STATE OF ARIZONA

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DEPARTMENT OF MINES AND MINERAL RESOURCES



51st Annual Report

1989-90



DEPARTMENT OF MINES AND MINERAL RESOURCES

STATE OF ARIZONA

Mineral Building • State Fairgrounds • Phoenix, Arizona 85007 (602) 255-3791

August 1990

The Honorable Rose Mofford, Governor The State of Arizona 1700 W. Washington Phoenix, Arizona 85007

Dear Governor Mofford:

The Annual Report of the Arizona Department of Mines and Mineral Resources is submitted to you in compliance with ARS Section 27-106.

The statutory obligation of the Department is one of service. The Department is fully funded by the Legislature to promote the development of mineral resources of this state through technical and educational processes including field investigations, public seminars, publications, conferences, mineral displays and by providing mining, metallurgical and other technical information and assistance to prospectors, operators of small mines, the mineral industry and to others interested in the mineral resources of this state.

The activity of the Department of Mines and Mineral Resources assists in the creation of economic activity by various phases of the mining industry in the State of Arizona. Arizona led the nation in the value of non-fuel minerals produced with a total of \$3.2 billion. In turn the industry paid approximately \$126 million in state and local taxes.

The most urgent current need of the Department is the completion of remodeling and renovation of the El Zaribah Shrine building, so the Department and the Arizona Mineral Museum can be moved to that location.

Respectfully yours,

Leroy E. Kissinger Director For the Board of Governors

BOARD OF GOVERNORS

Clifford B. Altfeld - Tucson Chairman Term Expires 1/31/95 Edna Vinck - Globe Vice Chairman Term Expires 1/31/94

Roy Miller - Phoenix Secretary Term Expires 1/31/92

Arthur H. Kinneberg - Phoenix Member Term Expires 1/31/91

C. J. Hansen - Tucson Member Term Expires 1/31/93

STAFF PERSONNEL

Phoenix Office - Mineral Building, Fairgrounds, Phoenix 85007 Phone: 255-3791

Leroy E. Kissinger - Director Ken A. Phillips - Chief Engineer Richard R. Beard - Engineer Nyal J. Niemuth - Engineer Glenn A. Miller - Museum Curator Ann Turney - Administrative Assistant Diane Bain - Secretary Marianne Charnauskas - Secretary Marcia Wawrzynek - Maintenance Alice Rosenfeld - Part Time Museum Tour Guide Alice Smith - Part Time Museum Tour Guide Joseph McIntosh - Part Time Museum Tour Guide Les Wagner - Part Time Museum Tour Guide Jeff Scovil - Part Time Museum Tour Guide

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THE DEPARTMENT OF MINES AND MINERAL RESOURCES

Statutory Assignment

The Arizona Department of Mines and Mineral Resources is authorized by ARS Section 27-101 to 27-111 to promote the development of the mineral resources of this state through technical and educational processes including field investigations, public seminars, forums, publications, public news media and other functions necessary to achieve its objectives.

IMPLEMENTATION OF ASSIGNMENT

Mineral Museum -The Department operates the State of Arizona Mineral Museum. The Museum is the official repository for the identification, cataloging and displaying of mineral specimens, ores, gemstones, and lapidary materials found in the state. The Museum also operates a small store to sell mineral specimens and publications relating to minerals.

Education - The Department conducts seminars and training sessions to assist the public in the proper staking of claims and locating and extracting of minerals. Through a series of publications, the Department has accumulated useful guides to mineral law, location of mineral occurrences in the state and technology to mine and extract minerals.

The Museum staff conducts programs on a regular basis to educate teachers and students of Arizona's schools from kindergarten though college about mining and its contribution to the general welfare of Arizona.

Information and Assistance - The Department maintains the most comprehensive records and resource library of mining activity, spanning the period of the earliest settlers to the present day, that is available anywhere. With these files and its library the Department is able to assist prospectors, mining companies, rockhounds and the general public in the efforts to locate and develop mineral resources. The engineering staff is able to provide technical assistance in general mining and processing of minerals for those who need it.

Assistance to Government Agencies - The Department staff spends a great deal of time investigating, sampling, acquiring assays of samples and providing a wide range of information to assist both state and federal agencies in their attempts to prosecute the many fraudulent "mining" promoters who are proliferating in Arizona. Recent national publicity has been given to the many schemes to defraud investors by selling them "ore" containing gold. Our Department staff has been in the forefront in acquiring evidence to build a legal case against the perpetrators. Both the Securities Division of the Corporation Commission and the Federal Trade Commission have been involved. We provide technical assistance to the Governor's Office, the State Legislature, the State Land Department, the State Department of Environmental Quality, the Department of Revenue, the Attorney General's Office and the Department of Commerce.

The Department has worked with the U.S. Bureau of Mines on many projects over the years. Most recently, the Department has compiled a complete data base listing of all the known mineral occurrences in the state for the Bureau's Mineral Industry Location System (MILS). We have all of that data filed both on computer storage and hard copy.

The Department regularly performs services for, or works cooperatively with, both the U.S. Bureau of Land Management and the U.S. Forest Service. The Department has assisted the World Affairs Council of Arizona in behalf of the U.S. Information Agency.

Response to Inquiries- The Department staff responds to thousands of in person and telephone inquiries each year. The inquiries are about every conceivable subject related to rocks, minerals and lands on which they occur. A sample of these subjects are listed for example only:

1. Identification of rocks and minerals

2. Regulatory interpretation

3. How to stake a claim

4. How to do placer mining

5. How to find a placer deposit

6. Should I invest in a project (Usually after the fact)

7. Responds to legitimate mining company geologists, engineers, and other prospectors reviewing our library and files for information that might lead them to locating and developing a viable mineral deposit.

8. How do I file assessment work

Project Work - The engineering/geological staff of the Department does major projects to evaluate mineral resource potential over the State. These efforts result in printed publications that are available to the public.

There are three projects that are currently assigned to staff. The greatest difficulty is in isolating the staff from the large number of public inquiries long enough to do this work. These projects are:

1. Gold and other precious metals. Preliminary reports and maps have been completed. Work is continuing to provide information on all of the area below the Mogollon Rim.

2. Oxide Copper. A survey of known oxide copper deposits is being made. Many of these are part of ongoing mining operations. Most notable are the Northwest Extension at Morenci and the Cochise at Bisbee.

3. Survey and development of markets for industrial minerals that occur in exploitable quantities in Arizona. Four open file reports listing resources and market potential in Arizona and Southern California have been completed. These reports will be consolidated into a formal publication.

The major administrative hurdle that needs to be overcome is the relocation of the Department offices and Mineral Museum. The El Zaribah Shrine Building on the Government Mall has been committed and is being remodeled for that purpose. The Facilities Planning Division of Department of Administration has predicted that remodeling and renovation will be completed and the building ready for occupancy sometime during the second half of fiscal year 1990-91.

GOALS OF DEPARTMENT

The short term goals of the Department of Mines and Mineral Resources are primarily related to moving the Department including the Mineral Museum from its present location on the State Fairgrounds to El Zaribah Shrine Building on the Government Mall, and to strengthen the engineering staff to be able to fulfill the commitment required by enabling statute.

In order to prepare for the move and to be able to properly manage a vibrant new museum with the increased attendance expected at the new location, the Department will recommend that the Museum staff be expanded to include two full time persons to conduct education programs and construct display galleries.

One additional full-time engineer may be requested in 1991-92 Fiscal Year budget request. This position will enable the Department to do the sand and gravel and other projects that will help us meet the assigned task to promote the development of mineral resources in the state.

It should be noted that the Department is performing the same service for the public that it was two years ago, in spite of a reduction in operating funds of over 30% of the total appropriation. Reorganization and improved productivity are responsible for this performance. A corp of volunteers contributes to this success.

SUMMARY OF ACTIVITY

Statistical Report

The Arizona Department of Mines and Mineral Resources has a staff of eight full-time people and one half-time person. In addition to the director, there are three mining engineer/geologists, a museum curator, three administrative people and a half-time custodian. Five part-time tour guides are paid from the museum store funds for work in the Mineral Museum and to conduct classes.

During the fiscal year 1989-90 the staff responded to approximately 12,000 telephone inquiries and 4,200 visitors seeking information about rocks, minerals, mining projects, and mineral occurrences in their search for new mineral discoveries. These calls and visits are sometimes taken care of in a few minutes. More often, each inquiry requires the staff person to research the mine files or library for more detailed information about the area of interest. This can take from a few minutes to a few days. Many of the visitors spend hours of their time researching files for leads and information about mineral occurrences in the state. There were approximately 5,800 file and/or library searches conducted for this purpose during the year.

As a part of this association with the mining companies and prospectors, the staff acquires additional information that is added to our files. There were 380 new mine files created during this period.

There were nine publications created or updated and published by the Department during the year. (A complete list of publications is available at the Department offices.) New or updated publications include:

- Directory of Earth Science Clubs
- Directory of Active Mines
- Directory of Arizona Mining Consultants
- 50th Annual Report
- The Primary Copper Industry of Arizona in 1988
- Mineral Show List
- Industrial Minerals in Southern California's Wallboard Joint Cement Industry

The following list of federal and state agencies were assisted by the Department staff one or more times during the year. Work varied from a brief evaluation of a specific area to extended support for regulatory and law enforcement agencies investigating fraudulent mining schemes:

U.S. Bureau of Mines U.S. Forest Service U.S. Geological Survey U.S. Securities and Exchange Commission Federal Trade Commission Federal Bureau of Investigation Arizona Geological Survey State Land Department Department of Environmental Quality State Mine Inspector University of Arizona Department of Water Resources **Corporation Commission - Securities Division** Department of Commerce Arizona State Parks Office of the Governor of Arizona World Affairs Council - U.S. Information Agency

Legislative Activity

Senate Bill 1380 was passed by the Legislature and signed into law. This law increases the maximum allowable amount of funds that may be held in the Department Publication Fund from \$5,000 to \$10,000.

House Bill 2286 was passed by the Legislature and signed into law. This law specifies that the Director of the Department of Mines and Mineral Resources must be registered as a professional engineer or as a professional geologist with the Arizona State Board of Technical Registration.

FINANCIAL STATEMENT

STATE APPROPRIATION

Appropriation	362,400
Expenditures	362,285
Reverted	.115
Disappropriated Funds	14,400

MINES AND MINERAL RESOURCES FUND

Income	
Balance Forward	11,723
Insurance Reimbursement	1,606
Donation Box Receipts	1,132
Donations (Other)	198
Museum Store Sales	18,053
Total Income	37,712
Expenses	
Personal Services	11,625
Employee Related Expenses	1,004
Resale Merchandise	6,629
Store Expenses	2,538
Museum Expenses	894
Total Expenses	22,690
Balance Forward to 7/1/90	10,023
PRINTING REVOLVING FUND	
Balance Forward	4,131
Publication Sales	9,342
Return to General Fund	844
Publication Expenses	8,266
Balance Forward 7/1/90	4,363

Industry Activity

During the fiscal year 1989/90 there were 26 Arizona based companies and 40 non-Arizona based companies conducting exploration activities in the state. Approximately 325 people were involved in this effort. Exploration activity includes drilling, geophysical surveys, claim staking, land surveying, surface and underground sampling, and assaying, among other activities.

As mentioned previously in this report, the majority of the people involved in the minerals exploration business in Arizona gather basic information for their efforts from the files and the staff of the Department of Mines and Mineral Resources.

It is impossible to determine an accurate account of economic impact this activity has on the economy of Arizona. However, some reliable assumptions can be made on the magnitude of expense involved.

Three hundred twenty-five people in the field for 200 days, spending \$85 per day on food, lodging and transportation generates \$5.5 million.

There are approximately 20,000 mining claimants that routinely work their claims on a regular schedule each year and spend \$200 each in the process. This generates \$4.0 million.

There are 135,000 active claims in the State of Arizona that require annual assessment work of \$100 per claim. Some of the claims will have no work done at all; however, approximately 60% of these claims will have a minimum of \$100 work done. This generates \$8.1 million.

In summary, minerals exploration activity in the State generates \$17.6 million of economic activity each year. Approximately \$1.25 million in state and local revenue are generated form this activity. Much of this activity is likely reported by other agencies. For example, the Office of Tourism reports the food, lodging and transportation part of this number. Gasoline sales are a factor in the other activities. It is all mining industry related economic activity none-the-less, and is directly related to the efforts of the Department of Mines and Mineral Resources.

The above discussion does not consider the economic impact of the major mining operations in copper, gold, sand and gravel and industrial minerals. These are summarized in the section on Mining Today.

MINING IN ARIZONA

Historical Perspective

"Mining is Basic." The slogan is commonly used by a variety of mining interests to promote the industry and to educate the public on how mining and its products affect everyone. There is nothing that is used by the human race that does not incorporate some product of the mining industry. Agriculture, automobiles, building construction, paint, computers, televisions, radio, paper products, aircraft, communications and everything else used by man has somewhere in its make-up at least one substance that was taken from the earth. This has been true since the beginning of man.

In Arizona, mining has been an important factor from the time of the early miners among the various Indian tribes. The ancient people used clays for pottery, pigments for decoration of their bodies and shelters, chert and flint for their tools and weapons, and turquoise, silver and gold for jewelry. Mining was crude and was done on a small scale, but it is still an example of how even the most primitive cultures were dependent on mining.

The primary reason for exploration of this part of the New World by the Spaniards was to find the treasures of gold and silver the natives had accumulated. As the missionaries established the settlements of Southern Arizona, mining became a part of the developing civilization. Mining in Arizona lay dormant from the period of the Mexican Revolution for independence from Spain (1810-1812) until after the U.S.-Mexican wars and the Gadsden Purchase. With a slowdown during the Civil War years excluded, mining activity has been an important part of the Territory and State ever since. The first Territorial Governor believed minerals were the most important factor in being able to establish a civilized society in Arizona. Minerals are equally important to the maintenance of civilization.

From the end of the Civil War to the beginning of World War II, as many as several hundred mines operated and produced copper, gold, silver, and other metals. The value of these mines to the new state in terms of jobs, commerce, revenue, and money into the economy are almost incalculable. Without this effort, it is difficult to envision what Arizona would have become.

Following World War II, the copper mining industry was renewed to higher than ever levels by the onset of several large open pit mining operations that now span the State from the southeast to the northwest. With several cycles of boom and bust, improved technology and new efficiencies developed by company- wide restructuring, the copper industry had come full circle by 1987, and is now competitive with the rest of the world. Production and revenue have not yet reached the peak years of 1979-82, but after the low point in 1986 it is on a positive climb. Copper prices have remained strong through the spring of 1990 and are expected to remain that way for the immediate future. World supplies of copper are short. A variety of problems, political and technical, continue to impede production from several large projects around the world.

Mining Today

During and since World War II there have been great strides in industrial development in Arizona. As a result, the mining industry is a smaller percentage of the total economy in spite of substantial growth in finite terms. Regardless of the relatively lower position in economic impact of the State, the mining industry and related businesses still contributed \$9.4 billion to the Arizona economy in the calendar year of 1989. Included in that is approximately \$750 million in revenue paid to state and local governments.

The industrial classification system used by the Arizona Department of Economic Security places some smelter and refinery workers in manufacturing employment so these workers must be included to present an accurate accounting for employment by the mining industry. However, the approximately 12,000 people employed directly by the mines and mills grows to about 53,000 when factored for the ripple effect of service industries related to the mining industry. The copper industry alone was directly and indirectly responsible for more than 4% of all personal income received by Arizona residents in 1989. It follows that personal income tax to the state paid by employees in the copper industry would be a similar percentage of the total revenue from income tax.

Every major copper company has announced or are involved in expansion plans. If prices hold, it is conceivable that copper production will soon exceed the historic high of 1981. Two companies without previous copper production in Arizona have announced intentions to start projects by 1991. Arimetco has acquired the Johnson Mine formerly operated by Cyprus with plans for early production. AZCO has acquired the Sanchez property near Safford and is in the process of raising financing for a near term start-up.

Both of these projects, in addition to the expansion projects announced by the major copper companies, will be using the solvent extraction-electrowinning technology only recently applied to copper extraction and production on a large scale. It has become an important factor with an excess of 25% of Arizona's total copper production coming from that source.

There are several additional new projects that have been announced including the following:

South Atlantic Ventures is in the process of developing a copper project at Oracle Ridge. They will produce copper concentrates with a flotation mill.

Arimetco has also acquired the Van Dyke property at Miami and the Emerald Isle property in Mohave County. Emerald Isle is already producing copper by a leaching and precipitation process. The Van Dyke property was acquired from Kocide Chemical Company who had been producing cement copper from an in-situ leach operation. Calcium Products Company of Arizona began operations in January 1990. They are producing a limited quantity of mineral filler for an Arizona manufacturer of wall board cement. This material had been previously imported from another state.

Mountain Mining Company began pumice mining operations at their mine near Williams during 1989. The pumice is processed in Phoenix for use in the garment industry. It had been imported from Italy prior to this time.

Non-fuel minerals produced in Arizona during the year 1989 had a value of \$3.2 billion. The chart below shows the quantities of each commodity produced and their relative value.

MINERAL	QUANTITY	VALUE IN \$1000
Clay (Short Tons)	212,000	2,000
Copper (Short Tons)	983,000	2,692,000
Gem Stones	NA	3,300
Gold (Troy Ounces)	92,000	35,000
Gypsum (Short tons)	550,000	2,000
Lime (Short Tons)	50,000	25,000
Moly (Pounds)	29,795,000	93,000
Pumice (Short Tons)	10,000	500
Sand & Gravel (Short Tons)	34,000,000	133,500
Silver (Troy Ounces)	3,856,000	23,200
Stone (Crushed Short Tons)	5,300,000	26,200
Other	NA	126,600
TOTAL		\$3,163,100

Note: Some production numbers are withheld for proprietary reasons; therefore some totals are estimated.

The statistics above do not include the coal mined on the Navajo and Hopi reservations. Because of federal policy of assigning fuel minerals such as uranium and coal to the Department of Energy instead of the Bureau of Mines, production data is more difficult to obtain. However, coal production in Arizona was approximately 12 million tons in 1989. All of this is produced from the two mining complexes on the Reservations. Depending on markets, the value of the coal mined is approximately \$240 million. It is difficult to measure the actual impact on the Arizona economy, but suppliers to the mines and users of the coal make a significant contribution. Most of the coal is used in the two power plants at Page, Arizona and Laughlin, Nevada. The operator also pays approximately \$20 million in taxes each year. Likewise, the production of uranium is not included in the table above. During the calendar year 1989, Energy Fuels Nuclear produced 2.5 million pounds of uranium with spot market value of approximately \$25 million. Uranium prices have dropped below \$10/pound for the first time in fifteen years resulting in severe reductions in production at domestic uranium facilities. Those in Arizona are being sustained because the product is sold on long term contracts. Until there is a clear policy established by the Federal government, the future for the domestic uranium industry is uncertain.

Gold production at Cyprus Minerals Company's Copperstone Gold Mine was over 73,000 ounces in 1989. Gold production for Arizona in 1989 was approximately 92,000 ounces with market value of \$35 million. Previous gold production has been primarily a by-product from the copper industry. By-product gold production will remain high with high copper production.

Sand and gravel for construction and industrial mineral production had a combined market value in excess of \$295 million during 1989.

The Future of Mining

Predicting the future is a risky endeavor particularly when it comes to mining. This is especially true in these times when the decisions on whether to explore and develop new mines is so heavily influenced by factors not related to mining or marketing of mine products. The boom and bust cycles of the past were largely a result of availability and markets.

Mining in the United States and in Arizona has become a very complex business influenced as much by environmental controls and land use planning as by prices and markets. While the mining industry has solved most of the environmental problems, the availability of new land for the exploration of minerals is questionable. Interference by the "environmental radicals" is still very strong in spite of the excellent record of improved mitigation and remediation by the industry.

With the combined lands encompassed by the National Forests, the National Parks, BLM managed pubic lands, Wildlife Reserves, Indian Reservations, and land withdrawn for military use, the Federal government controls 69% of all the lands in the State of Arizona. Lands already withdrawn from potential mineral exploration for all intents and purposes include the Military and Indian Reservations, the National Parks, the Wildlife Reserves, and 49 areas totaling 2,031,877 acres already in the National Wilderness Preservation System. It now appears certain that 1.1 million acres of BLM managed lands will be added to the total, possibly during the current session of Congress. In addition, approximately 2.5 million acres of wildlife preserves will also be added. The total wilderness area in Arizona will be 5.5 million acres. How much is enough? It is certain that otherwise exploitable, valuable mineral deposits are located within these withdrawn areas. It is equally certain that wilderness advocates will demand more land.

The only sensible solution is to take the time necessary to do a thorough evaluation of mineral potential and carve out those areas that have high potential. These, along with access and other rights, should be excluded from any wilderness designation.

Disregarding interests other than the mineral potential, the majority of the lands proposed for wilderness fall within the Arizona mineral belt that traverses the Transition and Basin and Range geologic provinces across the State of Arizona.

The availability of lands with potential for mineral deposits is under severe threat by the wilderness status. With proper regulation and management of these lands, all interests can be served. The permitting process can require necessary environmental protection of areas that are ultimately developed for their mineral resources. If, in fact, there are areas that have unique, natural and pristine values as defined in the 1964 Wilderness Act, they should be set aside and given thorough evaluation on an individual basis. The wholesale designation of large acreages as wilderness without consideration of other resources and uses should not be allowed.

Legislation to modify or outright repeal and replace the 1872 Mining Law has been introduced in both houses of Congress. It does not now appear that the legislation will move forward during the current session, however, the threat to the mining industry is imminent. Regardless of the attack by various "environmental entities" and their supporters in Congress, the body of law that has evolved over the past 118 years, and is commonly called the "1872 Mining Law" has served the industry and the nation well. It continues to allow a safe, environmentally sound development of mineral resources that are sorely needed to maintain the living standard the country desires and to fill the strategic need of the Nation. Revision of the law should be done only after careful consideration, and when it can be clearly shown the result will be better for the Nation.

The EPA has been trying for more than two years to develop rules and regulations to manage mined waste under subtitle D of the Resource Conservation and Recovery Act (RCRA). A task force group formed by the Western Governors Association has been working with EPA trying to keep regulations reasonable, and to keep control at the state level. While even the task force proposals would be damaging to the economics of mining projects and would destroy the small miners' ability to operate, the "Strawman II" proposals by the EPA are worse. The primary problem is that it would not consider the different parts of the country in the writing of rules and regulations. The states that have mining interests must resist this Federal encroachment if mining is to remain viable.