

The U.S. Geological Survey (USGS) provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, biological, and land resources. In this capacity, the USGS in Wyoming works in partnership with more than 30 local, State, and Federal agencies and two Indian tribes. Local agencies include county and municipal agencies, natural resources agencies, and county and regional planning agencies. This Fact Sheet describes some of the current USGS activities in Wyoming.

### Oil and Gas Resources

Several petroleum-resource projects are being conducted by the USGS in Wyoming. Among the most prolific petroleum-producing basins in the State are the Wind River and the Greater Green River. The USGS, in cooperation with the Bureau of Indian Affairs (BIA), has been investigating the petroleum potential on Indian lands in the Wind River Basin and has provided the BIA and the Indian tribes with geologic information needed to determine that potential.

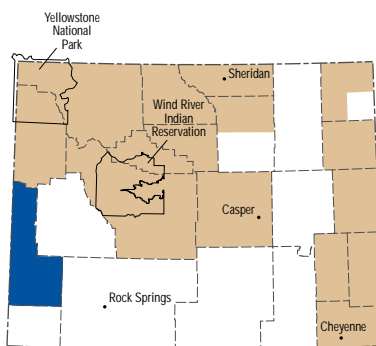
USGS investigations indicate that the Greater Green River Basin may contain a vast, untapped supply of clean-burning natural gas. This gas, however, may be in low-permeability reservoirs from which production is often difficult.

### Copper and Zinc Resources in Southeastern Wyoming

In the Hartville Uplift, which is north of Cheyenne, USGS scientists identified favorable areas for copper and zinc deposits. The USGS is conducting more detailed studies to determine the geologic setting of this geographically complex area. This information will be available to assess the resource potential of the area.

### Hydrologic Information for Local Water Management

General information about the occurrence, variability, and quality of surface and ground waters within political boundaries commonly is needed for local water management. To meet that need, the USGS, in cooperation with the Wyoming State Engineer, has conducted a series of county-level water-resources investigations in Wyoming since the 1950's (fig. 1); the Lincoln County study is in progress (1996). The USGS completed similar investigations of Yellowstone National Park (1973) in cooperation with the National Park Service, and of the Wind River Indian Reservation (1996) in cooperation with the Shoshone Tribe, Northern Arapahoe Tribe, and the BIA. Results of the investigations are used by all levels of government to manage and protect Wyoming's finite water resources under ever-increasing demands.



**EXPLANATION**

- Reports completed
- Report in progress

Figure 1. County-level water-resources investigations reports in Wyoming.

### Flood Investigations

Where human activity meets rivers and streams, hydrologic and hydraulic infor-

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mation about floodflows is needed. Since 1958, the USGS, mainly in cooperation with the Wyoming Department of Transportation, has conducted a series of integrated investigations to determine the flood characteristics of Wyoming streams. USGS hydrologists use information from streamflow-gaging stations to develop and refine procedures for estimating the size of floods of a given frequency at unmeasured sites throughout Wyoming. These procedures are being used by government agencies and private engineering and natural-resource companies to delineate areas of potential inundation, to determine the optimum size of highway bridges and culverts for safety and cost effectiveness, and to plan drainage systems at surface mines.

### Geologic Mapping

Geologic maps provide information useful for exploration and development of minerals, as well as for planning and locating industrial and housing developments. The USGS is funding geologic mapping of selected quadrangles (1:24,000 scale) by

the Wyoming State Geological Survey. Funds for the mapping projects are administered by the USGS through its State Geologic Mapping Program (STATEMAP). This Program is a component of the National Mapping Act of 1992, in which States and the Federal Government share equally in the cost of selected geologic mapping projects. The program in Wyoming is in its third year. The current (1995) mapping project is the Guernsey Quadrangle, which includes northeastern Platte and northwestern Goshen Counties. This quadrangle is within the Hartville Uplift, where there is active production of industrial minerals and decorative stone. Past mapping projects include the Laramie, the Red Buttes, and the Howell Quadrangles in the southeastern part of the State.

## Ground-Water Studies

Although about 95 percent of the water used in Wyoming is from rivers and streams, only ground water is available in many areas. The USGS, principally in cooperation with the Wyoming State Engineer, has conducted numerous small- and large-scale studies of the ground-water resource. Examples include a statewide series of hydrologic atlases that provide ground-water and related information for the major geologic basins of Wyoming, quantitative studies of the availability of ground water for irrigation and the estimated effects of future ground-water withdrawals, and continuous, long-term monitoring of water levels and water quality in a statewide network of observation wells. Large multi-State studies of regional aquifers that are partly in Wyoming were sponsored by the USGS—the Madison Limestone and the Northern Great Plains aquifer systems in northeastern Wyoming, the High Plains aquifer in southeastern Wyoming, and the Upper Colorado River Basin aquifer system in southwestern Wyoming.

## Water Use

Every 5 years since 1950, the USGS has compiled water-use estimates for the United States. Estimates for Wyoming for 1990 (fig. 2) include total water use, public supply, domestic, commercial, irrigation, livestock, industrial, mining, thermoelectric and hydroelectric power, and wastewater release. The information may be use-

ful to water-resource managers, State planners, industries, and the general public as a source of data to use in economic and resource allocation.

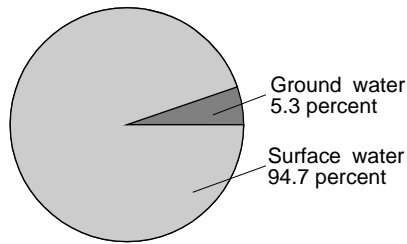


Figure 2. Estimated total off-stream water use in Wyoming by source in 1990.

## Selenium in the Environment

Although selenium is an essential element for animals and humans, excessive amounts can have potentially adverse effects on fish, birds, and human health. In Wyoming, areas where water flows over and through seleniferous soil and rocks are of special concern, especially where water drains into wildlife refuges, wetlands, lakes, reservoirs, and streams.

As part of the U.S. Department of the Interior's National Irrigation Water-Quality Program, the USGS, together with the Bureau of Reclamation, the U.S. Fish and Wildlife Service, the BIA, and the Shoshone and the Northern Arapahoe Tribes, conducted studies of three irrigation areas in Wyoming—the Kendrick Reclamation Project near Casper, the Riverton Reclamation Project, and the Wind River Indian Reservation. Samples of water, bottom sediments, and fish and bird tissue were collected and analyzed for selenium and other trace elements. Selenium concentrations in the food chain exceeded threshold concentrations, which are known to cause adverse effects in fish and aquatic birds, only in the Kendrick area. Results of the studies are being used by local, State, and Federal agencies to help evaluate potential cleanup options, irrigation practices, and changes in land use in the Kendrick area.

## Outreach Activities in Wyoming

USGS personnel frequently are asked to present exhibits and to give presentations to schools and organizations. As part of a Partnership Agreement with Cole Elementary School in Cheyenne, USGS personnel teach science to the 5th grade class each

week. The USGS, in cooperation with the city of Evanston, created informational signs along the Bear River Greenway.

## Studies of Soil and Water Contamination

The USGS is assisting the U.S. Air Force in studies of soil and water contamination at F.E. Warren Air Force Base, Wyoming. Because of contamination and the proximity of numerous suburban domestic wells, the Base was placed on the National Priorities List by the U.S. Environmental Protection Agency (USEPA) in February 1990. The USGS is characterizing the hydrology to predict the movement of contaminants on and from the Base in surface and ground water. The results of these studies are the basis for assessments of the actual and potentially adverse effects that contamination might have on human health and the environment and for the design of cleanup options, if needed.

Increased pesticide use has resulted in increased crop production but also has raised concerns about the effects of pesticides on the environment and human health. Ground water, in many cases the sole source for rural residents, is particularly susceptible to contamination. The Wyoming Department of Agriculture, in cooperation with other State and Federal agencies, including the USGS, initiated the preparation of a State pesticide management plan for the USEPA. The plan includes a pesticide-monitoring program in selected agricultural areas to determine the extent of pesticides in ground water. This information may be useful to State and local entities that make decisions about pesticide use.

## Volcanic and Earthquake Hazards in the Yellowstone Region

The geologic features and phenomena in the Yellowstone region in northwestern Wyoming are the result of active volcanic and mountain-building processes that have persisted for several million years. Volcanic eruptions and large earthquakes have occurred many times in Yellowstone's recent past and will likely continue to affect the region. The USGS, in cooperation with the National Park Service and the University of Utah, is studying past volcanic and seismic activity in Yellowstone and

monitoring signs of continued activity. These signs include frequent small earthquakes, rapid uplift and subsidence of the ground surface, and persistent, but ever-changing, hydrothermal activity. One goal is to provide the scientific basis for timely warnings of any future volcanic and earthquake activities.

## Topographic Mapping

The National Mapping Program of the USGS strives to ensure that map data in graphic and digital form are available to the public through timely and effective data collection and revision procedures. Among the most popular and versatile products of the USGS are its 1:24,000-scale topographic maps (1 inch on the map represents 2,000 feet on the ground). These maps show natural and cultural features of the landscape, such as lakes and streams, highways and railroads, boundaries, and geographic names. Contour lines show the elevation and shape of terrain. Wyoming is represented by 1,922 maps at this scale, which are useful for civil engineering, land-use planning, natural-resource monitoring, and other technical applications. These maps have long been favorites with the general public for a wide variety of outdoor uses.

For many years, the USGS has worked with the Wyoming Geographic Information Advisory Council (formerly the Wyoming State Mapping Advisory Council) through the Wyoming State Engineer's Office to provide accurate map products to the public at a nominal cost. Accomplishments include accelerated completion of state-wide coverage of 1:24,000-scale printed and digital topographic maps, preparation of 1:100,000-scale digital maps for identification of irrigated areas in the Wind River area and other parts of Wyoming, and revised 1:24,000-scale paper and digital topographic maps that represent the Cheyenne area.

## Mapping Agreements

The USGS, in cooperation with the Natural Resources Conservation Service (NRCS), is producing 350 digital orthophotoquads (DOQ's) that will cover the Wind River Indian Reservation in western Wyoming. A DOQ is a digital image of an aerial photograph in which displacements caused by the camera and the terrain have

been removed. A DOQ combines the image characteristics of a photograph with the geometric qualities of a map. The Bureau of Land Management (BLM) and the BIA are participating in this project by establishing horizontal control (land-surveyed data). The NRCS, in cooperation with land-resource managers in Wyoming, will use the DOQ's for conservation planning, habitat analysis, and soil surveys. The USGS, in cooperation with the BLM, is producing 35 DOQ's that will cover the Jackson Hole area. These DOQ's will be used by Federal, State, and local agencies for planning and impact studies for the Snake River drainage area in and around Jackson Hole.

## National Coal Resources Data System State Cooperatives

Current, credible, understandable, and standardized information on the location, quantity, and quality of the coal resources of the United States is needed by Federal, State, and regional planners, as well as scientists and industry. The USGS, in cooperation with the State Geological Surveys, including the Wyoming State Geological Survey, initiated a study in 1975 to develop the National Coal Resources Data System (NCRDS). The USGS provides the central hardware, software, and analytical capabilities; the USGS and the States contribute data and use the data bases. Currently (1996), Wyoming and 21 other States, representing 98 percent of current U.S. coal production, are participating in cooperative projects. The NCRDS data bases provide baseline information that can be accessed for annual State resource updates and used to meet many needs.

## Coal-Quality Studies

The Clean Air Act Amendments of 1990 created a renewed interest in locating coals that have low concentrations of hazardous air pollutants, sulfur, and ash. Coal of Tertiary age in Wyoming, Montana, and North Dakota has low sulfur and ash contents, but detailed studies of the distribution of hazardous air pollutants have only recently begun. USGS scientists have developed models for the distribution of coal on the basis of the environment that shaped and formed these deposits. The USGS, in cooperation with the Office of Surface Mining and the Wyoming State Geological Survey,

is evaluating the models in anticipation of increased coal production during the next two decades. This work is an important step because most of the coal in Wyoming, Montana, and North Dakota is on publicly owned land.

## Special Studies in Teton County

Recent geologic mapping by the USGS in the Jackson Hole area addresses several issues important to local residents and visitors to this scenic part of the State. The mapping project emphasizes three aspects of geology in this area—the glacial history of the valley, the extent of recent faulting, and the geology associated with 10 archeological sites around Jackson Lake. The work is coordinated with and benefits Grand Teton National Park, the Bureau of Reclamation, the Bridger-Teton National Forest, and Yellowstone National Park.

Ever-increasing urbanization of the Snake River Valley in Teton County has placed greater needs for accurate and reliable hydrologic and hydrogeologic data and related interpretive investigations. The USGS, in cooperation with the Teton County Board of Commissioners, the Teton County Natural Resource District, the Wyoming State Engineer, and Grand Teton National Park, is collecting data and investigating various aspects of ground- and surface-water interchange and water-quality issues and is reevaluating the ground-water resources within the Valley. This information may be used for comprehensive water-resources management planning for the area.

Gravel is used extensively as aggregate for asphalt-road surfacing. The cost of transporting gravel from mine site to application site is a major factor in the economics of road maintenance. The USGS, in cooperation with the Teton County Planning Office, is conducting a study to determine the availability and quality of gravel in the Jackson Hole area for road surfacing in Teton County. Several gravel sites along the Snake River near Jackson have been selected for the study. Availability includes an assessment of the quantity of gravel to a depth of 20 feet below land surface and the presence and depth of the water table. Quality includes gravel size distribution, sediment content, presence of fractures in the gravel, and quartzite content of the gravel.

## Collection of Hydrologic Data

Since 1895, the USGS has collected continuous, intermittent, and single-measurement surface-water data at more than 2,000 sites throughout Wyoming (fig. 3). Water-quality data have been collected at more than 1,600 sites. About 170 surface-water stations currently (1996) are in operation. The data-collection program is done in cooperation with many local, State, and Federal agencies. These data are used for the daily administration and management of water resources, interpretive hydrologic studies, determining the extent and severity of droughts, characterizing and predicting conditions during floods, and monitoring the effects of human activities on stream-flow and water quality.

## Earth Science Information

The Earth Science Information Centers (ESIC's) provide information about USGS programs, products, and technological developments to the public. The ESIC in Laramie was established under a cooperative agreement between the USGS and the Wyoming State Geological Survey at its Cartographic Information Center. As part of the National ESIC network, the ESIC in Laramie provides information on such

earth science topics as cartography, geography, digital data, remote sensing, geology, geophysics, geochemistry, hydrology, geohydrology, aerial photography, and land use in Wyoming. The USGS supports the ESIC in Laramie with reference materials, technical assistance, training and outreach activities, and access to USGS data bases.

## Cooperative Programs

Cooperative activities include water-resources data collection, interpretive water-availability and water-quality studies, mineral-resource assessments, and mapping. When local and State agencies are involved, activities typically are funded on a matching-funds basis. In addition to agencies already mentioned, the USGS cooperates with the cities of Cheyenne and Lander, the Midvale Irrigation District, the Fremont County Weed and Pest Control District, the U.S. Army Corps of Engineers, the Wyoming Water Development Commission, the Wyoming Department of Environmental Quality, the Lingle-Fort Laramie Conservation District, the Shoshone and Heart Mountain Irrigation District, the South Goshen Conservation District, the Star Valley Conservation District, and the Saratoga-Encampment-Rawlins Conservation District.

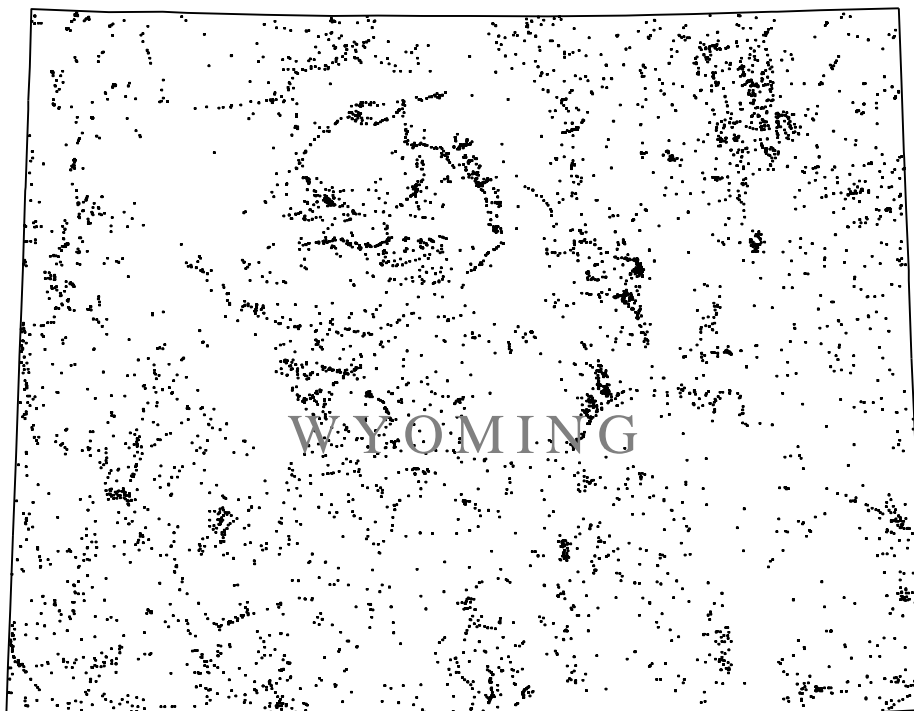


Figure 3. Surface- and water-quality data-collection sites in Wyoming

## For More Information

USGS State representative  
2617 E. Lincolnway, Suite B  
Cheyenne, WY 82001-5662  
(307) 778-2931  
Fax: (307) 778-2764  
Email: [dc\\_wy@usgs.gov](mailto:dc_wy@usgs.gov)

Additional earth science information can be found by accessing the USGS Home Page on the World Wide Web at <http://www.usgs.gov/>

For more information on all USGS reports and products (including maps, images, and computerized data), call **1-800-USA-MAPS**

The **USGS** provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, biological, and land resources. We help find the natural resources needed to build tomorrow and supply the scientific understanding needed to help minimize or mitigate the effects of natural hazards and environmental damage caused by natural and human activities. The results of our efforts touch the daily life of almost every American.