ANNUAL REPORT
OF THE
IDAHO GEOLOGICAL SURVEY
FISCAL YEAR 1992
I N T R O D U C T I O N

The FY-92 annual report is mostly one of good news, facts, and records. Despite a lingering national recession, the state's economy appeared healthy. Regional business indicators were up, and revenues flowed into state coffers as anticipated. The State Legislature finally boosted the personnel allocation to partially address salary parity with faculty at the University of Idaho. It has taken the Survey since 1984 to get back to a reasonable funding level with adequate support for regular programs. Hard work by staff scientists produced for the third year in a row record funding from grants and contracts. The Survey hosted for the first time the important annual cluster meeting of western state geologists and U.S. Geological Survey scientists to discuss policy and shared research interests.

More of the public is discovering the services available from the Survey through the active presence of the Boise and Pocatello branch offices. The economic geologist at Boise addressed local schools and civic clubs on the importance of the state's mineral industry. During the summer she worked in the Lochsa and Selway rivers area on the Idaho Initiative Mapping Program. The hydrogeologist at Pocatello was busy with inquiries on landfill sitings and aquifer studies. He was also involved with the design and testing of a new $200,000 straddle packer tool that will be used to monitor ground water at the Idaho National Engineering Laboratory. All of the agency's completed and continuing projects are discussed in the Research, Service, and Publications sections.

The Survey published this year the first all-digital product to issue from its computer-aided drafting and design (CADD) laboratory. The result—the geologic map of the Hailey 1° x 2° quadrangle—represented five years of field research by scientists from the Survey, the U.S. Geological Survey, and other institutions connected with the Hailey CUSMAP project.

A major research project in southwestern Idaho is winding down. Over the past few years numerous 7.5-minute quadrangles were mapped in Owyhee, Ada, and Gem counties. From this work, geologic maps are being completed for the Murphy and Boise 1:100,000-scale quadrangles. Geochemistry studies with the USGS, using $^{40}$Ar/$^{39}$Ar techniques and fossil identification, contributed to the mapping and shed light on ancient climates in the state.

The Idaho Initiative Mapping Program, the largest single project ever undertaken by the Survey, concluded its final year. During the three-year study, project staff completed over 4,000 square miles of new geologic mapping and compiled several statewide databases, including a new bibliography with over 10,000 references. The intensive field work has already produced one significant consequence—a new gold discovery near Shale Mountain in eastern Idaho.

The passage this spring of the National Geologic Mapping Act of 1992 indicates federal money may soon be available to continue other large mapping projects. State surveys will actively participate in the program under terms of the legislation. The act's purpose is to complete geologic mapping for the 80 percent of the country still unmapped at detailed scale. Federal funding for FY-93 has yet to be decided. Incidentally, the act officially renames the federal Geological Survey the United States Geological Survey and the Bureau of Mines the United States Bureau of Mines.

And, last but not least, the Survey is pleased to report the commendations given members of the staff for distinguished work. The agency's cartographic laboratory garnered national recognition for its leading role in computer-aided drafting. The computer software firm, Autodesk Retail Products, awarded the Survey third place in its contest for advanced users of the computer-drafting product, Generic CADD®. In December, the editorial department was honored by the Northwest Mining Association for excellent design and content in the Survey's 1990 Annual Report.
The Survey completed the third and final year of the Idaho Initiative Mapping Program. This project, the largest ever undertaken by the agency, more than doubled the size of the staff. Federally funded at $1.3 million for the period, the project sent 17 teams of geologists into the unexplored, rugged northern-central section of the state. Geologists and their support personnel mapped vast areas and identified promising mineral localities. In addition to the field program, Survey scientists searched the scientific literature and innumerable records for all references to the geology and mineral resources of the state and stored the information in large, computerized databases.

The impact of a study of this magnitude on the Survey will be felt for a long time. Its very size has allowed the agency to improve mapping capability and technology, to build comprehensive databases on the state's mining, and to generate much-needed geologic information, some of which is already prepared and published. Even as the program winds down, preliminary evaluations of its achievements far exceed original goals. The mapping program has undoubtedly been a success for the Survey and the state's citizens.

Research in the agency has always constituted more than just big programs. Despite the emphasis recently with major studies, the Survey's own statewide programs provide the bread and butter of standard operations. As the following account details, the staff is involved in many studies.

Boise Quadrangle

Over the past few years the Survey has undertaken a number of projects in the Boise 1° x 2° quadrangle. Many of these have been supported by cooperative funding with the U.S. Geological Survey and the Idaho Department of Water Resources. This spring, the Survey began mapping part of the area north of the Snake River (south of Boise) and preparing a preliminary air-photo map. The agency plans to produce a 1:100,000-scale geologic map compiled from the seventeen 7.5-minute quadrangles mapped so far.

Evidence from soil data, K/Ar dates, paleomagnetism, and the bracketing of terrace formations in the Boise Valley by the Glenns Ferry Formation and Bonneville Flood sediments suggests that the Boise terraces range in age from 15,000 to about 1,700,000 years old. Eight basalt lava flows in the Boise Valley were analyzed using the 40Ar/39Ar-dating facilities at the Berkeley Geochronology Laboratory, Institute of Human Origins, Berkeley, California. Dates for the samples ranged from 387,000 to 1,380,000 years old and confirmed the stratigraphy and earlier estimates of terrace formation.

Geologists found new evidence about the age and orientation of tectonic tilting and faulting of the Boise Valley terraces. Based on deformed terrace gradients, they now know that the rifting and subsidence of the western Snake River Plain continued from the Pliocene to sometime after 600,000 years ago. The two youngest terraces (about 15,000 and 150,000 years old) showed no evidence of tectonic deformation.

Survey geologists reported on the effects of the Bonneville Flood and the age, origin, faulting, and tilting of the terraces at the Pacific Northwest American Geophysical Union meeting in Richland, Washington. Other maps and reports on the geology of Boise Valley are being prepared for publication.

Borehole Straddle Packer

The Survey's Pocatello office maintained a high profile on the hydrogeologic research team assembled for the Idaho National Engineering Laboratory (INEL) oversight monitoring program administered by the Idaho Department of Health and Welfare. This past year, the Survey helped to design, build, and test a $200,000, state-of-the-art borehole straddle packer tool. The device allows hydrogeologists to sample
and test discrete zones within the Snake River Plain aquifer to depths of 1,000 feet. Construction and testing of the tool should be completed in the summer 1992. With data obtained from this research, scientists will be able for the first time to build a truly representative three-dimensional model of the aquifer.

In addition to the hydrogeologic application of the packer system, the Survey was involved in research on the geochemistry of ground water in the Snake River Plain aquifer. Scientists at the Survey and Idaho State University were awarded a contract by the Idaho Department of Health and Welfare to assemble a database on aquifer chemistry. This information will in turn be expanded with data obtained with the borehole tool.

Bruneau Hot Springs

Geologic mapping around Bruneau Hot Springs is nearly complete, and the final report is due early next fiscal year. The work is under contract with the Idaho Department of Water Resources. The geology of nineteen 7.5-minute quadrangles will be published in a summary technical report. The quadrangles include Broken Wagon Flat, Crowbar Gulch, Pot Hole Butte, Little Valley, Sugar Valley, Hot Spring, Pence Butte, Bruneau, C.J. Strike Dam, Bruneau Dunes, Grand View, Chalk Hills, Big Horse Basin Gap, Hole In Rock, Table Butte, Austin Butte, O X Lake, Perjue Canyon, and Vinson Wash. Compilations of the maps were completed in the spring for submission to the Idaho Department of Water Resources. The mapping eventually will be compiled and published at 1:100,000 scale.

Most of this area is underlain by sediments laid down in ancient Lake Idaho—a body of water, the size of Lake Erie, that covered the western Snake River Plain from 1.5 million to 10 million years ago. The lake probably formed in the spreading rift graben of the western Snake River Plain and later drained when it was breached by the cutting of the southern branch of the Columbia River, now called the Snake River. As the surrounding landscape eroded, hun-
dreds of meters of sediments and silicic ash were deposited and redeposited in the lake. Shoreline deposits included extensive beach sands and gravels containing large amounts of petrified wood, fish and mammal fossils, and freshwater clams and snails. In addition, large sand bars formed in some places, and in one area a barrier reef was built by sponges. All of these features attest to a long-lived lake that waxed and waned with the area’s climatic fluctuations.

...ancient Lake Idaho—
a long-lived lake that waxed and waned with the area’s climatic fluctuations...

Deep Microbiology

The Survey is developing hydrogeologic research programs with U.S. Department of Energy (DOE) contractors at the Idaho National Engineering Laboratory (INEL). The Pocatello office supervised Idaho State University students supported by subcontracts with INEL contractors. One of these contracts, awarded to Survey and Idaho State University researchers, involved analyzing the permeability and texture of sediments from INEL test boreholes. The Survey is also collaborating with researchers at EG&G, Idaho on initiating future research under the DOE's deep microbiology basic research program. A multiyear proposal involving Survey, University of Idaho, and EG&G scientists was submitted to the DOE for FY-94. The research calls for an extensive laboratory and field-scale hydrogeologic study of bacterial transport in ground water. Knowledge of the physical and chemical factors affecting the movement and growth of subsurface bacteria will aid in developing enhanced in-situ waste remediation technologies. The remedial processes involve biochemical degradation of hazardous materials through the control and management of resi-
dent and inoculated bacteria in the subsurface hydro-
egologic environment.

Fossil Dating

Two geologists from the Branch of Paleontology and Stratigraphy of the U.S. Geological Survey spent five days in September on field research with a Survey geologist. The cooperative work was sponsored by a USGS contract. The geologists collected fossil ostracods for dating and looked for new vertebrate fossil localities. Analysis of the work is still in progress. Reports are expected in the next two years. Results will help scientists reconstruct the geologic history of ancient Lake Idaho.

Geoanalytical Laboratory

The Survey's geoanalytical laboratory was involved in analyzing materials on several research projects: stratabound minerals from the Enterprise tunnel in the Coeur d'Alene mining district, volcanic ash in lacustrine sediments from the Clarkia fossil site, platinum in black sand placer deposits from Goodnews Bay, Alaska, the mineral natrolite at Peabody, Massachusetts, and the chemical variation in sulfosalts.

Idaho Initiative Mapping Program

The third field season of geologic mapping under the Idaho Initiative Mapping Program was conducted along the Lochsa River during the summer. Fifteen geologists mapped more than 1,400 square miles of the Bitterroot lobe of the Idaho batholith and surrounding metasedimentary rocks. As a result of this mapping, the previously unrecognized southwest margin of the Belt Supergroup was found near Lowell. In addition, numerous shear zones were located, some of which have the potential for containing mineralization. Geologic information from forty-two 7.5-minute quadrangles was digitized on the Survey's computer-aided cartographic system and presented in December as a poster display at the Northwest Mining Association Convention in Spokane, Washington. Research from previous field seasons has already been published. Geologic maps of the North Fork of the Clearwater River area (summer 1990) and the Lochsa River area (summer 1991) are now in print.

In the three years of field work under the Survey's largest research contract, geologists mapped for the first time over 4,000 square miles of essentially unexplored land in north-central Idaho. The project was also the largest geologic mapping program underway in the United States during this time.

Assessing the mineral potential over such a vast area has already produced results under the contract's primary charge. During the 1990 field season, geologists discovered gold near Shale Mountain located north of Lolo Pass on the Idaho-Montana border. There is no record of gold ever being mined in the area. Officials from the Survey, the U.S. Geological Survey, and the U.S. Bureau of Mines announced the discovery after laboratory analyses confirmed the surprising find. Whole-rock geochemical anomalies as high as 0.02 ounce of gold a ton were found at the surface in a brecciated Precambrian quartzite near the contact with overlying Challis Volcanics. The three agencies jointly reported on the discovery at the Northwest Mining Association Convention. By mid-April, over 300 mining claims had been staked in the area.

Staff continued work on compiling the Survey's bibliographic database and on revising the Mines and Prospects Map Series and accompanying database. The CADD mapping laboratory finished the digital cartography on several important projects.

Revisions on the mines and prospects data files, incorporating new properties and production figures from the U.S. Bureau of Mines' records, were completed for half the state. The second editions of several maps were being prepared for publication.

The bibliography of Idaho geology now contains over 10,300 references, and more information is being located all the time. Ninety-five percent of the citations have been edited, and the database is being reviewed for completeness and accuracy.
Digital cartographic projects being finished by the Survey's CADD lab included the maps for the second editions of the *Mines and Prospects Map Series*, geologic maps from the three summers' field work on the Idaho Initiative, and the geologic map of the Boise area. The full color Boise map broke new technological ground for the Survey in that the four-color separations were produced digitally. The geologic map for the Hailey 1° x 2° quadrangle, the result of the USGS's 5-year Hailey CUSMAP program, represented the first published map completed by the Survey as a total digital product. The CADD lab also provided valuable training to students from the University of Idaho's College of Mines and Earth Resources.

**Lead Contamination in Carpets**

The serious problem of lead poisoning in children who ingest flaking old paint in the home has been in the news for the past few years. The University of Idaho funded a cooperative study with the Survey to determine if minor and trace amounts of lead in carpets could be analyzed using a portable X-ray fluorescence unit. The study was conducted with the university's Department of Chemical Engineering in the College of Engineering. The scientists used the Survey's X-ray fluorescence instrument that has energy dispersive analytical capabilities. They found that the small portable unit had a lead-detection limit low enough to screen homes for contamination.

**Murphy Quadrangle**

During the fall, geologists mapped most of the Dorsey Butte and Jackass Butte 1:24,000-scale quadrangles, which are in the southeastern corner of the 1:100,000-scale Murphy quadrangle. The wide diversity of basaltic phreatomagmatic volcanism in this region was described in an article recently accepted for publication by the Journal of Volcanology and Geothermal Research.

**New Minerals from the DeLamar Mine**

The Survey determined the chemistry and X-ray diffraction spectra of two new minerals found in the DeLamar Mine in southeastern Idaho. The phase chemistry was partially completed for several synthetically grown minerals in the Ag₂S-Ag₅Se system. These data will help establish the composition and temperature at which the two unknown minerals formed. The next part of the study is to measure the optical properties, space group, and atomic structure of the minerals.

**Pearl Quadrangle**

Field work in the Pearl 7.5-minute quadrangle, located northwest of Boise, was limited to assisting a graduate student who is doing a thesis on the Pearl mining district. The Survey resumed mapping in June with the goal of completing a geologic map of the quadrangle. This research will add to the geologic database for urban development planning in the Treasure Valley. The study will also examine sediment-hosted, precious metal and hot-spring deposits currently being explored in the Boise-Weiser region.

**Pocatello Aquifer**

Preliminary hydrogeologic studies initiated by the Survey in the Pocatello area over the past two years led to a grant from the Idaho Water Resources Research Institute to the Survey and Idaho State University for further work in the Pocatello municipal water-supply aquifer. The current project calls for geologists to drill, monitor, and study for the first time wells in this important valley aquifer. The project created considerable interest and support from the municipality and the Idaho Department of Water Resources for possible future studies on the aquifer.

**Quaternary Lakes**

The Survey continued its cooperative research with University of Idaho faculty on the stratigraphy, geochemistry, and degree of metal contamination of sediments in the lateral lakes of the Coeur d'Alene
River. Scientists determined subbottom profiles of the lake using a depth indicator and analyzing sediment samples. The stratigraphy and geochemistry of the sediments reflect the history of mining and mineral-processing techniques in the Coeur d'Alene mining district. The South Fork of the Coeur d'Alene River flows through the district and into the lateral lakes. Results of the study will be invaluable for those scientists assessing the contamination and remediation of mine waste.

The Survey is conducting joint research on Coeur d'Alene Lake with the USGS's Water Resources Division in Boise. Scientists are interpreting the Quaternary stratigraphy of the lake basin using subbottom geophysical profiles collected by the USGS for a water quality survey. The logs show the large-scale effects of Pleistocene flooding from Glacial Lake Missoula and will aid in the research on these catastrophic floods.

**Quaternary Mapping**

The compilation for a new statewide surficial geology map was well underway. The geology of three 1:250,000-scale sheets was digitized for computer-drafted maps, and eight more sheets were in preparation. The original mapping was done as part of a cooperative effort with the USGS to update its Quaternary map of the U.S. Additional mapping is being included as the digitizing proceeds.

A new map showing the urban geology of Coeur d'Alene was also in the works. This product will combine the geology, hydrology, and engineering geology of the city in a map and graphic form for use by developers and planners.

**Seismic Risk**

Two projects were underway that are funded by the Federal Emergency Management Administration's National Earthquake Hazards Reduction Program. One study will produce a guide for determining earthquake hazards at building sites in the state. The guide will be an important aid for the commercial, industrial, and financial sectors as well as state agencies and local governments. In addition, researchers polled local jurisdictions to determine which earthquake codes were enforced. They also established a library of earthquake information on the state. The other project will study the results of the research conducted in the aftermath of the 1983 Borah Peak earthquake and will assess what scientists have learned from the largest historical seismic event in Idaho.

**Tephrochronology**

The Survey began a project this fall with the Geology Department at Washington State University to characterize the age and stratigraphy of the late Pleistocene Cascade tephra and their depositional environment in Idaho. Of special importance to the scientists are the Glacier Peak tephra. Two of three possible sites were drilled in October. In one core, geologists found more than 26 feet of ash attributed to the fallout from the eruption of Mt. Mazama. That cataclysmic event occurred about 6,700 years ago in Oregon and formed the water-filled caldera known today as Crater Lake.

**U.S. Geological Survey's Climate Program**

Paleontologists from the U.S. Geological Survey spent four weeks drilling a 900-foot core hole in sediments near Bruneau. Their work is part of the USGS's research on ancient climate cycles. The drilling program had an excellent 75-percent recovery rate. The core provided pollen samples from the deeper water portion of ancient Lake Idaho. Large lakes are excellent recorders of paleoclimate because of their location within continents and their freedom from tidal variations. The Survey recommended the site for the drilling.
worked to secure permits from the U.S. Bureau of Land Management, and helped with other logistical problems. A survey geologist spent two weeks in August at the site and provided stratigraphic information to the USGS scientists. Preliminary findings show that the climate in this area has alternated between its presently dry state and one much wetter, a condition similar to the sequoia forests on the northern California coast. Volcanic ash samples, collected for dating by the $^{40}\text{Ar}/^{39}\text{Ar}$ method, will be used to set an age framework for the core samples.

Western Idaho Ultramafic Belt

Research continued on the ultramafic rock bodies in the western Idaho accreted terrane and along or near the suture zone between this terrane and the continental crust to the east. For the main part of the ultramafic belt, rock samples revealed distinct differences. In the southern section (Riggins and New Meadows), the ultramafic rocks were normal oceanic-type peridotites. In the northern section (Asbestos Peak to Blacktail Mountain), Ca pyroxenites were more common, and peculiar hornblende-garnet-spinel rocks (metarodingites?) accompanied the peridotite bodies.
The Survey has worked hard to expand its service role. The Boise and Pocatello offices are well past their rookie seasons and are now full-fledged players on the team. Daily contact with the public, government, and industry is on a much broader scale than ever before. By all reports, the Survey is responding effectively to the varied concerns of its clientele.

Again this year the Survey reviews the most deserving of its current work. This includes new items as well as updates on regular programs. For FY-92, Service involved the following activities.

Bayhorse Core

Rock core from a 3,749 foot-deep diamond drill hole was salvaged by the Survey in July. The hole was drilled in 1987 by Shama Minerals Corporation, which declared Chapter 11 bankruptcy in 1990. The core is from a complete section through the Bayhorse anticline and includes rock from the Rams horn Slate, the Bayhorse Dolomite, the Garden Creek Phyllite, and the informally named Bayhorse Creek dolomite. This metasedimentary rock ranges in age from Cambrian through Ordovician. The core represents the most complete section of the early Paleozoic in this part of the state. The hole bottomed in what may be a Tertiary rhyolite(? porphyry. The core was moved by truck (compliments of Earl Waltie of Challis) from Challis to a warehouse in Osburn owned by Coeur d'Alene Mines Corporation. These rocks and other core stored in Osburn will eventually be housed in the Survey's core repository scheduled for construction at the University of Idaho in 1993 or 1994.

Bunker Hill Mine Records

In July, Survey personnel spearheaded a joint industry-government project to move for safekeeping over thirty pallets of maps and documents from the defunct Bunker Hill Mine. The materials had been stored in a large walk-in safe on the second floor of the mine's engineering building. Sunshine Mining Company provided a flatbed truck to haul the map and file cases to an Osburn warehouse furnished by Coeur d'Alene Mines Corporation. At Osburn, Faucett International unloaded the truck. The records contain geologic information about the huge mine (over 150 miles of underground workings) and considerable engineering and exploration data. The Survey contacted the Bunker Hill Company Ltd. about safeguarding the records after the company had earlier declared bankruptcy.

Disaster Preparedness

Last year was Idaho's first year of eligibility for financial support under the National Earthquake Hazards Reduction Program (NEHRP). The Survey has received two grants under this program and has another one for 1992. Guidelines in the act require the state to match the federal contribution in increasing amounts annually. The services of the Survey staff provide the state with a good part of the match. By executive order, federal regulations will soon impose earthquake-resistant construction in all federally funded buildings. The Survey is currently evaluating the effect this action will have on Idaho.

Under the NEHRP program, staff geologists prepared a brochure on earthquake awareness for the general public. The attractive color publication unfolds to make a poster depicting the earthquake risk in Idaho. The brochure was published this spring by the Idaho Bureau of Disaster Services.

A representative from the Survey attended the annual meeting of the Western States Seismic Policy Council held in Santa Fe, New Mexico. The session featured a geologic field trip to the Los Alamos National Laboratory. The report on Idaho was prepared and presented by the Bureau of Disaster Services and the Survey.

The Survey's studies on Idaho's earthquake hazards are being widely applied outside the state. The Survey is providing technical assistance to the Repub-
lic of Colombia on school safety measures for earthquakes. The state of New York is using an Idaho study in preparing its own earthquake education plan.

Idaho is one of three state studies cited by California in its development of a national guide for establishing state earthquake safety commissions.

Earthquake Monitoring

A major expansion in the state's earthquake monitoring was completed this year. Fifteen new seismograph stations were installed in the North Idaho Seismic Network (NISN). This brings the count to twenty-six stations deployed in this part of the state. The NISN enables better coverage of rockbursts in the Coeur d'Alene mining district and broader regional monitoring of natural earthquake hazards in Idaho and surrounding states. The network is operated by the Department of Geology and Geological Engineering at the University of Idaho. Primary funding for the seismic array is provided by the VPI Geologic Mineral Technology Center for Mines System Design and Ground Control and the U.S. Bureau of Mines' Spokane Research Center.


Earth Science Education

The Survey conducted its sixth annual workshop for teachers in the summer. The environmental geology and hydrology workshop was cosponsored by the Survey and the Idaho Water Resources Research Institute and was held at the University of Idaho's McCall field campus. McCall was the site for the inaugural workshop in 1986. The location was particularly suitable this year because of the workshop's emphasis on applying geologic knowledge to an area undergoing residential and recreational development. The workshop combined field observations of glacially derived landforms and deposits with the study of water. Included in the curriculum was the Institute's new project WET, or Water Education for Teachers, as well as the on-site examination of geologic and water conditions. The workshop was fully enrolled with twenty-five teachers. Along with the support from the Survey and the Institute, additional funding for the workshop came from a U.S. Department of Education, Dwight D. Eisenhower Act grant awarded by the Idaho Department of Education.

The Survey is helping plan the annual conference of the Idaho Science Teachers Association. It will be held in October 1992 at Post Falls. An area's geology always plays an important role for these meetings. Several field trips are scheduled for the conference. A key topic on the agenda is the role of outrageous hypotheses in the development of geologic thought.

Field Trips

Each year the Survey participates in a number of field trips to study regional geology "close-up and personal." The trips are organized to address different levels of expertise, from introductory overview to analytic detail. Notable this year were several scientific explorations into the outdoor laboratory. In the summer the Survey led a day trip by jet boat into Hells Canyon for the Continuing Education Program at the University of Idaho. Participants observed ancient volcanoes and eroding sandbars. In September, a Survey member led a trip to examine the lacustrine and volcanic geology south of Bruneau. Those in attendance included geologists from the Idaho Department of Water Resources and the U.S. Geological Survey. In October, the Survey accompanied a trip arranged by Friends of the Pleistocene, a national organization of professional geologists, to inspect the volcanics and
Lake Bonneville sediments in the area around Delta, Utah. Geologists working on the Idaho Initiative Mapping Program held several trips for government and academic scientists on the Precambrian stratigraphy of eastern Idaho and western Montana.

Geoanalytical Laboratory

The Survey's geoanalytical laboratory operates two X-ray diffraction instruments, a scanning electron microscope, an X-ray fluorescence detector, and an electron microprobe. This year the Survey and the University of Idaho's College of Mines and Earth Resources received private money for newer instrumentation. The Murdock Foundation partially funded the purchase of a new state-of-the-art X-ray powder diffraction instrument and single crystal diffractometer.

A new backscatter electron detector was bought from research funds. This attachment to the scanning electron microscope enables Survey scientists to examine materials at analytical levels not previously attained. The detector allows the scientist to study very subtle differences in surface concentrations on rough, unpolished materials. Differences in chemical variation can be seen and photographed at magnifications as high as 10,000x.

Mining Industry Review

Monitoring mineral exploration and mining in Idaho is an annual fall project of the Survey. Due to the nationwide recession and depressed metal prices, exploration was down about half from last year, though two new gold mines opened. The 1991 report on Idaho's mining was given at the Northwest Mining Association's annual meeting in Spokane. The report covered field visits to ten mines and advanced projects and information from over 100 government and industry representatives. The Survey also released the results of this annual summary through industry journals and U.S. Bureau of Mines' reports. The Survey is frequently the first contact for companies starting mineral exploration in the state.

National Geologic Mapping Act of 1992

In July, the State Geologist testified on behalf of the National Geologic Mapping Act before the U.S. Senate subcommittee on mineral resources development and production. The act, sponsored by the Association of American State Geologists (AASG) and the U.S. Geological Survey, provides for mapping the geology of the United States at a scale of 1:24,000. Governor Cecil Andrus obtained unanimous approval for the act from the National Governors' Conference. Field work will be conducted primarily by the state surveys and the USGS with assistance enlisted from scientists at state universities. The authorization act became law near the end of the federal fiscal year. The AASG will be actively encouraging Congress to fund the annual $25 million program.

Oil and Gas

No new exploration holes were drilled in the state during the past year. The oil and gas records in the Survey's library are still a well-used resource for stratigraphic and hydrologic information. The Survey is working with the Idaho Department of Water Resources in assessing the quality of formational waters in the Overthrust Belt of southeast Idaho.

Southeast Idaho Landfills

The Pocatello branch office has generated a high degree of visibility among counties and municipalities in southeast Idaho through its involvement with landfill sitings. The Survey was called upon by the Southeast Idaho Solid Waste Advisory Committee and individual counties for technical assistance. The staff geologist gave public presentations on the geotechnical criteria of landfills, attended meetings with officials, visited sites in Bannock, Bingham, and Caribou counties, and prepared advisory reports on site selection for Bingham and Caribou counties. Results from an Idaho State University thesis project (supervised in part by the Survey's Pocatello office) were instrumental in Bannock County's decision to have a
complete geotechnical site assessment of its existing and proposed regional landfill. The Survey conducted a preliminary study funded by Bingham County on soil moisture and permeability of a proposed landfill expansion site. After potential seepage problems were identified, the site was abandoned on the Survey’s recommendation.

Western State Geologists Meeting

In September, the Survey hosted for the first time the annual cluster meeting of western State Geologists with scientists from the U.S. Geological Survey in Moscow. The two days of meetings and field trips are important for regional interagency communication and planning at the state and federal levels. The featured theme for this year was computerized mapping. A staff member from the Survey’s computer-aided drafting design laboratory demonstrated the use of Generic CADD<sup>®</sup> to make geologic maps. Representatives from the USGS showed examples of how they are using GIS (Geographic Information System) for geologic maps.
Eight decades of publications sustain the Survey as the leading authority on the state's geology. Over 450 books and maps endorse a well-deserved reputation. This long-standing respect within the scientific community has of course solid research at its core. Once the research is done, the Publications Department completes the task of generating a readable and accurate product. With publication, vital work is finally brought to the greatest number of users.

The Publications Department also conducts other essential business for the Survey. It administers and performs internal operations necessary to enhance the staff's productivity and to keep the agency functioning well and looking its best. Some of these matters have been expediently assumed as duties over the years in the interests of getting the job done. Much has been further undertaken on the department's own initiative to aid staff commitments or to promote agency programs. For example, this year the Publications staff created the Survey's first corporate display in the foyer of the University of Idaho's Administration building. This special exhibit remained on view to the university community and its visitors for the month of November.

The editor and publications designer are frequently called upon to edit, design, and produce more than just books and maps. Considered collectively, these nonpublishing enterprises contribute significantly to the agency's well-being. The department routinely plans, develops, and executes the following additional activities beyond its major publishing role:

- The official stationery, business cards, envelopes, bookmarks, and other printed material representing the Survey.
- Commercial advertisements to newspapers, magazines, trade journals, telephone books, and catalogs.
- Brochures, flyers, mail forms, and bulk mailers announcing Survey activities.
- Forms for internal agency use, such as inventory, order blanks, tracking sheets, and organizational charts.
- Illustrations and title covers for proposals and final reports on government grants and contracts.
- Signs and posters for the office.
- Displays, signs, name tags, and cover sheets for professional meetings and conventions.
- Letters, memos, and other documents, as requested by staff.

In December the Publications Department received the Northwest Mining Association's inaugural "Award of Excellence" commending the design and editorial content of the agency's 1990 Annual Report. The Survey is particularly pleased with this unique recognition.

In FY92 the following reports were published:


Robert W. Bartlett  
DIRECTOR

Earl H. Bennett  
ASSOCIATE DIRECTOR
STATE GEOLOGIST

Dreucine C. Bonner  
PROGRAM COORDINATOR

Bill Bonnichsen  
RESEARCH GEOLOGIST

Roy M. Breckenridge  
RESEARCH GEOLOGIST

Charlotte D. Fullerton  
ACCOUNT TECHNICIAN

Virginia S. Gillerman  
RESEARCH GEOLOGIST

Ann G. Killen  
PUBLICATIONS ASSISTANT

Charles R. Knowles  
RESEARCH GEOLOGIST
Nola Steuer
PROGRAM COORDINATOR

Nola Steuer joined the Survey in June as secretary/program coordinator in the publications sales office replacing Deacina Bonner who left in April. Originally from eastern Montana, Nola has lived in Moscow for ten years and has owned and operated a local typing/word-processing service for the last several years. In her business, she has had experience in designing and preparing technical papers, newsletters, resumes, posters, flyers, and general correspondence. Nola’s first contact with the Survey came through the University of Idaho’s STAR program that supplies personnel to fill temporary positions on campus. Now, as a permanent Survey employee, Nola is the receptionist and handles the sales of publications and maps.
Publications


Abstracts


Presentations


Caribou County Landfill Site Recommendations, by John A. Welhan: Report and recommendations to Caribou County commissioners, January.


The Chalki Earthquake, by Virginia S. Gilleran: Interview on Channel 6 TV NewsCast, Boise, December.

Changes in Materials Science Over Forty Years, by Robert W. Bartlett: TMS/AMS Student Association, Washington State University, Pullman, March.


Copper Hydrometallurgy, by Robert W. Bartlett: Asociacion de Ingenieros de Minas, Metalurgistas, and Geologos, Guadalajara, Mexico, April.


Demonstration of Rapid Visual Screening of Buildings for Potential Seismic Hazards, by Roy M. Breckenridge: Geology 360 class, Use of Applied Technology Council Publication 21, University of Idaho, November.

Earthquake Research in Idaho, by Roy M. Breckenridge: Western States Seismic Policy Council XIV annual meeting, Santa Fe, New Mexico, November.


Environmental Geology, by John A. Welhan: Geology Department, Idaho State University, November.

An Evaluation of the Earthquake Hazard in Idaho, by Roy M. Brecken- ridge: Geology 360 class, University of Idaho, November.

Explosive Volcanism, by M.M. Godchaux and Bill Bonnichsen: Geol- ogy Department, Washington State University, Pullman, Washington, March.

Geologic Setting of the Moscow Area, by Kurt L. Otteberg: Water Education for Teachers Workshop, Idaho Water Resources Research Institute, University of Idaho, May.

Geology and Petrology of the Northern Part of the Bitterroot Lobe, Idaho Batholith—A Preliminary Report, by Reed S. Lewis: Geological Society of America, Cordilleran Section meeting, Eugene, Oregon, May.

Geology of the Clark Fork Area, by Roy M. Breckenridge: University of Idaho’s Clark Fork field campus, July.

Great Pleistocene Floods of Idaho, by Roy M. Breckenridge: University of Idaho’s visiting journalist program, March.

Ground Water—Stream Interaction Deduced by Hydrochemistry and Stable Isotopes, by John A. Welhan: Hydrogeology colloquium, Boise State University, October.

Heating Learning, by Robert W. Bartlett: Asociacion de Ingenieros de Minas, Metalurgistas, and Geologos, Guadalajara, Mexico, April.

The History of the Fabulous Coeur d’Alene Mining District, Idaho, by Earl H. Bennett: New Mining Museum fundraiser, Boise, December.

Idaho’s Mining Future, by Earl H. Bennett: Idaho Mining Association Convention, Coeur d’Alene, August.

Landfill Site Criteria in Southeast Idaho, by John A. Welhan: Southeast Idaho Solid Waste Advisory Committee, November.


Particulate Processing, by Robert W. Bartlett: American Institute of Mining, Metallurgical and Petroleum Engineers meeting, San Diego, California, March.

Results of Geologic Mapping During the Idaho Initiative Project, by Reed S. Lewis: Department of Geology and Geological Engineering, University of Idaho, February.

Results of Geologic Mapping During the Idaho Initiative Project, by Reed S. Lewis and Russell F. Burnmester: Geology Department, University of Montana, January.

Rhyolitic Lava Flows in southwestern Idaho, by Bill Bonnichsen: Volcanology class, University of Massachusetts, Amherst, Massachusetts, February.


Some Physical Aspects of Heap Leaching of Cold Ores, by Robert W. Barlett: University of Zacatecas, Mexico, April.

Stratigraphic Importance of Cascade Tephra in Dating Pliocene and Late Tertiary Deposits of Northern and Central Idaho, by Roy M. Breckenridge: Paleomony field seminar, Department of Geology, Washington State University, October.

Surface Water—Ground Water Interaction: Identification of Nutrient Sources in Non-Point Source Studies, by John A. Welhan: Biology Department seminar, Idaho State University, November.


The Three Types of Phenomenon Magmatic Volcanoes in the Western Snake River Plain, Idaho, by M.M. Godchaux and Bill Bonnichsen: Poster presentation at 38th Pacific Northwest Geophysical Union annual meeting, Richland, Washington, September.

Volcanism in the Snake River Plain, by Bill Bonnichsen and M.M. Godchaux: Geology Department, Washington State University, Pullman, Washington, March.

Volcanism in the Snake River Plain, Idaho, by Bill Bonnichsen: 38th Pacific Northwest Geophysical Union annual meeting, Richland, Washington, September.

Professional Activities


38th Pacific Northwest Geophysical Union annual meeting, Richland, Washington, September (B. Bonnichsen, K.L. Ohlberg).

American Association of State Geologists, Western States Cluster meeting, Moscow, September (E.H. Bennett, R.M. Breckenridge, V.S. Gilleman).

Awarded third place in Generic CADD’s technical computer-drawing contest with the early draft of the Geologic Map of the Boise Valley and Adjoining Western Snake River Plain, Idaho (J.R. Stanford).

Award of Excellence from the Northwest Mining Association for graphic design, technical information, and financial reporting in the Survey's 1990 Annual Report (A.G. Killen, R.C. Stewart).

Chair, Association of American State Geologists' environmental affairs committee (E.H. Bennett).

Chair, Association of American State Geologists's John Frye environmental award committee (E.H. Bennett).

Chair, Boise GEM section, American Institute of Mining, Metallurgical and Petroleum Engineers (V.S. Gilleman).

Chair, College of Mines and Earth Resources' computer committee (E.H. Bennett).

Chair, College of Mines and Earth Resources/Idaho Geological Survey Instruments committee (C.R. Knowles).

Chair, Northwest Mining Association's history committee (E.H. Bennet).

Co-chair, surficial geologic processes symposium, 38th Pacific Northwest Geophysical Union annual meeting, Richland, Washington, September (K.M. Breckenridge).

Disaster coordinator, Idaho Military Division, Idaho Bureau of Disaster Services, Boise (R.M. Breckenridge).

Education advisory committee, American Geological Institute, July-December (K.L. Ohlberg).

Emergency responder and member, toxic waste and hazardous materials team, University of Idaho (C.R. Knowles).

Fellow, Geological Society of America (B. Bonnichsen).

Fellow, Society of Economic Geologists (B. Bonnichsen).

Field trip, geologic setting of the Los Alamos National Laboratory, Western States Seismic Policy Council XIV annual meeting, Santa Fe, New Mexico, November (R.M. Breckenridge).


Geological Society of America annual meeting, San Diego, California, October (C.R. Knowles, K.L. Ohlberg).

Geological Society of America, Cordilleran Section meeting, Eugene, Oregon, May (R.S. Lewis).


Idaho Science Teachers Association annual meeting, Pocatello, October (K.L. Ohlberg).

Instructor, enrichment course on Palouse scablands, University of Idaho, July (K.L. Ohlberg).

Instructor, Geology 4211, ore deposits, Boise State University, spring semester (V.S. Gilleman).


Instructor, Metallurgy 409, solution mining, University of Idaho, spring semester (R.W. Barlett).

Instructor, Metallurgy 414, metallurgical process design, University of Idaho, spring semester (R.W. Barlett).
Instructor, stereo (3-D) photography in geology, 4H Teen Conference, Moscow, June (L.K. Stanford).

Instructor, team taught, Geology 360, geologic hazards, University of Idaho, fall semester (R.M. Breckenridge, K.L. Obbigh).

Instructor, team taught, Geology 335/Geography 315, geomorphology, University of Idaho, spring semester (K.L. Obbigh).

Instructor, team taught, Geology 504, environmental geology and hydrology workshop, University of Idaho, McCall, summer semester (K.L. Obbigh).

Leader, field trip, evaluation, and geotechnical advice on county landfill site for Caribou County commissioners, December (J.A. Wel- han).

Leader, field trip in southwestern Idaho, Friends of Rhyolite, July (B. Bonnichsen).

Leader, field trip on geology of Clark Fork area, University of Idaho's Clark Fork field campus, July (R.M. Breckenridge).

Leader, field trip on Pocatello's aquifer/municipal water supply, 6th grade class, Indian Hills Elementary School, Pocatello, November (J.A. Welhan).

Leader, field trips for 6th-grade elementary school classes, Boise area, April and May (V.S. Gilleran).

Liaison, Water Education for Teachers (Project WET) groundwater flow model, southeast Idaho (J.A. Welhan).

Manuscript reviewer, University of Minnesota at Duluth and American Geophysical Union (B. Bonnichsen).

Member, American Association for the Advancement of Science (K.L. Obbigh).

Member, American Geophysical Union (J.A. Welhan).

Member, American Quaternary Association (K.L. Obbigh).

Member, American Association of American State Geologists' liaison committee (E.H. Bennett).

Member, Association of American State Geologists' western lands committee (E.H. Bennett).

Member, Athena, University of Idaho professional women's organization (M.D. Jenkins).

Member, design team, inspection and factory testing of Idaho National Engineering Laboratory Oversight Monitoring Program's borehole straddle packer, Denver, Colorado, March (J.A. Welhan).

Member, Geological Society of America (V.S. Gilleran, K.L. Obbigh).

Member, Geological Society of Nevada (V.S. Gilleran).

Member, Hazardous Waste Management Council, Idaho State University (J.A. Welhan)

Member, National Association of Geology Teachers (K.L. Obbigh).

Member, National Earth Science Teachers Association (K.L. Obbigh).

Member, National Science Teachers Association (K.L. Obbigh).

Member, Northwest Mining Association's centennial committee (E.H. Bennett).

Member, planning committee and field trip coordinator for 1992 Idaho Science Teachers Association Conference in Post Falls, Idaho (K.L. Obbigh).

Member, Representative Larry Laroico's silver advisory committee (R.W. Bartlett, E.H. Bennett).

Member, review panel for asbestos accreditation, National Institute of Standards and Technology, Chicago, Illinois, February (C.R. Knowles).

Member, Society of Economic Geologists (V.S. Gilleran).

Member, steering committee for nonstructural seismic hazards workshops, Idaho Bureau of Disaster Services (R.M. Breckenridge).

Member, technical advisory board, North Idaho Seismic Net (R.M. Breckenridge).

Members, American Institute of Mining, Metallurgical and Petroleum Engineers (R.W. Bartlett, V.S. Gilleran).

Members, Association of Earth Science Editors (M.D. Jenkins, R.C. Stewart).

Members, Idaho Association of Professional Geologists (V.S. Gilleran, J.A. Welhan).


Members, Northwest Mining Association (E.H. Bennett, V.S. Gilleran).

Microbeam Analysis and Electron Microscopy annual meeting, San Jose, California, August (C.R. Knowles).

National Asbestos Council meeting, Pittsburgh, Pennsylvania, April (C.R. Knowles).


Northwest State/Province meeting, Association of Earth Science Editors, Northwest Mining Association Convention, Spokane, Washington, December (R.C. Stewart).

Participant, Occupational Safety and Health Administration's hazardous materials safety training course, Pocatello, February (J.A. Welhan).

Plenary invited speaker, International Kellogg Symposium, American Institute of Mining, Metallurgical and Petroleum Engineers (AIME), September (R.W. Bartlett).

Representative, Chemstar Lime Mine ground-breaking, August (J.A. Welhan).

Representative, Department of Geology and Geophysics, University of Idaho (B. Bonnichsen).

Representative, Department of Geosciences, Boise State University (V.S. Gilleran).

Representative, Division of Environmental Quality wellhead protection planning committee, Boise, February (J.A. Welhan).

Representative, Earthquake Engineering Research Institute, Oakland, California (R.M. Breckenridge).
Representative, Idaho Geographic Information advisory committee meeting, Boise, November (V.S. Gillerman).

Representative, Idaho Natural Resources Roundtable (V.S. Gillerman).

Representative, Idaho Water Resources Research Institute Policy Advisory Committee, September (J.A. Welhan).

Representative, U.S. Geological Survey's upper Snake River basin national water quality assessment liaison committee, October (J.A. Welhan).

Team leader, water-quality project, INEL (Idaho National Engineering Laboratory) Oversight Program, R & D Project 1, Quality Assurance and Project Plan, Moscow field test project (J.A. Welhan).


Technical expert for asbestos accreditation, National Institute of Standards and Technology (C.R. Knowles).

Technical expert interview, KXLY Television (Spokane) news story on Idaho's earthquakes, May (R.M. Breckenridge).


Trustee, Belt Association (E.H. Bennett).

Western States Seismic Policy Council, XIV Annual Meeting, Santa Fe, New Mexico, November (R.M. Breckenridge).

Graduate Thesis Committees

Troy Buenenge, M.A., History, University of Idaho (E.H. Bennett).


Jeanne Fromm, M.S., Geology, Idaho State University (J.A. Welhan).

Therese Harris-O'Connell, M.S., Geology, University of Idaho (B. Bonnichsen).

Andrew Hill, M.S., Geophysics, University of Idaho (R.M. Breckenridge).

Douglas Jones, M.S., Geology, 1992, University of Idaho (R.M. Breckenridge).

Jon Kaminsky, M.S., Geology, Idaho State University (J.A. Welhan).

James Keith, M.S., Geology, Idaho State University (J.A. Welhan).

Gary Kindel, M.S., Geology, Idaho State University (J.A. Welhan).

Robert McLeod, M.S., Hydrogeology, 1992, Memorial University of Newfoundland, Canada (J.A. Welhan).

Timothy Mibu, Ph.D., Biology, Idaho State University (J.A. Welhan).

Victoria E. Mitchell, Ph.D., Geology, University of Idaho (E.H. Bennett).

Robert Mullener, M.S., Geology, Boise State University (V.S. Gillerman).

Wayne Pudney, M.S., Geology, Idaho State University (J.A. Welhan).

Blaine Rowley, M.S., Hazardous Waste Management, Idaho State University (J.A. Welhan).

H. Scott Schilleroff, Ph.D., Hydrogeology, 1992, Memorial University of Newfoundland, Canada (J.A. Welhan).

Charles Unsworth, M.S., Geology, 1992, Boise State University (V.S. Gillerman).

Grants and Contracts

Borah Peak earthquake—10 years later: R.M. Breckenridge and K.F. Spenke (National Earthquake Hazard Reduction Program, Idaho Bureau of Disaster Services, $6,000).

Determination of hydraulic and chemical properties influencing subsurface microorganisms: J.A. Welhan and H.T. Ore (EC&G Idaho, Inc., $8,748, contract extension).


Fielding landfill expansion site investigation, Bingham County: J.A. Welhan (Bingham County, Public Works Department, $500).

Geologic mapping of the Bannock Hot Springs area: B. Bonnichsen (Idaho Department of Water Resources, $47,540, second year, revised final completion date—August 1, 1992).


Hydrogeologic studies of Pocatello's municipal water supply aquifer and development of a hydrogeologic teaching laboratory: J.A. Welhan and H.T. Ore (Idaho Water Resources Research Institute, $10,700).


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Idaho continued to avoid the national recession by virtue of the fairly strong economy in the southern part of the state. This good fortune allowed the state to fund one-time salary adjustments in the Survey. The agency’s budget allocation rose from $477,500 last year to $538,300 for FY-92. Most of the increase came about because the State Legislature finally addressed salary parity and brought salaries of the agency’s geologists closer to those of equivalent University of Idaho faculty. Although still behind in pay for equivalent faculty rank, the wage hike did give the Survey some of the largest raises in the state; one staff member received the biggest single increase of any state employee. In other budget categories, capital outlay was cut from $10,000 to $5,000, and the operating expense account was boosted $1,500.

Additional funds supplied by research grants and contracts totaled $648,680, a record amount in the agency’s history over last year’s revised previous high of $585,760. This is $110,380 more than the total state appropriation available to the Survey. Despite its relatively small size, the agency is once again in the top-ten of state surveys in acquiring outside funds. The Idaho Initiative Mapping Program ($450,000 each year) finished its third year. The 2-year contract ($103,000) with the Department of Water Resources completed its second year. Smaller yet significant agreements with the Idaho National Engineering Laboratory, the U.S. Geological Survey (COGEMAP), and the Bureau of Disaster Services (NEHRP) contributed to the total. In its first year, the Pocatello office obtained $51,580 in additional research money.

### Recent Budget History—Fiscal Years 1988-1992

<table>
<thead>
<tr>
<th>FISCAL YEAR</th>
<th>FY-88</th>
<th>FY-89</th>
<th>FY-90</th>
<th>FY-91</th>
<th>FY-92</th>
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<tr>
<td>Personnel</td>
<td>$276,500</td>
<td>$350,400</td>
<td>$389,000</td>
<td>$418,900</td>
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<td>Operating Expense</td>
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<td>56,600</td>
<td>58,600</td>
<td>60,100</td>
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<td>Capital Outlay</td>
<td>8,000</td>
<td>8,000</td>
<td>5,000</td>
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<tr>
<td>TOTAL</td>
<td>$332,600</td>
<td>$417,300</td>
<td>$445,600</td>
<td>$477,500</td>
<td>$538,300</td>
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* $10,000 in Capital Outlay authorized from salary savings.

### Overview of Grants and Contracts—Fiscal Year 1992

<table>
<thead>
<tr>
<th>FUNDING AGENCY</th>
<th>PROJECT/ITEM</th>
<th>AMOUNT</th>
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<tbody>
<tr>
<td>Bingham County</td>
<td>Land fill</td>
<td>$500</td>
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<tr>
<td>EGAGG, Idaho</td>
<td>Micro-organisms</td>
<td>8,748</td>
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<tr>
<td>Idaho Bureau of Disaster Services</td>
<td>Borah Peak earthquake</td>
<td>6,000</td>
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<tr>
<td>Idaho Department of Health and Welfare</td>
<td>INEL oversight monitoring program</td>
<td>31,632</td>
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<tr>
<td>Idaho Department of Water Resources</td>
<td>Geologic mapping—Bruneau Hot Springs</td>
<td>47,540</td>
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<td>Idaho Water Resources Research Institute</td>
<td>Pocatello aquifer chemistry</td>
<td>10,700</td>
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<tr>
<td>Idaho Department of Education</td>
<td>Geology workshop for teachers</td>
<td>6,960</td>
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<td>Idaho Board of Education</td>
<td>Clarkia volcanic ash dating</td>
<td>30,600</td>
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<td>University of Idaho Research Council</td>
<td>Lead in carpets</td>
<td>6,000</td>
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<tr>
<td>U.S. Geological Survey</td>
<td>Idaho Initiative Geologic Mapping Project</td>
<td>450,000</td>
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<tr>
<td>U.S. Geological Survey</td>
<td>Boise, COGEMAP</td>
<td>50,000</td>
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TOTAL $648,680
IDaho Geological Survey Enabling Act

47-201. GEOLOGICAL SURVEY CREATED—PURPOSE—ADVISORY BOARD. There is hereby created the Idaho geological survey, to be administered as a special program at the university of Idaho under the authority of the board of regents of the university of Idaho. This survey will conduct business hereafter carried out by the Idaho bureau of mines and geology. The survey shall be the lead state agency for the collection, interpretation, and dissemination of geologic and mineral data for Idaho. Such information is to be acquired through field and laboratory investigations by the staff of the survey and through cooperative programs with other governmental and private agencies. There is hereby established an advisory board for the survey, consisting of the following members: The dean of the college of mines and earth resources of the university of Idaho, who shall be director of the survey and board chairperson (voting); the chairman of the department of geology at Boise state university; the chairman of the department of geology at Idaho state university; the president of the Idaho mining association, or so long as said association continues to exist and elect a president; the governor of the state of Idaho or his designated representative; a member of the board of land commissioners designated by the state land board; the president or his designee of the Idaho association or professional geologists; and two (2) members at large selected by the director from other state or federal organizations, or from the private sector with a direct interest in the survey’s programs, both serving two (2) year staggered terms; all of whom shall serve as members of the said board and shall be compensated as provided by section 59-309(b), Idaho Code.

47-202. MEETINGS—OFFICE—STATE GEOLOGIST. The advisory board shall hold annual meetings at the university of Idaho, Boise state university or Idaho state university on the first Monday of June of each year and such other meetings as it may determine. The chief office of said survey and the office of its secretary shall be maintained at the university of Idaho. The director of the survey, or a professional geologist in the survey if so appointed by the director, is designated state geologist.

47-203. DUTIES—PUBLICATIONS—COORDINATION WITH OTHER AGENCIES—SATELLITE OFFICES. It shall be the duty of the said state survey to conduct statewide studies in the field; laboratory studies; prepare and publish reports on the geology and mineral resources of the state; maintain laboratory facilities to perform noncommercial mineral and chemical analyses; fix a price upon printed reports not used in exchange with other state bureaus or surveys, universities or public libraries, and deposit receipts from sales in a printing fund to be used for the preparation and publication of reports of the survey, and for no other purpose. The survey shall be allowed to seek and accept funded projects from and cooperative programs with other agencies for support of the survey’s research and service activities as authorized by the board of regents. All funds received from these projects shall be used for said projects and services. The survey shall be allowed to have satellite offices at the geology departments of Boise state university and Idaho state university.

47-204. REPORTS. The state geological survey shall annually, on or before the first day of January, make to the governor of the state and to the president of the university of Idaho a report detailing major events during the previous year concerning the geology and mineral resources of the state, a report of its expenditures and of the work of said survey during the preceding year, and budget requests for the following year; and it shall make a similar report of its dealings and its expenditures to the state legislature through the legislative council.