



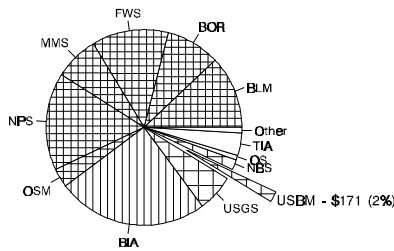
U.S. Bureau of Mines

Most Americans have never seen a mine or mineral processing plant. Yet minerals are very much a part of our lives. Minerals and the things produced from them underlie every enterprise of modern society. Hundreds of the things we do each day - from driving a car to opening a can of soup - depend on products made from minerals.

Each American now consumes 40,000 pounds of new minerals every year. The average newborn citizen will use more than 1,050 pounds of lead, 1,050 pounds of zinc, 1,750 pounds of copper, 4,550 pounds of aluminum, 91,000 pounds of iron and steel, 360,500 pounds of coal, and more than a million pounds of stone, sand, gravel, cement, and clay over the course of his or her lifetime.

Helping the Nation to use these resources in a safer, less wasteful, and environmentally sound manner is the mission of the Interior Department's U.S. Bureau of Mines (USBM).

FY 1994 USBM Budget Authority (\$ in millions)



Total DOI Budget Authority - \$9,663

Founded in 1910, the USBM conducts research and collects information concerning almost every activity involved in recovering minerals from the earth, making them into useful products, and recycling materials for future use.

The USBM is viewed both nationally and internationally as the focal point for new and emerging science and technology in the minerals

field. Since entering competition in 1978, the Bureau has won 34 "R&D 100" Awards, given annually by Research & Development magazine for the 100 most important research innovations of the year.

The Bureau's research program develops technologies to help protect the health and safety of workers in the minerals industries, clean up waste and pollution from past mining and mineral processing activity, and find better ways to minimize waste and pollution in current and future mining activity. In addition, the Bureau is the Federal agency responsible for the collection and dissemination of the national supply and demand data for the minerals-related sector of the economy.

Health and Safety Research: USBM health and safety research has resulted in significant declines in on-the-job injuries to mine workers. Among the results of USBM successes:

- Fire suppression systems and technology to control the levels of methane gas and explosive dust, both developed by the USBM, are in common use in mines today. These technologies contributed to an 82 percent decrease in coal mine fatalities between 1965 and 1993. Emergency breathing devices developed by the USBM are used in every underground mine in the Nation. When fires, explosions, and other emergencies occur, these devices save lives by providing breathable air to allow miners to escape oxygen-poor or smoke-filled tunnels.
- USBM ventilation and dust-suppression techniques and more sensitive dust-measurement instruments have lowered the levels of respirable dust exposure for underground miners fourfold over the past decade. Even so, respirable dust remains the number-one health risk facing mine workers today.
- USBM ground control research has provided technology that improved support techniques, analyzed the geologic factors contributing to ground failures, and developed roof monitoring methods. This contributed to a more than 50

percent reduction in roof-fall fatalities from 1989 to 1994.

There are hundreds of thousands of inactive and abandoned mines on public lands. Since there are few or no private parties responsible for these sites, the potential public liability is enormous. The Bureau is assisting Federal land managing agencies with inventorying these sites and determining steps necessary to remove hazards to the public.

Environmental Research: The Bureau's environmental research program is aimed at cost-effective solutions for alleviating environmental problems resulting from extractive processes. It also emphasizes the prevention of pollution before it occurs and the creation of technologies needed for long-term sustainable development. For example, USBM researchers have:

- formed a partnership with the Bureau of Land Management and the U.S. Forest Service to develop and demonstrate the technology to prevent, control, or, if necessary, treat metal contamination and acidity resulting from past, present, and future hard rock mines. This is an enhanced effort designed to improve the stewardship of public lands.
- conducted, on behalf of the Interior Department, a study of a particularly difficult inactive mine reclamation site on an Indian reservation in the Pacific Northwest. Bureau researchers have conducted process field trials of two innovative systems for removal of uranium/radium from impounded waters, and they have provided the land management agencies with essential information on groundwater quality and flow, site radioactivity, and determinations of the suitability of on-site materials for site reclamation. As a result of the Bureau's work, the Department is able to proceed with the reclamation of this site that could otherwise adversely affect thousands of visitors each year.
- identified bacteria that clean up arsenic, one of the most difficult metals to remove from water; reduce selenium, a toxic contaminant found in mining wastes and agricultural runoff, and selectively recover metals from acid mine drainage and other waste water.
- developed and licensed tiny, porous beads, made

from peat moss and polymers, to extract dangerous concentrations of metal ions from industrial waste water and mine drainage.

- constructed more than 1,000 artificial wetlands to stabilize acid levels and remove contaminants from the waters passing through those marshes. This methodology provides a low-cost approach to environmental clean up of the thousands of miles of U.S. waters that are contaminated by heavy metal from acid mine drainage.
- provided the technological base for the Office of Surface Mining Reclamation and Enforcement's Appalachian Clean Streams Initiative.

Analysis of Information: In addition to its technological research, the Bureau collects, analyzes, and disseminates information about mining, processing, and using more than 100 mineral and inorganic commodities across the Nation and around the world.

USBM analysts study the impact of proposed mineral-related Federal and State legislation and regulations upon the national interest, especially in such areas as trade and the environment. They monitor international trade flows, such as those among nations participating in the North American Free Trade Agreement (NAFTA). Areas of study include potential compliance costs; technical feasibility; impacts on jobs, local economies, government revenues, and the environment, and the total flow of materials through the economy. The Bureau's international minerals-data collection has been acclaimed by many of its customers as being without peer in the world.

The USBM also produces timely and accurate statistics on every important mineral commodity produced in each of the United States, its territories, and more than 180 countries. These statistics are standard references for defense planners, government policy analysts, Federal trade negotiators, investment bankers, international loan officers, and commodity market analysts. Recently, the USBM expanded the availability of this information, giving public access to data through on-line bulletin boards, automated facsimile systems, Internet connections, and CD-ROM products.

USBM field engineers and minerals analysts work

closely with Federal land managers. The USBM helps these managers to meet higher analytic standards for permitting mineral operations in sensitive environmental areas, such as in Desert Tortoise Priority Habitat in California's West Mojave Desert and the headwaters of Montana's Yellowstone River, and to deal with impacts from past mining in watersheds, such as Nevada's Humboldt River basin.

With land managers increasingly taking a "landscape planning" approach to ensuring sustainable development and biological diversity in mineral-rich areas, the USBM is providing insight as to where future mineral production is likely to occur and estimating the likely environmental impacts and mitigating options. This information is becoming critical to land-use planning as land managers

consider cumulative environmental impacts of total economic activity within a landscape in providing for future natural resource development or use.

For 84 years, the U.S. Bureau of Mines has proven to be a world leader in developing technology and practices to protect workers' health and safety and to enable miners to extract minerals in a more efficient and environmentally responsible manner. Today, the USBM is taking much of that safe, efficient extractive technology and putting it to work cleaning our Nation's soils, lakes, wetlands, and streams. Minerals-based materials contribute \$360 billion per year to America's economy.



The emergency breathing devices, being tested here, were developed by the U.S. Bureau of Mines, and are used in every underground mine in the Nation. When fires, explosions, and other emergencies occur, these devices allow miners to escape oxygen-poor or smoke-filled tunnels.