MINING IN MISSOURI'S PUBLIC LANDS

by

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by

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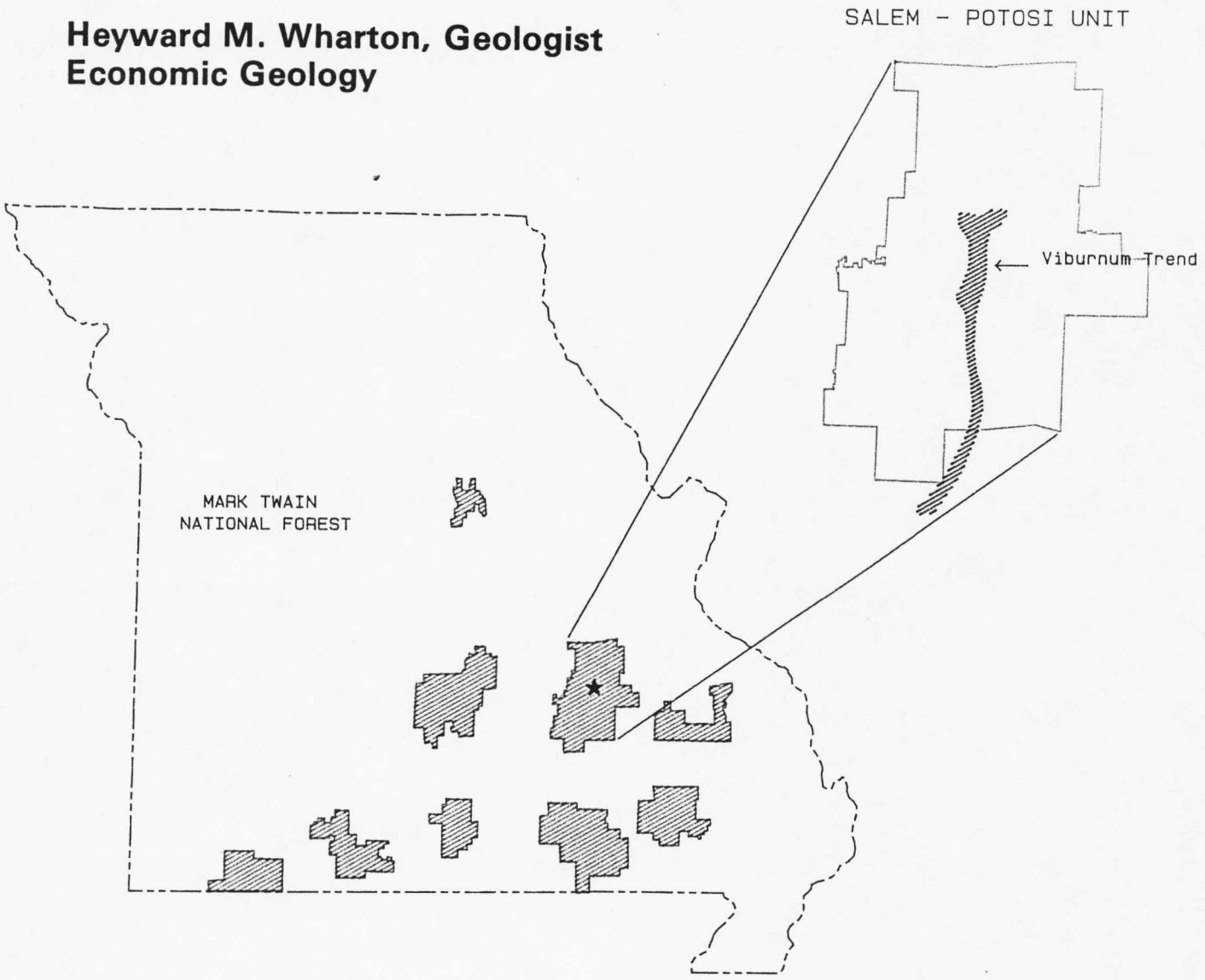

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
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PREFACE

The National Public Lands Advisory Council to the Bureau of Land Management (BLM), U. S. Department of Interior, met in Rolla, Missouri, November 11-14, 1986. The 21-member council was established in 1985 to advise the Secretary of the Interior, through the BLM, on matters of policy and programs of national scope related to the resources and uses of Public Lands under BLM jurisdiction. The meeting was the first held in the Eastern States region, and it included a state agencies panel discussion on the management of Federal lands and minerals in Missouri. Mining in Missouri's Public Lands was the topic addressed by the Missouri Department of Natural Resources. A written version of the talk is presented in this report.

To start with, the Public Lands in Missouri are identified. Rules for prospecting and mining of hardrock minerals in the Federal Acquired Lands in the Mark Twain National Forest are described next. A brief review of the ore discoveries and mine developments in the Viburnum Trend lead-zinc district follows. The national importance of the new mining district is emphasized, and its economic impact on local counties and the State. Some mining industry problems arising from more intensive environmental regulation are then cited. Other known mineral deposits in the Mark Twain National Forest are described. Finally, an optimistic future is predicted for the Viburnum Trend, and for possible new ore discoveries in the Public Lands in southern Missouri.

MINING IN MISSOURI'S PUBLIC LANDS

Public Lands in Missouri

Virtually all federal lands in Missouri were sold off in the early days of statehood, and there are now only 2,847 acres classified as public domain. The existing U.S. lands were repurchased from private landowners, and are referred to as Federal Acquired Lands. The National Forests were established and land purchases initiated in the early 1930's. The Corps of Engineers lands were bought in areas selected for construction of large Corps dams and reservoirs. The U. S. Bureau of Land Management (BLM) is responsible for minerals management in both the Forest Service and Corps areas, as well as in the smaller federal holdings. BLM is also responsible for 13,375 acres of U.S. mineral rights in 182 small split-estate tracts scattered about in 58 of Missouri's total of 114 counties (table 1). These small holdings became government property due to federal loan foreclosures. The surface acreages were subsequently sold off, but the mineral rights retained. The rules for conveying them to the present surface owners are such that little progress in that direction is expected.

The acreages of federal and state lands in Missouri are given in table 1. Locations are best shown in a general way in the Missouri Department of Conservation wall map of State and Federal Lands in Missouri, Nov. 1984. The Forest Service owns nearly 1.5 million acres in eight large units which encompass slightly more than three million acres within their borders. The Corps of Engineers is the other large federal property owner. The State's largest landowners are the Missouri Department of Conservation (DOC) and Missouri Department of Natural Resources (DNR). There are 515,761 acres in DOC's fisheries, forestry, recreation and wildlife areas. Over 288,000 acres are in the State Forests. DNR's Parks, Recreation and Historic Preservation Division administers 74 sites totaling 102,352 acres. DOC has a prospecting permit and lease system for the State Forests based on BLM regulations for lead & zinc. Only one permit and five leases remain in effect today.

TABLE 1

PUBLIC LANDS IN MISSOURI*

Federal	Acres	% of Total
Forest Service (3,081,618)	1,470,309	67.5
Corps of Engineers	539,297	24.8
Dept. of Army	63,071	2.9
National Park Service	54,013	2.5
Fish & Wildlife Service	43,263	2.0
BLM Split-Estate Mineral Rights	(13,375)	--
U.S. Air Force	5,783	0.3
Public Domain	2,847	0.1
BLM-Owned Surface, Public Domain	(399)	--
Other	245	--
TOTAL	2,178,828	100.0%

*The Federal total is about 5% of the Missouri State total of 44,248,320 acres.

State	Acres
Dept. of Conservation (Fisheries, Foresty, Recreation, and Wildlife Areas): 288,616 acres in State Forests	515,761
DNR Division of Parks, Recreation, & Historic Preservation	102,352

Sources: BLM's Public Land Statistics - 1985
Missouri Official Manual - 1985/1986

Prospecting Permits and Preference Right Leases

The Federal Acquired Lands in Missouri are open to prospecting for and mining of hard rock minerals under provisions given in CFR Title 43, Part 3500. The regulations provide for mineral leasing, rather than for staking the lode or placer claims permissible in states with public domain. Prospecting permit and lease applications are filed with BLM's Eastern States Office (ESO) in Alexandria, Virginia. The permits are adjudicated there, and copies sent on to BLM and Forest Service (FS) in Milwaukee, and thence to their respective offices in Rolla for checking. It generally takes about two years for a permit to be processed and issued, but this has sometimes been reduced to around a year more recently. The next step is the submission of a prospecting plan for approval by both BLM and FS offices in Rolla. Finally, the permittee must signify agreement to special stipulations directed toward protecting the environment.

Permits call for a $0.50 per acre per year rental payment for the initial two-year plan. One drill hole per permit, or equivalent expenditure, is required to qualify for the final four-year extension. A prospecting permit cannot exceed 2,560 acres, and no more than 20,480 acres in permits and leases can be held by a company at one time. Drill logs, assays, and drill hole plugging reports have to be submitted to the local BLM office at least quarterly; and the companies work closely with the district foresters as drilling proceeds.

The discovery of significant mineralization in a drill hole in the permit area is required to qualify for a Preference Right Lease. The leases have a 20-year term and rental payments are $1 per acre per year for the first five years, and $3 an acre a year thereafter. Mining operations are to start within ten years. Detailed construction, operating and mining plans must be submitted for approval to both BLM and FS in the event of a discovery and the subsequent plan for a mining

development. Land exchanges are arranged by the Forest Service in situations where a company needs the land for surface facilities. Only the surface acreages are conveyed; the mineral rights being retained by the government. If mine production is achieved, the royalty payments are made monthly to the Minerals Management Service at the rate of 5 percent of the net smelter returns on the tonnages of lead, zinc and copper ore concentrates produced from the BLM lease.

Viburnum Trend Ore Discoveries

St. Joe Lead made the first ore discovery on private land in Crawford County in September 1955, but much of the ore in the general area was found on surrounding Forest Service land. The company subsequently tied up large acreages with prospecting permits to protect and hopefully extend the important new find. It was the culmination of a 10-year, $10 million exploration program by St. Joe. Numerous companies were soon attracted to the area when news of the discovery became known. A vigorous competition for land position ensued, much of it involving BLM prospecting permits. In this case, the 20,480-acre limitation prevented any one company from securing most or all of the ore deposits. Later discoveries along the Viburnum Trend followed: Bear Creek Mining Company (Kennecott) at Blair Creek in January 1958; the St. Joe Fletcher orebody in July 1958; the AMAX Buick deposit late in 1960; the Ozark Lead (Kennecott) Milliken deposit in January 1962; the Cominco-Dresser Magmont orebody in September 1962; the St. Joe Brushy Creek deposit in 1963; the ASARCO West Fork orebody late in 1963. All the new discoveries and mines are inside the Salem-Potosi Forest districts boundaries except those of Ozark Lead Company at the south end of the 45-mile long mineralized belt. Mine locations are shown in the accompanying index maps, figures 1 & 2.

LEAD MINES, MILLS, AND SMELTERS IN THE SALEM - POTOSI UNIT OF THE MARK TWAIN NATIONAL FOREST

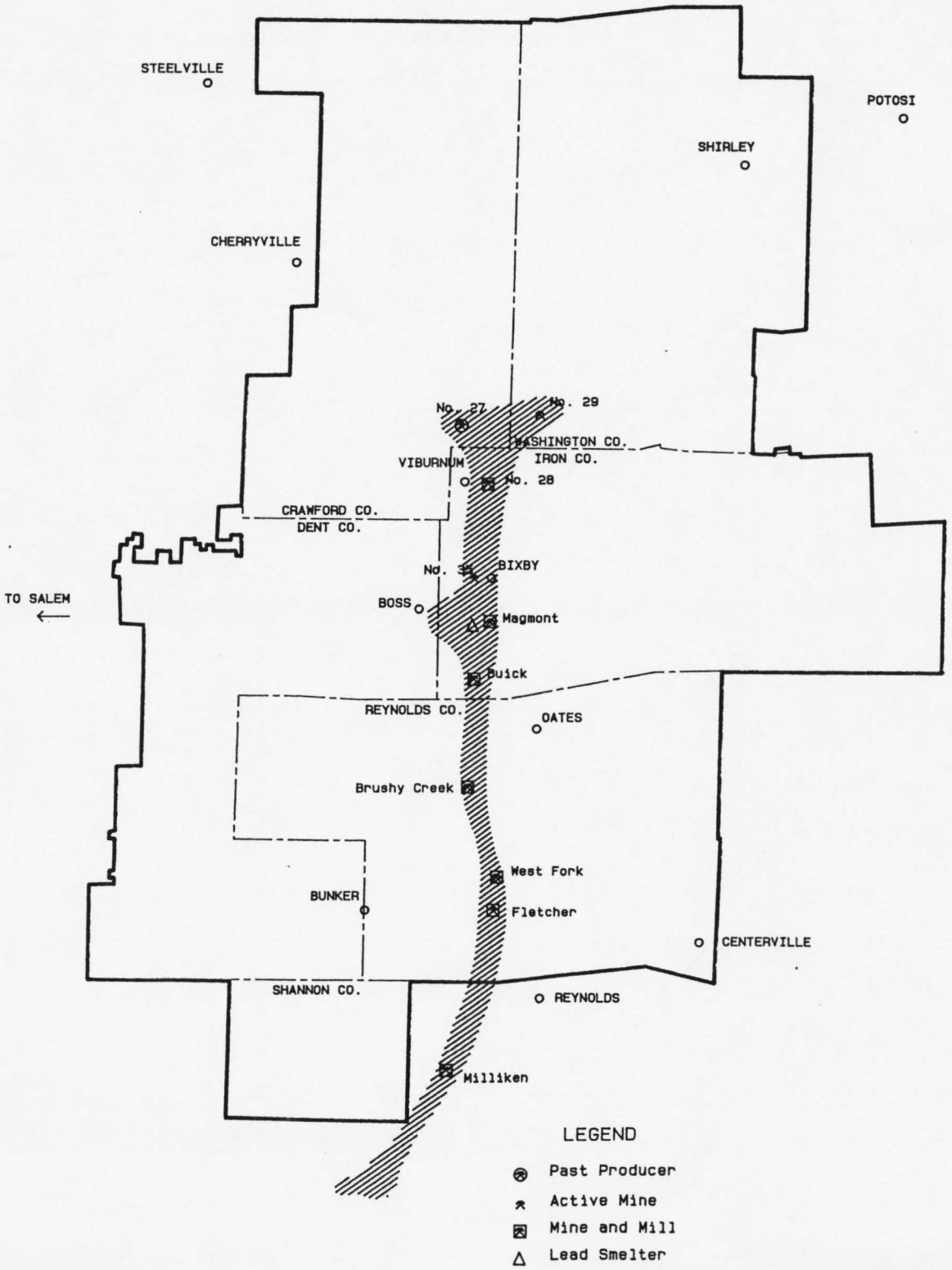
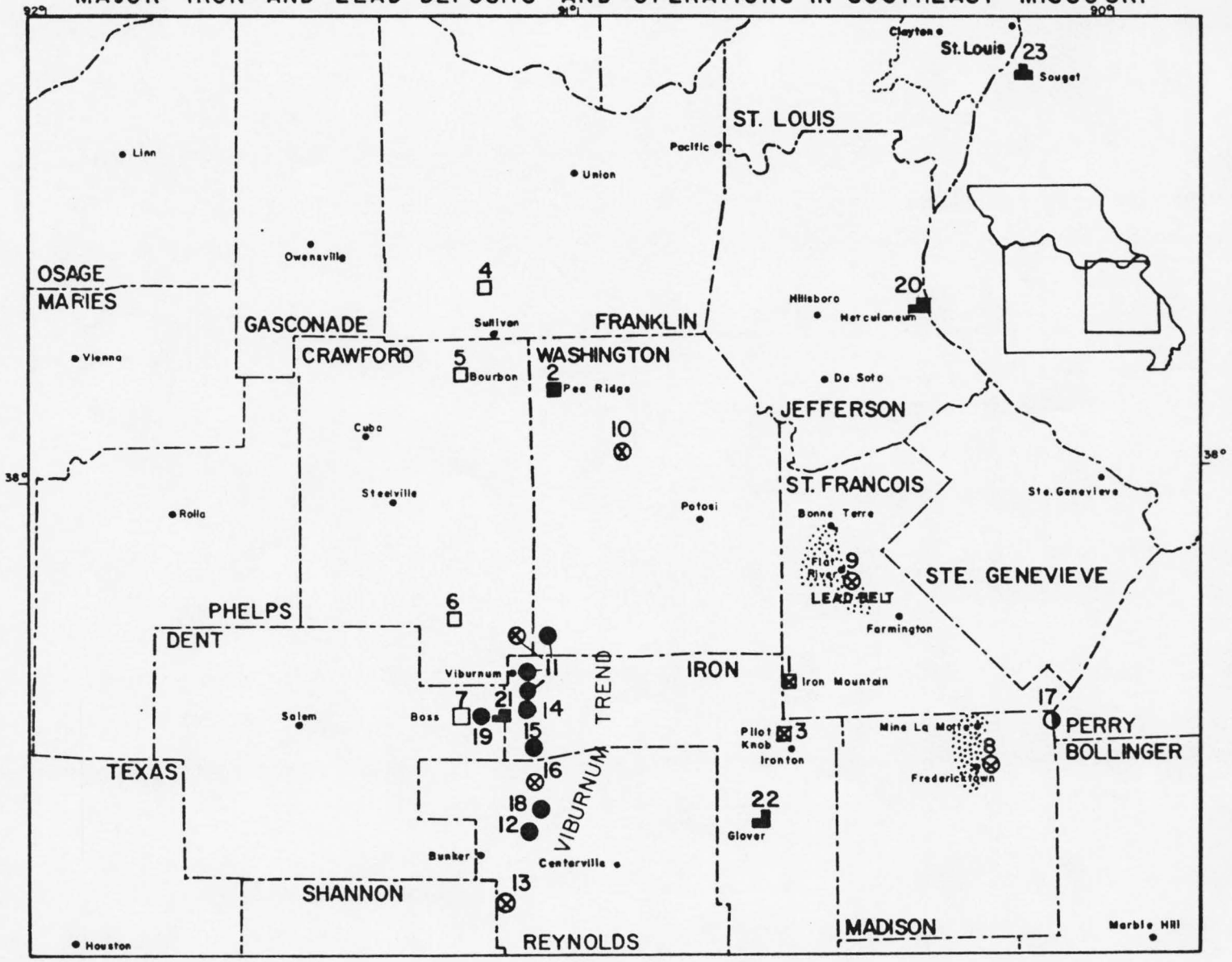


Figure 1

FIGURE 2

MAJOR IRON AND LEAD DEPOSITS AND OPERATIONS IN SOUTHEAST MISSOURI



IRON		LEAD
⊠	Past Producer	⊗
■	Now Operating	●
◧	Partly Developed	◐
□	Undeveloped Deposits	○

IRON

1. Iron Mountain Mines – The Hanna Mining Co.
2. Pea Ridge Mine, Mill, and Pellet Plant Pea Ridge Iron Ore Co., Inc – St. Joe Minerals Corporation
3. Pilot Knob Mine, Mill, and Pellet Plant Pilot Knob Pellet Co. – The Hanna Mining Co. and Granite City Steel Div., National Steel Corp.
4. Kratz Spring Deposit – St. Joe Minerals Corp.
5. Bourbon Deposit – Gold Fields Mining and Granite City Steel Div., National Steel Corp.
6. Camels Hump Deposit – St. Joe Minerals Corp.
7. Boss Deposit (Copper & Iron) – Cominco American, Inc. & Dresser Industries, Inc.

LEAD – ZINC – COPPER

8. Madison Mine – Anschutz Mining Corp
9. Federal Division Mines and Mill
10. Indian Creek Division Mines and Mill
11. Viburnum Division Mines and Mill
12. Fletcher Division Mine and Mill
16. Brushy Creek Division Mine and Mill

St. Joe Minerals Corporation

LEAD – ZINC – COPPER cont.

13. Milliken Mine and Mill – Ozark Lead Co., Subsidiary of Kennecott Copper Corp.
14. Magmont Mine and Mill – Cominco American, Inc and Dresser Industries, Inc.
15. Buick Mine and Mill – Homestake Mining Co. – formerly AMAX-Homestake Missouri Lead Complex
17. Higdon Mine – GRC Exploration Co. Pintlar Corp. (Bunker Hill Co.)
18. West Fork Mine and Mill – ASARCO, Inc.
19. Magmont West Mine – Cominco American, Inc. & Dresser Industries, Inc.

LEAD SMELTERS & ZINC PLANT

20. St. Joe Minerals Corp., Herculaneum Division Plant
21. Homestake Buick Smelter
22. ASARCO, Inc., Glover Plant
23. AMAX, Inc., Electrolytic Zinc Plant (Sauget, Ill.)

Missouri Department of Natural Resources
Division of Geology & Land Survey
1986

The Missouri Geological Survey played an important role during the exploration boom. Newly arriving companies were briefed on the geology of southeast Missouri, and were helped with logging their exploration drill holes. Our Well Log File, begun in the 1930's, got unprecedented attention because it included many descriptive logs of holes previously drilled in areas of interest. Finally, a prospecting permit status map was maintained by our drafting section, based on information supplied by the Forest Service office next door. The map helped companies keep track of the competition, and highlighted the locations of Forest lands still open for filing prospecting permits.

Mining Developments and Importance of the Viburnum Trend

Four new mine-mill complexes and two large, new lead smelters were built in the Viburnum Trend area in the second half of the 1960's. The Frisco Lead Belt Line, a 32-mile railroad spur from the company's main line near Steelville, was completed to the new mining area in 1967. St. Joe rebuilt and doubled the capacity of its lead smelter and refinery at Herculaneum at about the same time. When all the new facilities reached full operation in 1970, Missouri and the Viburnum Trend became the world leader in lead mining. Missouri has been the principal lead mining state in the U.S. since 1907, but the peak output from the "Old" Lead Belt was only about 210,000 tons of recoverable lead in 1925. By 1975, the State's annual mine-mill-smelter capacity exceeded 500,000 tons of lead metal, and large amounts of zinc, copper and silver were also being recovered. Details are given in the Design Capacities listing in table 2.

Important amounts of cobalt and nickel are contained in the lead ores. The U.S. Bureau of Mines has investigated ways of recovering the two strategic metals from these ores for many years. The work has been done mostly at the Bureau's Rolla Research Center, and this has included a pilot flotation plant operation at the Cominco-Dresser Magmont mine.

TABLE 2

DESIGN CAPACITIES OF LEAD MINES, MILLS & SMELTERS AND IRON ORE PELLET PLANTS IN SOUTHEAST MISSOURI IN 1984-1985 10-09-1986

*Iron Ore Pellet Plants	Annual Capacity (Long Tons of Pellets)	Start-Up	County
1. Pea Ridge Iron Ore Co. (5600 tpd)	1,600,000	2-1964	Washington
2. Pilot Knob Pellet Co. (3000tpd)	1,000,000	6-1968 Shutdown 11-1980	Iron

Lead Smelters	Annual Capacity (Short Tons of Lead)	Start-Up	County
1. St. Joe Herculaneum plant (Modernization and Expansion)	230,000+	Early 1967	Jefferson
2. ASARCO Glover plant	110,000+	7-1968	Iron
+3. Homestake Buick smelter	140,000+	8-1968	Iron
	480,000+tpy Pig Lead		

Mines & Mills (Crude Ore Capacity)	Annual Capacity (Short Tons of Recoverable Lead)	Start-Up	County
1. St. Joe Minerals Corp.			
**Federal Division --	--	Shutdown 10-1-1972	St. Francois
Indian Creek Div.--	--	Shutdown 4-30-1982	Washington
Viburnum Div. (12,000tpd)	120,000	1960-1964/1983	Iron & Washington
Nos. 28 & 29 mines (8000tpd)			
Casteel (No. 35) mine (4000tpd)		8-1983	Iron
Fletcher Div. (5000tpd)	80,000+	2-1967	Reynolds
***Brushy Creek Div. (5000tpd)	50,000+	11-1973	Reynolds
Subtotals: (22,000tpd)	250,000+ tpy		
2.***Milliken mine (8500tpd)	80,000+	6-1968	Reynolds
3. Magmont mine (4200tpd)	60,000+	7-1968	Iron
+4. Buick mine (7000tpd)	100,000+	2-1969	Iron
5. West Fork mine (3800tpd)	51,000+	9-1985	Reynolds
(23,500tpd)	291,000+ tpy	(350,000+ tpy potential)	
Total District Mine-Mill (45,500 tpd) Production Capacity	541,000+ tpy	(550,000+ tpy potential)	

ANNUAL MINE PRODUCTION OF LEAD AND THE COPRODUCT METALS IN MISSOURI
(Recoverable metal content of ores & concentrates in short tons)

	1984	1985 Final	National Rank	% of U.S. Mine Output
Lead -	306,805	408,966	1	89.6%
Zinc -	50,108	54,388	2	~22%
Copper -	6,413	14,782	5	~ 1%
Silver -	1,401,070 T.Oz.	1,635,301 T.Oz.	6	4%

* Operations suspended and Meramec Mining Co. (St. Joe-Bethlehem Steel joint venture) dissolved 12-1977. St. Joe's newly formed Pea Ridge Iron Ore Co., Inc. resumed pellet production in June 1979. The Pilot Knob Pellet Co. operation was terminated 11-21-1980.

** St. Joe began mining in the Old Lead Belt in 1864 and operated continuously during the next 108 years until October 1972. The company's Southeast Missouri Mining & Milling Division headquarters in Bonne Terre was moved to Viburnum in 1976.

*** Indefinite shutdown of Milliken mine 3-4-1983; 4-1984 at Brushy Creek mine.

\+ Homestake Mining Co. assumed ownership & control of the AMAX-Homestake Missouri Lead Complex at the end of May 1986.

Mine-mill smelter operations suspended 5-15-1986.
Plan to combine St. Joe - Homestake MO Opns. ann. 9-10-86

At the peak of the last exploration play for lead and zinc in southeast Missouri in the early 1980's, prospecting permits covering about 350,000 acres were on file at BLM's ESO in Alexandria. Over twenty companies were involved, and most of the federal land in the Fristoe and Poplar Bluff Forest districts was covered. See table 3. There were also a few permit applications in the Salem-Potosi and Fredericktown Forest districts. Over 100 permits containing about 160,000 acres were eventually approved. At present, there are 37 active mineral leases for lead and zinc in the Mark Twain National Forest, covering 33,863 acres. All the presently active mines have some workings in the federal leases. There are only about 50 prospecting permits still in effect today. They cover something like 50,000 acres, and most of them will be allowed to expire because of the present lack of interest in exploration. A mined-land inventory of the Viburnum Trend area by the State Geological Survey in 1982 showed only about 2000 surface acres actually occupied by company facilities.

TABLE 3

MINING COMPANIES WITH EXPLORATION INTERESTS

IN MISSOURI EARLY 1980'S

AMAX Explor. Inc.	Coastal Mining Co.	GRC Exploration Co.
AMSELCO Explor. Inc.	Cominco American, Inc.	Gulf Mineral Resources Co.
Anschutz Mining Corp.	Crown Resources Corp.	Homestake Mining Co.
ASARCO Explor. Inc.	EXXON Minerals Co., USA	Houston Oil & Minerals Explor. Co.
Bear Creek Mining Co.	Getty Mining Co.	Kerr-McGee Resources Corp.
Marathon Resources/U.S. Steel Corp.		St. Joe Minerals Corp.
Molybdenum Corp./Union Oil		Tenneco Minerals Co.
Mountain States Resources Corp.		Texasgulf Mineral & Metals, Inc.
Newmont Exploration Ltd.		Union Carbide Corp.
Noranda Exploration, Inc.		U.S. Borax & Chemical Co.
		Utah International Inc.

Importance of the Viburnum Trend

In 1985, despite two idle mines, lead mine production was a little over 400,000 tons, approximately 90 percent of the total U.S. lead mine output. At the same time, the lead ores yielded over 54,000 tons of zinc, nearly a quarter of the U.S. total, and significant amounts of copper and silver. The quantities and national ranking of these metal outputs in 1985 are shown in table 2.

What does this mean to local communities, the state and federal government? In normal times, employment at company offices, mines, mills and smelters is over 3,000 with an annual payroll in excess of $50 million. The industry and its employees obviously support large numbers of merchants, and pay important amounts of property, sales and income taxes. Power and equipment suppliers, and other services, depend heavily on the industry. The town of Viburnum, with a population of about 1,000, came into being as a result of St. Joe's initial discovery and mine development in the area.

The mining companies pay rents and royalties to the federal government for prospecting permits and leases; the mine production royalties from the BLM leases being by far the most important. The amounts paid during the decades from FY 1966 through 1975, and FY 1976 through 1985 are shown in table 4. The Clark and Mark Twain National Forest were consolidated into one unit, called the Mark Twain, after 1975. The mineral payment's share of total National Forest revenue for each fiscal year is also given. In recent years, the payments ranged from about 60 percent to above 90 percent of the total. Actual payments were between $3 million and nearly $14 million annually, and the cumulative total over the 20-year period was $90.4 million. High metal prices for lead were often more important that the actual tonnages mined on the

TABLE 4

CLARK NATIONAL FOREST REVENUES

Year	Mineral Rent & Royalty	Total Revenue	% Revenue Related to Minerals	25% Receipts to Counties
FY 1966	$ 160,278.	$ 291,400.	55%	$ 72,850.
FY 1967	$ 207,500.	$ 278,350.	75%	$ 69,590.
FY 1968	$ 543,725.	$ 626,158.	87%	$ 156,540.
FY 1969	$1,129,895.	$1,263,310.	90%	$ 315,830.
FY 1970	$1,725,165.	$2,114,178.	82%	$ 528,544.
FY 1971	$2,156,339.	$2,631,398.	82%	$ 657,850.
FY 1972	$2,033,965.	$2,179,622.	93%	$ 544,905.
FY 1973	$2,624,037.	$2,789,657	94%	$ 697,414.
FY 1974	$4,206,652.	$4,238,271.	97%	$1,084,568.
FY 1975	$6,537,525.	$6,678,286.	98%	$1,669,572.
TOTALS	$21,325,081.	$23,090,630.	92%	$5,797,663.

*MARK TWAIN NATIONAL FOREST REVENUES & "PILT" PAYMENTS

Year	Mineral Rent & Royalty	Total Revenue	%MRR	*PILT Payments	25% Receipts	Total Payments to Counties
FY 1976	$ 4,923,125.	$ 5,285,762.	93%	-	$1,321,440.	$1,321,440.
FY 1977	$ 7,350,598.	$ 8,452,680.	87%	$234,150.	$2,113,170.	$2,347,320.
FY 1978	$ 6,470,591.	$ 7,629,664.	85%	$726,357.	$1,907,416	$2,633,773.
FY 1979	$10,637,436.	$12,406,250.	86%	$526,929.	$3,101,563.	$3,628,492.
FY 1980	$13,997,886.	$15,409,269.	91%	$649,533.	$3,852,317.	$4,501,850.
FY 1981	$ 9,650,287.	$11,270,643.	86%	$486,481.	$2,817,661.	$3,304,142.
FY 1982	$ 5,257,509.	$ 7,370,071.	71%	$224,857.	$1,842,518.	$2,067,375.
FY 1983	$ 4,066,095.	$ 6,210,918.	66%	$431,671.	$1,552,730.	$1,984,401.
** FY 1984	$ 3,608,000.	$ 5,744,560.	63%	$647,585.	$1,436,140.	$2,083,725.
FY 1985	$ 3,075,000.	$ 5,367,734.	57%	$718,434.	$1,341,934.	$2,060,368.
TOTALS	$69,036,527.	$85,147,551.	81.1%	$4,645,997.	$21,286,889.	$25,932,886.
GRAND TOTAL	$90,361,608.	$108,238,181.	83.5%		$27,084,552.	$31,730,549.

*The Clark & old Mark Twain Ranger districts were consolidated into one unit effective Feb. 17, 1976. From then on, payments to the counties are being made in proportion to their fractions of the total national forest acreage in Missouri. P.L. 94-565 (1976) resulted in payments in lieu of taxes (PILT) payments to counties in addition to the 25% funds. Federal FY is October 1 thru September 30.

**Actual mineral payments in FY 1984 were $4,864,683, but over $1 million was credited to the mining companies to offset overpayments during 1978-1982 resulting from "best contract" settlements with the smelters.

federal leases. Finally, the total of the 25 percent fund and payments in lieu of taxes (PILT) payments to the Missouri counties included in the Mark Twain National Forest are given for each fiscal year beginning in 1976 (table 4). The range is from $1.3 million to $4.5 million per year. Payments to the counties from FY 1966 through FY 1975 totalled about $5.8 million; the grand total through FY 1985 was $31.7 million. Actual payments to each of the 29 counties during FY 1985 are shown in table 5, issued by the FS office in Rolla. The eight counties with the largest acreages in the MTNF each received over $100,000. The funds are used primarily for schools and roads.

The actual tonnages of lead, zinc and copper concentrates produced from mining in the federal leases in comparison with Missouri's total mine outputs during 1984 and 1985 are shown in the next illustration, table 6. About 70 percent of the ore was from federal ground in 1984, but it dropped to 65 percent in 1985. On average, about 60 to 70% of the lead concentrates and 70 to 80% of the zinc concentrates are from the federal leases. Total values of the recoverable metals from the Viburnum Trend mines during 1984 and 1985 are given in the lower part of the table.

Mineral Industry Problems - Past and Present

Four problem areas affecting prospecting and mining in the Mark Twain National Forest (MTNF) are singled out for a brief review:

1. National Environmental Protection (NEPA) Act of 1969. Delays and Problems with Compliance.
2. RARE I & II Exercise to Identify and Recommend Wilderness Areas in MTNF. Irish Wilderness Controversy.
3. Development and Implementation of a Management Plan for MTNF, 1976-1986.
4. USX-St. Joe Lease Applications, Winona District, 1983 to Present.

TABLE 5

MARK TWAIN NATIONAL FOREST
PAYMENT TO STATE - 25% OF NATIONAL FOREST FUND RECEIPTS
AND PILT PAYMENTS
COUNTY ALLOCATIONS BASED ON NATIONAL FOREST ACREAGE
FISCAL YEAR ENDING SEPTEMBER 30, 1985

COUNTY	NET NATIONAL FOREST ACREAGE	AMOUNT PAID TO STATE 25 PERCENT OF RECEIPTS	PILT PAYMENT ON N. F. LANDS	TOTAL AMOUNT REC'D FROM NFL
Barry	53,890	49,627.02	27,491.51	77,118.53
Bollinger	1,566	1,442.12	735.00	2,177.12
Boone	532*	489.91	2,008.00	2,497.91
Butler	48,250	44,433.17	20,239.37	64,672.54
Callaway	1,384*	1,274.52	6,939.00	8,213.52
Carter	89,924	82,810.55	44,117.64	126,928.19
Christian	51,337	47,275.98	23,833.52	71,109.50
Crawford	49,442	45,530.89	26,631.79	72,162.68
Dent	68,624	63,195.49	32,504.23	95,699.72
Douglas	41,186	37,927.98	19,331.00	57,258.98
Howell	48,850	44,985.72	22,868.00	67,853.72
Iron	96,797	89,139.86	46,139.00	135,278.86
Laclede	28,656	26,389.16	13,092.00	39,481.16
Madison	49,426	45,516.15	22,611.00	68,127.15
Oregon	97,945	90,197.05	45,965.00	136,162.05
Ozark	38,807	35,737.17	21,566.41	57,303.58
Phelps	63,003	58,019.14	27,787.00	85,806.14
Pulaski	45,418	41,825.21	20,482.00	62,307.21
Reynolds	88,453	81,455.92	46,125.40	127,581.32
Ripley	95,050	87,531.06	44,422.00	131,953.06
St. Francois	893	822.36	420.00	1,242.36
Ste. Genevieve	10,254	9,442.86	4,788.00	14,230.86
Shannon	83,503	76,897.49	45,818.42	122,715.91
Stone	16,423	15,123.86	10,224.79	25,348.65
Taney	63,684	58,646.27	31,900.71	90,546.98
Texas	47,999	44,202.04	21,085.50	65,287.54
Washington	82,759	76,212.34	38,751.99	114,964.33
Wayne	86,152	79,336.94	47,233.74	126,570.68
Wright	6,999	6,445.36	3,322.00	9,767.36
FOREST TOTALS	1,457,196	$1,341,933.59	$718,434.02	$2,060,367.61

*Acres Purchased under Weeks Law only.

Source: Mark Twain National Forest Office, Rolla, 1986

TABLE 6

LEAD-ZINC-COPPER-SILVER PRODUCTION & ROYALTIES FROM MARK TWAIN NATIONAL FOREST MINING LEASES COMPARED TO TOTAL MISSOURI MINE PRODUCTION (Short Tons) IN 1984 & 1985*

Calendar Year - 1984

	Missouri Totals	Mark Twain NF	Mark Twain %
Value	Gross Metal Value: $225,454,000 (Contained Pb-Zn-Cu-Ag)	Royalty Receipts: $4,437,678 (Based on Ore Conc. Values)	~5% Net Smelter Returns
Crude Ore (s.t.)	5,234,776	3,721,842	71.1%
Lead Conc.(s.t.)	416,619	305,551	73.3%
Zinc Conc.(s.t.)	92,706	76,036	82.0%
Copper Conc.(s.t.)	9,262	4,503	48.6%
Silver - Recov. Metal	1,401,070 Troy Oz.		

Calendar Year - 1985

	Missouri Totals	Mark Twain NF	Mark Twain %
Value	Gross Metal Value: $229,705,172 (Contained Pb-Zn-Cu-Ag)	Royalty Receipts: $2,446,680 (Based on Ore Conc. Values)	~5% Net Smelter Returns
Crude Ore (s.t.)	7,091,945	4,627,607	65.3%
Lead Conc.(s.t.)	558,207	383,868	68.8%
Zinc Conc.(s.t.)	101,862	80:715	79.2%
Copper Conc.(s.t.)	38,914	13,133	33.8%
Silver - Recov. Metal	1,635,301 Troy Oz.		

ANNUAL MINE PRODUCTION & VALUE OF RECOVERABLE METALS IN MISSOURI

	1984		1985	
Commodity	Production	Value	Production	Value
Lead (s.t.)	306,805	$156,766,000	408,966	$155,955,257
Zinc (s.t.)	50,109	48,707,000	54,388	43,908,207
Copper (s.t.)	6,413	8,575,000	14,782	19,797,362
Silver (T. oz.)	1.401,070	11,406,000	1,635,301	10,044,346
		$225,454,000		$229,705,172

*Production and value data from the Dept. of Interior, U.S. Bureau of Mines and Bureau of Land Management

MO Geological Survey
11-1986

NEPA Act of 1969

Uncertainty about how the new rules should affect permitting and leasing procedures led to a moratorium on issuing or renewing any prospecting permits in Missouri for over 5 years, from around 1972 until 1978. To address the problem, the Forest Service's Region 9 conducted a 5-day Minerals-Geology Workshop in Rolla in February 1977. The program included FS, BLM, USGS, USBM representatives. State agencies and the mining companies were invited. FS then prepared an environmental analysis (EA) report on Lead Prospecting on the Mark Twain National Forest (Missouri-1977), issued in May 1977. The Regional Forester concluded in the EA that prospect drilling does not constitute a major federal action, so environmental statements would not be needed for issuing prospecting permits. However, a new stipulation was attached to each permit specifying that no mineral lease would be issued without the prior rendition of an environmental impact assessment. As a result of the EA report, permit approvals were resumed in 1978, but a large backlog of applications persisted until 1983. The long delays obviously added to the costs and difficulties of conducting exploration on the federal lands.

Wilderness (RARE II) Studies

These exercises are a source of frustration to the mineral industry, and to state and federal agencies interested in mineral resources development. The USGS and Bureau of Mines are responsible for the mineral appraisals, but their field work and reports tend to be ignored, and they often postdate wilderness designations. Given the limited time and money made available to the agencies

for the appraisals, they are generally superficial and not very satisfactory. The Irish Wilderness area in Oregon County received the most attention in Missouri because of its large size and favorable location with respect to the Viburnum Trend. It was carefully studied by USGS and USBM, and its mineral potential given a high rating. Wilderness designation was delayed for several years because the three successive congressmen representing the area, the Honorable Richard Ichord, Wendell Bailey, and Bill Emerson, all opposed it, as did most of the local residents. Due to Congressman Emerson's efforts a compromise bill was eventually passed in 1984. Prospecting and mining are allowed in a 1070-acre excluded area within the 17,500-acre wilderness. St. Joe Minerals has permits in the former area and its prospecting plan has recently been approved.

MTNF "Forest Plan"

The proposed management plans, related reports and maps were issued early in 1985, and there was a July 7, 1985 deadline for comments. The latter were recorded and in some cases incorporated into the final report, which was approved by the Regional Forester and issued to the public in June 1986. The Forest Plan is a very complex and detailed set of reports and maps. A 45-day period for appeals was provided for, but no review and comment period like the one in 1985.

One of the main concerns of the mineral industry is access to the largest possible acreages in MTNF for prospecting and mining. In the final Forest Plan (Alternative 5), about 95 percent of the land is open to prospect drilling. However, about 340,000 acres, nearly one fourth of the Forest, will be managed

for Semi-Primitive Recreation which is stated to be incompatible with mineral development. The inconsistency was recognized and the plan amended so that up to 10 percent of the motorized S-P Recreation areas (~26,500 acres) can be accommodated for mineral development, if supported by a favorable environmental assessment.

USX-St. Joe Lease Applications

The two adjoining prospecting permits, containing 3,743 acres, are located from 7 to 10 miles south of Winona, and about 35 miles south of the nearest Viburnum Trend lead mine. Drilling was done after the permits were issued in November 1979, and a 2-year extension was granted in November 1981. Mineralization was found in the drilling, and valid lease applications were filed by U. S. Steel (now USX) in November 1983. The applications were assigned to St. Joe Minerals in October 1984. The permits expired in November 1983, so the leases are needed to conduct additional drilling to find out if mineable lead deposits are present. The permit area is near the Current and Eleven Point Rivers, and is susceptible to groundwater pollution, particularly from a tailings pond. An environmental analysis (EA) was prepared, and was released for public comment in April 1986. In it, the Forest Supervisor recommended the leases be issued so exploration could continue; but opposition was strong. The FS decided in October to prepare an environmental impact statement (EIS). This action is unfortunate, since a mine development is not at issue at this time. It means the further delay of a year or more before additional prospect drilling can be done in the area of the leases. The EIS will address a sizeable area surrounding the leases themselves. This will save time and effort in the event of other mineral discoveries in the general area.

Future Prospects - Undeveloped Deposits in MTNF

Ore reserves of lead and zinc in the Viburnum Trend are surely adequate for another 15 to 20 years at reasonably high production rates. If the market for new lead were to stabilize at the current low level, or decline, then the life of the district would be extended proportionally. There is also good potential for new discoveries in the Salem-Potosi, Fristoe, and Poplar Bluff Forest districts.

Nearly all the 20-odd mining companies involved in recent exploration in Southeast Missouri have subsequently donated their drill cores to the Missouri Geological Survey. Nearly 1,360 drill holes containing about a million feet of core have been received since 1980. We estimate that the companies paid close to $25 million for the core drilling. Information from the cores will be tremendously valuable to the Survey and the private and public sectors for a variety of scientific, mineral, groundwater and exploration studies. When mineral exploration in the State resumes, the cores will be indispensable to the mining companies.

The deservedly heavy emphasis on the Viburnum Trend ore deposits and mines tends to obscure the fact that other mineral deposits are known in the National Forest. The following is a list of other undeveloped deposits in the MTNF covered in part by BLM mineral leases:

Name	Owner	Commodities	County	Development Potential
Boss	Cominco-Dresser	Copper, Cobalt, Iron	Dent	Long Term Only
Camels Hump	St. Joe Minerals (Pilot Knob P.C.)	Iron Ore	Crawford	Long Term Only
Higdon	Gulf Resources (GRC)	Lead-Zinc Cobalt-Nickel	Perry, Madison Bollinger	Long Term Only
Palmer Area	St. Joe, Dresser	Barite; Lead-Zinc	Washington	Unknown

Locations of the Boss, Camels Hump and Higdon deposits are shown in figure 2. All three deposits are over a thousand feet deep and have been thoroughly drilled. BLM leases cover large parts of the Boss and Camels Hump deposits, but only a small part at Higdon. There are two 1500-ft drilled shafts at this mine, but no further development. No sustained mine developments are expected at any of the three deposits in the near future.

The Palmer area, about 12 miles southwest of Potosi, has been an important source of surface lead and barite in the past. Barite was last mined in 1976, and Dresser has held BLM leases for barite in the area until this year. St. Joe and others have investigated the area for deep lead & zinc, reportedly with some encouragement.

There is also an active lease for fire clay in Callaway County in the Cedar Creek Purchase unit of the Mark Twain, and one oil & gas lease in the Richards-Gebaur Air Force Base south of Kansas City.

Since the mid-1970's, the Missouri Geological Survey has cooperated with the U.S. Geological Survey in that agency's Conterminous United States Mineral Assessment (CUSMAP) Program. In each project, a multi-discipline approach is used to evaluate the metallic mineral potential of a 1^{o} x 2^{o} quadrangle, containing about 7500 square miles in this area. Surface and subsurface geology, geochemistry, geophysics and known mineral resources data are carefully examined in making the appraisal. So far, CUSMAP studies of the Rolla and Springfield 1^{o} x 2^{o} quadrangles have been completed, and work on the Harrison, Joplin and Paducah 2^{o} quadrangles is now in progress in cooperation with Arkansas, Kansas and Illinois, respectively. The presence of substantial federal land is one of the criteria for selecting the quadrangles. The Rolla 2^{o} CUSMAP project included most of the Southeast Missouri Lead district, including all the Viburnum Trend ore deposits, and several sizeable iron ore deposits. The study was done from 1976 to 1981when exploration was intense. The mining companies were keenly interested, and several cooperated by donating mapping and drillhole information.

The CUSMAP projects focus attention on a region's mineral potential and often stimulate new exploration activity. The results of the Rolla 2^{o} project, the first CUSMAP study done in the Midwest, reflect the view that the region still has outstanding potential for important mineral discoveries. By coincidence, there are large acreages of public lands in southern Missouri in some of the most favorable-looking areas. They include both State and National Forests.