DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TO ACCOMPANY MAP MR-13

COPPER IN THE UNITED STATES

(Exclusive of Alaska and Hawaii)

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Introduction

The copper districts in the United States (exclusive of Alaska and Hawaii) are shown on the accompanying map. In compiling the map, the estimated total quantity of copper present before mining was used to assign districts to size categories, and both production and reserves are included without distinction as to the status of exploitation. Four categories have been distinguished: deposits that contain 50± to 1,000 tons; 1,000 to 50,000 tons; 50,000 to 1 million tons; and over 1 million tons of copper respectively. In many of the smaller deposits copper occurs with other metals, as gold, silver, lead, or zinc, that may be quantitatively and economically more important than the contained copper. Thus, for example, a deposit that contains large values in gold or zinc may contain only a small amount of copper and is shown on this map as a small copper deposit.

Five principal morphologic types of deposits have been distinguished on the map by letter symbols. These are disseminated, replacement, vein, massive sulfide, and native copper deposits (see Explanation). They are not strictly genetic types, however, for the disseminated deposits, the massive sulfide deposits, and many of the vein deposits were formed largely or entirely by replacement processes.

The symbols show either individual mines or the approximate centers of districts. Some of the more prominent districts are identified by name on the map, and all with over 1,000 tons of copper are numbered to correspond to the Locality Index. As mining district names do not always correspond to locality names, and a name established through common usage may not be the legal name of the mining district, several names are given in the index for some localities. The index is arranged alphabetically by States. Both published and unpublished data were used, and at least one reference is given for each locality if reports on it have been published.

Distribution of copper deposits

Copper occurs in three major areas in the United States which are, in order of discovery and increasing importance, the Appalachian province, extending from Alabama to the Canadian border, the Keweenaw Peninsula in northern Michigan, and the Cordilleran province, extending from the Rocky Mountain front to the Pacific. By far the greatest concentration of copper is in the southwestern United States, in Arizona and New Mexico, in bodies of disseminated sulfides--the great "porphyry copper" deposits--but large disseminated deposits also occur in Utah and Nevada.

Appalachian province.--Numerous copper deposits, practically all lenticular or tabular bodies of massive sulfides, are found throughout the length of the Appalachian Mountain system along the eastern border of the United States. Most of these are of small or moderate size, but a few are large, as at Ducktown, Tennessee, and the Gossan Lead, Virginia.

The Appalachian deposits are, for the most part, in Precambrian or early Paleozoic metamorphic rocks along the central core of the folded structure, in schists and gneiss mainly derived from sedimentary and volcanic rocks. The copper deposits are along shear and fracture zones that postdate the major Paleozoic metamorphism in the Appalachians and may be related to late Paleozoic metamorphism or intrusions.

The greater part of the copper in the Appalachians is in bodies of massive pyrrhotite or of massive pyrite and pyrrhotite. Copper occurs as chalcopyrite, and the deposits commonly contain zinc, minor gold and silver, and locally lead. The geologic setting of these deposits is very similar to that of the massive sulfide deposits on the west side of the continent in the metamorphic rocks west of the Sierra Nevada batholith.

A few minor copper deposits in basins of Triassic sandstone and shale in Pennsylvania, New Jersey, and Virginia are related to Triassic diabase sheets and dikes. Concentrations of native copper in Precambrian greenstone are common in the central part of the Appalachian system, but these are small, have not been of commercial importance for many years, and are of interest chiefly for their similarities to native copper deposits of the Keweenaw Peninsula.

Keweenaw Peninsula.--The great copper deposits on the Keweenaw Peninsula of northern Michigan are of two types: (1) concentrations of native copper in the tops of late Precambrian mafic lava flows and in rhyolitic conglomerates interlayered with the flows, and (2) disseminated chalcocite and native copper in sandstone and shale that is much younger than the flows. Solutions that deposited native copper in the lavas and conglomerates were restricted to the zones of high permeability afforded both by amygdaloidal flow tops, particularly those that are fragmental, and by the interlayered conglomerates.

In the lavas and conglomerates, copper is almost entirely in grains and large masses of native metal; minor copper arsenides and sulfides are found locally in veins cutting the lavas. Native copper, together with traces of native silver, fills vesicles, cements

breccia, and replaces other cementing material. Copper is not uniformly distributed in the flow tops or conglomerates, however, and none of the amygdaloidal flows or conglomerates is mineralized over more than a small part of its known extent. Minable ore is restricted to ore shoots conformable to the beds along the zones that were most permeable, but solutions did not reach some permeable zones because of the channeling effect of impervious layers. A few deposits are in cross-cutting fissure zones.

In the upper part of the lava-sediment series, disseminated native copper and chalcocite are present over large areas at the base of a thick shale formation overlying sandstone and conglomerate. This copper is locally accompanied by a little native silver. Most of the copper in shale and sandstone appears to antedate the deformation of the area and was probably introduced very early in the history of these sedimentary rocks.

The reverse fault which lies beneath the ore zones and parallels the strike of the flows and the alinement of copper deposits may reflect the major tilting of the basin. The principal fault itself contains no copper, although branch faults are locally mineralized. Although it has been suggested that this major fault was a channel-way along which solutions gained access to permeable horizons in the overlying flows and conglomerates, there is little direct evidence for this.

Cordilleran province.--Copper is widely distributed in the Cordilleran province of the Western United States. The principal areas of concentration are in the Basin and Range province; in the Front Range of the Rocky Mountains; in western Montana; and in central and northern California.

Of these, the most important is the Basin and Range province in Nevada, Utah, Arizona, and New Mexico. The ores here are of many types, but by far the largest bodies are disseminated sulfides of the type commonly known as the "porphyry copper" deposits. Most of these are in southern Arizona and southwestern New Mexico, but large deposits occur also in Nevada and Utah.

The disseminated deposits are along the contact of intrusive stocks of granitic rock where the sulfides occur either in intensely-shattered intrusive rock, or in both the intrusive rock and the wall rocks. Many of the stocks are late Mesozoic or Tertiary in age, but the age of others is not known. The primary sulfides of the disseminated deposits are chiefly pyrite and chalcopyrite, usually with minor molybdenite. The deposits are leached of copper where they are exposed at the surface, but the leached zones are underlain by enriched zones of supergene chalcocite precipitated on and replacing the primary sulfides. The chalcocite "blanket" of enriched ore is the only minable part of many deposits, and the primary mineralization is generally below minable grade.

The larger deposits of the disseminated or "porphyry copper" type are those at Ely, Nevada; Bingham, Utah; Ajo, Globe-Miami, Ray, San Manuel, Morenci, and Bisbee in Arizona; and Tyrone and Chino in New Mexico.

Replacement and vein deposits are the most numerous copper ore bodies in the Basin and Range province, but only a few compare in size with the deposits of disseminated sulfides. Examples of large replacement deposits are the United Verde and United Verde Extension deposits near Jerome, Arizona, which are lenticular bodies of copper- and zinc-bearing massive pyrite that replace Precambrian schist. The mineralization is Precambrian in age. The Magma ore body, Arizona, is a large replacement vein with accompanying replacement of limestone along bedding. Mineralization is of Late Cretaceous or early Tertiary age. The Old Dominion mine in Arizona is a quartz-sulfide vein deposit in a fault in sandstone, quartzite, and limestone.

The ore deposits at Bisbee, Arizona, are in part supergene-enriched disseminated deposits in a stock of granite porphyry, and in part irregular replacement ore bodies in limestone. Mineralization is pre-Cretaceous and probably Nevadan in age.

Pyrometasomatic deposits are common in the Basin and Range province, the largest being the Pima and the Mission disseminated and replacement deposits, Arizona, where the ore replaces limestone, quartzite, and other clastic rocks intruded by quartz-monzonite porphyry; the Mason Valley deposit, Nevada, a pyrometasomatic replacement of limestone and tuff; and the Christmas mine, Arizona, a pyrometasomatic replacement of limestone in the border of a stock of quartz diorite.

In the northwestern United States the principal concentration of copper is in the great vein deposits of Butte, Montana, and minor vein deposits north of Butte, in or near the Late Cretaceous or early Eocene quartz monzonite of the Boulder batholith. The ore in the central part of the Butte district occurs in filled and replacement veins in quartz monzonite that contain principally chalcocite, enargite, and bornite, with quartz and pyrite. In the outer part of the district sphalerite and galena predominate over copper minerals, and much manganese is present as rhodochrosite.

Although small copper deposits are widely distributed in Washington, Idaho, and Montana, only a few major districts are known in the numerous granitic batholiths and their bordering rocks of this region. The copper deposits in the northwestern corner of Washington occur in or near intrusive rocks of Tertiary age or border the Chelan batholith. The principal deposits are veins and stockworks in schist and granitic rock. Some of the larger concentrations of copper in the northwest, as those of the Blackbird district and the Coeur d'Alene district, Idaho, are in deposits that have been mined chiefly for other metals.

Copper occurs in Colorado in the Front Range of the Rocky Mountains and in the San Juan region. The areas with the largest concentrations of copper, those at Gilman and Leadville, are primarily lead-zinc-gold-silver districts in which copper is a coproduct. This is also true of most of the minor copper-bearing deposits in Colorado. Most of the deposits in the

Front Range are veins and replacement deposits in Paleozoic limestone and in Precambrian schist. Many small stocks of intrusive rock of Tertiary age are associated with the copper-lead-zinc-gold-silver deposits. A few of the Front Range deposits are of Precambrian age, but most deposits are Tertiary or are associated with the deformation of the Laramide revolution.

In the San Juan region copper-bearing deposits range from fissure veins to bedding replacements and pyrometasomatic deposits in Paleozoic and Mesozoic sedimentary rocks. In most deposits copper is subordinate to gold, silver, lead, or zinc. The mineralization is related to numerous Tertiary stocks.

A large number of copper deposits have been found in central and northern California in metamorphosed eugeosynclinal rocks along the western border of the granitic intrusives collectively called the Sierra Nevada batholith, and along smaller batholiths to the northwest. All of the larger deposits, except for the Walker mine and the Engels mine, are lenticular bodies of copper-zinc-bearing massive pyrite with minor gold and silver in chloritic or sericitic rocks. They lie near major zones of dislocation in the metamorphosed volcanic and sedimentary rocks along the northern part of the Sierra Nevada batholith, but the deposits are not on the main faults, and none is in the granitic rock. The ores are probably of Late Jurassic or Early Cretaceous age.

Numerous but minor copper deposits have been found in or near the widespread granitic rocks in southern California.

Locality Index

Mining district or locality	Lat. N.	Long. W.
ALABAMA		
1. Stone Hill (Woods) mine. Massive sulfide and disseminated. Pallister and Thoenen, 1948.	33°29'	85°27'
2. Alabama (National) mine. Massive sulfide and disseminated.	33°21'	85°50'
3. Southern (Carpenter) mine. Massive sulfide and disseminated.	33°21'	85°51'
ARIZONA		
1. White Mesa (Kaibito Plateau). Copper carbonates and silicates in sandstone. Hill, 1914; Read and others, 1943.	36°40'	111°23'
2. Jacobs Lake (Warm Springs). Copper carbonates and silicates in limy sand bed in limestone. Tainter, 1947.	36°43'	112°14'
3. Bentley district, Grand Gulch and Savanic mines. Copper carbonates and silicates in limy sandstone. Hill, 1915.	36°16'	113°48'
4. Wallapai (Chloride Camp, Cerbat Camp). Enriched disseminated sulfides and veins. Dings, 1951.	35°22'	114°08'
5. Cedar Valley, Antler, and Copper World mines. Sulfides in quartz veins in granite. Berger, 1938.	34°54'	113°56'
6. Planet district, Swansea-Clara and Planet mines. Pyrometasomatic replacement of limestone. Bancroft, 1911.	34°10'	113°50'
7. Eureka (Bagdad area). Bagdad, Copper King mines: enriched disseminated sulfides. Copper King and Old Dick mines: massive sulfide in metamorphic rock. Anderson and others, 1955.	34°35'	113°12'
8. Copper Basin district, Commercial-Loma Prieta mine. Disseminated sulfides in quartz diorite breccia pipe. Blake, 1889.	34°29'	112°35'
9. Walker district, Sheldon mine. Vein in granodiorite. Lindgren, 1926.	34°27'	112°24'
10. Verde district, United Verde and United Verde Extension mines. Massive sulfide in metamorphic rock. Anderson and Creasey, 1958.	34°45'	112°07'
11. Black Hills district, Yeager mine. Bornite vein in Precambrian tuff. Anderson and Creasey 1958.	34°40'	112°11'
12. Big Bug district, Iron King mine. Massive sulfide in metamorphic rock. Anderson and Creasey, 1958.	34°30'	112°15'
13. Agua Fria district, Binghampton and Stoddard mines. Replacement quartz-sulfide lenses in metamorphic rock. Lindgren, 1926.	34°27'	112°11'
14. Big Bug district, Blue Bell mine. Massive sulfide in metamorphic rocks. Lindgren, 1926.	34°20'	112°14'
15. Peck district, DeSoto mine. Massive sulfide and quartz-sulfide replacement of metamorphic rocks. Lindgren, 1926.	34°17'	112°17'
16. Superior (Pioneer) district, Magma mine. Vein and replacement. Short and others, 1943.	33°18'	111°05'
17. Summit district, Gibson mine. Replacement veins along shear zone. Ransome, 1903.	33°20'	110°57'
18. Globe-Miami district, Castle	33°25'	110°58'

Dome mine. Enriched disseminated sulfides. Peterson and others, 1951.

19. Globe-Miami district, Miami-Inspiration deposit. Enriched disseminated sulfides. Ransome, 1919. 33°25' 110°53'

20. Globe-Miami district, Copper Cities deposit. Enriched disseminated sulfides. Peterson, 1954. 33°27' 110°52'

21. Globe-Miami district, Old Dominion, United Globe, Arizona, Commercial, Iron Cap, Superior and Boston mines. Veins in sandstone, quartzite and limestone. Willis, 1922. 33°25' 110°47'

22. Mineral Creek district, Copper Butte mine. Supergene carbonates and silicates in conglomerate. Gowling, 1904. 33°09' 111°04'

23. Mineral Creek district, Ray mine. Enriched disseminated sulfides. Ransome, 1919. 33°10' 110°00'

24. Banner district, Christmas mine. Pyrometasomatic replacement of limestone. Peterson and Swanson, 1956. 33°04' 110°45'

25. Banner district, Chilito and London-Arizona mines. Pyrometasomatic replacement of limestone. Ross, 1925. 33°04' 110°47'

26. Old Hat (Mammoth) district, San Manuel mine. Enriched disseminated sulfides. Schwartz, 1953. 32°42' 110°42'

27. Bunker Hill district, Copper Creek area. Mineralized breccia pipes. Kuhn, 1941. 32°45' 110°29'

28. Morenci (Copper Mountain) district, Clay, Coronado, Clifton, Humbolt, Longfellow, New England, Shannon, Stephens, and other mines. Disseminated sulfide and pyrometasomatic replacements and veins. Lindgren, 1905. 33°05' 109°22'

29. Lone Star (Safford) district. Disseminated sulfides. 32°57' 109°37'

30. Old Hat district, Geesman, Control, and Daily mines. Pyrometasomatic replacement of limestone. 32°28' 110°44'

31. Johnson Camp area, Republic, Mammoth, Peabody, and Copper Chief mines. Pyrometasomatic replacement in limestone. Cooper, 1950. 32°06' 110°05'

32. Dos Cabezas district, Mascot mine. Replacement in limestone. 32°13' 109°38'

33. Silver Bell district. Enriched disseminated sulfides and pyrometasomatic replacement of limestone. Stewart, 1912. 32°24' 111°31'

34. Ajo district, New Cornelia mine. Disseminated sulfides. Gilluly, 1946. 32°21' 112°52'

35. Pima, Mission, Daisy, Mineral Hill mines. Pyrometasomatic replacement of limestone and shale. 31°59' 111°04'

36. Esperanza deposit, Pima district. Enriched disseminated sulfides. 31°52' 111°07'

37. Helvetia district, Copper World, Tip Top, Narraganset, Peach and other deposits. Creasey and Quick, 1956. 31°52' 110°47'

38. Patagonia (Duquesne) district, Patagonia, Pride of the West, Santo Niño mines. Pyrometasomatic replacement of limestone. Schrader, 1915. 31°23' 110°42'

39. Palmetta district, Three R deposit. Vein stockwork and disseminated. Schrader, 1915. 31°28' 110°46'

40. Oro Blanco district, Montana mine. Lead, zinc, silver vein, byproduct copper. Fowler, 1938. 31°28' 111°14'

41. Tombstone district. Silver, lead veins, byproduct copper. Butler and others, 1938. 31°42' 110°04'

42. Turquoise district, Gleeson and Courtland areas. Replacement in limestone. Wilson, 1927. 31°45' 109°50'

43. Bisbee (Warren) district. Enriched disseminated and replacement. Trischka, 1938. 31°26' 109°54'

44. San Francisco (Oatman) district. Byproduct copper in gold-silver veins in Tertiary volcanic rocks. Lausen, 1931. 35°01' 114°24'

45. Hassayampa (Groom Creek) district. Veins in Precambrian granite. Hewett and others, 1936. 34°26' 112°22'

46. Osborn district, Belmont, McNeil mine. Tenney, 1928. 33°37' 112°52'

47. Eureka District, Old Dick mine. Massive sulfide. Anderson and others, 1955. 34°33' 113°14'

Locality Index (cont'd.)

CALIFORNIA

1. Gray Eagle mine (Happy Camp). Replacement of shear in metamorphic rock. Huttl, 1943.	41°53'	123°22'
2. Blue Ledge deposit. Massive sulfide and replacement. Hundhausen, 1947.	41°57'	123°06'
3. Island Mountain mine. Massive sulfide. Averill, 1941.	40°04'	123°29'
4. Darwin (Coso) district. Replacement. Hall and Mackevett, 1958.	36°15'	117°35'
5. East Shasta district, Bully Hill and Rising Star mines. Massive sulfide and replacement.	40°48'	122°12'
6. Cow Creek district, Afterthought and Donkey mines. Massive sulfide and replacement. Albers, 1953.	40°43'	122°04'
7. Engels and Superior mines. Pyrometasomatic replacement. Anderson, 1931.	40°13'	120°45'
8. Genessee district, Walker mine. Replacement veins along shear zone. Knopf, 1935.	39°58'	120°40'
9. Dairy Farm and Valley View deposits. Massive sulfide. Weed, 1916.	39°00'	121°18'
10. Newton mine. Massive sulfide. Heyl and Eric, 1948.	38°21'	120°53'
11. Campo Seco district, Penn mine. Massive sulfide. Heyl and others, 1948.	38°14'	120°52'
12. Copperopolis district, Keystone and North Keystone mines. Heyl, 1948a.	37°59'	120°39'
13. Quail Hill and Napoleon mines. Massive sulfide. Heyl, 1948b.	37°57'	120°45'
14. Copper King mine. Massive sulfide. Bradley, 1914.	36°55'	119°27'
15. Bishop district, Pine Creek mine. Byproduct copper in tungsten ore. Bateman, 1956.	37°23'	118°43'
16. West Shasta district, Iron Mountain mine. Massive sulfide and vein. Kinkel, and others, 1956.	40°40'	122°32'
17. West Shasta district, Stowell mine. Massive sulfide. Kinkel, and others, 1956.	40°41'	122°31'
18. West Shasta district, Keystone mine. Massive sulfide. Kinkel, and others, 1956.	40°42'	122°30'
19. West Shasta district, Balaklala mine. Massive sulfide and disseminated. Kinkel and others, 1956.	40°43'	122°30'
20. West Shasta district, Shasta King mine. Massive sulfide. Kinkel, and others, 1956.	40°44'	122°29'
21. West Shasta district, Mammoth mine. Massive sulfide. Kinkel, and others, 1956.	40°46'	122°27'
22. West Shasta district, Sutro mine. Massive sulfide. Kinkel, and others, 1956.	40°47'	122°27'
23. West Shasta district, Early Bird mine. Massive sulfide. Kinkel, and others, 1956.	40°43'	122°31'

CALIFORNIA (cont'd.)

COLORADO

1. Red Cliff (Gilman, Battle Mountain) district, Eagle mine. Replacement mantos in limestone. Radabaugh, 1953.	39°32'	106°23'
2. Central City district. Veins. Lovering and Goddard, 1950.	39°49'	105°30'
3. Idaho Springs district. Veins and stockworks. Vanderwilt, 1947a, Lovering and Goddard, 1950.	39°47'	105°32'
4. Argentine district. Veins. Lovering, 1935.	39°35'	105°51'
5. Leadville (California) district. Replacement of limestone. Emmons and others, 1927.	39°14'	106°16'
6. Elk Mountain district. Veins. Emmons and others, 1894.	38°52'	107°06'
7. Sedalia mine. Replacement. Lindgren, 1908.	38°36'	106°03'
8. Monarch (Garfield) district. Replacement and veins. Dings and Robinson, 1957.	38°32'	106°18'
9. Bonanza (Kerber Creek) district. Replacement and vein. Burbank, 1932.	38°19'	106°08'
10. La Sal Creek district, Cashin mine. Chalcocite in sandstone. Vanderwilt, 1947b.	38°18'	108°57'
11. Poughkeepsie, Mineral Point, Upper Uncompahgre districts. Veins and replacement. Kelley, 1946.	38°00'	107°40'
12. Sneffels district. Epithermal veins. Burbank and others, 1947.	37°59'	107°46'
13. Telluride (Upper San Miguel) district. Epithermal veins. Burbank and others, 1947.	37°56'	107°48'
14. Ophir (Iron Springs) district. Epithermal veins, Burbank	37°51'	107°49'

COLORADO (cont'd.)

and others, 1947.

15. Animas (Silverton) district. Epithermal veins. Burbank, 1933. 37°48' 107°36'

16. Eureka (Cement Creek, Mineral Creek, Animas Forks) district. Epithermal veins. Burbank and others, 1947. 37°54' 107°35'

17. Lake City (Galena Lake) district. Epithermal veins. Burbank, 1947; Irving and Bancroft, 1911. 38°01' 107°22'

18. Rico (Pioneer) district. Replacement in limestone, vein. Burbank and others, 1947. 37°42' 108°01'

19. Summitville district. Veins and mineralized shear zones. Vanderwilt, 1947c. 37°26' 106°36'

20. Copper Hill mine, Allard tunnel deposits. Disseminated and veins. Eckel, 1938. 37°24' 108°05'

CONNECTICUT

1. Bristol mine. Veins and disseminated in Triassic sandstone. Bateman, 1923. 41°43' 72°55'

GEORGIA

1. No. 20 mine. Massive sulfide. Furcron and others, 1938. 34°58' 84°25'

2. Chestatee mine. Massive pyrite. 34°33' 83°53'

3. Seminole (Magruder) mine. Veins in schist. Peyton and Cofer, 1950. 33°46' 82°34'

4. Little Bob mine. Massive pyrite. Shearer and Hull, 1918. 33°54' 84°49'

5. Tallapoosa (Tudor, Waldrop) mine. Massive sulfide. Ballard and McIntosh, 1948. 33°51' 85°05'

IDAHO

1. West Coeur d'Alene district. Byproduct copper from lead-silver veins. Shenon and McConnel, 1939. 47°31' 116°09'

2. Hunter district, Snowstorm lode. Disseminated sulfides in quartzite. Umpleby and Jones, 1923. 47°28' 115°44'

3. Seven Devils district, Red Ledge mine. Massive sulfide and replacement. Cook, 1954. 45°14' 116°40'

4. Seven Devils district, South Peacock area. Pyrometasomatic replacement of limestone. Cook, 1954. 45°09' 116°39'

IDAHO (cont'd.)

5. Blackbird district. Copper-cobalt ore in schist. Anderson, 1943. 45°07' 114°20'

6. Eureka district, Pope-Shenon mine. Replacement of shear zone in quartzite. Anderson, 1956. 45°04' 113°51'

7. Alder Creek district, Mackay area. Pyrometasomatic replacement of limestone and granite. Umpleby, 1917. 43°50' 113°44'

8. Blue Wing district. Veins in Precambrian slates and schist. Callaghan and Lemmon, 1941. 44°32' 113°42'

9. Warm Springs district. Replacement of shear zones. Kiilsgaard, 1950. 43°40' 114°17'

MAINE

1. Blue Hill district, Douglass, Blue Hill, Twin Lead, Stewart mines. Massive sulfide. Emmons, 1910b. 44°24' 68°37'

2. Cape Rosier, Deer Isle, Tapley mines. Massive sulfide. Emmons, 1910b. 44°21' 68°48'

MARYLAND

1. Bare Hills mine. Vein and replacement in gneiss. Weed, 1911. 39°23' 76°40'

2. Sykesville district, Mineral Hill mine. Replacement and veins in schist. Weed, 1911. 39°26' 76°56'

3. Sykesville district, Springfield (Sykesville) mine. Replacement in schist. Weed, 1911. 39°23' 76°58'

4. Linganore district, Liberty mine. Replacement in marble. Weed, 1911. 39°31' 77°15'

5. Linganore district, New London mine. Replacement in marble. Weed, 1911. 39°25' 77°15'

MASSACHUSETTS

1. Davis mine. Massive pyrite. Quinn, 1945. 42°41' 72°52'

MICHIGAN

1. Central mine. Vein. Butler and Burbank, 1929. 47°24' 88°12'

2. Cliff mine. Vein. Butler and Burbank, 1929. 47°22' 88°18'

3. Iroquois mine. Vein. Butler and Burbank, 1929. 47°20' 88°20'

4. Houghton (Allouez No. 3 shaft) mine. Native copper in conglom- 47°19' 88°22'

MICHIGAN (cont'd.)

erate. Butler and Burbank, 1929.

5. Allouez mine. Native copper in conglomerate. Butler and Burbank, 1929. 47°18' 88°24'

6. Kearsarge mines (Seneca, Mohawk, Ahmeek, Allouez, North Kearsarge, Wolverine, South Kearsarge, Centennial mines). Native copper in amygdaloidal lava. Butler and Burbank, 1929. 47°18' 88°23'

7. Calumet and Hecla, Osceola mines. Native copper in conglomerate and amygdaloidal lava. Butler and Burbank, 1929. 47°14' 88°27'

8. Franklin Junior mine. Native copper in conglomerate and amygdaloidal lava. Butler and Burbank, 1929. 47°11' 88°31'

9. Quincy mine (incl. Franklin, Hancock, Pewabic, Pontiac, and Mesnard mines). Native copper in amygdaloidal lava. Butler and Burbank, 1929. 47°08' 88°34'

10. Atlantic mine. Native copper in amygdaloidal lava. Butler and Burbank, 1929. 47°06' 88°37'

11. Isle Royal mine. Native copper in amygdaloidal lava. Butler and Burbank, 1929. 47°06' 88°35'

12. Baltic mines (Superior, Baltic, Trimountain, Champion). Native copper in amygdaloidal lava. Butler and Burbank, 1929. 47°03' 88°38'

13. Winona mine. Native copper in amygdaloidal lava. Butler and Burbank, 1929. 46°52' 88°55'

14. Adventure mine. Native copper in amygdaloidal lava. Butler and Burbank, 1929. 46°45' 89°05'

15. Mass mine. Native copper in amygdaloidal lava. Butler and Burbank, 1929. 46°46' 89°06'

16. Michigan mine. Vein deposit. Butler and Burbank, 1929. 46°44' 89°10'

17. Victoria mine. Native copper in amygdaloidal lava. Butler and Burbank, 1929. 46°42' 89°14'

18. White Pine mine. Sulfides in sandstone. White and Wright, 1954. 46°46' 89°34'

19. American Metals exploration. Sulfides in sandstone. 46°41' 89°59'

MISSOURI

1. St. Genevieve area, Chicago, 37°54' 90°09'

MISSOURI (cont'd.)

Swansea, Herzog, Crow, and Cornwall mines. Replacement in limestone. Bain and Ulrich, 1905.

2. Mine La Mott mines. Byproduct copper from lead deposits in dolomite. Bain and Ulrich, 1905. 37°37' 90°17'

3. Fredericktown district. Byproduct copper from lead deposits. James, 1949. 37°32' 90°16'

4. Viburnum district. Byproduct copper in lead deposits in dolomite. 37°44' 91°05'

MONTANA

1. Hellgate district, Argo mine. Replacement along fractured zone. Pardee and Schrader, 1933. 46°41' 111°35'

2. Cataract (Basin) and Boulder districts, Comet, Gray Eagle, Hope-Katie mines. Veins and replacement. Pardee and Schrader, 1933. 46°17' 112°13'

3. Colorado (Wickes) district. Veins. Pardee and Schrader, 1933. 46°22' 112°07'

4. Radersburg (Cedar Plains) district. Veins. Pardee and Schrader, 1933. 46°11' 111°42'

5. Butte (Summit Valley) district. Veins and replacement. Sales, 1914. 46°00' 112°30'

6. Bryant (Hecla) district. Replacement of dolomite. Karlstrom, 1948. 45°36' 112°54'

7. Utopia (Birch Creek) district. Indian Queen, Greenstone mines. Pyrometasomatic replacement in limestone. Winchell, 1914. 45°24' 112°49'

8. Heddleston district. Vein and replacement. Pardee and Schrader, 1933. 47°02' 112°22'

9. Neihart (Montana) district. Vein and replacement. Schafer, 1935. 46°57' 110°44'

10. Philipsburg (Flint Creek) district. Veins and replacement. Emmons and Calkins, 1913. 46°20' 113°16'

11. New World (Cooke City) district. Pyrometasomatic deposits in limestone, veins. Lovering, 1930. 45°02' 109°57'

NEVADA

1. Mountain City (Cope) district Rio Tinto deposit. Disseminated r 41°50' 115°59'

NEVADA (cont'd.)

replacement of quartzite. Granger and others, 1957.

2. Contact district. Pyrometasomatic replacement of limestone. Schrader, 1935. 41°49' 114°46'

3. Battle Mountain district. Copper Basin area. Pyrometasomatic replacement of limestone. Hill, 1915. 40°37' 117°02'

4. Battle Mountain district. Copper Canyon area. Ferguson and others, 1952. 40°32' 117°07'

5. Railroad district. Replacement of limestone and pyrometasomatic replacement. Granger and others, 1957. 40°30' 116°00'

6. Ely (Robinson) district, Kimbley, Ruth, Liberty, Morris-Brooks, and Veteran mines. Spencer, 1917. 39°15' 114°58'

7. Yerrington district, Mason Valley mines. Pyrometasomatic replacement and veins. Knopf, 1918. 38°57' 119°13'

8. Yerrington district, Weed Heights mine. Disseminated sulfides in granodiorite. 38°59' 119°11'

9. Bullion district. Quartz veins with sulfides. Emmons, 1910a. 40°23' 116°44'

10. Eureka district. Replacement in limestone. Sharp, 1948. 39°30' 115°58'

11. Aurum district. Replacement of limestone. Hill, 1916. 39°45' 114°40'

12. Ward district. Veins and replacement deposits. Hill, 1916. 39°04' 114°52'

13. Santa Fe district. Veins with sulfides. Clark, 1922. 38°30' 118°05'

14. Bristol (Jackrabbit) district. Byproduct copper in lead-silver replacement deposits in limestone. Westgate and Knopf, 1932. 38°05' 114°36'

15. Pioche (Ely) district. Byproduct copper from lead-zinc-silver replacement deposits in limestone. Westgate and Knopf, 1932. 37°55' 114°27'

16. Goldfield district. Veins, replacements, byproduct copper. Ransome, 1909. 37°42' 117°13'

17. Yellow Pine (G00dsprings) district. Byproduct copper from lead-zinc deposits in limestone. Hewett, 1931; Albritton and others, 1954. 35°53' 115°30'

NEW HAMPSHIRE

1. Milan mine. Massive sulfide. Emmons, 1910b. 44°34' 71°15'

NEW JERSEY

1. Pahaquarry mine. Disseminated sulfides in quartzite. Cornwall, 1945b. 41°02' 75°02'

2. Arlington (Schuyler) mine. Supergene copper minerals in sandstone. Cornwall, 1945a. 40°47' 74°08'

NEW MEXICO

1. Nacimiento Mountains district. Supergene copper minerals in sandstone. Gott and Erickson, 1952. 36°00' 106°53'

2. Willow Creed (Pecos) district, Pecos mine. Replacement of schist. Harley, 1940. 35°46' 105°40'

3. New Placers district, San Pedro mine. Pyrometasomatic replacement of limestone. Lindgren and others, 1910. 35°15' 106°11'

4. Pintada district, Stauber deposit. Supergene copper minerals in sandstone. Harley, 1940. 34°51' 104°51'

5. Magdalena district. Pyrometasomatic replacement in limestone. Loughlin and Koschmann, 1942. 34°04' 107°12'

6. Burro Mountains district, Tyrone area. Enriched disseminated sulfides. Paige, 1911a. 32°38' 108°23'

7. Lordsburg district, Eighty Five, Miser's Chest, Bonney, and Atwood mines. Veins. Lasky, 1938. 32°19' 108°46'

8. Pinos Altos district. Veins and replacement deposits with byproduct copper. Paige, 1911b. 32°52' 108°13'

9. Central (Hanover, Santa Rita) district, Chino and Bayard mines. Enriched disseminated sulfides. Spencer and Paige, 1935. 32°47' 108°04'

10. Organ district, Torpedo deposit. Secondary copper minerals in veins in fault. Dunham, 1935. 32°26' 106°36'

11. Pintada district, Pintada Lodes. Supergene copper minerals in sandstone. Gott and Erickson, 1952. 34°56' 104°52'

NEW YORK

1. Shawangunk mine. Byproduct copper from lead-zinc vein. Sims and Hotz, 1951. 41°36' 74°27'

2. Croton magnetite mine. Copper 41°22' 73°39'

NEW YORK (cont'd.)

in magnetite lens in gneiss. Colony, 1923.

NORTH CAROLINA

1.	Virgilina district, Bluewing mine and others. Sulfides in quartz veins and byproduct copper in gold quartz veins. Laney, 1917.	36°31'	78°47'
2.	Ore Knob mine. Massive sulfide in gneiss. Ross, 1935.	36°25'	81°20'
3.	Fentress (North Carolina) mine. Veins in sheared granite. Pardee and Park, 1948.	36°00'	79°45'
4.	Gold Hill district, Union, Randolph, Miller, Barnhardt mines. Veins in schist. Pardee and Park, 1948.	35°30'	80°21'
5.	King's Mountain (Catawba) mine. Replacement in limestone. Pardee and Park, 1948.	35°13'	81°20'
6.	Cullowhee mine. Massive sulfide in gneiss. Ross, 1935.	35°16'	83°09'
7.	Hazel Creek (Adams, Everett) mine. Massive sulfide in schist. Espenshade and others, 1943.	35°29'	83°43'
8.	Fontana mine. Massive sulfide in schist. Ross, 1935.	35°29'	83°46'
9.	Virgilina district, Holloway, Durgy, and other mines. Veins and byproduct copper in gold-quartz veins. Laney, 1917.	36°29'	78°48'

OREGON

1.	Iron Dyke mine. Massive sulfide. Parks and Swartley, 1916.	45°02'	116°51'
2.	Waldo district, Queen of Bronze mine. Massive sulfide. Oregon Metal Mine Handbook, 1942.	42°03'	123°37'

PENNSYLVANIA

1.	Cornwall mine. Byproduct copper in magnetite ore body. Weed, 1911.	40°16'	76°24'
2.	Gap Nickel mine. Byproduct copper in nickel deposit. Knopf and Jonas, 1929.	39°57'	76°05'

TENNESSEE

1.	Ducktown district, Burra Burra, London, East Tennessee, Ocoee, Isabella, Eureka, and Mary mines. Massive sulfide in schist. Ross, 1935.	35°03'	84°22'

TEXAS

1.	Allamoor-Van Horn district,	31°10'	104°54'

TEXAS (cont'd.)

Hazel, Eureka, Pecos, Dallas, Mohawk, Sancho, Panza, St. Elmo, Black Shaft mines. Veins in faults in sandstone. Sample and Gould, 1945.

UTAH

1.	Lucin district, Copper Mountain mine. Replacement of limestone. Butler and others, 1920.	41°16'	114°00'
2.	Carbonate district, Dyer mine. Replacement in limestone. Butler and others, 1920.	40°44'	109°35'
3.	Uinta district, Park City area. Replacement and veins mainly in limestone, byproduct copper. Boutwell, 1912.	40°37'	111°31'
4.	Blue Ledge district, Mayflower, Galena mines. Byproduct copper from lead-zinc bodies. Butler and others, 1920.	40°35'	111°27'
5.	Little Cottonwood district. Replacement veins and replacement of limestone. Butler and others, 1920.	40°35'	111°38'
6.	Bingham (West Mountain) district. Enriched disseminated sulfides and replacement. Hunt and Peacock, 1948; Boutwell, 1905.	40°31'	112°09'
7.	Gold Hill (Clifton) district. Pyrometasomatic replacement of marble. Butler,and others, 1920; Nolan, 1935.	40°10'	113°50'
8.	Tintic district. Lead-silver replacement of limestone, byproduct copper. Lindgren and Loughlin, 1919.	39°57'	112°07'
9.	East Tintic district. Lead-silver replacement of limestone, byproduct copper. Lindgren and Loughlin, 1919.	39°58'	112°04'
10.	Ophir district. Replacement of limestone. Butler and others, 1920.	40°24'	112°14'
11.	Rocky district, Harrington-Hickory mine. Replacement of limestone. Butler, 1913.	38°21'	113°06'
12.	Beaver Lake district, OK deposit. Replacement pipe in quartz monzonite. Butler, 1913.	38°29'	113°07'
13.	San Francisco district, Horn Silver mine. Byproduct copper-lead-zinc deposit in limestone. Butler, 1913.	38°26'	113°16'
14.	Preuss district, Cactus mine. Breccia pipe in quartz monzonite. Butler, 1913.	38°29'	113°17'

Locality Index (cont'd.)

UTAH (cont'd.)

15. American Fork district. Byproduct copper from lead-zinc-silver ore. Calkins and Butler, 1943.	40°32'	111°40'
16. Stockton (Rush Valley) district. Lead-zinc replacement of limestone, byproduct copper. Gilluly, 1932.	40°28'	112°18'
17. Star and North Star districts. Lead-zinc replacement in limestone, byproduct copper. Butler and others, 1920.	38°23'	113°08'
18. Tutsagubet district, Apex mine. Replacement and fissure filling in limestone. Kinkel, 1951.	37°06'	113°53'
19. Big Indian mine. Disseminated supergene copper minerals in sandstone. Butler and others, 1920.	38°14'	109°13'
20. Lisbon Valley (Pioneer) district. Disseminated supergene copper minerals in sandstone. Butler and others, 1920.	38°09'	109°06'

VERMONT

1. Eureka Union mine. Massive sulfide and disseminated. White and Eric, 1943.	44°03'	72°18'
2. Ely (Vershire, Vermont Copper) mine. Massive sulfides and disseminated. White and Eric, 1943.	43°56'	72°17'
3. Elizabeth mine. Massive sulfide and disseminated. White and Eric, 1943; McKinstry and Mikkola, 1954.	43°49'	72°20'

VIRGINIA

1. Valzinco (Holladay) mine. Massive sulfide in schist. Grosh, 1949b.	38°10'	77°48'
2. Louisa County pyrite district. Arminius, Boyd-Smith, Sulphur and Allah-Cooper mines. Massive sulfides in schist. Hickman, 1947; Grosh, 1949a.	38°02'	77°54'
3. Dillwyn district, London and Virginia, Buckingham, Anaconda, and United States mines. Sulfide replacement of schist. Taber, 1913.	37°35'	78°27'
4. Sutherland mine. Massive sulfide. Grosh, 1948a.	36°50'	80°20'
5. Toncrae - Howard mine. Massive sulfide. Grosh, 1948b.	36°50'	80°22'
6. Gossan Lead, Monarat, Betty Baker, and other mines. Massive sulfide in schist. Ross, 1935.	36°44'	80°56'
7. Virgilina district, Virginia section. Copper in quartz veins and byproduct copper in gold-quartz veins. Laney, 1917.	36°35'	78°47'

WASHINGTON

1. Glacier Peak district. Disseminated and veins in quartz diorite.	48°12'	120°58'
2. Lake Chelan district, Holden mine. Sulfides in shear zone. Youngberg and Wilson, 1952.	48°11'	120°47'
3. Index district, Sunset mine. Veins. Weaver, 1912.	47°51'	121°27'
4. Chewelah district, Copper King mine. Replacement of schist. Weaver, 1920.	48°19'	117°40'
5. Danville district, Lone Star and Washington deposit. Disseminated sulfides in schist. Bancroft, 1914.	48°59'	118°36'

WYOMING

1. Hartville district, Sunrise mine. Supergene copper minerals in sandstone and limestone. Ball, 1907.	42°20'	104°41'
2. Holmes district, Rambler mine. Enriched disseminated and replacement. Emmons, 1903.	41°15'	106°14'
3. Encampment district, Ferris-Haggerty mine. Massive sulfide. Spencer, 1904.	41°11'	107°04'

WISCONSIN

1. Upper Mississippi Valley district. Copper minerals in zinc and lead ore in limestone. Heyl and others, 1955.	42°51'	90°11'

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