

Program Highlights—Fiscal Year 2002

Introduction. The Idaho Geological Survey has a statewide mission as the lead agency for collecting and disseminating geologic information and mineral data. In addition to its main office in Moscow at the University of Idaho, the Survey has branch offices in Boise at Boise State University and in Pocatello at Idaho State University. Staff geologists conduct applied research with a strong emphasis on producing geologic maps and providing technical and general information about Idaho's geology. Externally funded projects enhance this research.

Idaho experienced budget shortfalls during the past year as holdbacks were imposed on education and agencies. Budget cuts have forced the Survey to reduce its operation in research, public service, and education. For example, state funds no longer support research and provide only minimal support of earth science education. The operating expense budget of the Survey was cut 61.8% from the FY-2001 base. The proposed operating budget for FY-2003 is less than any budget in the last 29 years: the last 18 years as the Idaho Geological Survey and the 11 years prior to that as the Idaho Bureau of Mines and Geology.

The University of Idaho reorganized its colleges during FY-2002. The College of Mines and Earth Resources has been replaced by a new College of Science. In response to the budget decreases, the University offered severance packages to staff and faculty for early retirement in 2002 and 2003. Bill Bonnichsen announced his retirement effective June 2003, and Director Earl Bennett, presently the interim dean of the new College of Science, also announced his retirement. The college reorganization will require an administrative realignment of the Survey within the University. The Survey's enabling legislation will also need revision to reflect this realignment and to internalize the director's position.

Publications. In the past 10 years, the Survey has released 195 publications in a variety of formats that include books, maps, reports, posters, and fact sheets. This output represents a substantial gain in recent knowledge on the state's geology. Remarkably, it also accounts for over 30 percent of all the published research in the Survey's 83-year history. This solid productivity can be attributed to three factors: experienced staff, prudent investment in computer technology, and success in obtaining external research funds to augment state appropriations.

The Survey devotes most of its resources to geologic mapping throughout the state, particularly at 1:24,000 and 1:100,000 scales. Cooperative federal grants and contracts have provided much-needed funding for this research. At the same time, the publishing of maps has changed dramatically. Extraordinary advances in cartography through computer hardware and software make it possible to generate better maps today than ever before.

Idaho Geology, the Web site—www.idahogeology.org. Viewable on the Internet, interest in the site has been strong and the offerings continue to expand through new Web pages and publications and an ever-widening network of links. The Web site offers the Survey multiple opportunities to get information before the public. The searchable *List of Publications* and a searchable *Index to Geologic Maps* are always on line. The Web site provides electronic access to selected geologic maps, GIS databases, and wide-ranging information such as geologic hazards and earth science education. A new series devoted to digital Web maps in PDF format can be downloaded free of charge.

Geological mapping and related research. Central to the Survey's applied research is geologic mapping and related topical studies that together form the technical content of digital geologic maps, databases, reports, and publications. Since 1985 the Survey has been conducting detailed geologic mapping in selected urban-impact areas. The Survey participates in the U.S. Geological Survey's STATEMAP program, which since 1990 has augmented geologic mapping in urban areas and development-impact corridors throughout Idaho. The State Mapping Advisory Committee of which the Survey is a member was reorganized to better assess Idaho's mapping needs and address long-term plans for geologic mapping. During the year, STATEMAP project geologists mapped twenty-seven 7.5-minute quadrangles. Of these, nine individual geologic maps at 1:24,000 scale were made available to the public. The Murphy 30' x 60' quadrangle was completed and included new mapping in seven 7.5-minute quadrangles. The U.S. Geological Survey's Headwaters project and the Idaho Department of Lands helped support regional geologic mapping in the large areas of the state that have not been studied in detail. This year the Headquarters 30' x 60' quadrangle was digitized from new interpretations on 1:24,000-scale sheets, fifteen of which required field mapping during the project. All of these new data will be entered into the statewide digital database. Following review and corrections, all the new geologic maps will be published as print-on-demand color maps.

The Survey cooperates with several universities by endorsing EDMAP proposals for student geologic mapping in several areas of Idaho and participates in the Association of American State Geologists's Mentored Field Experience Program funded by the National Science Foundation and the U.S. Geological Survey.

Geologic map production and publishing. The Survey's digital mapping and GIS laboratory performs services ranging from digital cartography to spatial data management. The lab uses computer-aided design and GIS software to produce maps for publication and to fashion existing geologic maps into digital-map compilations. Most new geologic maps published by the Survey are available as full color, print-on-demand products. Twelve maps were released in FY-2002.

The Survey participates in the North American Data Model Steering Committee that provides guidelines for digital-legend design for geologic maps. The Digital Data Series is a new publication category for Idaho that is undergoing careful research and development. The first publications in the new series were released this year.

Hydrogeology. The Survey has a number of hydrologic projects in cooperation with other state and federal agencies, university programs, and water-user groups. These projects contribute to a better understanding of geologic controls on recharge and ground-water flow and of the distribution and transport of ground-water contaminants. This technical information is then provided to end-users for ground-water resource development and protection. Research applications include quantifying ground-water resources, data analysis and mapping of ground-water quality, and integration of surface geological and subsurface hydrogeological information to assess ground-water vulnerability.

A statistical approach to analyzing the state's ground-water quality database is being developed to assist other agencies in managing Idaho's ground-water resources. The Survey is working with the Department of Water Resources, the Department of Environmental Quality, and the U.S. Geological Survey to develop statistically-based GIS tools for identifying areas of water quality concern, defining trends and spatial boundaries, and prioritizing problem areas.

In the lower Portneuf Valley aquifer, cooperation between various area jurisdictions, the Environmental Protection Agency, the local county Health District, and citizen groups has led to a prototype effort to develop protection and management methods for the area's ground-water resources. The work includes a functioning environmental GIS database for aquifer vulnerability assessment, a special Web site developed in cooperation with the Portneuf Groundwater Guardian and the cities of Pocatello and Chubbuck, and ongoing technical assistance to city and county leaders and management staff.

The Survey is involved in funded research projects to map water quality in the Treasure Valley and Twin Falls areas and other areas of the state, to map surficial geology and aquifer characteristics in the Big Wood River Valley, and to develop technical criteria for assessing septic drain field performance in the lower Portneuf Valley. In addition, the Survey and the Idaho Water Resources Research Institute began an EPA-funded program to provide geologically based ground-water information to rural communities that have critical water issues.

Databases, bibliographies, and collections. Many of the digital geologic maps are also available as GIS databases. Other databases include information on the state's

Mines and Prospects, earthquakes, faults, and landslides. Digital geologic databases and earthquake information are available on the Web site. Several technical bibliographies are published. A collection of over 1,200 theses and dissertations on Idaho's geology are available at the Moscow Office. The Survey recently completed a new digital database and an *Index to Geologic Maps* funded by the Idaho Board of Education. To date, the areal coverages of 614 thesis maps have been digitized for inclusion in the searchable database. These products will complement the existing U.S. Geological Survey's index available on the Internet.

Geologic hazards. As the state's population has grown and disaster losses have increased, the Survey devotes increasing time to geologic-hazard mitigation. The agency works in close cooperation with the Idaho Bureau of Disaster Services, both formally and informally, to mitigate, respond to, and recover from the impacts of floods, fires, landslides, and earthquakes and to provide technical analysis when needed.

The Survey's digital mapping laboratory designed a statewide landslide database for use by state and federal agencies, local planners, and emergency response personnel. The Survey's new surficial geologic maps are an integral part of Nez Perce County's geologic hazards interpretation project. A similar project is beginning in Clearwater County.

The Survey has finished a seismic-shaking study of the Boise metropolitan area. The Idaho active fault map has been reviewed and updated and will be released in the next year. The mapped faults are linked to an extensive database as well as an earthquake reference collection.

As an active participant in the Western States Seismic Policy Council (WSSPC) and Pacific Northwest and Intermountain regional planning groups of the Advanced National Seismic System, the Survey is involved in organizing seismic network operators and planning several hazard mitigation projects. The Survey is organizing a state geologic hazards clearinghouse capability in cooperation with the Idaho Bureau of Disaster Services and is already participating at regional clearinghouse planning functions with the other Basin-and-Range states in WSSPC.

Mitigation of natural hazards is a major component of the Survey's annual summer workshop for teachers. Training activities provide knowledge of Idaho's tectonic setting and classroom safety and disaster response. Master teachers successfully developed and tested classroom activities for geologic-hazard education.

Mines and the geology of mines. The Survey maintains a working knowledge of the geology and status of all active and many inactive mines in the state. Information and statistics on Idaho's mines, including production, exploration, and reclamation

information, are collected and published annually. An overview of the year's mining and exploration activity is presented each December at the annual meeting of the Northwest Mining Association. In addition, the Survey cooperates with the U.S. Geological Survey to collect and interpret mining information and to publish the annual review and production statistics. The Survey's summary of Idaho's mineral industry is published annually in the May issue of *Mining Engineering* journal, in the U.S. Geological Survey's *Minerals Yearbook*, and in the Idaho Department of Commerce *Idaho Facts* newsletter. After a major downturn in the metals' market, commodity prices, especially for gold and molybdenum, were up in 2002, and there has been a slight increase in exploration and metal mining activity in Idaho. Industrial mineral operations, such as sand and gravel, were fairly stable.

The Survey continued to inventory and evaluate abandoned and inactive mines in Idaho. A major project was conducted in cooperation with the Boise National Forest. Thirty sites were inventoried on the Boise Forest, including many that were noted in the initial inventory of 1994. Geochemical sampling of water and solid materials, such as tailings, was conducted along with video documentation and mapping. Results identify physical and environmental hazards for possible future remediation. Increasing residential and recreational use of the Boise Basin mining district has led to increased concern about the hazards associated with the old mines. Past work for the U.S. Bureau of Land Management was also completed.

An outgrowth of previous mine inventory work has been a small research project in the Lemhi Pass Thorium District of Lemhi County. The Survey's economic geologist worked with out-of-state university colleagues to obtain U-Pb electron microprobe and Re-Os geochronology on samples from one of the Lemhi Pass thorium deposits and a copper mine, respectively. The matching results document a Precambrian age (about 1.05 billion years old) for the primary copper and thorium mineralization with subsequent Paleozoic hydrothermal activity that redistributed some of the thorium. This is the first use of these valuable tools in Idaho and the only geochronology on pre-Tertiary rocks in that area.

Earth science education. The Survey staff supports a variety of formal and informal geologic education efforts throughout the state, the region, and the nation. Through close working relationships with the geology departments at the three state universities, Survey geologists make their expertise available by participating in seminars, field trips, and workshops, by teaching selected upper-division courses, and by directing graduate student research. Survey geologists contributed to a geology, minerals, and mining exhibit at the Idaho Science Teachers Association meeting in Idaho Falls. The exhibit was cooperatively sponsored by the Survey, the Society of Mining Engineers, and the Minerals Education Coalition. Survey geologists also designed and implemented

displays, handouts, and field trips for the Ice Age Floods Institute, highlighting the ice-dam story of Glacial Lake Missoula in northern Idaho.

Through limited external funds, the Earth Science Education Coordinator guides and helps conduct the Survey's education program. The Survey is primarily engaged in promoting earth science education with the state's teachers through the Idaho Earth Science Teachers Association, by hosting the IESTA's Web site at www.idahogeology.org, and with field workshops conducted around the state so that teachers can observe the methods and science of geology in Idaho's own outdoor laboratory. Idaho is one of a handful of states in which the state geological survey and earth science teachers work closely to enhance the teaching of earth science at the elementary and secondary level. This includes cooperating with selected master teachers to classroom-test student activities for geologic-hazard education, a project funded by EPSCoR. The Survey's partnership with teachers includes Earth Science Week activities in early October and the summer field workshop. As part of the field workshop, the Survey cosponsors and incorporates hazards mitigation education in cooperation with the Idaho Bureau of Disaster Services. The summer of 2001 marked the 22nd teacher workshop the Survey has conducted since 1986.