimmler, 1946a; Geach, 1963.	47°53'	112°16'

Locality	Lat N.	Long W.
MONTANA—Continued		
3. Running Wolf (Willow Creek). Massive hematite and magnetite lenses in Madison Limestone (Mississippian) along syenite porphyry contact. Westgate, 1920; Robertson and Roby, 1951.	47°02′	110°20′
4. Iron Mountain (Neihart). Massive magnetite and hematite with some brown ore in Belt Series sedimentary rocks (Precambrian) near syenite contact. Roby, 1950.	46°56′	110°54′
5. Sheep Creek (White Sulphur Springs). Massive hematite and brown ore veins and replacement deposits in Belt Series sedimentary rocks (Precambrian). Reed, 1949; Roby, 1950.	46°45′	110°56′
6. Southern Cross. Massive magnetite in contact zone of limestone in Hasmark Formation (Cambrian) with intrusive granodiorite. Wimmler, 1946b.	46°12′	113°14′
7. Iron Cross (Radersburg). Bedded titaniferous magnetite with some hematite in Horsethief(?) and Virgelle(?) Sandstones (Upper Cretaceous). Reed, 1951; Geach, 1963.	46°09′	111°45′
8. Dry Boulder Creek. Bedded magnetite in metasedimentary rocks of Cherry Creek Group (Precambrian). Geach, 1963.	45°35′	112°05′
9. Ramshorn (Copper Mountain). Bedded magnetite in Cherry Creek metasedimentary rocks (Precambrian). James and Wier, 1962; Geach, 1963.	45°25′	112°00′
10. Kelly. Bedded magnetite in Cherry Creek metasedimentary rocks (Precambrian). James and Wier, 1961a; Geach, 1963.	45°15′	112°15′
11. Carter Creek (Dillon). Bedded magnetite with some hematite in Cherry Creek gneisses and limestones (Precambrian). Mining Record, 1956; James and Wier, 1961b; Mining World, 1962; Geach, 1963.	45°12′	112°30′
12. Johnny Gulch. Bedded magnetite in Cherry Creek metasedimentary rocks (Precambrian). Geach 1963.	45°03′	111°44′
13. Black Butte. Banded quartz-magnetite in Precambrian iron formation. Wier, 1965.	44°53′	111°45′
14. Stillwater (Beartooth Mountains). Iron-formation in Precambrian metasedimentary rocks. Jones and others, 1960.	45°25′	110°06′
NEVADA		
1. Jackson Mountains. Massive magnetite and some hematite in Paleozoic metavolcanic rocks. Shawe and others, 1962; Horton, 1962; Reeves, 1964.	41°24′	118°31′
2. Barth mine. Massive hematite and some magnetite in Tertiary(?) andesite. Shawe and others, 1962; Horton, 1962; Reeves, 1964.	40°33′	116°17′
3. Modarelli mine. Massive hematite and some magnetite in Frenchie Creek Rhyolite (Mesozoic). Shawe and others, 1962; Horton, 1962; Muffler, 1964.	40°22′	116°16′
4. McCoy district. Massive magnetite and some hematite in Osobb Formation (Triassic). Shawe and others, 1962; Horton, 1962; Reeves, 1964.	40°19′	117°13′
5. Buena Vista Hills. Massive magnetite and some hematite in Jurassic(?) diorite and metavolcanic rocks of Leach(?) Formation (Mississippian or older). Reeves and Kral, 1955; Wright, 1960; Horton, 1962; Reeves, 1964.	39°58′-40°05′	118°07′-118°12′
6. Dayton. Massive hematite and magnetite in metasedimentary rocks of unknown age. Reeves and others, 1958; Horton, 1962; Reeves, 1964.	39°22′	119°29′
7. Minnesota mine. Massive magnetite in Triassic(?) dolomite. Reeves and others, 1958; Horton, 1962; Reeves, 1964.	39°03′	119°20′
8. Lyon (Pumpkin Hollow). Massive magnetite in limestone of unknown age. Horton, 1962; Reeves, 1964.	38°55′	119°05′
9. Phelps Stokes. Massive magnetite in dolomite of Luning Formation (Upper Triassic). Reeves and others, 1958; Horton, 1962; Reeves, 1964.	38°53′	117°55′

Locality	Lat N.	Long W.
NEVADA—Continued		
10. Pioche district. Manganiferous iron-carbonate replacement deposits in Lyndon Limestone and Highland Peak Formation (Cambrian). Westgate and Knopf, 1932; Hewett and others, 1936.	37°55′	114°32′
NEW JERSEY		
1. Ogden mines. Massive magnetite veins in Precambrian gneiss. Bayley, 1910.	41°05′	74°34′
2. Ringwood belt. Replacement deposits of massive magnetite in Precambrian metasedimentary rocks. Hotz, 1953b.	41°07′	74°20′
3. Dover district. Replacement deposits of massive magnetite principally in Precambrian gneiss, granite, and skarn. Sims, 1953; 1958.	40°55′	74°30′
4. Oxford mines. Massive magnetite veins in Precambrian gneiss. Bayley, 1910; 1941.	40°48′	75°00′
NEW MEXICO		
1. Sycamore-Bear Canyons (Pinos Altos Mountains). Bedded oolitic hematite in Bliss Sandstone (Cambrian and Ordovician). Harrer and Kelly, 1963; Harrer, 1965.	32°55′	108°21′
2. Chloride Flat. Manganiferous hematite and brown ore derived from carbonates, principally in Fusselman Dolomite (Silurian). Harrer and Kelly, 1963; Harrer, 1965.	32°47′	108°18′
3. Boston Hill. Manganiferous hematite derived from carbonates, with some magnetite, specularite, and brown ore, in Ordovician and Silurian dolomites near Silver City quartz-monzonite stock. Harrer and Kelly, 1963; Harrer, 1965.	32°46′	108°17′
4. Hanover-Fierro district. Massive magnetite and hematite, with some manganiferous units, in Paleozoic limestones near Hanover-Fierro stock and other intrusives. Harrer and Kelly, 1963; Harrer, 1965.	32°50′	108°04′
5. Iron Mountain. Massive magnetite and some specular hematite (tactite) in limestone of Magdalena Group (Pennsylvanian) near underlying Tertiary intrusives. Harrer and Kelly, 1963; Harrer, 1965.	33°28′	107°38′
6. Caballo Mountains (Sierrite mine). Bedded oolitic hematite in Bliss Sandstone (Cambrian and Ordovician). Harrer and Kelly, 1963; Harrer, 1965.	32°51′-33°07′	107°11′-107°16′
7. San Andres Mountains. Bedded oolitic hematite in Bliss Sandstone (Cambrian and Ordovician). Harrer and Kelly, 1963.	32°30′-33°20′	106°31′-106°38′
8. Jones. Massive magnetite and some hematite in Yeso Formation (Permian) near monzonite and diabase intrusives. Harrer and Kelly, 1963; Harrer, 1965.	33°52′	106°10′
9. Capitan. Massive magnetite and some hematite in San Andres Limestone (Permian) near aplitic intrusive mass. Harrer and Kelly, 1963; Harrer, 1965.	33°37′	105°33′
10. Orogrande district (Jarilla Mountains). Massive magnetite and hematite with some specularite in Paleozoic limestones near monzonite porphyry intrusive. Harrer and Kelly, 1963; Harrer, 1965.	32°25′	106°07′
NEW YORK		
1. Lyon Mountain. Massive nontitaniferous magnetite in Precambrian granite gneiss. Postel, 1952.	44°43′	73°54′
2. Mary anomaly. Disseminated magnetite with some hematite in Precambrian granite, mostly gneissic. Balsley and others, 1959.	44°35′	74°19′
3. Saranac Valley. Massive nontitaniferous magnetite in Precambrian granite gneiss. Postel, 1952.	44°36′	73°48′
4. Ausable Forks area (Arnold Hill). Massive nontitaniferous magnetite in Precambrian granite gneiss. Postel, 1952.	44°28′	73°40′

Locality	Lat N.	Long W.
NEW YORK—Continued		
5. Northwest Adirondack hematites (Keene-Antwerp belt). Replacement bodies of secondary hematite with some specularite, probably derived from pyrite, in limestone, schist, and gneiss of Grenville Series (Precambrian). Newland, 1921; Buddington, 1934.	44°11′-44°19′	75°11′-75°35′
6. Northwest Adirondack magnetites (including Benson Mines). Massive nontitaniferous magnetite in Precambrian skarn and granite gneiss; some hematite. Leonard and Buddington, 1964.	44°05′-44°23′	74°50′-75°10′
7. Mineville-Port Henry. Massive nontitaniferous magnetite in Precambrian gneiss. Newland, 1908; Newland, 1921.	44°05′	73°30′
8. Lake Sanford. Vanadium-bearing titaniferous magnetite in Precambrian gabbroic and anorthositic rocks. Balsley, 1943; Stephenson, 1945.	44°01′	74°01′
9. Hammondville-Crown Point. Massive nontitaniferous magnetite in Precambrian gneiss. Newland, 1921.	43°56′	73°34′
10. West-central New York. Beds of Clinton hematite in limestones and shales of Clinton Group (Silurian). Newland and Hartnagel, 1908; Gillette, 1947.	42°58′-43°17′	75°05′-77°42′
11. Harlem Valley. Brown ore and iron-carbonate deposits in Paleozoic limestones and schists. Newland, 1921.	41°33′-42°14′	73°30′-73°37′
12. Fishkill-Clove Valley. Brown ore and iron-carbonate deposits in Paleozoic limestones and schists. Newland, 1921.	41°35′-41°40′	73°40′-73°45′
13. Brewster belt (including Croton Mine). Massive magnetite in Precambrian rocks. Colony, 1923; Hawkes and Hotz, 1947.	41°20′-41°25′	73°40′-73°44′
14. Forest of Dean group. Massive magnetite in Precambrian gneisses. Colony, 1923.	41°20′	74°05′
15. Sterling Lake. Massive magnetite in Precambrian metasedimentary rocks. Hotz, 1953b.	41°12′	74°16′

Locality	Lat N.	Long W.
NORTH CAROLINA		
1. Ballou belt. Massive nontitaniferous and titaniferous magnetite veins or dikes in Precambrian rocks. Bayley, 1923a; 1923b.	36°31′-36°36′	81°22′-81°30′
2. Cranberry mine. Massive nontitaniferous magnetite veins in Precambrian grantized gneiss. Bayley, 1923a; 1923b; Kline and Ballard, 1948.	36°08′	81°59′
3. Knap of Reeds (Camp Butner). Hematite and magnetite lenses in Precambrian metased mentary rocks. Drane and Stuckey, 1925.	36°10′	78°48′
4. Nottely and Valley River belt. Brown ore in veins and in residual deposits in Cambrian rocks. Bayley, 1923c; 1925; Robertson, 1946.	35°00′-35°15′	83°44′-84°10′
5. Catawba-Iron Station, Newton, Eastern, and Costner mine belts. Siliceous magnetite and brown ore in irregular deposits in Precambrian rocks. Bayley, 1923a; 1923b; 1923c.	35°13′-35°42′	81°05′-81°26′
OHIO		
1. Eastern Ohio. Iron-carbonate deposits of Pennsylvanian age. Stout, 1944; Ireland, 1944; Bengston and others, 1950.	38°27′-41°15′	80°30′-82°56′
OKLAHOMA		
1. Witchita Mountains (Iron Mountain-Mountain Glenn-Mount Baker area). Titaniferous magnetite in Precambrian gabbroic rocks. Merritt, 1939; Chase, 1950; 1951.	34°48′	98°48′
2. Lake Lawtonka. Bedded magnetite with ilmenite in Recent alluvial black sands derived from Precambrian gabbroic rocks. Merritt, 1939; Chase, 1952.	34°44′	98°30′
3. Arbuckle Mountain district, western part. Brown ore mostly derived from secondary siderite, in Paleozoic sedimentary rocks. Merritt, 1940.	34°29′	97°11′
4. Arbuckle Mountain district, north-central part. Brown ore, mostly derived from secondary siderite, in Paleozoic sedimentary rocks. Merritt, 1940.	34°30′	96°40′

Locality	Lat N.	Long W.
OREGON		
1. Scappoose (St. Helens). Residual deposits of lateritic brown ore derived from weathering of basalt of the Columbia River Group (Tertiary). Zapffe, 1949; Hotz, 1953a.	45°45′	122°50′
2. Coos Bay. Magnetite with chromite and ilmenite in black sand originally derived from serpentinized ultramafic rock (Jurassic?). Griggs, 1945; Zapffe, 1949.	43°15′	124°20′
PENNSYLVANIA		
1. Western Pennsylvania. iron-carbonate deposits of Pennsylvanian age. Hayes, 1909; Hickok, 1939; Ashley and others, 1944.	39°44′-41°10′	78°50′-80°30′
2. Central Pennsylvania brown ore area, including Scotia ore bank. Residual brown ore deposits, mainly derived from pyrite and siderite, in Cambrian and Ordovician limestones. Butts and Moore, 1936; Hickok, 1939; Ashley and others, 1944; Julihn and Moon, 1945.	40°16′-40°52′	77°47′-78°24′
3. Central Pennsylvania hematite area. Beds of "Clinton" hematite in Clinton (Rose Hill) Formation (Silurian). Hayes, 1909; Hickok, 1939; Ashley and others, 1944.	39°43′-41°12′	76°02′-78°44′
4. Rittenhouse Gap-Seisholtzville district. Massive magnetite veins in Precambrian igneous gneisses. Hickok, 1939; Ashley and others, 1944.	40°28′	75°36′
5. Vera Cruz. Massive magnetite veins in Precambrian igneous gneisses. Hickok, 1939; Miller and others, 1941; Ashley and others, 1944.	40°31′	75°29′
6. White Rocks (Ege and Beltzhoover banks). Residual brown ore deposits, somewhat manganiferous, in Tomstown Dolomite (Cambrian). Foose, 1945; Burton and Sanford, 1949.	40°09′	77°04′
7. Dillsburg field. Replacement deposit of massive magnetite at contact of Triassic diabase with limestone conglomerate. Hickok, 1939, Ashley and others, 1944; Hotz, 1950.	40°08′	77°01′
8. Cornwall. Replacement deposit of massive magnetite at contact of Triassic diabase with limestone of Conococheague Group (Cambrian). Spencer, 1908; Hickok, 1933; 1939; Ashley and others, 1944; Shale, 1953.	40°16′	76°25′
9. Boyertown. Replacement deposit of massive magnetite at contact of Triassic diabase with Tomstown Dolomite (Cambrian). Spencer, 1908; Hickok, 1939; Ashley and others, 1944; Hawkes and others, 1953.	40°20′	75°39′
10. Grace mine. Replacement deposit of massive magnetite at contact of Triassic diabase with Paleozoic limestones. Knoerr, 1953; Bingham, 1957.	40°10′	75°53′
RHODE ISLAND		
1. Iron Mine Hill. Titaniferous magnetite (cumberlandite) in coarse-grained gabbro. Johnson, 1908; Singewald, 1913.	42°00′	71°27′
SOUTH DAKOTA		
1. Rochford-Nahant district. Brown ore in Recent bog deposits derived from oxidizing of pyritic-pyrrhotitic Precambrian slates and schists. Harrer, 1964b; 1966.	44°08′	103°45′
2. Black Hills Nemo district. Bedded specularite-martite-magnetite (taconite) in iron-formations of Nemo Series of Runner (Precambrian). Harrer, 1964b; 1966.	44°07′-44°16′	103°28′-103°36′
3. Iron Mountain. Replacement deposits of secondary hematite and some brown ore in Precambrian pyritic-pyrrhotitic quartzite. Connolly and O'Harra, 1929; Harrer, 1964b; 1966.	43°51′	103°30′
4. Grand-Moreau Rivers area. Iron-carbonate concretions and nodules, somewhat manganiferous, in terrace gravels from Hell Creek Formation (Cretaceous); some brown ore. Harrer, 1964b; 1966.	45°05′-45°54′	100°45′-102°25′

Locality	Lat N.	Long W.
TENNESSEE		
1. Western Highland Rim. Irregular deposits of brown ore, probably derived from Cretaceous glauconite-bearing beds, chiefly overlying Mississippian limestones. Burchard, 1934; Pallister and Burchard, 1953.	35°02′-36°32′	87°10′-88°00′
2. Northeastern Tennessee, including La Follette. Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 19137 Whitlow, 1962.	36°03′-36°35′	83°10′-84°19′
3. Rockwood-Cardiff. Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 1913; Whitlow, 1962.	35°53′	84°43′
4. Glen Alice. Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 1913; Whitlow, 1962.	35°45′	84°46′
5. Chamberlain-Bernardsville. Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 1913; Whitlow, 1962.	35°45′	84°40′
6. Euchee. Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 1913; Whitlow, 1962.	35°38′	84°45′
7. Inman. Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 1913; Whitlow, 1962.	35°05′	85°33′
8. North Chattanooga (Hill City-Moccasin Bend). Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 1913; Whitlow, 1962.	35°02′	85°20′
9. Ooltewah (Whiteoak Mountain). Beds of "Clinton" hematite in Rockwood Formation (Silurian). Burchard, 1913; Whitlow, 1962.	35°04′	85°04′
10. Eastern Tennessee. Scattered brown ore deposits in Paleozoic sedimentary rocks. Hayes, 1909; Pallister and Burchard, 1953; Maher, 1964.	35°00′-36°36′	81°50′-84°57′
11. Ducktown district. Gossan ore derived from massive sulfide deposits in the Ocoee Series (Precambrian). Emmons and Laney, 1926; Maher, 1964.	35°01′	84°22′

Locality	Lat N.	Long W.
TEXAS		
1. North Basin. Irregular deposits of brown ore, nodular and lenticular, and siderite in Weches Greensand (Tertiary). Eckel, 1938; Brown, 1959.	32°45′-33°10′	94°04′-94°52′
2. South Basin. Laminated deposits of brown ore, with some siderite, overlying white clay that grades downward into Weches Greensand (Tertiary). Eckel, 1938; Brown, 1959.	31°33′-32°42′	95°02′-95°45′
UTAH		
1. Iron Springs district. Massive hematite and magnetite in Homestake Limestone Member of Carmel Formation (Jurassic) near quartz monzonite intrusives. Reeves, 1964b.	37°38′-37°44′	113°12′-113°22′
2. Bull Valley-Cove Mountain district. Massive hematite and magnetite in Mesozoic limestone near biotite syenite porphyry intrusive. Zoldok and Wilson, 1953; Reeves, 1964b.	37°26′-37°28′	113°45′-113°51′
VIRGINIA		
1. Clifton Forge iron district. Beds of "Clinton" hematite in Rose Hill Formation (Silurian); replacement deposits of "Oriskany" brown ore mainly in Helderberg Limestone (Devonian). Morrison and Grosh, 1950; Gooch, 1954; Lesure, 1957.	37°33′-37°50′	79°46′-80°09′
2. Blue Ridge district. Bedded hematite in Lower Cambrian(?) shales and quartzites (Unicoi ? Formation). Harder, 1909b; Woodward, 1932; Gooch, 1954.	37°21′-37°25′	79°42′-79°49′
3. Lynchburg district. Bedded hematite and magnetite in Mount Athos Formation (Paleozoic?). Espenshade, 1952; Gooch, 1954.	37°23′-37°36′	78°50′-79°05′
4. Lee-Wise district. Beds of Clinton hematite in Clinton (Rockwood) Formation (Silurian). Harder, 1909b; Gooch, 1954.	36°36′-36°52′	82°43′-83°35′
5. Pulaski-Smyth district. Residual brown ore deposits in Lower Cambrian quartzites and limestones. Harder, 1909b; Gooch, 1954.	36°43′-37°02′	80°36′-81°31′

Locality	Lat N.	Long W.
VIRGINIA—Continued		
6. Carroll-Grayson district. Massive magnetite lenses and veins, somewhat titaniferous, in Precambrian gneiss. Gooch, 1954; Stose and Stose, 1957.	36°34′-36°47′	80°55′-81°10′
7. Great Gossan Lead belt. Gossan ore derived from weathering of massive sulfides in Lynchburg Gneiss (Precambrian). Kline and Ballard, 1949; Gooch, 1954; Stose and Stose, 1957.	36°40′-36°51′	80°40′-80°58′
WASHINGTON		
1. Sumas Mountain. Lateritic brown ore deposits presumably derived from weathering of basic volcanic rock (pre-Tertiary?). Zapffe, 1949; Huntting, 1956.	48°53′	122°14′
2. Hamilton (Iron Mountain). Bedded manganiferous hematite and magnetite in pre-Tertiary glaucophane-garnet schist. Zapffe, 1949; Huntting, 1956; Livingston, 1966.	48°30′	121°56′
3. Buckhorn Mountain (Magnetic, Neutral Aztec). Replacement deposits of massive magnetite in limestone along hornblende syenite contact (Mesozoic?). Zapffe, 1949; Huntting, 1956; Livingston, 1966.	48°56′	119°01′
4. Deep Lake (Bechtol and Thompson). Residual brown ore veins in dolomitic limestone (Paleozoic?). Huntting, 1956.	48°50′	117°36′
5. Deer Trail (Read). Replacement deposit of massive magnetite in limestone (Paleozoic?) near granite intrusive. Huntting, 1956; Livingston, 1966.	48°06′	118°09′
6. Summit (Denny and Guye). Replacement deposit of massive magnetite in limestone of Guye Formation (Eocene) at Snoqualmie Granodiorite (upper Tertiary) contact. Zapffe, 1949; Huntting, 1956; Livingston, 1966.	47°25′	121°26′
7. Cle Elum River. Metamorphosed lateritic magnetite and hematite, both nickeliferous and chromiferous, derived from weathering of pre-Tertiary serpentinized peridotite. Zapffe, 1949; Huntting, 1956; Livingston, 1966.	47°26′	121°05′

Locality	Lat N.	Long W.
8. Blewett. Metamorphosed lateritic magnetite and hematite, both nickeliferous and chromiferous, derived from weathering of pre-Tertiary serpentinized peridotite. Zapffe, 1949; Lamey, 1950; Huntting, 1956; Livingston, 1966.	47°25′	120°37′
WEST VIRGINIA		
1. Central West Virginia. Iron-carbonate deposits of Pennsylvanian age. Grimsley, 1909; Price and others, 1938.	38°14′-39°44′	79°30′-81°54′
2. Northeastern West Virginia. Beds of Clinton hematite in Clinton (Rose Hill?) Formation (Silurian); replacement deposits of "Oriskany" brown ore in Helderberg Limestone (Devonian). Grimsley, 1909; Price and others, 1938.	38°30′-39°37′	78°00′-79°33′
3. Southeastern West Virginia. Beds of Clinton hematite in Clinton (Rockwood?) Formation (Silurian); replacement deposits of "Oriskany" brown ore in Helderberg Limestone (Devonian). Grimsley, 1909; Price and others, 1938; Reeves, 1942; Julihn and Moon, 1945.	37°16′-38°17′	79°53′-81°15′
WISCONSIN		
1. Gogebic range, west. Bedded hematite (jaspilite), with some magnetite and iron carbonates, in Ironwood Iron-Formation (Animikie). Irving and Van Hise, 1892; Van Hise and Leith, 1911; Aldrich 1929; Leith and others, 1935; Dutton, 1955; Carr and Dutton, 1959.	46°16′-46°27′	90°10′-91°01′
2. Florence area. Bedded hematite and brown ore, mostly derived from interbedded siderite and chert, in Riverton Iron-Formation (Animikie). Van Hise and Leith, 1911; Leith and others, 1935; Dutton, 1955; James, 1958; Dutton and Linebaugh, 1960.	45°53′-45°56′	88°14′-88°24′
3. Black River Falls. Bedded magnetite (taconite) with some hematite in Precambrian metasedimentary rocks. Irving, 1877.	44°18′	90°50′

Locality	Lat N.	Long W.
WISCONSIN—Continued		
4. Baraboo range. Bedded hematite, with some brown ore and iron carbonates, interbedded with ferruginous chert, slate, and dolomite, in Freedom Dolomite (Precambrian). Weidman, 1904; Van Hise and Leith, 1911.	43°28′	89°40′–89°50′
5. Mayville-Iron Ridge district. Lenses of oolitic hematite (Clinton-type) overlying Maquoketa Shale (Ordovician). Van Hise and Leith, 1911; Thwaites, 1914; Savage and Ross, 1916.	43°25′–43°28′	88°30′–88°33′
WYOMING		
1. Atlantic City. Bedded iron-formation (siliceous magnetic taconite somewhat hematitic and limonitic) in Precambrian rocks. U.S. Geol. Survey, 1960; Bayley, 1963.	42°30′–42°34′	108°43′–108°45′
2. Rawlins. Bedded hematite in Cambrian quartzite at Madison Limestone (Mississippian) contact. Lovering, 1929; Osterwald and others, 1959; U.S. Geol. Survey, 1960.	41°50′	107°15′
3. Seminoe Mountains (Bradley Peak). Bedded magnetite (taconite) in Precambrian greenstone schist some hematite. Lovering, 1929; Osterwald and others, 1959; U.S. Geol. Survey, 1960.	42°10′	107°02′
4. Shirley (Freezeout Mountains). Massive hematite scattered throughout pegmatite dikes in Precambrian granite. Lovering, 1929; Osterwald and others, 1959; U.S. Geol. Survey, 1960.	42°15′	106°33′
5. Hartville (Sunrise mine). Bedded hematite in Precambrian metasedimentary rocks. Ball, 1907; Osterwald and others, 1959; U.S. Geol. Survey, 1960.	42°20′	104°42′
6. Taylor (Laramie Range). Titaniferous magnetite in Precambrian anorthosite complex. Newhouse and Hagner, 1957; Osterwald and others, 1959; U.S. Geol. Survey, 1960.	41°44′	105°18′
7. Iron Mountain (Laramie Range). Titaniferous magnetite in Precambrian anorthosite complex. Newhouse and Hagner, 1957; Osterwald and others, 1959; U.S. Geol. Survey, 1960; Dow, 1961.	41°36′	105°20′
8. Shanton (Laramie Range). Titaniferous magnetite in Precambrian anorthosite complex. Newhouse and Hagner, 1957; Osterwald and others, 1959; U.S. Geol. Survey, 1960.	41°33′	105°23′

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