

Annual Report of the Idaho Geological Survey

Fiscal Year 2007

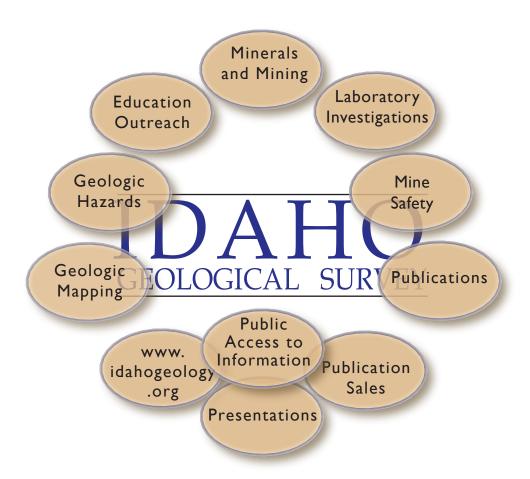
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Highlights

The funding and collegial support provided through cooperative projects have long been integral components of the agency's operation. The activities highlighted for the 2007 Annual Report represent long-term research and service programs by the Survey. Over time, the staff has developed wide-ranging interdisciplinary networks in support of its mission. For a one-year snapshot of what has been a very productive synergy, look at the *Partners and Collaborators* section below for the many organizations currently involved in Survey projects. This is a tribute to the staff's interest, initiative, and ingenuity in building these relationships. Details of the staff's professional engagement in the agency's agenda are in the *Staff Publications and Activities* section at the end of this report.

Mission Statement



The Idaho Geological Survey is the lead agency for collecting and disseminating geologic information and mineral data in the state. In addition to its main office in Moscow at the University of Idaho, the Survey has branch offices in Pocatello at Idaho State University and in Boise at the Idaho Water Center and also Boise State University. Staff geologists conduct applied research with a strong emphasis on producing maps and information on Idaho's geologic setting, earth resources, and geologic hazards. Externally funded projects enhance this research.

Administration

Partners and Collaborators

The Survey's statewide mission encourages interdisciplinary partnerships and collaboration with many other agencies, organizations, and universities. This broad cooperation ranges from direct grants for individual projects to the collegial sharing of expertise and information. On the national level, the Survey is also directly involved in the initiatives of the Association of American State Geologists. These alliances offer many opportunities to engage in projects that enhance the agency's applied research and outreach.

Funding Partners

Idaho Bureau of Homeland Security ~ Idaho Department of Environmental Quality ~ Idaho Department of Lands ~ Idaho State University ~ Idaho Transportation Department ~ Incorporated Research Institutions for Seismology ~ National Park Service ~ National Science Foundation ~ U.S. Bureau of Land Management ~ U.S. Forest Service ~ U.S. Geological Survey ~ U.S. Mine Safety and Health Training Program ~ University of Idaho Research Office ~ Washington State University

Collaborators

Association of American State Geologists ~ Belt Association ~ Boise State University ~ Bonner County Museum ~ Cooperative Ecosystem Studies Units ~ Earthquake Engineering Research Institute ~ Greater Portneuf Water Resource Partnership ~ Ice Age Floods Institute ~ Idaho Conservation League ~ Idaho Earth Science Teachers Association ~ Idaho Mining Association ~ Idaho National Laboratory ~ Idaho Water Resources Research Institute ~

Inside Idaho ~ Intermountain Forest Tree Nutrition Cooperative ~ Intermountain Regional Advisory Council, Advanced National Seismic System ~ Latah County Historical Society ~ Lewis Clark State College ~ Montana Bureau of Mines and Geology Earthquake Studies Office ~ Natural Resources Conservation Service ~ Nez Perce County ~ North Idaho College ~ Northwest Mining Association ~ Oregon Department of Geology and Mineral Industries ~ Pacific Northwest National Laboratory and Battelle-Pacific Northwest Division ~ Pocatello Ground Water Task Force ~ Tobacco Root Geological Society ~ U.S. Department of Agriculture Plant Materials Center, Agricultural Research, Washington State University ~ University of Utah Seismograph Stations ~ Utah State University ~ Washington Division of Geology and Earth Resources ~ Western North American Volcanic and Intrusive Rock Database ~ Western States Seismic Policy Commission

Association of American State Geologists

The Survey is an active participant in the Association of American State Geologists (AASG). As Idaho State Geologist, Roy Breckenridge attended the annual meeting in Florida, the spring liaison in Washington, D.C., and the Western States Cluster meeting in Utah. Roy is chair of the minerals and policy committee and served the third year of a three-year term as the Western Regional Representative on the U.S. Geological Survey's Peer-Review Panel for the STATEMAP Component of the National Cooperative Geologic Mapping Program (NCGMP). The AASG is a strong advocate for the federal reauthorization of the NCGMP as well as research programs for data preservation, minerals and energy resources, and geologic hazards.

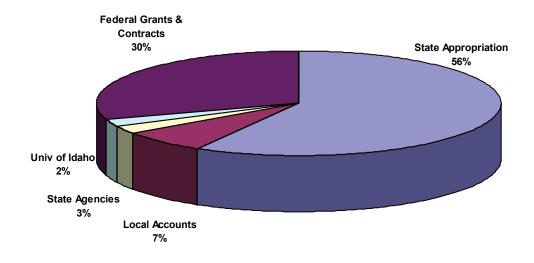
Fiscal Overview

This year, the State Legislature funded a merit salary increase that averaged 5 percent. The Survey's operations budget was again funded at base level for FY-07, with no appropriation for capital outlay. The 2002-2003 cuts and hold-backs to the budget base continue to adversely impact the agency's mission in research, public service, and education.

	Budget Fiscal Year 2007			
Appropriation	Beginning Balance	Income	Expense	Ending Balance
Personnel	\$ 0	\$ 802,200	\$ 802,200	\$ 0
Operating Expense	0	26,200	26,200	0
Capital Outlay	0	0	0	0
Total	0	828,400	828,400	0
U/I Personnel Funds	0	31,653	31,653	0
Local Accounts	113,235	106,987	96,193	124,030
Grants and Contracts	NA	462,094	462,094	NA
TOTAL	\$113,235	\$1,429,134	\$1,418,340	\$124,030

NA = not applicable

Sources of Funding



Research

Geological Mapping and Related Studies

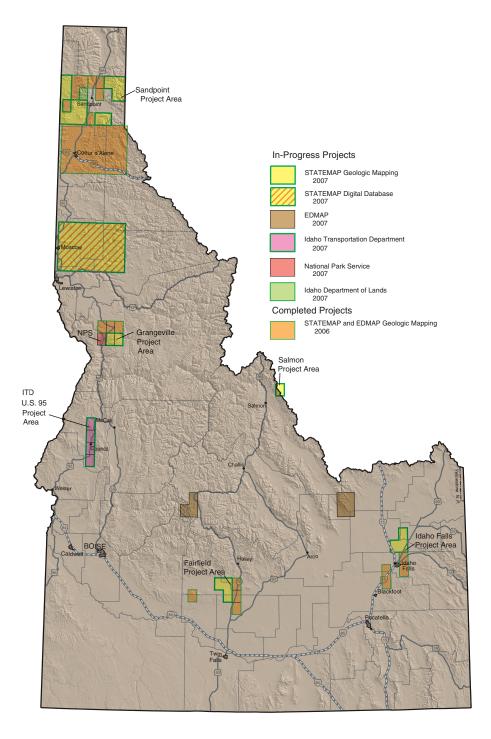
Geologic mapping and topical studies are the Survey's primary applied research and generate the content of digital maps, databases, reports, and publications. Before 1990, geologic mapping in Idaho was conducted in rural areas primarily to facilitate extraction of earth resources. In the last two decades, the Survey has been mapping in areas selected specifically because of development impacts in urban settings, for earth-resource needs, and to advance the science.

The Survey is a strong supporter of the National Cooperative Geologic Mapping Program (NCGMP). For fourteen years, the agency has partnered with the STATEMAP component of the NCGMP to deliver digital geologic maps to Idaho users. The Idaho Geologic Mapping Advisory Committee assists the Survey by assessing Idaho's mapping needs and addressing long-term plans for geologic mapping. The committee guides the medium- and short-term mapping plans to take advantage of state partnerships. Additional funding for geologic mapping comes from the Idaho Transportation Department, Idaho Department of Lands, and National Park Service. During the year, STATEMAP project geologists mapped fourteen 7.5-minute quadrangles and produced one digital geologic map database.

Fairfield Project

Mapping in the Magic Reservoir area revised the stratigraphic position of the andesite of Square Mountain (formerly mapped as Square Mountain Basalt and Square Mountain ferrolatite). Previously it had been mapped stratigraphically below the Poison Creek tuff, but researchers found it above that unit and also above the Clay Bank basalt, which also is younger than the Poison Creek tuff. The relative stratigraphic positions of several units remain ambiguous

Geologic Mapping Projects



and unresolved. Ar/Ar dating of sanidine in the Wedge Butte and Rattlesnake Butte rhyolites confirmed previous K/Ar ages of about 3 Ma for these units.

Grangeville Project

Mapping in the Grangeville East, Grangeville West, and Fenn quadrangles identified previously unmapped rocks of probable Seven Devils Group in a window through the Columbia River Basalt Group on the north slope of Mt. Idaho. The Mt. Idaho structure, which includes the Mt. Idaho shear zone and Mt. Idaho fault, was traced across the Grangeville East quadrangle and through a corner of the Grangeville West quadrangle. The shear zone records pre-Tertiary shearing in the basement rock assemblage and Miocene and younger displacement of basement rocks and basalt along the fault. A dike in Rocky Canyon, previously mapped as basalt of Grangeville, was determined by chemical analysis to be Grande Ronde Basalt.

Idaho Falls Project

In the Idaho Falls area, the goal of STATEMAP work is to improve regional mapping of lava flows, stream terraces, and loess deposits along the Snake River. These materials are essential components of the Snake River Plain aguifer and the state's agricultural industry. In FY-07, relationships between Rocky Mountain glaciation and deposition of outwash stream gravels and loess along the Snake River were investigated together with correlating the lava flows. Two backhoe pits exposing 4-5 m of loess were sampled for optically stimulated luminescence dating, grain size analysis, and magnetic susceptibility. Preliminary results indicate loess deposition occurred at 18-25 Ka, well before the local glacial maximum in Grand Teton National Park at 14-17 Ka. Outwash gravels in stream terraces were deposited throughout the last glacial period, between 12 Ka and 25 Ka. Paleomagnetic properties suggest new correlations between lava flows in the Firth and Woodville quadrangles south of Idaho Falls. Previous work assigned these flows to vents west of the field area.

The new paleomagnetic data suggest the units were erupted from a northern vent called basalt of Rifle Range. Stratigraphic relationships with dated loess and terrace deposits also suggest the Rifle Range flows are late Pleistocene, possibly as young as 25-30 Ka.

Sandpoint Project

Geologic mapping in the northern part of the Sandpoint 30' x 60' quadrangle has focused in part on the relationship between the Priest River metamorphic complex and the low-grade Belt Supergroup rocks to the east. Near Elmira, researchers have confirmed the more transitional nature of this boundary (as reported by earlier workers) but found evidence of a fault east of the Purcell Trench that appears to juxtapose high-grade rocks on the west with low-grade rocks on the east.

Hydrogeology

The Survey conducts research applicable to improving the management of Idaho's ground-water resources in cooperation with state and federal agencies, local governments, universities, and community and tribal water users across the state. Research during FY-07 included mapping of aquifer stratigraphy, statistical analysis of subsurface lithologic data, geochemical analysis of ground-water quality to identify sources of contamination, and basin water balance analysis to improve ground-water management on tribal lands.

As part of the mapping under the STATEMAP program, researchers developed a methodology to utilize the vast amount of untapped lithologic information contained in the Well Construction Database (drillers' logs) maintained by the state. In certain stratigraphic contexts that are sufficiently well understood (like the eastern Snake River Plain), the lithologic contrasts that drillers report during water-well drilling provide information on the subsurface for statistically valid modeling of certain stratigraphic features. The methodology relies on Geographic Information Systems (GIS)

technology and has been used successfully on the eastern Snake River Plain (ESRP) in the Idaho Falls area to create maps of overburden thickness, topography of the buried volcanic surface, geometry of Snake River fluvial deposits, and the elevations and thicknesses of major sedimentary interbeds within the basalt aquifer.

A statistical analysis of aquifer lithology beneath the Idaho National Laboratory was published this year as a collaborative effort between the IGS and the U.S. Geological Survey. The IGS-led research team analyzed distributions of sedimentary interbeds in the ESRP basalt aquifer to create a model of the amount of sediment intercalated within the basalt. A follow-up study, also funded by the USGS and using recent borehole data, tested the hypotheses posed in the previous analysis and confirmed the conclusions of that study. The results will be used to improve future digital flow models of the ESRP aquifer.

During FY-07, the Survey conducted an eight-month program of ground-water sampling near American Falls for the Idaho Department of Environmental Quality (IDEQ). Geochemical and stable isotope analyses, used to systematically unravel the sources of ground-water contamination, revealed that fertilizers and septic effluent are the principal sources of nitrate contamination in the shallow aquifer. Most surprising was the observation that nitrate in the deeper aquifer is almost exclusively of septic origin, and that even in this rapidly flushed aquifer system, the impact of cumulative, upgradient septic pollution is significant.

The Pocatello branch office has worked closely with the Shoshone-Bannock Tribes' Water Resources Department for more than three years to develop a geologically sound conceptual model and water balance of the Upper Ross Fork watershed. The analysis, completed this year, was based on hydrologic data, water well data, and drillers' logs synthesized within a GIS framework. The results will be used to improve future data collection and monitoring activities on tribal lands and to design better management policies

for alleviating the ground-water shortages of recent drought years. Perhaps as significantly, in an agreement with the Tribal Council, the Survey will publish the study's results.

The Survey provides in its work with other state agencies advice on applying geostatistical tools in analyzing ground-water quality. Near the end of FY-07, the state's Ground Water Monitoring Technical Committee recommended that IDEQ use kriging tools when it updates its published Nitrate Priority Area boundaries, and this recommendation has been adopted. The Survey was also involved as technical advisor, workshop presenter, and contributor to IDEQ's Draft Statistical Guidance. This document furnishes the technical rationale and guidance for regulators and operators in determining when the degradation of ground-water quality is statistically significant and defensible.

The Survey continues to cooperate with other state and federal agencies, university programs, and water-user groups throughout Idaho to better understand the geology influencing the flow and recharge of ground water and the distribution and transport of ground-water contaminants. Results are provided to end-users for ground-water resource development and protection. Research applications include modeling the aquifer stratigraphy, analyzing and mapping the ground-water quality, and assessing ground-water vulnerability to septic sewage disposal.

The Survey has developed and applied a new group of spatial-temporal geostatistical tools for analyzing patterns of change in both water quality and ground-water storage. These practical approaches improve the effectiveness of monitoring network sampling designs and are being successfully applied in the analysis of other state ground-water monitoring databases.

A ten-year evaluation of ground-water quality in the lower Portneuf River valley has provided the first strong evidence of the magnitude of ground-water quality impairment due to septic sewage disposal. A novel modeling approach was applied to quantify the cumulative effects of individual septic systems on Pocatello's municipal water supply and to predict impacts of future development.

Digital Geologic Maps

The Survey's digital mapping and GIS laboratory provides services that include digital cartography, spatial data management, database management and design, network system administration, graphic design and desk-top publishing, and Web-site support. The lab continues to compile geology from around the state in a geologic map database in addition to producing geologic maps. Thirty-three geologic maps were published this year. Most of these are available as print-on-demand color maps. All are available for free on the Web site, and paper copies can be purchased through the Survey's sales office.

The digital mapping lab added the Coeur d'Alene $30' \times 60'$ geology tile to the statewide geologic map database. The statewide geologic map database will eventually supply map users with the best available data while helping the Survey to manage the data better and implement software updates and migration. The ESRI Geodatabase format lends itself to interactive online delivery.

Databases and Archives

The Survey stores and maintains several databases. Many of these data portray spatial information and include additional data tables all stored in relational databases. Interactive data available on the Survey's Web site include sets of information on epicenters, mines and prospects, and geologic faults. Fault information for Miocene and younger faults is also now available as a Google Earth application where the user can interactively view the faults and access information. Mines and prospects data are available for download.

Geologic Hazards

Idaho is susceptible to significant hazards from earthquakes, landslides, and volcanic activity. The Survey works to support hazard mitigation in several ways. Public awareness is addressed through Web site information, a summer field workshop for K-12 teachers, and direct contact by e-mail and telephone. Landslide hazards are documented in geological mapping conducted through the STATEMAP program. In FY-07, a grant from the Idaho Bureau of Homeland Security supported efforts to improve the Idaho Miocene-Recent Fault Database and to add enhanced graphic capabilities, including access through Google Earth. The database is similar to the U.S. Geological Survey's Quaternary Fault and Fold Database, but it includes many structures for which Quaternary movement cannot be demonstrated. The Google Earth capability allows the viewing of faults displayed on top of a three-dimensional photorealistic landscape and greatly increases the ease and precision of access. The database is available at www.idahogeology.org.

The Survey assisted in locating seismic station sites for the USArray component of EarthScope in northern Idaho and for the USGS Advanced National Seismic System (ANSS) sites in central Idaho. Staff also attended the ANSS Intermountain West Region strategic planning meeting in August. The meeting focused on efforts by western states to collectively purchase EarthScope seismic stations after their temporary placement in the region.

Mines and Mining

Active Mining

A review of the state's mining for the year, a collaborative effort with the private sector and other government agencies, was presented at the Northwest Mining Association meeting held in Reno,

Nevada. The state's mining and exploration industry is benefitting from the high metal prices, especially for molybdenum and silver. Owing to the high prices, nonfuel mineral production for 2005 set a record of \$906 million for the state. The preliminary estimate for 2006 is \$810 million. Two new proposed metal mines are in the permitting stage: an open pit, precious metal mine at Atlanta and an underground cobalt-copper-gold mine in the Blackbird district. Both are undergoing considerable agency and public scrutiny, as are new mine plans and expansions in the phosphate district. The strong economy and housing market have also fostered a good year for construction-related industrial minerals from sand and gravel to decorative rock. The 2006 review of the mining industry was published in the May issue of *Mining Engineering*, and is also available on the Survey's Web site.

Mine Histories

The Survey continues with its popular—and award-winning—series of mine history reports, which combine published references with unpublished materials from its mineral property files. Histories of the Deadwood mine in Valley County and the Dewey mine in Idaho County were published during the year.

Abandoned and Inactive Mines

The Abandoned Mine Lands project wound down during the year. Limited new funds were added to the contract with the U.S. Bureau of Land Management, extending the project to 2010. Project work includes mine history and field inventory for the Dewey mine near Grangeville. During the year, the Survey published two Staff Reports detailing abandoned mine land field investigations from previous years.

Lemhi Pass Research

A new project, "Geochronology of Iron Oxide-Copper-Thorium-REE Mineralization in Proterozoic Rocks at Lemhi Pass, Idaho, and a Comparison to Copper-Cobalt Ores, Blackbird Mining District, Idaho," was funded by the U.S. Geological Survey's Mineral Resources External Research Program. Geologic mapping was conducted during the summer, and samples were collected in the Lemhi Pass district for geochemical, mineralogical, and geochronological analyses. The new mapping revealed a previously unmapped syenite intrusion with locally abundant iron oxide mineralization and veins. In addition, a newly found zone of hornfels and silica veining may be related to the syenite or a concealed intrusive. Detailed mapping of the Lucky Horseshoe mine and other prospects confirmed the presence of potassium feldspar wall rock alteration adjacent to the thorium ore zones and noted sulfidebearing veins cutting dikes at the Copper Queen. Preliminary results of the U-Pb zircon geochronology from the SHRIMP analyses suggest a Cambrian age for the syenite. Detrital zircons from two localities in the metasedimentary rocks indicated the expected patterns compatible with the Proterozoic Apple Creek to Gunsight Formations.

Outreach

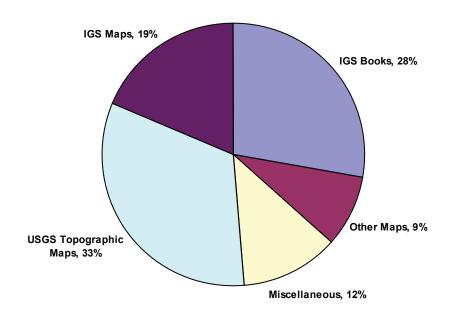
The Survey disseminates geologic and mineral data on Idaho primarily through its publications, Web site, in-house collections, and efforts by the staff in educating the public in the earth sciences.

Publications

Since 2000, the Survey has released about 200 publications that include books, maps, reports, databases, posters, and fact sheets. The rate of output now averages about 25 publications a year. Geologic maps and Staff Reports represent most of the increase (see the Staff Publications and Activities section).

The substantial output in the Survey's geologic mapping in recent years can be traced back to the late 1970s when the agency broadened its published research to include topical and geologic maps designed to stand alone as finished products. Along the way, the Survey developed a solid mapping capability. Sensible investments in

Publication Sales



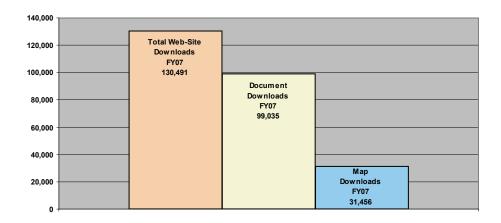
digital technology and computer-aided cartography greatly expanded the potential of this small research agency to create very accurate maps using state-of-the-art methods. In 1993, the nation's state surveys joined in support of the National Cooperative Geologic Mapping Act. Since then, Idaho has competed successfully in the program and received nearly \$2 million to map 130 quadrangles. The Survey has expanded output by adding two new publication series, Digital Geologic Maps and Digital Web Maps, that already account for over sixty titles in just five years. Since 1990, twenty-four more titles have been added to the Geologic Map series, and the Surficial Geology Map series, started in 1991, now has fourteen.

Since the late 1970s, the Survey has released about 500 publications. Of these, about 200 are stand-alone maps, practically all of them geologic. These numbers represent a strong research output, especially in mapping the state's geology.

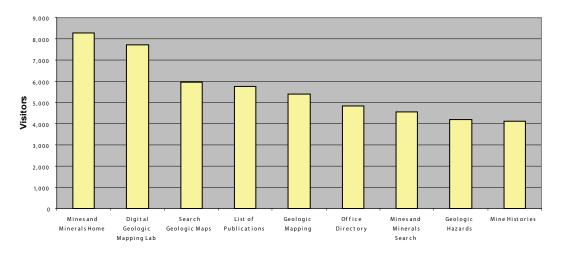
The Web Site—www.idahogeology.org

The Survey's Web site provides customers electronic access to its publications and data. Hundreds of online documents are available free for download in PDF format. Publications can be located via search engines on the site. Geologic data are available there as well, including GIS geologic map data sets (Digital Geologic Map series), geochemical analyses (Digital Analytical Data series), and the mines and prospects digital database.

Customer Downloads of Documents and Maps



Most Popular Web Pages



Mine Safety Training

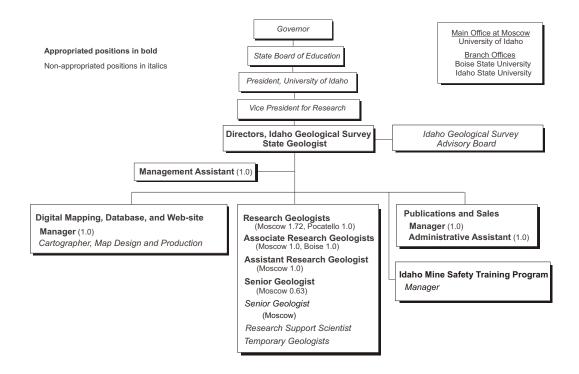
The U.S. Department of Labor's Mine Safety and Health Training Program in Idaho is administered by the Survey. During FY-07, this program trained and certified over 1,400 miners and industry supervisors in the state and region. A mine safety module and associated classroom materials were popular at the Survey's annual summer field workshop for teachers.

Earth Science Education

The Survey advances its commitment to earth science education through a summer field workshop for Idaho's educators and with materials available on its Web site. Over the years, the workshop has visited various geologic locales and served different Idaho communities. This year, it met in July on the shores of Lake Pend Oreille near Hope. Major funding for the workshop was provided by the Idaho Bureau of Homeland Security (IBHS) with additional support from the National Energy Foundation and the Idaho Mining Association. The workshop's aim was to present and explore ways to reduce losses from natural hazards by training K-12 teachers in hazard recognition and mitigation. Instruction was provided by staff from the Survey and IBHS together with a professor from Northern Idaho College. Teachers were given information and support to help them develop natural hazard educational activities for their own classrooms. The workshop also promoted high quality teaching of the earth sciences in Idaho schools by providing instruction on important geological concepts and Idaho's unique geologic history. This year, the workshop focused on earthquakes, mass wasting, and flooding. Activities included rapid visual screening of buildings in Sandpoint and field trips to view geological features such as the regionally important Hope fault. Using workshop information, the fifteen participants then presented their techniques for teaching natural hazards and earth science relevant to their classrooms. The results of the workshop, including downloadable teaching activities, are available on the Survey's Web site.

Organization and Personnel

Organization Chart



Directory

Main Office-Moscow

Morrill Hall, Third Floor University of Idaho PO Box 443014 Moscow, ID 83844-3014 208-885-7991 Fax 208-885-5826

Idaho Water Center, Suite 201 322 E. Front Street Boise, ID 83702-7359 208-332-4420 Fax 208-332-4400

Branch Office-Boise Branch Office-Pocatello

Physical Science, Room 235 Idaho State University MS 8072 Pocatello, ID 83209-8072 208-282-4254 Fax 208-282-4414

Administrative and Support Staff

Roy M. Breckenridge	Director and State Geologist
Kurt L. Othberg	
Roger C. Stewart	Manager, Publications and Communications
Charlotte D. Fullerton	
Sherry E. Pixley	· · · · · · · · · · · · · · · · · · ·
Bobbie Jo Ogden	
	·
Research, Full Time	
Roy M. Breckenridge	Full Research Geologist
Jane S. Freed	
Dean L. Garwood	Geologist
Virginia S. Gillerman	Associate Research Geologist, Boise
John D. Kauffman	Senior Geologist
Reed S. Lewis	Associate Research Geologist
Victoria E. Mitchell	Research Support Scientist
Kurt L. Othberg	Full Research Geologist
William M. Phillips	Assistant Research Geologist
Loudon R. Stanford	Manager, Digital Map and GIS Lab
Michael J. Weaver	Mine Safety Specialist, C.M.S.P.
John A. Welhan	Full Research Geologist, Pocatello
Research and Support, Part-Time	
Jeremy T.Alexander	Geologic Assistant
Jesse S. Bird	Work Study
Russell F. Burmester	Geologist
James R. Cash	Earth Science Instructor
Nelda A. Davis	,
Brian E. Faulkner	Office Assistant
Patrick J. Hickey	Geologist
Cherry L. Kersey	Work Study
Jerrod A. Loveland	Work Study
Mark D. McFaddan	9
Sherry E. Pixley	Office Assistant/Sales
Keegan L. Schmidt	Geologist
Kenneth F. Sprenke	Geologist
David E. Stewart	3
Lynnessa R. Struble	,
Daniel J. Sturgis	S
Teresa A. Taylor	Work Study

Advisory Board Members

George Bacon

Idaho Department of Lands

Roy Breckenridge

Chair, ex officio Director, Idaho Geological Survey

Dennis Geist

Chair, Department of Geological Sciences, University of Idaho

David Hawk

(Representing Office of the Governor)

Scott Hughes

Chair, Department of Geosciences Idaho State University

David Jackson

Idaho Bureau of Homeland Security

Karl Languirand

Idaho Association of Professional Geologists

Jack Lyman

Executive Director Idaho Mining Association

C.J. Northrup

Chair, Department of Geosciences Boise State University

Kurt Othberg

Chair, ex officio Director, Idaho Geological Survey

Publications and Activities

Publications

- Field Trip Guide to the Natural Hazards of the Boise Area, Idaho, by William M. Phillips: Idaho Geological Survey Staff Report 07-1, 26 p.
- Geochronological Constraints on Mesoproterozoic and Neoproterozoic(?) High-Grade Metasedimentary Rocks of North-Central Idaho, U.S.A., by Reed S. Lewis, Jeffrey D. Vervoort, Russell F. Burmester, William C. McClelland, and Zhaoshan Chang, in P.K. Link and R.S. Lewis, eds., Proterozoic Geology of Western North America and Siberia: Society for Sedimentary Geology Special Publication 86, p. 37-53, 2007.
- Geologic Map of the Dietrich Butte Quadrangle, Lincoln County, Idaho, by Matthew F. Cooke, John W. Shervais, John D. Kauffman, and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 63, scale 1:24,000, 2006.
- Geologic Map of the Dietrich Quadrangle, Lincoln County, Idaho, by Matthew F. Cooke, John W. Shervais, John D. Kauffman, and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 66, scale 1:24,000, 2006.
- Geologic Map of the Fenn Quadrangle, Idaho County, Idaho, by John D. Kauffman, Keegan L. Schmidt, Dean L. Garwood, and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 87, scale 1:24,000, 2007.
- Geologic Map of the Grangeville East Quadrangle, Idaho County, Idaho, by Keegan L. Schmidt, John D. Kauffman, David E. Stewart, Kurt L. Othberg, and Reed S. Lewis: Idaho Geological Survey Digital Web Map 86, scale 1:24,000, 2007.

- Geologic Map of the Grangeville West Quadrangle, Idaho County, Idaho, by John D. Kauffman and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 85, scale 1:24,000, 2007.
- Geologic Map of the Idaho Parts of the Orofino and Clarkston 30 x 60 Minute Quadrangles, Idaho, by John D. Kauffman, Dean L. Garwood, Keegan L. Schmidt, Reed S. Lewis, Kurt L. Othberg, and William M. Phillips: Idaho Geological Survey Digital Web Map 69, scale 1:100,000, 2006.
- Geologic Map of the Idaho Falls North Quadrangle, Bonneville County, Idaho, by William M. Phillips and John A. Welhan: Idaho Geological Survey Digital Web Map 77, scale 1:24,000, 2006.
- Geologic Map of the Idaho Falls South Quadrangle, Bingham and Bonneville Counties, Idaho, by William M. Phillips and John A. Welhan: Idaho Geological Survey Digital Web Map 78, scale 1:24,000, 2006.
- Geologic Map of the Kinzie Butte Quadrangle, Lincoln County, Idaho, by Kurt L. Othberg and John D. Kauffman: Idaho Geological Survey Digital Web Map 83, scale 1:24,000, 2007.
- Geologic Map of the Magic Reservoir East Quadrangle, Blaine and Camas Counties, Idaho, by John D. Kauffman and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 82, scale 1:24,000, 2007.
- Geologic Map of the Owinza Butte Quadrangle, Jerome and Lincoln Counties, Idaho, by John W. Shervais, Scott H. Matthews, John D. Kauffman, and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 65, scale 1:24,000, 2006.
- Geologic Map of the Owinza Quadrangle, Lincoln County, Idaho by John W. Shervais, Matthew F. Cooke, John D. Kauffman, and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 64, scale I:24,000, 2006.
- Geologic Map of the Sagle Quadrangle, Idaho, by Reed S. Lewis, Russell F. Burmester, Roy M. Breckenridge, Mark D. McFaddan, Fred K.

- Miller, and David M. Miller: Idaho Geological Survey Digital Web Map 74, scale 1:24,000, 2006.
- Geologic Map of the Sandpoint Quadrangle, Idaho, by Reed S. Lewis, Russell F. Burmester, Roy M. Breckenridge, Stephen E. Box, and Mark D. McFaddan: Idaho Geological Survey Digital Web Map 76, scale 1:24,000, 2006.
- Geologic Map of the Shoshone Ice Cave Quadrangle, Blaine, Lincoln, and Camas Counties, Idaho, by John D. Kauffman and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 84, scale 1:24,000, 2007.
- Geologic Map of the Shoshone SE Quadrangle, Jerome and Lincoln Counties, Idaho, by Scott H. Matthews, John W. Shervais, John D. Kauffman, and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 62, scale 1:24,000, 2006.
- Geologic Map of the Star Lake Quadrangle, Jerome and Lincoln Counties, Idaho, by Scott H. Matthews, John W. Shervais, John D. Kauffman, and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 67, scale 1:24,000, 2006.
- Geologic Map of the Talache Quadrangle, Idaho, compiled and mapped by Russell F. Burmester, Mark D. McFaddan, Roy M. Breckenridge, and Reed S. Lewis: Idaho Geological Survey Digital Web Map 75, scale 1:24,000, 2006.
- Geologic Mapping Page and IGS STATEMAP Deliverable Online Database, by Kurt L. Othberg, Loudon R. Stanford, and Dustin Thomas: Idaho Geological Survey Web page and database application.
- Geostatistical Modeling of Sediment Abundance in a Heterogeneous Basalt Aquifer, Idaho National Laboratory, Idaho, by J. Welhan, R. Farabaugh, M. Merrick, and S. Anderson: U.S. Geological Survey Scientific Investigations Report 2006-5316.

- Glacial Modification of Granite Tors in the Cairngorms, Scotland, by A.M. Hall and William M. Phillips: Journal of Quaternary Science, v. 21, no. 8, p. 811-830, 2006.
- Gravity, Morphology, and Bedrock Depth of the Rathdrum Prairie, Idaho, by Guy W. Adema, Roy M. Breckenridge, and Kenneth F. Sprenke: Idaho Geological Survey Technical Report 07-2, 37 p.
- History of the Buckhorn and Related Mines, Lemhi County, Idaho, by Victoria E. Mitchell: Idaho Geological Survey Staff Report 07-8, 18 p.
- History of the Deadwood Mine, Valley County, Idaho, by Victoria E. Mitchell: Idaho Geological Survey Staff Report 07-2, 26 p.
- History of the Dewey Mine, Idaho County, Idaho, by Victoria E. Mitchell: Idaho Geological Survey Staff Report 07-5, 13 p.
- Idaho, by Virginia S. Gillerman, Earl H. Bennett, and Michael J. Weaver: Mining Engineering, v. 59, no. 5, p. 82-86, 2007 (2006 statewide mining review).
- Idaho Geological Survey's Mapping Fact Sheet, by Idaho Geological Survey staff: Idaho Geological Survey Web page, 2007.
- Idaho Geological Survey's Minerals Fact Sheet, by Idaho Geological Survey staff: Idaho Geological Survey Web page, 2007.
- Idaho Report, Inland States, by William M. Phillips, Roy M. Breckenridge, and David Jackson: Western States Seismic Policy Council, Earthquake Quarterly, p. 4-5, 2006.
- Idaho State Report—2006, by Roy M. Breckenridge: Association of American State Geologists, The State Geologists Journal, v. 58.
- Idaho's Ground Water Page, by John A. Welhan, Kurt L. Othberg, and Loudon R. Stanford: Idaho Geological Survey Web page.

- Idaho's Mineral Resources Page, by Virginia S. Gillerman, Loudon R. Stanford, and Kurt L. Othberg: Idaho Geological Survey Web page.
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- Major Oxide and Trace Element Analyses for Volcanic Rock Samples From Idaho, 1996 Through 2006, by John D. Kauffman: Idaho Geological Survey Digital Analytical Data 4, Excel spreadsheet, 2007.
- Minerals Resources, by Roy M. Breckenridge, chair: Association of American State Geologists, Minerals Commitee, 2 p., 2006.
- Miocene and Younger Faults in Idaho: Google Earth Version, by Loudon R. Stanford, William M. Phillips, Dean L. Garwood, and Dustin Thomas: Idaho Geological Survey Web page and database application.
- Oil and Gas Map of Idaho, by Roy M. Breckenridge, Virginia S. Gillerman, and Ellen Wray-Macomb: Idaho Geological Survey Digital Web Map 81, scale 1:1,000,000, 2006.
- Oligocene Alkaline Volcanic Rocks Along the Eastern Margin of the Columbia Plateau, Northern Idaho, by John D. Kauffman, John H. Bush, and Reed S. Lewis: Idaho Geological Survey Technical Report 06-7, 9 p.
- Photographs of the Geology of Northern and Central Idaho, by James R. Cash, Reed S. Lewis, and Daniel J. Sturgis: Idaho Geological Survey Information Circular 62, CD, 2007.
- Proterozoic Geology of Western North America and Siberia, edited by Paul K. Link and Reed S. Lewis: Society for Sedimentary Geology Special Publication 86, 257 p., 2007.
- Sediment Mixing and Basin-Wide Cosmogenic Nuclide Analysis in Rapidly Eroding Mountainous Environments, by S.A. Binnie, William M.

- Phillips, M.A. Summerfield, and L.K. Fifield: Quaternary Geochronology, v. I, no. I, p. 4-14, 2006.
- Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Bureau of Land Management Property in the Challis Area: Challis Area Group, Custer County, Idaho, by Virginia S. Gillerman and Forrest S. Griggs: Idaho Geological Survey Staff Report 06-3, 76 p.
- Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Bureau of Land Management Property in the Lemhi Pass Area, Lemhi County, Idaho, by Virginia S. Gillerman, Bruce Otto, and Forrest S. Griggs: Idaho Geological Survey Staff Report 06-4, 170 p.
- Site Inspection Report for the Abandoned and Inactive Mines in Idaho on U.S. Forest Service Lands (Region 4), Boise National Forest: Boise Basin, Lowman, and Middle Fork of Boise River Areas, Boise, Ada, and Elmore Counties, Idaho (Selected Properties), by Dave Leppert, Mike Berwick, and Virginia S. Gillerman: Idaho Geological Survey Staff Report 07-4, DVD including 396 page report.
- Site Inspection Report for Abandoned and Inactive Mines on Land Administered by the U.S. Bureau of Land Management in the Boise Resource Area, Idaho Almaden Mine, Washington County, Idaho, by Dave E. Leppert and Virginia S. Gillerman: Idaho Geological Survey Staff Report 07-6, CD including 27 page report.
- Surficial Geologic Map of the Cascade Quadrangle, Valley County Idaho, by Roy M. Breckenridge and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 72, scale 1:24,000, 2006.
- Surficial Geologic Map of the Donnelly Quadrangle, Valley County Idaho, by Roy M. Breckenridge and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 70, scale 1:24,000, 2006.
- Surficial Geologic Map of Long Valley, Valley County, Idaho, by Roy M. Breckenridge and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 68, scale 1:50,000, 2006.

- Surficial Geologic Map of the Meadows Quadrangle, Valley County Idaho, by Roy M. Breckenridge and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 73, scale 1:24,000, 2006.
- Surficial Geologic Map of the No Business Mountain Quadrangle, Valley County Idaho, by Roy M. Breckenridge and Kurt L. Othberg: Idaho Geological Survey Digital Web Map 71, scale 1:24,000, 2006.
- Terroir of the Western Snake River Plain, Idaho, USA, by Virginia S. Gillerman, David Wilkins, Krista Shellie, and Ron Bitner, in R.W. Macqueen and L.D. Meinert, eds., Fine Wine and Terroir: Geological Association of Canada, Geoscience Canada Reprint Series 9, p. 153-164, 2006.
- U-Pb Detrital Zircon Analyses of Metasedimentary Rocks in the Pierce Area, North-Central Idaho, by Jeffrey D. Vervoort, Reed S. Lewis, and Zhaoshan Chang: Idaho Geological Survey Digital Analytical Data 3, Excel spreadsheet, 2006.
- U.S. Geological Survey-Idaho Geological Survey STATEMAP Fact Sheet, by Idaho Geological Survey staff, I p., 2007, http://ncgmp.usgs. gov/ncgmpabout/statemap/statemapfs/ID.pdf>.
- Water Balance and Pumping Capacity of the Lower Portneuf River Valley Aquifer, Bannock County, Idaho, by John A. Welhan: Idaho Geological Survey Staff Report 06-5, 33 p.

Abstracts

- The Grande Ronde Basalt After 30 Years of Study, by Stephen P. Reidel, John D. Kauffman, and Dean L. Garwood: Geological Society of America 103rd Annual Meeting, Cordilleran Section, Abstracts with Programs, paper 30-3.
- Kriging, an Exceedance Probability: Delineating Ground-Water Quality Areas of Concern, by John A. Welhan: Idaho Water Resources Research Symposium, Presenter Abstracts, p. 11.

- Quantifying Septic Sewage Impacts in Shallow Ground Water: The Lower Portneuf River Valley Aquifer, SE Idaho, by John A. Welhan: 17th Annual Water Quality Monitoring Results Workshop— Monitoring, Assessment, and Management, Program and Abstracts, p. 14.
- What Lies Below the Columbia River Basalt? by Stephen Reidel, John D. Kauffman, Dean L. Garwood, and John Bush: Eos Transactions, American Geophysical Union, v. 87, no. 52, fall meeting supplemental, abstract T21B-0422.

Reports

- Association of American State Geologists' Minerals Committee Report, by Roy M. Breckenridge, chair: Association of American State Geologists Annual Meeting, Key Largo, Florida, June.
- Association of American State Geologists' Minerals Report, by Roy M.
 Breckenridge, chair: Executive Committee, Association of
 American State Geologists Annual Meeting, Key Largo, Florida,
 June.
- Digital Geologic Map Database of the Coeur d'Alene 30' x 60' Quadrangle, Idaho: An ESRI GeoDatabase in ArcGIS 9.2, produced by Loudon R. Stanford: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, April.
- Final Report for Idaho Earthquake Education and Mitigation, Task Order No. 002-FY-2006, Memorandum of Agreement NGB I 6-05D-003, Idaho Bureau of Homeland Security, by William M. Phillips, Loudon R. Stanford, Dean L. Garwood, and Roy M. Breckenridge, November.
- Geologic Map of the Ammon Quadrangle, Bonneville County, Idaho, by William M. Phillips and John A. Welhan: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale I:24,000, April.

- Geologic Map of the Cocollalla Quadrangle, Bonner County, Idaho, by Russell F. Burmester, Roy M. Breckenridge, Mark D. McFaddan, and Reed S. Lewis: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Colburn Quadrangle, Bonner County, Idaho, by Mark D. McFaddan, Roy M. Breckenridge, Russell F. Burmester, and Reed S. Lewis: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Elmira quadrangle, Bonner County, Idaho, by Reed S. Lewis, Roy M. Breckenridge, Mark D. McFaddan, and Russell F. Burmester, Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Fenn Quadrangle, Idaho County, Idaho, by John D. Kauffman, Keegan L. Schmidt, Dean L. Garwood, and Kurt L. Othberg: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Firth Quadrangle, Bingham County, Idaho, by William M. Phillips and John A. Welhan: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Grangeville East Quadrangle, Idaho County, Idaho, by Keegan L. Schmidt, John D. Kauffman, David E. Stewart, Kurt L. Othberg, and Reed S. Lewis: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Grangeville West Quadrangle, Idaho County, Idaho, by John D. Kauffman and Kurt L. Othberg: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Kinzie Butte Quadrangle, Lincoln County, Idaho, by Kurt L. Othberg and John D. Kauffman: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.

- Geologic Map of the Magic Reservoir East Quadrangle, Blaine and Camas Counties, Idaho, by John D. Kauffman and Kurt L. Othberg: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Oden Bay Quadrangle, Bonner County, Idaho, by Reed S. Lewis, Roy M. Breckenridge, Mark D. McFaddan, and Russell F. Burmester: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Shoshone Ice Cave Quadrangle, Blaine, Lincoln, and Camas Counties, Idaho, by Kurt L. Othberg and John D. Kauffman: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Ucon Quadrangle, Bonneville County, Idaho, William M. Phillips and John A. Welhan: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Geologic Map of the Whitebird Quadrangle, Idaho County, Idaho, by Dean L. Garwood and Roy M. Breckenridge: Idaho Geological Survey progress report to National Park Service, December.
- Geologic Map of the Woodville Quadrangle, Bingham and Bonneville Counties, Idaho, by William M. Phillips and John A. Welhan: Idaho Geological Survey report to the U.S. Geological Survey for STATEMAP, scale 1:24,000, April.
- Idaho Geological Survey, Budget Request, by Roy M. Breckenridge and Kurt L. Othberg: Idaho Legislature, Joint Finance Appropriations Committee, Boise.
- Idaho Geological Survey's Agency Profile, by Roy M. Breckenridge and Kurt L. Othberg: State Board of Education, Idaho Division of Financial Management, 2007.

- Idaho Geological Survey's Performance Indicators, by Roy M. Breckenridge and Kurt L. Othberg: State Board of Education, Division of Financial Management, 2007.
- Idaho Geological Survey's Strategic Plan, 2007-2011?, by Roy M. Breckenridge and Kurt L. Othberg: University of Idaho, State Board of Education, 2006.
- Idaho Geological Survey's Water Fact Sheet, by Idaho Geological Survey staff, 2007.
- Inland Northwest Research Alliance Subsurface Architecture Field Trip Guidebook, by John A. Welhan, M. McCurry, and D. Rodgers: Pocatello-Hagerman, March.
- Language and Suggested Modifications to "Idaho Ground Water Quality Rule Statistical Guidance" Technical Manual, by John A. Welhan: Idaho Department of Environmental Quality, Boise, January.
- Mapping Report, by Ron Tesseire and Roy M. Breckenridge: Association of American State Geologists, Western States Cluster, St. George, Utah, May.
- Maps and Information on Mean Ground-Water Depth in Rigby, Idaho, by John A. Welhan: Report for Idaho Intermountain Claims, Inc., September.
- Preliminary Progress Report of the Alpha Swarm Seismicity in the Cascade Area, Valley County, Idaho, by William M. Phillips, Roy M. Breckenridge, and Kenneth S. Sprenke: Idaho Bureau of Homeland Security, October.
- A Rapid Visual Analysis of Sandpoint Buildings, by Stephen Weiser and Roy M. Breckenridge: Idaho Geological Survey guide for Earth Science Teachers Workshop, July.
- Recommendations for Minimizing Environmental Impacts of Chlorinated Water Disposal at the Lowder Water Recreation Park, Niter, Idaho,

- by John A. Welhan: Idaho Geological Survey report to Caribou County commissioners, December.
- Soils, Geology and Flash Flood Hazards, Boise, Idaho, by Paul McDaniel, Kurt Othberg, Bill Phillips, and Stephen Weiser: Western Soil Science Society of America, Boise, June.

Presentations

- Dating Superfloods, by William M. Phillips: Ice Age Floods Institute, Coeur du Déluge (Sandpoint) Chapter, August.
- Demonstration of IGS Mapping Lab Operations: Map Data Capture, Publication, Database Management, by Loudon R. Stanford and Jane S. Freed: North Central Idaho Networking Cooperative meeting, Moscow, July.
- Geologic History of Northern Idaho and Surrounding Area, by Reed S.

 Lewis: University of Idaho-Washington State University geology seminar series, Pullman, Washington, September; Northwest Geological Society, Seattle, Washington, October.
- Geology and Geologic Hazards of the Clark Fork Area, by Roy M.

 Breckenridge, Mark D. McFadden, and William M. Phillips: Idaho
 Geological Survey, Earth Science Teachers Workshop, July.
- Geology of Lightning Creek Drainage, by Roy M. Breckenridge: Idaho Geological Survey, Earth Science Teachers Workshop, July.
- Geology Tour of the Weiser River Trail, by William M. Phillips: Friends of the Weiser Trail, Weiser River Trail 10th Anniversary Celebration, Cambridge, June.
- Geostatistics Applications in the Earth Sciences, by John A. Welhan: Guest lecture, geosciences seminar 601, Idaho State University, December.

- Ground-Water Chemical Mass Balance Modeling: A Case Study in Quantifying Septic Effluent Impacts on Shallow Ground Water, by John A. Welhan: Guest lecture, engineering seminar 651, Idaho State University, November.
- Ground Water in the Portneuf Watershed: A Resource Under Stress, by John A. Welhan: Portneuf Watershed Symposium, Idaho State University, June.
- History of the Deadwood Mine, Valley County, Idaho, by Victoria E. Mitchell: Idaho Geological Survey report to the U.S. Forest Service, Region 4, 26 p., 2007.
- History of the Dewey Mine, Idaho County, Idaho, by Victoria E. Mitchell: Idaho Geological Survey report to the U.S. Bureau of Land Management, 13 p., 2007.
- Ice Age Animals—Mammoth Exhibit, by Roy M. Breckenridge: National Earth Science Week, Woodland Middle School, Coeur d'Alene, October.
- Idaho Geological Survey and Boise Branch Office Activities, by Virginia S. Gillerman: University of Idaho's Boise Open House, Boise, October.
- Idaho Geological Survey Digital Geologic Map Data Model v3. I b: ESRI Geodatabase Schema Diagram, by Loudon R. Stanford and Steve Mulberry: Digital Mapping Techniques Workshop poster, Columbia, South Carolina, May.
- Idaho Geological Survey Map Products: STATEMAP peer review panel, Association of American State Geologists, Annual Meeting, panel display, Key Largo, Florida, June.
- The Idaho Geological Survey: Geologic Mapping Program and Delivery of Maps Through the Web, by K.L. Othberg: Instituto Geológico y Minero de España, Madrid, Spain, July.

- Idaho Geologic Map Data in a Statewide Geodatabase: Design, Data Management Tools, and Online Distribution, by Loudon R. Stanford and Steve Mulberry: Digital Mapping Techniques Workshop, Columbia, South Carolina, May.
- Idaho Geology and Aggregate Resources, by Virginia S. Gillerman: Idaho Concrete and Aggregate Producers Association Annual Meeting, lackpot, Nevada, January.
- Idaho Geology and Mines, by Virginia S. Gillerman: Capital City Kiwanis, Boise, July.
- Idaho Mining and Exploration, 2006, by Virginia S. Gillerman: Northwest Mining Association Convention, Reno, Nevada, December.
- Impact of Septic Effluent on Urban and Rural Ground-Water Quality, by John A. Welhan: Idaho Ground Water Association Workshop, Idaho Falls, September.
- Hydrothermal Alteration in Porphyry Copper Deposits, by Virginia S. Gillerman: Guest lecture, Geology 324, petrography, Department of Geosciences, Boise State University, March.
- Kriging, an Exceedance Probability: Delineating Ground-Water Quality Areas of Concern, by John A. Welhan: Idaho Water Resources Research Symposium, Boise, November.
- A Methodology Based on Probability Kriging to Assist in Updating Statewide Nitrate Priority Area Maps, by John A. Welhan: Idaho Department of Environmental Quality, Boise, June.
- Northwest Geology, Emphasis on North Idaho, by Kurt Othberg: Soil Geomorphology Institute, University of Idaho, April.
- Overview of Statistical Analysis of New Borehole Data for USGS-INL Field Office, by Caleb Stroupe and John A. Welhan: Idaho State University, May.

- Pleistocene Climate Change, Loess, Soils, and Catastrophic Floods, by Kurt L. Othberg: Guest lecture, geological sciences 404/504, geological evolution of the Northern Rocky Mountains, Department of Geological Sciences, University of Idaho, May.
- Quantifying Septic Sewage Impacts in Shallow Ground-Water: The Lower Portneuf River Valley Aquifer, Southeast Idaho, by John A. Welhan: 17th Annual Water Quality Monitoring Results Workshop— Monitoring, Assessment, and Management, Boise, January.
- A Rapid Visual Analysis of Sandpoint Buildings, by Stephen Weiser and Roy M. Breckenridge: Idaho Geological Survey, Earth Science Teachers Workshop, July.
- Update on Geologic Mapping in Northern Idaho, by Reed S. Lewis: Intermountain Forest Tree Nutrition Cooperative, Annual Meeting, Moscow, April.
- The Use of Probability Kriging as a Quantitative, Defensible Method for Delineating and Updating Statewide Nitrate Priority Area Maps, by John A. Welhan: Ground-Water Monitoring Technical Committee, Boise, December.

Professional Activities

- Advanced National Seismic System Intermountain West Workshop, Salt Lake City, Utah, August (W.M. Phillips).
- Advisory board meeting, Idaho Geological Survey teleconference, Moscow and Boise, June (R.M. Breckenridge, V.S. Gillerman, K.L. Othberg).
- Association of American State Geologists, Annual Meeting, Key Largo, Florida, June (R.M. Breckenridge).
- Association of American State Geologists, spring liaison meeting, Washington, D.C., March (R.M. Breckenridge).

- Association of American State Geologists, Western States Cluster meeting, St. George, Utah, May (R.M. Breckenridge).
- Budget-request meetings, Idaho Division of Financial Management and Idaho Legislative Services, Boise, November (R.M. Breckenridge, K.L. Othberg).
- Budget-request meetings, University of Idaho, Office of the President (R.M. Breckenridge, K.L. Othberg).
- Chair, minerals and policy committee, Association of American State Geologists (R.M. Breckenridge).
- Chair, search committee, senior geologist position, Idaho Geological Survey, September (K.L. Othberg).
- Chair, Western States Cluster, Association of American State Geologists (R.M. Breckenridge).
- Co-leader, subsurface architecture field trip, Inland Northwest Research Alliance, Pocatello-Hagerman, March (J.A. Welhan).
- Data capture working group teleconference, Association of American State Geologists and U.S. Geological Survey, February (L.R. Stanford).
- Earthscope Western GeoSwath meeting, Boise, April (R.S. Lewis).
- Fellow, Society of Economic Geologists (V.S. Gillerman).
- Field forum, Geological Society of America, McCall, August (R.S. Lewis).
- Field trip, Friends of the Rhyolite, organized by William Leeman, Rice University, Fairfield, June (J.D. Kauffman).
- Field trip, Grand Teton National Park, American Quaternary Association 2006 meeting, Jackson Hole, Wyoming, August (W.M. Phillips).

- Field trip, Hell's Canyon, organized by Rebecca Dorsey, University of Oregon, March (D.L. Garwood, J.D. Kauffman, R.S. Lewis).
- Field trip, Intermountain Forest Tree Nutrition Cooperative, Pierce, July (R.S. Lewis).
- Field trip, Mica Creek experimental watershed, College of Natural Resources, University of Idaho, August (W.M. Phillips).
- Field trip co-coordinator and co-leader, subsurface science graduate program, Inland Northwest Research Alliance (J.A. Welhan).
- Field trip leader, Western Soil Society of America, Boise, June (K.L. Othberg).
- Field trip preview, 2007 Earth Science Educators Field Workshop, Island Park, November (W.M. Phillips).
- Field trip preview, Western Soil Society of America, Boise, May (K.L. Othberg, W.M. Phillips).
- Field Workshop for Idaho Earth Science Educators, Hope, July (R.M. Breckenridge, W.M. Phillips).
- Geological Society of America, Rocky Mountain section meeting, St. George, Utah, May (R.M. Breckenridge).
- Host and sponsor, Sarah Andrews author and visiting lecturer, Latah County Historical Society (R.M. Breckenridge).
- Idaho Association of Professional Geologists meetings, Boise (V.S. Gillerman).
- Idaho Bureau of Homeland Security, State Agency Emergency Coordination working group, monthly meetings, Boise (V.S. Gillerman).
- Idaho Department of Commerce and Labor, Mongolian mining delegation meeting, Boise, March (V.S. Gillerman).

- Idaho Department of Lands Reclamation Awards Luncheon, Boise, October (V.S. Gillerman).
- Idaho Earth Science Teachers winter meeting teleconference, December (W.M. Phillips).
- Idaho Environmental Forum meetings, Boise (V.S. Gillerman).
- Idaho Geospatial Committee meetings, Boise, September and December (L.R. Stanford).
- Idaho State Historical Society Awards Luncheon, Idaho Geological Survey's Victoria E. Mitchell the recipient of Esto Perpetua Award, Boise, October (V.S. Gillerman, V.E. Mitchell).
- Instructor, entry and underground hazards on abandoned mine lands for personnel with the U.S. Forest Service, U.S. Bureau of Land Management, and U.S. Park Service, Wallace, September; Boise, June (M.J. Weaver).
- Instructor, geological evolution of the Northern Rocky Mountains, geological sciences 404/504, Department of Geological Sciences, University of Idaho, spring semester (R.S. Lewis).
- Instructor, geology and geologic hazards of the Lake Pend Oreille-Clark Fork area, geological sciences 404-504, Department of Geological Sciences, University of Idaho, Hope, July (W.M. Phillips).
- Instructor, use and trouble shooting of automated external defibrillators, University of Idaho, Morrill Hall Safety Committee, Moscow, September (M.J. Weaver).
- Joint Finance and Appropriation Committee, agency budget presentation, Idaho Legislature, Boise, January (R.M. Breckenridge, Kurt L. Othberg).
- Judge, Central Mine Rescue Contest, Osburn, May (M.J. Weaver).

- Judge, National Hard Rock Mining Reclamation Awards, U.S. Bureau of Land Management, September (V.S. Gillerman).
- Judge, 19th Annual Coeur d'Alene Mining Contest, Osburn, August (M.J. Weaver).
- Member, advisory board, Advanced National Seismic System, Intermountain West Regional Advisory Council (R.M. Breckenridge).
- Member, American Quaternary Association (R.M. Breckenridge).
- Member, Association of Earth Science Editors (R.C. Stewart).
- Member, data capture working group, Association of American State Geologists and U.S. Geological Survey, February (L.R. Stanford).
- Member, editorial board, Quaternary Geochronology (W.M. Phillips).
- Member, Geological Society of Nevada (V.S. Gillerman).
- Member, geologic hazards and policy committee, Association of American State Geologists (R.M. Breckenridge).
- Member, Idaho Geospatial Committee (L.R. Stanford).
- Member, Idaho Museum of Mining and Geology (W.M. Phillips).
- Member, Pocatello Mayor's open-space committee, Pocatello (J.A. Welhan).
- Member, search committee, Vice President for Research, University of Idaho (R.M. Breckenridge).
- Member, Seismological Society of America (R.M. Breckenridge).
- Member, Society for Sedimentary Geology (V.E. Mitchell).
- Member, steering committee, Idaho Earth Science Teachers Association (R.M. Breckenridge).
- Member, steering committee, Greater Portneuf Water Resources Partnership (J.A. Welhan).

- Member, steering committee, North American Digital Geologic Map Data Model (L.R. Stanford).
- Member, technical committee, Idaho Ground-Water Monitoring (J.A. Welhan).
- Members, American Geophysical Union (W.M. Phillips, J.A. Welhan).
- Members, Geological Society of America (R.M. Breckenridge, V.S. Gillerman, R.S. Lewis, V.E. Mitchell, W.M. Phillips).
- Members, Idaho Earth Science Teachers Association (R.M. Breckenridge, W.M. Phillips).
- Members, Northwest Mining Association (V.S. Gillerman, R.S. Lewis).
- Members, search committee, senior geologist position, Idaho Geological Survey, September (R.M. Breckenridge, J.S. Freed, K.L. Othberg, L.R. Stanford).
- Members, Society for Mining, Metallurgy, and Exploration (V.S. Gillerman, M.J. Weaver).
- Mine tours: Idaho cobalt project, Blackbird mining district, Lemhi County, July; Sunshine mine and Lucky Firday mine, Shoshone County, August; Monsanto's South Rasmussen mine, Agrium's Dry Valley mine, and Simplot's Smoky Canyon mine, Idaho phosphate district, Caribou County, August; CAS exploration property and Beartrack mine, Lemhi County, September; Hell and High Water Mining's gold placer prospect, Boise County, October; Raft River geothermal site, Cassia County, March (V.S. Gillerman).
- National Geologic Map Database, Phase 3 Project, Northwest Geology Internet Map Service meeting, Portland, Oregon, April (K.L. Othberg, L.R. Stanford).
- National Mine Rescue Competition, Reno, Nevada, July (M.J. Weaver).

- Northwest Mining Association, 111th annual convention, Reno, Nevada, December (M.J. Weaver).
- Organizer, Belt Association Annual Meeting, Spokane, Washington, January (R.S. Lewis).
- Registered geologist, Oregon Board of Geologist Examiners (R.M. Breckenridge).
- Representative, Department of Geosciences, Idaho State University (J.A. Welhan).
- Representative, Governor's carbon sequestration advisory committee (J.A. Welhan).
- Representative, graduate faculty, School of Graduate Studies, Idaho State University (J.A. Welhan).
- Representative, Pocatello geotechnical advisory committee (I.A. Welhan).
- Representative (University of Idaho), Intermountain West Geothermal Consortium, Boise (V.S. Gillerman).
- Representative, Association of American State Geologists western region, U.S. Geological Survey STATEMAP review panel, Reston, Virginia, December (R.M. Breckenridge).
- Reviewer, Bruce Bjornstad manuscript, Quaternary Research, University of Washington Press (R.M. Breckenridge).
- Reviewer, grant proposal, National Science Foundation, August (W.M. Phillips).
- Reviewer, Kirsten Peters' manuscript, Washington Department of Natural Resources, Geology of Washington volume (R.M. Breckenridge).
- Reviewer, manuscript, Earth Science Reviews, December (W.M. Phillips).
- Reviewer, manuscript, *Geology*, January (W.M. Phillips).

- Reviewer, manuscripts, *Quaternary Geochronology*, January, April, and May (W.M. Phillips).
- Secretary, board of directors, Belt Association (R.S. Lewis).
- Steering committee meeting, North American Digital Geologic Map Data Model, Columbia, South Carolina, May (L.R. Stanford).
- Supervisor, Work Study student Cherry Kersey, preparation of mineral separates for cosmogenic nuclide surface exposure dating, August-December; paleomagnetic analysis of basalts, January-April (W.M. Phillips).
- Technical advisor, Bannock County's planning and zoning department (J.A. Welhan).
- Technical advisor, Bannock County's sewer task force (J.A. Welhan).
- Technical advisor, Pocatello Mayor's scientific advisory panel, Pocatello (J.A.Welhan).
- Technical advisor, Pocatello's water engineering consultants, Spronk Engineering (J.A. Welhan).
- Technical advisor, Shoshone-Bannock Tribes' water resources department (J.A. Welhan).
- Technical advisor, statistical methods in ground-water monitoring, Idaho Department of Environmental Quality (J.A.Welhan).
- Tobacco Root Geological Society, 31st annual field conference, Libby, Montana, August (J.S. Bird, V.S. Gillerman).
- Tour, Center for Advanced Energy Studies, Idaho National Laboratory, Idaho Falls, May (V.S. Gillerman).
- Tour, Raft River geothermal project, Idaho Department of Water Resources Energy Division, March (V.S. Gillerman).
- Training, defibrilator short course for van drivers, University of Idaho (R.M. Breckenridge).

- Visiting Professional, University of Idaho Taylor Ranch Field Station, July (W.M. Phillips).
- Visitor, Instituto Geológico y Minero de España (IGME, Geological Survey of Spain), Madrid, Spain, July (K.L. Othberg).

Media Interviews

- Climate Data Analysis, the Global Warming Debate, and Its Impacts on Eastern Idaho, the Snake River Plain, and Idaho Water Resources: Television interview with Bridget Shanahan, KIFI Channel 8 News, February 27-28 (J.A. Welhan).
- The New Napa Valley?: Article in Idaho Business Review, April 30, 2007 (V.S. Gillerman).
- Uranium Drilling Close to Stanley? by Matt Christensen: Twin Falls Times-News, May 31; Idaho Statesman, June 1 (V.S. Gillerman).

Graduate Thesis Committees

- Jessie Bird, B.S., Geology, University of Idaho (R.S. Lewis).
- Cephas Holder, M.S., Geological Sciences, Idaho State University (J.A. Welhan).
- Chris Jenkins, Ph.D., Biological Sciences, Idaho State University (J.A. Welhan).
- Caleb Stroupe, M.S., Geological Sciences, Idaho State University (J.A. Welhan).
- Alex Zirakparvar, M.S., Geology, Washington State University (R.S. Lewis).

Awards

- Esto Perpetua Award, granted by Idaho Historical Society to Victoria E. Mitchell, October 19.
- Finalist, University of Idaho Student Worker of the Year, March (J.S. Bird).

Grants and Contracts

- Abandoned Inactive Mine Inventory: R.S. Lewis (U.S. Forest Service, Region I, September 2001-September 2006, \$97,593).
- Compilation and Geologic Mapping in the Sandpoint 30'x 60' Quadrangle: R.S. Lewis (U.S. Geological Survey STATEMAP Program, May 2006-April 2007, \$53,391).
- Digital Geology of Idaho: R.S. Lewis (National Science Foundation, subcontract with Idaho State University, June 2004-May 2007, \$20,000).
- Geochronology of Iron Oxide-Copper-Thorium-REE Mineralization in Proterozoic Rocks at Lemhi Pass, Idaho, and a Comparison to Copper-Cobalt Ores, Blackbird Mining District, Idaho: V.S. Gillerman (U.S. Geological Survey, Mineral Resources External Research Program, July 2006-June 2008, \$61,372).
- Geologic Map of the WhiteBird Quadrangle: R.M. Breckenridge (National Park Service, June 2006-December 2007, \$20,000).
- Geologic Mapping in the Happy Fork Gap 7.5-Minute Quadrangle: R.S. Lewis (Idaho Department of Lands, June 2006-June 2007, \$6,000).
- Geologic Mapping in the Sandpoint, Idaho Falls, Fairfield, and Grangeville Project Areas, and a Digital Geologic Database Project: R.S. Lewis, W.M. Phillips, K.L. Othberg, J.D. Kauffman, and L.R. Stanford (U.S.

- Geological Survey STATEMAP Program, May 2006-April 2007, \$226,513).
- Geologic Mapping in the, Sandpoint, Idaho Falls, Fairfield, Grangeville, and Salmon Project Areas, and a Geodatabase Project: K.L. Othberg, R.M. Breckenridge, R.S. Lewis, J.D. Kauffman, W.M. Phillips, and L.R. Stanford (U.S. Geological Survey STATEMAP Program, May 2007-April 2008, \$241,558).
- Geologic Mapping, U.S. 95, Tamarack to Indian Valley: K.L. Othberg and D.L. Garwood (Idaho Department of Transportation, May 2006-September 2008, \$60,000).
- Hydrostratigraphy and Nitrate Distribution in Shallow Ground Water of Pleasant Valley: I.A. Welhan (Idaho Department of Environmental Quality, May 2006-June 2007, \$49,080).
- Idaho BLM Abandoned Mine Lands Program of Inventory and Remediation of Inactive and Abandoned Mine Sites on or near BLM Lands in Idaho: V.S. Gillerman (U.S. Bureau of Land Management, September 2005-December 2008, \$20,000).
- Idaho Earthquake Education: W.M. Phillips and R.M. Breckenridge (Idaho Bureau of Homeland Security, April-October 2007, \$10,000).
- Idaho Earthquake Education and Mitigation: W.M. Phillips and R.M. Breckenridge (Idaho Bureau of Homeland Security, March-September 2006, \$30,000).
- Idaho Geological Survey Support of Idaho BLM Abandoned Mine Lands Program—FY-2006 Modification: V.S. Gillerman (U.S. Bureau of Land Management, RM CESU, September 2006- September 2010, \$20,000).
- Idaho Hazards Mitigation: W.M. Phillips and R.M. Breckenridge (Idaho Bureau of Homeland Security, April 2007-March 2008, \$35,000).

- Mineral Resource Database Update: R.S. Lewis (U.S. Geological Survey Minerals Program, October 2006-March 2007, \$12,000).
- Mine Site Database: R.S. Lewis (U.S. Forest Service, Region 4, June 2003-December 2007, \$360,000).
- Ross Fork Basin Hydrologic Analysis: J.A. Welhan (Shoshone-Bannock Tribal Water Resources Department, June-August 2007, \$2,623).
- Statistical Methods Training and Interpretive Guidance for Ground-Water Quality Data Analysis: J.A. Welhan (Idaho Department of Environmental Quality, December 2005-January 2007, \$14,600).
- USArray, Incorporated Research Institutions for Seismology: K.F. Sprenke and R.M. Breckenridge (National Science Foundation, May 2006-April 2007, \$33,879).