

U.S. Geological Survey Mineral Resources Program— *Science Supporting Mineral Resource Stewardship*

The United States is the world's largest user of mineral resources. We use them to build our homes and cities, fertilize our food crops, and create wealth that allows us to buy goods and services. Individuals rarely use nonfuel mineral resources in their natural state—we buy light bulbs, not the silica, soda ash, lime, coal, salt, tungsten, copper, nickel, molybdenum, iron, manganese, aluminum, and zinc used to convert electricity into light.

The USGS Mineral Resources Program (MRP) is the sole Federal source of scientific information and unbiased research on nonfuel mineral potential, production, and consumption, as well as on the environmental effects of minerals. The MRP also provides baseline geochemical, geophysical, and mineral-deposit data used to understand environmental issues related to extraction and use of mineral resources. Understanding how minerals, water, plants, and organisms interact contributes to our understanding of the environment, which is essential for maintaining human and ecosystem health. To support creation of economic and national security policies in a global context, MRP collects and analyzes data on essential mineral commodities from around the world.

Program Mission and Personnel

The MRP provides timely and unbiased analyses of minerals and inorganic materials to (1) improve stewardship of public lands and resources; (2) support national and international economic and security policy; (3) sustain prosperity and improve our quality of life; and (4) protect and improve public health, safety, and environmental quality.

The MRP supports about 400 USGS research specialists. Cooperative agreements with universities, industry, and other governmental agencies support collaborative research and information exchange, and through grants the MRP supports additional mineral research on topics consistent with program goals.



Mineral Resources Program

Basic and Applied Mineral Research

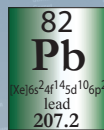
The MRP supports research on how and where mineral deposits form and supports development of methods to detect potential mineral resources. This research facilitates assessments of undiscovered mineral resources, most of which are not easily identified at the Earth's surface because they are hidden by non-mineral bearing rocks or dense vegetation. Geophysical tools and techniques allow us to see geologic units and structures beneath the Earth's surface and build three-dimensional models of an area to understand how mineral resources are distributed. Innovative geochemical tools and methods are being developed to reduce uncertainty in mineral resource assessments.

Natural and Man-Made Chemicals in North American Soils

Soils play a key role in human health and ecosystem integrity, support food production, and contribute to natural recycling of carbon and essential nutrients in the environment. Limited knowledge of the concentration and distribution of naturally occurring and man-made chemicals in North American soils makes it difficult to establish standards for soil clean-up, evaluate effects of chronic exposure to contaminated soils on human health, and determine the impact of new land-use practices on the environment. MRP scientists along with colleagues at the Geological Survey of Canada and the Servicio Geológico Mexicano are sampling and mapping the spatial distribution of elements and selected chemicals in soils throughout North America.

Minerals Information

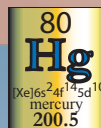
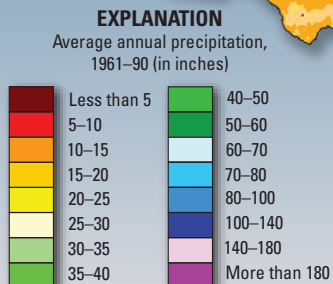
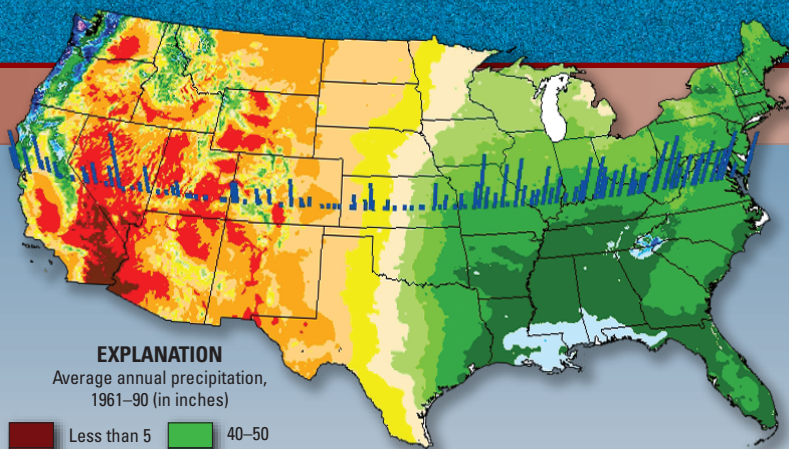
Information on domestic and international supplies and uses of minerals and mineral materials is essential to the U.S. economy and to national security. Public and private organizations rely on this objective information to make informed decisions, to understand the impact of mineral materials on the economy, and to forecast future mineral supply and demand. The MRP collects data on mineral production, consumption, recycling, inventory, and shipments from the U.S. mining and mineral processing industry. In addition, production data, trade data, and other information on more than 80 commodities from about 100 countries are compiled and published. Materials flow studies, such as a recent lead wheel-weight study, use available data to study life cycles of mineral products.



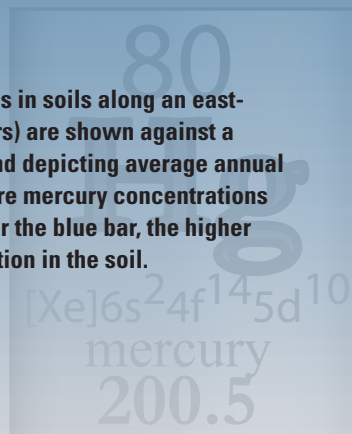
Lead Wheel Weights

The implications of lead deposited along the Nation's highways when lead weights used to balance tires are dislodged and spread by wind and water is one example of a recent materials flow study supported by the MRP. Estimates of the amount of lead lost from wheels, such as the 1 ounce clip-on wheel weights, shown here both new and abraded by traffic, ranged from 2,000 to 5,000 tons in 2003. Lead wheel weights have been used on vehicles for about 70 years so the cumulative amount of lead dispersed in the environment is significant. The complete study can be found at <http://pubs.usgs.gov/of/2006/1111>.

. a National Resource



Mercury concentrations in soils along an east-west transect (blue bars) are shown against a color-coded background depicting average annual precipitation to compare mercury concentrations with climate. The taller the blue bar, the higher the mercury concentration in the soil.



Mineral Resource and Mineral Environmental Assessments

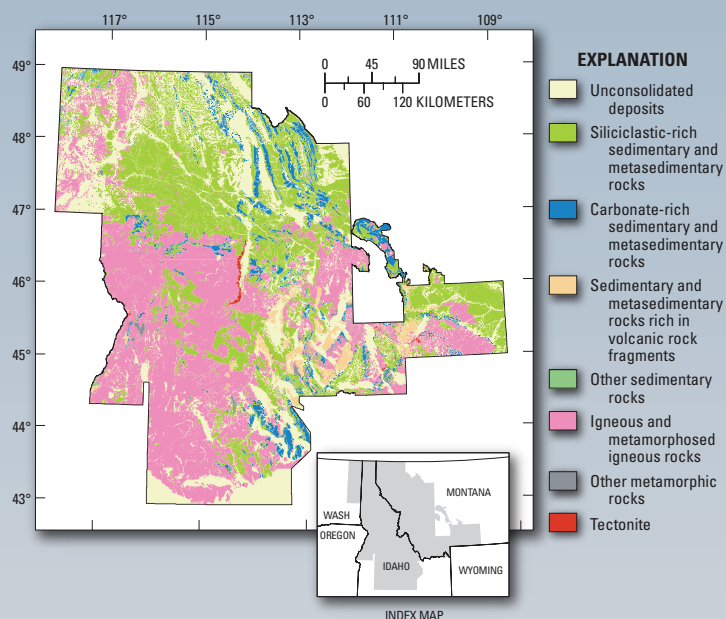
Decisions that ensure a secure supply of mineral commodities depend on information on the location, quality, and quantity of resources. The MRP supports studies that produce scientifically accurate and reproducible mineral resource assessments. To prepare for an assessment, data are collected and compiled. Research studies are conducted to understand the geologic history and characteristics of the area, define what processes formed the mineral deposits, and identify keys to predicting undiscovered deposits. Teams of experts analyze available information, identify characteristics that suggest the presence of undiscovered mineral deposits, and evaluate the quality and quantity of potential mineral deposits.

Assessments at a variety of scales provide valuable information to a range of users, including Federal, State, and local land-use managers. Assessments currently supported by the MRP range from one in central Colorado designed to facilitate land-use planning on and near Federal lands to one working with partners from around the world to assess select nonfuel minerals on a global scale.

In addition, MRP supports development of tools and techniques designed to understand what happens when mineral deposits are weathered or mined. Mineral environmental assessments use understandings of mineral deposits to anticipate environmental challenges associated with abandoned mines and the effects of developing new mineral deposits, providing specific information on the potential release of contaminants into the environment, an issue of concern to a wide range of land managers.

Northern Rocky Mountains

The foundation of any mineral resource or mineral environmental assessment is a geologic map, such as this one created from data collected by MRP scientists in the Northern Rocky Mountains. The geologic information helps us understand Earth history; assess mineral, energy, and water resources; and identify potential hazards related to Earth processes. The data shown on this map, combined with other information, are used by land managers at the Forest Service and Bureau of Land Management who are responsible for management of Federal lands.



Mineral Resources Program Goals, 2006–2010

- **Ensure availability of up-to-date quantitative assessments of potential for undiscovered mineral resources**

Objective information on distribution of undiscovered mineral resources underpins informed policy decisions. Quantitative assessments combine estimates of amount, grade, and locations permissive for undiscovered mineral resources with economic viability and uncertainty.

- **Ensure availability of up-to-date geoenvironmental assessments of priority Federal lands**

Models describing the environmental geochemistry of mined and unmined mineral deposits and mine wastes provide powerful tools to anticipate environmental effects and characterize environmental challenges associated with active and abandoned mines.

- **Ensure availability of reliable geologic, geochemical, geophysical, and mineral locality data for the United States**

Modern geologic maps, recent geochemical and geophysical surveys, and up-to-date inventories of known mineral localities are essential for land-use decisions, to understand issues related to public health, and to ensure a secure and strong economy for the Nation.

- **Ensure availability of long-term data sets describing mineral production and consumption for national security needs**

A long tradition of voluntary collaboration between the U.S. Government, private mineral producers, and governments of other countries results in availability of comprehensive data on nonfuel minerals for the U.S. and the world.

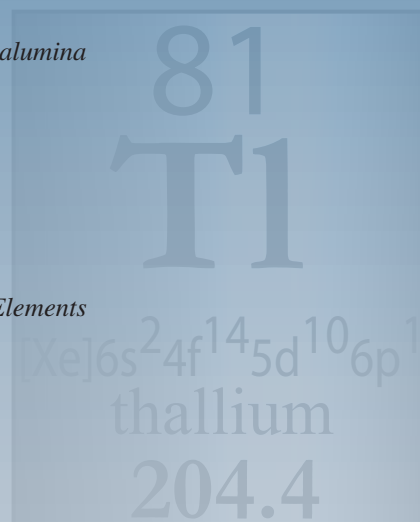
- **Ensure availability of scientific facilities and services needed to achieve MRP goals**

Analytical and geospatial laboratories provide consistent, quality-assured analyses and spatial data for mineral resource and mineral environmental investigations. Analytical techniques, methods, and standards developed in the labs provide the basis for work by other national and international labs.

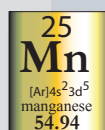
Why is it important for the Federal government to study and provide information on nonfuel minerals?

The U.S. imported 100 percent of these mineral commodities in 2006:

- Arsenic
- Asbestos
- Bauxite and alumina
- Columbium
- Fluorspar
- Graphite
- Indium
- Manganese
- Rare Earth Elements
- Rubidium
- Strontium
- Thallium
- Thorium
- Vanadium
- Yttrium

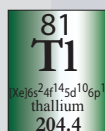


Nonfuel minerals are important in many items we use every day. Rare metals, such as platinum, ruthenium, and indium, play an increasingly important role in new technologies, such as fuel cells, electronic vehicles, and in everyday items, such as cell phones and video and computer monitors.



Manganese

- Used to make dry cell batteries
- Imported from Gabon, South Africa, Australia, and Brazil



Thallium

- Used in cardiovascular imaging
- Imported from Belgium, Russia, the Netherlands, and France



Yttrium

- Used to make television and computer monitors
- Imported from China, Japan, France, and Austria

For more information contact:

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Internet-based geochemical, geophysical, mineral-deposit, and lithologic data for the United States

