ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY, STATUS OF IDAHO PROJECTS, FISCAL YEAR 1986

U.S. GEOLOGICAL SURVEY

Open-File Report 87-115

Boise, Idaho

1987

UNITED STATES DEPARTMENT OF THE INTERIOR

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MESSAGE FROM THE IDAHO OFFICE CHIEF

The Water Resources Division of the U.S. Geological Survey has for many years maintained a significant role in furthering knowledge of surface water, ground water, and water quality in Idaho. The need for hydrologic data and a thorough understanding of man's impact on the hydrologic system is intensifying as irrigators, hydroelectric power producers, and domestic water users compete for a limited resource.

The chief focus of the Geological Survey's activities during the 1986 fiscal year was to evaluate the impacts of water use, particularly irrigation, on the availability of ground and surface water. Ground-water levels have declined in many areas in southern Idaho because of heavy pumping. The declines have limited further agricultural development in some areas. New programs were initiated to (1) study water resources in the rapidly growing Sun Valley recreational area in the Big Wood River valley, (2) determine methods that would accurately and economically quantify annual withdrawals of water pumped from the Snake River, and (3) better understand the relation between erosion of Pliocene fossil beds near Hagerman and local water use.

Ongoing projects include development of mathematical models. Two of the models are part of Phase II of the Snake River Plain RASA (Regional Aquifer-System Analysis) program and will simulate ground- and surface-water interrelations in the Big Lost River basin and the American Falls area. A third mathematical model will help evaluate effects of artificial recharge on the aquifer system in the Oakley Fan area, southern Idaho.

Other Geological Survey programs include (1) statewide monitoring to determine long-term changes in ground-water quality, (2) assessing the impact of waste discharge on stream and lake quality, (3) determining the most probable cause of ground-water contamination in the Blackfoot area, (4) monitoring geothermal resources to provide an understanding of the extent and characteristics of this resource, and (5) estimating magnitudes and frequencies of potential flooding in 10 selected communities.

Fourteen reports describing hydrologic conditions on the Snake River Plain were produced during fiscal years 1985 and 1986. These reports were prepared as part of the RASA program.

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In 1987, the RASA program will begin a study of the ground-water flow system in the Thousand Springs area. Results of this and other RASA studies will be incorporated in a stream/aquifer model that will be the culmination of the RASA program on the Snake River Plain. Another major 1987 project will be a study of the impacts of potentially toxic levels of heavy metals in irrigation drainage water on plants, migratory birds, and fish in the American Falls Reservoir area.

In the future, the collection of surface-water, ground-water, and water-quality data will continue to play a significant role in all Survey activities--especially as the State of Idaho moves toward adjudication of water rights. Future water-resource studies will include all phases of the hydrologic system, but will emphasize water quality. Degradation of water from irrigated agriculture, toxic-waste disposal, mining and ore processing, and domestic use probably will receive most attention.

The opportunities to answer difficult questions posed by water managers in Idaho and the excellent support from Geological Survey employees bring both challenges and many rewards to my experiences as Idaho Office Chief.

Jerry L. Hughes
Idaho Office Chief
U. S. Geological Survey
Water Resources Division
Boise, Idaho

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ILLUSTRATIONS

U.S. GEOLOGICAL SURVEY ORIGIN

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 fact-finding 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.

- 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."

WATER RESOURCES DIVISION

Basic Mission and Program

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-NEVADA DISTRICT ORGANIZATION

The U.S. Geological Survey State Office in Boise and the Nevada State Office in Carson City are operated under the direction of the Idaho-Nevada District Chief, who is headquartered in Boise. The organization chart (fig. 1) shows the main operating sections and support units in the Idaho-Nevada District.

ACTIVITIES IN IDAHO

In conducting its FY (fiscal year) 1986 activities in Idaho, the U.S. Geological Survey employed a total of 78 persons (56 full time and 22 other than full time)--53 in the Boise office, 9 in the Idaho Falls Field Headquarters, 4 in the Sandpoint Field Headquarters, 4 in the Twin Falls Field Headquarters, and 8 at the INEL Project Office.

TYPES OF FUNDING

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.

In FY 1986, the following State, local, and Federal agencies participated in cooperative programs with the Idaho Office:

State and Local

City of Middleton
City of Orofino
City of Twin Falls
College of Southern Idaho
Idaho Department of Fish and Game
Idaho Department of Health and Welfare
Idaho Department of Water Resources
Idaho Transportation Department
Nez Perce Indian Tribe
Shoshone-Bannock Tribes, Fort Hall Indian Reservation
Sun Valley Water and Sewer District
Teton County Board of Commissioners, Wyoming
University of Idaho
Water District 01
West Cassia Soil and Water Conservation District

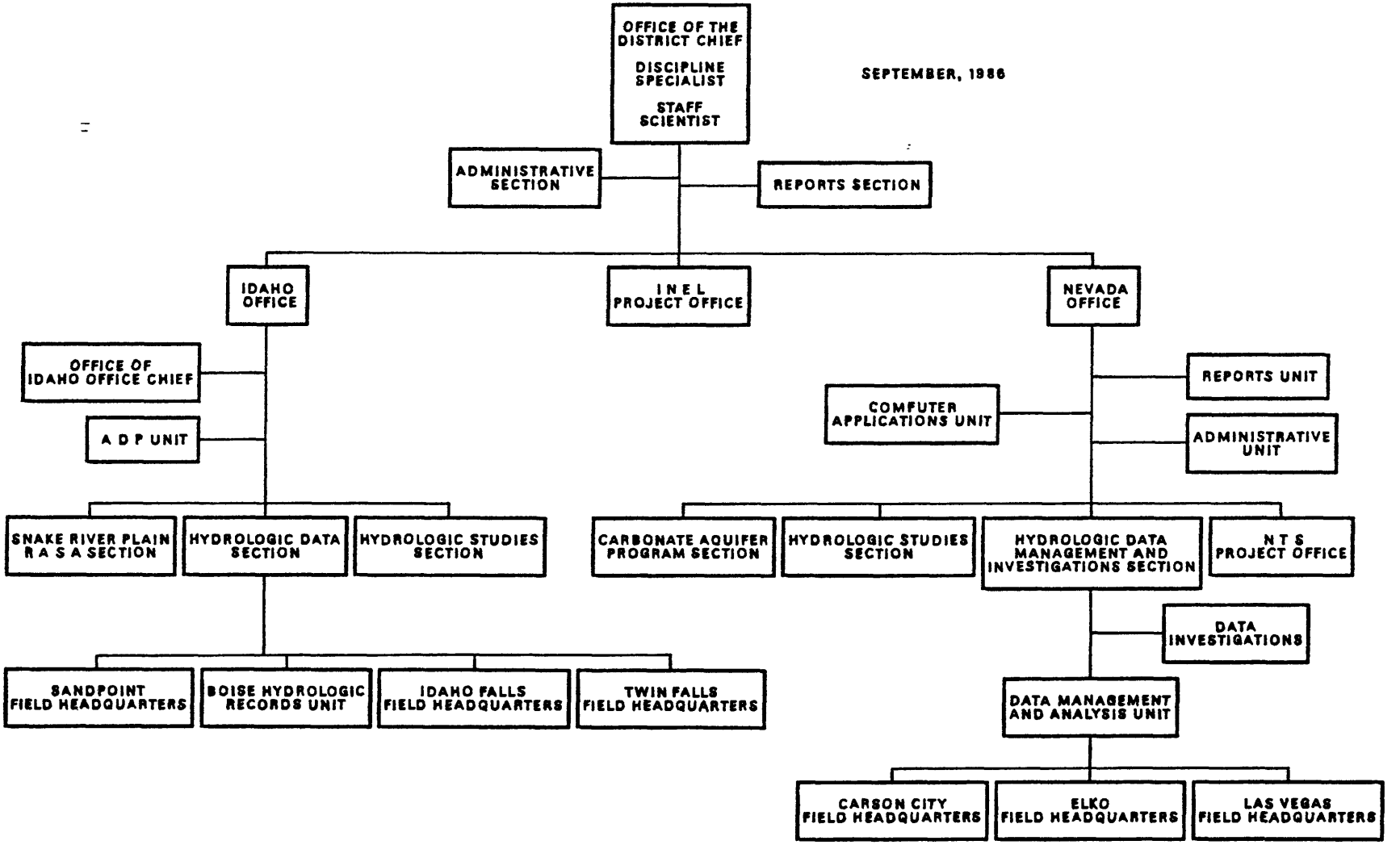


Figure 1.--Idaho-Nevada District organization chart.

Federal

Federal Emergency Management Agency
Federal Energy Regulatory Commission
International Joint Commission (Waterways Treaty)
National Park Service
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

Proportional amounts of funding from all contributing agencies are shown in figure 2.

WATER CONDITIONS

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 1980, about 88 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 3 percent of total ground-water withdrawal. By far the largest use of ground water in the State is irrigated agriculture. In 1980, about 65 percent of total ground-water withdrawals were for irrigation. In several areas of the State, ground-water levels have been declining steadily. Since 1962, the Idaho Department of Water Resources has identified nine areas on the Snake River Plain where overall water-level declines are significant. These areas were declared Critical Ground-Water Areas and presently are closed to further development.

Ground Water

During the 1985 water year (last water year for which records were published in 1986), which covers the period October 1, 1984, to September 30, 1985, ground-water levels in wells penetrating the sand and gravel aquifer in the Boise Valley were near average during the fall, below average during the winter and spring, and above average during the summer. Water levels reached new monthend highs for 7 consecutive months and were above average the entire

State and Local Funds	$ 844,640
Federal Funds - - - - -	$2,256,252
TOTAL - - - - - - - - -	$3,100,892

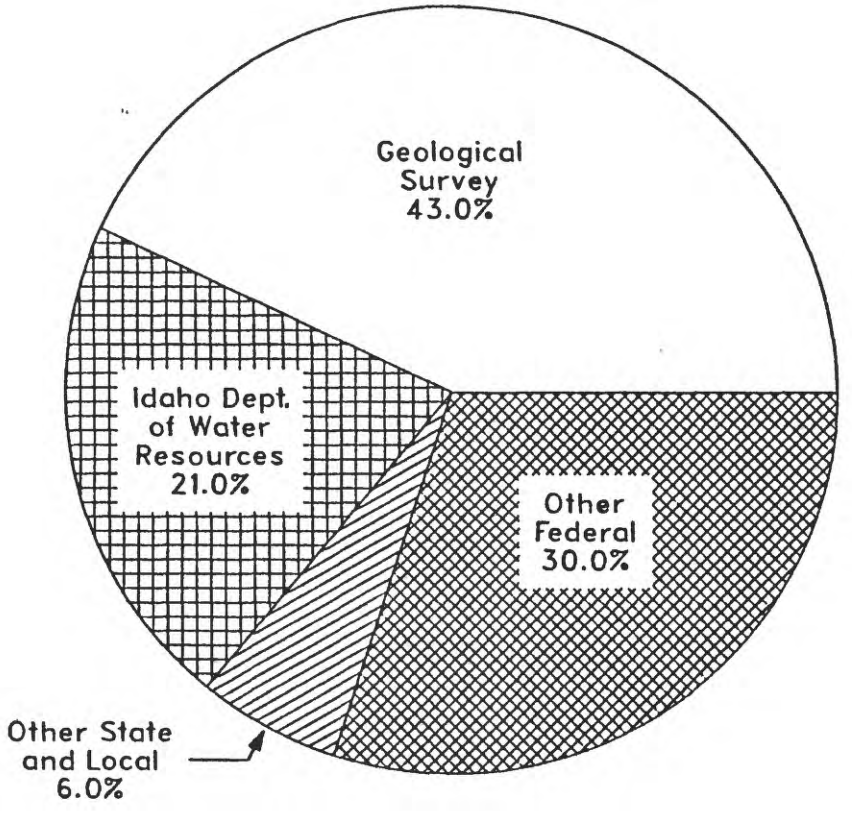


Figure 2.--Idaho Office funding, fiscal year 1986.

year in the eastern part of the Snake River Plain aquifer but were below average in the south-central and southwestern parts of the aquifer. Water levels were above average in the western part of the Snake River Plain aquifer and the alluvial aquifer underlying the Rathdrum Prairie in northern Idaho. Various aspects of ground water in the State are shown in figures 3 and 4.

Surface Water

Surface-water conditions during the 1985 water year were generally normal throughout Idaho. Flow in most streams was near the median. During October 1984, hydrologic conditions were normal throughout the State. During November, however, unusually wet conditions prevailed in southern Idaho. According to the National Weather Service, Boise had its wettest November in 11 years. Flows in the Boise River and upper Snake River tributaries were well above normal. December was dry and cold. January 1985 was the driest ever recorded for the Columbia River basin. Many locations in the basin also had record-breaking cold temperatures. The Kootenai River iced over at Bonners Ferry for the first time since the completion of Libby Dam in 1972. February and March were the sixth and seventh of consecutive months of below-normal temperatures. These low temperatures, concurrent with below-normal precipitation, resulted in below-normal streamflow throughout the winter.

Snowpack was slightly below normal throughout Idaho. Snow accumulation was rapid during the first part of the winter, but then slowed as a result of below-normal amounts of precipitation. Cool temperatures helped maintain the snowpack until late spring.

April was generally warm and dry; temperature departures of +2 to +6 °F were common. By April 22 most of the low-lying snowfields were depleted; this depletion brought most streamflows near the median. Minor flooding occurred in lowlands along the Portneuf and Henrys Fork Rivers in eastern Idaho. High-elevation snowpack was nearly depleted by May, much earlier than normal. Most Idaho streams reached peak flow by late May and most storage reservoirs were full by early June.

By late June and July the weather was hot and dry. Irrigation demands were high, reservoirs were emptying rapidly, and flows in small stream systems were below normal. Showers and cool temperatures in the last 2 weeks of August ended one of the driest Idaho summers on record.

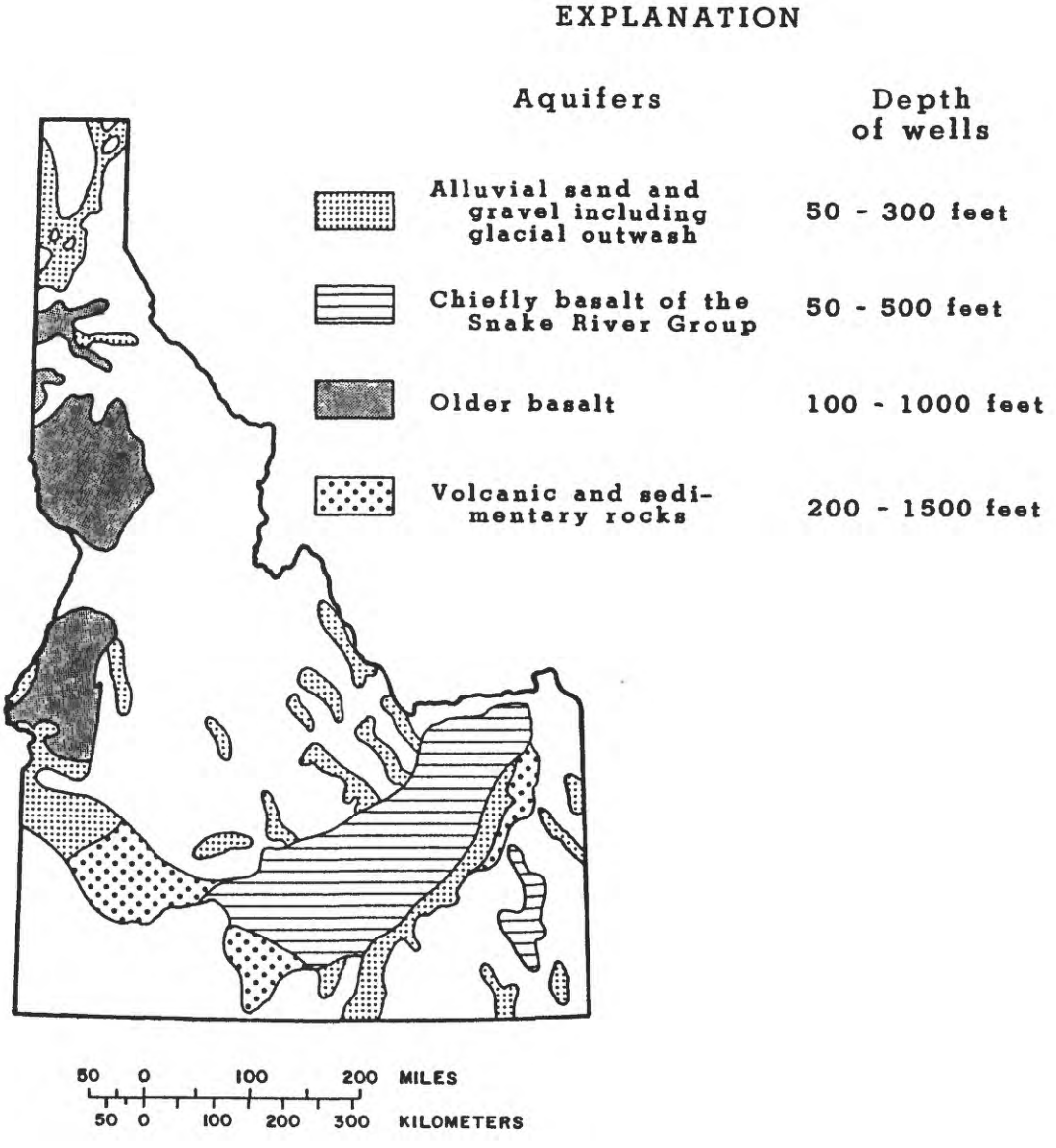


Figure 3.--Principal aquifers and common depths of wells.

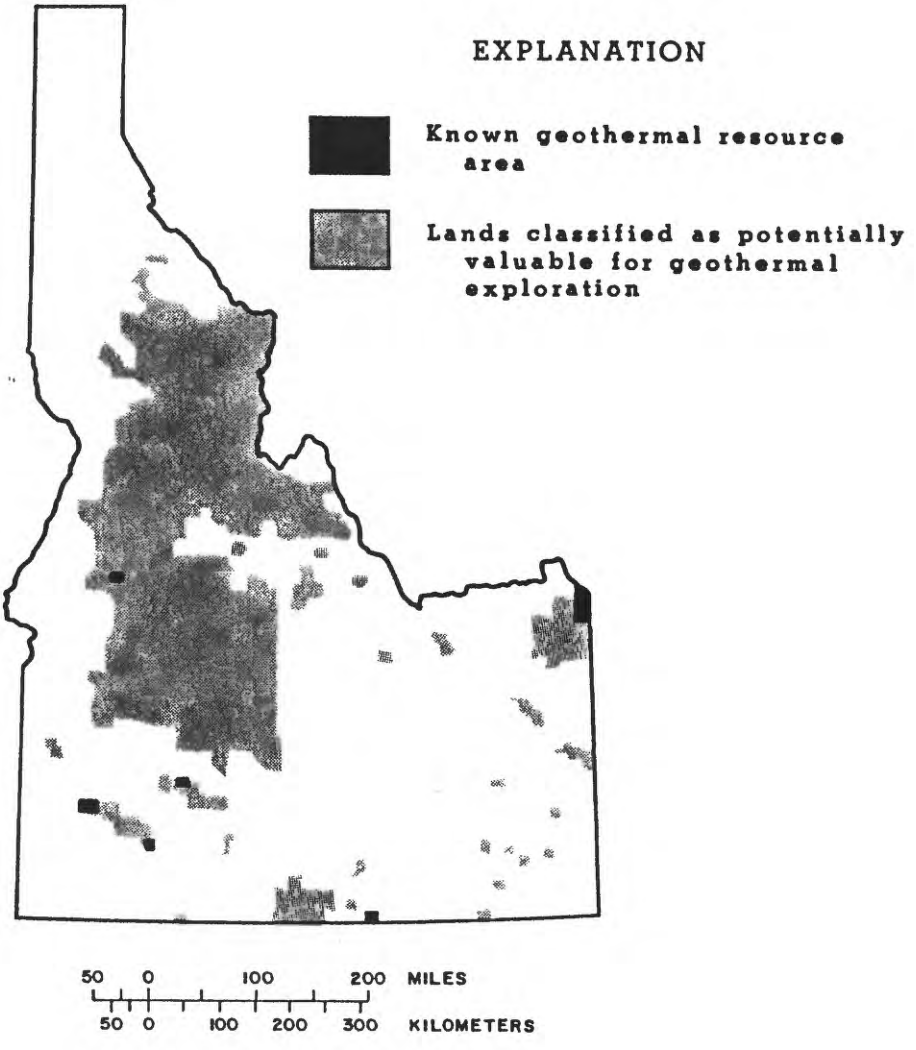


Figure 4.--Locations of known geothermal resource areas and areas classified as potentially valuable for geothermal exploration.

In September, precipitation was up to 300 percent of normal at many Idaho sites. Boise had the wettest September ever recorded in its 120-year history. Streamflows increased dramatically across the State, and the 1985 water year finished with flows generally above normal.

Most irrigation and hydropower storage reservoirs statewide were full by June 1. Heavy demands by irrigation and power users began to deplete the stored water about 3 weeks earlier in the summer than normal. Low base flows during the late summer were inadequate to maintain reservoir levels; consequently, water was drafted from storage. For example, storage in the eight major irrigation reservoirs in the upper Snake River basin at the end of September was about 50 percent of storage available 1 year earlier and was about 80 percent of the 10-year average storage.

Various aspects of surface water in the State are shown in figures 5-7.

Water Quality

Surface- and ground-water quality in Idaho generally is good and is suitable for most uses. However, some streams, lakes, and aquifers have been affected by farming, grazing, logging, mining, or urbanization. In basalt terrain, rapid infiltration of precipitation and surface-water runoff increase the potential for aquifer contamination. Principal land use in Idaho is shown in figure 8. Concentrations of dissolved solids (a general indicator of water quality) in Idaho's surface water are shown in figure 9.

STATUS OF PROJECTS

The Idaho Office program in FY 1986 consisted of 18 funded projects, which are described in the following section.

Projects 001, 002, 003, and 004 are continuing basic-data collection projects. The locations and types of surface-water and water-quality data (projects 001 and 003) collected are shown in figures 10-16. Locations of observation wells where water levels, discharge, and water-quality data (project 002) are collected are shown in figures 17-23. Project wells not part of the statewide network are not shown in these figures. Water levels and other related data for project wells are available from the Boise, Idaho, office at the address shown on the inside front cover.

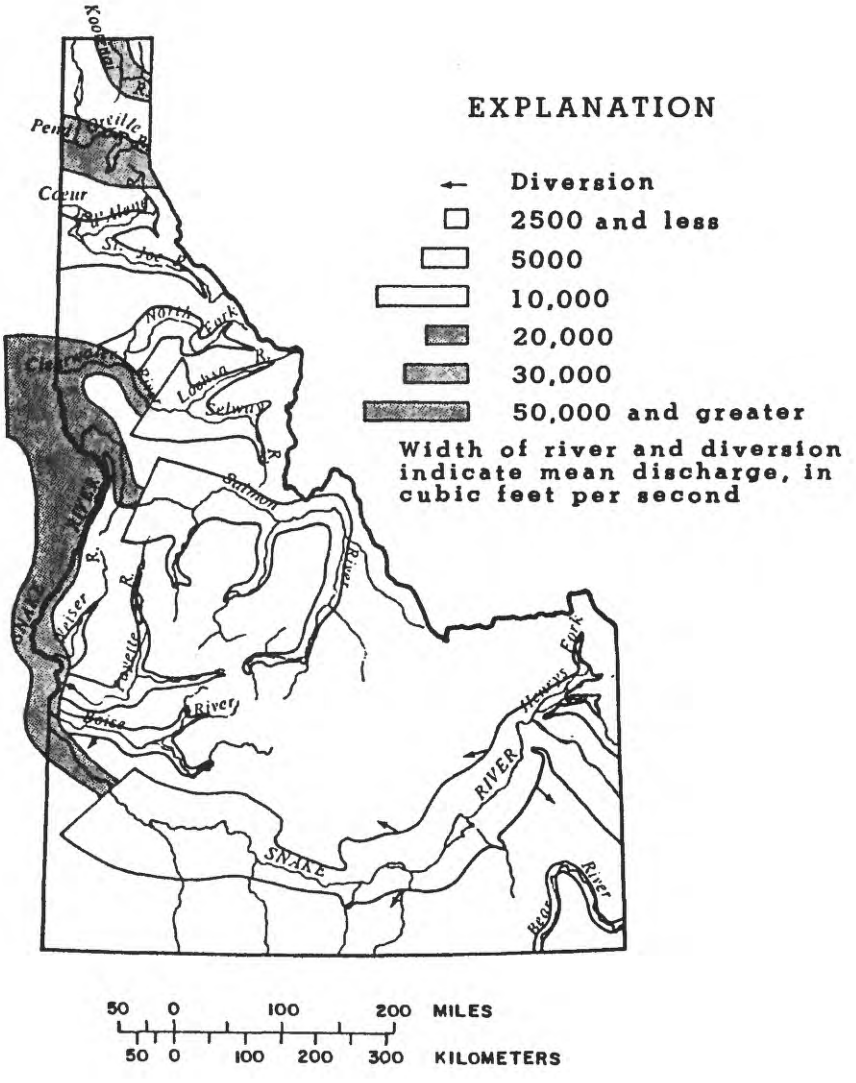


Figure 5.--Mean discharge of principal streams and diversions.

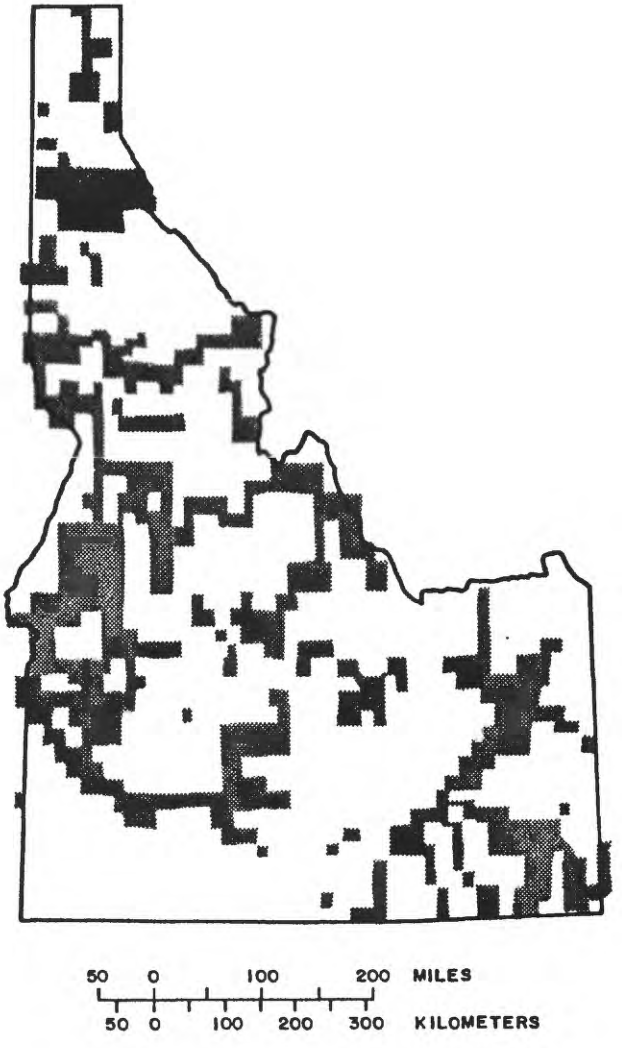


Figure 6.--Areas for which flood-prone-area maps are available.

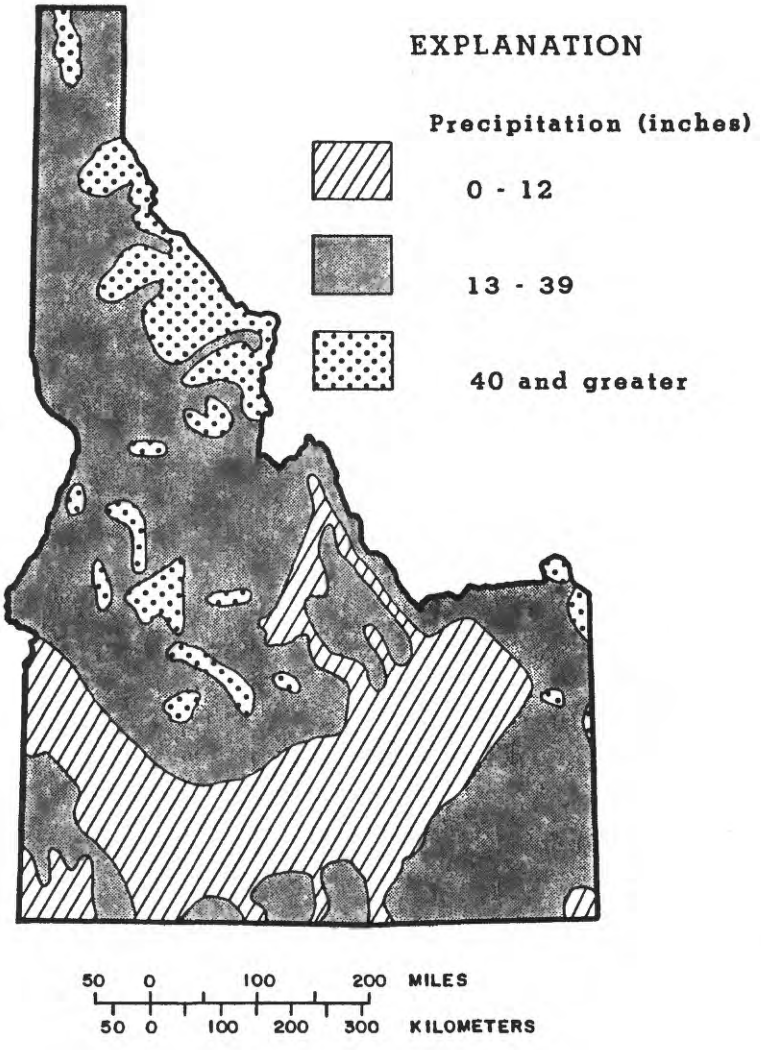


Figure 7.--Mean annual precipitation (Data from National Weather Bureau, NOAA).

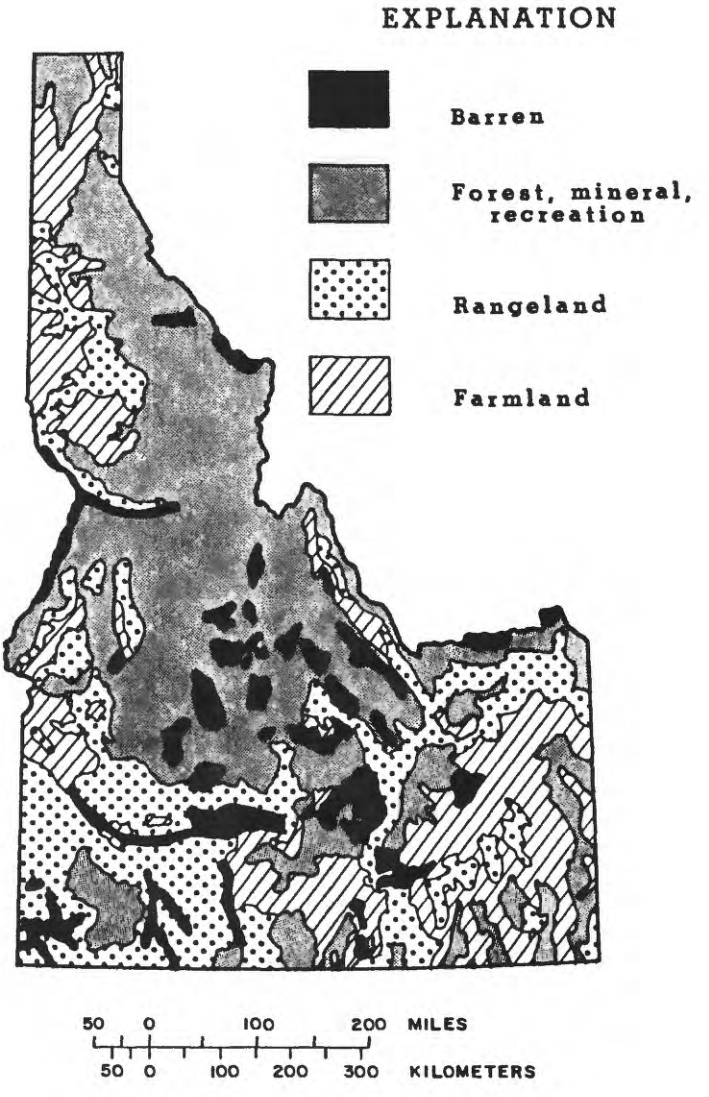


Figure 8.--Principal land use.

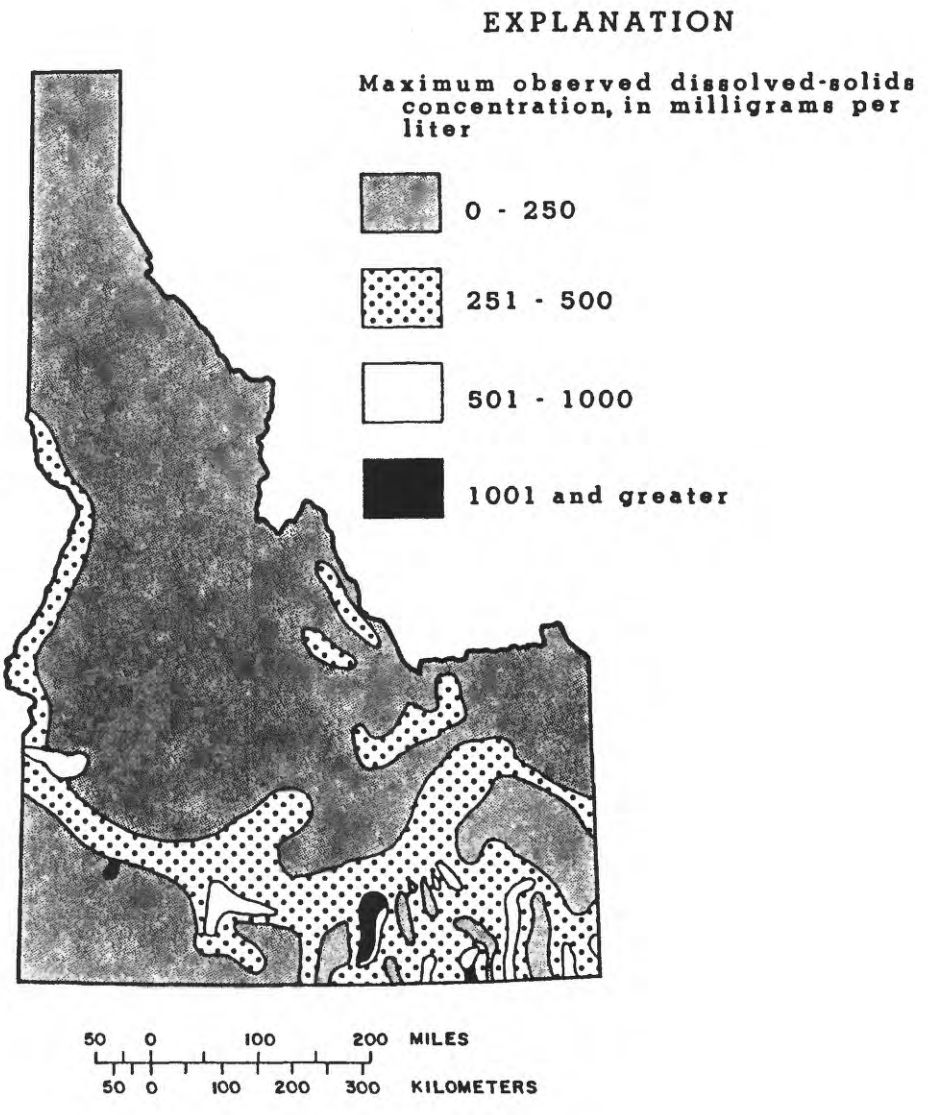


Figure 9.--Dissolved-solids concentration in surface water.

The following figures 10-23 show locations of surface-water and water-quality measurement sites and locations of observation wells in various parts of Idaho.

EXPLANATION

PART 13 River basin boundary and number

▲ 302500 Gaging station and number; inverted symbol indicates water-quality station

Chemical-measurement site

Temperature-measurement site

Biological-measurement site

Sediment-measurement site

• 35AAB1 Observation well and number

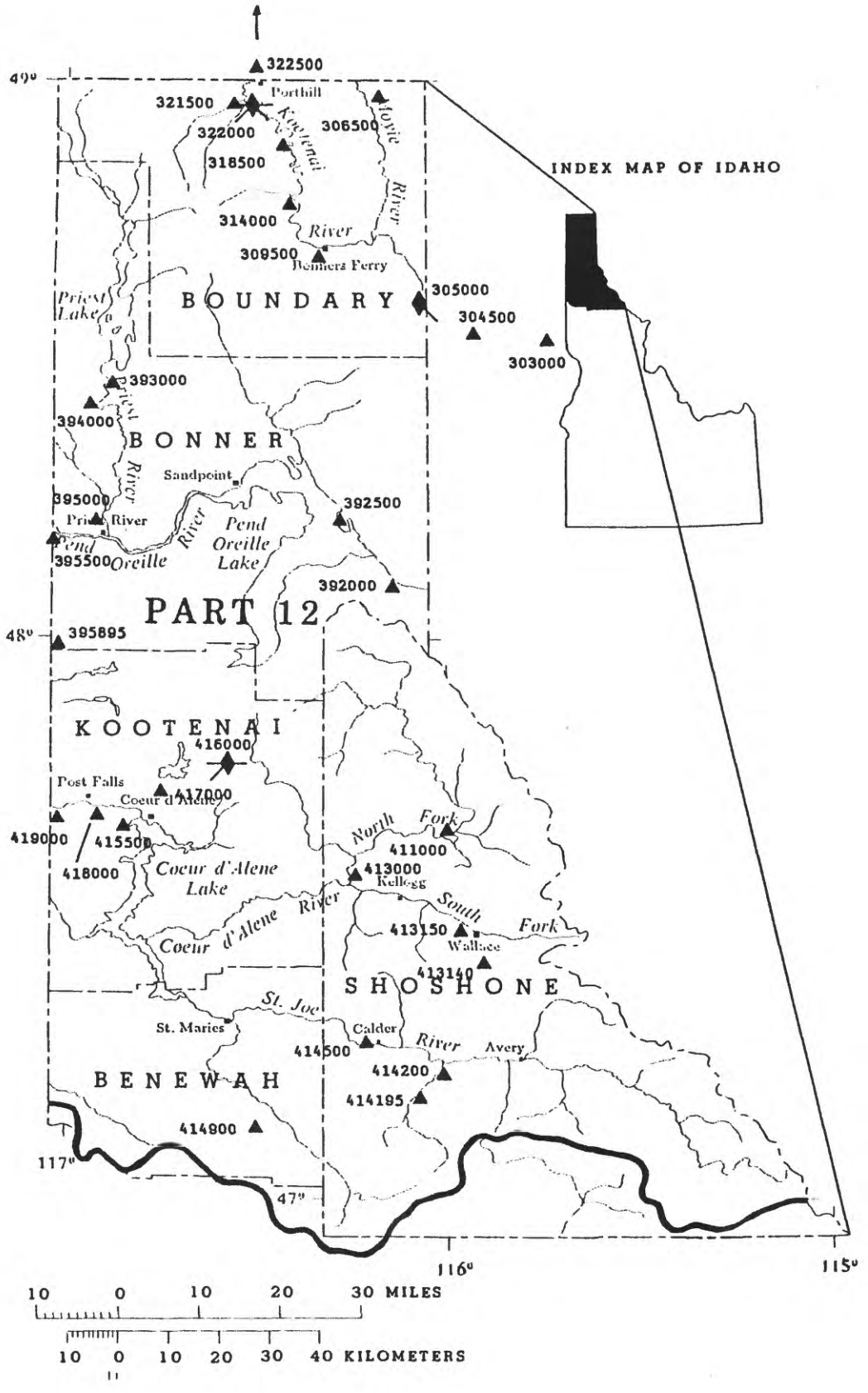


Figure 10.--Locations of surface-water and water-quality measurement sites in north Idaho.

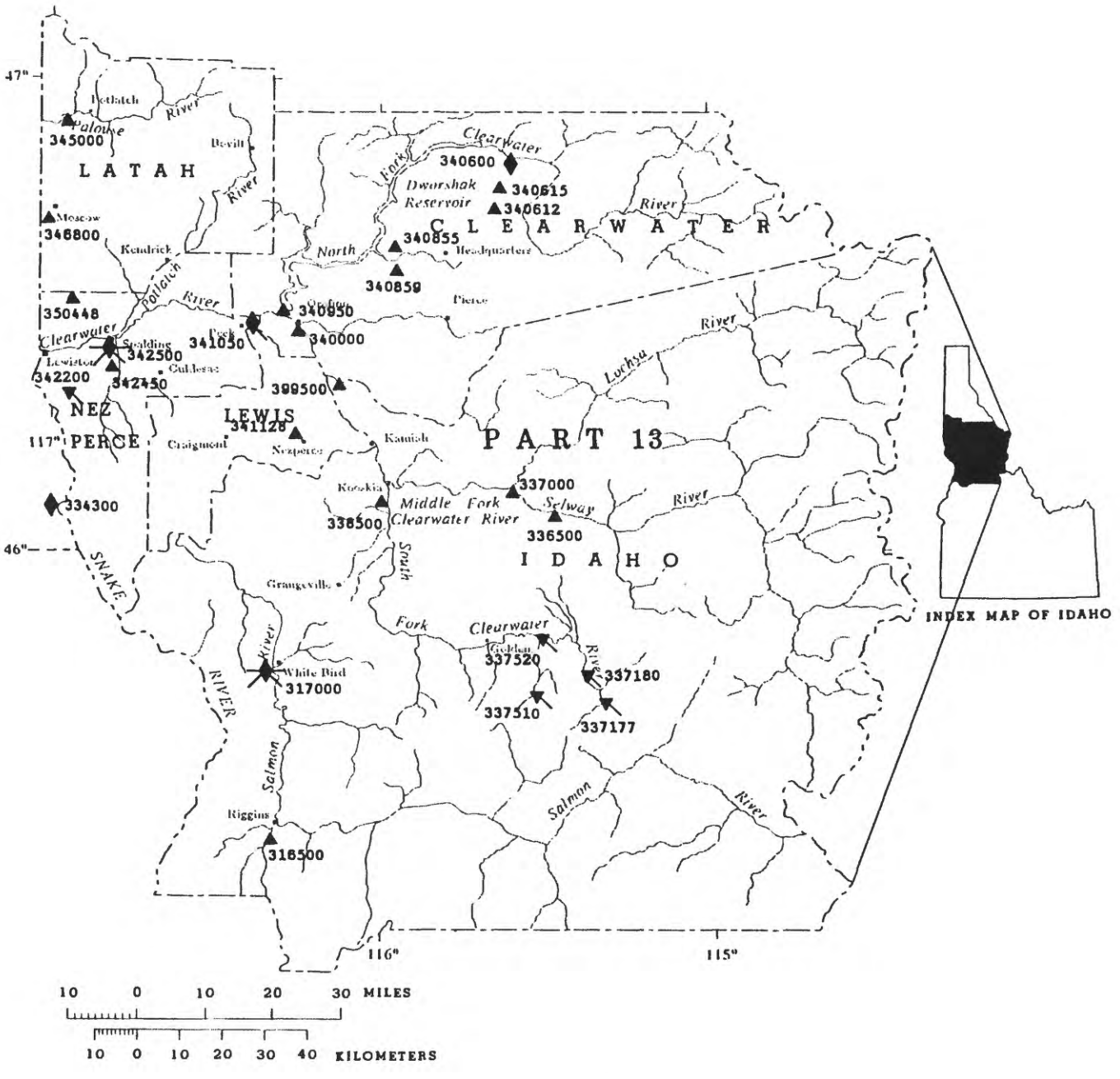


Figure 11.--Locations of surface-water and water-quality measurement sites in north-central Idaho.

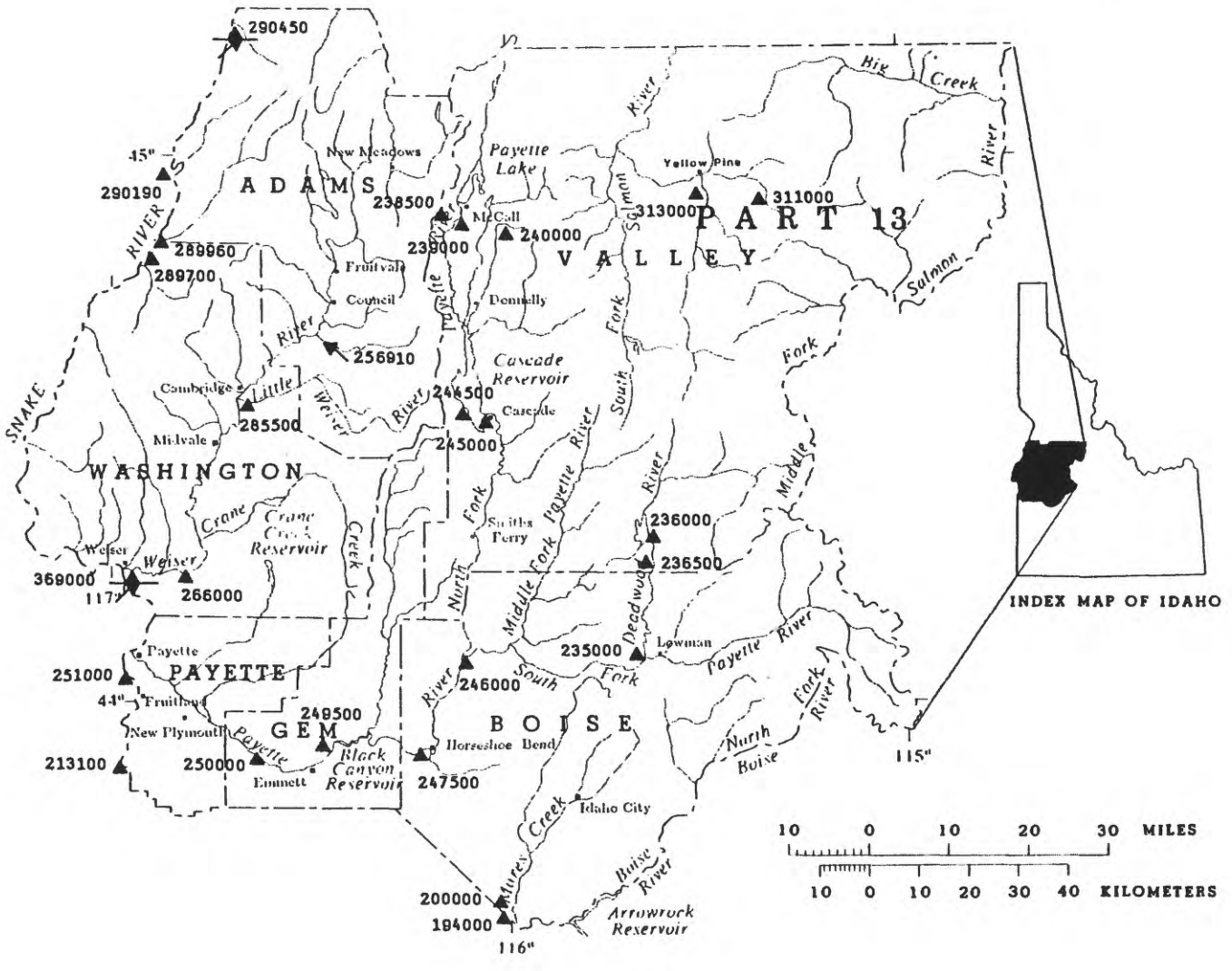


Figure 12.--Locations of surface-water and water-quality measurement sites in west-central Idaho.

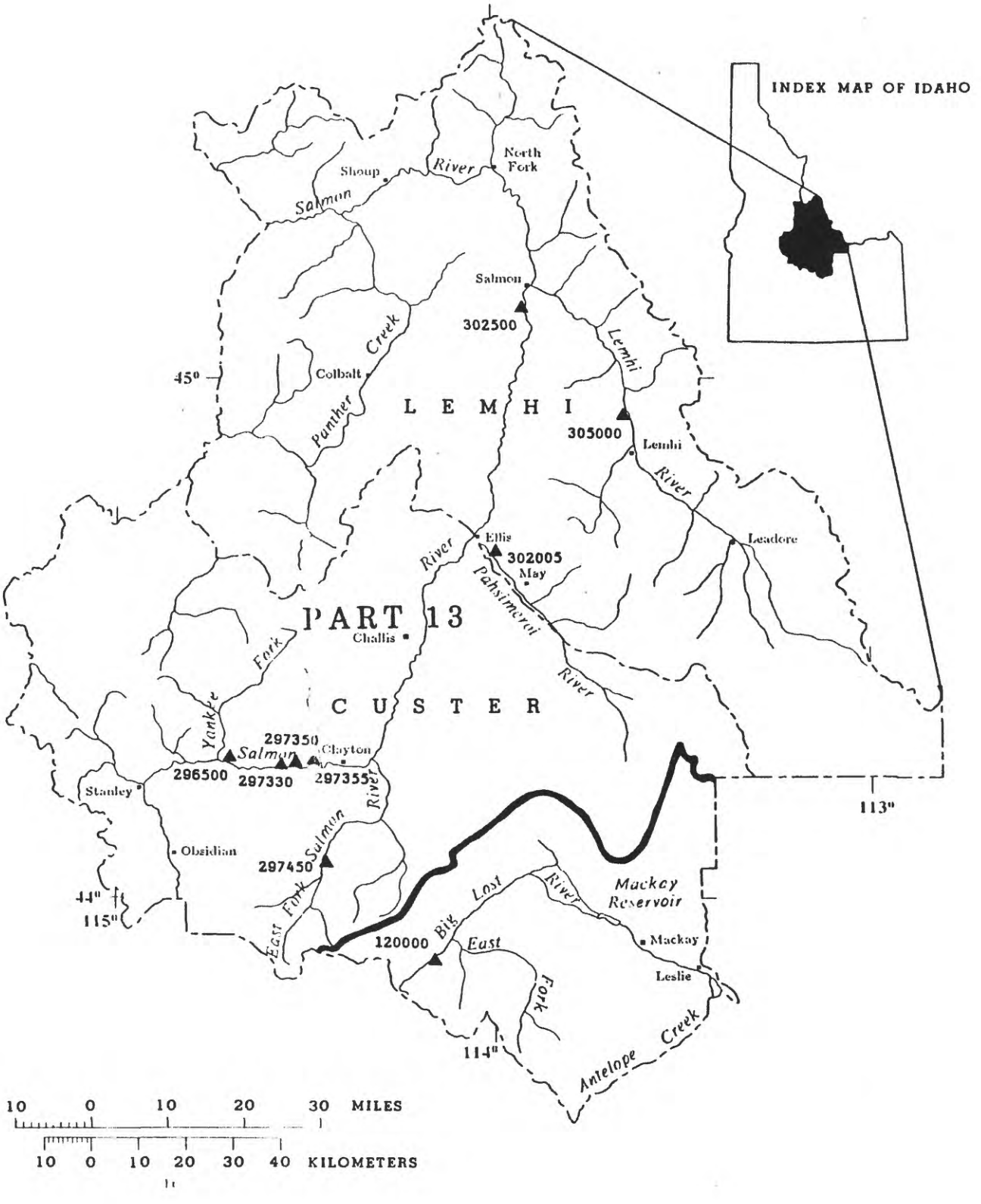


Figure 13.--Locations of surface-water and water-quality measurement sites in east-central Idaho.

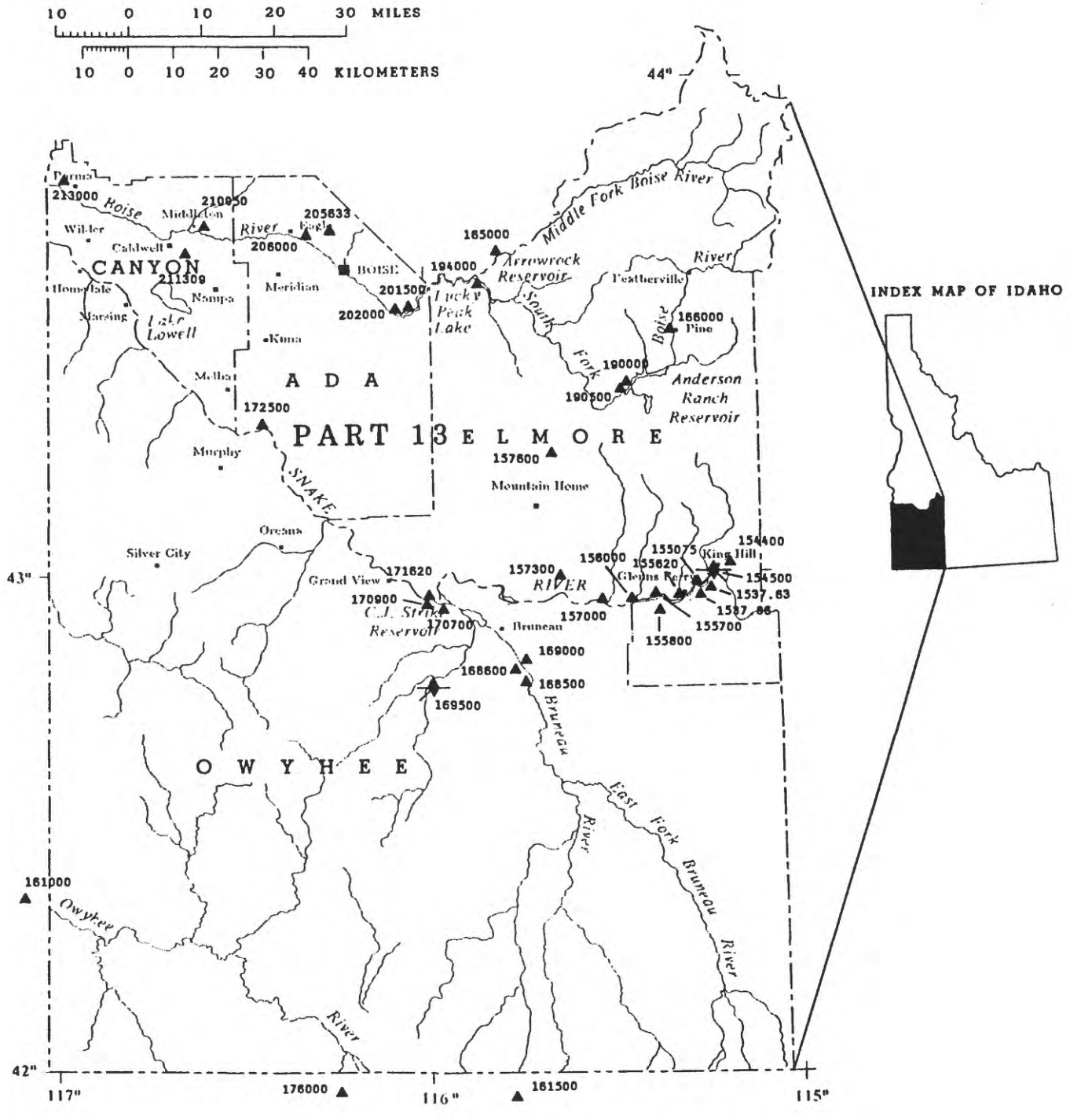


Figure 14.--Locations of surface-water and water-quality measurement sites in southwest Idaho.

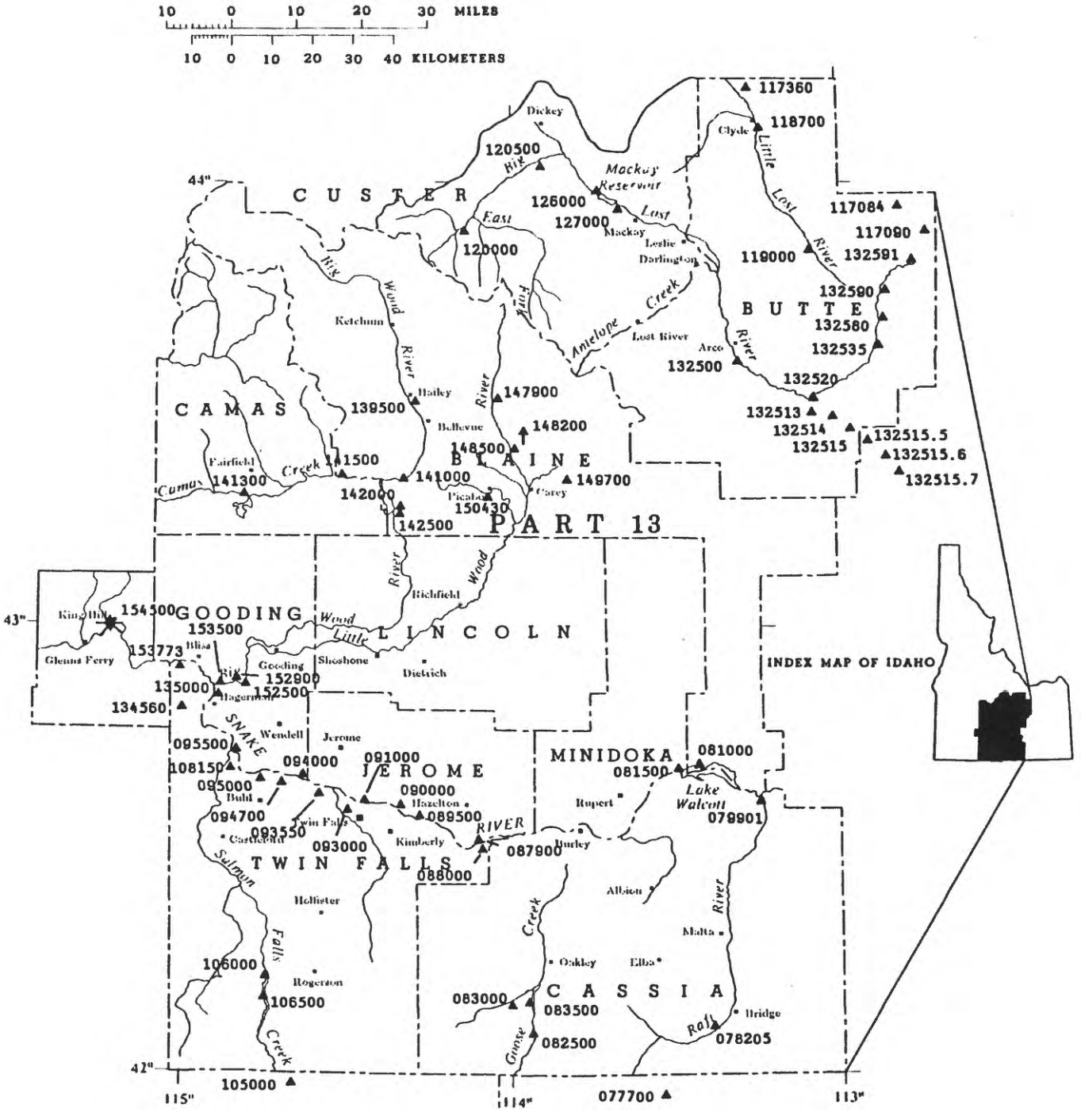


Figure 15.--Locations of surface-water and water-quality measurement sites in south-central Idaho.

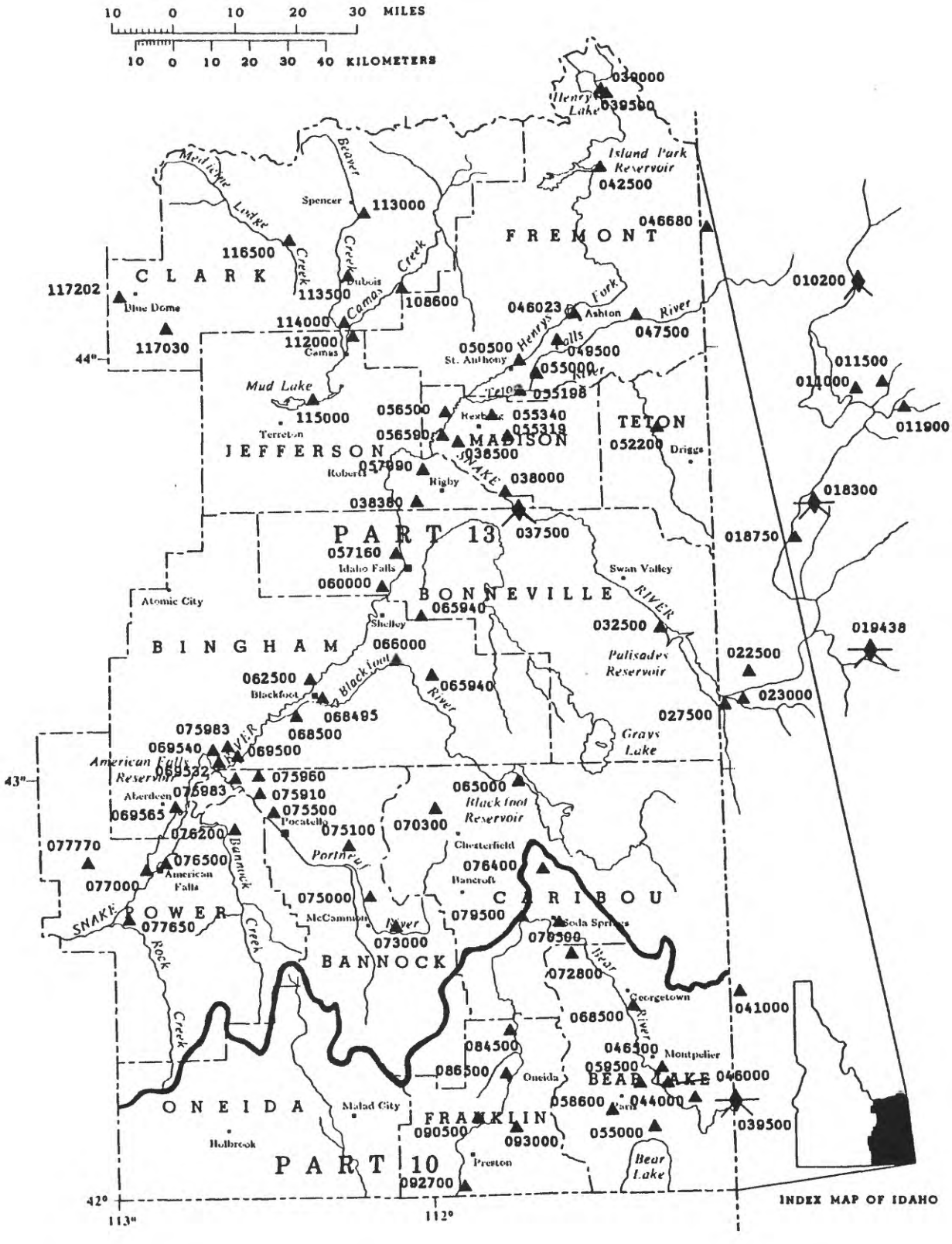


Figure 16.--Locations of surface-water and water-quality measurement sites in southeast Idaho.

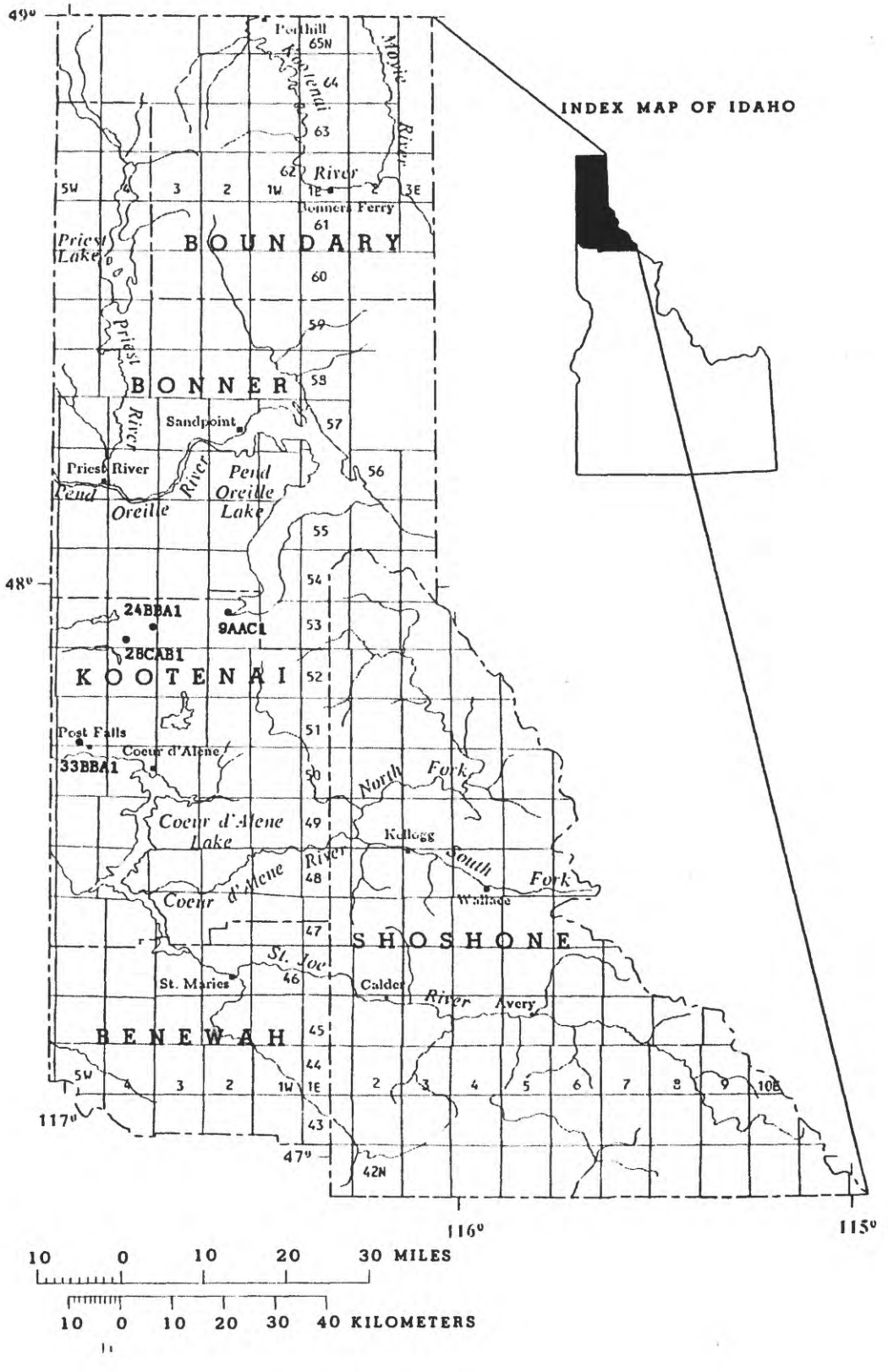


Figure 17.--Locations of observation wells in north Idaho.

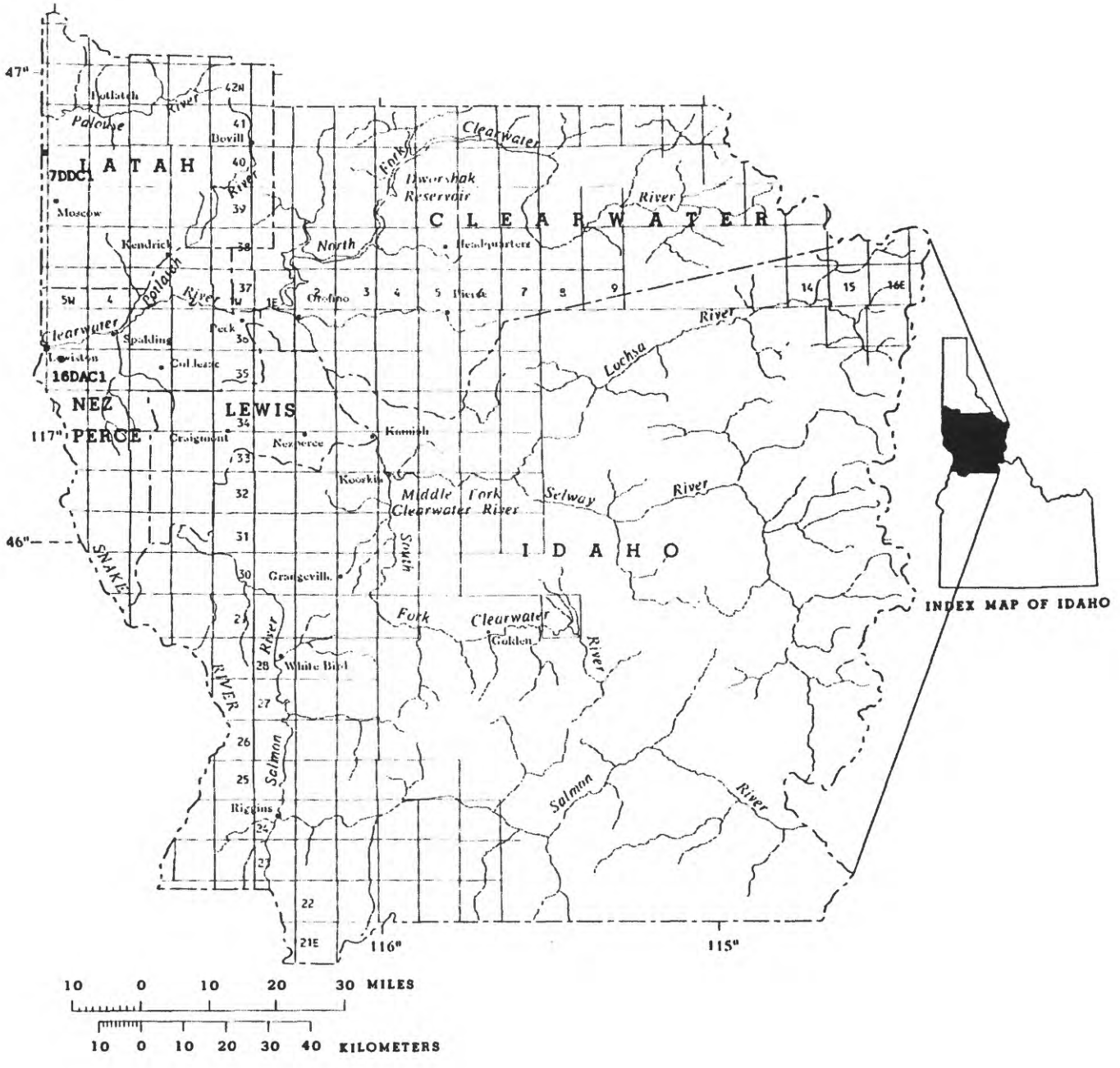


Figure 18.--Locations of observation wells in north-central Idaho.

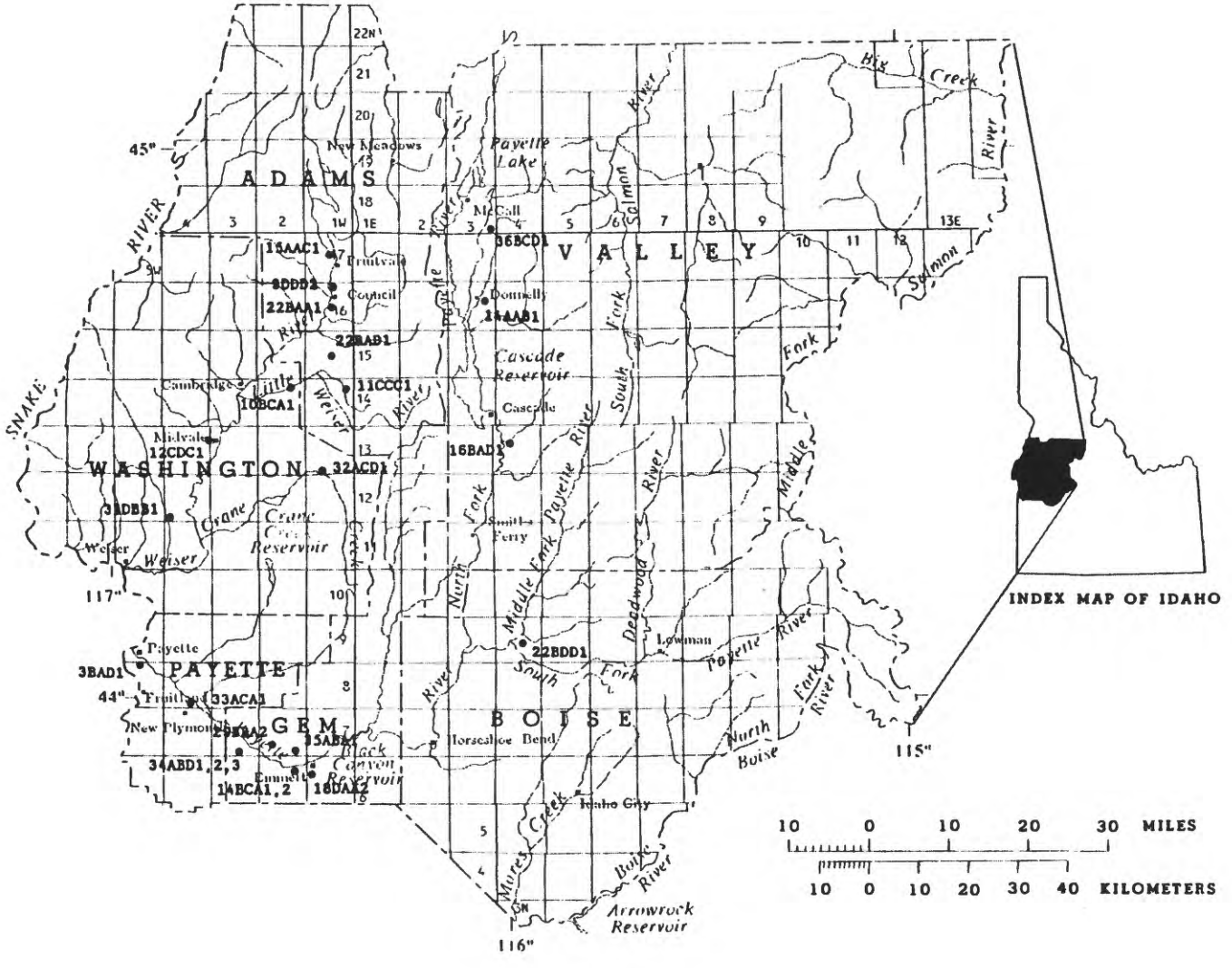


Figure 19.--Locations of observation wells in west-central Idaho.

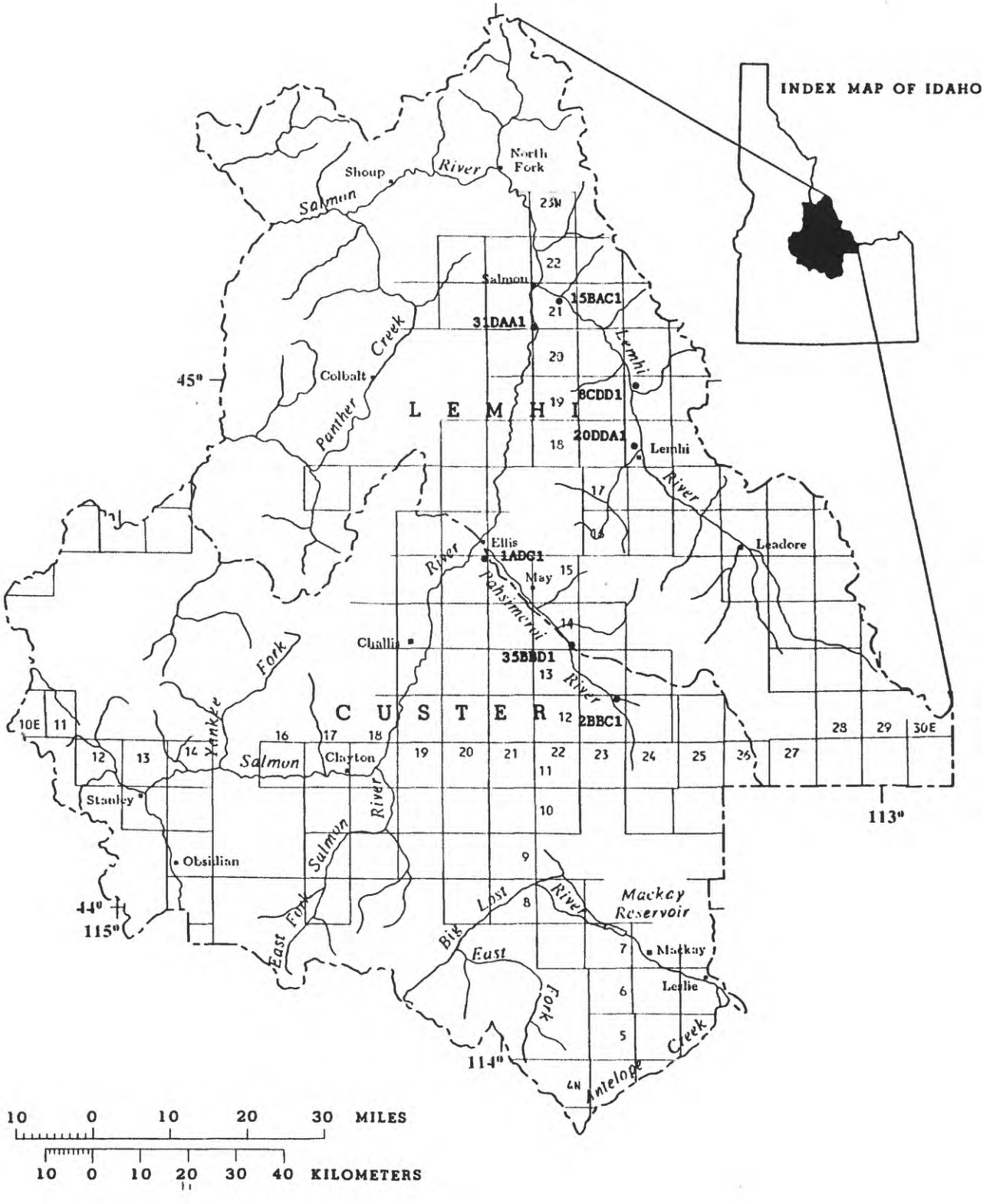


Figure 20.--Locations of observation wells in east-central Idaho.

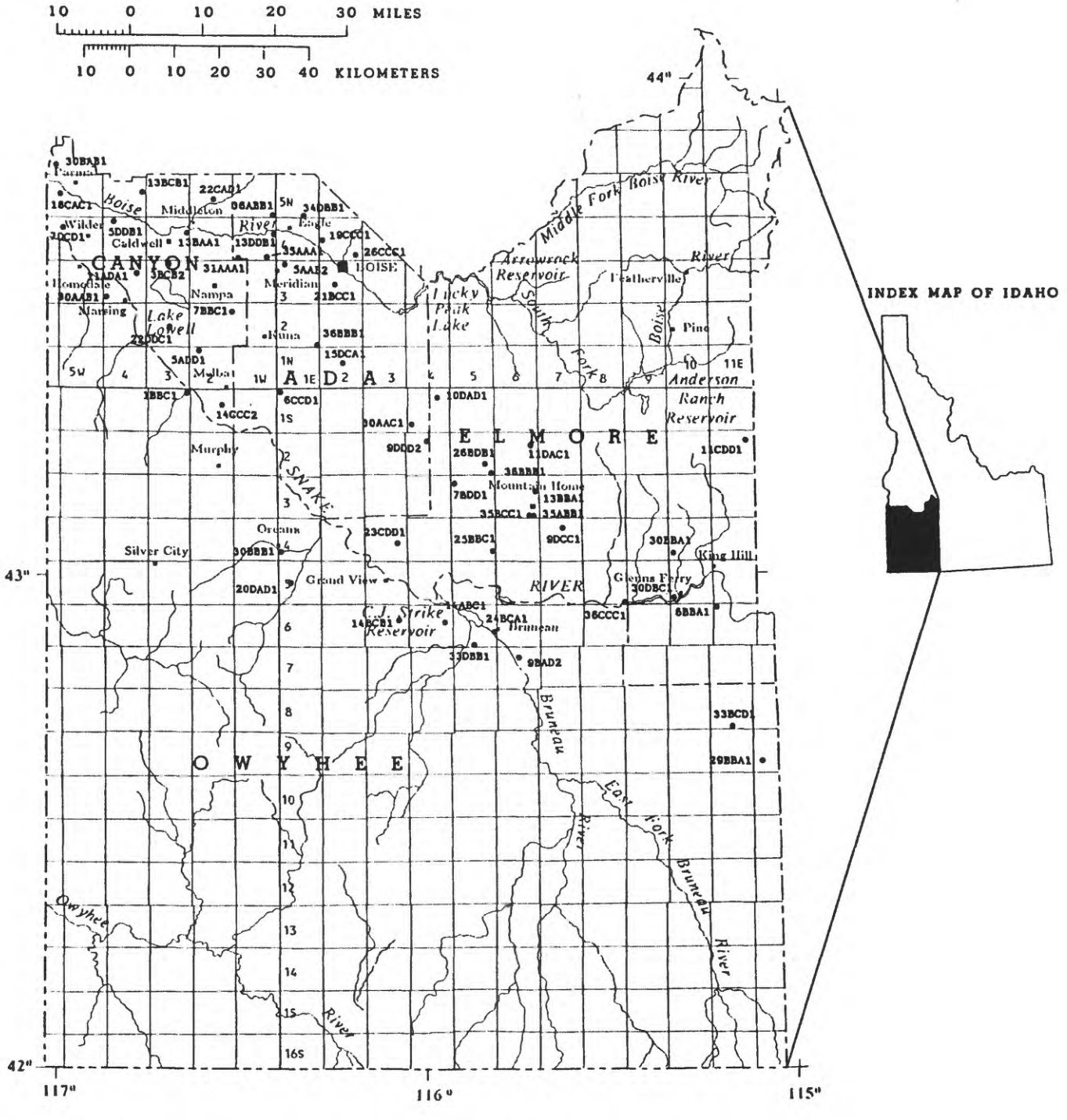


Figure 21.--Locations of observation wells in southwest Idaho.

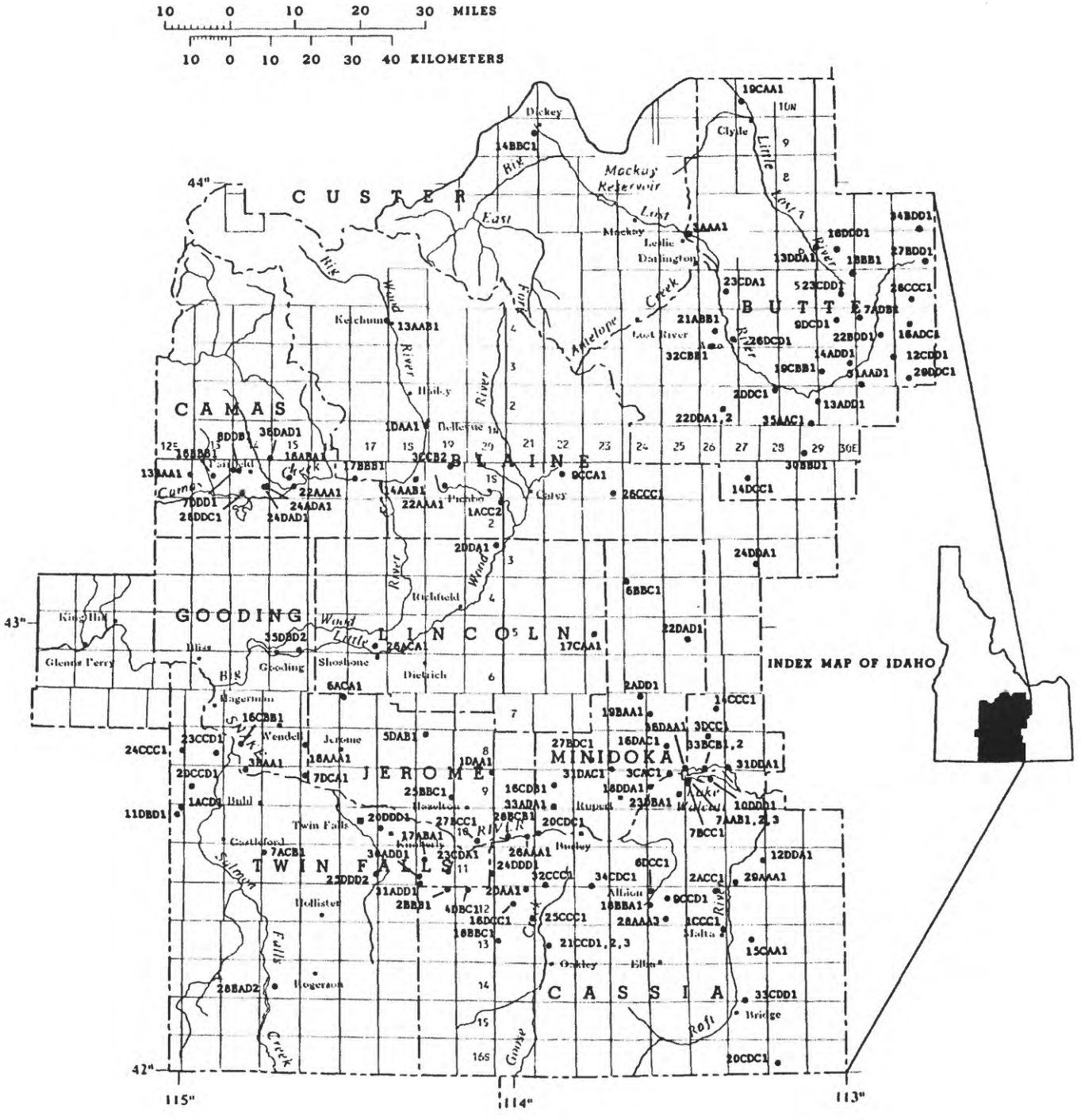


Figure 22.--Locations of observation wells in south-central Idaho.

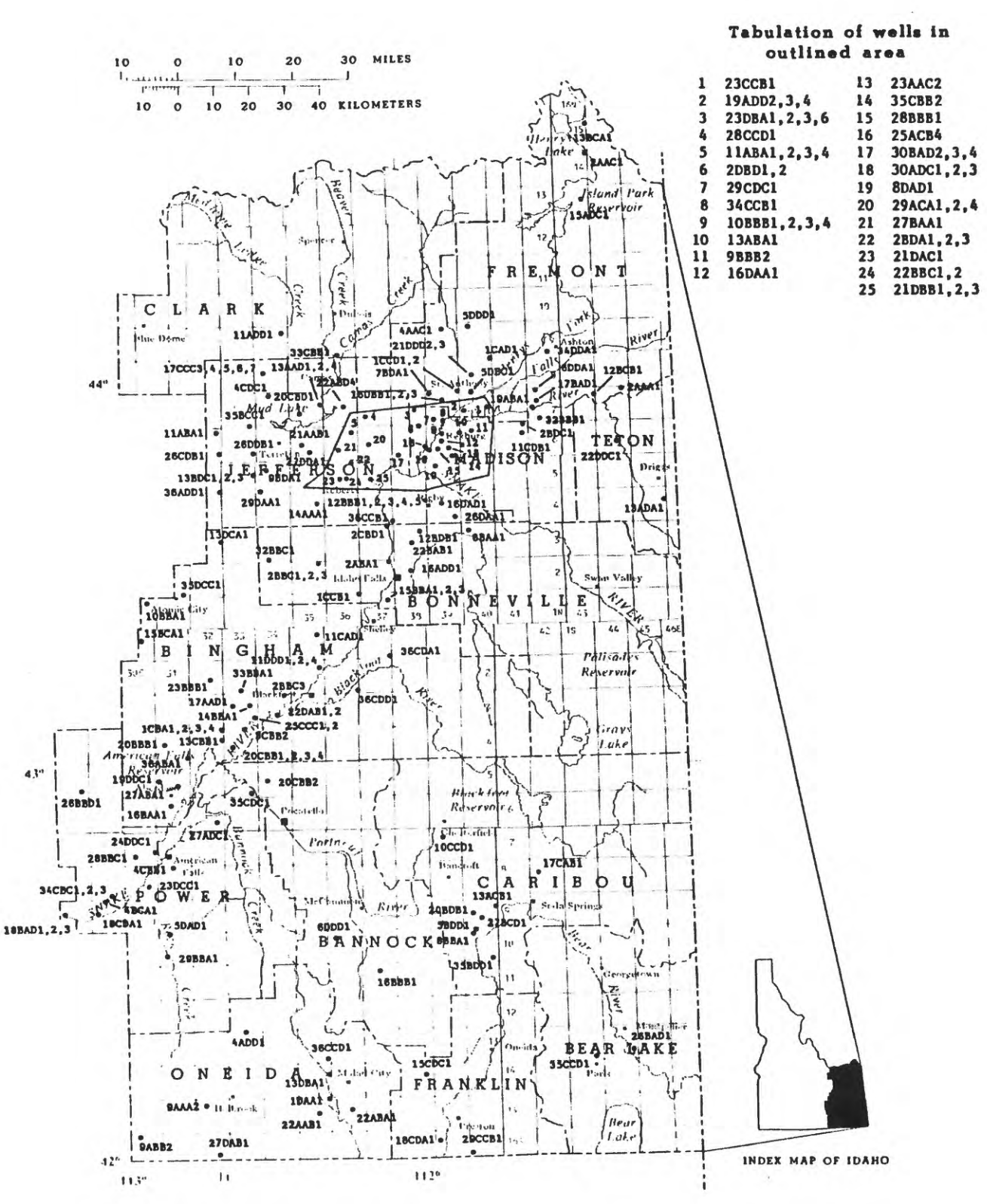


Figure 23.--Locations of observation wells in southeast Idaho.

PROJECT DESCRIPTIONS

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.

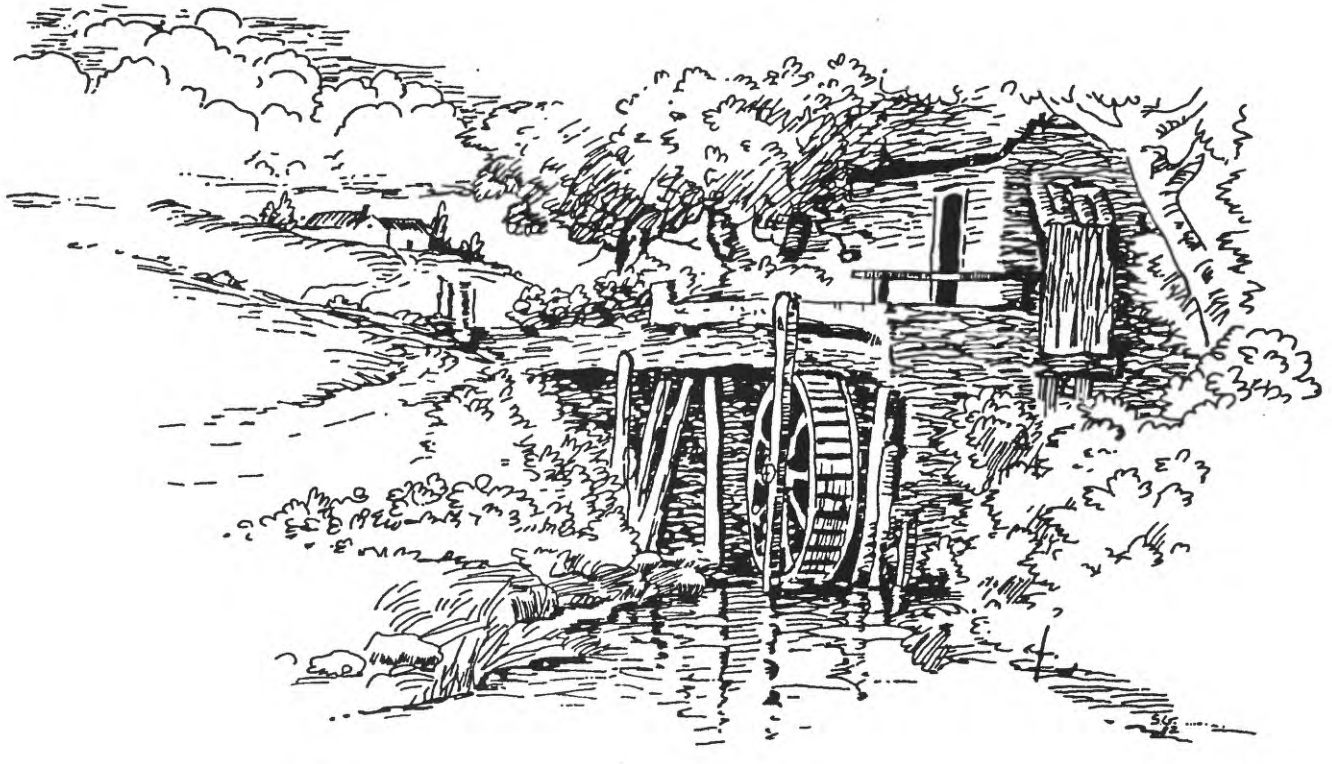
Approach: Measure and record stage and discharge of streams and stage and contents of lakes and reservoirs, using standard methods of data collection as described in the series "Techniques of Water Resources Investigations of the United States Geological Survey." (For more information on this series, see p. 54, "Publications of the U.S. Geological Survey.") Use partial-record data collection rather than continuous-record data collection where it serves the required purpose.

Progress in WY (water year) 1985: Collected and compiled stage and discharge data for 189 gaging stations and 7 partial-record gaging stations, stage only for 3 gaging stations, stage or elevation for 8 lakes and reservoirs, and contents only for 20 lakes and reservoirs. Incorporated data as part of the WATSTORE (National Water Data Storage and Retrieval) system. (For more information on this system, see p. 54, "Water-Data Program.") The Idaho Office 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.

Data supplied by: Bureau of Indian Affairs; City of Nampa; Idaho Power Company; Oakley Canal Company; Salmon River Canal Company; Utah Power and Light Company; Washington Water Power Company; and Water Districts 01, 31, 33, 34, 37, 37N, 45C, 63, and 65K.

Funding sources: City of Middleton, City of Orofino, Federal Energy Regulatory Commission, Idaho Department of Fish and Game, Idaho Department of Health and Welfare, Idaho Department of Water Resources, Idaho Transportation Department, International Joint Commission (Waterways Treaty), National Park Service, Nez Perce Indian Tribes, Shoshone-Bannock Tribes (Fort Hall Indian Reservation), 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, and Water District 01.

Reports: See report No. 24 in Bibliography.



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 resources; 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 WY 1985: Measured water levels annually, semiannually, quarterly, bimonthly, or monthly in 297 wells and continually in 37 wells equipped with automatic recorders. Also, measured water levels bimonthly and monthly in 78 wells and continually in 11 wells for the U.S. Bureau of Reclamation.

Plans for WY 1986: Continue to update, code, and process well-data records for storage and retrieval in the automated data base. The number of sites maintained for specific projects will decrease; those operated as part of the statewide network will increase significantly.

Funding sources: City of Twin Falls, College of Southern Idaho, Idaho Department of Water Resources, U.S. Bureau of Reclamation, and U.S. Geological Survey.

Reports: See report No. 24 in Bibliography.

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 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 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 WY 1985: Collected water-quality data routinely at 197 stations. Determined water temperature at all 197 stations; specific conductance at 193 stations; pH, dissolved oxygen, and inorganic constituents at 11 stations; organic constituents at 1 station; and biological data at 11 stations. Seven of the 197 stations are also part of NASQAN (National Stream Quality Accounting Network), which detects nationwide trends in water quality. Three of the 197 stations are part of the National Hydrologic Benchmark Network, which provides data representative of basins relatively undisturbed by man's activities. Collected water-quality data bimonthly at six NASQAN stations and one benchmark station, quarterly at one NASQAN station and two benchmark stations, and monthly at Little Granite Creek near Bondurant, Wyo.

Plans for WY 1986: Continue to collect water-quality data at NASQAN and benchmark stations, from one minimonitor (continuous recorder) in Yellowstone National Park for the National Park Service, and at Little Granite Creek near Bondurant, Wyo. Collect continuous records of water temperature at nine stations.

Funding sources: Federal Energy Regulatory Commission, Idaho Department of Fish and Game, Idaho Department of Health and Welfare, National Park Service, U.S. Bureau of Reclamation, and U.S. Geological Survey.

Reports: See report No. 24 in Bibliography.

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 WY 1985: Collected suspended-sediment samples daily by PS 69 automatic pumping sampler at Kootenai River at Porthill and at a special study station, Little Granite Creek near Bondurant, Wyo. Collected suspended-sediment samples monthly at one NASQAN station, bimonthly at five NASQAN stations and one benchmark station, and quarterly at two benchmark stations. During spring runoff, collected bedload samples at Little Granite Creek near Bondurant and bedload and suspended-sediment samples at Granite Creek near Bondurant. Collected suspended-sediment samples monthly at Clark Fork near Cabinet, Idaho, and weekly during spring runoff.

Plans for WY 1986: Collect suspended-sediment samples daily at Kootenai River at Porthill, monthly at one NASQAN site, bimonthly at five NASQAN sites and one benchmark site, and quarterly at two benchmark sites. Collect sediment samples monthly (weekly during spring runoff) at Clark Fork River near Cabinet and at Granite Creek and Little Granite Creek near Bondurant, Wyo. Discontinue collecting sediment samples daily at Little Granite Creek. Collect bedload samples weekly during spring runoff at Granite Creek and Little Granite Creek.

Funding sources: International Joint Commission (Waterways Treaty) and U.S. Geological Survey.

Reports: See report No. 24 in Bibliography.

ID 006--Hud Flood Insurance

Location: Statewide, specified areas

Period of project: October 1985 to September 1987

Project leader: William A. Harenberg

Objectives: Conduct limited-detail flood-insurance studies of areas designated by FEMA (Federal Emergency Management Agency).

Approach: Conduct engineering surveys, prepare computer models of drainage networks, compute magnitudes and profiles of floods of specified frequencies, and furnish results in reports prepared to FEMA specifications.

Progress in FY 1986: Completed field work. Completed about 20 percent of hydrologic and hydraulic analyses on six studies.

Plans for FY 1987: Finish hydrologic analyses for four studies. Complete hydraulic analyses on remaining studies and submit results to FEMA. Attend final meetings as they are scheduled.

Funding source: Federal Emergency Management Agency.

ID 007--Water Use

Location: Statewide

Period of project: Continuous since October 1978

Project leader: William A. Harenberg

Objectives: Evaluate for the State of Idaho the NWUDS (National Water Use Data System) and other data-management systems to establish a water-use data collection and dissemination program that will be responsive to needs of users at both State and national levels.

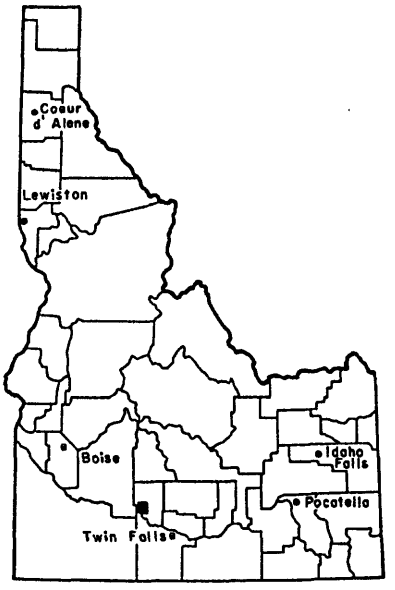
Approach: Contract with governmental and private agencies currently collecting water data to establish a framework for coordination of water-use data. Identify future data needs and determine the best way to meet those needs. Investigate and develop new techniques for better data collection. Review the NWUDS State level data-elements dictionary, prepare a guide to Idaho water-data information sources, and furnish written documentation of study results.

Progress in FY 1986: Generated data for all water-use categories for 1985 and entered into the NWUDS.

Plans for FY 1987: Generate data for 1986 and enter into the NWUDS. Include some irrigation return-flow data.

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

ID 108--Special Hydrologic and Hydraulic Studies



Location: South-central Idaho

Period of project: March 1986 to September 1987

Project leader: Harold W. Young

Objectives: Provide special hydrologic and hydraulic studies as requested by other Federal and State agencies. Following Western Region approval, assign experienced district hydrologists to conduct specialized studies.

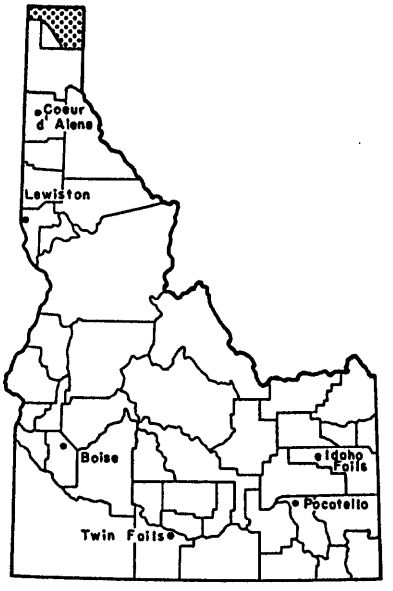
Approach: Experienced hydrologists will use latest available techniques to provide the requested work, contacting Western Region specialists as required. All data collected or compiled will be considered for publication in the Open-File Report series or, if significant results accrue, in the Water-Resources Investigations Report series or other appropriate publication series.

Progress in FY 1986: This special study is a continuation of the 1984 investigation of erosion at the Hagerman fossil beds. Springs issuing from the canyon wall above the fossil beds discharge water from a perched aquifer and are destroying part of the internationally recognized site. Recharge to the perched aquifer is from seepage losses in unlined irrigation canals in the area. Work this year entailed: (1) Completing 11 test holes on the flat above the fossil beds to determine the hydraulic gradient and to monitor water-level fluctuations in the aquifer, and (2) installing continuous recorders in 5 test holes and measuring water levels monthly in the remaining 6.

Plans for FY 1987: Monitor continuous water-level recorders in five of the test holes and continue measuring water levels monthly in the other six.

Funding sources: U.S. Bureau of Land Management and U.S. Department of Energy.

ID 110--Kootenay Lake Board of Control



Location: Northern Idaho, Kootenai River basin

Period of project: Continuous since January 1938

Project leader: Ernest F. Hubbard

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

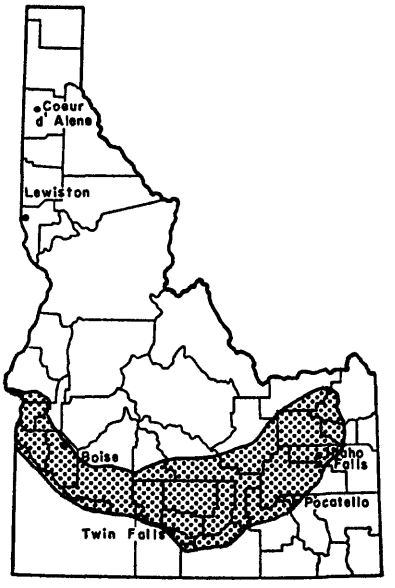
Approach: Attend scheduled meetings and inspection trips. Review hydrologic data concerning regulation of Kootenay Lake or effects of Libby Dam operation on Kootenay Lake.

Progress in FY 1986: Following review and signature by all members, including E. F. Hubbard, Idaho-Nevada District Chief, the Kootenay Lake Board of Control presented the 47th Annual Report to the International Joint Commission. 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 Water Directorate at Vancouver. J. L. Hughes, Idaho Office Chief, participated in the Board-sponsored tour of I.J.C. sites in the fall of 1985.

Plans for FY 1987: For many years, flow records from Kootenai River at Porthill have been computed using manual normal-fall techniques between Klockmann Ranch and Copeland gages and between Copeland and Porthill gages. An attempt is being made to replace these computational techniques with a velocity-area rating. As this technique seems to provide satisfactory results, the use of the normal-fall relation will be considered only as a backup system.

Funding source: International Joint Commission (Waterways Treaty).

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



Location: Southern Idaho

Period of project: October 1979 to September 1987

Project leader: Gerald F. Lindholm

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

Approach: (1) Preliminary (Phase I) work--establish liaison committees and review existing literature and data base, and plan and contract for geophysical, geologic, and test drilling; (2) data acquisition and modeling--assimilate Phase I data, collect additional data, and develop a regional ground-water flow model; (3) production and completion--use models to evaluate the aquifer system and simulate projected water-use schemes to evaluate hypothetical future conditions; and (4) followup studies--identify and quantify key parts of the regional hydrologic system.

Progress in FY 1986: Obtained Director's approval for publication of five Phase I reports. Continued data collection for and analysis of Phase II studies in the American Falls Reservoir area and the Big Lost River basin. Modified the Idaho Department of Water Resources' computer program that calculates recharge for direct input to ground-water flow models for both study areas. Entered data from drillers' logs into a computer data base and used the data to define subsurface geology in the American Falls area. Completed maps showing geology, sediment thickness, top of basalt, and potentiometric surfaces. Used aerial photos and field reconnaissance to update the 1980 irrigated acreage map to 1985. Acquired electrical power data to estimate ground-water pumpage for irrigation. Collected ground-water samples for chemical analyses. Defined model boundaries and developed input data sets. Obtained initial estimates of flow across boundaries from the regional ground-water model developed during Phase I.

Completed maps showing geology, thickness of valley fill, and altitude of the water table in the Big Lost River basin. Drew geologic sections that incorporated results of resistivity surveys. Compiled an irrigated acreage map from 1980 Landsat data and high-altitude photos. Acquired electrical power data to estimate volume of ground water pumped for irrigation in 1984 and 1985. Used delayed yield curves to reanalyze aquifer tests made in the 1960's. Estimated transmissivity from specific-capacity data and aquifer tests. Determined Big Lost River gains and losses during low flow when Mackay Reservoir was nearly empty. Sampled several springs and surface-water sites for chemical analyses. Estimated basin water yield by several methods and compared results. Defined model boundary conditions, developed input data sets, and made initial model runs.

Plans for FY 1987: Emphasize calibration of steady-state and transient ground-water flow models. Write reports summarizing Phase II results.

Funding: U.S. Geological Survey.

Reports: See reports No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 21, 25, 26, 27, 28 in Bibliography.

ID 142--Ground Water, Michaud Flats

Location: Southeastern Idaho

Period of project: October 1980 to September 1987

Project leader: Nathan D. Jacobson

Objectives: Describe degree and extent of ground-water contamination, identify major data gaps, and establish a ground-water monitoring network. Using data obtained, determine occurrence and movement of ground water, describe hydrologic and geologic framework, identify land-use activities or waste-disposal practices that are potential sources of contamination, and identify in-plant processing procedures implemented by local industrial complexes to control ground-water contamination.

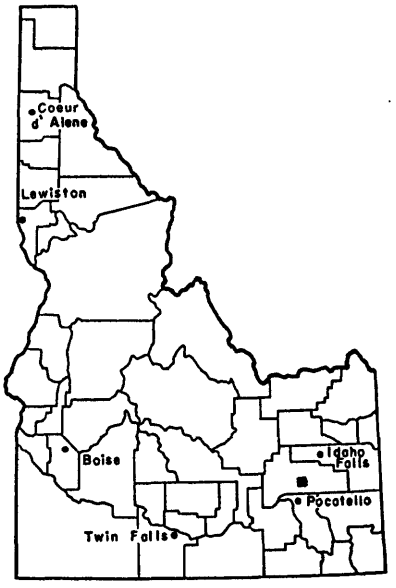
Approach: (1) Obtain historical water-quality data and review available literature, (2) design a water-quality monitoring network to provide for semiannual sampling at selected sites, and (3) obtain water-level measurements and water-quality samples from wells to determine direction and extent of contaminant migration.

Progress in FY 1986: As part of the continuing water-quality network, collect water samples semiannually from five springs and one well for chemical analyses.

Plans for FY 1987: Continue collection of water samples from designated wells and springs for selected chemical and radiochemical analyses.

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

ID 154--Groveland-Collins Area Ground-Water Contamination



Location: Groveland-Collins area north of Blackfoot, Idaho

Period of project: January 1984 to December 1986

Project leader: Deborah J. Parliman

Objectives: Study local ground-water hydrology and water chemistry. Determine areal and vertical extent of contamination and seasonal variations in water chemistry. Determine the most probable causes of contamination.

Approach: Compile existing geologic, hydrologic, and water-chemistry data. Inventory area wells and periodically obtain water-level measurements from selected wells. Obtain water samples from selected wells for chemical analyses. Construct a water-level contour map. Drill shallow (less than 50 feet) test wells, obtain core samples for analysis, and install soil-moisture monitoring equipment. Determine chemical mechanisms involved in the release and transport of selected constituents in the water. Determine the feasibility of developing and calibrating a mathematical ground-water model.

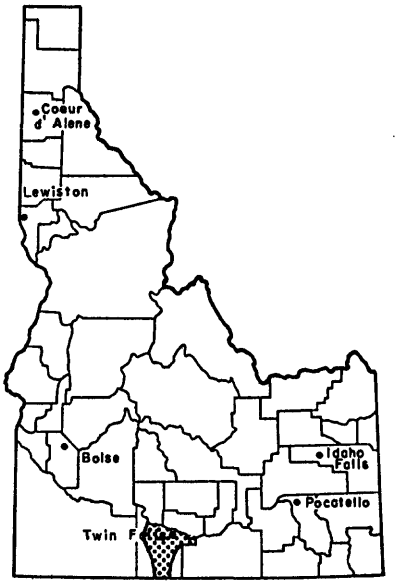
Progress in FY 1986: Published a data report compiling all historical and recent data used in the study. Obtained inhouse and colleague review for the final interpretive report.

Plans for FY 1987: Obtain Director's approval and publish final interpretive report.

Funding sources: Idaho Department of Health and Welfare and U.S. Geological Survey.

Reports: See report No. 22 in Bibliography.

ID 163--Twin Falls Geothermal



Location: Southern Idaho

Period of project: August 1984 to September 1985

Project leader: Robert E. Lewis

Objectives: (1) Determine areal extent and thickness of the low-temperature geothermal aquifer in the Twin Falls area; (2) determine volume, recharge, effects of present development, and anticipated longevity of the resource.

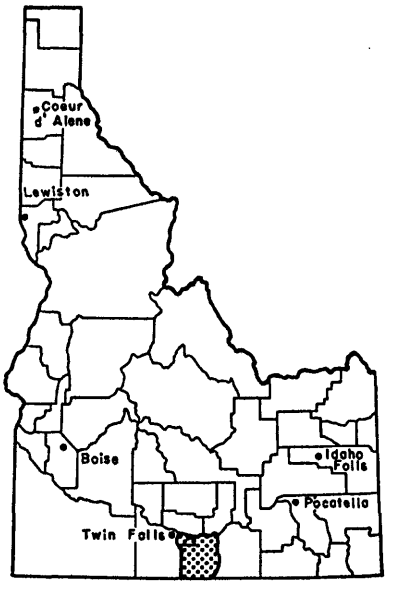
Approach: (1) Inventory new geothermal wells, (2) collect water samples from selected wells for chemical and isotopic analyses, (3) complete 25-35 miles of electrical-resistivity and gravity profiles, (4) obtain geophysical logs for selected wells, (5) install continuous recorders on selected wells, (6) determine volume of hot water discharged from the aquifer, and (7) summarize results of the study in a final report.

Progress in FY 1986: Inventoried all wells and obtained necessary water samples for chemical and isotopic analyses. Completed planned surface and borehole geophysics. Prepared report summarizing results of the study for Director's approval.

Plans for FY 1987: None.

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

ID 164--Oakley Fan Artificial Recharge



Location: Southern Idaho

Period of project: August 1984 to September 1988

Project leader: Harold W. Young

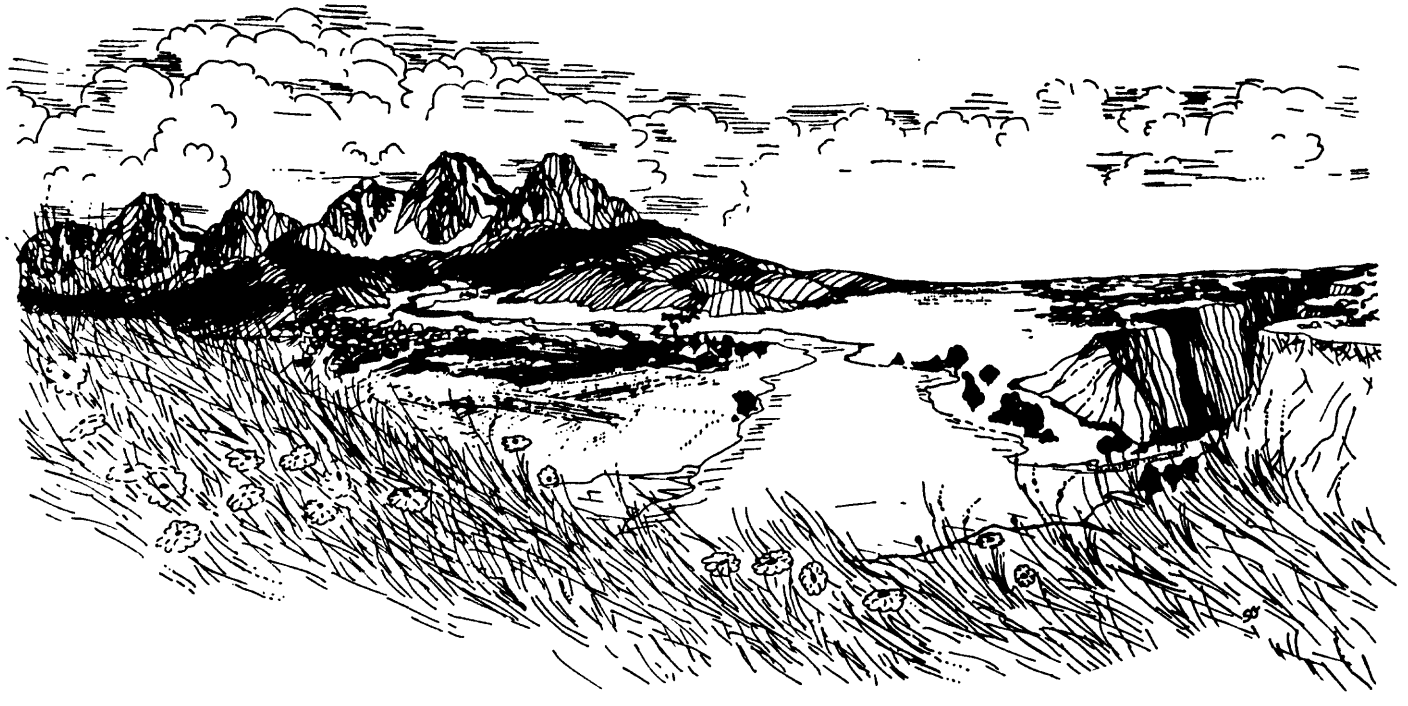
Objectives: (1) Describe the geohydrology of the area, (2) develop a ground-water model to evaluate effects of recharge on the aquifer system, and (3) establish a water-level and water-quality monitoring program following injection testing to evaluate possible impacts of recharge on the hydrologic system.

Approach: During Phase I: (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 mathematical model. During Phase II: (1) Conduct injection tests, (2) establish a water-level and water-quality monitoring network, (3) refine earlier modeling results using newest data, and (4) prepare a report describing results of the study.

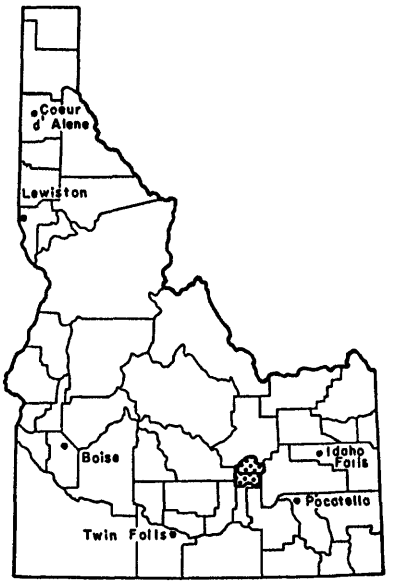
Progress in FY 1986: Continued monitoring of ground- and surface-water networks. Collected water samples from selected wells and analyzed for chemical and isotopic composition. Sampled six ground-water sites and one surface-water site for concentration of pesticides. On the basis of chloride concentrations, differentiated water types on both sides of a fault to aid in determining the effects of the fault on ground-water movement. On the basis of silica concentrations, mapped the areal extent of a limestone aquifer. Wrote program to compute monthly recharge and used the program to estimate recharge from 1979 to 1984. Nearly completed calibration runs for the steady-state model. Began initial calibration runs for the transient model.

Plans for FY 1987: Continue operation of the ground- and surface-water monitoring network. Complete calibration of steady-state and transient models by December 31, 1986. Evaluate and use the model to predict water-level changes as a result of proposed water-management decisions. Write a report summarizing data collection and analysis, model calibration, and model simulation results.

Funding sources: U.S. Geological Survey and West Cassia Soil and Water Conservation 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 INEL (Idaho National Engineering Laboratory) 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 1986: Continued studies of distribution and migration of radioactive and chemical waste products and provided geohydrologic consultation to the Department of Energy and its contractors. Published reports describing volumes of aqueous radioactive and industrial-waste disposal at INEL through 1982 and characterizing the hydraulic properties of rocks and chemical quality of water for a 10,365-foot deep test hole. Began a study to define the geologic, hydraulic, and chemical quality of water in a perched zone underlying a system of percolation ponds. Prepared a report describing the capacity of a diversion channel from the Big Lost River. Instrumented two test trenches with about 40 thermocouple psychrometers and two weighing lysimeters and began data collection. Conducted a second seepage run on the Big Lost River to define transmission losses of the channel.

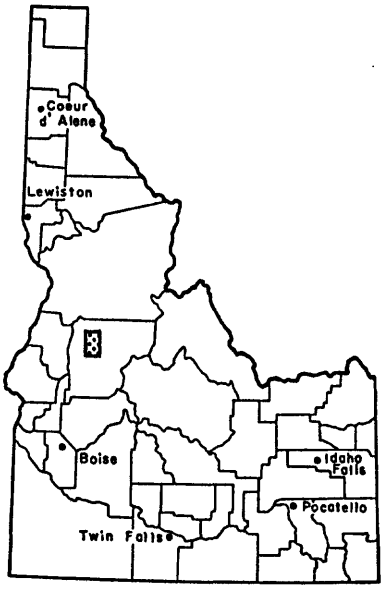
Began preparing a report describing hydrologic changes at INEL during 1981-85. Began a test-drilling program at the Chemical Processing Plant to monitor a perched-water zone.

Plans for FY 1987: Continue data collection programs and work initiated in FY 1986. Publish three reports begun during 1985-86. Complete the test-drilling program begun in 1986. Complete an evaluation of the observation well network and begin an evaluation of the water-quality network. Begin compiling and analyzing data from the test trenches and weighing lysimeters. Begin a detailed analysis of recharge to the Snake River Plain aquifer at INEL. Begin working with the U.S. Department of Energy and U.S. Environmental Protection Agency to characterize the geohydrology of land-disposal and solid-waste management sites at INEL and to develop plans for ground-water monitoring at these sites.

Funding source: U.S. Department of Energy.

Reports: See reports No. 10, 11, 19, 20, and 23 in Bibliography.

ID 166--Sediment Transport, South Fork Salmon River



Location: West-central Idaho

Period of project: May 1985 to September 1986

Project leaders: Rhea P. Williams and Ivalou O'Dell

Objectives: (1) Determine 1985 rates of sediment transport in the South Fork Salmon River and compare results with estimates obtained by using one of the existing sediment-transport equations; (2) using one of the verified (or calibrated) equations, estimate bedload rates on the basis of hydraulic data for the period 1967-85.

Approach: (1) Compile existing hydraulic and sediment data for the area; (2) collect new hydraulic and sediment data, including stream discharge, bedload, suspended sediment, bed-material size, and water-surface slope. Collect data at three sites thrice weekly and at two sites semiweekly during the runoff period; and (3) analyze applicability of existing bedload equations to conditions at the study sites on the basis of bedload data collected.

Progress in FY 1986: Compiled existing and collected new hydraulic and sediment data, and prepared noninterpretive data report.

Plans for FY 1987: None.

Funding sources: Idaho Department of Fish and Game and U.S. Geological Survey.

ID 167--Big Wood River Hydrology

Location: South-central Idaho

Period of project: October 1985 to September 1988

Project leader: Steven A. Frenzel

Objectives: Determine the quantity of ground- and surface-water resources in the upper Big Wood River valley. Evaluate the suitability of these resources for present and anticipated uses.

Approach: (1) Collect and tabulate geologic, hydrologic, and water-use data; (2) inventory existing wells in the area; (3) obtain water samples from selected wells and streams for chemical analyses; (4) complete seismic-refraction profile across mouth of valley to determine thickness of unconsolidated deposits; (5) determine tributary inflows and gains and losses along lower Big Wood River; (6) determine a water budget for the basin; and (7) complete a final report.

Progress in FY 1986: Assembled historical hydrologic and geologic data. Inventoried wells during April 1986 to determine ground-water levels and direction of movement. Selected five wells to be measured monthly during the remainder of the project. Measured discharge monthly in Trail Creek, Warm Springs Creek, and the East Fork Big Wood River to aid in determining basin yield. Measured discharge at 19 sites along the Big Wood River to determine areas of gain or loss.

Plans for FY 1987: Obtain samples in November and March from about six surface-water and six ground-water sites for chemical analyses. Continue collecting streamflow and water-level data to aid in determining a water budget. Complete data collection and begin work on the final report.

Funding sources: Sun Valley Water and Sewer District and U.S. Geological Survey.

ID 168--Pumped Diversions

Location: Southern Idaho

Period of project: October 1986 to September 1988

Project leader: Luther C. Kjelstrom

Objectives: Define accurate, reliable, and cost effective methods for quantifying pumped withdrawals from the Snake River and identify the best methods for providing long-term records of withdrawals.

Approach: (1) Evaluate sites where water currently is being pumped from the Snake River and select 10 representative stations for study; (2) identify potential direct and indirect devices and other estimation methods for measuring flow in closed conduits; (3) screen measuring methods for feasibility; (4) furnish study sites with conventional measuring equipment and with various test instruments; (5) collect flow data using both conventional and test methods; (6) evaluate and report the accuracy, reliability, and relative costs of each test method.

Progress in FY 1986: Arranged with irrigators for installation of flow meters and collection of data at seven pumping-plant sites. Installed between one and six meters at each of the seven sites, and installed open-channel gaging stations at three of the seven sites.

Plans for FY 1987: Analyze performance of measuring devices and compare data obtained with flow data from open-channel gaging stations. Purchase and install additional measuring devices at selected sites. Continue to collect data from all sites during the 1987 irrigation season. Begin final reports.

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

ID 169--Statewide Ground-Water Quality

Location: Statewide

Period of project: October 1986 to September 1988

Project leader: Walton H. Low

Objectives: Design and implement a ground-water quality monitoring network to detect changes in or degradation of water quality that may result from natural or man-induced causes.

Approach: Phase I (year 1): (1) Evaluate earlier (1979) work describing ground-water quality monitoring alternatives, including major elements of the Ground-Water Quality Management Plan for Idaho, proposed by the Idaho Department of Health and Welfare; and (2) establish and maintain a ground-water quality data base to define current water-quality conditions in selected aquifers, and establish a monitoring network and sampling frequency schedule. Phase II (years 2 and 3): Collect hydrologic and chemical data for all established sites. At the end of the third year, prepare a report summarizing results of the study. Phase III (years 4-8): Continue to sample network sites and submit annual reports summarizing work for the year. At the end of the 8th year, prepare a comprehensive report that discusses the causes of any changes in ground-water quality.

Progress in FY 1986: Collected water samples from 18 sites in south-central Idaho for analysis of pesticides, cyanide, tritium, gross alpha, and strontium. Collected 11 samples from selected geothermal wells in south-central and southwestern Idaho.

Plans for FY 1987: Continue collecting water samples for chemical analyses from selected wells in southern Idaho.

Funding sources: Idaho Department of Health and Welfare and U.S. Geological Survey.

OTHER HYDROLOGIC WORK BY THE DISTRICT IS VARIED

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 activites 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 Office personnel work as members and advisors to committees and task forces including the Swan Falls Technical Advisory Committee, the Columbia River Water Management Group, International Kootenai Lake Board of Control, and the Idaho Natural Resources Roundtable.

Review of Environmental Impact Statements and other agency reports.--The Water Resources Division reviews Environmental Impact Statements for Federal airport and highway projects to insure that available hydrologic data are used, that they are used correctly, and that the impact of construction on water features and resources is 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 Office continually receives calls, visits, and mail requests for information on groundwater availability, streamflow data, and water quality from landowners, consultants, public officials, and business concerns. 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 Office 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--drought, floods, volcanic eruptions, earthquakes, and hazardous-waste spills--and giving presentations concerning aspects of water-resource activities at symposia and seminars. The Idaho Office also investigates hydrologic impacts and data needs related to small hydroelectric power development for the Federal Energy Regulatory Commission.

SOURCES OF WRD PUBLICATIONS AND INFORMATION

Publications of the U.S. Geological Survey.--Professional Papers, Water-Supply Papers, and Bulletins are sold by the U.S. Geological Survey at the following address: Books and Open-File Reports, Federal Center, Bldg. 41, Box 25425, Denver, CO 80225. Also available from Books and Open-File Reports 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. Hydrologic Investigations Atlases, Hydrologic Unit Maps, and other maps pertaining to Idaho are sold by U.S. Geological Survey, Map Distribution, Federal Center, Bldg. 41, Box 25286, Denver, CO 80225.

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resources. These data can be retrieved in machine-readable form or in the form of 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 Office.

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