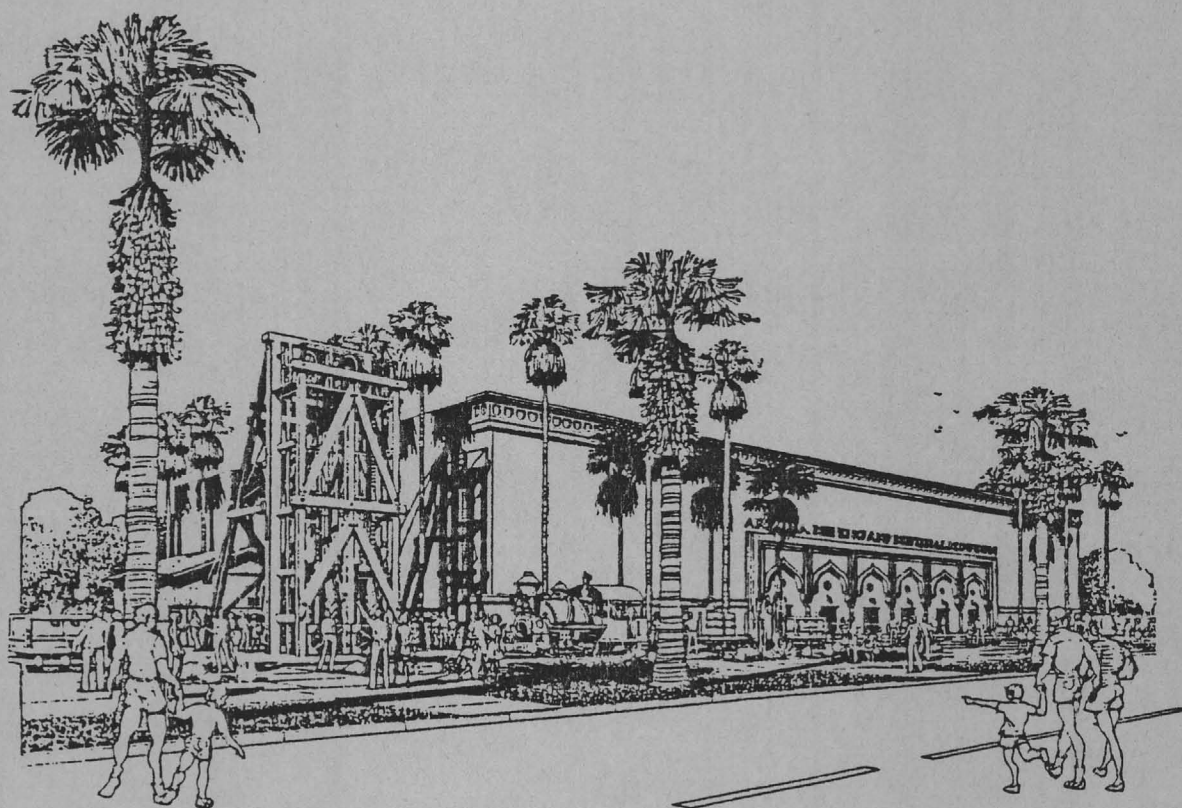


# STATE OF ARIZONA

## DEPARTMENT OF MINES AND MINERAL RESOURCES



54th Annual Report  
1992 - 93



STATE OF ARIZONA

DEPARTMENT OF MINES AND MINERAL RESOURCES  
ARIZONA MINING AND MINERAL MUSEUM

Phone (602) 255-3791 1-800-446-4259 (IN ARIZONA ONLY)

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Fife Symington, Governor

STATE OF ARIZONA

1700 West Washington

Phoenix, Arizona 85007

Dear Governor Symington:

The Annual Report of the Arizona Department of Mines and Mineral Resources for the Fiscal Year of 1992/93 is submitted to you in compliance with A.R.S. Section 27-106.

The Department of Mines and Mineral Resources has the statutory obligation to promote the development of mineral resources in the state. The attached report is a summary of past efforts, especially for the fiscal year of 1993, to accomplish that task. The report sets realistic goals for the future and provides a plan to reach those goals. As in the past the Department has taken a close look inward to determine if funding provided by the taxpayers of Arizona has been used wisely to do the job assigned to the agency. It is not the desire of the Department to grow in numbers just for the sake of growth. Even though there is apparently some improvement in the Arizona economy, the Department will continue to utilize the present staff to the fullest extent to do the job assigned to us. We will continue to develop a dedicated corps of volunteers to do the work necessary to make the Mining and Mineral Museum a source of education on minerals, mining and the importance of minerals to civilization. However, with the continued growth in attendance by students and teachers of Arizona's schools, especially those in Maricopa County, it is absolutely necessary that one full-time employee be added to the museum staff. A request for one full-time Education Curator will be included in our budget proposal for fiscal year 1994/95. This position will require an appropriation of approximately \$32,000 including employee related expenses.

In the meantime, because the need is now, every effort is being made to acquire donated funds to fill the position on a temporary basis. Even if the position does not become permanent, the person could develop education programs that could be used by the museum indefinitely.

Student attendance at the museum minerals education classes has increased from approximately 5400 in 1988 to over 8000 in 1992. That represents an increase of 48% during the period. If the rate of growth continues, it will soon become impossible for the present staff to provide the services on an unlimited basis. It will become necessary to turn down requests for classes in minerals education.

DMMR continues to develop the minerals education program in cooperation with the Arizona Mining Association, the Museum Educators of Central Arizona (MECA), and the Department of Education. The Museum Curator is an officer in MECA. During the fiscal year of 1992/93, a teaching unit designed to help students learn about minerals and their uses was written and published.

The "Teacher Pac" is done in both English and Spanish for grades K-2, 3-5, and 6-8. Arizona Public Service Company published the Pacs in large quantity for distribution to teachers.

Arizona led the nation in the production of non-fuel minerals with approximately \$3.2 billion in value. The state benefited directly from this activity with over \$100 million in total taxes paid directly and a payroll of over \$400 million. When combined with the activity generated by suppliers to the mining industry, the benefit to Arizona's economy amounted to over \$6 billion.

Even more important than the economic contribution is the continued supply of raw materials produced that make civilization possible. Without the products of mining, Arizona would be an empty desert.

The area of greatest concern to the DMMR is related to the deliberation going on in the Congress of the U.S. to repeal, or at least revise, the Mining Law of 1872. The Western Governors Association and the State of Arizona have taken essentially the same position on Mining Law Reform as the American Mining Congress and most of the industry. That is good. Unfortunately, the likely final compromise that will come out of Congress will do serious damage to the mining industry and the ability to do mining projects on the public lands. Since most of the mining going on in Arizona is on privately held land, the immediate effect will not be significant. The long range effect will be the shut down of exploration, development and production of minerals from the public lands. The industry will go out of this country to countries with better ore bodies and less punitive rules and regulations, taxes and royalties.

Arizona must continue to take the stand that mining is an important part of our existence. No other industry produces so much for so many. The Department of Mines and Mineral Resources is a vital component of that effort.

Respectfully yours,

A handwritten signature in cursive script, reading "Leroy E. Kissinger". The signature is written in dark ink and is positioned above the typed name.

Leroy E. Kissinger, Director

For the Board of Governors

**STATE OF ARIZONA**  
**DEPARTMENT OF MINES & MINERAL RESOURCES**

**ANNUAL REPORT**

**FISCAL YEAR 1992 - 93**



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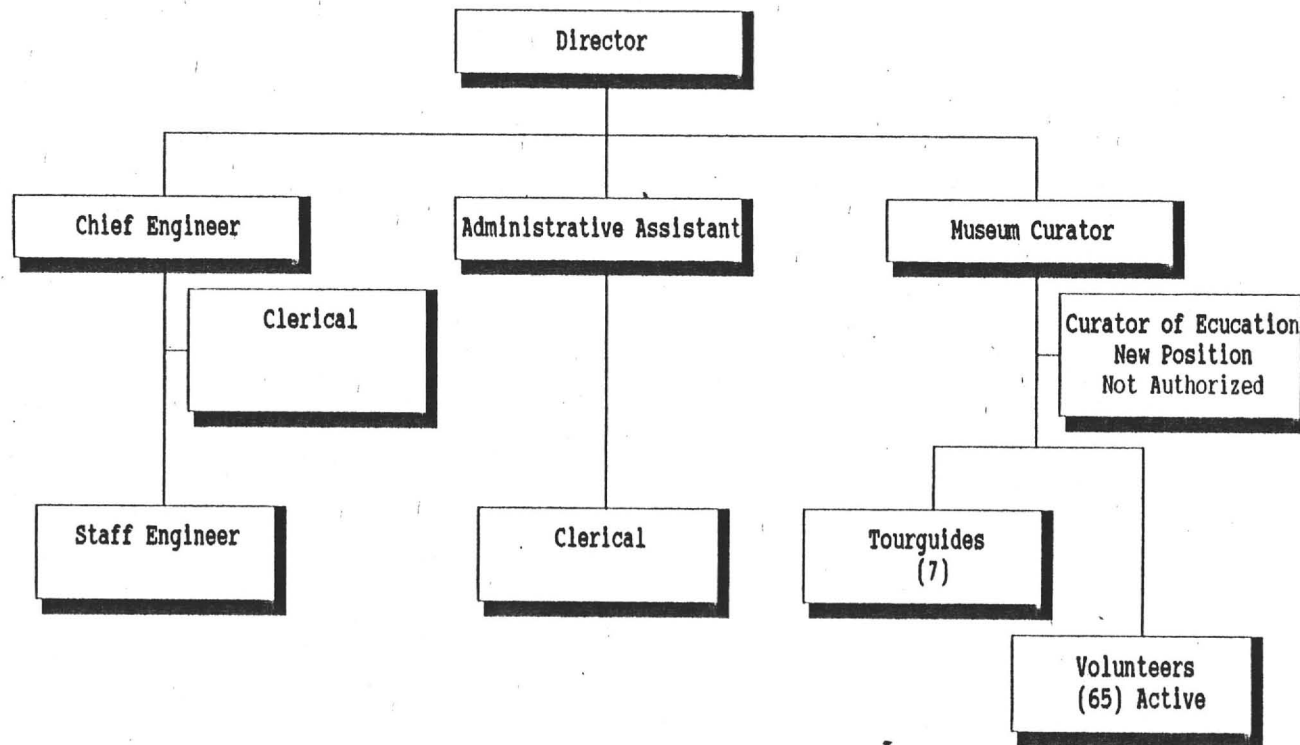
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ARIZONA DEPARTMENT OF  
MINES AND MINERALS RESOURCES  
Organization Chart



Between July 1, 1992 and June 30, 1993  
The Volunteer Staff Donated 7,200 Hours

## FINANCIAL STATEMENT

### Appropriated Funds

Appropriation . . . . .	\$609,400
Expenditures . . . . .	608,615
Reverted . . . . .	785

### Mines and Mineral Resources Fund

Balance Forward 7/1/92 . . . . .	\$3,904
Sales, Donations & Sales Tax Collected . . . . .	106,934
Expenses . . . . .	83,428
Balance Forward . . . . .	27,410

### Printing Revolving Fund

Balance forward 7/1/92 . . . . .	\$3,655
Publication Sales . . . . .	15,076
Publication Expenses . . . . .	11,175
Balance Forward . . . . .	7,556

## **BOARD OF GOVERNORS**

Ken Bennett - Phoenix  
Chairman  
Term Expires 1/31/96

Roy Miller - Phoenix  
Vice Chairman  
Term Expires 1/31/97

Clifford Altfeld - Tucson  
Secretary  
Term Expires 1/31/95

Edna Vinck - Globe  
Member  
Term Expires 1/31/94

Eric Nordhausen - Tucson  
Member  
Term Expires 1/31/98

## **STAFF PERSONNEL**

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Leroy E. Kissinger, Director  
Ken A. Phillips, Chief Engineer  
Glenn A. Miller, Museum Curator  
Nyal J. Niemuth, Engineer  
Ann Turney, Administrative Assistant  
Diane Bain, Secretary  
Marianne Charnauskas, Secretary  
Alice Rosenfeld, Museum Tour Guide  
Joseph McIntosh, Museum Tour Guide  
Les Wagner, Museum Tour Guide  
Jeff Scovil, Museum Tour Guide  
Ann Baker, Museum Tour Guide  
Jerry Myers, Museum Tour Guide  
Doug Duffy, Museum Tour Guide

## THE DEPARTMENT OF MINES AND MINERAL RESOURCES STATUTORY ASSIGNMENT

*The Arizona Department of Mines and Mineral Resources is authorized by A.R.S. 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 Resource Information Center** - The department maintains the most comprehensive set of files and library information on Arizona mining that is available anywhere. The information spans the period from the earliest activity in the mid-nineteenth century to the present day. The files are kept up to date with current information as it becomes available. The information is used to assist prospectors, mining companies, rockhounds, mineral collectors, educators and the general public in their efforts to locate and utilize the products that are made possible by this industry. The engineering staff is able to provide technical assistance in general mining and processing of minerals for those who need it.

The department provides a wide range of assistance on mining, processing, environmental effects and mitigation of those effects, in addition to information on other technical matters related to mining for the Governor's office, the State Legislature, and other city, county state and federal agencies.

**Mining and Mineral Museum** - The department operates the State of Arizona Mining and Mineral Museum. The museum is the official repository for the identification, cataloging and displaying of mineral specimens, ores, gemstones and lapidary material found in the state. The museum also operates a small gift shop for the sale of mineral specimens, jewelry made from minerals, and publications related to minerals. The museum conducts classes and tours for students and teachers from Arizona's schools as a part of the effort to educate the public about the presence and uses of minerals in the state. The museum has developed a comprehensive minerals education program that is directed at teachers, who in turn reach thousands of Arizona school kids.



## DEPARTMENT ACTIVITY

**Introduction** - The following general description of how the staff of the department accomplishes the task of "promoting the development of mineral resources". The projects that are underway mesh with the list of contacts with the mining industry itemized in the "Industry Activity" section of this report.

**Mineral Resource Information Center** - The department staff makes field contacts and mineral deposit evaluations, studies markets and technology to encourage private sector investment in prospecting, exploration, development and production of mineral deposits. Encouragement and information is supplied through technology transfer methods of personal contacts, seminars, publications and operation of the Arizona Mining and Mineral Museum.

The DMMR maintains current computer database records on approximately 10,500 mineral occurrences, mines and prospects in Arizona. Hardcopy files of about 6,000 of those mineral occurrences are maintained in up to date, secure fashion. These files contain such data as location, bibliographies, mineral content, size, economics, complete feasibility studies, and other data. As new information is developed by DMMR studies and by industry exploration and mining activity, it is entered into the files. Additional files are also created as new mineral occurrences are discovered and evaluated.

The information contained is made available to, and is used by members of the mining industry. Through the use of this information, the industry has been able to make significant discoveries and develop new mining projects. These new projects return revenue to the state's economy many times over what it costs to fund the DMMR.

The return to the state for these efforts must be measured against the results of the exploration and mining activity conducted by individuals and companies that make up the mining industry. Successful projects reap important benefits to the economy in general, and in the form of taxes paid directly to state and county treasuries. Even the failures, those exploration projects that don't find viable ore bodies, make a significant contribution to the state's economy in the form of sales of supplies, and in taxes on those sales. It is estimated that exploration activity alone spent over \$12 million in Arizona during 1992. While that is down about 20% from the previous year, it still generated \$0.75 million in sales and payroll taxes.

In summary, the DMMR continues to have a positive economic impact on the State of Arizona. The focused orientation of the department is to aid in the promotion and development of the state's mineral resources. The search for mineral deposits, and the development and production of metals and other minerals is a \$3.12 billion per year business in Arizona. That places Arizona as the top producer of non-fuel minerals in the United States during 1992. By making contact with hundreds of individuals and companies around the world, the staff of the department collects, analyzes, and disseminates information to foster and expand that business.

**Mining and Mineral Museum** - The mission of the Arizona Mining and Mineral Museum is to demonstrate that mineral resources are the cornerstone of mankind's existence; that minerals are functional and that minerals are aesthetic.

The Arizona Mining and Mineral Museum can be traced back to the first Territorial Fair in 1894 when mineral specimens from the mines of the territory were displayed for the first time. It was not until 1917 that the State Legislature appropriated the funds to construct the original museum building. Additional funds to complete the building and construct display cases were provided by the major mining companies that were operating in Arizona.

Since 1919 the museum's collections have been on public display, except for a few years during the "great depression" and World War II. In the early years, the display was open to the public only during the State Fair. Since 1953, the museum has been open to the public on a daily year around basis. In 1973, the museum collections were donated to the State of Arizona by the Arizona Mining Association, and the museum was established officially as a part of the Department of Mineral Resources, an agency of State Government. The Mining Association had funded museum operations for a number of years just prior to that time.

The museum collection, the resource information center, and all subsidiary equipment were moved to the newly renovated El Zaribah Shrine building, now called the "Polly Rosenbaum Building", during the late summer and early fall of 1991. The building is located at 1502 West Washington on the government mall. There is still about \$0.5 million worth of work to be done on the building when funding can be allocated for that purpose by the DOA. The work is primarily mechanical and electrical installation, although there is some basic construction work needed on the building. The main floor of the building houses approximately 3,000 mineral specimens and artifacts out of a collection of 15,000. Preparations are underway for the installation of an 1882 H.K. Porter "baby gauge" mine locomotive in front of the building facing Washington Street. This engine hauled ore from the Coronado Mine near Morenci until 1923. It rested on top of the mountain until 1990 when Phelps Dodge was able to haul it and two of its brothers to the pad near the Morenci smelter. Phelps Dodge Morenci, Inc. donated the engine to the Department of Mines and Mineral Resources, and also provided funding to supplement a grant from the Arizona Heritage Fund to restore and relocate the historic locomotive to the Mining and Mineral Museum. The engine, a decorative security fence, and other related exhibits will be dedicated on September 15, 1993.

Approximately 30,000 people visited the Mining and Mineral Museum and the Mineral Resource Information Center during the 1992/93 fiscal year. Growth in total attendance has levelled off at this approximate number, however with new coordination with other museums in the downtown Phoenix area and an improving economy, it is expected that there will be a new spurt in attendance during the next year. More importantly, attendance by students and their teachers increased by more than 40% over the previous year to just under 9,000. If this rate of growth continues through the next fiscal year, the museum staff, including volunteers, will be unable to properly handle them all. It is absolutely necessary that funding for one full-time museum assistant become available. Visitors to the facility came from every one of the 50 states of the U.S., 4 U.S. territories, and from 40 foreign countries.

The museum prepares "Teacher Kits" that contain a variety of mineral specimens, identification techniques and tools for the minerals, and a packet of printed material that gives teachers background to teach their students about minerals and how they are used. These kits are handed out free of charge to any school teacher who asks for one. Several hundred of these are distributed each year. The number of requests for minerals education materials have increased drastically during the last year. The Mining and Mineral Museum is involved in the Central Arizona Museum Association programs for education, and cooperates with the Arizona Mining Association to reach teachers.

New materials for education produced by the museum during the year was "Teacher Pac", an educational reference guide. The guide is published in both English and Spanish for grades K through 8. Printing of these packets were done, courtesy of the Arizona Public Service Company. They have already become a popular item among teachers.

Regular tours are conducted for small groups of mentally and physically disadvantaged people who visit the museum. Being able to see and sometimes touch the minerals and rocks has a beneficial therapeutic affect for them.

Eight well organized clubs of hobbyists, collectors and prospectors hold regular meetings in the museum. The museum now has, courtesy of volunteer labor and materials, an excellent lapidary shop and teaching laboratory where the arts and crafts of lapidary and working with gemstones and precious metals is conducted. This facility is self-supported by the people who use it. These clubs have provided a dependable corps of volunteers for all kinds of work associated with the museum. They contributed about 7,000 hours of labor during the fiscal year. The value of this effort is almost incalculable.

The museum hosted a number of major events during the year including VIP involved with the "Fabulous 4th" celebration that is held every year at the State Capitol. Other events of importance were meetings of the Mining and Minerals Cluster of GSPED and the Arizona Arts Congress.

## DEPARTMENT PROJECTS

**AzMILS Database** - AzMILS (Arizona Mineral Industry Location System) is a compilation of all known mineral deposits and mineral processing facilities in the state. It is the synthesis of DMMR's mine file collection and published technical literature. The continuous development of this knowledge base is a primary objective of the department's technical staff. The majority of industry inquiries begin with AzMILS. It is also distributed in paper and data diskette forms. Reductions in staff have slowed progress in enlarging and improving the database. DMMR is still in danger of falling significantly behind in gathering information from industry and abstracting new research literature. Lack of access to this information hinders industry development efforts. DMMR has had to make some choices of the more important types of information that will be most used by the public, and as a result will concentrate the limited resources available on those topics. Other topics will remain static, although the historic reference will remain valid.

DMMR published a new County Mine Map Series during the fiscal year of 1992/93. The map series consists of sets of 20" X 24" maps showing the locations of mines, prospects, quarries, and processing mills and plants. They are plotted on Arizona Department of Transportation base maps (scale 1"=2 miles) using the DMMR AzMILS number system. Each map set includes a geographically sorted mine index that lists AzMILS number, primary mine name, alternate names, a file reference, topographic quadrangle name, township, range, section, quarter section, and up to 7 commodities that occur in the county. Over 10,400 locations cover the entire series of 12 sets for Arizona's 15 counties. These are sold for a small amount to cover the cost of production.

This has become a very important resource for those in the industry who are searching for new mineral deposits. Approximately 200 sets of county maps were sold in a period of 6 months after publication was complete. It is encouraging to see continued high interest in the prospect of new mineral discoveries in the state.

**Copper Oxide Resource Project** - Even though copper prices have dipped to the 80 to 90 cent range during the last quarter of the fiscal year, wide spread acceptance of the solvent extraction electrowinning (SX-EW) process continues to result in numerous inquiries about properties that may have acid soluble copper ores. The SX-EW process produces marketable cathode copper directly from leach solutions. To encourage and facilitate exploration for deposits amenable to this process, a report listing all known sites and a brief description of the process was prepared and published by DMMR early in the 1992/93 fiscal year. The economic benefits to Arizona of attracting capital to explore and develop these properties will likely be significant as it is expected that several new mining operations will result from these investigations during the next several years. This prospect will be greatly enhanced by the imminent successful start-up of the Sanchez Mine in Graham County, and the Carlota Mine in Gila-Pinal Counties. This publication has been a popular item among those seeking new opportunities for the discovery of mineral deposits.

**Industrial Mineral Development project** - Arizona, Southern California, and other South-western markets are an important key to development of industrial mineral deposits in Arizona.

The department is continuing to compile data to encourage the development of industrial mineral deposits in Arizona. The manufacturing industries of Arizona and those manufacturing centers within a reasonable shipping distance, especially Southern California, use a large quantity of industrial minerals that are currently shipped to the southwestern states at considerable transportation cost. The development of deposits and processing operations for these minerals in Arizona could have a number of beneficial effects. The state economy would benefit from increased employment and tax base, and manufacturers would benefit from increased availability of raw materials, and possible lower prices resulting from lower transportation costs, increased competition, and potential substitution.

DMMR believes that by quantifying consumption, reporting specifications, and explaining uses of minerals in various industries, sufficient demand will be generated to justify new development of a variety of non-metallic industrial mineral deposits in Arizona. In just the last two years Specialty Minerals, Inc. (formerly a division of Pfizer, Inc.) and Georgia Marble Company have acquired existing calcium carbonate producing mines. They have both increased the size of their market and continue to expand their mining and processing facilities south and east of Tucson. A third company called Superior Marble Co. started production of calcium carbonate products at a mine just east of Superior, AZ early in 1993.

Budget constraints continue to curtail necessary travel to keep up with these developments and to gather information to promote new projects. The DMMR was able to get a grant of \$5,000 from Minerals Technology Company (parent of Specialty Minerals), to be used for travel and expense related to the industrial minerals project. They believe that it will benefit their company to have DMMR continue this work.

**Metallogenic Project** - As time is available, work to compile and map data for the series of Metallogenic Maps is continuing. This series of maps are specifically designed to illustrate the relationship of occurrences of precious metals, especially gold and silver, to the geological and geochemical expressions that occur throughout the mineralized areas. Nyal Niemuth of the DMMR staff continues to cooperate with Pat O'Hara and George Ryberg of Prescott on this project. The data used in this effort comes from the AzMILS database owned by the DMMR.



## **PUBLICATIONS OF THE DEPARTMENT DURING THE FISCAL YEAR, 1993**

Directory 39, Directory of Active Mines in Arizona, 1993

Special Report 17, The primary Copper Industry of Arizona, 1991

Annual Report of the Arizona Department of Mines and Mineral Resources

Circular 46, Assayers and Assay Offices in Arizona

County Mine Map Series,

CM-1 Apache

CM-2 Cochise

CM-3 Coconino

CM-4 Gila

CM-5 Graham/Greenlee

CM-6 La Paz/Yuma

CM-7 Maricopa

CM-8 Mohave

CM-9 Navajo

CM-10 Pima/Santa Cruz

CM-11 Pinal

CM-12 Yavapai

Arizona Exploration Review, 1992, Mining Engineering, May 1993

Teacher Pac, An Educational Resource Guide

Newsletter, Arizona Mineral Resources, No. 3, August, 1992

## INDUSTRY ACTIVITIES

Descriptions of some of the projects and contacts in which the Arizona Department of Mines and Mineral Resources has been involved during fiscal year 1992/93 are described below.

### COPPER

#### Introduction

Interest in copper oxide/leach properties remains strong. AZCO is in the late stages of permitting on the Sanchez Mine in Graham County and Carlota Mining Co. (Cambior Resources) is working on permitting for the Carlota Mine in Gila-Pinal Counties in spite of a drop of copper prices earlier this year to the 80 to 90 cent range.

**AZCO - Sanchez Project** - AZCO has set up a local office in Solomon to conduct mine planning, permitting operations, and other tasks related to the preparation of starting a new mining project. Both the permitting process and the financing are in their final stages, and should be completed by the end of the third quarter of 1993. That being so, construction will start before the end of the year. This project is located about 10 miles northeast of the town of Safford in Graham County.

**Arimetco Incorporated** - The company's Johnson Mine in Cochise County contributed more than 60% of their total copper production during 1991, and is expected to produce over 9 million pounds of copper in 1992. The addition of a second solution train in the solvent extraction plant has increased the flexibility and overall operational efficiency of the mine.

Progress and plans for production from the company's Van Dyke Mine in Gila County, a planned in-situ leaching operation, were negatively impacted by the exceptionally heavy winter rains. Flooding of an adjacent mine flowed into the Van Dyke workings.

**Carlota Copper Company** - Carlota Copper Company (Cambior, USA) is in the process of acquiring necessary permits and gaining approval for operating plans to start up their Carlota Mine project that straddles the Gila-Pinal County line. The mine is in the western part of the Globe-Miami mining district. This project is designed as a heap-leach, SX-EW, open pit mining operation with about a 15 year life. They have experienced some opposition from a few locals and more outsiders who do not want another copper mine. It is projected that if the permitting process moves at a reasonable rate, the operation will be able to start some time in late 1994 or early 1995.

**Cyprus Copper Company** - The Cyprus Miami smelter, formerly the Inspiration smelter, has informed DMMR that they consume approximately 25,000 tons of limestone as flux in the smelter process. The limestone is mined by Kesson and Kesson at the Magma limestone quarry east of Superior. It is interesting to note that the specifications for the limestone require that it be free of alumina, fluorine, chlorine, and penalty metals indicating that the rock must be of high grade nature to be acceptable. It is suggested that the Magma quarry might be an important source of high quality limestone for other purposes in the future.

**Tee Claims** - Don Koby and his three brothers have held a large claim group in Graham County for some time, that has both copper and zinc in significant values. They have done Geochemical and Induced Polarity surveys, and some drilling on the property. During the copper boom of the 1970's, many of the copper companies owned by "Big Oil" looked closely at the property, and some even held options for a time. The new rental fee on unpatented mining claims on federal land has made it impossible for the Koby brothers to continue to hold these claims, because the money they would normally use to do development work will now go to the federal treasury. This is a prime example of what is happening to the right of citizens to locate mining claims on the federal domain and to produce minerals from them.

## **GOLD**

Weak gold prices that finally went as low as \$325/oz, has had a continuing negative impact of exploration activity for precious metals. However, since late spring, prices have rebounded to nearly \$400 and appear to be holding firm in the \$395 range. With this surge in prices, exploration activity should increase over the next several months. Proposed reform of the general mining laws in addition to the rental fee will seriously dampen any hoped for recovery if passed in the form proposed. The future is not bright for those who wish to seek mineral resources on the public lands in the U.S.

**Congress Mine** - Republic Goldfields, Inc. shut down the Congress Mine in Yavapai County last year because of a combination of factors, all related to the economics of mining a small, not so high-grade gold mine with declining gold prices. They did, in fact, recover just over 9,000 ounces of gold with a value of \$3,619,000 during 1992 from clean-up operations at the mill and from the heap leach area.

Because of under-capitalization, Republic was unable to develop access to proven reserves in the mine necessitating the shutdown. With new exploration effort and financing to properly develop access to proven reserves, Republic is optimistic that they will once again be in production with a mid-range cost and 45,000 to 50,000 ounces production per year. With the prospect of higher gold prices in the foreseeable future, equity financing to do the necessary development work will be more readily accessible.

**Reymert Mine** - GeoResources' Reymert Mine in Gila County has been an important source of siliceous smelter flux containing silver. The Cyprus Miami smelter is no longer using smelter flux from the property because of the low price of silver. Instead of closing their operating plan with the Forest Service and reclaiming the unpatented claims, they have modified the plan to hold the operation on a care and maintenance basis pending production in the future when silver prices rebound.

**Queenstake Resources** - Queenstake Resources operated the Gold Prince Mine in Cochise County. The mine has been shut down and the company is selling off the equipment. The track, pipe, and wiring is being left in the mine. A watchman will be located at the mine site. Negotiations with another Canadian company are underway to take over and operate the mine.

**Robert Corley** - Robert Corley has submitted an operating plan to the Prescott National Forest to sink an 8 foot by 8 foot, 100 foot deep shaft on his John 316 claim to develop a gold prospect.

**Lydia Claims** - Connie Rogge, owner of the Lydia Claims fits what is becoming a common scenario in reaction to the requirement of rental fees by the Federal Government in lieu of assessment work. In the past she has paid someone to do the assessment work, but did get some productive development work done in the process. While the new rules won't likely cost any more out-of-pocket expense, there will not be any development work done. She can't afford doing both.

**Postmaster Mine** - George E. Travis, Independent Registered Mining Engineer, provided DMMR with copy of a 1984 geologist's report by Robert L. Wells on the Postmaster Mine in Yavapai County. A reserve of proven and probable gold ore is outlined in the report. Donation of private reports is one of many ways the DMMR obtains information on mines, deposits, and prospects in Arizona that have potential for future development.

**Thunderbolt Mine** - John Frazzini has submitted a plan of operations to the Prescott National Forest for underground development work he plans to do at the Thunderbolt Mine in Yavapai County. Approval of his plans is expected to take only two weeks and is necessary for him to obtain a small miner's exemption from the rental fees to the Federal Government. He has five claims and cannot afford the \$1,000 for rentals and still have funds for his one man development effort. He plans to drill, shoot, and tram vein material to the portal and crush and pan free gold from the ore profitably.

**Golden Wonder Mine** - Truebar Mill and Mining of Seattle has submitted a plan of operations to run a 1,000 ton test at the Golden Wonder Mine. The test is to be run using a portable plant with cyanide vat leaching. If the tests are successful, they plan to construct a vat leach operation on site to treat newly mined ore.

**Black Canyon Milling** - The Black Canyon Mill, owned by Arizona Zinc Platers, Inc. is being operated by Bill Scheisman doing business as Black Canyon Milling Co. The mill is located one half mile south of Rock Springs on the west side of Interstate 17. The mill can gravity process three tons of ore per hour. The current fee schedule is \$65 per ton with a 5 ton minimum run. Smaller runs are \$135 for the first ton and \$65 per ton for each additional ton. The operation is on 6 millsite claims on federal lands. There is significant demand for custom milling on a small scale by small miners in the area including Maricopa and Yavapai Counties.

## INDUSTRIAL MINERALS

**Arizona Portland Cement Company** - Arizona Portland Cement Company has established full production at the their new, large cement kiln at the Rillito mill. The kiln has adequate capacity to provide all the roasted material necessary for full production at the plant. Shorter retention time in the kiln makes a more efficient production of Portland Cement.

**Arizona Silica Sand Company** - Although the oil well drilling is their major customer, the company is developing more varied markets for the naturally rounded silica sand grains from their Houck Silica Sand Mine. The mine silica sand from their pits between the thaw in the spring until about the end of December during which time they produce enough raw plant feed for daily operations and to build a stockpile to feed the plant during the very cold months. At various times in the past they attempted to operate the pits year round, but the frozen sand was difficult to load and haul to the plant. The late fall and early winter are typically their best business season due to end-of-year exploratory oil well drilling budgets.

**Bitterroot Resources** - Bitterroot Resources has optioned a group of nearly 100 claims in Mohave County. The claims are located in several sections and cover an alluvial garnet occurrence that the company hopes to prove to be a viable deposit. The occurrence contains red almandite garnet. They hoped to complete a placer sampling project on a portion of the claim group by the end of April 1993. They believe that there is potential for placer concentrations with 4 to 5% garnet. Dry separation methods are being considered. The presumed marked for the concentrates would be providing grit for a variety of uses.

Bitterroot has also investigated a kyanite occurrence on the Tire claims in Mojave County. The investigation and a review of potential markets for this high alumina mineral has led them to offer the claim owner an option agreement to acquire the claims.

**White Rock Mine** - Catalina Marble, Inc. produces white marble from the White Rock Mine in Pima County. Once an important producer, the mine has had only limited production in the last two years. Catalina is now a subsidiary of Mountain Gravel and Construction. In addition to producing crushed and screened marble for decorative stone, livestock feed, and plaster, they are now producing subgrade aggregate for highway construction. Approximately 80,000 tons of material has been mined, crushed and stockpiled at the quarry.

**Andrada Marble Quarry** - Georgia Marble Company has installed a 50 inch Raymond roller mill and are producing filler grade ground limestone for the joint cement industry at their Andrada Marble Quarry in Pima County. They are planning to install a 66 inch Raymond mill and the equipment necessary to produce fine paint grade fillers.

**Red Hills Mine** - Gila Red Hills Mining company is attempting to determine if there are markets for industrial mineral commodities that are present in the rocks of their Red Hills copper mine in Maricopa County. Particular attention was given to aplite. A possible limiting factor in the usefulness of the aplite is a dark contamination. Two suggestions have been made: (1) Obtain a "whole rock" chemical analysis and (2) Pulverize some of the material and attempt to pan out the



dark mineral inclusions. The panning tails should also be analyzed to determine if gravity separation will eliminate any significant impurities. The Red Hills Mine has been considered to be a typical leachable copper deposit.

**Heat Shield Technologies** - Heat Shield Technologies continued work on their Klaner-Doolin property in Mojave County. They mined and shipped an 80 ton sample to Australia for evaluation for thermal shielding. They have re-evaluated their marketing position and are working on producing a good non calcium carbonate paint filler at 18 microns particle size, and possibly a silane coated filler 6 microns thick for plastics. Access is difficult because of a requirement by Santa Fe Pacific Railroad that Heatshield Technologies arrange and pay for a flagman to be provided by Santa Fe 48 hours in advance of each use of the access crossing at Franconia.

**Queen Creek Marble Mine** - The Superior Marble Division of Mineral Development Corporation of Mesa, Arizona developed and began production from their Queen Creek Marble deposit in Gila County. Initial production was coarse to fine crystalline, white, calcium carbonate marble for decorative landscape material and eventual fine grind uses. The operating plan approved by the Forest Service for this project required that unreclaimed material left by previous operators be cleaned up by Superior. A new access road was constructed. The new road follows the approximate course of the long time 4 wheel drive road up Queen Creek. The new road, built at a reported cost of \$80,000 was required by the Forest Service to be kept completely in the stream bed with no new scars created on the land surface. By late spring of 1993, they had crushed and stockpiled 18,000 tons of marble at the property and were ready to accept orders for landscape stone. Their future plans include expansion of their processing facility to produce ground limestone products.

**Picketpost Clinoptilolite** - The Picketpost Clinoptilolite deposit in Pinal County continues to be exploited for odor control and medical/pharmaceutical products. It appears that 50 to 100 tons of clinoptilolite has been quarried in the past year. DMMR continues to receive calls from throughout the United States inquiring about "Zeolite from Arizona" used as an odor absorbent. As a result numerous prospectors have spent considerable time and money trying to find similar deposits.

**PDQ Rock and Sand** - PDQ Sand and Gravel, an aggregate producer in Irwindale, California reported they have purchased a section of land in Yavapai County from which they will produce crushed rock for landscape and decorative purposes. The company has determined that the sandstones and limestones present in the section have a great range of colors suitable for such use. They plan a crushing and screening plant to produce material to primarily serve a Southern California market.

**Rhyzona, Inc.** - Rhyzona, Inc. is in the process of developing a decorative stone deposit in ? County. The deposit is in a red-maroon-brown (possibly dolomitic) limestone. The material will be used for crushed stone, and for facing, decking and other dimension stone uses.

**Harquahala Gypsum Mine** - Western Organics, Inc., formerly WAPCO (Western Agricultural Products Company), has acquired complete ownership of the Harquahala Gypsum mine. They plan additional production in the near future. Past mining has been by contractors to produce a

finished horticultural product composition is reported to the Arizona Department of Agriculture on which they pay fertilizer fees.

## NON-FUEL MINERAL PRODUCTION FOR 1992

Non-fuel minerals produced in Arizona during the year of 1992 had a value of \$3.1 billion. The chart below shows the quantities of each commodity produced and their relative value as reported by the U.S. Bureau of Mines.

MINERAL	QUANTITY	VALUE
Clay (Metric tons)	217,922	\$4,708,000
Copper (Metric tons)	1,123,439	2,707,763,000
Gemstones	NA	4,502,000
Gold (Troy ounces)	197,920	69,272,000
Sand & Gravel (Short tons)	26,000,000	93,600,000
Silver (Troy ounces)	3,553,200	18,133,000
Stone (Crushed short tons)	6,000,000	28,700,000
Combined value of cement, diatomite, gypsum (crude), lime, molyb- denum, perlite, pumice, pyrites, salt, sand and gravel (industrial), and stone (dimension).		
	NA	<u>194,994,000</u>
<b>TOTAL</b>		<b>\$3,121,672,000</b>

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 Indian Reservations. Because of federal policy assigning fuel minerals such as uranium and coal to the Department of Energy in stead of the Bureau of Mines, production data is more difficult to obtain. Our source is the mining companies themselves. Coal production for the calendar year of 1992 was approximately 14 million short tons. All of this production was produced from the two mining complexes on the reservations. Depending on markets, the value of coal mined is approximately \$340 million. It is difficult to measure the actual impact on the Arizona economy, but this effort combined with the suppliers to the mines and the users of the coal make it a very significant contributor. Except for a few tons used for domestic purposes, it is shipped via rail to the Navajo plant at Page, or by slurry

pipeline to the Laughlin, Nevada plant. The mine operator pays approximately \$25 million in taxes to state and county governments in Arizona. The coal mines are a shining example of responsible reclamation of mined lands that are possible with shallow strip mines. They are by far the largest employer of Native Americans in the state.

There was no uranium produced in Arizona during 1992 because of continued low prices that persist worldwide. Without a significant change in policy regarding the importation of uranium and/or a change in the prospects for new nuclear power plants, this condition will likely continue through the end of the century.

## GOALS OF THE DEPARTMENT

The Department of Mines and Mineral Resources has set several goals for the next several years to insure the continued viability of the department's existence. An important part of this plan is to show that, not only are appropriations justified by results, but the DMMR causes a return in state revenue greater than the cost of operation.

**Public Education** - The public at large in Arizona has little knowledge about the importance of minerals in everyday life. This phenomena, strange for the "mining state", is especially true in the Phoenix Metropolitan Area, and to a lesser degree, in Tucson. Rural communities who are near to, and dependent upon, mining activity have at least an insight of how mining plays a large part in their lives. They understand that the products they produce are vital to the well-being of the state and nation. They also understand that their lives and the lives of their children are enhanced by the mines and the jobs they provide.

But far more important than this is the knowledge that the car they drive, the house they live in, the television set they watch, the computer they program, the telephone they talk on and listen to, and even the food they eat would not be available without the minerals that are dug out of the ground and processed into the products that make all of these things possible.

DMMR believes that it is an important goal to disseminate this information to school children and their teachers, but also to the general population of the state.

It is the goal of DMMR to continue to expand this education program to include upper levels of formal education and adults. We have successfully reached several hundred teachers and teacher trainees with basic minerals education during the past year. The facility at 1502 West Washington has proven to be an excellent facility for educational purposes. As the museum is developed, it will continue to improve, particularly if the museum can be expanded in the near future.

The goal of highest priority for the next year is to make it possible to add one full time education person to the staff. The first effort will be to add a full-time employee through the appropriation process. At the same time, funds will be sought in the form of a grant to pay for a full time education consultant for a three year period to further develop the education programs already started. In the meantime, the Museum Curator, the part-time tour guides and the volunteers will continue to do the best they can. With the high rate of growth experienced during the last year, the job is becoming nearly impossible.

**Promotion of Mineral Development** - The DMMR staff believes that the continued development of mineral resources, even the expansion of that effort, is a vital component in economic recovery and expansion in the State of Arizona.

Participation by DMMR in the Minerals and Mining Cluster of GSPED for the past two years has presented an excellent opportunity for the department to be a major contributor in work related to development of new projects beneficial to the state. The Mineral and Mining Cluster is a very active group with a definite direction that will lead to success of the process. DMMR should continue to be a part of this effort.

Through refinement and expansion of the data base of valuable resource information accumulated over the past 50 years by DMMR, we believe that the exploration for and development of minerals in the state can be greatly improved. Continued research and ultimate publication of reports on a wide range of mineral commodities will add to that base of information. These studies include broad based geologic and economic information to assist the industry in locating and developing mineral deposits. The studies also include market data that enhance the potential for successful mining ventures. The one negative factor in the equation is the likelihood of radical reform of the General Mining Law in the current session of Congress.

With DMMR located on the Government Mall, access to the information by other agencies of state government has been improved. The staff of DMMR is readily available to those agencies that have a need for the information held in our files. The Department of Water Resources, the Department of Environmental Quality, the Land Department, the Attorney General's office, the Corporation Commission, and the Governor's office have all made good use of the services that is provided.

**Museum Development** - While it is the goal of DMMR to make the Arizona Mining and Mineral Museum a world class exhibit of mining history, mining technology, and the wide range of mineral materials that occur in Arizona, reaching that goal would be meaningless unless that program can be used to transfer knowledge about mining and minerals to the general population across the state. The exhibit is an educational tool to illustrate the mission of the museum. That is, to show that "minerals are the cornerstone of mankind's existence". While the mineral collection is dominated by specimens from Arizona, most of the world domain of minerals is represented.

To accomplish that goal, DMMR initiated a fund raising program in 1992 designed to reach private sector donors and foundations who have an interest in the improvement of knowledge about the world of mineral resources. A goal of \$1,250,000 was set to complete the primary museum development program. During the last fiscal year \$160,000 were accumulated for museum development. Principal donations included a grant from the Arizona Heritage Fund to restore and relocate a 1882 H.K. Porter mine locomotive that had been given to the museum by Phelps Dodge, Morenci. Phelps Dodge provided the remaining needed funds to accomplish the project. Other funds donated will be used to prepare the outside exhibit area of the museum where the locomotive will be located. There is optimism that this initial start will generate new interest. It is expected that we will receive a substantial grant from a mining related foundation for education programs in the near future.

Aside from the fund raising program for museum development, the program is primarily people dependent. The volunteer program established during 1991/92 has continued to be successful. Volunteers contributed over 7,000 hours of work to the museum during the past 12 months. The monetary value of this work would be a minimum of \$70,000.



## ARIZONA AND MINING

**A 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 effect everyone. There is nothing that is used by the human race that does not incorporate some product of the mining industry. Agriculture, aircraft, automobiles, building construction, computers, communications, paint, paper products, radio, television, and everything else used by man has somewhere in its make-up at least one substance that was taken from a hole in the ground. This has been true since the beginning of man, and will be to the end of the earth.

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 upon 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 reportedly accumulated. As the missionaries established the settlements of Southern Arizona, mining became a part of the changing 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 into the future.

From the end of the Civil War to the beginning of World War II, as many as several thousand 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 demand of recovery and development in a post-war world. The onset of several large open pit mining operations 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 and industry-wide restructuring, the copper industry had come full circle by 1987, and is now competitive with the rest of the world with their high-grade ore bodies and cheap labor. Production and revenue have reached the highest level in the history of mining in the state. During the latter part of the fiscal year, copper prices slipped to below \$1.00 per pound, and are now in the 85 to 90 cent range. Reduced consumption worldwide because of a slowdown in economic activity rather than competition from foreign producers are the primary sources of the lowering of demand for copper. Current world supplies are substantial. As the economy improves, it is expected that consumption will increase with renewed construction and manufacturing, especially in the developing nations. The North American Free Trade Agreement and the markets it will open up in the western hemisphere will

have a positive effect on Arizona mining. Arizona can and should be in the forefront of the efforts to meet that demand. Access to the minerals locked up on the public lands are absolutely critical to the success of this dream.

## THE FUTURE OF MINING

Predicting the future is a risky endeavor, particularly when it comes to mining. This is especially true when the decisions of whether to explore for and develop new mines is so heavily influenced by factors not related to mining or the marketing the products of mining.

Mining in the United States and in Arizona has become a very complex business influenced as much by environmental regulation and land use planning as by prices, costs, and the fluctuations in the demand for mineral products. While the industry has solved most of the technological problems related to environmental protection and mitigation, the permitting process required to assure that procedures become a part of mine planning, is a serious obstacle to the success of every new or revised project coming on stream. There must be relief built into the process that will speed up the time necessary to get new projects underway. Interference by environmental radicals just for the sake of preventing new mining projects as well as legitimate concerns of individual citizens and groups of people who worry that a new mining operation will have a negative impact on their way of life, must be tempered in a way that will allow timely approval for those projects to proceed. Unnecessary delays in the process add cost that in most cases cause a burden too heavy for the project to bear. The cancellation of these projects will not only have a very negative effect on the Arizona economy, but will cancel jobs and commerce that would otherwise benefit everyone, including those who have caused the delays.

The availability of lands with potential for mineral deposits is still under severe threat by the continued expansion of wilderness status of Arizona lands. The wholesale designation of large acreages as wilderness without consideration of other resources and uses should not be allowed. It is informative to note that throughout history, approximately 190,000 acres of Arizona land have been affected by mining. This compares to 5.5 million acres that have been removed from public access by wilderness designation since the passage of the Wilderness Act in 1964. How much wilderness is enough to satisfy the appetites of the so-called preservationists?

With the combined lands encompassed by the National Forests, the National Parks, BLM managed public lands, Wildlife Reserves, Indian Reservations and land withdrawn for military uses, the Federal Government controls 69% of all the land surface in Arizona. In addition the State land Trust has total control over 9 million acres of land. That leaves only 17% of the land in the state in private hands. Without access to those lands controlled by Government, there are few opportunities for the discovery of needed new mineral deposits.

Legislation to modify or outright repeal the General Mining Law of 1872 has again been introduced in the current session of Congress. Both Senator Bumpers of Arkansas and Representative Rahall of West Virginia have introduced their version of mining law reform. Senator Bumper's bill is numbered S-257. Representative Rahall's bill is HR-322. Both bills are more

damaging than in previous years. Both call for an 8% royalty on the gross value of minerals removed from the public lands. Both include a Title II section creating extremely rigorous and lengthy requirements for environmental protection, mitigation and the reclamation of mined areas. They each have a provision that some of the revenue produced by the royalty would be earmarked for the reclamation of abandoned mined lands. Is clear that passage of this version of mining law reform would remove the public lands from future consideration for exploration and development of minerals.

Senator Larry Craig of Idaho introduced yet another version of Mining Law Reform in 1993. A companion bill with essentially the same provisions was also introduced in the House of Representatives. Senator Craig's bill is designated S-775. It would require a royalty of 2% of the net proceeds of all minerals produced from the public lands. It provides that environmental regulation already in force under the Clean Water Act, the Clean Air Act, the solid waste requirements under the Resource Conservation and Recovery Act (RCRA) and the mine reclamation laws and regulations that are already in force in nearly all of the mining states are adequate to properly protect the environment. The royalty collected would all be earmarked for the reclamation of the abandoned and unowned mines present especially in the western mining states. The Craig bill would continue the right of access and tenure to those who stake claims on the federal lands, and would allow the patenting of those lands that qualify as viable mining properties. Patented lands that are mined out will revert to the public domain after all reclamation is completed. It should be noted that neither of the last two provisions are allowed in S-257 or HR-322. The Craig bill has passed the Senate and is awaiting House action and then Conference Committee deliberations.

The mining industry for the most part, including the American Mining Congress, is in support of S-775. If it could be passed intact, it would likely be acceptable to all but a few of the mining community. The endangered species called the "small miner" probably cannot stay in business because of the heavy burden of regulation and the added cost built into such a system. It appears that America faces a future of being virtually totally dependent on the import of the mineral resources necessary to maintain our civilization and our creature comforts. Lets hope that the public will awaken before we all have to move back into the caves and into the trees.

The Federal EPA has yet to complete an acceptable plan for the management of mined waste under subtitle D of RCRA. The Western Governors Association Mined Waste Task Force continues to work with the various states and the EPA to develop a plan that is acceptable to all parties involved. The Director of DMMR is a member of the Mined Waste Task Force.

Land use planning, environmental regulation, withdrawal of public lands from mineral entry, and radical changes in mining law are coming together to make America a nation dependent on, and at the mercy of imported natural resources. It is already true that most of the active minerals exploration programs currently being conducted by US and Canadian Companies is taking place in the northern states of Mexico and other Latin American Countries. The nation must rethink its priorities in relation to natural resources to remain the leading nation of the world.