

# SCIENCE

The U.S. Geological Survey (USGS) provides the Nation with reliable, impartial information to describe and understand the Earth. This information is used to:

- Minimize loss of life and property from natural disasters;
- Manage water, biological, energy, and mineral resources;
- Enhance and protect the quality of life; and
- Contribute to wise economic and physical development.

The USGS supports the major land and water resources missions of the Department of the Interior and provides significant and critical earth science information to a wide range of clientele, both Federal and non-Federal. The USGS continues efforts to improve its ability to collect, analyze, provide, and preserve data and information, and to develop and disseminate techniques and technology that support the decision processes related to the wise use of the Nation's natural resources.

The USGS faced tremendous change and challenges during 1996. The bureau underwent a major organizational downsizing in its geologic division activities, even as external factors led to the addition of new programmatic responsibilities in other areas. The Minerals Information Program of the former Bureau of Mines was integrated within USGS after the closure of the Bureau of Mines. Congress also directed the merger of the National Biological Service (NBS) with USGS, adding a biological sciences component. Consolidation

planning for this new USGS division, the Biological Resources Division, was a major focus throughout the year, and much of NBS programmatic and support activity was not fully under USGS management during 1996.

## Major Disaster Response

The USGS worked closely with others in scientific studies, spatial depictions of geographic and earth science data, and response to disasters. Examples of USGS disaster response included:



- Assisted in the assessment of the July 1996 rock-fall near Happy Isles at Yosemite National Park. This event, in which 70,000+ cubic yards of rock spalled off the upper part of the cliff, killed one person, and injured many others.

- In May 1996, responded to a report of a landslide developing near Aspen in Pitkin County, Colorado. After examining the scene, the USGS informed Pitkin County officials that a landslide debris flow could occur shortly

that would impact nearby Aspen Country Day School. Appropriate emergency measures were taken as a result. Subsequently, two debris flows occurred on May 13 and 14, causing considerable damage to the school. Because of USGS warnings, no injuries were reported from either event.

- In February 1996, widespread flooding struck the Pacific Northwest, causing \$800 million damage in the States of Washington, Oregon, and Idaho. However, real-time information on river levels provided by the



USGS employee analyzes water samples from across the United States in the National Water Quality Laboratory (photo by USGS).

USGS enabled the accurate forecasting of peak flood heights on the Columbia and Willamette Rivers, averting much greater damage. The dedicated response of USGS employees to the disastrous floods in western Oregon and the availability of real-time streamflow information on the World Wide Web earned them a “Hammer Award.” USGS employees were honored for their quick and efficient use of the World Wide Web for the dissemination of river level and streamflow information nationwide, and for electronic distribution of real-time stream flow information, which was used as the basis for dozens of decisions regarding the evacuation of people and property throughout Oregon and Washington.

In presenting the Hammer award, Patricia Beneke, the Department of the Interior’s Assistant Secretary for Water and Science, said, “In the Willamette Valley alone, the outstanding partnership between the USGS and other Federal and State agencies, and based on USGS data, saved an estimated \$2.7 billion dollars of flood damage in February, as well as the lives of many Oregonians.”

**National Seismic Hazard Maps:** The USGS completed and released new national maps showing the potential hazard from seismic ground shaking. The maps present data in the probabilistic formats most requested by engineers and land use planners. They will also be used in implementing the recommended provisions of the National Earthquake Hazards Reduction Program for seismic regulations for new buildings, as well as for designing bridges, planning retrofitting strategies, setting insurance premiums, and estimating earthquake losses.

### Minerals Information Used as Economic Indicators

USGS minerals information is used by the private and public sector as barometers of industrial activity.

- Economic indices of metals activity are constructed, analyzed, and published monthly. Metal-producing and metal-consuming industries, as well as the banking and finance sector, government, academia, and capital goods industries, use the USGS Metal Industry Indicators to gauge future price trends and to assess where the metals industry is in the business cycle.
- The National Portland Cement Association uses monthly USGS Minerals Information Survey data to calculate business indicators for the cement industry. The cement industry then uses other indicators, along with the Minerals Information data on local cement shipments, to make business decisions, including large capital investment decisions.
- The USGS quarterly survey on domestic production of sand, gravel, and crushed stone is used as an economic indicator of construction activity at the National, regional, and State level. Quarterly data are used by industry associations as early indicators of regional construction activity.
- The Federal Reserve Board began using the USGS Quarterly Crushed Stone and Sand and Gravel Survey data as the basis for creating improved indices for

### Earthquake Technology Fights Crime

*Seismologists at the U.S. Geological Survey have transferred the technology they use to locate the epicenters of earthquakes to locating the origins of bullets flying through several San Francisco Bay area neighborhoods.*

*The system uses a triangulation process to determine the source of gunshots by tracing sound waves, in the same way that seismologists and their computers locate the source of seismic waves, which are also sound waves, emitted by an earthquake.*

*USGS scientists tested the first prototype gunshot locating system in 1992, and more recently the Redwood City, California, Police Department tested an updated version of the system developed by private industry. Other cities across the nation, including Washington, D.C., have expressed interest in using the system in some of their high-crime neighborhoods.*

*“The development and use of this system is an excellent example of the exchange of science and technology in one field to another,” said Redwood City Police Captain Jim Granucci, “and also an excellent example of cooperation among various levels of government and government with private industry. It’s a win-win situation for everyone, except the criminals.”*

*More information on this technology is available on the USGS “Earthquake Technology Fights Crime” Fact Sheet (FS-096-96).*

industry groups within the monthly Industrial Production and Capacity Utilization Report.

## Techniques for Planning Future Water Supplies

By knowing which streams (and watersheds) are contributing water to wells, cities and counties can make better-informed decisions regarding land-use planning and well-head protection. USGS research is helping these cities and counties to locate the surface water source(s) of water that is eventually pumped from deep water wells. In the Black Hills area of South Dakota, USGS has used information about the hydrogen and oxygen in local streams and ground water to help Rapid City water managers determine the source of the water that is pumped from their municipal-supply wells. Knowing the source of their wells’ water allows managers to more efficiently, economically, and effectively protect the principal source of drinking water for their 50,000+ residents. The Rapid City managers also



USGS employee at the National Earthquake Information Center in Golden, Colorado (photo by USGS).

can now more accurately forecast and plan for the effects of reduced stream flow (such as during a drought) on their water supply.

## Colorado River Experimental Flood

The “experimental flood” proposed by USGS scientists as a means of replenishing the beaches of Grand Canyon National Park which was carried out in 1996, was highly successful, extensively covered by the press, and widely viewed on the Internet. USGS computer models predicted that controlled flooding could replenish Grand Canyon beaches that had been lost when the Glen Canyon Dam was built, cutting off the supply of sediment to the Colorado River. The flood was planned in cooperation with the Bureau of Reclamation, responsible for operating Glen Canyon Dam, and the National Park Service, responsible for managing Grand Canyon National Park.

## Massachusetts Bay/Boston Harbor

There is concern about the long-term impact of contaminants in Massachusetts Bay because this area is used extensively for transportation, recreation, fishing, and tourism. Results from a USGS study of Boston Harbor and Massachusetts Bay were used to help make management decisions throughout the Boston Harbor Cleanup program. USGS computer models of circulation illustrate the comparative impact of sewage from Boston’s existing and future outfall. The models suggest that when the outfall is moved to the offshore location, water quality will improve dramatically in Boston Harbor. The model was used by the U.S. Attorney’s Office (Justice Department) in defending the Government in the

endangered species case concerning right whales in the Stellwagen Bank National Marine Sanctuary. The model results also helped evaluate and gain approval for downsizing of the planned secondary sewage treatment plant. The downsizing saved Boston area rate payers \$160 million.

## Global Land Information System

The Global Land Information System (GLIS) reached a significant milestone of accessibility to USGS customers in April 1996 when a World Wide Web interface was announced at the American Society of Photogrammetry and Remote Sensing meeting in Baltimore, Maryland. Since the release of the Web GLIS, the number of online customer product searches rose from 4,000 per month to 17,000 per month. Likewise, product orders by USGS customers using GLIS have grown almost 400 percent.

## Partnership with Minnesota Mining and Manufacturing

The USGS entered into partnership agreements with the private sector to develop technology for rapid customized product dissemination. The USGS and Minnesota Mining and Manufacturing (3M) of St. Paul, Minnesota agreed to develop on-demand map printing and for 3M to develop a series of commercial instant map-printing systems. 3M engineers will be working with USGS cartographers to develop a system allowing USGS customers to print a specific topographic map in a matter of minutes. Cost savings result from decreasing the USGS printed map inventory, while customers will gain rapid access to all USGS map products.

## Biological Research

The goal of the Biological Research Division is to work with others to provide the scientific understanding and technologies needed to support sound management and conservation of our Nation's biological resources. During 1996, there were many noteworthy accomplishments including:

- "Our Living Resources", which describes the abundance, health, and distribution of biological resources of the Nation, won several awards, including a Blue Panel award from the National Association of Government Communicators.



USGS employees at work in South Florida (photo by USGS).

- Based on analyses of 45-year data records, a decision was made to discontinue stocking Federally produced hatchery lake trout in most areas of Lake Superior. The analyses indicated that wild populations are successfully reproducing and that protection from over-exploitation and seal lamprey predation should be the primary management strategy to further restoration. This success on Lake Superior is a milestone in the international effort to restore Great Lakes fisheries.

## Implementation of the Government Performance and Results Act

During 1996, the USGS continued to report the National Water-Quality Assessment Program (NAWQA) as a Government Performance and Results Act (GPRA) pilot project designed to prototype performance measure efforts for the Bureau. Other NAWQA Program Pilot results and program performance measures are presented in the Supplemental Information section of this report.

In 1996, a draft GPRA Strategic Plan was provided to the Department and the Office of Management and Budget for review. The plan will be used to plot the course for a future of continued government change, high-technology revolution, and significant societal evolution. Major challenges before the USGS include:

- Maintaining a multi-disciplinary workforce for addressing complex scientific problems;
- Creating long-term national data bases and using them in interpretive studies to provide a solid scientific foundation for effective policy development; and

- Placing a greater emphasis on relationships and partnerships to ensure the most efficient means available for providing earth science information to the public.

During the coming year, USGS will continue to refine that plan to coincide with the 10-year strategic plan and to improve the description of related performance measures.

## Streamlining Operations

The USGS has continued to improve its business practices through streamlining and efficiencies in 1996.

- By pioneering the use of bankcards, USGS is eliminating administrative procedures previously required before making low-dollar purchases of commercial goods. In 1996, USGS use of bankcards increased from 59,000 to 84,000 transactions, nearly doubling the value of transactions to \$21 million.
- The USGS continues to expand its use of electronic remote entry of many financial transactions such as commitments, obligations, and payments directly into the accounting system. This initiative has been fully implemented in the Water Resources Division and will be expanded to other divisions in 1997. This streamlining action improved the timeliness of financial entries, decreased reconciliation time at field sites, and simplified year-end closing.
- The USGS is providing its employees with Internet access to current information such as policies and other reference documents related to the functional areas of acquisition, computing, facilities, financial resources, information services, service requests, human resources, information management, management services, safety and security, telecommunications, and training. This streamlining action reduces the need for administrative staff to handle all requests for information or service.

## Customer Service

The USGS has developed and published the following customer service standards:

- Our products will meet the most rigorous standards of scientific accuracy and integrity;

### Serving the Community

*The National Biological Service's Leetown Science Center in Leetown, West Virginia, has long been recognized as part of the community of Leetown. Located in Leetown, West Virginia since 1931, the Center covers 480 acres and has three reservoirs used for water storage. Over the years, the Center's employees have consistently demonstrated "good neighbor policy" helping neighbors and community while carrying out the Center's work involving aquatic ecosystems and fish health.*

*Such was the case early one morning in January during the meltdown that followed the blizzard of '96. Maintenance foreman **Daryl Christine** was visited by one of the neighboring farmers who reported that thirty acres of water was moving toward the reservoirs, placing local homes and the center's own buildings in jeopardy. Well aware of a similar situation in 1949 when floods inundated buildings and grounds, Daryl quickly rallied the maintenance crew to assess the situation. **Frank Roach**, administrative specialist, observed that the reservoirs were very close to overflowing and advised managers of nearby FWS's National Education and Training Center to dismiss their employees who were working in the buildings closest to the reservoirs. The maintenance crew began digging a ditch to divert the water toward an area where there weren't any homes or buildings. Despite the rain and cold, the crew remained on the job to assure that the homes close to the Center's property would suffer no flood damage from the overflow and runoff.*

*In a letter to the editor of the Martinsburg Journal, one neighbor wrote: "The people in Leetown area are fortunate to have these Good Samaritans as friends and neighbors."*

- Customers will be treated with courtesy and with respect for their time;
- Their requests will be handled promptly, and due dates will be honored;
- We will continue to expand the availability of data; we will try to make it as easy as possible for someone to access or order our products; and
- We will seek and consider our customers' input about USGS plans, programs, and services.

The USGS produced its second annual Customer Service Report in 1996. This report described goals for improving customer service, opportunities for improvement identified by its customers through surveys, progress toward improvement, accomplishments, and success stories.

### What's in a (Geographic) Name?

*It's hard to get respect when you live in a town called Mole Hill. So in 1949, officials in the town of Mole Hill, West Virginia, petitioned the U.S. Board of Geographic Names to change the town's name to "Mountain." The Board policy is to recognize local usage or preference when possible, so the town got its wish to make a Mountain out of a Mole Hill.*

*The Board on Geographic Names was created in 1890 and established in its present form in 1947. Members represent the departments of Agriculture, Commerce, Defense, Interior, and State plus the Central Intelligence Agency, Government Printing Office, Library of Congress, and the U.S. Postal Service. Staff support is provided by the USGS for the Domestic Names Committee and by the Defense Mapping Agency for the Foreign Names Committee. The Secretary of the Interior acts as presiding and final approving officer over the board's monthly decisions.*

*At present, some 2.5 million names are compiled in the Geographic Names Information System database. At a recent meeting, the USGS demonstrated how to access its latest digital (CD-ROM) listing of more than two million geographic names in the United States and its territories and possessions. These names are the official ones for use on federal publications and maps.*

- The USGS sent a customer feedback card with each mail order it filled. The response indicated that 90 percent of USGS customers are pleased with its service.
- The Information Services Branch in Denver, Colorado, improved response time to customer orders. Customers are now receiving orders within two weeks of their request. This response time is significantly shorter than the eight-week average in 1994.
- To better serve the government and private sector customers involved with disaster mitigation, the USGS provides emergency responses for map products and data requests 24 hours per day, 7 days per week, every day of the year. The emergency response provision was made via a pager linked to the National Emergency Command Center, the National Security Council (NSC), and the Domestic Emergency Notification System. During 1996, USGS participated in emergency responses including the TWA airline disaster and the wildfire suppression in Yosemite as an integral member of this team.
- The USGS toll-free customer inquiry line, 1-800-USA-MAPS, was considerably enhanced to make this service more customer-oriented. Callers can now obtain information about topographic, geologic, and wetland maps available from USGS, as well as digital data and aerial photographs. Much information can be faxed by selecting the EARTHFAX options. At any time, customers can elect to speak to a customer service representative. This toll-free number was used by 57,000 callers in 1996, an increase of 1,677 calls, or three percent over 1995.
- The Biological Resources Division measured customer satisfaction with its products and services through responses to 759 surveys distributed in 1996. More than 80 percent of the respondents reported that they were satisfied or very satisfied with the overall usefulness of these products and services.
- In 1996, conversion of seismic data (which are invaluable to geologic analyses to determine potential oil and gas deposits) from magnetic tapes to CD-ROM media reduced cost of providing information from approximately \$80,000 to \$475. In addition, the conversion preserves a priceless archive of earth science data on stable CD-ROM media (estimated life: 100 years or more) whereas magnetic tapes deteriorate over time.
- Credit card orders for mapping products can now be accepted through the mail and by fax at (303) 202-4693.
- The Inventory Management Team recommendations included a refined process for reprinting products, massive cleanup of inventory data and locations, and timely updating of the system when new or reprinted products are received. Previously this process took 2-3 months; it is now handled in 7-10 days. This means that the system, which is used by customer service personnel, will provide more timely information about the availability of products for customers.
- The USGS is working to increase partnerships with businesses to handle retail sales of USGS stocked products. During 1996, the number of partnerships with retail sales providers increased from 1,600 to 2,300 (44 percent), with 80 percent of USGS stocked products being distributed by these retail sales business partners.