IOWA'S MINERAL HERITAGE

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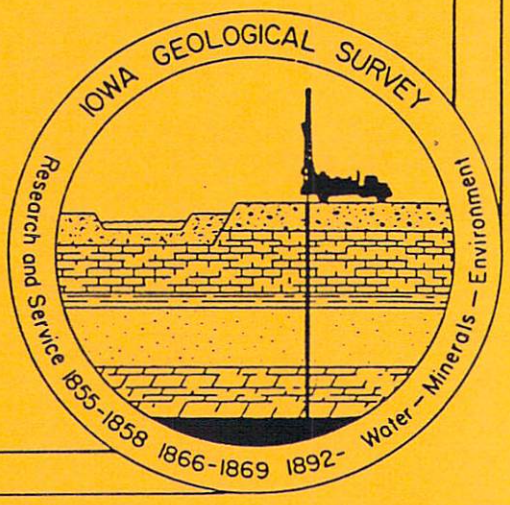

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by

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ABSTRACT

Iowa's mineral resources have been valued and utilized by its residents ever since man began to inhabit this area of North America. Early explorers recognized many of these resources, and they soon became the economic base for settlement of many areas in the state. By the middle of the 20th century mineral deposits were being extracted in all regions of Iowa. In recent years total production has continued to increase, with 1978 marking an all-time high in the value of minerals produced in the state. Today, on-going research suggests that other recoverable mineral resources lay deep beneath the surface. With increasing world demand, and with proper planning and state guidance, Iowa's potential deep resources could contribute to the supply of materials needed to sustain our rapidly expanding, technological society.

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HISTORICAL PERSPECTIVE

Presettlement

Iowa has been known for its mineral resources for many hundreds of years. plains Indian tribes are known to have traveled great distances to extract the white chert along the Mississippi River near Burlington. The chert was used to make spearpoints, arrow points, lances, knives, and scrapers. There is evidence that Sioux Quartzite from Northwest Iowa was also used by Indian tribes for weapons. Archaeological sites throughout the state provide evidence of widespread use of local stone for a variety of uses. Grinding, weapons, some construction, and jewelry are most common.

When the native Americans first used lead and coal is not known, but evidence suggests that some uses were made of both substances more than 800 years ago.

Various soils and clays were used for pigments for body and animal skin painting. Gypsum from the Fort Dodge area was probably used for medicinal purposes.

Native copper was pounded into some tools and weapons but these finds are very rare in Iowa. It is likely that some native copper nuggets were found in glacial drift in Iowa. However, larger quantities are found in eastern Illinois and Wisconsin.

Postsettlement

The French were the first known white men to have explored the territory known as Iowa. In the mid 1600's when the Dubuque area lead deposits were found, the French taught the Indians mining methods. For more than 150 years small-scale mining operations were carried out by the Indians and the French. Lead mining became much more important as settlements became established after 1821. By the 1840's the Tri-State area near Dubuque was the leading lead-producing district in the United States. The 1840's, 50's, and 60's were peak years but then decline was rapid. Zinc also began to be mined in 1860 and peaked during WW I. A revival in zinc mining began in 1938 and continued through WW II. Added exploration and development in the early 1950's brought major new production of zinc.

Coal mining began in Iowa as settlers established homesteads and communities especially along the interior river valleys. Production records were maintained starting in 1840. By 1890 coal mining was a major industry in the south-central part of the state. Annual coal production reached almost 9 million tons in 1917 but has declined to less than 400,000 tons in 1978, see Figure 1, and Table 1.

Limestone production was also begun as settlements were established. Early limestone quarries produced building blocks. As crushing machines came into being, crushed rock began to be used for road metal, floors, fill material. Finely crushed limestone (powdered) began to be used as agricultural lime in the early part of this century. With the development of portland cement and macadam, limestone began to be used for aggregate. The use of lime for agriculture and aggregate remains high, while dimension stone uses have declined sharply. Quarries are in operation in 65 of Iowa's counties today. (See Figure 2.) In recent years 12 underground limestone mines have been opened in Iowa. In most cases quarrying was done first and then mines were opened from the walls of the quarry. This has been prompted in part by environmental and reclamation considerations as well as the soaring value of farm land and the advantages of year-round mining regardless of weather conditions at the surface.

Sand and gravel, while being used as fill, road surfacing, and miscellaneous uses came into its own with the development of cements and macadam. Sand and gravel production reached its heyday in the 1960's when expanded highway construction was underway. Though production today is down from that period the industry remains strong. (See Figure 3.) A specialized sand production operation began in Clayton County in 1946. A relatively pure quartz sandstone (St. Peter) is mined for refractory sand. Some of the sand has been used for glass manufacture. Hundreds of thousands of tons of sandstone have been mined at Clayton leaving 60 foot high ceilings and miles of tunnels.

In 1849 gypsum was discovered near Fort Dodge and was initially quarried as building stone. The first gypsum mill west of the Mississippi River was erected just south of Fort Dodge in 1872. The gypsum was extracted from underground mines. Surface mining began in 1927 and all underground operations were discontinued by 1947.

In 1910 another gypsum deposit was encountered during the drilling of a coal exploration test hole at Centerville in Appanoose County. By 1917 a mine and mill were opened which operated sporadically until 1934.

The U.S. Gypsum Comapny opened an underground gypsum mine near Mediapolis in Des Moines County in 1960. Gypsum at this location had been documented during investigations made by the Iowa Geological Survey.

The newest gypsum mine in the state is located near Harvey in Marion County. This mine, originally operated as a stone mine, began to produce gypsum in 1974 when the mineral was encountered during expansion of the mine to a deeper level. Gypsum mines are located on Figure 4.

Iron ore was extracted from 1913 thru 1921 from a deposit near Waukon. The deposit is small and contains low grade oxides of iron namely limonite and hematite. Early workers estimated 12 million tons of ore reserves, about 10% of which was extracted during the 8 years of mining.

While exploration for additional lead-zinc and iron has been done to a small degree no other major deposits have been found.

Figure 1. MINERAL PRODUCTION IN IOWA
1940-1978

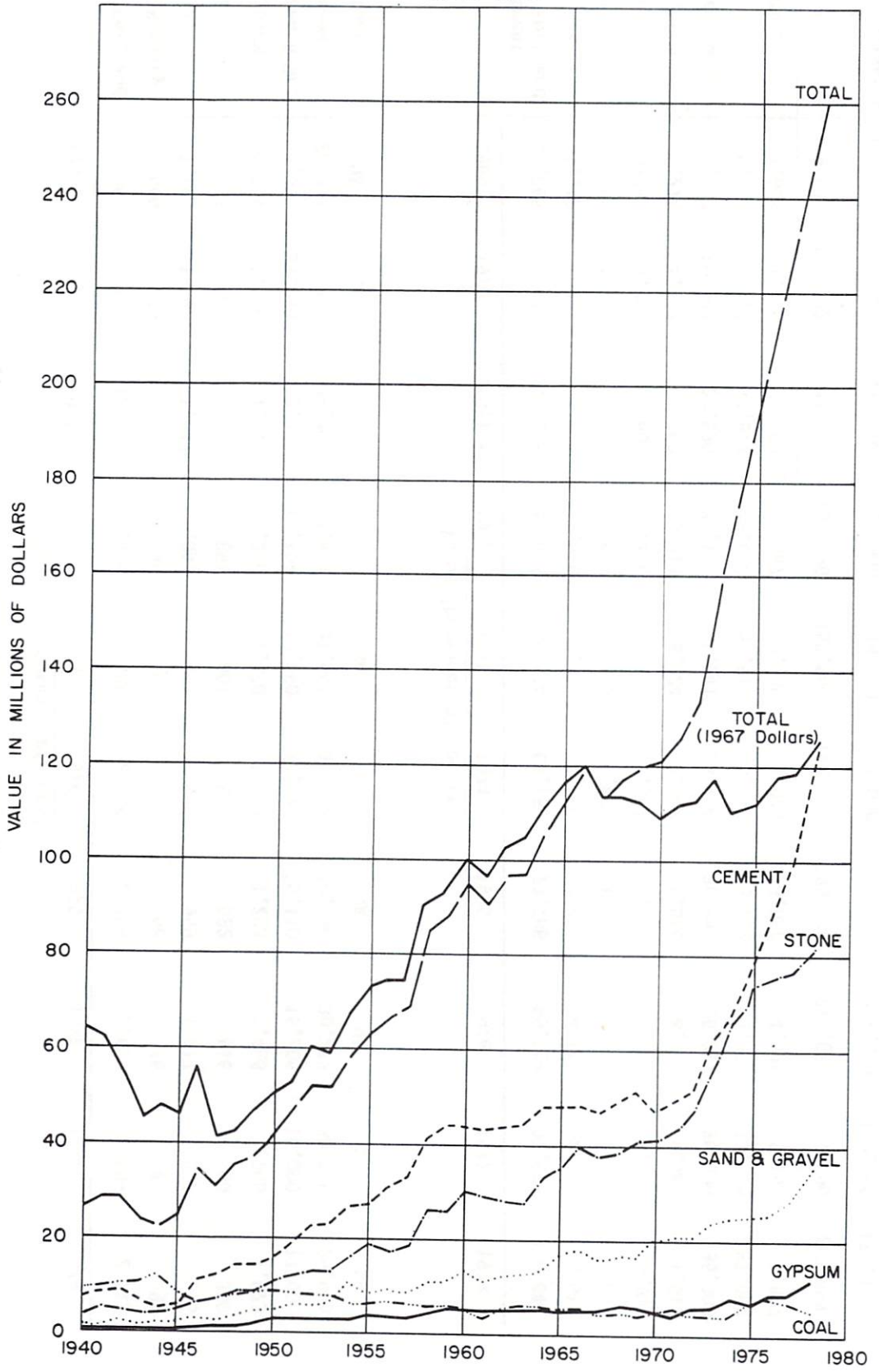


Table 1. IOWA MINERAL PRODUCTION 1969-78 *

Quantity(Thousands of Tons)

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Cement										
Portland	14,084	12,744	12,726	2,458	2,688	2,424	2,258	2,438	2,605	2,743
Masonry	606	520	473	66	68	65	62	76	86	91
Clay	1,199	1,181	1,028	1,047	967	960	959	1,017	827	845
Coal	903	987	989	851	601	590	622	616	500	350
Gypsum	1,169	1,136	1,154	1,380	1,470	1,397	1,208	1,486	1,706	1,873
Sand & Gr.	18,391	21,058	18,279	17,107	19,950	17,091	15,410	15,206	16,000	17,000
Stone	26,233	25,305	25,389	27,457	31,541	32,342	30,336	30,272	30,255	29,900
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Value(Thousands of dollars)

	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Cement										
Portland	47,265	45,432	47,925	49,635	59,574	64,156	73,786	86,107	97,501	116,440
Masonry	1,912	1,758	1,719	1,916	2,351	2,660	2,933	4,143	4,951	6,010
Clay	1,660	1,823	1,702	2,643	2,028	1,869	1,916	2,245	1,770	2,265
Coal	3,392	4,059	4,609	4,138	3,279	4,591	6,891	8,351	7,185	5,775
Gypsum	5,274	4,223	4,460	5,714	6,324	7,142	6,546	8,288	9,382	11,613
Sand & Gr.	17,867	20,642	20,530	20,140	25,541	26,104	26,844	26,277	28,000	35,000
Stone	40,895	41,119	44,977	48,642	56,918	66,119	73,732	75,921	77,338	81,000
Other	1,665	1,766	1,899	1,667	2,785	4,079	3,092	4,695	5,163	4,827
Total	119,930	120,822	127,821	134,496	158,800	176,720	195,740	216,027	231,290	262,899
1967 Costant $	113,000	110,000	112,000	113,000	118,000	111,000	112,000	118,000	119,000	126,000

* From data supplied by USDI Bureau of Mines

Figure 2. STONE PRODUCERS IN IOWA - 1978

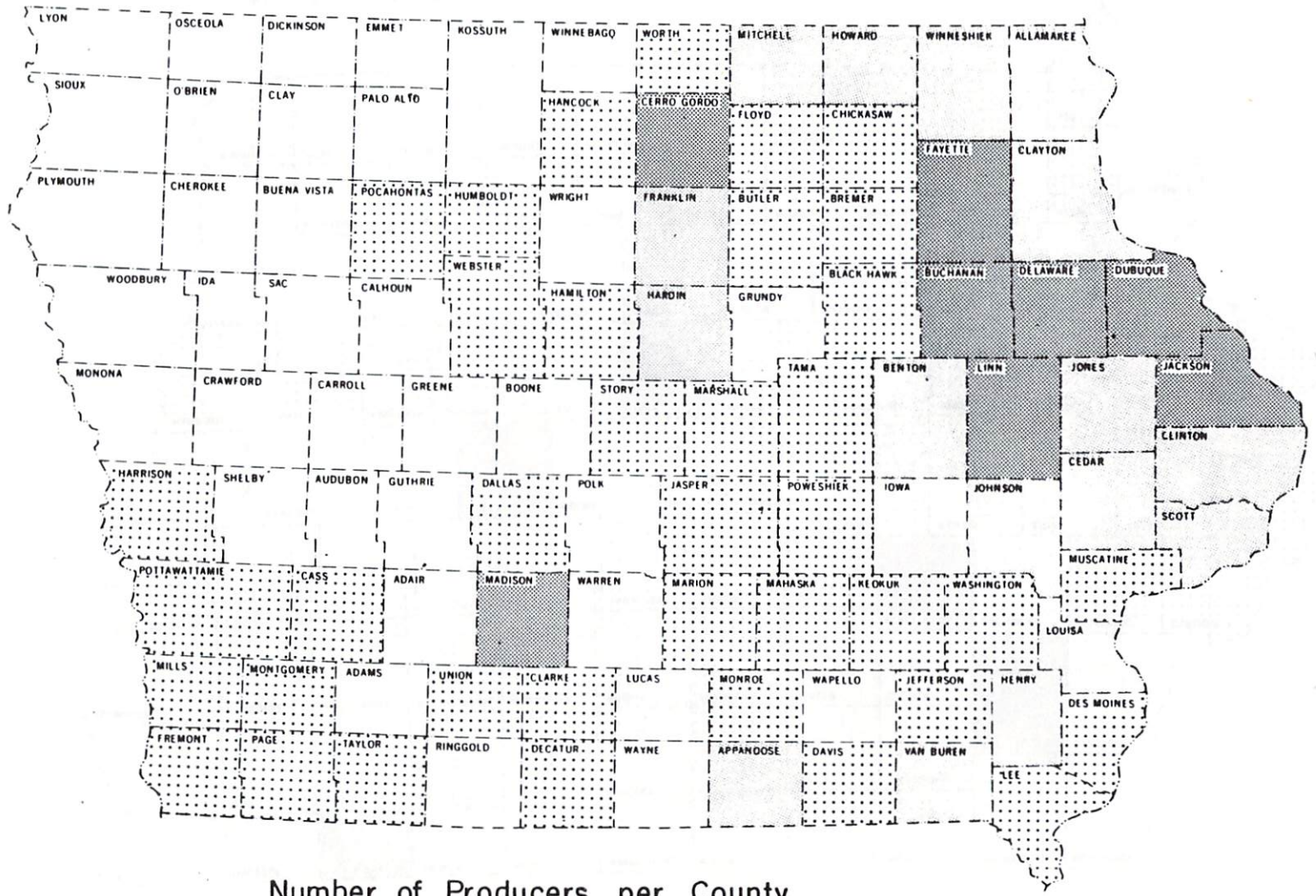
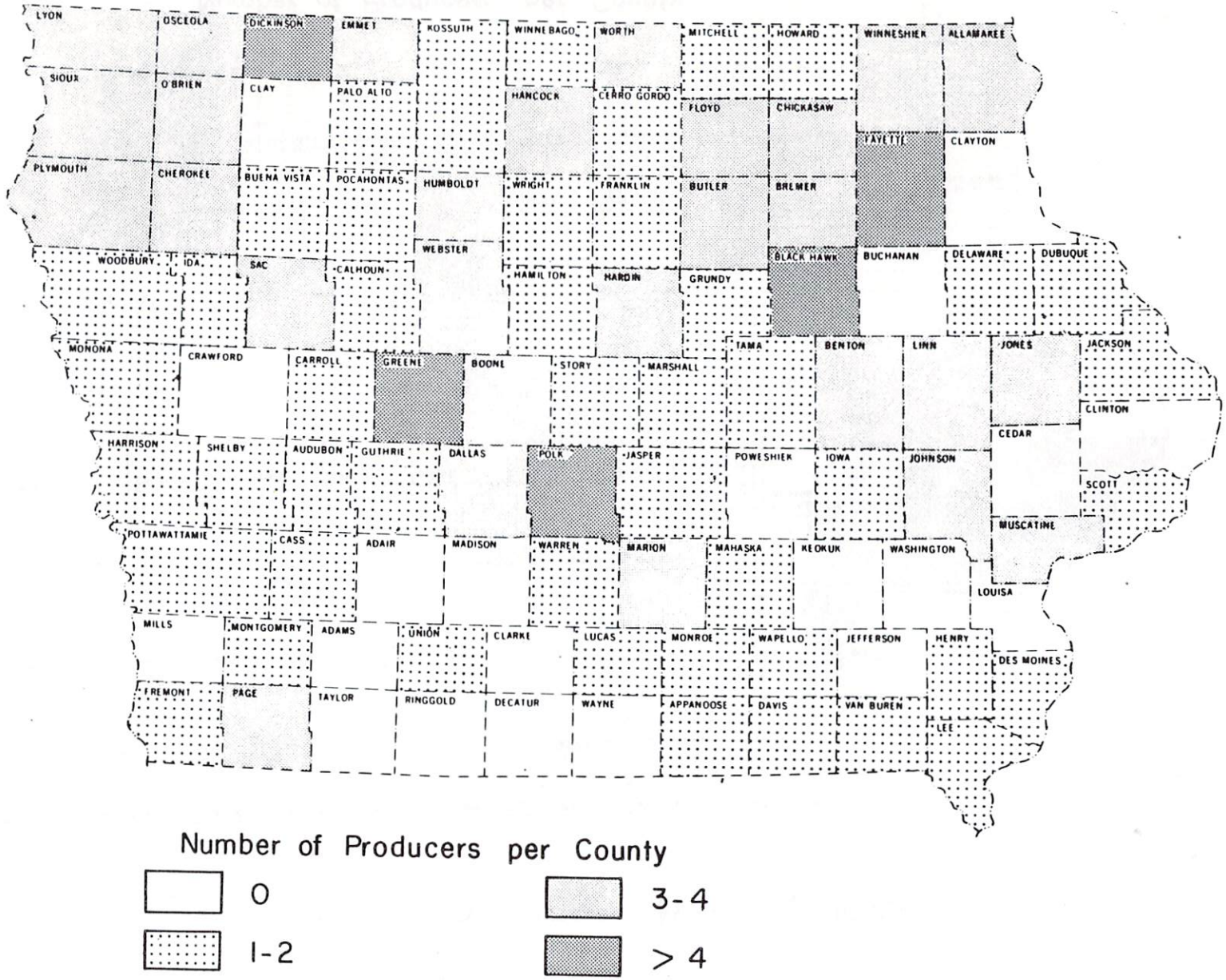


Figure 3. SAND AND GRAVEL PRODUCERS IN IOWA - 1978



Oil and gas have been found in Iowa only in "shows" and one producing well near Keota which produced about 400 barrels of low gravity crude in 1963. The crude was discovered accidentally by Natural Gas Pipeline Company of America during development drilling for underground storage of natural gas. About 130 oil and gas test wells have been drilled in Iowa. Most of these were true wildcats with little or no geological work being done by the operators.

CURRENT SITUATION

Lead-Zinc: no lead or zinc is currently mined in Iowa. Though both ores are thought to be present in mineable quantities no significant exploration is underway. Some Iowa coals contain zinc in the form of spalerite but no attempt at recovery is being made today.

Coal: production of coal in Iowa has been at a low ebb the past three years, but is picking up again now. Production in 1977 was 500,000 tons, and in 1978 350,000 est. tons. Production for 1979 is expected to be about 750-800,000 tons. The low production levels primarily are the result of poor pricing schedules and problems with environmental controls. Iowa coal must be washed to make it minimally acceptable as boiler fuel.

Limestone and Sand/Gravel: High levels of these mineral products are being produced throughout much of the state. Though several counties have limited accessible limestone there remains an abundance of these products.

Gypsum: Major mining of gypsum continues at Fort Dodge, Mediapolis, and Harvey. Additional deeper deposits of gypsum are known in much of southern Iowa but no new mines have been proposed.

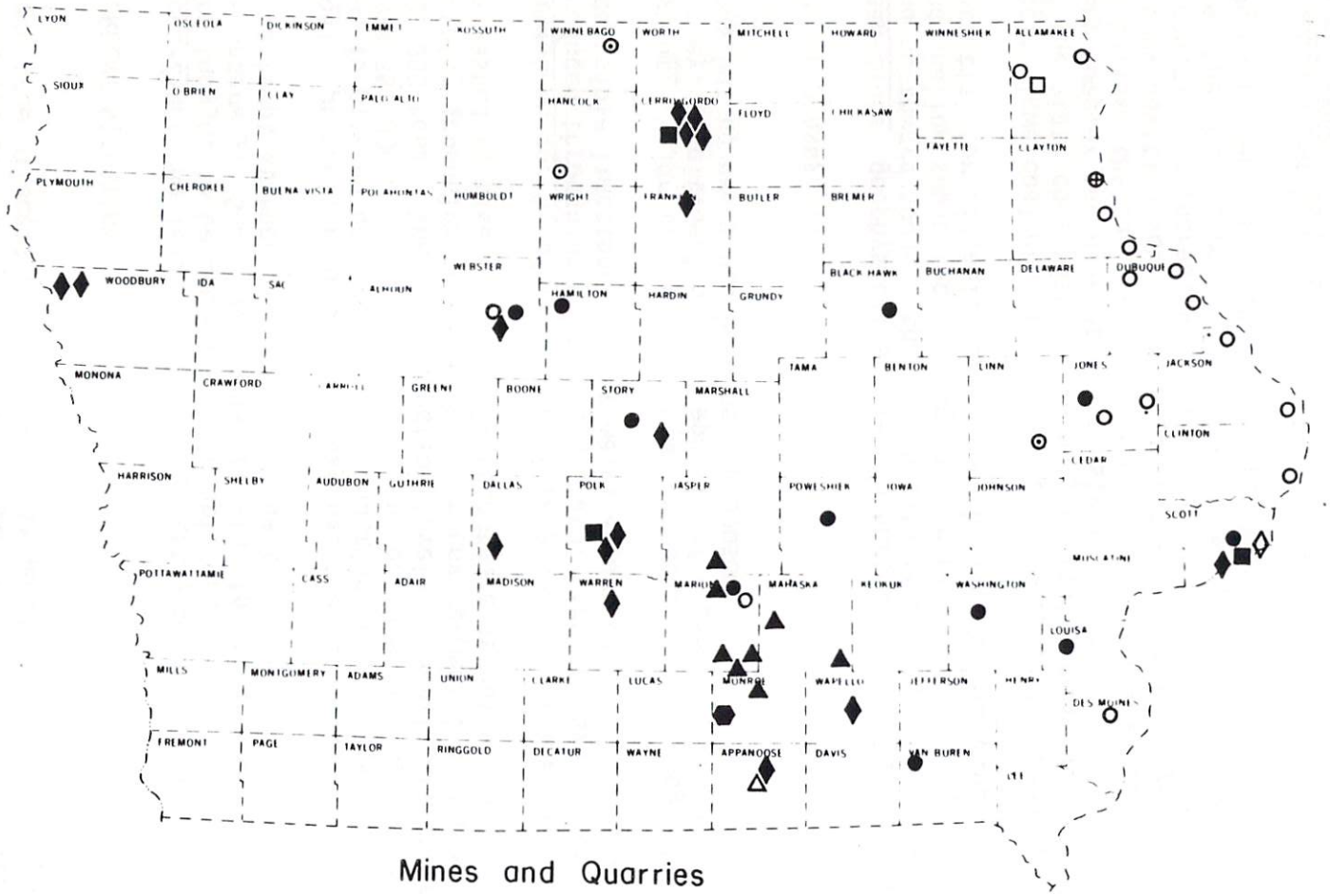
FUTURE PERSPECTIVE

Lead-Zinc: geophysical studies in northeast Iowa between Waterloo, Dubuque, and northward suggest the possibility of deep-seated minerals. Surface and shallow subsurface mining and mineral evidence suggest a reasonable potential for sizeable deposits to be located and mined in the future.

Coal: Iowa coal deposits are relatively small but widespread. Evaluation of the state coal resource is only partially complete. The deposits are very complex and have been extensively altered by erosion and deformation. We believe the coal resource (Figure 5), through extensively tapped, remains a very positive source of energy for this region in years ahead. Though production is increasing slowly, we expect a more rapid rise in production over the short term. Zinc in the form of sphalerite, may be extracted from the coal when sufficient quantities are again mined.

Limestone and Sand/Gravel: Although local shortages exist in western Iowa these materials are generally available in adequate quantities, and we expect continued production for concrete and asphalt aggregates. Because highway construction appears to be depressed in the short-term, production of concrete and concrete aggreage may decrease. However, EPA stack emission

Figure 4. NON-AGGREGATE MINERAL PRODUCTION LOCALITIES



Mines and Quarries

Active

- ⊕ Silica sand
- ⊙ Peat
- O Gypsum
- ● Limestone (Underground)
- ◊ Lime
- ■ Cement
- ♦ Clay-Shale
- ⬢ Coal (Underground)
- ▲ Coal (Pit)

No Longer Active

- □ Iron
- O Lead (Zinc)
- △ Gypsum

regulations soon to be implemented may bring a marked increase in stone production for use in scrubbers at coal fired power plants. Ag lime uses are expected to remain high and increase in demand. We have seen some evidence that dimension stone production is on the rise due to higher costs of competitive building materials.

Gypsum: Production is expected to continue at a pace somewhat controlled by the building industry. As housing starts increase the demand for drywall rises. Newly defined deposits of gypsum southeast of Fort Dodge (Figure 6) will probably be developed in the next few years. Fort Dodge plant officials indicate a 50 year supply in the current mines.

Iron-Copper: Though no deposits of copper are presently known in Iowa there is some potential for future discovery. (Figure 7.) Copper deposits would be relatively deep and major exploration would be necessary to determine their location and quality.

Iron on the other hand, has been discovered in northwest Iowa. A ninety foot zone of iron-rich rock was found at a depth of about 500 feet by New Jersey Zinc in Lyon County in the early 1960's. The company was not particularly interested in the deposit, however. Today there is more interest by other mining companies, but the potential for further exploration and/or development remains for the future. Major iron ore deposits may well be found at mineable depths in northern Iowa. Geophysical evidence supports the possibility as do regional geological relaionships.

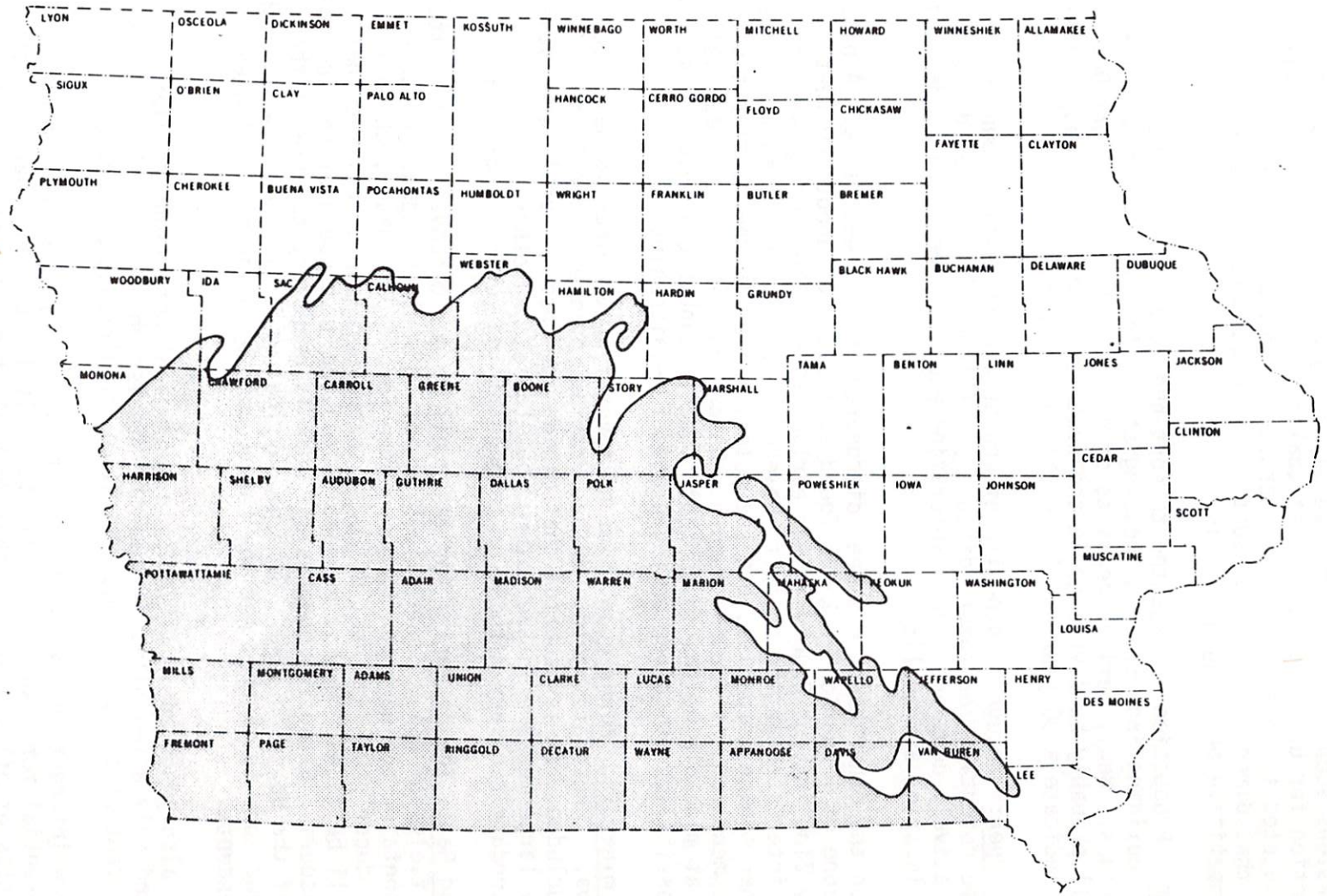
Other minerals: Minor quantities of several other minerals have been identified in Iowa. Phosphate, gold, barite, uranium, pyrite, and refractory clays are included. It is doubtful that mining for these minerals will develop in any large measure in the future, but these, and others may be extracted by secondary recovery methods or through mining for other minerals.

Oil and Gas: The potential for major oil or gas discoveries is limited. Small fields of heavy crude oil may exist in southern Iowa. Because southwest Iowa contains the northern flanks of the Forest City Basin, which is an oil producer south and west of Iowa, there is reason to believe that some oil will be found. Oil is presently produced just south of the Iowa border in Missouri. Extensive geophysical work is necessary to unravel the complexities of the Basin in Iowa. Some geophysical work has been done into the past and more is planned for the future both by major oil companies and independents.

Oil is also produced in Illinois in geological conditions similar to southeast Iowa and only a few miles east of the Mississippi River. Though we believe some potential exists in southeast Iowa, significant production is unlikely.

Much new interest in Iowa is evident by a variety of petroleum companies. Gas potential for Iowa is very limited. It is apparent that Iowa did contain quantities of oil and gas but that much of it escaped through natural forces of deformation, erosion, and possibly surface pressures due to the weight of ice during glaciation.

Figure 5. POTENTIAL COAL RESOURCES



Areas of Potential Coal Reserves

Figure 6. POTENTIAL GYPSUM RESOURCES

Jurassic Age Deposits

Mississippian Age Deposits

Devonian Age Deposits

PROBLEMS

Short Term

A firmly established federal energy policy and related environmental regulations are necessary to enhance Iowa coal production. The coal is available in small to medium sized deposits in up to 30 counties. How much coal is available in 22 additional counties is not yet know but reserves should be sizeable. Without a positive energy policy, coal production may languish for many years.

The development of all minerals have some difficulties due to competition for land use. Surface mining does remove land from agricultural uses. However, it is short term. It is not like a new shopping center or encroaching urbanization. Land can be reclaimed when mining operations are done correctly. The lack of public awareness of this fact is still a problem.

Long Term

Mineral resources must be considered in the long term. The socio-economic factors of major mining and milling operations may be great. We must have legislation and rules which will protect the best interests of the state. Legislation is necessary to ensure that drilling and coring information are made available to the Geological Survey for resource evaluation.

Long Term economics in resource evaluation, development, production, and depletion is also a problem to be dealt with.

POTENTIAL SOLUTIONS OR ALTERNATIVES

Iowa has a good land recovery act. Most current mining companies are working with the law and the agencies involved. Encouragement, assistance, and enforcement must be constant and consistent.

Continued pressure on congress and the White House to enact meaningful federal laws which will encourage mineral exploration and production of needed materials, be they energy related or otherwise, is a must.

AGENCY OR GOVERNMENT NEEDS TO ARRIVE AT SOLUTIONS

Financial Requirements

Continued support of Survey research, data analysis, and service programs. Maintaining the financial level consistent with rising inflationary costs and special "one-time" needs.

AEROMAGNETIC MAP OF IOWA

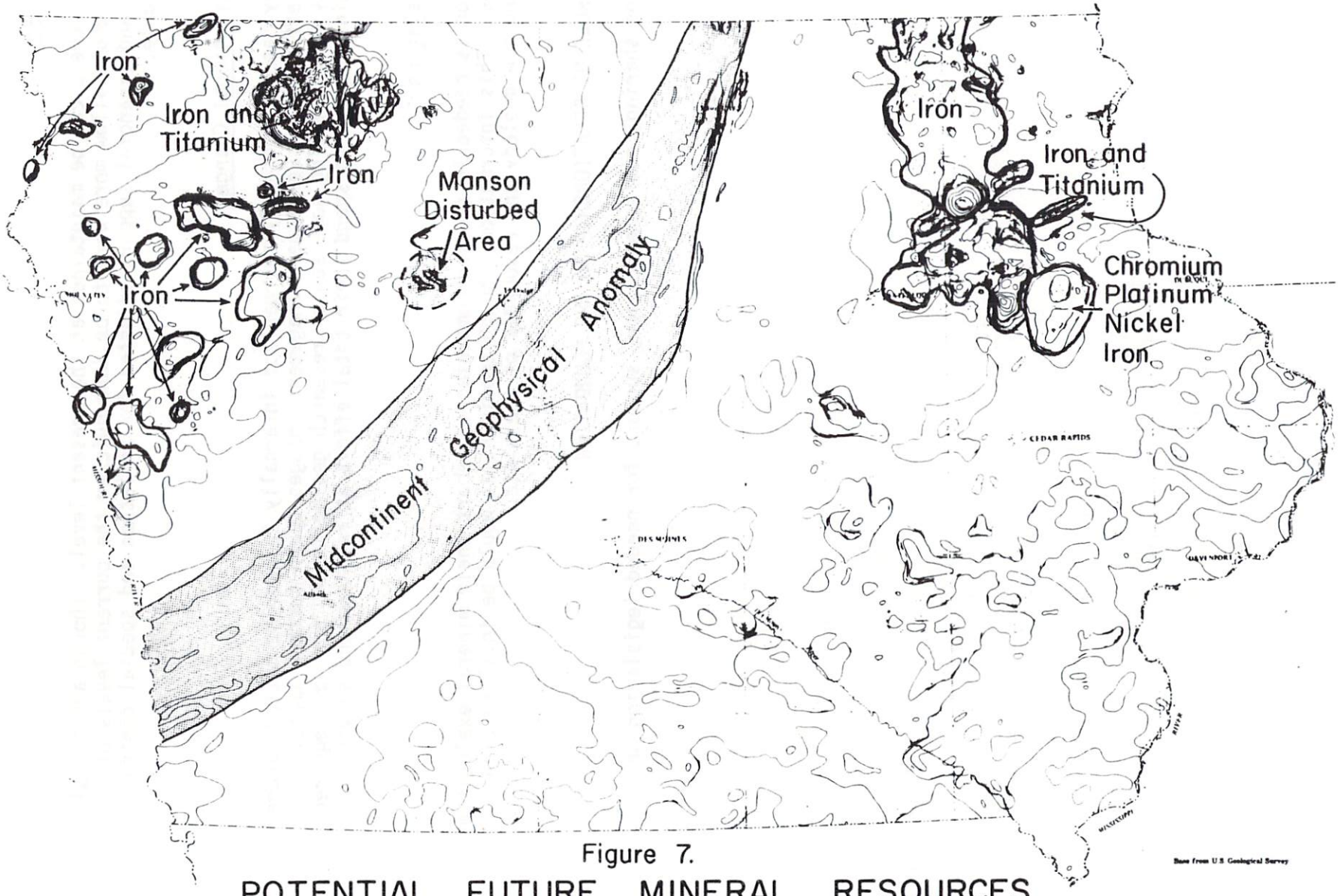


Figure 7.

POTENTIAL FUTURE MINERAL RESOURCES

Manpower

Personnel levels can be maintained at the present level. Though additional personnel would allow more work to be done quicker the current levels of personnel and financial support adjusted for inflation and special contracts is reasonable.

Institutional Changes

The Survey has been recently reorganized internally to provide better management and efficiency. Personnel management changes could further improve efficiency by permitting some senior research geologist who are now required to be administrators to spend their total effort at research and service.

Legislation

Legislation is needed to require companies to report their mineral exploration activities. This information, though confidential would be invaluable in determining the geology and resources of the state.

POSSIBLE ROLE OR RELATIONSHIP TO THE FOUNDATION

Information sharing, public education, support for needed legislation or programs.

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