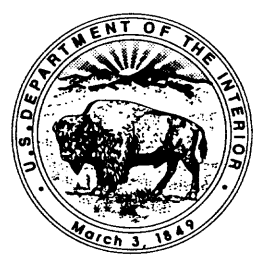
WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN IDAHO, FISCAL YEARS 1989–90

Compiled by Barbara N. Kemp

U.S. GEOLOGICAL SURVEY

Open-File Report 93–149

Boise, Idaho
1993



U. S. DEPARTMENT OF THE INTERIOR

BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY

Dallas L. Peck, Director

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U.S. Geological Survey
230 Collins Road
Boise, ID 83702

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Denver, CO 80225

MESSAGE FROM THE IDAHO DISTRICT CHIEF

The U.S. Geological Survey, Water Resources Division, collects and analyzes surface-water, ground-water, and water-quality data throughout the Nation. In Idaho, data are collected principally by employees in field offices in Boise, Idaho Falls, Sandpoint, and Twin Falls. Interpretive studies are conducted by employees in the District office in Boise and a project office at the Idaho National Engineering Laboratory (INEL) near Idaho Falls.

All data collected as part of the Idaho District program are entered into up-to-date data bases; these data are available to other State and Federal agencies, universities, consultants, and the general public who use them to study, understand, and manage the ground- and surface-water resources of the State. Currently (1990), most collection and interpretation of data for the Survey in Idaho center around the quality and availability of water and competition for its use.

As part of continuing or new interpretive studies in fiscal years 1989 and 1990, hydrologists and hydrologic technicians will: (1) Establish a statewide ground-water quality monitoring network to characterize ground-water quality and identify problem areas in the State's major aquifers; (2) delineate aquifers in Idaho, Oregon, Washington, Montana, North and South Dakota, Wyoming, Alaska, and Hawaii for the National Ground-Water Atlas; (3) develop a hydraulic model for the Snake River in the Deer Flat National Wildlife Refuge to determine water-surface elevations for decreased discharges at Swan Falls Dam; (4) determine the susceptibility of Pend Oreille Lake to cultural eutrophication from nutrient sources within its drainage basin and develop a nutrient-load/lake-response model to predict the lake's response to alterations in nutrient loading rates; (5) continue monitoring and evaluating the effects of radioactive and chemical waste disposal at the INEL on ground-water quality; (6) sample shallow ground water in agricultural areas of the State to delineate areas with high concentrations of dissolved nitrogen; (7) classify all streams in the Salmon and Clearwater River basins according to basin characteristics and estimate mean annual and mean monthly discharge; (8) evaluate water use and its effect on ground-water levels in the Mud Lake area; (9) determine the cause or causes of rapidly decreasing hot-spring discharges along Hot Creek and assess the effects of continued use of hot-water resources in the valley lowlands; and (10) for selected basins in Idaho, document and describe the hydrogeologic systems, relations between ground water and surface water, hydrologic relations between basins, and baseline water quality.

In the next few years, collection and analysis of hydrologic data in the Idaho District will increase in response to increased needs by State and Federal regulatory agencies for reliable, unbiased information to better manage the water resources of the State. An increasing awareness by the general public about their water resources and the expanding possibilities for contamination created by a growing agricultural

and urbanized economy will exert further pressures on these agencies to manage the resource in the most efficient manner. The Idaho District will strive to meet the demand for additional hydrologic data and answers to complex hydrologic problems. I look forward to these challenges in the coming years and consider it an opportunity to serve in this progressive and beautiful State.

Jerry L. Hughes
Idaho District Chief
Geological Survey
Water Resources Division
Boise, Idaho

CONTENTS

CONTENTS–Continued

ILLUSTRATIONS

TABLE

ORIGIN OF THE U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey was established by an act of Congress on March 3, 1879, to provide a permanent Federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of national domain." An integral part of that original mission includes publishing and disseminating the earth-science information needed to understand, to plan the use of, and to manage the Nation's energy, land, mineral, and water resources.

Since 1879, the research and factfinding role of the Survey has grown and been modified to meet the changing needs of the Nation. As part of that evolution, the Survey has become the Federal Government's largest earth-science research agency, the Nation's largest civilian mapmaking agency, the primary source of data on the Nation's surface- and ground-water resources, and the employer of the largest number of professional earth scientists. Today's programs serve a diversity of needs and users. Programs include:

- Conducting detailed assessments of the energy and mineral potential of the Nation's land and offshore areas;
- Investigating and issuing warnings of earthquakes, volcanic eruptions, landslides, and other geologic and hydrologic hazards;
- Conducting research on the geology of the United States;
- Studying the geologic features, structure, processes, and history of the other planets in our solar system;
- Conducting topographic surveys and preparing topographic and thematic maps and related cartographic products;
- Developing and producing digital cartographic data bases and products;
- Collecting data on a routine basis to determine the quantity, quality, and use of surface and ground water;
- Conducting water-resource appraisals in order to describe the consequences of alternative plans for developing land and water resources;
- Using remotely sensed data to develop new cartographic, geologic, and hydrologic research techniques for natural resources planning and management; and
- Providing earth-science information through an extensive publications program and a network of public access points.

Along with its continuing commitment to meet the growing and changing earth-science needs of the Nation, the Survey remains dedicated to its original mission to collect, analyze, interpret, publish, and disseminate information about the natural resources of the Nation—providing "earth science in the public service."

BASIC MISSION AND PROGRAM OF THE WATER RESOURCES DIVISION

The mission of the Water Resources Division is to provide the hydrologic information and understanding needed for the optimum utilization and management of the Nation's water resources for the overall benefit of the people of the United States.

This is accomplished, in large part, through cooperation with other Federal and non-Federal agencies, by:

- Collecting, on a systematic basis, data needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources;
- Conducting analytical and interpretive water-resource appraisals describing the occurrence, availability, and the physical, chemical, and biological characteristics of surface water and ground water;
- Conducting supportive basic and problem-oriented research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurement techniques, and to quantitatively predict the response of hydrologic systems to stress, either natural or manmade;
- Disseminating water data and results of investigations and research through reports, maps, computerized information services, and other forms of public releases;
- Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and ground waters; and
- Providing scientific and technical assistance in hydrologic fields to other Federal, State, and local agencies, to licensees of the Federal Energy Regulatory Commission, and to international agencies on behalf of the Department of State.

IDAHO DISTRICT, WRD

Organization

The Idaho District is responsible for water-related activities of the U.S. Geological Survey in Idaho and employs a staff of about 83 employees, who in 1990 were assigned as follows: 49 in Boise (headquarters); 8 in a field office in Idaho Falls; 5 in a field office in Sandpoint; 5 in a field office in Twin Falls; and 16 in a project office in Idaho Falls. The organization and responsibilities of the sections and support units in the Idaho District are shown in figure 1.

IDAHO DISTRICT ORGANIZATION

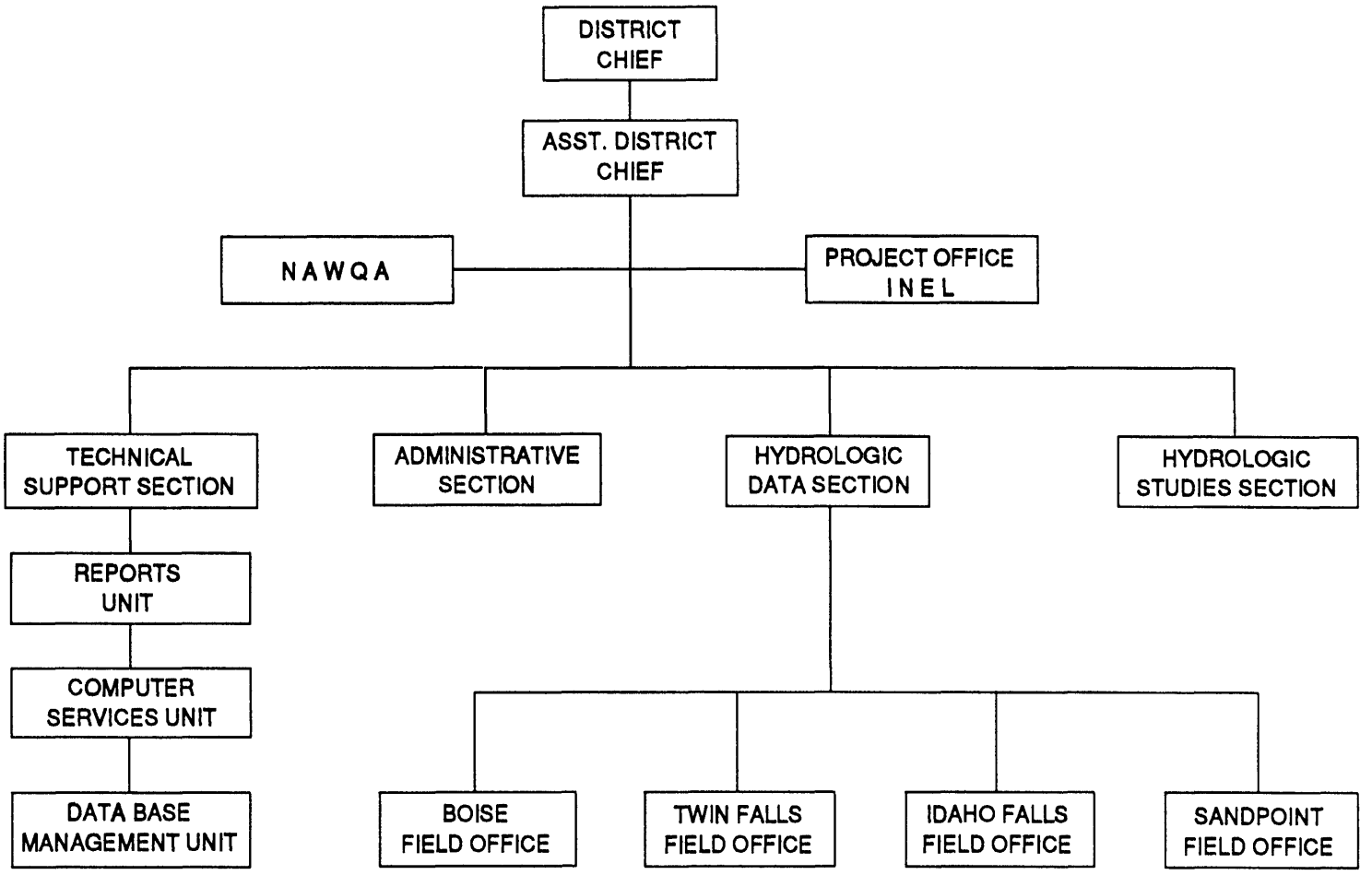


Figure 1.—Idaho District organization.

Questions regarding projects described in this report may be directed to one of the following offices:

Idaho District Office

U.S. Geological Survey, WRD
230 Collins Road
Boise, ID 83702–4520

Phone: (208) 387–1300

Field Office, Idaho Falls

U.S. Geological Survey, WRD
366 D Street
P.O. Box 51099
Idaho Falls, ID 83402–3533

Phone: (208) 529–4287

Field Office, Sandpoint

U.S. Geological Survey, WRD
1500 Highway #2
Room 336, Federal Building
Sandpoint, ID 83864–1757

Phone: (208) 263–4123

Field Office, Twin Falls

U.S. Geological Survey, WRD
P.O. Box AC
2496 Addison Ave. East
Twin Falls, ID 83301–6762

Phone: (208) 734–9168

Project Office, Idaho Falls

U.S. Geological Survey, WRD
INEL, MS–4148
P.O. Box 2230
Idaho Falls, ID 83403

Phone: (208) 526–2438

Funding and Cooperating Agencies

Programs of the Water Resources Division in Idaho are funded as follows: (1) For the Federal program, funding is appropriated directly to the U.S. Geological Survey by Congress for projects of national interest; (2) for the cooperative program, funding is shared equally between the U.S. Geological Survey and interested State or local agencies; and (3) for the other-Federal-agencies program, funding is supplied by Federal agencies requesting technical assistance from the U.S. Geological Survey. The U.S. Geological Survey and agencies of the State of Idaho have had joint funding agreements for the systematic collection of streamflow data since 1909 and for interpretive ground-water studies and ground-water data collection since 1946. Total funds and sources of those funds for fiscal years 1989–90 are shown in figure 2. State, local, and Federal cooperating agencies active during fiscal years 1989–90 are listed in table 1.

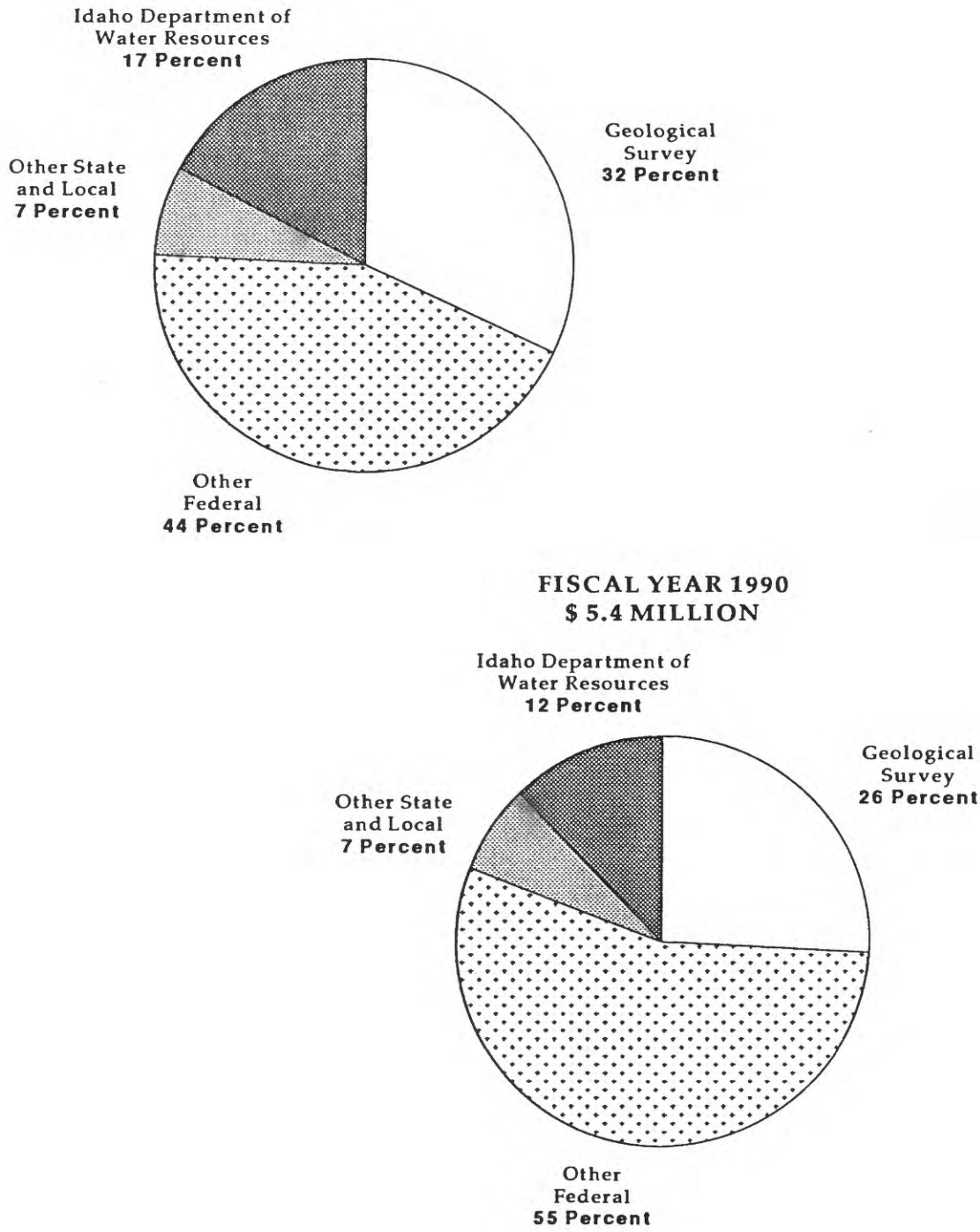


Figure 2.—Idaho District funding.

Table 1.—*Cooperating agencies*

State and Local	Federal
City of Nampa	Air Force
College of Southern Idaho	Army Corps of Engineers
County of Shoshone	Bonneville Power Administration
Idaho Department of Health and Welfare	Bureau of Indian Affairs
Idaho Department of Parks and Recreation	Bureau of Land Management
Idaho Department of Water Resources	Bureau of Reclamation
Nez Perce Tribe	Department of Energy
Southwest Irrigation District	Department of the Interior, Office of the Secretary
Shoshone-Bannock Tribes	Federal Energy Regulatory Commission
Teton County (Wyoming) Commissioners	Fish and Wildlife Service
Water District 01	Geological Survey
Water District 31	National Park Service
Water District 32D	

International

International Joint Commission (Waterways Treaty)

WATER CONDITIONS IN IDAHO

In a semiarid agricultural State such as Idaho, a major part of the economy relies on a perennial abundance of water for irrigation and electric power supply. Reservoirs provide water for irrigation, mostly on the Snake River Plain in southern Idaho, and for electric power generation. Presently, all the flow in the Snake River is appropriated for use, and use of ground water for irrigation has increased.

In 1985, about 87 percent of the people in Idaho depended on ground water for domestic supply; however, withdrawals for public and rural domestic supplies amounted to only about 6 percent of total ground-water withdrawals. By far the largest use of ground water in the State is irrigated agriculture. In 1985, about 91 percent of total ground-water withdrawals were for irrigation.

In several areas of the State where irrigation is the primary use of water, ground-water levels have been declining steadily. Since 1962, the Idaho Department of Water Resources has identified eight areas—seven on the Snake River Plain and one in Curlew Valley—where overall water-level declines are significant. These areas, designated as Critical Ground-Water Areas, presently are closed to further development. Water-level declines have warranted designation of Ground-Water Management Areas in five other areas of the Snake River Plain. Development in these areas is restricted.

Ground Water

Ground-water levels fluctuate in response to seasonal and climatic changes and ground-water usage. During the 1989–90 water years, the continuation of below-normal precipitation and mountain snowpack resulted in less available surface water and therefore greater use of ground water for irrigation. Water levels in five wells used to monitor the Snake River Plain aquifer in southern Idaho and the Rathdrum Prairie aquifer in northern Idaho were below average the entire period and indicate a general decline in water levels. Water levels in a well penetrating a sand and gravel aquifer in the Boise River valley, affected by recharge from unlined canals and ditches, recovered to normal levels during the irrigaton season.

Surface Water

The 1989 water year began with no relief from the drought conditions that persisted through 1988. During the year, storms continued to pass to the north or south of the State. During the 1990 water year, precipitation was near normal in the northern part of the State; drought conditions continued in the southern part of the State. Streamflow levels reflected the precipitation patterns during both water years.

During the 1989 water year, water "carried over" from the previous year in most storage reservoirs was sufficient for most irrigators. Exceptions were in small basins where irrigators rely on natural flow from streams. During 1990, the quantity of water carried over was insufficient. By the end of the water year, reservoir contents in southern Idaho were nearly depleted.

Water Quality

The natural water-quality characteristics of surface and ground water result largely from the dissolution of minerals from surrounding rocks and soils. Land uses such as agriculture, grazing, logging, mining, and urbanization can alter natural water quality and affect its suitability for beneficial uses such as public or agricultural water supply, recreation, and fisheries. Water quality in Idaho generally is perceived to be good and water is suitable for most uses. This perception is, however, highly qualitative because, until 1990, Idaho lacked a network of stations for monitoring water-quality constituents such as sediment, temperature, pH, dissolved oxygen, trace elements, toxic substances, and radionuclides. The resultant scarcity of water-quality data has made it difficult to identify time trends, to assess long-term effectiveness of best management practices, or to locate surface or ground water with impaired beneficial uses. The newly established statewide surface- and ground-water-quality monitoring programs will provide data for detection of trends and will supply information for sound planning and management decisions.

One of the few water-quality constituents that has been monitored statewide over a long period of time is dissolved solids. Concentrations of dissolved solids are larger in southern Idaho than in central or northern Idaho, mainly because of differences in rock type.

STATUS OF PROJECTS

The Idaho District program in fiscal years 1989–90 consisted of 25 funded projects. Projects 001, 002, 003, and 004 are continuing hydrologic-data collection projects. Geographic areas of responsibility for data collection by Idaho District field office personnel are shown in figure 3. Locations of measurement sites where many types of surface-water and water-quality data are collected (projects 001 and 003) and locations of observation wells where water levels are measured (project 002) are shown in figures 4–11. Wells that are part of hydrologic-studies projects are not shown in these figures. Water levels and other related data for project wells are available from the Idaho District office at the address shown on page 4.

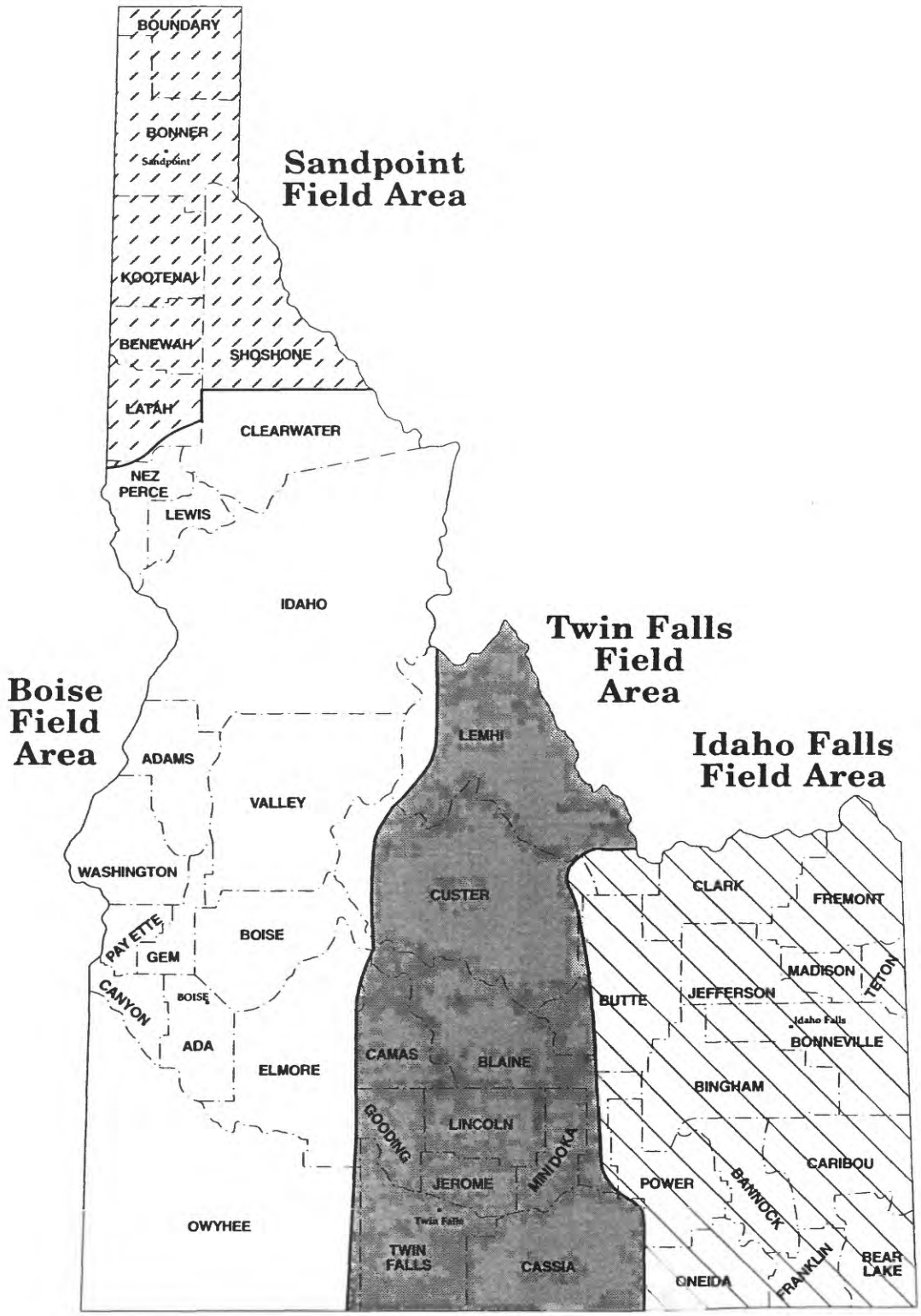


Figure 3.—Geographic areas of responsibility for data collection by Idaho District field offices.

EXPLANATION OF SYMBOLS USED IN FIGURES 4 THROUGH 11

▲ **Gaging station**—Inverted symbol indicates water-quality station

Chemical measurement site

Temperature measurement site

Biological measurement site

Sediment measurement site

Observation well

Water-quality well—for statewide monitoring network

Water-quality well also an observation well—for statewide monitoring network

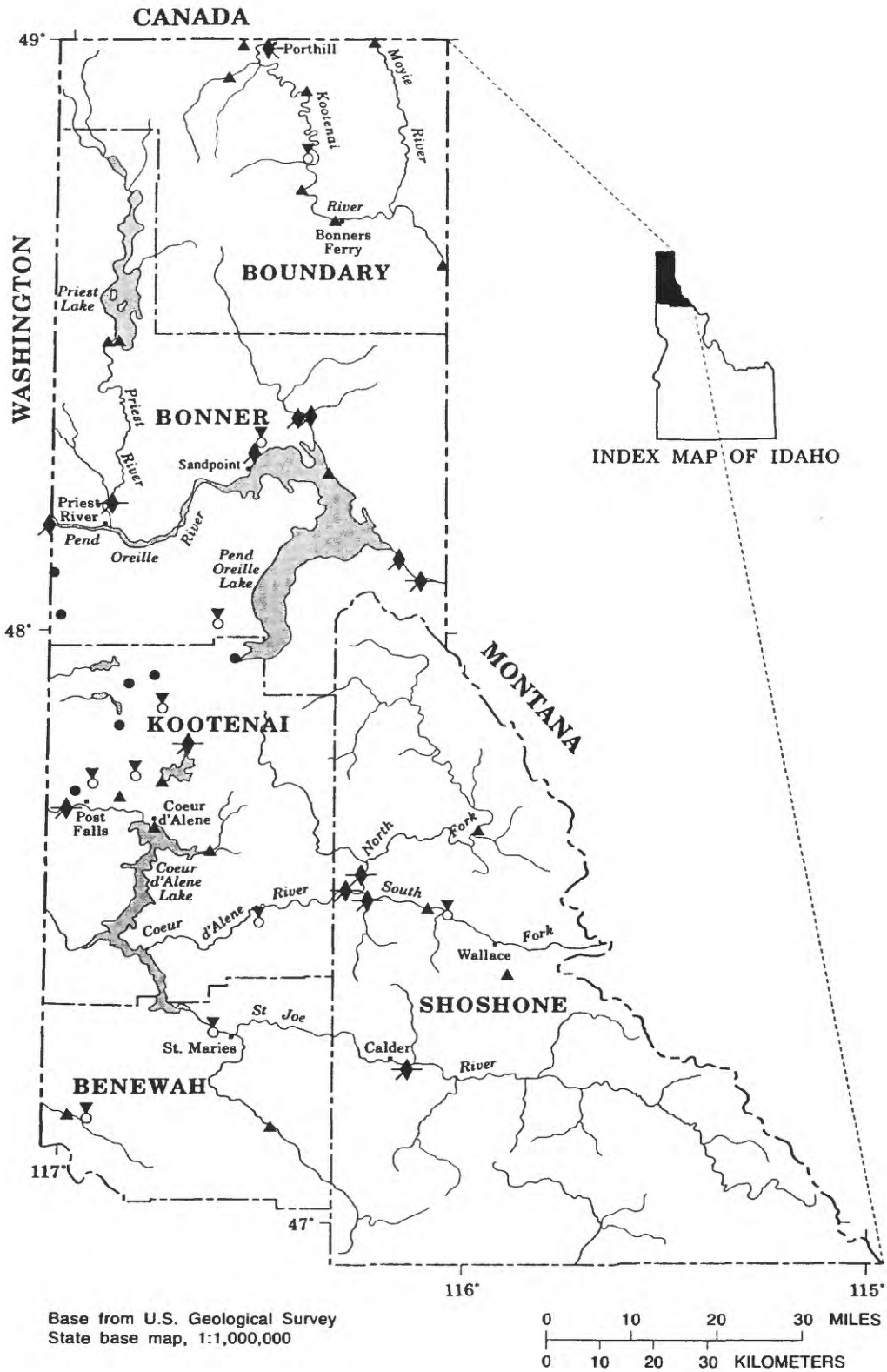


Figure 4.—Locations of surface-water and water-quality measurement sites and observation wells in north Idaho.

(One site in Canada and two sites in Montana, not shown on map, are maintained by the Idaho District)

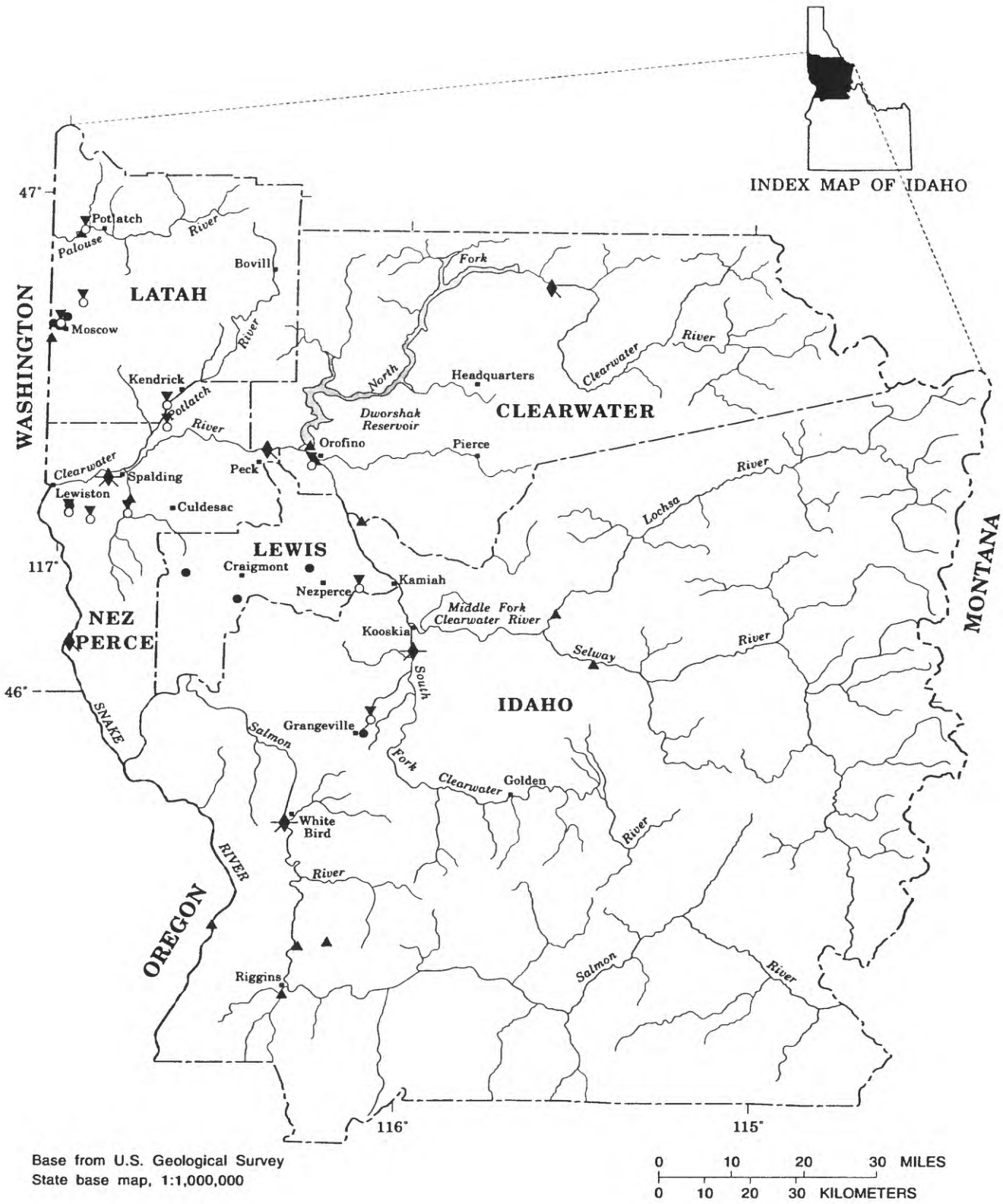


Figure 5.—Locations of surface-water and water-quality measurement sites and observation wells in north-central Idaho.

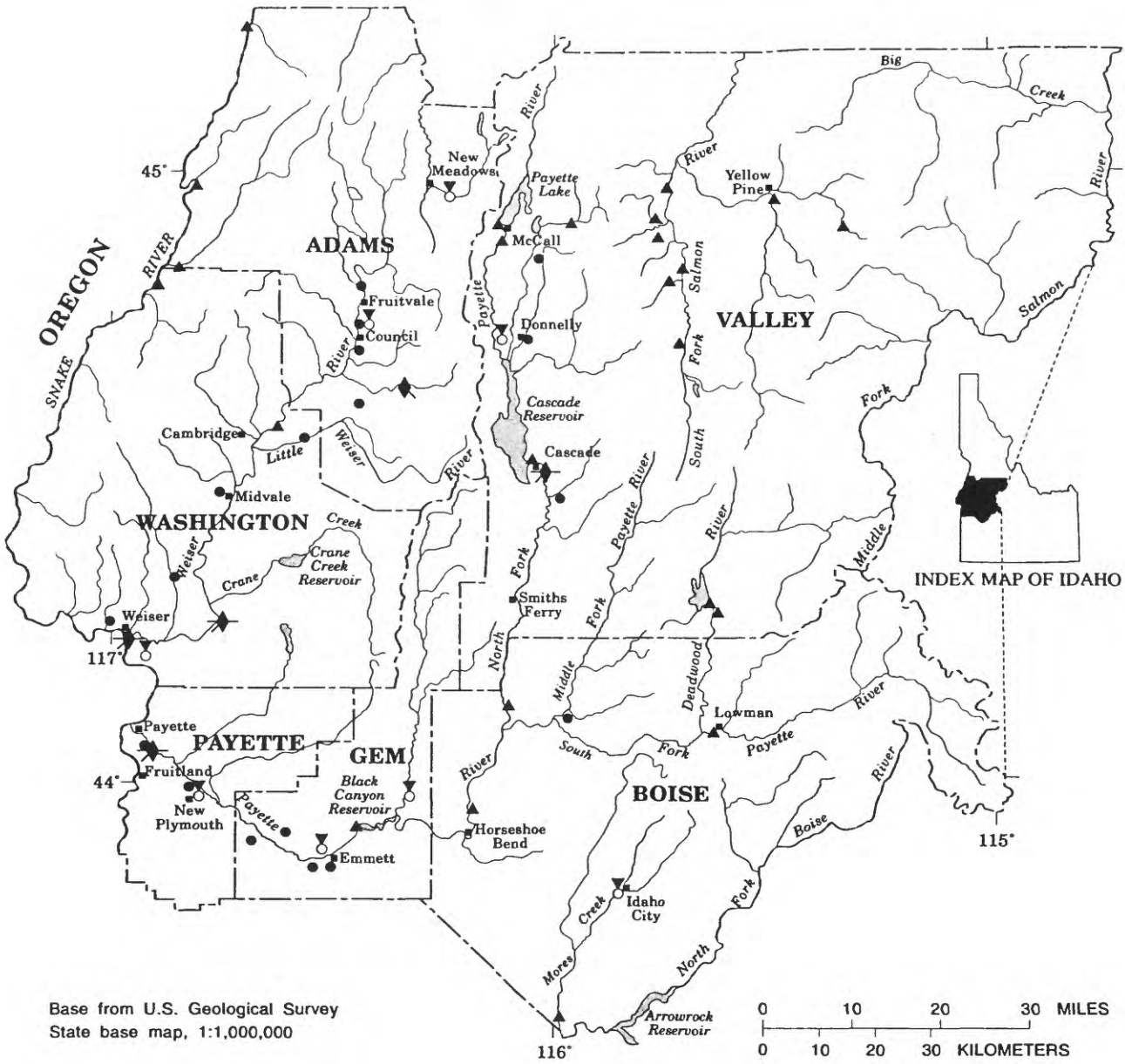


Figure 6.—Locations of surface-water and water-quality measurement sites and observation wells in west-central Idaho.

Figure 7.—Locations of surface-water and water-quality measurement sites and observation wells in east-central Idaho.

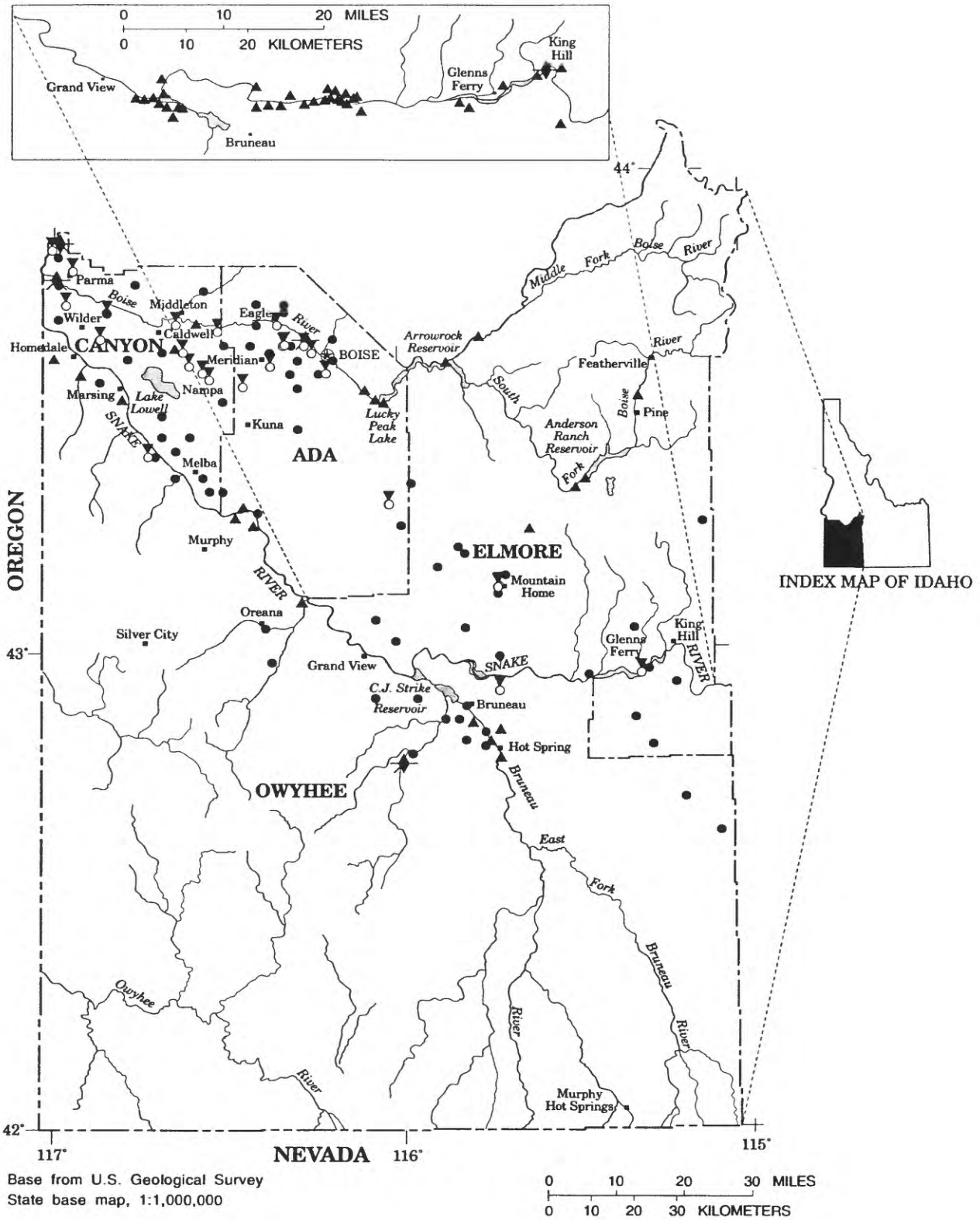


Figure 8.—Locations of surface-water and water-quality measurement sites and observation wells in southwest Idaho.
(One site in Oregon and one site in Nevada, not shown on map, are maintained by the Idaho District)

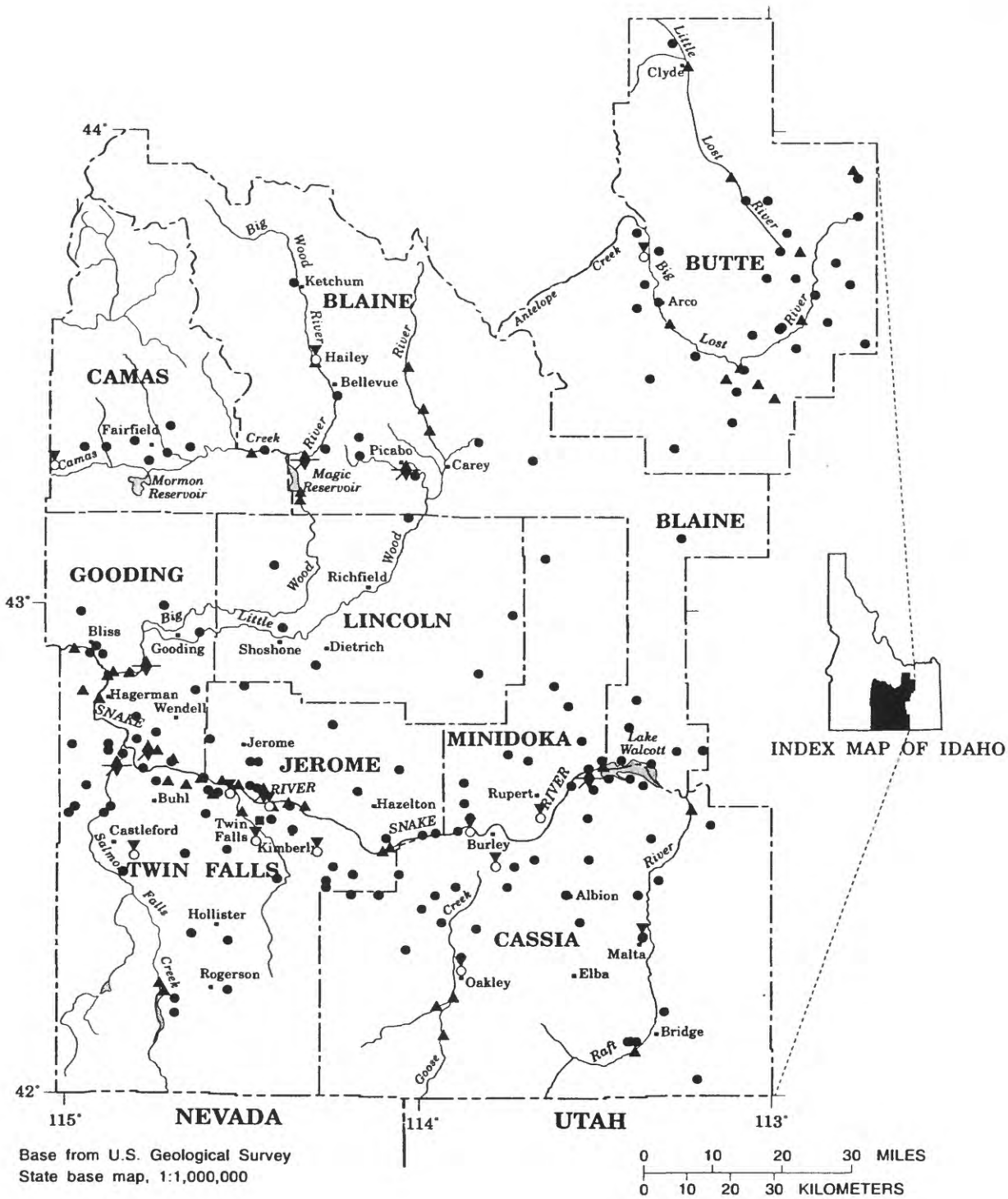


Figure 9.—Locations of surface-water and water-quality measurement sites and observation wells in south-central Idaho.
(One site in Nevada, not shown on map, is maintained by the Idaho District)

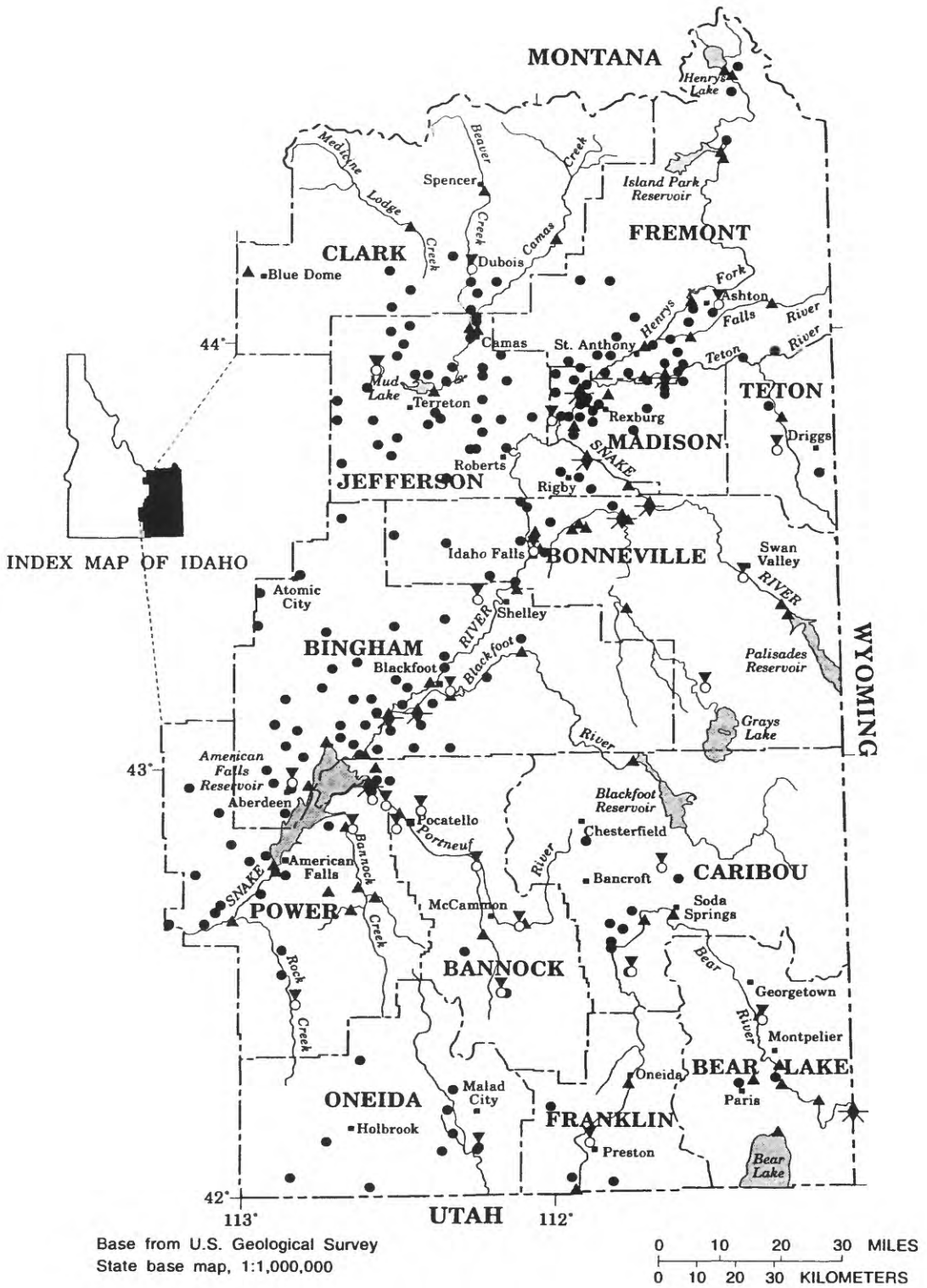


Figure 10.—Locations of surface-water and water-quality measurement sites and observation wells in southeast Idaho.

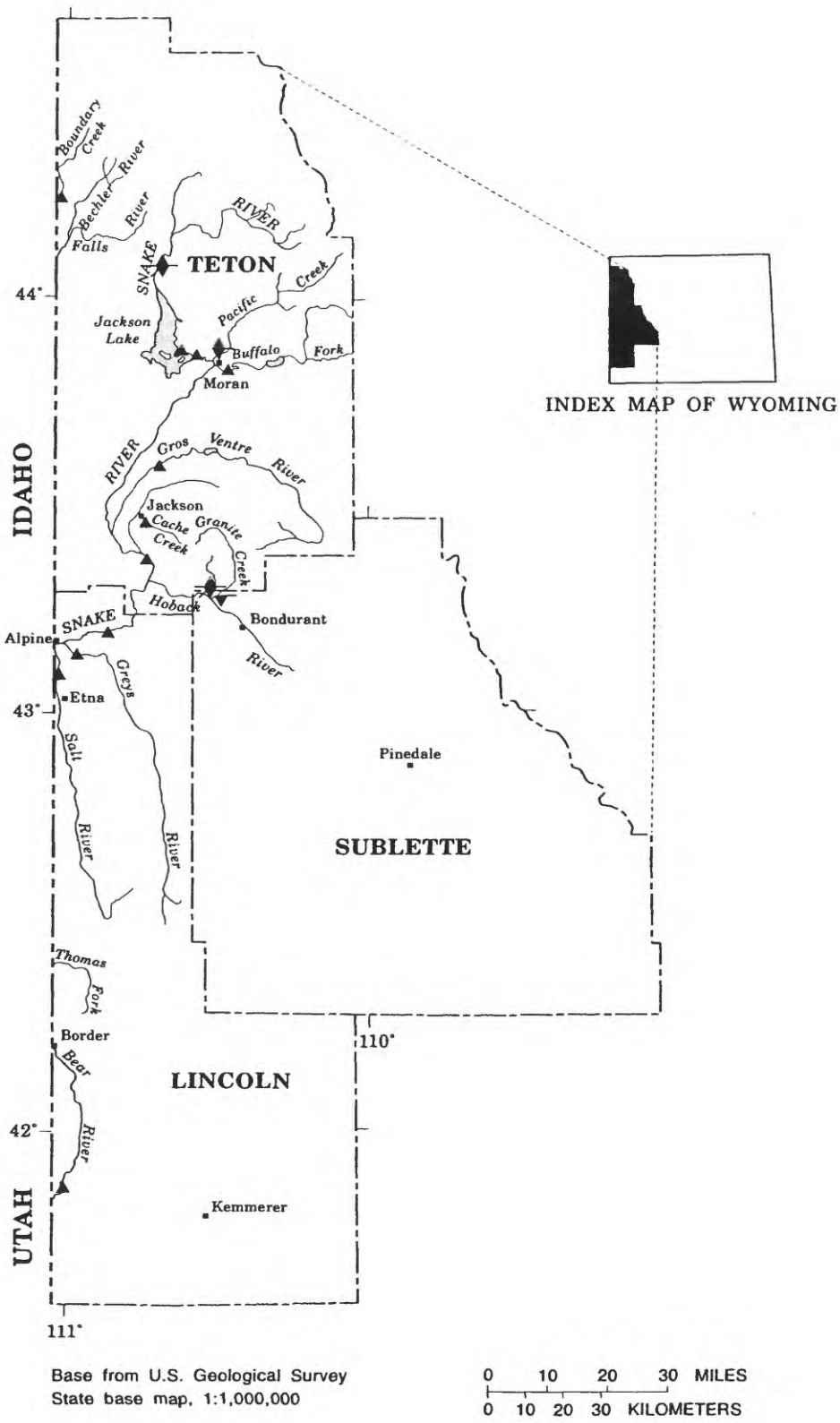


Figure 11.—Locations of surface-water and water-quality measurement sites and observation wells in west-central Wyoming.

PROJECTS FUNDED IN FISCAL YEARS 1989–90

(pg 21 follows)

ID 001—*Surface-Water Stations*

Location: Statewide

Period of project: Continuous since July 1889

Project leader: William A. Harenberg

Objectives: Collect surface-water data to meet the needs for: (1) Assessment of water resources; (2) operation of reservoirs or industries; (3) forecasting; (4) disposal of wastes; (5) determination of discharge to accompany water-quality measurements; (6) legal requirements; and (7) research, planning, and design studies that define the statistical properties of and trends in streamflow and lake levels.

Approach: Measure and record stage and discharge of streams and stage and contents of lakes and reservoirs using standard methods of data collection as described in the series, "Techniques of Water-Resources Investigations of the United States Geological Survey." (For more information on this series, see p. 51, "Publications of the U.S. Geological Survey.") Collect partial-record data at sites where continuous-record data are not required.

Progress in FY 1989–90: Collected and compiled discharge data for 250 gaging stations in 1989 and 243 gaging stations in 1990, stage only for 2 gaging stations in both years, stage or elevation for 8 lakes and reservoirs in 1989 and 6 lakes and reservoirs in 1990, contents only for 23 lakes and reservoirs in 1989 and 21 lakes and reservoirs in 1990, and partial-record data.[1] Incorporated data as part of the National Water Data Storage and Retrieval (WATSTORE) system. (For more information on this system, see p. 51, "Water-Data Program.") The Idaho District is also engaged in establishing a "real-time" data network to provide a continuous record of river stage and discharge. Such data are used for: (1) Prompt identification of extreme flows that could have an effect on the safety of life and property, (2) decision making where high flows might affect the management of hazardous waste materials, (3) irrigation and hydrologic project operations, and (4) joint operation of selected Canadian gaging stations under the Boundary Waters Treaty with the International Joint Commission on Waterways.

Plans for FY 1991: Continue to collect and compile stage and discharge data at 271 continuous-record sites. Compile data collected at numerous miscellaneous sites. Add new data to WATSTORE and publish results at end of water year. Continue operation of all surface-water data networks.

Funding sources: City of Nampa, County of Shoshone, Federal Energy Regulatory Commission, Idaho Department of Health and Welfare, Idaho Department of Parks and Recreation,

[1] Some data supplied by the Idaho Power Company, Oakley Canal Company, Salmon River Canal Company, Utah Power and Light Company, Washington Water Power Company, and Water Districts 01, 31, 32, 33, 34, 37, 37N, 63, and 65K.

Idaho Department of Water Resources, International Joint Commission (Waterways Treaty), Teton County (Wyoming) Commissioners, U.S. Army Corps of Engineers, U.S. Bonneville Power Administration, U.S. Bureau of Land Management, U.S. Bureau of Reclamation, U.S. Department of Energy, U.S. Geological Survey, Water District 01, and Water District 32D.

Reports:

Harenberg, W.A., Jones, M.L., O'Dell, I., and Cordes, S.C., 1990, Water resources data, Idaho, water year 1989: U.S. Geological Survey Water-Data Report ID–89–1, 681 p.

Harenberg, W.A., Jones, M.L., O'Dell, I., and Lehmann, A.K., 1991, Water resources data, Idaho, water year 1990: U.S. Geological Survey Water-Data Report ID–90–1, 641 p.

ID 002—*Ground-Water Stations*

Location: Statewide

Period of project: Continuous since July 1946

Project leader: Michael L. Jones

Objectives: (1) Establish and maintain an observation-well network sufficient to provide a long-term data base so that the general response of the hydrologic system to climatic variations and induced stresses is known and potential problems can be identified early enough to allow proper planning and management of the water resource, and (2) provide a data base with which short-term records acquired in areal studies can be compared and analyzed.

Approach: (1) Select wells in which water-level fluctuations will be representative of the aquifers to be monitored, (2) make water-level measurements in these wells periodically or continuously by means of a recording device, (3) keep tabular and graphical (hydrograph) records of the water-level fluctuations, and (4) evaluate and revise the network on a continual basis to provide the best possible coverage at the least possible cost.

Progress in FY 1989–90: Measured water levels annually, semiannually, quarterly, or monthly in 355 wells in 1989 and in 362 wells in 1990. Measured water levels continuously in 20 wells equipped with recorders in 1989 and 1990. Measured water levels monthly or bimonthly in 77 wells for the U.S. Bureau of Reclamation in 1989–90, monthly in 9 wells for Water District 31 in 1989, and monthly in 14 wells for the Shoshone-Bannock Tribal Council in 1989–90. Personnel in the Hydrologic Studies Section of the Idaho District inventoried about 400 new sites and measured water levels at about 1,000 sites.

Plans for FY 1991: Continue to update and process well data for storage and retrieval in the automated data base. The number of sites maintained for specific projects will increase; the number operated as part of the statewide network will remain the same.

Funding sources: College of Southern Idaho, Idaho Department of Water Resources, Shoshone-Bannock Tribes, U.S. Bureau of Reclamation, U.S. Geological Survey, and Water District 31.

Reports:

Harenberg, W.A., Jones, M.L., O'Dell, I., and Cordes, S.C., 1990, Water resources data, Idaho, water year 1989: U.S. Geological Survey Water-Data Report ID–89–1, 681 p.

Harenberg, W.A., Jones, M.L., O'Dell, I., and Lehmann, A.K., 1991, Water resources data, Idaho, water year 1990: U.S. Geological Survey Water-Data Report ID–90–1, 641 p.

ID 003—*Quality-of-Water Stations*

Location: Statewide

Period of project: Continuous since July 1966

Project leader: Ivalou O'Dell

Objectives: Provide a national base of surface-water/ground-water-quality data for broad Federal and State planning and action programs and provide data for Federal management of interstate and international waters.

Approach: Establish and operate a network of water-quality stations and wells to provide data on average chemical concentrations, loads, and time trends as required by planning and management agencies. Use standard methods of water-sample collection and preparation for laboratory analyses. Make applicable field determinations of water quality.

Progress in FY 1989–90: Collected water-quality data bimonthly at six National Stream Quality Accounting Network (NASQAN) sites and at Snake River above Jackson Lake at Flagg Ranch, Wyo. Collected water-quality data quarterly at two benchmark stations and at Little Granite Creek near Bondurant, Wyo. Collected continuous records of water temperature at six stations during 1989 and at seven stations during 1990. Established a statewide surface-water-quality monitoring network in 1989 consisting of 56 sites that are sampled on a rotating schedule. Established a statewide ground-water-quality monitoring network in 1990 and collected samples of ground water from 97 wells. Collected conductivity and water-temperature data at all gaging stations during routine visits.

Plans for FY 1991: Collect water-quality data at NASQAN and benchmark stations. Collect water-quality data bimonthly at 25 sites as part of the statewide surface-water-quality network and at Snake River above Jackson Lake at Flagg Ranch, Wyo. Collect continuous records of water temperature at six stations. Expand the statewide ground-water-quality network to include 400 wells. Collect conductivity and water-temperature data at all gaging stations during routine visits.

Funding sources: Federal Energy Regulatory Commission, Idaho Department of Health and Welfare, Idaho Department of Water Resources, National Park Service, Nez Perce Tribe, U.S. Army Corps of Engineers, and U.S. Geological Survey.

Reports:

Harenberg, W.A., Jones, M.L., O'Dell, I., and Cordes, S.C., 1990, Water resources data, Idaho, water year 1989: U.S. Geological Survey Water-Data Report ID–89–1, 681 p.

Harenberg, W.A., Jones, M.L., O'Dell, I., and Lehmann, A.K., 1991, Water resources data, Idaho, water year 1990: U.S. Geological Survey Water-Data Report ID–90–1, 641 p.

ID 004—*Sediment Stations*

Location: Statewide

Period of project: Continuous since November 1968

Project leader: Ivalou O'Dell

Objectives: Provide a national base of sediment data for use in broad Federal and State planning and action programs and provide data for Federal management of interstate and international waters.

Approach: Establish and operate a network of sediment stations to collect data that define spatial and temporal averages and trends of sediment concentration, sediment discharge, and particle size of sediment being transported by rivers and streams.

Progress in FY 1989–90: Collected suspended-sediment samples daily by PS 69 automatic pumping sampler at Kootenai River at Porthill. Collected suspended-sediment samples bimonthly at six NASQAN sites and at Snake River above Jackson Lake at Flagg Ranch, Wyo., and quarterly at two benchmark stations and at 25 statewide monitoring network stations. During spring runoff, collected suspended-sediment samples weekly at Granite and Little Granite Creeks near Bondurant, Wyo., and at Pacific Creek at Moran, Wyo., and collected bedload samples at Flagg Ranch, Little Granite and Granite Creeks, and Pacific Creek.

Plans for FY 1991: Collect suspended-sediment samples daily at Kootenai River at Porthill, bimonthly at six NASQAN sites and at Snake River above Jackson Lake at Flagg Ranch, Wyo., and quarterly at two benchmark stations and at 25 statewide monitoring network stations. Collect four bedload samples during spring runoff at Snake River above Jackson Lake at Flagg Ranch, Wyo., and at Pacific Creek at Moran, Wyo.

Funding sources: Idaho Department of Health and Welfare, International Joint Commission (Waterways Treaty), and U.S. Geological Survey.

Reports:

Harenberg, W.A., Jones, M.L., O'Dell, I., and Cordes, S.C., 1990, Water resources data, Idaho, water year 1989: U.S. Geological Survey Water-Data Report ID–89–1, 681 p.

Harenberg, W.A., Jones, M.L., O'Dell, I., and Lehmann, A.K., 1991, Water resources data, Idaho, water year 1990: U.S. Geological Survey Water-Data Report ID–90–1, 641 p.

Williams, R.P., O'Dell, Ivalou, and Megahan, W.F., 1989, Hydraulic geometry and sediment data for the South Fork Salmon River, Idaho, 1985–86: U.S. Geological Survey Open-File Report 89–233, 22 p.

ID 005—*Precipitation Studies*

Location: Hayden Creek drainage basin

Period of project: Continuous since October 1989

Project leader: Robert W. Harper

Objectives: Establish and maintain precipitation recording gages in locations representative of headwater drainage basins.

Approach: Select a few small basins tributary to major streams where precipitation data can be collected and correlated with streamflow data from that basin.

Progress in FY 1989–90: Located a site in the Hayden Creek basin, one of the basins included in the Federal Benchmark Network in October 1989, and installed one precipitation recording gage.

Plans for FY 1991: Continue operation of the Hayden Creek basin precipitation recorder and, if funding is available, establish a precipitation recorder in the Big Jacks Creek basin in southern Idaho.

Funding source: U.S. Geological Survey.

ID 007—*Water Use*

Location: Statewide

Period of project: Continuous since October 1978

Project leader: Molly A. Maupin

Objectives: Maintain a water-use data collection and dissemination program to provide information to the National Water-Use Data System (NWUDS) and to satisfy the needs of local users, the U.S. Geological Survey, and other Federal agencies.

Approach: Contract with governmental agencies currently collecting water data to maintain a framework for coordination of water-use data. Using a geographical information system (GIS) and other techniques, identify major water-use issues and determine best methods of data collection and analysis. Document study results, compute totals for water-use data every fifth year, and maintain a guide to Idaho water-data information sources.

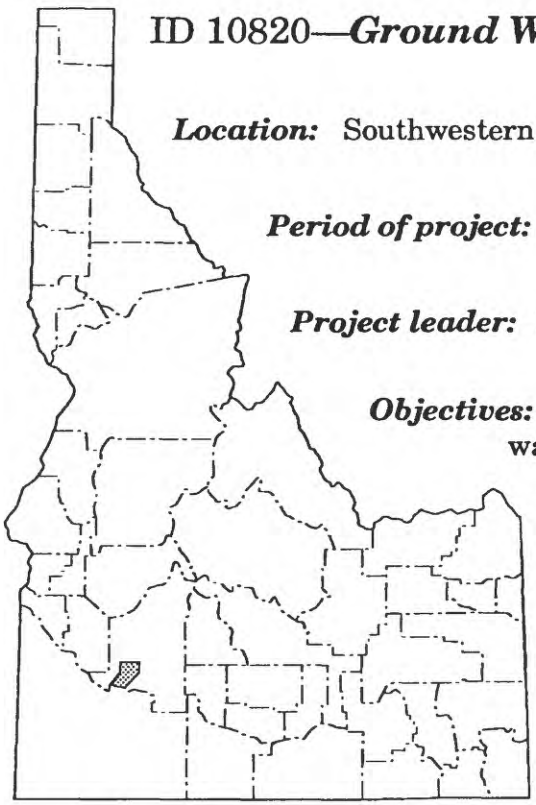
Progress in FY 1989–90: Generated data for all water-use categories and submitted to the Aggregated Water-Use Data System (AWUDS). Began collecting point-of-diversion data.

Plans for FY 1991: Continue to compile data for all water-use categories. Summarize information, including changes from 1985 to 1990, and submit for review as an Open-File Report. Devise techniques for location of measurement sites and estimation of point-of-diversion and return-flow values. Compute totals for all water-use categories for 1990 and submit to Headquarters for publication in a Circular.

Funding sources: Idaho Department of Water Resources and U.S. Geological Survey.

ID 108—*Special Hydrologic and Hydraulic Studies*

The purpose of this project is to conduct special hydrologic and hydraulic studies requested by other Federal and State agencies. Experienced hydrologists use established and specialized techniques to study a variety of hydrologic conditions throughout Idaho. Western Region specialists are consulted as required. All data collected or compiled are published in the annual Idaho Water-Resources Data report. Significant results are published in the Water-Resources Investigations Report series or other appropriate publication series. During fiscal years 1989–90, the Idaho District conducted three special studies.



ID 10820—*Ground Water, Mountain Home Area*

Location: Southwestern Idaho

Period of project: September 1989 through November 1992

Project leader: Harold W. Young

Objectives: Investigate and define the chemical quality of ground water in southern Elmore County, including Mountain Home Air Force Base.

Approach: Inventory approximately 100 wells; measure depth to water; and make onsite determinations of specific conductance, pH, water temperature, alkalinity, dissolved chloride, and nitrite plus nitrate as nitrogen. Collect water samples for analyses of volatile organic compounds. Culture additional water samples from selected wells for fecal coliform and fecal streptococci bacteria analyses.

Progress in FY 1989–90: Inventoried wells, measured water levels, and completed onsite and laboratory analyses of chemical properties and constituents. Published a report summarizing the data.

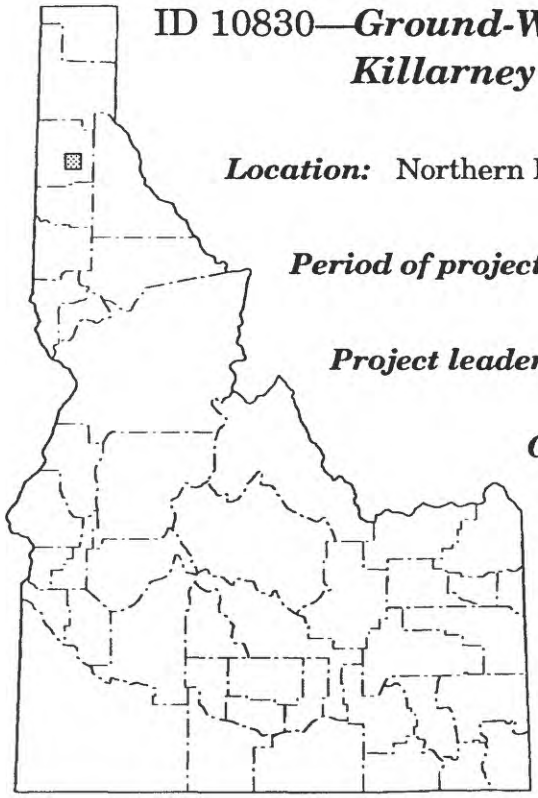
Plans for FY 1991: Assess seasonal changes in ground-water movement, depth to water, and ground-water quality, and summarize information in a map report.

Funding source: Department of the Air Force.

Report:

Parliman, D.J., and Young, H.W., 1990, Hydrologic and chemical data from selected wells and springs in southern Elmore County, including Mountain Home Air Force Base, southwestern Idaho, fall 1989: U.S. Geological Survey Open-File Report 90–112, 35 p.

ID 10830—*Ground-Water/Surface-Water Hydrology, Killarney Lake Area*



Location: Northern Idaho

Period of project: October 1989 through September 1990

Project leader: Timothy B. Spruill

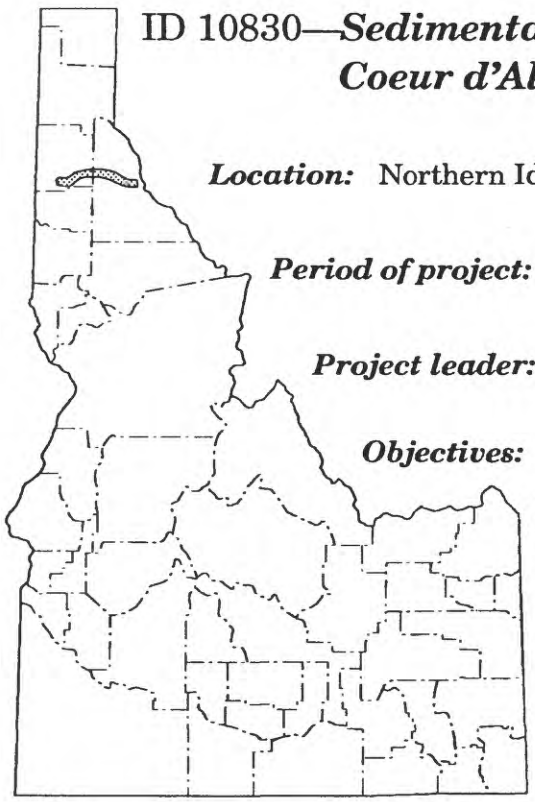
Objectives: (1) Evaluate hydrogeology and ground-water quality in the vicinity of Killarney Lake; (2) using sparse field data, evaluate ground-water/surface-water relations between Killarney Lake and the Coeur d'Alene River; (3) evaluate ground-water quality in the vicinity of Killarney Lake with respect to possible human health and environmental hazards; (4) establish locations of monitoring wells and procedures for monitoring ground-water quality in the vicinity of Killarney Lake; and (5) prepare a report summarizing findings of the study.

Approach: (1) Conduct a survey of published literature and data available from various public agencies, (2) collect water-level and chemical-quality data, and (3) install monitoring wells.

Progress in FY 1990: Completed all field aspects of the project, analyzed data, and submitted a rough draft of the report for review. Installed six monitoring wells and one piezometer in alluvium near Killarney Lake. Collected water samples from four wells and a site on Killarney Lake and analyzed for major ions, selected trace elements, nutrients, and total organic carbon. Performed slug tests to determine hydraulic characteristics of the alluvial sediments.

Plans for FY 1991: Publish report.

Funding source: U.S. Bureau of Land Management.



ID 10830—*Sedimentation and Erosion Processes in the Coeur d'Alene River Valley*

Location: Northern Idaho

Period of project: October 1989 through September 1990

Project leader: Timothy B. Spruill

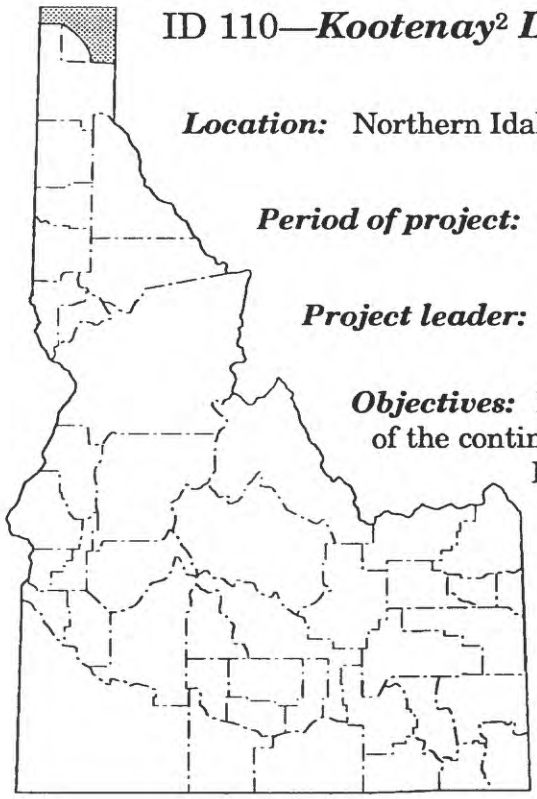
Objectives: (1) Identify changes in land-use practices that have affected sedimentation and erosion processes; (2) determine whether sedimentation and erosion processes have changed as a result of remedial actions; (3) evaluate water-quality changes in the Coeur d'Alene River that have resulted from past land-use practices; (4) if data are available, identify major water-quality and sediment problems associated with mining in the Coeur d'Alene River Valley; (5) if data are sparse, identify where and what additional data are necessary to identify those problems and to evaluate effectiveness of remedial actions; and (6) prepare a report summarizing findings.

Approach: (1) Identify most significant works in the published literature and summarize what is known about mining and its effects on sedimentation and erosion processes, (2) retrieve and analyze current and past water-quality data to characterize sedimentation and erosion processes in the Coeur d'Alene River Valley, and (3) conduct a limited field investigation to determine concentrations of selected trace elements in sediments of the Coeur d'Alene River Valley.

Progress in FY 1989–90: Completed all analytical and field aspects of the project. Prepared and submitted for review a report summarizing findings of the study.

Plans for FY 1991: Publish report.

Funding source: U.S. Bureau of Land Management.



ID 110—*Kootenay*[2] *Lake Board of Control*

Location: Northern Idaho, Kootenai River basin

Period of project: Continuous since January 1938

Project leader: Jerry L. Hughes

Objectives: Fulfill United States' responsibilities under the terms of the continuing International Waterways Treaty program. The Board serves as advisor to the International Joint Commission.

Approach: Attend scheduled meetings and inspection trips. Review hydrologic data concerning regulation of Kootenay Lake or effects of Libby Dam operation on Kootenay Lake.

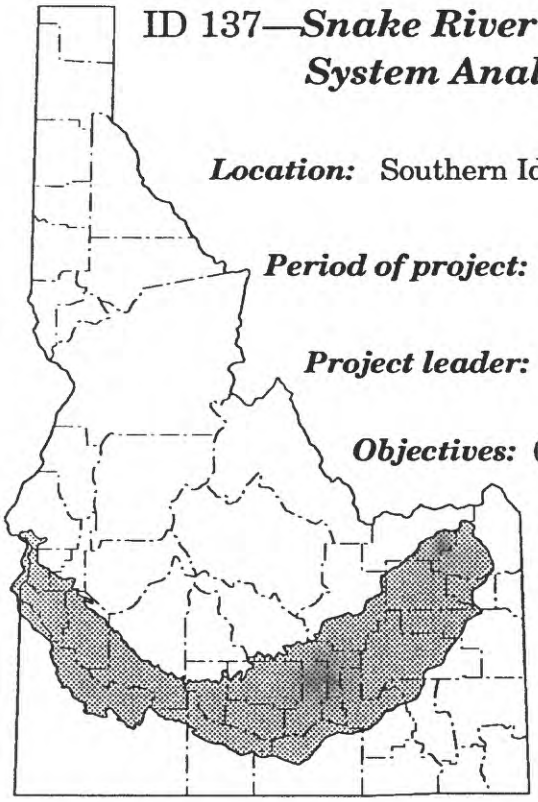
Progress in FY 1989–90: Revised the Annual Report of the Kootenay Lake Board of Control to reflect operations of the previous 12 months. District hydrographers made thrice-yearly inspections and measurements of the Kootenay River at Grohman Narrows, British Columbia, and forwarded the information to Canada's Inland Waters Directorate at Vancouver. During the 1989 water year, completed work on the Water Resources Division Branch-Network Flow Model to simulate streamflows in the reach between Klockmann Ranch and Porthill gaging stations. On June 21, 1989, technician teams made continuous, 24-hour discharge measurements on Kootenai River at Copeland and at Porthill. Compared discharge computations from the model with average daily discharge measured at both sites and with more than 40 discharge measurements at Porthill to verify the model's applicability. Jerry L. Hughes, Idaho District Chief, accompanied personnel from the U.S. Geological Survey and the U.S. Army Corps of Engineers and commissioners of the Kootenay Lake and Osoyoos Lake Boards of Control on a tour of the projects in Canada in August 1990.

Plans for FY 1991: Continue to collect data on the Kootenai River and at Kootenay Lake. Publish daily discharge values generated by the computer model for the 1990 water year at Copeland and Porthill. Attend meeting in Victoria, British Columbia, with U.S. Geological Survey personnel from Alaska and Washington and representatives from the Water Survey of Canada to discuss operation of the International Boundary gaging stations.

Funding source: International Joint Commission (Waterways Treaty).

[2]"Kootenay" is the preferred spelling in Canada; "Kootenai" is the preferred spelling in the United States.

ID 137—*Snake River Plain RASA (Regional Aquifer-System Analysis)*



Location: Southern Idaho

Period of project: October 1979 through September 1990

Project leader: Gerald F. Lindholm

Objectives: (1) Describe geologic, hydrologic, and chemical-quality aspects of the aquifer system, (2) evaluate the water-supply potential of the system, and (3) predict responses of the system to changes in ground-water development through the use of hydrologic-system models.

Approach: Phase I: (1) Establish liaison committees, review existing literature and data bases, and plan and contract for geophysical and geological mapping and test drilling; (2) compile existing data, collect additional data, and develop regional ground-water flow models; and (3) use models to evaluate aquifer systems and simulate projected water-use schemes to evaluate hypothetical future conditions. Phase II: Identify and quantify key parts of the regional hydrologic system.

Progress in FY 1989–90: Obtained Director's approval for a Phase I Professional Paper on streamflow gains and losses in the Snake River and ground-water budgets. Published the first two in a five-part series of miscellaneous investigations maps that will present results of geologic mapping of the north wall of the Snake River canyon between Milner and King Hill. Submitted three Phase II reports for review.

Plans for FY 1991: Obtain Director's approval for the remaining Phase I and Phase II reports.

Funding source: U.S. Geological Survey.

Reports:

Covington, H.R., and Weaver, J.N., 1989, Geologic map and profiles of the north wall of the Snake River canyon, Bliss, Hagerman, and Tuttle quadrangles (map A), Idaho: U.S. Geological Survey Miscellaneous Investigations Series I–1947A, scale 1:24,000.

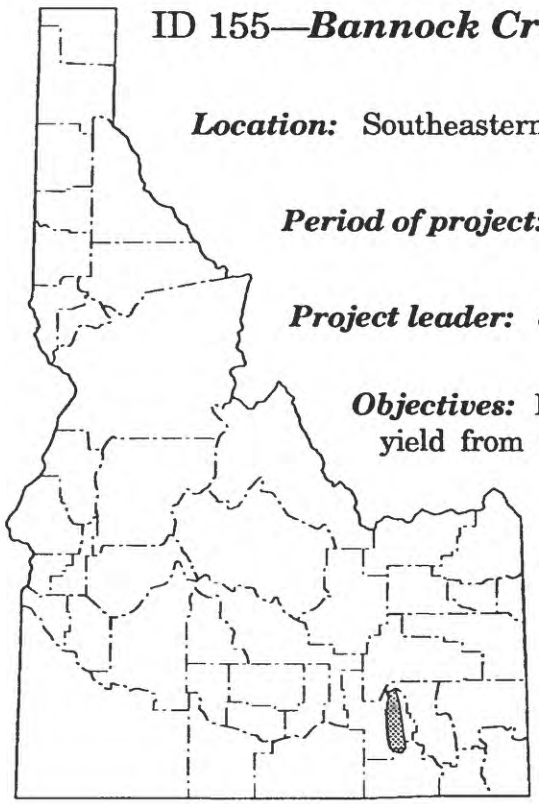
Covington, H.R., and Weaver, J.N., 1990, Geologic map and profiles of the north wall of the Snake River canyon, Pasadena Valley and Ticeska quadrangles (map B); Jerome, Filer, Twin Falls, and Kimberly quadrangles (map D); Eden, Murtaugh, Milner Butte, and Milner quadrangles (map E), Idaho: U.S. Geological Survey Miscellaneous Investigations Series I–1947–B, D, E, scale 1:24,000.

Lindholm, G.F., and Vaccaro, J.J., 1988, Region 2, Columbia Lava Plateau, Chapter 5 *in* Back, W., Rosenshein, J.S., and Seaber, P.R., eds., Hydrogeology, v. O–2, *in* Geology of North America: Boulder, Colo., The Geological Society of America, Inc., p. 37–50.

Lindholm, G.F., 1989, The basalt aquifer system underlying the eastern Snake River Plain in Idaho and hydrologic changes due to 100 years of irrigation [abs.]: Twenty-eighth International Geological Congress, Washington, D.C., July 9–19, 1989, v. 2, p. 2–303.

Newton, G.D., 1989, Geohydrology of the regional aquifer system, western Snake River Plain, southwestern Idaho: U.S. Geological Survey Open-File Report 88–317, 82 p.

ID 155—*Bannock Creek Hydrology*



Location: Southeastern Idaho

Period of project: October 1986 through September 1989

Project leader: Joseph M. Spinazola

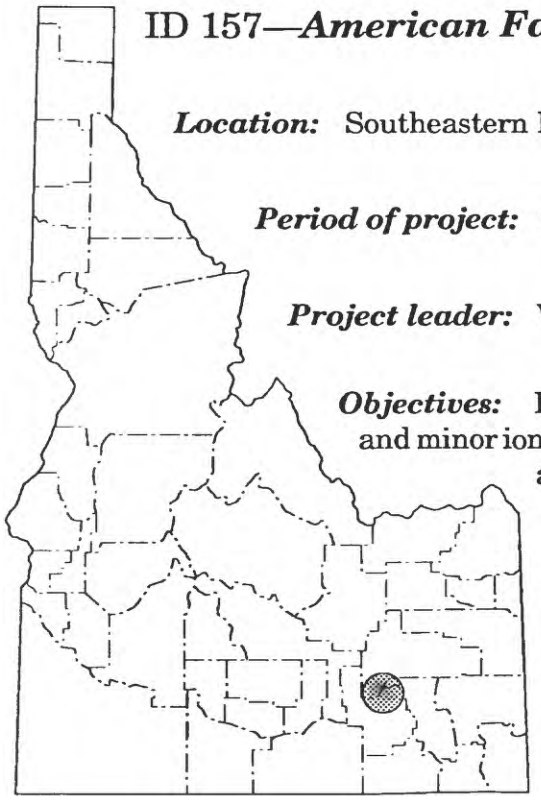
Objectives: Describe the general hydrology of and determine water yield from the Bannock Creek basin on the Fort Hall Indian Reservation.

Approach: Phase I: (1) Compile existing geologic and hydrologic data, (2) inventory and measure all wells and springs and construct water-level contour map, (3) complete seismic refraction study, and (4) obtain discharge measurements at sites on Bannock Creek and principal tributaries. Phase II: (1) Locate sites for and drill four to six test holes, (2) complete geophysical logs in test holes and other available wells, (3) conduct aquifer tests in about four wells and obtain specific capacity data in others, and (4) obtain ground-water samples for chemical analyses. Phase III: Complete report describing hydrology and yield of the basin.

Progress in FY 1989–90: Completed collection, compilation, and analyses of hydrologic data. Determined basin yield and developed water budgets for four individual parts of the basin. Completed rough draft of report and submitted to Idaho District for review.

Plans for FY 1991: Obtain Director's approval and publish report.

Funding sources: Shoshone-Bannock Tribes and U.S. Geological Survey.



ID 157—*American Falls Irrigation Drainage*

Location: Southeastern Idaho

Period of project: October 1987 through September 1989

Project leader: Walton H. Low

Objectives: Determine whether concentrations of selected major and minor ions and organic compounds in water, bottom sediments, and biota at American Falls Reservoir exceed known standards or criteria.

Approach: Once during irrigation season, collect samples of water, bottom sediment, aquatic plants, benthic invertebrates, fish, and waterbirds and analyze for selected major and minor ions and organic compounds. Once after irrigation season, collect water samples and analyze for selected major and minor ions.

Progress in FY 1989–90: Completed study and report.

Plans for FY 1991: Publish report.

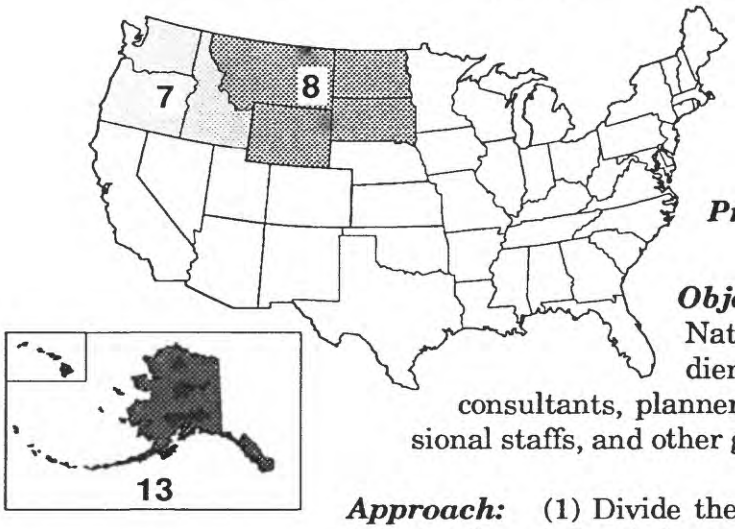
Funding source: Department of the Interior, Office of the Secretary.

Report:

Low, W.H., and Mullins, W.H., 1990, Reconnaissance investigation of water quality, bottom sediment, and biota associated with irrigation drainage in the American Falls Reservoir area, Idaho, 1988–89: U.S. Geological Survey Water-Resources Investigations Report 90–4120, 78 p.

ID 159—*National Ground-Water Atlas*

Location: Idaho, Oregon, and Washington (Segment 7); Montana, North Dakota, South Dakota, and Wyoming (Segment 8); and Alaska and Hawaii (Segment 13)



Period of project: October 1987 through September 1991

Project leader: Richard L. Whitehead

Objective: Provide a summary of the Nation's ground-water resources for an audience that includes the general public, consultants, planners, colleges and universities, Congressional staffs, and other governmental agencies.

Approach: (1) Divide the study into 13 multi-State segments; (2) compile existing information, including reports resulting from the Regional Aquifer-System Analysis; and (3) obtain additional information from Federal, State, and local resource agencies.

Progress in FY 1989–90: Submitted report on Segment 7 to Central Region for review. Submitted report on Segment 8 to Idaho District for review. Completed data compilation for Segment 13.

Plans for FY 1991: Obtain Director's approval for Segment 7 atlas. Submit Segment 8 atlas to Central Region for review. Submit Segment 13 atlas to Idaho District for review.

Funding source: U.S. Geological Survey.

ID 160—*Water-Surface Elevations, Snake River*

Location: Southwestern Idaho

Period of project: July 1989 through September 1991

Project leader: Luther C. Kjelstrom

Objectives: Develop a hydraulic model to: (1) Simulate water-surface elevations for specific discharges along a 65-mile-long reach of the Snake River downstream from Swan Falls Dam; and (2) provide information on channel depths, widths, and velocities that can be used by other agencies to determine the effects of decreased discharges on fish and wildlife habitat.

Approach: Run level lines from U.S. Coast and Geodetic Survey benchmarks to establish elevations where cross-section data are collected. Survey about 280 cross sections. Determine water-surface elevations at cross sections for measured discharges and use this information to calibrate the hydraulic model (WSPRO).

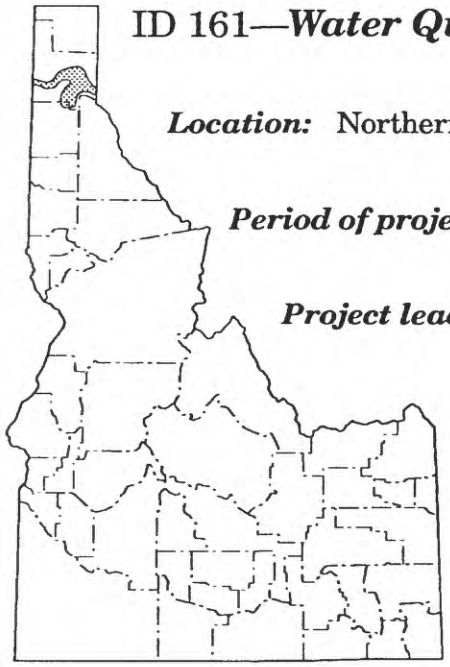
Progress in FY 1989–90: Ran level lines to establish elevations at about 500 temporary benchmarks along the Snake River. Surveyed river-bottom elevations across 420 channels (258 channels were associated with an island or group of islands). Measured discharge and determined water-surface elevations at selected cross sections during steady discharges.

Plans for FY 1991: Calibrate the hydraulic model and use it to simulate water-surface elevations at specific discharges. Prepare appropriate graphs and tables for publication in a report.

Funding sources: Federal Energy Regulatory Commission and U.S. Fish and Wildlife Service.

Report:

Kjelstrom, L.C., 1992, Simulation of water-surface elevations for the Snake River in the Deer Flat National Wildlife Refuge, Idaho: U.S. Geological Survey Water-Resources Investigations Report 91–4198, 105 p.



ID 161—*Water Quality, Pend Oreille Lake*

Location: Northern Idaho

Period of project: October 1988 through September 1991

Project leader: Paul F. Woods

Objectives: Conduct a large-scale investigation of Pend Oreille Lake to determine its susceptibility to eutrophication from nutrient sources within its drainage basin.

Approach: (1) Quantify the hydrologic and nutrient budgets of the lake, (2) characterize spatial and temporal variations in limnological variables, and (3) develop a nutrient load/lake response model to predict the lake's response to alterations in nutrient loading rates.

Progress in FY 1989–90: Measured streamflow and collected water samples periodically at seven tributary stations from October 1988 through September 1990. During both years of study, collected limnological samples at five lake stations triweekly from May through September and every six weeks from October through April. Computed hydrologic and nutrient budgets for both water years. Used the limnological data to characterize spatial and temporal variations throughout the lake. Entered the hydrologic and nutrient budgets and the limnological characterization data into the nutrient load/lake response model.

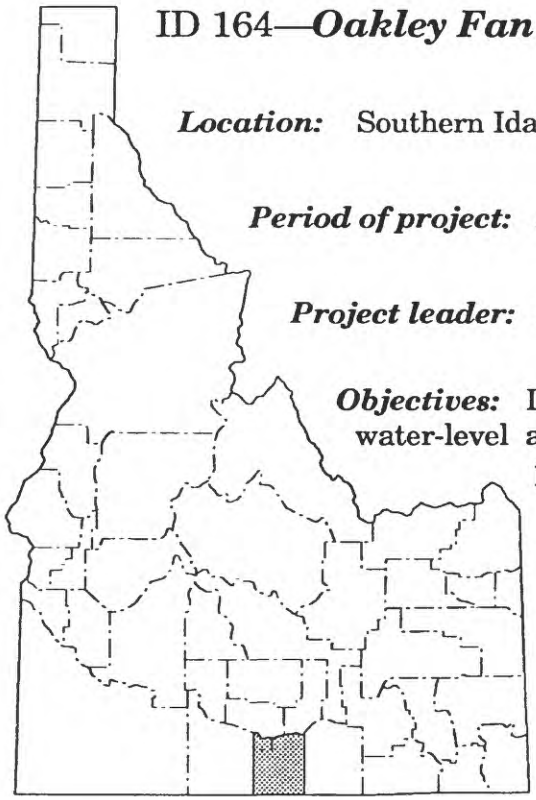
Plans for FY 1991: Calibrate and verify the nutrient load/lake response model and use the model to simulate the lake's response to alterations in nutrient loading rates. Complete rough drafts of the project reports and submit to the Idaho District for review.

Funding sources: Idaho Department of Health and Welfare, Division of Environmental Quality, and U.S. Geological Survey.

Reports:

Fields, R.L., and Woods, P.F., 1990, Processing of bathymetric data for Pend Oreille Lake, Idaho [abs.] *in* Balthrop, Barbara H., and Baker, Eva G., compilers, U.S. Geological Survey National Computer Technology Meeting, San Antonio, Tex., May 1990, Program and Abstracts: U.S. Geological Survey Open-File Report 90–161, p. 11.

Fields, R.L., and Woods, P.F., 1990, Processing of bathymetric data for Pend Oreille Lake, Idaho: U.S. Geological Survey National Computer Technology Meeting, San Antonio, Texas, May 7–11, 1990, Poster Session contribution.



ID 164—*Oakley Fan Artificial Recharge*

Location: Southern Idaho

Period of project: August 1984 through February 1992

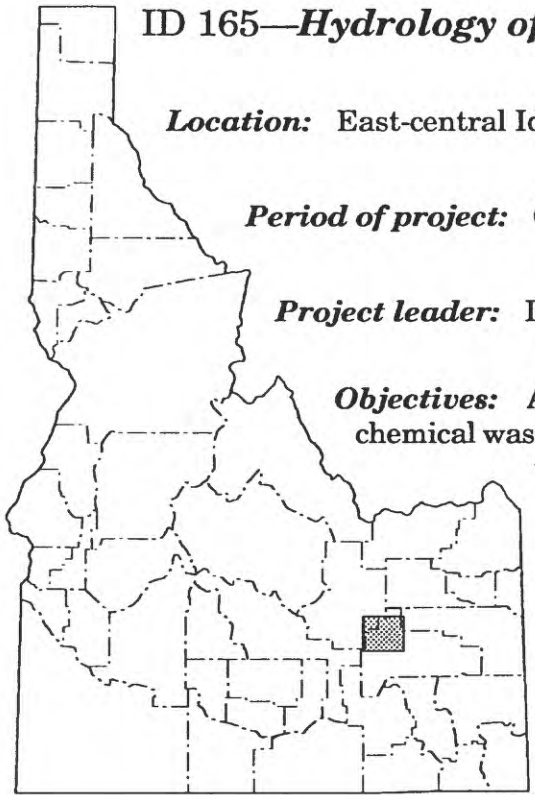
Project leader: Harold W. Young

Objectives: Describe the geohydrology of the area and establish a water-level and water-quality monitoring program to evaluate possible effects of recharge on the hydrologic system.

Approach: (1) Collect and evaluate available data; (2) obtain geophysical logs for selected wells; (3) conduct surface geophysical surveys as needed; (4) estimate recharge, pumpage, and outflow; (5) conduct aquifer tests; (6) obtain water samples for chemical and isotopic analyses; and (7) determine boundary conditions and develop a digital ground-water flow model.

Progress in FY 1989: Continued to collect data at sites established during the study to reflect hydrologic conditions.

Funding sources: U.S. Geological Survey and Southwest Irrigation District.



ID 165—*Hydrology of Subsurface Waste Disposal*

Location: East-central Idaho

Period of project: Continuous since 1959

Project leader: Larry J. Mann

Objectives: Assess the effects on ground water of radioactive and chemical waste disposal at the Idaho National Engineering Laboratory (INEL) and determine principles of water and solute movement in fractured rocks. Map and describe distribution patterns of waste products in ground water so future patterns can be predicted. Evaluate hydrogeochemical controls on subsurface migration of solutes from buried solid radioactive waste. Evaluate hydrologic properties of the deep aquifers in the Snake River Plain.

Approach: (1) Compare current and historical hydrologic data to evaluate distribution and dispersion patterns and rates of water and solute movement, dilution factors, and mass balances of various components; (2) evaluate radiochemical, geochemical, and hydraulic processes affecting changes in water chemistry; (3) using digital models, study hydraulic dispersion, radioactive decay, and sorption phenomena; and (4) provide instrumentation for studying the unsaturated zone underlying a solid-waste burial ground to determine solute transport toward the regional aquifer.

Progress in FY 1989–90: Continued studies of the distribution and migration of radioactive- and chemical-waste products. Published 19 reports describing the hydrologic and geologic characteristics and the chemical properties of ground water at the INEL. Began work on 15 other reports. Expanded the off-site ground-water monitoring network to include 50 wells and 5 springs downgradient from the INEL. Prepared and implemented a quality assurance plan for quality of water activities performed by the INEL Project Office. Developed a long-term ground-water monitoring program for the Naval Reactors Facility. Developed a research program at the Radioactive Waste Management Complex to be conducted by employees in the Geological Survey's National Research Program.

Plans for FY 1991: Continue data-collection programs and work initiated in previous years. Finalize and publish about 10 reports. Begin operation of the core library at the INEL. Begin a study of chlorine-36 concentrations in water in the Snake River Plain aquifer.

Funding source: U.S. Department of Energy.

Reports:

Anderson, S.R., 1989, A preliminary geohydrologic evaluation of basalt and sediment underlying the Snake River Plain at the Idaho National Engineering Laboratory, Idaho [abs.]: Geological Society of America Abstracts with Programs, v. 22, no. 3, p. 3.

Anderson, S.R., and Bartholomay, R.C., 1990, Use of natural gamma logs correlated to potassium-oxide content in determining the stratigraphy of basalt and sediment at the Idaho National Engineering Laboratory, Idaho [abs.]: Geological Society of America Abstracts with Programs, v. 22, no. 6, p. 1.

Anderson, S.R., and Lewis, B.D., 1989, Stratigraphy of the unsaturated zone at the Radioactive Waste Management Complex, Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Water-Resources Investigations Report 89–4065 (DOE/ID–22080), 54 p.

Bartholomay, R.C., 1990a, Digitized geophysical logs for selected wells on or near the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Open-File Report 90–366 (DOE/ID–22088), 347 p.

———1990b, Mineralogical correlation of surficial sediment from area drainages with selected sedimentary interbeds at the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Water-Resources Investigations Report 90–4147 (DOE/ID–22092), 18 p.

Bartholomay, R.C., and Knobel, L.L., 1989, Mineralogy and grain size of surficial sediment from the Little Lost River and Birch Creek Drainages, Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Open-File Report 89–385 (DOE/ID–22082), 19 p.

Bartholomay, R.C., Knobel, L.L., and Davis, L.C., 1989, Mineralogy and grain size of surficial sediment from the Big Lost River drainage and vicinity, with chemical and physical characteristics of geologic materials from selected sites at the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Open-File Report 89–384 (DOE/ID–22081), 74 p.

Bennett, C.M., 1990, Streamflow losses and ground-water level changes along the Big Lost River at the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Water-Resources Investigations Report 90–4067 (DOE/ID–22091), 49 p.

Cecil, L.D., Knobel, L.L., Wegner, S.J., and Moore, L.L., 1989, Evaluation of field sampling and preservation methods for strontium-90 in ground water at the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Water-Resources Investigations Report 89–4146 (DOE/ID–22083), 24 p.

Davis, L.C., and Pittman, J.R., 1990, Hydrological, meteorological, and geohydrological data for an unsaturated zone study near the Radioactive Waste Management Complex, Idaho National Engineering Laboratory, Idaho—1987: U.S. Geological Survey Open-File Report 90–114 (DOE/ID–22086), 208 p.

Edwards, D.D., Bartholomay, R.C., and Bennett, C.M., 1990, Nutrients, pesticides, surfactants, and trace metals in ground water from the Howe and Mud Lake areas upgradient from the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Open-File Report 90–565 (DOE/ID–22093), 19 p.

Knobel, L.L., and Mann, L.J., 1988, Radionuclides in ground water at the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Open-File Report 88–731 (DOE/ID–22077), 37 p.

Mann, L.J., 1989, Tritium concentrations in flow from selected springs that discharge to the Snake River, Twin Falls–Hagerman area, Idaho: U.S. Geological Survey Water-Resources Investigations Report 89–4156 (DOE/ID–22084), 20 p.

———1990, Purgeable organic compounds in ground water at the Idaho National Engineering Laboratory, Idaho—1988 and 1989: U.S. Geological Survey Open-File Report 90–367 (DOE/ID–22089), 17 p.

Mann, L.J., and Cecil, L.D., 1990, Tritium in ground water at the Idaho National Engineering Laboratory, Idaho: U.S. Geological Survey Water-Resources Investigations Report 90–4090 (DOE/ID–22090), 35 p.

Mann, L.J., and Knobel, L.L., 1990, Radionuclides, metals, and organic compounds in water, eastern part of A&B Irrigation District, Minidoka County, Idaho: U.S. Geological Survey Open-File Report 90–191 (DOE/ID–22087), 36 p.

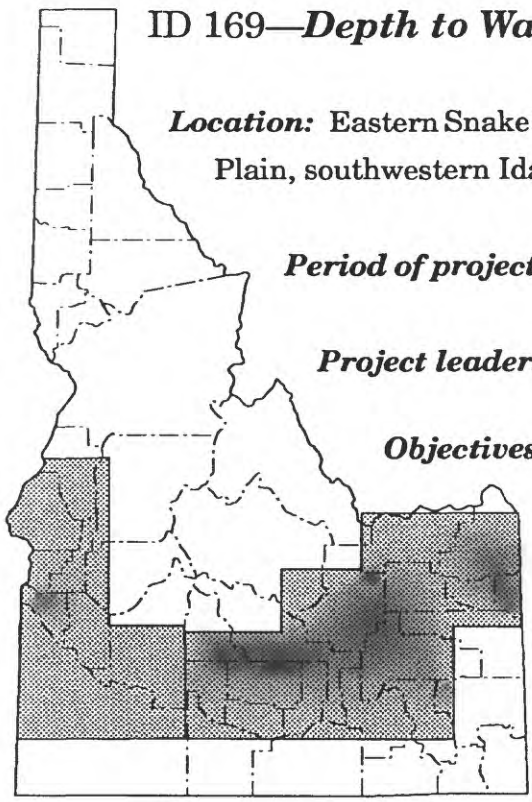
Pittman, J.R., 1989, Hydrological and meteorological data for an unsaturated zone study near the Radioactive Waste Management Complex, Idaho National Engineering Laboratory, Idaho—1985–86: U.S. Geological Survey Open-File Report 89–74 (DOE/ID–22079), 175 p.

Pittman, J.R., Jensen, R.J., and Fischer, P.R., 1988, Hydrologic conditions at the Idaho National Engineering Laboratory, 1982 to 1985: U.S. Geological Survey Water-Resources Investigations Report 89–4008 (DOE/ID–22078), 73 p.

Wegner, S.J., 1989, Selected quality assurance data for water samples collected by the U.S. Geological Survey, Idaho National Engineering Laboratory, Idaho, 1980 to 1988: U.S. Geological Survey Water-Resources Investigations Report 89–4168 (DOE/ID–22085), 91 p.

ID 169—*Statewide Ground-Water Quality*

Ground-water quality is a statewide concern. Various parts of Idaho are threatened by increases in nutrient concentrations in ground water, movement of inferior-quality ground water to surface water, and effects of waste disposal on ground-water quality. During fiscal years 1989–90, the Idaho District conducted several studies designed to address these concerns and to define local water-quality conditions. These studies also will complement the statewide ground-water-quality monitoring program initiated in 1990.



ID 169—*Depth to Water, Snake River Plain*

Location: Eastern Snake River Plain, southeastern Idaho; Western Snake River Plain, southwestern Idaho and eastern Oregon

Period of project: October 1988 through September 1990

Project leader: Molly A. Maupin

Objectives: Digitally generate maps representing depth-to-water zones for eleven 1:100,000-scale quadrangles on the eastern Snake River Plain and surrounding tributary valleys and for nine 1:100,000-scale quadrangles on the western Snake River Plain and surrounding tributary valleys for use in assessing relative vulnerability of ground water to contamination.

Approach: Calculated depth-to-water values by subtracting estimated water-table altitudes from land-surface altitudes at selected points. Estimated water-table values using selected wells from the Ground-Water Site Inventory (GWSI) system and universal kriging software. Contoured and plotted depth-to-water and standard deviation of error values using ARC/INFO.

Progress in FY 1989–90: Completed map reports and received Director's approval for publication.

Funding source: Idaho Department of Health and Welfare, Division of Environmental Quality.

Reports:

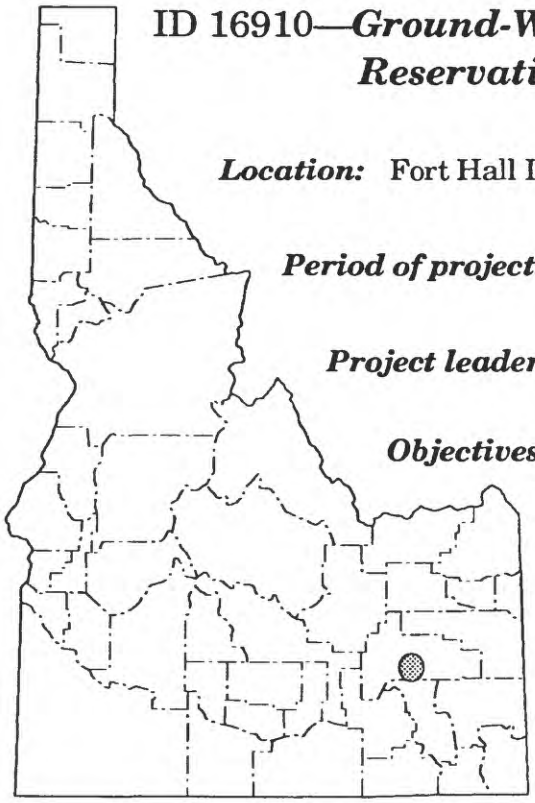
Maupin, M.A., 1990, Depth to water in the Snake River Plain and surrounding tributary valleys, southern Idaho and eastern Oregon: Fifth Annual Northwest ARC/INFO User

Conference, Sun Valley, Idaho, September 16–19, 1990, Poster Session contribution.

Maupin, M.A., 1991a, Depth to water in the eastern Snake River Plain and surrounding tributary valleys, southeastern Idaho, calculated using water levels from 1980 to 1988: U.S. Geological Survey Water-Resources Investigations Report 90–4193, scale 1:750,000.

Maupin, M.A., 1991b, Depth to water in the western Snake River Plain and surrounding tributary valleys, southwestern Idaho and eastern Oregon, calculated using water levels from 1980 to 1988: U.S. Geological Survey Water-Resources Investigations Report 91–4020, scale 1:750,000.

ID 16910—*Ground-Water Quality, Fort Hall Indian Reservation*



Location: Fort Hall Indian Reservation

Period of project: October 1987 through September 1990

Project leader: D.J. Parliman

Objectives: Determine the nature and extent of contamination, particularly nutrient concentrations, in ground water on the Fort Hall Indian Reservation.

Approach: (1) Conduct intensive ground-water sampling in the area north of the reservation and reconnaissance sampling in the southwestern part of the reservation, (2) establish a quarterly monitoring network in each area, and (3) measure water levels in about 80 wells in the Fort Hall area prior to the irrigation season to determine directions of ground-water movement.

Progress in FY 1989–90: During June 1989, inventoried 71 wells on the Fort Hall Indian Reservation near Fort Hall. Made onsite analyses for selected chemical constituents. During July 1989, completed a reconnaissance investigation of nutrient concentrations in ground water southwest of Pocatello. Inventoried 56 wells and made onsite analyses for selected chemical constituents. Designed a ground-water-quality monitoring network for the Fort Hall Indian Reservation and, as part of the monitoring program, collected water samples from 31 wells and analyzed for selected nutrients in July and October of 1989 and February, April, and June of 1990. In April 1990, measured water levels in 81 wells near Fort Hall to determine directions of ground-water movement prior to the irrigation season. In July 1989 and June 1990, collected water samples from 20 wells and sent them to the Idaho State Laboratory for analyses of selected pesticides and volatile organic compounds.

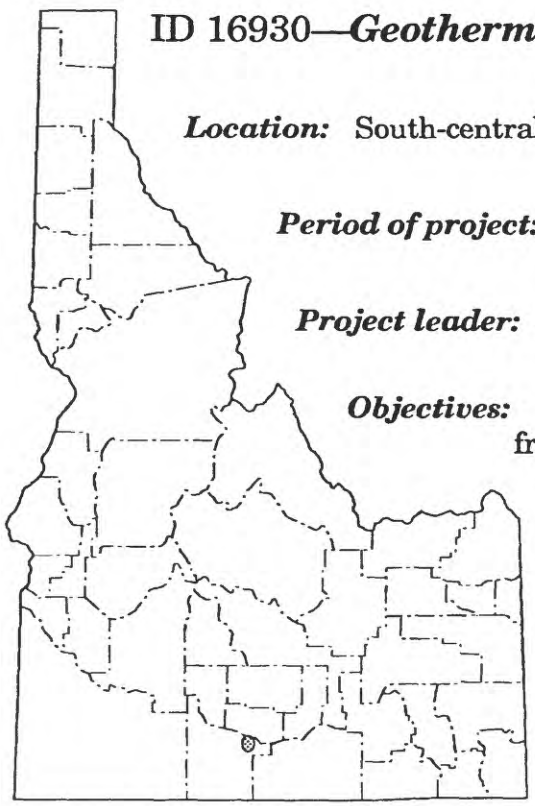
Plans for FY 1991: Collect water samples from about 30 wells on the Fort Hall Indian Reservation in November 1990. When laboratory analyses are complete, send individual water analyses to well owners and submit a compilation of analyses to personnel from the Fort Hall Indian Reservation.

Funding sources: Shoshone-Bannock Tribes and U.S. Geological Survey.

Reports:

Parliman, D.J., and Young, H.W., 1989, Selected ground-water quality data for the area near Fort Hall, Fort Hall Indian Reservation, southeastern Idaho, June 1989: U.S. Geological Survey Open-File Report 89–594, scale 1:100,000.

Young, H.W., and Parliman, D.J., 1989, Selected ground-water quality data for the southern part of the Fort Hall Indian Reservation, southeastern Idaho, July 1989: U.S. Geological Survey Open-File Report 89–593, scale 1:100,000.



ID 16930—*Geothermal Monitoring in Twin Falls County*

Location: South-central Idaho, northern Twin Falls County

Period of project: Continuous since 1984

Project leader: Harold W. Young

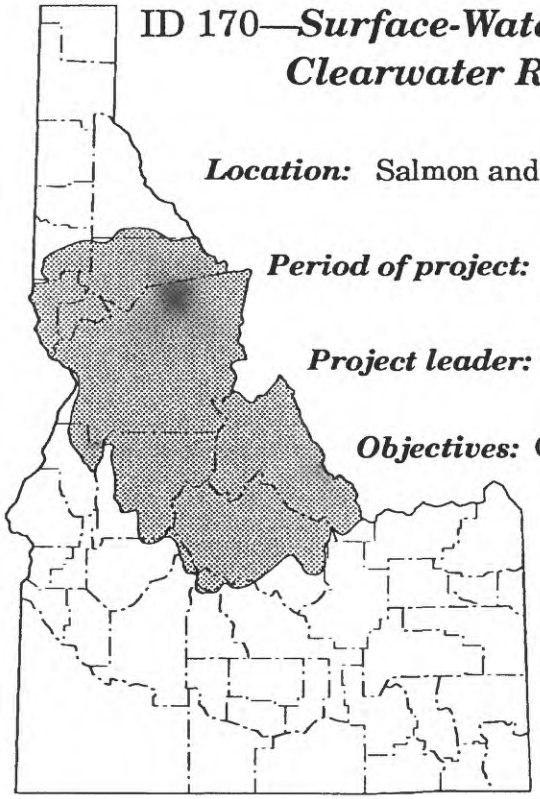
Objectives: Monitor water-level fluctuations and withdrawals from the geothermal system in northern Twin Falls County, south-central Idaho.

Approach: Equip one well with a continuous recorder to monitor water-level fluctuations and read inline flow meters monthly in each of five wells to determine withdrawals.

Progress in FY 1989–90: Serviced the continuous recorder to monitor water-level fluctuations and read inline flow meters to determine ground-water withdrawals.

Plans for FY 1991: Continue operation of monitoring network.

Funding sources: College of Southern Idaho and Idaho Department of Water Resources.



ID 170—*Surface-Water Hydrology, Salmon and Clearwater Rivers*

Location: Salmon and Clearwater River basins

Period of project: January 1989 through September 1991

Project leader: Stephen W. Lipscomb

Objectives: Classify all streams within the Salmon and Clearwater River basins according to basin characteristics and estimate mean annual and mean monthly discharge for all identified streams.

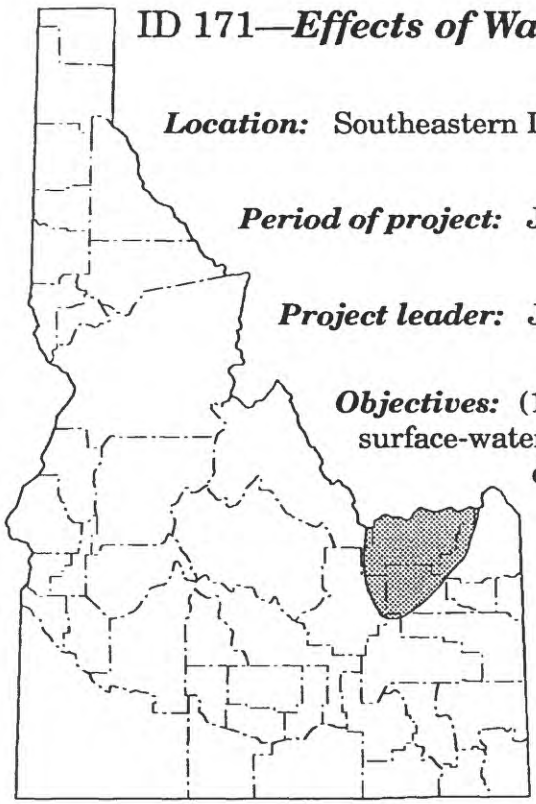
Approach: (1) Develop a data base that will contain nearly 100 basin characteristics for each of 1,070 subbasins within the Salmon and Clearwater River basins using a GIS. Basin characteristics will include basin area, mean elevation, mean annual precipitation, channel gradient, basin slope, aspect, underlying geology, and land cover type; (2) conduct a principal components analysis and a cluster analysis with selected basin characteristics to group subbasins with similar hydrologic characteristics; (3) estimate mean annual discharge for each of the streams using regional regression equations developed by the Idaho District office; and (4) estimate mean monthly discharge for each of the streams on the basis of streamflow records from representative gaging stations and/or supplementary streamflow measurements.

Progress in FY 1989–90: Developed a data base containing nearly 100 basin characteristics for each of the 1,070 subbasins. Identified 43 groups of subbasins with similar hydrologic characteristics. Estimated mean annual discharge for each of the streams.

Plans for FY 1991: Measure discharge monthly at representative gaging stations through April or May of 1991 to help estimate mean monthly discharges. Complete a draft report detailing procedures and results of the study and submit to the Idaho District for review.

Funding source: U.S. Bureau of Indian Affairs.

ID 171—*Effects of Water Use, Mud Lake Area*



Location: Southeastern Idaho

Period of project: January 1989 through December 1991

Project leader: Joseph M. Spinazola

Objectives: (1) Quantify recharge and discharge and determine the surface-water/ground-water relations in the Mud Lake area using digital modeling techniques, and (2) identify concentrations of natural or anthropomorphic chemical constituents in selected samples of ground water.

Approach: Compile and evaluate existing data to determine the initial geohydrologic framework. Drill and complete several wells to obtain geohydrologic information. Collect, compile, and analyze surface- and ground-water data. Collect samples for water-quality analyses. Compile information on historical cropped area, irrigated area, and irrigation practices. Compile soils and climatic data. Compute historical recharge from available data and estimates of ground-water withdrawals. Enter the compiled data into the U.S. Geological Survey three-dimensional ground-water-flow model and calibrate the model to ground-water and lake levels and to streamflow gains or losses over the period of available power consumption records (1981–90, inclusive). Store data sets created for this project in ARC/INFO as reference for future ground-water studies of the Snake River Plain.

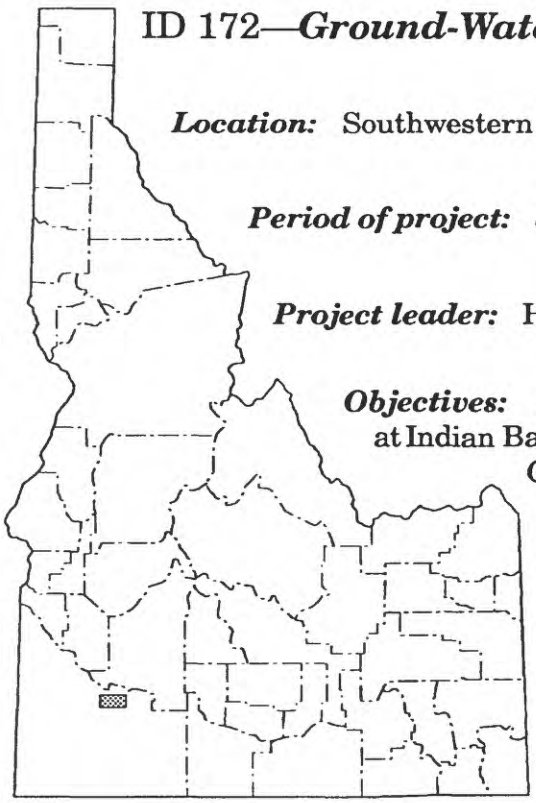
Progress in FY 1989–90: Completed a comprehensive inventory of about 900 irrigation wells and measured water levels in about 250 wells in April and August 1989. Measured water levels weekly at staff gages installed at 6 ponds on wildlife refuges and monthly at about 30 wells. Collected water samples from 9 wells for water-quality analysis. Conducted an aquifer test and seepage run. Drilled and completed observation wells at 4 sites. Conducted pump efficiency tests at 30 installations; acquired power consumption data from the local power company; and compiled digital land-use, soils, and climatic data to compute recharge from land surface.

Plans for FY 1991: Complete data collection. Begin interpretation of data and testing and calibration of model. Complete rough draft of reports.

Funding sources: Idaho Department of Water Resources and U.S. Geological Survey.

Report:

Bassick, M.D., 1990, Changes in irrigated acreage, Mud Lake area, Idaho: Fifth Annual Northwest ARC/INFO User Conference, Sun Valley, Idaho, September 16–19, 1990, Poster Session contribution.



ID 172—*Ground-Water Hydrology, Indian Bathtub*

Location: Southwestern Idaho, northern Owyhee County

Period of project: January 1990 through June 1992

Project leader: Harold W. Young

Objectives: Determine the cause or causes of decreased discharge at Indian Bathtub Spring and other thermal springs along Hot Creek.

Approach: Phase I: (1) Inventory thermal-water wells and springs, (2) establish and operate a water-level monitoring network, and (3) collect water samples for chemical and isotopic analyses. Phase II: Drill test holes. Phase III: Develop a ground-water flow model.

Progress in FY 1990: Inventoried 86 thermal-water wells and 5 springs. Established a monitoring network including thermal-water wells and springs. Collected water samples from 33 thermal-water wells and 5 springs and analyzed for chemical and isotopic analyses. Drilled 8 test holes and collected water samples from 6 of the test holes for chemical and isotopic analyses. Published two reports.

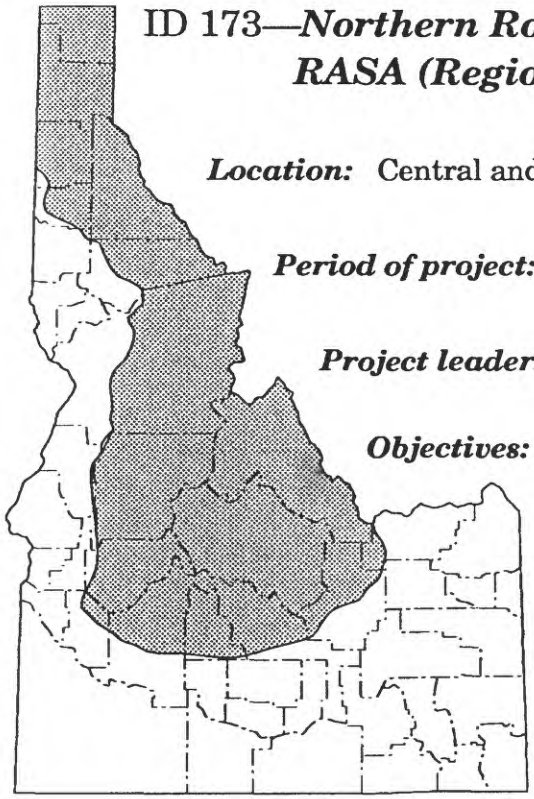
Plans for FY 1991: Continue operation of monitoring network, conduct aquifer tests, and develop ground-water-flow model.

Funding source: U.S. Fish and Wildlife Service.

Reports:

Young, H.W., Jones, M.L., Parliman, D.J., and Tungate, A.M., 1990, Results of test drilling and hydrologic monitoring in the Indian Bathtub area, Owyhee County, southwestern Idaho, January 1989 through September 1990: U.S. Geological Survey Open-File Report 90–597, 40 p.

Young, H.W., and Parliman, D.J., 1989, Hydrologic and chemical data for selected thermal-water wells and springs in the Indian Bathtub area, Owyhee County, southwestern Idaho: U.S. Geological Survey Open-File Report 89–589, 19 p.



ID 173—*Northern Rocky Mountains Intermontane Basins RASA (Regional Aquifer-System Analysis)*

Location: Central and northern Idaho

Period of project: July 1990 through September 1995

Project leader: D.J. Parliman

Objectives: Document and describe: (1)The hydrogeologic systems in a group of intermontane basins, (2) the relations between ground water and surface water in individual basins, (3) the hydrologic relations between selected basins, and (4) baseline water quality in individual basins. Take advantage of an opportunity to understand the hydrogeology of a fragile, relatively undeveloped area while effects of land and water use on the quantity and quality of ground water are documented.

Approach: (1) Compile existing data; (2) conduct field inventory; (3) develop a GIS data base; and (4) conduct surface geophysical surveys, test drilling, borehole geophysics, aquifer tests, ground-water-level monitoring, remote sensing, and ground-water-quality sampling. Measure surface-water stage, flow, and quality to help determine relations between ground water and surface water.

Progress in FY 1990: Assigned project chief and other personnel, prepared planning document, began data compilation and data-base development, and prepared for field activities.

Plans for FY 1991: Retrieve data from all U.S. Geological Survey data bases. Compile and assess geologic and hydrologic information on all major basins. Complete reconnaissance-level field inventory and measure water levels in wells in major basins. Complete a synoptic survey of water levels in selected wells in major basins. Develop GIS data bases. Install continuous water-level recorders in selected wells.

Funding source: U.S. Geological Survey.

OTHER HYDROLOGIC WORK BY THE IDAHO DISTRICT

As part of its responsibility to provide water information to all users, the Geological Survey is involved in numerous activities in addition to the regular programs of data collection and hydrologic investigations. One of these activities is to provide a Survey representative to serve on advisory committees or ad hoc groups. Some of the current special activities are described below:

Committee and Task Force Memberships—Idaho District personnel work as members and advisors to committees and task forces including the Clean Lakes Coordinating Council Technical Advisory Committee, the Coeur d'Alene Basin Interagency Group, the Columbia River Water Management Group, the Idaho Department of Health and Welfare Water Quality Technical Advisory Committee, the Idaho Natural Resources Roundtable, the Idaho Technical Committee on Hydrology, the International Kootenay Lake Board of Control, the Pend Oreille Lake Technical Advisory Committee, and the Swan Falls Technical Advisory Committee.

Review of Environmental Impact Statements and other agency reports—The Water Resources Division reviews Environmental Impact Statements to ensure that available hydrologic data are used, that they are used correctly, and that the effects of construction on water features and resources are accurately evaluated.

Assistance to other agencies and individuals—In addition to the Survey's formal programs and studies, water information and assistance are provided to other agencies with specific problems. The Idaho District continually receives calls, visits, and mail requests for information on ground-water availability, streamflow data, and water quality from landowners, consultants, public officials, and business personnel. Federal regulations prohibit activity that encroaches on the work of professional consultants, but much information and assistance are provided to professional engineers, geologists, and other consultants.

Special activities—The Idaho District is called on for certain work not covered under specific projects or data-collection programs. These activities include obtaining hydrologic data to document significant events—droughts, floods, volcanic eruptions, earthquakes, and hazardous-waste spills—and giving presentations concerning aspects of water resources at symposia and seminars. The Idaho District also investigates hydrologic effects and data needs related to small hydroelectric power development for the Federal Energy Regulatory Commission.

OTHER REPORTS BY THE IDAHO DISTRICT

REPORTS PUBLISHED FOR PROJECTS THAT ENDED BEFORE FISCAL YEAR 1989

Frenzel, S.A., 1989a, Response of aquatic communities in the Boise River, Idaho, to trace elements in municipal wastewater effluents, *in* Pederson, G.L., and Smith, M.M., compilers, U.S. Geological Survey Second National Symposium on Water Quality, Orlando, Fla., November 12–17, 1989, Abstracts of the Technical Sessions: U.S. Geological Survey Open-File Report 89–409, p. 27.

———1989b, Water resources of the upper Big Wood River basin, Idaho: U.S. Geological Survey Water-Resources Investigations Report 89–4018, 47 p.

———1990, Effects of municipal wastewater discharges on aquatic communities, Boise River, Idaho: American Water Resources Association, Water Resources Bulletin, v. 26, no. 2, p. 279–287.

Kjelstrom, L.C., 1988, Estimates of gains and losses for reservoirs on the Snake River from Blackfoot to Milner, Idaho, for selected periods, 1912 to 1983: U.S. Geological Survey Water-Resources Investigations Report 87–4063, 62 p.

Lewis, R.E., and Stone, M.A.J., 1988, Geohydrologic data from a 4,403-foot geothermal test hole, Mountain Home Air Force Base, Elmore County, Idaho: U.S. Geological Survey Open-File Report 88–166, 30 p.

Lewis, R.E., and Young, H.W., 1989, The hydrothermal system in central Twin Falls County, Idaho: U.S. Geological Survey Water-Resources Investigations Report 88–4152, 44 p.

Mariner, R.H., Young, H.W., Parliman, D.J., and Evans, W.C., 1989, Geochemistry of thermal water from selected wells, Boise, Idaho, *in* The geysers—three decades of achievement—a window on the future: Geothermal Resources Council Transactions, v. 13, p. 173–178.

Parliman, D.J., 1988, Hydrogeology and water quality of areas with persistent ground-water contamination near Blackfoot, Bingham County, Idaho [abs.]: Geological Society of America 41st Annual Meeting, Rocky Mountain Section, Sun Valley, Idaho, Abstracts with Programs, v. 20, no. 6.

Parliman, D.J., and Young, H.W., 1989, Ground-water data from selected sites in Grand Teton National Park, Wyoming: U.S. Geological Survey Open-File Report 89–51, scale 1:250,000.

Woods, P.F., 1989, Hypolimnetic concentrations of dissolved oxygen, nutrients, and trace elements in Coeur d'Alene Lake, Idaho: U.S. Geological Survey Water-Resources Investigations Report 89–4032, 56 p.

REPORTS PUBLISHED FOR FEDERAL PROGRAMS NOT DESCRIBED IN THIS REPORT

Frenzel, S.A., 1990, Idaho water supply and use, *in* Carr, J.E., Paulson, R.W., and Moody, D.W., compilers, National water summary 1987—Hydrologic events and water supply and use: U.S. Geological Survey Water-Supply Paper 2350, p. 229–234.

Lewis, R.E., and Channel, L.K., 1988, U.S. Geological Survey ground-water studies in Idaho: U.S. Geological Survey Open-File Report 88–117, 2 p.

Parliman, D.J., 1988, Idaho ground-water quality, *in* Moody, D.W., Carr, Jerry, Chase, E.B., and Paulson, R.W., compilers, National water summary 1986—Hydrologic events and ground-water quality: U.S. Geological Survey Water-Supply Paper 2325, p. 229–236.

SOURCES OF WRD PUBLICATIONS AND INFORMATION

Publications of the U.S. Geological Survey—Professional Papers, Water-Supply Papers, Bulletins, Hydrologic Investigations Atlases, Hydrologic Unit Maps, and other maps pertaining to Idaho are sold by the U.S. Geological Survey at the following address: Map Sales, Branch of Distribution, Federal Center, Box 25286, Denver, CO 80225. Also available from Branch of Distribution are single copies of Circulars still in print, and manuals from the series entitled "Techniques of Water-Resources Investigations of the United States Geological Survey," which describe procedures for planning and executing specialized work in water-resources investigations.

Geological Survey Water-Resources Investigations Reports and Open-File Reports are available for inspection at the Idaho District office, Water Resources Division, 230 Collins Road, Boise, ID 83702; information on their availability also may be obtained from the Idaho District Chief at the above address. In addition, those reports having an alpha-numeric designation in parentheses at the end of the citation may be purchased as paper copy or microfiche from the National Technical Information Service (NTIS), U.S. Department of Commerce, 5265 Port Royal Road, Springfield, VA 22161. Alpha-numeric numbers are required when ordering from NTIS. The annual publication series entitled, "U.S. Geological Survey Water-Data Report," is also available from NTIS. Ordering information may be obtained from the offices listed on the inside cover page of this report.

New reports are announced monthly in "New Publications of the U.S. Geological Survey." Subscriptions to "New Publications" can be obtained by writing to the U.S. Geological Survey, 582 National Center, Reston, VA 22092.

Water-Data Program—Water-data stations at selected locations throughout the Nation are used by the Geological Survey to obtain records on stream discharge and stage, reservoir and lake storage, ground-water levels, well and spring discharge, and the quality of surface and ground water. These data provide a continuing record of the quantity and quality of the Nation's surface- and ground-water resources, and thus provide the hydrologic information needed by Federal, State, and local agencies and the private sector for developing and managing land and water resources. All data collected are stored in the Survey's National Water Storage and Retrieval (WATSTORE) data base and are available to water planners and others involved in making decisions that affect the State's water resources. These data can be retrieved in machine-readable form or as computer-printed tables, statistical analyses, or graphs. The data also are published by water year for each State in the annual data reports. Information about the Water-Data Program can be obtained from the Idaho District.

NAWDEX—The National Water Data Exchange was established to assist users of water data to identify, locate, and acquire needed data. It provides a nationwide service for indexing and describing the characteristics of data available from the entire spectrum of data-collection activities throughout the Federal and non-Federal water-data community. NAWDEX maintains two data bases: (1) A Water-Data Sources Directory, and (2) a Master Water-Data Index, which identifies and describes water data available. NAWDEX services can be obtained from the Idaho District. A leaflet explaining NAWDEX services is available from the NAWDEX Program Office, U.S. Geological Survey, 421 National Center, Reston, VA 22092.

SOURCES OF INFORMATION ON U.S. GEOLOGICAL SURVEY PROGRAMS IN IDAHO

Hydrology

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Maps and Formal Series Publications

Map Sales, Branch of Distribution
U.S. Geological Survey
Federal Center, Box 25286
Denver, CO 80225

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Informal Series Publications

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