DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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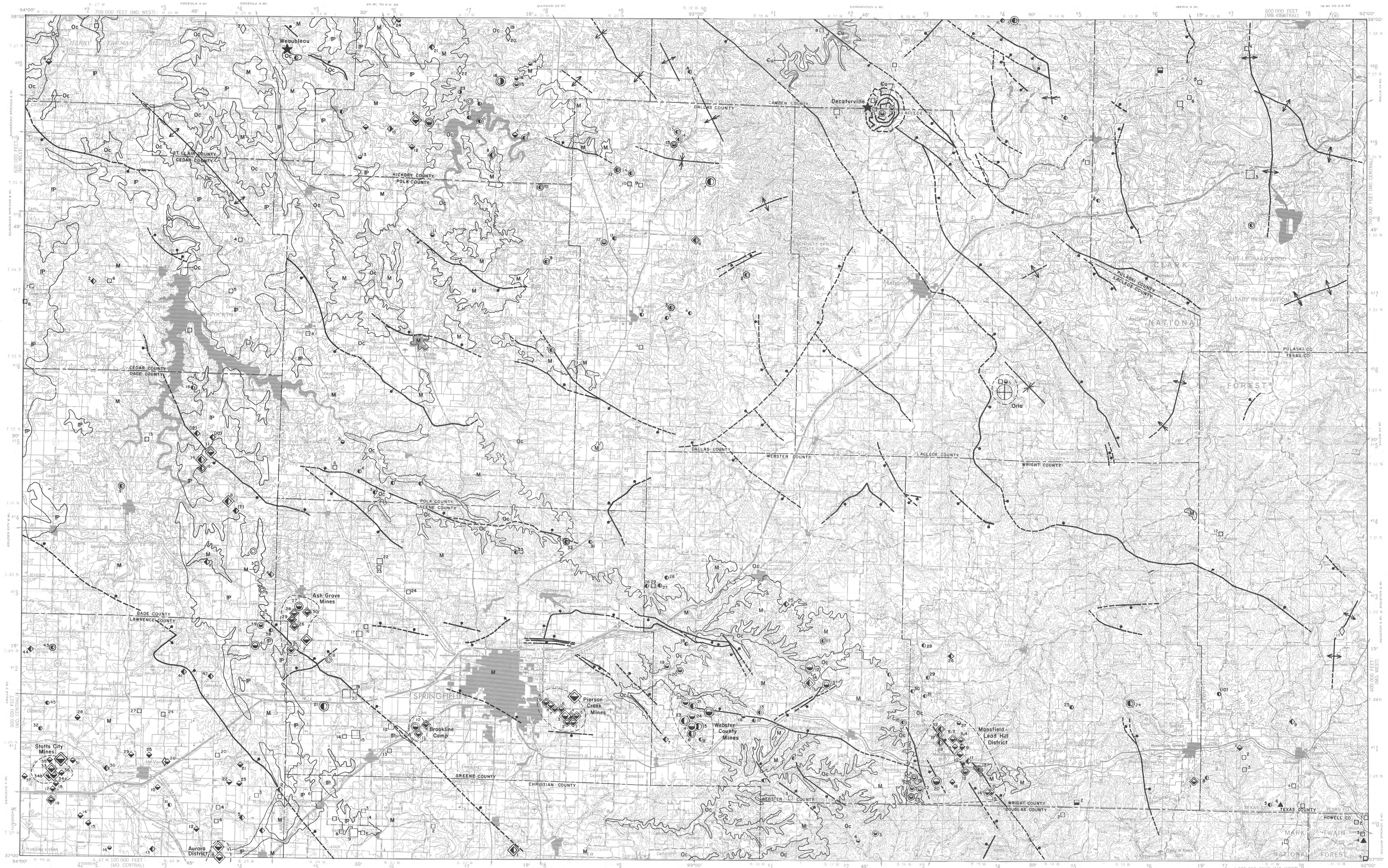
MISCELLANEOUS FIELD STUDIES
MAP MF-1830-C
FOLIO OF THE SPRINGFIELD 1° X 2° QUADRANGLE, MISSOURI
SHEET 1 OF 2



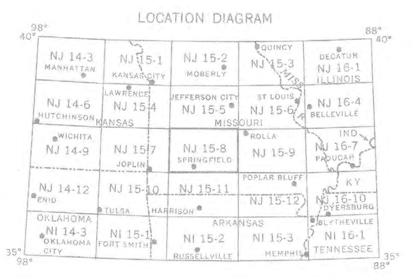
Base from U.S. Geological Survey, 1954-69

Geology simplified from Middendorf (1987)

Scale 1:250,000

20 Statute Miles
30 Kilometers
15 Nautical Miles

CONTOUR INTERVAL 100 FEET
WITH SUPPLEMENTARY CONTOURS AT 50 FOOT INTERVALS



MINES, PROSPECTS, AND OCCURRENCES OF METALLIC MINERALS AND BARITE, SPRINGFIELD 1° X 2° QUADRANGLE, MISSOURI

By

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EXPLANATION

- P — Pennsylvanian bedrock
- M — Mississippian bedrock
- Oc — Ordovician (Canadian Series) bedrock
- Єu — Upper Cambrian bedrock
- Contact
- **Fault**--Dashed where approximately located; bar and ball on downthrown side
- Anticline
- Syncline
- Monocline
- Cryptoexplosion structure
- Orla magnetic anomaly

Mines, prospects, occurrences--Locality numbers are listed by county in table 1; number in parentheses indicates approximate site of cluster of prospects. Symbol indicates production, when known

- Barite
- Copper
- Iron ore
  - Less than 100 tons of ore shipped
  - 100-500 tons of ore shipped
  - 1,000-10,000 tons of ore shipped
  - More than 20,000 tons of ore shipped
- Pyrites
- Lead
  - No production known
  - Less than 100 tons ore concentrate
  - 100-500 tons ore concentrate
  - 500-4,000 tons ore concentrate
- Lead-barite
- Lead-zinc (more lead than zinc)
  - Less than 100 tons ore concentrate
  - 100-500 tons ore concentrate
  - 500-4,000 tons ore concentrate
- Manganese
- Zinc
  - Less than 1,000 tons ore concentrate
  - 1,000-10,000 tons ore concentrate
  - 25,000-35,000 tons ore concentrate
- Zinc-barite
- Zinc-lead (more zinc than lead)
  - Less than 1,000 tons ore concentrate
  - 1,000-10,000 tons ore concentrate
  - 25,000-35,000 tons ore concentrate
- District total

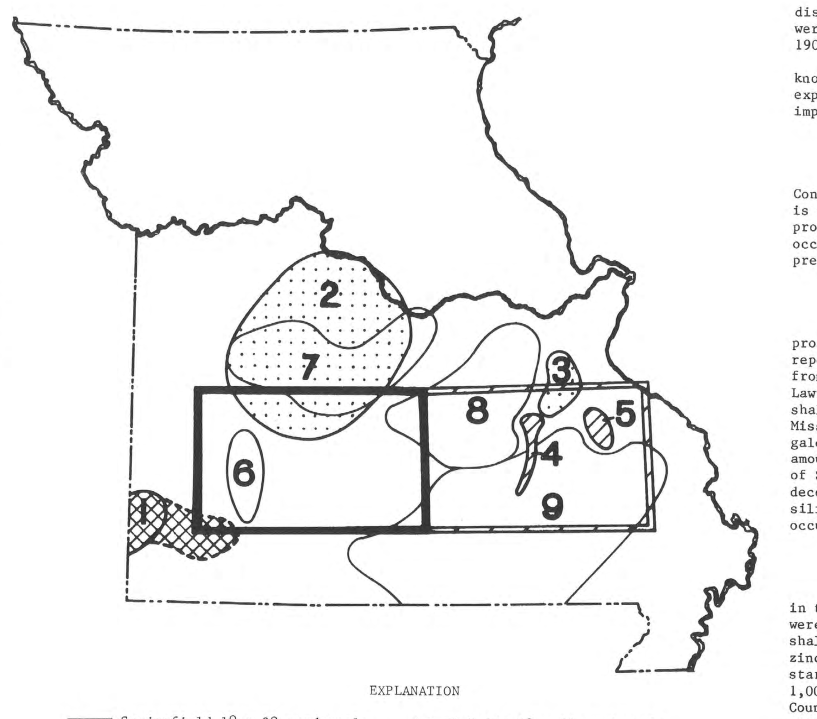

Figure 1.--Missouri mining districts related to the Springfield and Rolla 1° x 2° quadrangles.

DISCUSSION

This map is part of a folio of maps of the Springfield 1° x 2° quadrangle, Missouri, prepared under the Conterminous United States Mineral Assessment Program. Other publications in this folio to date include U.S. Geological Survey Miscellaneous Field Studies Maps MF-1830-A and B and Missouri Geological Survey Open-file Report OFR-85-42-MR. Additional maps showing various geologic aspects of the Springfield quadrangle will be published as U.S. Geological Survey Miscellaneous Field Studies Maps bearing this same serial number with different letter suffixes (MF-1830-D, E).

INTRODUCTION

This map and report present basic information on the types of deposits present in the Springfield 1° x 2° quadrangle, and their location, character, and significance. The data were compiled from records at the Missouri Geological Survey. The mode of occurrence, host rock, period of mining activity, and production information are summarized as far as possible for each known or reported mine, prospect, and occurrence.

The relationship of the Springfield quadrangle to the several nearby mining districts is shown in figure 1. The Springfield quadrangle is about 50 miles west of the Southeast Missouri Lead and Barite Districts, but only about 25 miles east of the once major Duenweg--Webb City--Oronogo mining areas of the Tri-State Zinc-Lead District. In fact, the U.S. Bureau of Mines, U.S. Geological Survey, and some other authorities extend the outlines of the Tri-State District eastward to include even the Pierson Creek mines southeast of the City of Springfield. In effect, any significant zinc and lead deposits hosted by Mississippian rocks are included in the district. Small sections of the Central Missouri District (mostly barite deposits) and the Steelville Filled-Sink Iron District also lie within the quadrangle. All of the Springfield Iron District and fringe areas of the Osage River and West Plains Iron Districts are also included.

MINERAL DEPOSIT TYPES

The following eight mineral deposit types have been identified in the Springfield quadrangle:

1. Mississippi Valley-type (stratabound, carbonate-hosted) zinc and lead deposits in Mississippian rocks
2. Mississippi Valley-type lead and zinc deposits in Cambrian and Ordovician rocks
3. Residual brown iron ore deposits
4. Hematite and marcasite-pyrite deposits in filled sinks
5. Barite and lead-barite deposits in sedimentary rocks
6. Base-metal minerals in the Decaturville structure
7. Copper minerals in sedimentary rocks
8. Manganese deposits in sedimentary rocks

Mine production of barite, iron ore, iron pyrites, lead, and zinc is known from deposits of the first six types, but not from the copper and manganese occurrences. Because there is no mining of these mineral types in the quadrangle at the present time, the listing is in order of past economic importance. Zinc-lead deposits in Mississippian rocks are by far the most important. The Upper Cambrian Bonneterre Formation, host rock of the major lead-zinc deposits of southeastern Missouri, is found only in the subsurface in the quadrangle. This formation has been the target for considerable prospect drilling in the area, but the writer knows of no important discoveries to date. Lead and zinc minerals and minor ore production have been reported from Cambrian formations exposed at the Decaturville structure in Camden and Laclede Counties. A separate listing is given for these occurrences as type 6 because their genesis is in question.

Zinc and lead were last mined in the quadrangle about 1950, but there has been intermittent exploration drilling for these metals (and copper) up to and including the 1980's. Barite was last mined in the 1960's, but there was some leasing activity as recently as 1982. No shipments of pyrites are known since 1918, or of hematite after 1934. Last reported mining of brown iron ore in the area was in 1958.

Table 1 contains data on the mines, prospects, and reported occurrences, listed by county. A total of 275 deposits is indicated. Some 190, or 70 percent, contained lead, zinc, or zinc and lead combined. Among the known mines, 90 of the 116 (nearly 80 percent) contained lead or zinc, or both metals. Zinc-lead mines in Mississippian rocks (Tri-State model) were the most abundant, and by far the most important ore producers. Only about a third of the quadrangle, mostly in the western part, is underlain by Mississippian rocks. In the following sections, the principal mines and prospects in each commodity group will be briefly described and evaluated. More complete discussions are given in Wharton (1985).

PRINCIPAL MINES OF LEAD AND ZINC

A separate section has been set aside for the lead and zinc mines in the quadrangle because of their past importance and the special interest attached to the possibility of new ore discoveries in the general area. Each of the commodity groupings shown in the map legend will be described separately.

Lead mines

Typical lead mines in the area are small, shallow diggings in the residual clays developed on both Ordovician and Mississippian bedrock. Workings sometimes extended downward into fractures, crevices, and joints containing galena in the bedrock itself. Five mining areas are singled out as the most important. The Pickerel Creek mines in southwestern Greene County and the "Webster County mines" near Fordland were each reported to have produced at least 4,000 tons of lead ore, mostly before 1880. Hundreds of pits and shallow shafts were used to extract ore in the clays and underlying bedrock of Mississippian and, in some cases, Ordovician ages.

The Rex Consolidated and Rambo mines are considered the next largest producers. They are located at the south edge of the Central Missouri district in Hickory and Dallas Counties, respectively; both are associated with Ordovician rocks. There is no record of the output from the Rex Consolidated mine, but there was reported to be a 500-tons-per-day (tpd) jig mill in operation when it was last worked in 1908. The Rambo mine was a clay-filled circle deposit 60 ft in diameter and initially mined from 1868 to 1870. About 500 tons of galena were recovered, and it was later mined from time to time as an open pit, perhaps as recently as the 1930's.

The Brazelton mines near Mountain Grove in Wright County round out this discussion of the more important lead mines. Several hundred tons of galena were probably mined from residual clays above Ordovician bedrock here before 1900.

The surficial lead deposits in the quadrangle are similar to the better known ones in Washington County, Missouri. They could be easily and cheaply exploited by hand mining methods for many years in the past, but have no importance in terms of today's mining industry.

Lead-barite prospects

Some barite was probably recovered along with galena at the Rex Consolidated mine in Hickory County, described in the previous section. There is no record of successful operations here after 1908. The Tatum lead-barite prospect nearby was not large enough to warrant mining. The lead-barite occurrences have the same economic shortcomings as the lead mines described previously.

Lead-zinc mines

Three lead-zinc mines are singled out as the most important past producers in the quadrangle. The Teague Creek mines in Webster County are reported to have produced more than 500 tons of lead ore and some zinc ores from residual clays above Ordovician rocks during the 1870's. The Lawrenceburg mines, located near the northeast corner of Lawrence County, were shallow pits opened for lead in 1894. By 1905, there were shafts into the Mississippian bedrock which yielded some zinc silicate ores in addition to the galena. Recorded output was only about 250 tons of lead ores, and lesser amounts of zinc ores. The Brookline camp, located in Greene County southwest of Springfield, was discovered in 1873. Mining was by shafts in clays and decomposed Mississippian bedrock. Only about 200 tons each of lead and zinc silicate ores had reportedly been recovered through 1893. These surficial occurrences are of no economic importance today.

Zinc mines

Five former zinc producers were selected as the most important zinc mines in the quadrangle. The Robertson Mining Company mines in Christian County were active from 1916 to 1918. Initially, zinc carbonate ores were mined by shallow shafts in Mississippian bedrock. Later, they were deepened to mine zinc sulfide ores discovered by drilling. Construction of a 150-tpd mill was started in 1916. There is no record of production but it is likely that over 1,000 tons of zinc ore were mined. The Star (Porter) mine and mill in Webster County were operated for a year during 1927 and 1928, but no record of production is available. Two shafts were used to mine ore occurring in Ordovician rocks. Mostly oxidized zinc ores were mined from the "Old and New Mines" in Dade County in the Corry Mines area. Over 2,000 tons of ore were mined at the former site and lesser amounts at the latter from residual material above Mississippian bedrock. All the reported activity was in the 1870's. The Pittsburg mines in Hickory County also yielded mostly oxidized zinc ores in and above Ordovician bedrock. Activity was around the turn of the century.

The near-surface zinc deposits exploited in these mines are much too small to be of economic importance today, and it is unlikely that many undiscovered deposits of this type remain in the area.

Zinc-lead mines

Zinc-lead mines are by far the most important and numerous type in the area. There were 32 known mines in the quadrangle. The six foremost mining areas will be reviewed. Mineralization was in Mississippian rocks (Tri-State model) in the first five, and in Ordovician rocks at the sixth area, the Mansfield district. The Red Wasp-Arrow mines, part of the important Aurora district, are listed third only because most of the mine workings are just outside the Springfield 1° x 2° quadrangle. Aurora ranks with Granby as an outstanding ore producer, and it is usually treated as an integral part of the Tri-State Zinc-Lead district. Information about the Aurora camp as a whole will be given since it is not unreasonable to expect that undiscovered zinc-lead deposits of this size could possibly be present in the Springfield quadrangle, as well as in the bordering Harrison 1° x 2° quadrangle to the south.

(1) The Stotts City deposits in Lawrence County were mined at intervals from 1888 until 1945, and yielded about 31,000 tons of zinc ore concentrates and 1,000 tons of lead ore concentrates. Crude ore production may have approached 500,000 tons. The principal output was from two parallel, linear ore runs striking NNW, the main one being about 3,000 feet long. They appear to be fracture zones with little or no vertical displacement. The main ore horizon was near the top of the Mississippian Reeds Spring Formation. Drilling by the U.S. Bureau of Mines in 1943 and 1944 failed to find additional ore.

(2) The Pierson Creek mines are located in Greene County near the southeast edge of the City of Springfield. Mineralization along the James River was reported by Schoolcraft in 1819, and mining for lead began in a small way in 1844, possibly the first instance in southwestern Missouri. Ore occurred in a series of parallel faults and fractures striking NNW, mainly in the Mississippian Northview and Compton Formations, with some extending downward into the Ordovician Cotter Dolomite. Production from 1875 through 1916 is estimated to be about 29,000 tons of zinc ore concentrates and 3,000 tons of lead ore concentrates. Total crude ore production may have exceeded 400,000 tons. Exploration drilling was done in the area by Eagle-Picher in the 1960's and by Gulf Oil in the 1970's. Mineralization in Ordovician rocks was of particular interest in the later campaigns.

(3) The Red Wasp and Arrow mines are located in Lawrence County at the north edge of the Aurora district. Mineralization is localized in a N-S fracture zone with the main ore horizon in the Mississippian Reeds Spring and Elsey Formations. Production between 1916 and 1940 may have exceeded 10,000 tons of combined zinc and lead ore concentrates, but no production data are available after 1918. Output reported for 1916-1918 was about 4,500 tons. Two strong trends are apparent in the main mining area of the Aurora district: one roughly E-W and a less prominent one nearly N-S. They may be related to the E-W Richey fault located about 2 miles to the south. All the Mississippian formations were mineralized, but mineralization was strongest in the Reeds Spring and Elsey beds. Ore was also found at the top of the Ordovician Cotter Dolomite in some of the mines. The district was active from 1886 until 1951, a span of over 60 years. Production records are incomplete, but it is estimated that about 404,000 tons of zinc concentrates and 35,000 tons of lead concentrates with a combined value of nearly $13 million were produced from four to five million tons of crude ores. Mining covered an area of about 2 square miles.

(4) The Ash Grove-Everton mines in Greene and Dade Counties and the Corry mines not far to the northwest in Dade County were groups of small surface mines and shallow shafts in Mississippian bedrock. Both areas were discovered in the 1870's, and there was some minor production as late as the 1940's. Estimated production from the Ash Grove-Everton area is about 5,500 tons of zinc concentrates and 800 tons of lead concentrates; and from Corry mines, 5,000 tons and 2,500 tons, respectively.

(5) The Mansfield district, near the southwestern corner of Wright County, included many small mines developed on narrow fissure-vein deposits in the Ordovician Jefferson City and Cotter Dolomites. Mining was mostly from the 1850's until 1900, and an estimated 3,000 tons of zinc and 500 tons of lead ore concentrates were produced. This type of deposit is of no importance today.

Summary

The mineral deposits at Aurora and Stotts City are believed to be large enough to be economically minable today. Those at Pierson Creek were smaller and scattered, as were those at Ash Grove-Everton and the Corry mines. Since the general area has probably been carefully prospected over the years, it is unlikely that any large zinc-lead deposits remain to be discovered in areas where Mississippian rocks are exposed. Residual lead and oxidized zinc deposits were generally found at the surface above important bedrock deposits. It is concluded that the best chances for significant ore discoveries in Mississippian rocks in the quadrangle are in areas where they are overlapped and masked by Pennsylvanian formations. Perhaps a tenth of the quadrangle in the western part is underlain by the younger rocks.

PRINCIPAL MINES AND PROSPECTS OF OTHER METALS

Barite mines

Only five small barite mines were identified in the quadrangle. The McCanless (Murphy) mine near Houston in Texas County was the most important, yielding about 1,300 tons of barite concentrates over many years. The deposit is unusual in being about 60 miles away from the Washington County and Central Barite districts. The barite itself is semi-transparent and has a distinctive blue color. It occurred in a solution-collapse structure similar to the karst-related "circle" deposits in the Central district. Deposits of this type were described in detail by Mather (1947). The other four mines were located at the southern edge of the Central district. Given the small size of these deposits, plus the long history of prospecting and mining in the general area, there seems little chance for discovering larger deposits.

Copper prospects

There were only four minor copper occurrences identified in the quadrangle, and they were of no importance.

Hematite and magnetite iron ore

The G. W. Lane and Moccasin Bend mines in Pulaski County, located at the edge of the Steelville Filled-Sink Iron District, were the only noteworthy hematite mines in the quadrangle. About 3,000 tons of hematite ore were shipped from the former around 1930, and one carload from the latter in 1934. Chances for discovering important new deposits of this type in the Springfield quadrangle are considered small.

Disseminated magnetite, but no mineral deposits, was found in the Precambrian basement rocks at the Orla magnetic anomaly near Lebanon (Laclede County). This prominent anomaly was test drilled by mining companies in the 1950's and 1960's.

Brown iron ore

The five most productive brown iron ore mines in the quadrangle were located in the Springfield Iron District in Christian and Greene Counties. All were small and were operated before 1910. The Frisco mine, located near the northwest corner of Christian County, produced 23,000 tons of ore between 1904 and 1907. The four other mines yielded between 1,100 and 8,000 tons. Last known production (about 1,200 tons) was from a small mine near Republic (Greene County) in 1957-1958. By 1968, the market for this type of material was practically nil. Since good surface exposures of iron-ore rubble are common at these sites, it seems unlikely that any sizable deposits remain to be discovered in the Springfield quadrangle.

Iron pyrites

Only one iron pyrites mine and two prospects are known in the quadrangle. According to Grawe (1945), a carload of ore was shipped from the Hinote mine in Wright County in 1918, but he stated that the mine had little potential. The two prospects are located in Pulaski County, near the western border of the Steelville Filled-Sink Iron District. It is doubtful that any large deposits are present in the Springfield quadrangle.

Manganese

The single manganese prospect identified in the quadrangle is located in Howell County. It was explored by two shafts, and was then abandoned as being too small for further development. A very minor occurrence was also reported nearby in Texas County. The potential for discovering economic deposits of manganese in the Springfield quadrangle is practically nil.

REFERENCES CITED

Erickson, R. L., Erickson, M. S., Mosier, E. L., and Chazin, B., 1985, Summary geochemical and generalized geologic maps of the Springfield 1° x 2° quadrangle and adjacent area, Missouri: U.S. Geological Survey Miscellaneous Field Studies Map MF-1830-A, scale 1:500,000.

Grawe, O. R., 1945, Pyrites deposits of Missouri: Missouri Geological Survey and Water Resources, 2d series, v. 30, 282 p.

Martin, J. A., and Pratt, W. P., eds., 1985, Geology and mineral resource potential of the Springfield 1°x2° quadrangle, Missouri, as appraised in September 1985: Missouri Department of Natural Resources, Division of Geology and Land Survey, Open-File Report OFR-85-42-MR, 82 p.

Mather, W. B., 1947, Barite deposits of central Missouri: American Institute of Mining and Metallurgical Engineers Technical Publication 2246, 15 p.; also published as Transactions, v. 173, p. 94-108.

Middendorf, M. A., 1987, Geologic map of the Springfield 1° x 2° quadrangle, Missouri: U.S. Geological Survey Miscellaneous Field Studies Map MF-1830-D, scale 1:250,000.

Wharton, H. M., 1985, Mines, prospects, and occurrences of metallic minerals and barite in the Springfield 1°x2° quadrangle; in Martin, J. A., and Pratt, W. P., eds., Geology and mineral-resource potential of the Springfield 1°x2° quadrangle, Missouri, as appraised in September 1985: Missouri Department of Natural Resources, Division of Geology and Land Survey Open-File Report OFR-85-42-MR, p. 73-82.

Whitfield, J. W., 1986, Surficial materials map of the Springfield 1° x 2° quadrangle, Missouri: U.S. Geological Survey Miscellaneous Field Studies Map MF-1830-B, scale 1:250,000.

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