UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1982 THROUGH SEPTEMBER 1983

Compiled by Robert S. Roberts

Open-File Report 83-260

Prepared in cooperation with the
State of Montana and other agencies

Helena, Montana

May 1983

UNITED STATES DEPARTMENT OF THE INTERIOR

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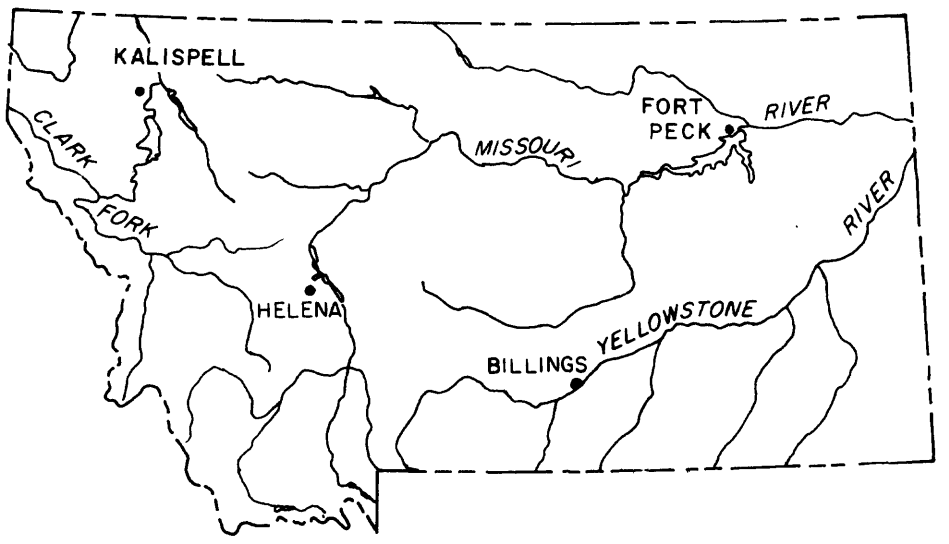

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MONTANA, OCTOBER 1982 THROUGH SEPTEMBER 1983

INTRODUCTION

The U.S. Geological Survey was established as an agency in the Department of the Interior on March 3, 1879, 30 years to the day after establishment of the Department itself. The initial purpose of the Survey was to prepare a plan that would secure the best possible results at the least possible cost for surveying and mapping the Territories of the United States. One mission of the Geological Survey 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 mission is accomplished, in large part, through cooperation with other Federal and non-Federal agencies by:

1. Collecting data needed for the continuing determination and evaluation of the Nation's water resources;
2. Conducting water-resources investigations to describe the occurrence, availability, and characteristics of surface and ground waters;
3. Conducting supportive research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurements and to understand hydrologic systems sufficiently well to be able to predict their response to stress;
4. Disseminating the water data and the results of these investigations and research through reports, maps, and other forms of public release;
5. Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, and ground waters; and
6. 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.

The Montana district of the Geological Survey conducts its hydrologic work through a headquarters office in Helena (Federal Office Building, 301 S. Park), a subdistrict office in Billings, and field offices in Helena, Kalispell, and Fort Peck. The district employs 67 people (47 full-time and 20 less than full-time) to work on 24 funded projects. Funding for program operation comes from joint-funding agreements with State and local agencies, direct Federal allotments to the U.S. Geological Survey, and transfer of funds from other Federal agencies.

Funding agencies include:

State and local agencies

Montana Bureau of Mines and Geology
Montana Department of Natural Resources and Conservation
Montana Department of State Lands
Montana Department of Fish, Wildlife, and Parks
Montana Department of Highways
Office of the Governor (Montana)
Wyoming State Engineer
Montana State University
Montana Department of Health and Environmental Sciences

Federal agencies

U.S. Geological Survey
U.S. Bureau of Land Management
U.S. Bureau of Indian Affairs
U.S. Army Corps of Engineers
U.S. Department of State-International Joint Commission
Federal Energy Regulatory Commission
U.S. Bureau of Reclamation
Bonneville Power Administration
U.S. Forest Service
U.S. Fish and Wildlife Service

Distribution of funding for program operation is illustrated in figure 1.

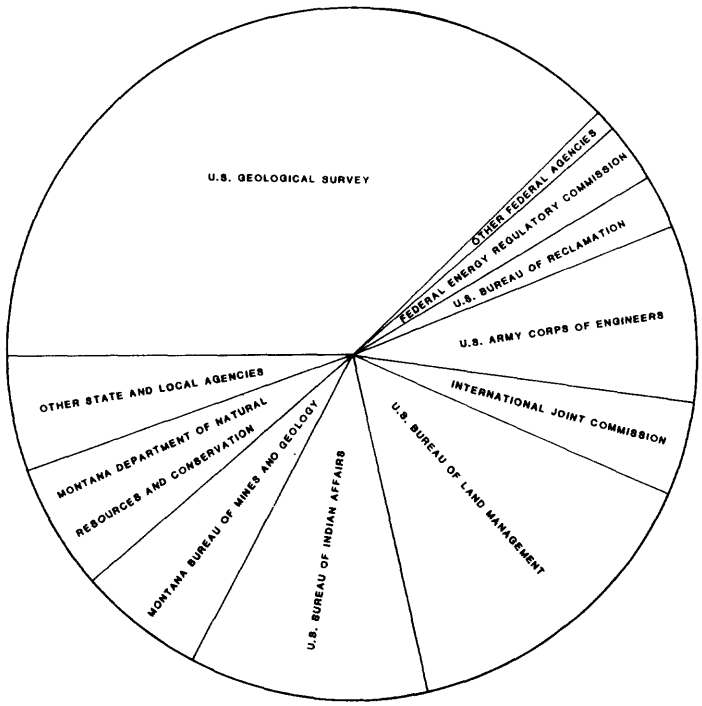

Figure 1.--Sources of funding for the water-resources program in Montana.

The following projects are funded for fiscal year 1983 in Montana:

001 Surface-Water Stations
002 Ground-Water Stations
003 Water-Quality Stations
004 Sediment Stations
005 Precipitation Stations
007 Water Use
023 Bridge-Site Investigations
056 Madison Aquifer in Montana
059 Coal-Lease Monitoring
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094 Impacts of Mining, Otter Creek
095 Yellowstone River Tributary Flow

These projects are described in following sections of this report under the general headings of: (1) Data-collection programs, (2) Problem-oriented studies, (3) Areal appraisals, (4) Coal-related studies, and (5) Research projects. An additional section describes contracts administered by the Montana district to research organizations.

DATA-COLLECTION PROGRAMS

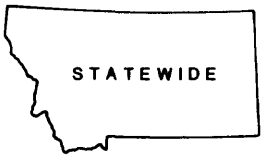
Hydrologic-data stations are maintained at selected sites throughout Montana to collect basic information concerning streamflow, ground-water levels, quality of water, sediment concentrations in streams, and depth and water content of snowpack. The network of stations is revised periodically to ensure collection of meaningful and worthwhile data. Information collected from the network is kept on file for use by managers, investigators, and users of water resources. Much of the information is published annually in water-data reports, most is stored in computer files for efficient processing and retrieval, and all is available to requesters.

The locations of data-collection stations in Montana are shown in figure 2 for surface water and figure 3 for surface-water quality. Surface-water stations in operation as of October 1982 are listed in table 1. Surface-water-quality stations are listed in table 2.

In addition to the data collected within the State, the Montana district has access to water data collected nationwide. The National Water Data Exchange (NAWDEX) of the Geological Survey indexes water data available from more than 400 organizations. The National Water Data Storage and Retrieval System (WATSTORE) serves as a central repository of water data collected by the Geological Survey, including large volumes of data on the quantity and quality of both surface and ground waters. The Office of Water Data Coordination (OWDC) coordinates Federal water-data acquisition activities and maintains a "Catalog of Information on Water Data." Information on the programs and availability of the water data can be obtained from the District Chief, U.S. Geological Survey, 428 Federal Building, 301 South Park, Drawer 10076, Helena, MT 59626.

Surface-Water Stations

(MT001)



Location: Statewide

Period of project: Continuing

Project chief: George M. Pike, Helena

Objectives: (1) To collect surface-water data sufficient to satisfy needs for current-purpose uses, such as (a) assessment of water resources, (b) operation of reservoirs or industries, (c) forecasting, (d) disposal of wastes and pollution control, (e) discharge data to accompany water-quality measurements, (f) compact and legal requirements, and (g) research and special studies. (2) To collect data necessary for analytical studies to define for any location the statistical properties of, and trends in, the occurrence of water in streams, lakes, and so forth, for use in planning and design.

Information products: Missouri River Basin Ground Water Resources Work Group, 1980, Inventory of ground-water resources, technical paper *of* Upper Missouri River Basin Level B Study: Missouri River Basin Commission, 54 p.

Moore, L. G., and Shields, R. R., 1980, Streamflow characteristics of the Yellowstone River basin, Montana, through 1976: U.S. Geological Survey Water-Resources Investigations 80-41, 67 p.

Omang, R. J., Parrett, Charles, and Hull, J. A., Floods estimates for ungaged streams in Glacier and Yellowstone National Parks: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Parrett, Charles, Carlson, D. D., Craig, G. S., Jr., and Chin, E. H., Floods of May 1978 in southeastern Montana and northeastern Wyoming: U.S. Geological Survey Professional Paper 1244 (in press).

Parrett, Charles, Carlson, D. D., Craig, G. S., Jr., and Hull, J. A., 1978, Data for floods of May 1978 in northeastern Wyoming and southeastern Montana: U.S. Geological Survey Open-File Report 78-985, 16 p.

Parrett, Charles, Omang, R. J., and Hull, J. A., 1982, Floods of May 1981 in west-central Montana, *with a section on* Meteorological setting by John W. Fassler: U.S. Geological Survey Water-Resources Investigations 82-33, 20 p.

Shields, R. R., and White, M. K., 1981, Streamflow characteristics of the Hudson Bay and upper Missouri River basins, Montana, through 1979: U.S. Geological Survey Water-Resources Investigations 81-32, 144 p.

U.S. Geological Survey, Water resources data for Montana--Water year 1982, v. 1, Hudson Bay basin and Missouri River basin: U.S. Geological Survey Water-Data Report MT-82-1 (in preparation).

_____Water resources data for Montana--Water year 1982, v. 2, Columbia River basin: U.S. Geological Survey Water-Data Report MT-82-2 (in preparation).

Waltemeyer, S. D., and Shields, R. R., 1982, Streamflow characteristics of the upper Columbia River basin, Montana, through 1979: U.S Geological Survey Water-Resources Investigations 81-82, 74 p.

Yellowstone River Compact Commission, 1982, Thirty-first annual report; 22 p.

Ground-Water Stations

(MT002)

Location: Statewide

Period of project: Continuing

Project chief: Thomas E. Reed, Helena

Objectives: (1) To collect water-level data sufficient to provide a minimum long-term data base so that the general response of the hydrologic system to natural climatic variations and induced stresses is known and potential problems can be defined early enough to allow proper planning and management. (2) To provide a data base against which the short-term records acquired in areal studies can be analyzed. This analysis must (a) provide an assessment of the ground-water resource, (b) allow prediction of future conditions, (c) detect and define pollution and supply problems, and (d) provide the data base necessary for management of the resource.

Information products: Coffin, D. L., Reed, T. E., and Ayers, S. D., 1977, Water-level changes in wells along the west side of the Cedar Creek anticline, southeastern Montana: U.S. Geological Survey Water-Resources Investigations 77-93, 11 p.

Roberts, R. S., 1980, Hydrogeologic data for selected coal areas, east-central Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-329, 63 p.

U.S. Geological Survey, Water resources data for Montana--Water year 1982, v. 1, Hudson Bay basin and Missouri River basin: U.S. Geological Survey Water-Data Report MT-82-1 (in preparation).

_____Water resources data for Montana--Water year 1982, v. 2, Columbia River basin: U.S. Geological Survey Water-Data Report MT-82-2 (in preparation).

Water-Quality Stations

(MT003)

Location: Statewide

Period of project: Continuing

Project chief: J. Roger Knapton, Helena

Objectives: (1) To provide a national bank of water-quality data for broad Federal and State planning and action programs. (2) To provide data for Federal management of interstate and international waters.

Information products: Knapton, J. R., 1978, Evaluation and correlation of water-quality data for the North Fork Flathead River, northwestern Montana: U.S. Geological Survey Water-Resources Investigations 78-111, 95 p.

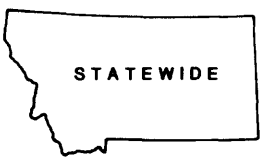
Knapton, J. R., and Jacobson, M. A., 1980, Simulation of water-quality data at selected stream sites in the Missouri River basin, Montana: U.S. Geological Survey Water-Resources Investigations 80-76, 30 p.

U.S. Geological Survey, Water resources data for Montana--Water year 1982, v. 1, Hudson Bay basin and Missouri River basin: U.S. Geological Survey Water-Data Report MT-82-1 (in preparation).

_____Water resources data for Montana--Water year 1982, v. 2, Columbia River basin: U.S. Geological Survey Water-Data Report MT-82-2 (in preparation).

Sediment Stations

(MT004)



Location: Statewide

Period of project: Continuing

Project chief: J. Roger Knapton, Helena

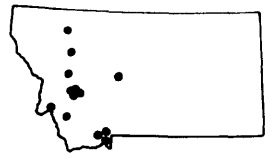
Objectives: (1) To provide a national bank of sediment data for use in broad Federal and State planning and action programs. (2) To provide data for Federal management of interstate and international waters.

Information products: U.S. Geological Survey, Water resources data for Montana--Water year 1982, v. 1, Hudson Bay basin and Missouri River basin: U.S. Geological Survey Water-Data Report MT-82-1 (in preparation).

_____Water resources data for Montana--Water year 1982, v. 2, Columbia River basin: U.S. Geological Survey Water-Data Report MT-82-2 (in preparation).

Precipitation Stations

(MT005)



Location: West-central Montana

Period of project: Continuing

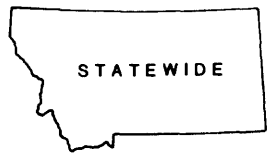
Project chief: Ronald R. Shields, Helena

Objective: To obtain the depth and water content of the snowpack at 13 designated snow courses for use in runoff forecasting.

Information product: Results of measurements are included in U.S. Soil Conservation Service report, "Water supply outlook for Montana."

Water Use

(MT007)



Location: Statewide

Period of project: Continuing

Project chief: Charles Parrett, Helena

Objective: To develop and maintain a water-use data system for Montana that is responsive to the needs of users at both State and national levels.

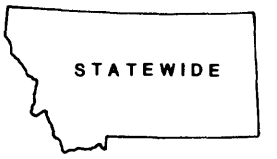
Information product: Water-use information will be supplied to requesters. Contributed water-use data for the report by Solley, W. B., Chase, E. B., and Mann, W. B., 1983, Estimated use of water in the United States in 1980: U.S. Geological Survey Circular 1001, 56 p.

PROBLEM-ORIENTED STUDIES

The Geological Survey is often asked by Federal, State, or local agencies to investigate hydrologic problems of limited areal extent. These problem-oriented studies range in scope from cursory examination of baseline conditions to detailed investigations of cause and effect. For problems of a recurring nature, such as bridge-site investigations for the Montana Department of Highways, continuing projects are established to provide an ongoing service to the funding agency. Some problems are of sufficient scope to warrant formal projects. Other problems, such as those created by the improper disposal of hazardous wastes, may or may not be of a recurring nature.

Bridge-Site Investigations

(MT023)



Location: Statewide

Period of project: Continuing

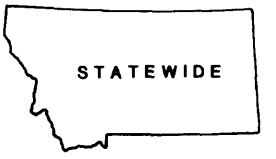
Project chief: Robert J. Omang, Helena

Objective: To supply the Montana Department of Highways with sufficient hydrologic and hydraulic information at selected sites to allow the most economic and hydraulically safe bridge or culvert design possible.

Information product: Johnson, M. V., 1978, Floods of June 4 and 12, 1976, at Culbertson, Montana: U.S. Geological Survey Open-File Report 78-429, 6 p.

Ground-Water Quality

(MT091)



Location: Statewide

Period of project: July 1982 to June 1983

Project chief: Robert E. Davis, Helena

Objective: To evaluate existing ground-water-quality data for Montana to determine its adequacy for (1) describing current ground-water quality areally and by aquifer, (2) documenting ground-water-quality problems associated with disposal of hazardous waste, and (3) identifying areas where data are insufficient to assess the two previous items.

Information product: Davis, R. E., Evaluation of ground-water quality in Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

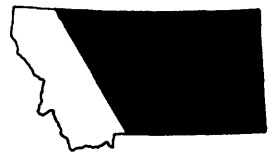
AREAL APPRAISALS

The Geological Survey has a continuing program of areal studies designed to provide hydrologic information needed in managing the State's water resources. These studies evaluate the occurrence and movement of ground water, thickness and extent of aquifers, distribution of streamflow in time and space, and quality of surface and ground waters. The studies generally include a ground-water basin, hydrologic unit, county, or other convenient subunit of the State.

Each areal investigation is uniquely designed to address hydrologic conditions, development potential, and specific hydrologic problems associated with the area in question. Some studies are aimed primarily at evaluating the potential for development of ground-water supplies, some deal primarily with water-quality problems, and some are broad investigations of the hydrologic system. All are intended to provide a clearer understanding of the State's water resources.

Madison Aquifer in Montana

(MT056)



Location: Central and eastern Montana

Period of project: October 1975 to September 1983

Project chief: Richard D. Feltis, Billings

Objective: To compile information from test holes and wells and prepare maps describing the (a) structural configuration of the top of the aquifer, (b) potentiometric surface, and (c) quality of water. These maps will form the basis for a future evaluation of the aquifer and will supplement an intensive study of the Madison aquifer in eastern and southeastern Montana.

Information products: Feltis, R. D., 1980, Map showing configuration of the top of the Madison Group, Havre 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 9.

_____1980, Map showing configuration of the top of the Madison Group, Great Falls 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 10.

_____1980, Map showing configuration of the top of the Madison Group, Shelby 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 11.

_____1980, Map showing configuration of the top of the Madison Group, Lewistown 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 12.

_____1980, Map showing potentiometric surface of water in the Madison Group, Montana: Montana Bureau of Mines and Geology Hydrogeologic Map 2.

_____1980, Map showing dissolved-solids concentration of water in the Madison Group, Montana: sheet 1 *of* Montana Bureau of Mines and Geology Hydrogeologic Map 3.

_____1980, Map showing ratio of sodium, potassium, and chloride to dissolved-solids concentration in water of the Madison Group, Montana: sheet 2 *of* Montana Bureau of Mines and Geology Hydrogeologic Map 3.

_____1980, Map showing ratio of sulfate to total anions in water of the Madison Group, Montana: sheet 3 *of* Montana Bureau of Mines and Geology Hydrogeologic Map 3.

_____1981, Map showing configuration of the top of the Madison Group, Glendive 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 15.

_____1981, Map showing configuration of the top of the Madison Group, Jordan 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 16.

_____1981, Map showing configuration of the top of the Madison Group, Wolf Point 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 17.

_____1981, Map showing configuration of the top of the Madison Group, Glasgow 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 18.

_____1981, Map showing configuration of the top of the Madison Group, Miles City 1-degree by 2-degree quadrangle, southeastern Montana: Montana Bureau of Mines and Geology Geologic Map 20.

_____1981, Map showing configuration of the top of the Madison Group, Ekalaka 1-degree by 2-degree quadrangle, southeastern Montana: Montana Bureau of Mines and Geology Geologic Map 21.

_____1981, Map showing configuration of the top of the Madison Group, Forsyth 1-degree by 2-degree quadrangle, southeastern Montana: Montana Bureau of Mines and Geology Geologic Map 22.

_____Map showing configuration of the top of the Madison Group, Roundup 1-degree by 2-degree quadrangle, Montana: Montana Bureau of Mines and Geology Geologic Map (in review).

_____Map showing configuration of the top of the Madison Group, Hardin 1-degree by 2-degree quadrangle, Montana: Montana Bureau of Mines and Geology Geologic Map (in review).

_____Map showing configuration of the top of the Madison Group, Billings 1-degree by 2-degree quadrangle, Montana: Montana Bureau of Mines and Geology Geologic Map (in review).

_____Map showing configuration of the top of the Madison Group, White Sulphur Springs 1-degree by 2-degree quadrangle, Montana: Montana Bureau of Mines and Geology Geologic Map (in preparation).

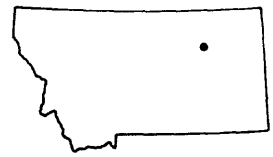
_____Map showing configuration of the top of the Madison Group, Bozeman 1-degree by 2-degree quadrangle, Montana: Montana Bureau of Mines and Geology Geologic Map (in preparation).

_____Map showing configuration of the top of the Madison Group, Choteau 1-degree by 2-degree quadrangle, Montana: Montana Bureau of Mines and Geology Geologic Map (in preparation).

_____Map showing configuration of the top of the Madison Group, Cut Bank 1-degree by 2-degree quadrangle, Montana: Montana Bureau of Mines and Geology Geologic Map (in preparation).

Willow Creek Modeling

(MT077)



Location: Willow Creek watershed in Valley County

Period of project: October 1980 to September 1983

Project chief: Charles Parrett, Helena

Objectives: (1) To develop a runoff model of Willow Creek basin. (2) To evaluate the effects of reservoirs and water-conservation structures on runoff.

Information product: Parrett, Charles, and Waltemeyer, S. D., Effects of water conservation on runoff in the Willow Creek basin, Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Stillwater Complex

(MT079)

Location: Stillwater and Sweet Grass Counties

Period of project: October 1980 to September 1983

Project chief: Richard D. Feltis, Billings

Objectives: (1) To collect hydrologic information needed to assess the effects of mining in the Stillwater Complex. (2) To inventory wells and springs in areas subject to population increases. (3) To develop baseline water-quality information needed to approve exploration and mining permits.

Information products: Feltis, R. D., 1982, Selected hydrogeologic data from southern Sweet Grass County, south-central Montana: U.S. Geological Survey Open-File Report 82-265, 12 p.

_____Geohydrology of the Stillwater Complex and vicinity, Sweet Grass and Stillwater Counties, Montana: Montana Bureau of Mines and Geology Memoir (in preparation).

Milk River Apportionment

(MT 083)

Location: Milk River in Montana and Alberta

Period of project: Continuing

Project chief: Ronald E. Thompson, Jr., Helena

Objectives: (1) To develop and test methods for detailed computation of natural flow in the Milk River at Eastern Crossing to allow apportionment of water in accordance with the Boundary Water Treaty. (2) To develop a network of hydrologic stations to provide data to calculate natural flow.

Information product: Thompson, R. E., Jr., Computation and apportionment of Milk River natural flow, Montana and Alberta: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Big Hole Basin

(MT085)

Location: Big Hole basin in southwestern Montana

Period of project: October 1981 to September 1983

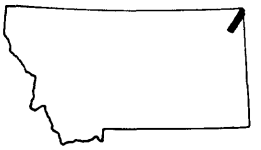
Project chief: Julianne F. Levings, Helena

Objectives: (1) To compile existing data on streamflow, aquifer characteristics, geology, and water chemistry. (2) To design and implement a hydrologic-data-collection program. (3) To describe the hydrologic system including cause-effect relationships. (4) To evaluate the effects of water-management plans on the hydrologic system.

Information product: Levings, J. F., Water resources of the Big Hole basin, southwestern Montana: Montana Bureau of Mines and Geology Memoir (in preparation).

Buried Channel

(MT086)



Location: Sheridan County

Period of project: April 1982 to September 1984

Project chief: Gary W. Levings, Helena

Objectives: (1) To define the geometry, aquifer characteristics, water quality, and water budget of the ancestral Missouri River channel aquifer. (2) To determine potential effects of increased withdrawals on water levels, water quality, and pothole or lake levels in the area.

Information product: Levings, G. W., Ground-water availability from a buried channel of the Missouri River, northeastern Montana: Montana Bureau of Mines and Geology Memoir (in preparation).

Mountain Streamflow

(MT088)

Location: Mountainous areas in western Montana

Period of project: March 1982 to September 1983

Project chief: Charles Parrett, Helena

Objective: To determine flow characteristics for typical stream sites in mountainous areas using miscellaneous streamflow measurements obtained at index sites.

Information product: Parrett, Charles, Flow characteristics of small mountain streams in western Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Yellowstone River Tributary Flow

(MT095)

Location: Upstream Yellowstone River basin

Period of project: November 1982 to February 1985

Project chief: James A. Hull, Helena

Objective: To determine percentile discharges for tributaries using miscellaneous streamflow measurements obtained at index sites.

Information product: Hull, J. A., Flow characteristics of tributaries in the upper Yellowstone River basin, south-central Montana: U.S. Geological Survey Water-Resources Investigations Report (planned).

COAL-RELATED STUDIES

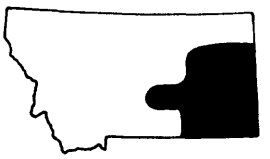
The nation's pressing need for an expanded domestic energy base has resulted in increased interest in Montana's vast coal resources. Environmental impacts associated with exploration, mining, conversion, and transportation of coal must be considered in planning and managing the coal-mining activities. Many of the activities associated with coal utilization may significantly affect the water resources in Montana. To address these problems, the Geological Survey is involved in several hydrologic projects relating to coal development.

Projects include investigations in the coal areas of Montana designed to provide baseline hydrologic information at proposed coal-lease sites, to monitor water quality of streamflow, to estimate runoff characteristics of ungaged watersheds, to map

the areal distribution of aquifer units, and to evaluate the impact of mining on shallow ground-water systems.

Coal-Lease Monitoring

(MT059)



Location: Southeastern Montana

Period of project: Continuing

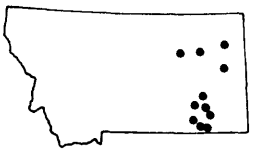
Project chief: Ronald R. Shields, Helena

Objectives: (1) To determine the characteristics of the regional water-resources system. (2) To detect and document changes in the system or in its components that may be associated with coal mining should changes occur.

Information products: Results of measurements are included in reports of other projects.

EMRIA Sites

(MT066)



Location: Eastern Montana

Period of project: October 1977 to September 1983

Project chief: Neal E. McClymonds, Helena

Objectives: (1) To collect hydrologic data at selected coal-lease application sites. (2) To evaluate potential hydrologic impacts of coal development at the sites. (3) To design monitoring networks to define baseline conditions and document changes in the hydrologic system associated with mining and reclamation.

Information products: Cannon, M. R., 1982, Potential effects of surface coal mining on the hydrology of the Cook Creek area, Ashland coal field, southeastern Montana: U.S. Geological Survey Open-File Report 82-681, 30 p.

_____1983, Potential effects of surface coal mining on the hydrology of the Snider Creek area, Rosebud and Ashland coal fields, southeastern Montana: U.S. Geological Survey Water-Resources Investigations 82-4051, 28 p.

_____Potential effects of surface coal mining on the hydrology of the Bloomfield coal tract, Dawson County, eastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in review).

_____Potential effects of surface coal mining on the Circle West tract, east-central Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Levings, G. W., 1983, Potential effects of surface coal mining on the hydrology of the Greenleaf-Miller area, Ashland coal field, southeastern Montana: U.S. Geological Survey Water-Resources Investigations 82-4101, 31 p.

McClymonds, N. E., 1982, Hydrology of the Prairie Dog Creek drainage basin, Rosebud and Big Horn Counties, Montana: U.S. Geological Survey Water-Resources Investigations 81-37, 64 p.

_____Potential effects of surface coal mining on the hydrology of the Corral Creek area, Hanging Woman Creek coal field, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in review).

_____Potential effects of surface coal mining on the hydrology of the West Otter area, Ashland and Birney-Broadus coal fields, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in review).

_____Potential effects of surface coal mining on the hydrology of the Horse Creek drainage basin, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

_____Potential effects of surface coal mining on the hydrology of the Little Bear Creek drainage basin, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

_____Potential effects of surface coal mining on the hydrology of the southwest Glendive mining unit, east-central Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

_____Potential effects of surface coal mining on the hydrology of the upper Otter Creek basin, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Runoff Characteristics

(MT073)

Location: Eastern Montana

Period of project: October 1979 to September 1983

Project chief: Robert J. Omang, Helena

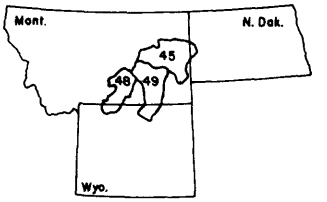
Objectives: (1) To develop methods to estimate runoff characteristics from ungaged watersheds in eastern Montana. (2) To estimate mean annual flow, peak discharges, and flood boundaries at selected ungaged sites in the Fort Union coal region using the best available techniques.

Information products: Omang, R. J., A method of estimating mean annual runoff from ungaged watersheds, eastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Omang, R. J., and others, Streamflow characteristics of the Yellowstone River basin, Montana, through 1981: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Coal-Area Hydrology

(MT080)



Location: Coal areas in Montana, North Dakota, and Wyoming

Period of project: April 1981 to September 1983

Project chief: Steven E. Slagle, Helena

Objective: To describe the surface-water, ground-water and water-quality conditions in coal areas of the Northern Great Plains and Rocky Mountain Coal Provinces in a manner that will be most useful to land managers, coal developers, regulatory agencies, and water users.

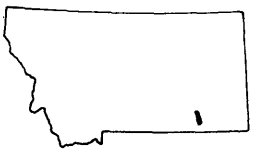
Information products: Slagle, S. E., and others, Hydrology of Area 49, Northern Great Plains and Rocky Mountain Coal Provinces, Montana and Wyoming (in press).

_____Hydrology of Area 45, Northern Great Plains and Rocky Mountain Coal Provinces, Montana and North Dakota (in review).

_____Hydrology of Area 48, Northern Great Plains and Rocky Mountain Coal Provinces, Montana and Wyoming (in preparation).

Post-Mining Ground-Water Quality

(MT092)



Location: Otter Creek area in southeastern Montana

Period of project: October 1982 to September 1983

Project chief: Robert E. Davis, Helena

Objective: To apply batch-mixing methodology of predicting post-mining ground-water quality in resaturated mine spoils to an area being considered for future coal mining.

Information product: Davis, R. E., Hydrogeochemical impacts of surface coal mining in the Otter Creek area, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Sediment Yields from Coal Areas

(MT093)

Location: Eastern Montana

Period of project: January 1983 to September 1983

Project chief: John H. Lambing, Helena

Objectives: (1) To compile existing sediment-yield data collected by various agencies into a regional data base. (2) To use the data base to establish correlations between sediment yield and basin characteristics. (3) If significant correlations can be identified, to generate multiple regression equations for estimating yields from small, ungaged watersheds.

Information product: Lambing, J. H., Estimation of sediment yields from small watersheds in coal areas of eastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Impacts of Mining, Otter Creek

(MT094)

Location: Otter Creek area in southeastern Montana

Period of project: October 1982 to September 1984

Project chief: Michael R. Cannon, Helena

Objective: (1) To determine the probable cumulative impacts of coal mining on the surface-water and shallow-ground-water resources in the downstream 16-mile reach of the Otter Creek valley.

Information product: Cannon, M. R., Probable cumulative impacts of surface coal mining on the hydrology of the Otter Creek valley, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

RESEARCH PROJECTS

The Montana district program includes basic and applied research on various hydrologic principles. All projects directly or indirectly benefit from the results of research activities and contribute data needed in research programs. However, certain projects are primarily research-oriented and are designed to develop or apply new or unconventional hydrologic methods. Two such projects are currently underway.

Stream-Response Modeling

(MT065)

Location: Prairie Dog Creek, southeastern Montana

Period of project: October 1977 to September 1983

Project chief: Lawrence E. Cary, Billings

Objective: To develop a stream-response model capable of simulating effects of land-use changes on runoff. The model will include problems associated with (a) runoff and infiltration for frozen-ground conditions, (b) runoff from melting snow, (c) redistribution of snowpack, and (d) changes in base flow due to changes in ground-water flow pattern (if applicable).

Information products: Cary, L. E., and Johnson, J. D., 1981, Selected hydrologic and climatologic data from the Prairie Dog Creek basin, southeastern Montana, water year 1979: U.S. Geological Survey Open-File Report 81-412, 73 p.

_____1982, Selected hydrologic and climatologic data from the Prairie Dog Creek basin, southeastern Montana, water year 1980: U.S Geological Survey Open-File Report 82-273, 74 p.

Cary, L. E., An application of the USGS precipitation-runoff modeling system to the Prairie Dog Creek basin, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

Cary, L. E., and others, An application of the USGS precipitation-runoff modeling system to selected small basins in southeastern Montana: U.S. Geological Survey Professional Paper (in preparation).

Redwater River Salinity Model

(MT090)

Location: Redwater River, northeastern Montana

Period of project: May 1982 to September 1983

Project chief: Rodger F. Ferreira, Helena

Objective: To develop a computer model capable of spatial simulation of streamflow and dissolved solids in the Redwater River for selected hydrologic conditions under various coal-mining and agricultural development plans.

Information product: Ferreira, R. F., Modeled impacts of surface coal mining on dissolved solids in the Redwater River, northeastern Montana: U.S. Geological Survey Water-Resources Investigations Report (in preparation).

CONTRACT PROGRAM

In addition to the projects conducted by its own personnel, the Montana district administers contracts to other agencies and universities to participate in hydrologic studies and perform research on particular problems. This program not only provides research essential to program operation, but it also greatly increases the district capabilities by utilizing expertise of personnel in other agencies. In the past, this program has funded test-drilling projects, research in stream biology, and development of computer programs for data storage and retrieval.

Investigation of Soluble Salts and Quality of Water in Mine Spoils

Contractor: Montana Bureau of Mines and Geology

Project chief: Wayne A. Van Voast, Billings

Objectives: To investigate methods to predict water quality in mine spoils, install test wells at selected locations, and monitor ground-water conditions in and around surface coal mines.

Ground-Water Monitoring in Poplar River Area of Northeastern Montana

Contractor: Montana Bureau of Mines and Geology

Project chief: Marvin R. Miller, Butte

Objective: To monitor water levels and water quality in selected observation wells in the Poplar River area.

SOURCES OF GEOLOGICAL SURVEY PUBLICATIONS

Current reports are listed in a pamphlet, "New Publications of the Geological Survey." Subscription to the pamphlet, which is issued monthly, is free upon request to the U.S. Geological Survey, 329 National Center, Reston, VA 22092.

Professional papers, bulletins, water-supply papers, techniques of water-resources investigations, circulars, and publications of general interest (such as leaflets, pamphlets, booklets) are available by mail from the Branch of Distribution, U.S. Geological Survey, 604 South Pickett Street, Alexandria, VA 22304.

Miscellaneous investigations maps, hydrologic investigations atlases, hydrologic unit maps, and other maps pertaining to Montana are available for sale from the Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225.

Records of streamflow, ground-water levels, and quality of water have been published for many years as Geological Survey water-supply papers. Beginning with the 1971 water year, however, this series was replaced by a new publications series, U.S. Geological Survey Water-Data Reports. This new series combines for each State: streamflow data, water-quality data for surface and ground water, and ground-water-level data from the basic network of observation wells. For Montana, an example title is, "Water-Resources Data for Montana--Water Year 1981: U.S. Geological Survey Water-Data Report MT-81-1." Additional information on these publications can be obtained from the District Chief, U.S. Geological Survey, 301 South Park, Drawer 10076, Helena, MT 59626.

Open-file reports and water-resources investigations reports are available for inspection at the District office of the Geological Survey in Helena, Mont. Most reports in these series can be purchased in microfiche and paper-copy forms from sources in Denver, Colo., or Springfield, Va. Availability of the reports can be obtained from the District office.

REPORTS PUBLISHED OR RELEASED DURING PRECEDING 5 YEARS
(April 1978 through March 1983)

Boettcher, A. J., 1982, Ground-water resources in the central part of the Flathead Indian Reservation, northwestern Montana: Montana Bureau of Mines and Geology Memoir 48, 28 p.

Boettcher, A. J., and Wilke, K. R., 1978, Ground-water resources in the Libby area, northwestern Montana: Montana Bureau of Mines and Geology Bulletin 106, 36 p.

Cannon, M. R., 1982, Potential effects of surface coal mining on the hydrology of the Cook Creek area, Ashland coal field, southeastern Montana: U.S. Geological Survey Open-File Report 82-681, 30 p.

_____1983, Potential effects of surface coal mining on the hydrology of the Snider Creek area, Rosebud and Ashland coal fields, southeastern Montana: U.S. Geological Survey Water-Resources Investigations 82-4051, 28 p.

Cary, L. E., and Johnson, J. D., 1981, Selected hydrologic and climatologic data from the Prairie Dog Creek basin, southeastern Montana, water year 1979: U.S. Geological Survey Open-File Report 81-412, 73 p.

_____1982, Selected hydrologic and climatologic data from the Prairie Dog Creek basin, southeastern Montana, water year 1980: U.S. Geological Survey Open-File Report 82-273, 74 p.

Chadwick, R. A., and Leonard, R. B., 1979, Structural controls of hot spring systems of southwestern Montana: U.S. Geological Survey Open-File Report 79-1333, 25 p.

Dockins, W. S., Olson, G. J., McFeters, G. A., Turback, S. C., and Lee, R. W., 1980, Sulfate reduction in ground water of southeastern Montana: U.S. Geological Survey Water-Resources Investigations 80-9, 13 p.

Dodge, K. A., and Levings, G. W., 1980, Measurements of discharge, gain or loss in flow, and chemical quality of the Poplar and Redwater Rivers, northeastern Montana, October 24-25, 1979: U.S. Geological Survey Open-File Report 80-1210, 16 p.

Druse, S. A., Dodge, K. A., and Hotchkiss, W. R., 1981, Base flow and chemical quality of streams in the northern Great Plains area, Montana and Wyoming, 1977-78: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-692, 60 p.

Feltis, R. D., 1979, Water resources of shallow aquifers in the upper Poplar River basin, northeastern Montana: U.S. Geological Survey Water-Resources Investigations 79-51, 27 p.

_____1980, Map showing configuration of the top of the Madison Group, Havre 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 9.

_____1980, Map showing configuration of the top of the Madison Group, Great Falls 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 10.

_____1980, Map showing configuration of the top of the Madison Group, Shelby 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 11.

_____1980, Map showing configuration of the top of the Madison Group, Lewistown 1-degree by 2-degree quadrangle, north-central Montana: Montana Bureau of Mines and Geology Geologic Map 12.

_____1980, Water resources of the Judith Basin, central Montana: Montana Bureau of Mines and Geology Hydrogeologic Map 1.

_____1980, Map showing potentiometric surface of water in the Madison Group, Montana: Montana Bureau of Mines and Geology Hydrogeologic Map 2.

_____1980, Map showing dissolved-solids concentration of water in the Madison Group, Montana: sheet 1 *of* Montana Bureau of Mines and Geology Hydrogeologic Map 3.

_____1980, Map showing ratio of sodium, potassium, and chloride to dissolved-solids concentration in water of the Madison Group, Montana: sheet 2 *of* Montana Bureau of Mines and Geology Hydrogeologic Map 3.

_____1980, Map showing ratio of sulfate to total anions in water of the Madison Group, Montana: sheet 3 *of* Montana Bureau of Mines and Geology Hydrogeologic Map 3.

_____1981, Map showing configuration of the top of the Madison Group, Glendive 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 15.

_____1981, Map showing configuration of the top of the Madison Group, Jordan 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 16.

_____1981, Map showing configuration of the top of the Madison Group, Wolf Point 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 17.

_____1981, Map showing configuration of the top of the Madison Group, Glasgow 1-degree by 2-degree quadrangle, northeastern Montana: Montana Bureau of Mines and Geology Geologic Map 18.

_____1981, Map showing configuration of the top of the Madison Group, Miles City 1-degree by 2-degree quadrangle, southeastern Montana: Montana Bureau of Mines and Geology Geologic Map 20.

_____1981, Map showing configuration of the top of the Madison Group, Ekalaka 1-degree by 2-degree quadrangle, southeastern Montana: Montana Bureau of Mines and Geology Geologic Map 21.

_____1981, Map showing configuration of the top of the Madison Group, Forsyth 1-degree by 2-degree quadrangle, southeastern Montana: Montana Bureau of Mines and Geology Geologic Map 22.

_____1982, Selected hydrogeologic data from southern Sweet Grass County, south-central Montana: U.S. Geological Survey Open-File Report 82-265, 12 p.

Feltis, R. D., Lewis, B. D., Frasure, R. L., Rioux, R. P., Jauhola, C. A., and Hotchkiss, W. R., 1981, Selected geologic data from the northern Great Plains area of Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-415, 63 p.

Feltis, R. D., and Shields, R. R., 1982, Streamflow losses to Madison Group rocks in the Little Belt and Big Snowy Mountains, Montana: U.S. Geological Survey Water-Resources Investigations 82-49, 16 p.

Feltis, R. D., and Wood, W. A., 1982, Selected hydrogeologic data from southern Sweet Grass County, south-central Montana: U.S. Geological Survey Open-File Report 82-265, 12 p.

Ferreira, R. F., 1980, Limnological data for 12 reservoirs in Valley County, Montana: U.S. Geological Survey Open-File Report 80-339, 68 p.

_____1981, Mean annual streamflow of selected drainage basins in the area of southeastern Montana: U.S. Geological Survey Water-Resources Investigations 81-61, 21 p.

Johnson, M. V., 1978, Floods of June 4 and 12, 1976, at Culbertson, Montana: U.S. Geological Survey Open-File Report 78-429, 6 p.

Knapton, J. R., 1978, Evaluation and correlation of water-quality data for the North Fork Flathead River, northwestern Montana: U.S. Geological Survey Water-Resources Investigations 78-111, 95 p.

_____1982, Quality of streams in the Bull Mountains region, south-central Montana: U.S. Geological Survey Water-Resources Investigations 82-2, 50 p.

Knapton, J. R., and Ferreira, R. F., 1980, Statistical analyses of surface-water-quality variables in the coal area of southeastern Montana: U.S. Geological Survey Water-Resources Investigations 80-40, 128 p.

Knapton, J. R., and Jacobson, M. A., 1980, Simulation of water-quality data at selected stream sites in the Missouri River basin, Montana: U.S. Geological Survey Water-Resources Investigations 80-76, 30 p.

Lee, R. W., 1979, Ground-water-quality data from the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 79-1331, 55 p.

_____1981, Geochemistry of water in the Fort Union Formation of the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Water-Supply Paper 2076, 17 p.

Lee, R. W., Slagle, S. E., and Stimson, J. R., 1980, Magnitude and chemical quality of base flow of Otter Creek, Tongue River, and Rosebud Creek, southeastern Montana, October 26 - November 5, 1977: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-1298, 25 p.

Leonard, R. B., Brosten, T. M., and Midtlyng, N. A., 1978, Selected data from thermal-spring areas, southwestern Montana: U.S. Geological Survey Open-File Report 78-438, 71 p.

Leonard, R. B., and Janzer, V. J., 1978, Natural radioactivity in geothermal waters, Alhambra Hot Springs and nearby areas, Jefferson County, Montana: U.S. Geological Survey Journal of Research, v. 6, no. 4, p. 529-540.

Leonard, R. B., and Wood, W. A., 1980, Geothermal gradients in the Missoula and Bitterroot Valleys, west-central Montana: U.S. Geological Survey Water-Resources Investigations 80-89, 15 p.

_____1980, Supplemental data from the Ennis and other thermal-spring areas, southwestern Montana, 1978-80: U.S. Geological Survey Open-File Report 80-1182, 79 p.

Leonard, R. B., Wood, W. A., and Boettcher, A. J., 1980, Changes in quality of ground water in the Lincoln area, Montana, 1974-79: U.S. Geological Survey Open-File Report 80-1108, 17 p.

Levings, G. W., 1981, Selected drill-stem-test data from the northern Great Plains area of Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-326, 20 p.

_____1981, Selected hydrogeologic data from the Northern Great Plains area of Montana: U.S. Geological Survey Open-File Report 81-534, 241 p.

_____1982, Potentiometric-surface map of water in the Judith River Formation in the northern Great Plains area of Montana: U.S. Geological Survey Open-File Report 82-562.

_____1982, Potentiometric-surface map of water in the Lakota Formation and equivalent units in the northern Great Plains area of Montana: U.S. Geological Survey Open-File Report 82-563.

_____1982, Potentiometric-surface map of water in the Fox Hills-lower Hell Creek aquifer in the northern Great Plains area of Montana: U.S. Geological Survey Open-File Report 82-564.

_____1982, Potentiometric-surface map of water in the Eagle Sandstone and equivalent units in the northern Great Plains area of Montana: U.S. Geological Survey Open-File Report 82-565.

_____1983, Potential effects of surface coal mining on the hydrology of the Greenleaf-Miller area, Ashland coal field, southeastern Montana: U.S. Geological Survey Water-Resources Investigations 82-4101, 31 p.

Levings, J. F., 1981, Selected hydrogeologic data from the Judith basin, central Montana: U.S. Geological Survey Open-File Report 81-1015, 98 p.

Levings, J. F., Levings, G. W., Feltis, R. D., Hotchkiss, W. R., and Lee, R. W., 1981, Selective annotated bibliography of geology and ground-water resources of the Montana part of the northern Great Plains regional aquifer system analysis: U.S. Geological Survey Water-Resources Investigations Open-File Report 81-401, 91 p.

Lewis, B. D., Custer, S. G., and Miller, M. R., 1979, Saline-seep development in the Hailstone basin, northern Stillwater County, Montana: U.S. Geological Survey Water-Resources Investigations 79-107, 28 p.

Lewis, B. D., and Hotchkiss, W. R., 1981, Thickness, percent sand, and configuration of shallow hydrogeologic units in the Powder River Basin, Montana and Wyoming: U.S. Geological Survey Miscellaneous Investigations Map I-1317, 6 sheets.

Lewis, B. D., and Roberts, R. S., 1978, Geology and water-yielding characteristics of rocks of the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Miscellaneous Investigations Map I-847-D, 2 sheets.

McClymonds, N. E., 1982, Hydrology of the Prairie Dog Creek drainage basin, Rosebud and Big Horn Counties: U.S. Geological Survey Water-Resources Investigations 81-37, 64 p.

McKinley, P. W., 1979, Water quality of selected streams in the coal area of east-central Montana: U.S. Geological Survey Water-Resources Investigations 78-142, 56 p.

Miller, W. R., 1979, Water resources of the central Powder River area of southeastern Montana: Montana Bureau of Mines and Geology Bulletin 108, 69 p.

_____1981, Water resources of the southern Powder River area, southeastern Montana: Montana Bureau of Mines and Geology Memoir 47, 53 p.

Miller, W. R., and Strausz, S. A., 1980, Preliminary map showing freshwater heads for the Mission Canyon and Lodgepole Limestones and equivalent rocks of Mississippian age in the northern Great Plains of Montana, North and South Dakota, and Wyoming: U.S. Geological Survey Water-Resources Investigations Open-File Map 80-729, 1 sheet.

_____1980, Preliminary map showing freshwater heads for the Red River Formation, Bighorn Dolomite, and equivalent rocks of Ordovician age in the northern Great Plains of Montana, North and South Dakota, and Wyoming: U.S. Geological Survey Water-Resources Investigations Open-File Map 80-730, 1 sheet.

Montana Bureau of Mines and Geology and U.S. Geological Survey, 1978, Ground water of the Fort Union Coal Region, eastern Montana: Montana Bureau of Mines and Geology Special Publication 80, 47 p.

Moore, L. G., and Shields, R. R., 1980, Streamflow characteristics of the Yellowstone River basin, through 1976: U.S. Geological Survey Water-Resources Investigations 80-41, 67 p.

Moreland, J. A., and Leonard, R. B., 1980, Evaluation of shallow aquifers in the Helena valley, Lewis and Clark County, Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-1102, 24 p.

Moreland, J. A., Leonard, R. B., Reed, T. E., Clausen, R. O., and Wood, W. A., 1979, Hydrologic data from selected wells in the Helena valley, Lewis and Clark County, Montana: U.S. Geological Survey Open-File Report 79-1676, 54 p.

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Omang, R. J., Hull, J. A., and Parrett, Charles, 1979, Annual peak discharges from small drainage areas in Montana for stations discontinued before 1978: U.S. Geological Survey Open-File Report 79-510, 124 p.

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_____1980, Annual peak discharges from small drainage areas in Montana through September 1979: U.S. Geological Survey Open-File Report 80-340, 114 p.

_____1981, Annual peak discharges from small drainage areas in Montana through September 1980: U.S. Geological Survey Open-File Report 81-332, 114 p.

_____1982, Annual peak discharges from small drainage areas in Montana through September 1981: U.S. Geological Survey Open-File Report 82-270, 114 p.

Parrett, Charles, 1981, Potential effects of urbanization on peak flows in Rattlesnake Creek, Missoula County, Montana: U.S. Geological Survey Water-Resources Investigations 81-34, 18 p.

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Parrett, Charles, Omang, R. J., and Hull, J. A., 1982, Floods of May 1981 in west-central Montana, *with a section on* Meteorological setting by John W. Fassler: U.S. Geological Survey Water-Resources Investigations 82-33, 20 p.

Rioux, R. P., and Dodge, K. A., 1980, Hydrologic data from the Bull Mountains area, south-central Montana: U.S. Bureau of Land Management report, 148 p.

Roberts R. S., 1980, Hydrogeologic data for selected coal areas, east-central Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 80-329, 63 p.

Shields, R. R., and White, M. K., 1981, Streamflow characteristics of the Hudson Bay and upper Missouri River basins, Montana, through 1979: U.S. Geological Survey Water-Resources Investigations 81-32, 144 p.

Slagle, S. E., 1981, Hydrogeologic data for Dawson, McCone, Prairie, and Richland Counties, east-central Montana: U.S. Geological Survey Open-File Report 81-801, 101 p.

Slagle, S. E., and Stimson, J. R., 1979, Hydrogeologic data from the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 79-332, 111 p.

Stoner, J. D., 1981, Horizontal anisotropy determined by pumping in two Powder River Basin coal aquifers, Montana: Ground Water, v. 19, no. 1, p. 34-40.

Stoner, J. D., and Lewis, B. D., 1980, Hydrogeology of the Fort Union coal region, eastern Montana: U.S. Geological Survey Miscellaneous Investigations Map I-1236, 2 sheets.

U.S. Geological Survey 1978, Water resources data for Montana--Water year 1977: U.S. Geological Survey Water-Data Report MT-77-1, 751 p. [1979].

_____1978, Water-resources investigations of the U.S. Geological Survey in Montana, October 1977 through September 1978: U.S. Geological Survey Open-File Report 78-436, 39 p.

_____1979, Water resources data for Montana--Water year 1978: U.S. Geological Survey Water-Data Report MT-78-1, 824 p. [1980].

_____1979, Water-resources investigations of the U.S. Geological Survey in Montana, October 1978 through September 1979: U.S. Geological Survey Open-File Report 79-418, 44 p.

_____1980, Water resources data for Montana--Water year 1979: U.S. Geological Survey Water-Data Report MT-79-1, 824 p.

_____1980, Water-resources investigations of the U.S. Geological Survey in Montana, October 1979 through September 1980: U.S. Geological Survey Open-File Report 80-222, 45 p.

_____1981, Water resources data for Montana--Water year 1980, v. 1, Hudson Bay basin and Missouri River basin: U.S. Geological Survey Water-Data Report MT-80-1, 651 p.

_____1981, Water resources data for Montana--Water year 1980, v. 2, Upper Columbia River basin: U.S. Geological Survey Water-Data Report MT-80-2, 184 p.

_____1981, Water-resources investigations of the U.S. Geological Survey in Montana, October 1980 through September 1981: U.S. Geological Survey Open-File Report 81-817, 46 p.

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Table 1.--Surface-water gaging stations in operation as of October 1982

Station number

Stations are listed in downstream order by standard drainage basin number: Part 5 (Hudson Bay basin), Part 6 (Missouri River basin), and Part 12 (Upper Columbia River basin). Each station number contains a 2-digit part number plus a 6-digit downstream order number. Locations of streamflow and major-reservoir stations are shown in figure 2; locations of stations for small reservoirs are not identified on the map.

Supported by

BIA	U.S. Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BPA	Bonneville Power Administration
FERC	Federal Energy Regulatory Commission
MBMG	Montana Bureau of Mines and Geology
MDH	Montana Department of Highways
MDHES	Montana Department of Health and Environmental Sciences
MDNRC	Montana Department of Natural Resources and Conservation
MDFWP	Montana Department of Fish, Wildlife, and Parks
MDSL	Montana Department of State Lands
MSU	Montana State University
USAE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey
WSE	Wyoming State Engineer
WWT	U.S. Department of State-International Joint Commission, Waterways Treaty

Gage equipment

A - Thermograph recorder
C - CDCP
D - Digital recorder
G - Graphic recorder
M - Manometer (bubbler) gage
O - Observer record only
P - Electrical power
R - Rain gage
S - Selsyn unit
T - Telemark, BDT satellite
U - Other agency Telemark
W - Well gage

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Gage equipment
	Part 5		
05014500	Swiftcurrent Creek at Many Glacier	USGS	GWP
05015500	Lake Sherburne at Sherburne	WWT	GMP
05016000	Swiftcurrent Creek at Sherburne	USBR	DGWP
05017500	St. Mary River near Babb	WWT	GW
05018500	St. Mary Canal at St. Mary Crossing, near Babb	WWT	GW
05020500	St. Mary River at international boundary	WWT	GWPT
	Part 6		
06012000	Lima Reservoir near Monida	MDNRC	O
06014500	Red Rock River at Red Rock	USBR	DGM
06015300	Clark Canyon Reservoir near Grant	USGS	G
06015400	Beaverhead River near Grant	USBR	DGW
06016000	Beaverhead River at Barretts	USBR	DGWP
06018000	Beaverhead River near Dillon	USBR	DGWM
06018500	Beaverhead River near Twin Bridges	USGS	DGW
06019500	Ruby River above reservoir, near Alder	MDNRC	DGW
06020500	Ruby River Reservoir near Alder	MDNRC	O
06020600	Ruby River below reservoir, near Alder	MDNRC	DW
06024590	Wise River near Wise River	MDNRC	DGM
06025500	Big Hole River near Melrose	MDNRC	DGWPAC
06035000	Willow Creek near Harrison	MDNRC	DGW
06036000	Willow Creek Reservoir near Harrison	MDNRC	O
06036650	Jefferson River near Three Forks	MDFWP	DGMP
06038000	Hebgen Lake near West Yellowstone	FERC	O
06038500	Madison River below Hebgen Lake, near Grayling	FERC	DGWP
06038800	Madison River at Kirby Ranch, near Cameron	MDFWP	O
06040300	Jack Creek near Ennis	MDNRC	DGWP
06040500	Ennis Lake near McAllister	FERC	O
06041000	Madison River below Ennis Lake, near McAllister	FERC	DGWPSA
06049500	Middle Creek Reservoir near Bozeman	MDNRC	O
06050000	Hyalite Creek at Hyalite ranger station, near Bozeman	MDNRC	DGW
06052500	Gallatin River at Logan	USAE	DGWPTA
06054500	Missouri River at Toston	USGS	DGWPTA
06058500	Canyon Ferry Reservoir near Helena	USGS	GWPS
06061500	Prickly Pear Creek near Clancy	MDNRC	DGW
06062500	Tenmile Creek near Rimini	MSU	DGWP
06064500	Lake Helena near Helena	FERC	O
06065000	Hauser Lake near Helena	FERC	O

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Gage equipment
	Part 6--Continued		
06066000	Holter Lake near Wolf Creek	FERC	O
06066500	Missouri River below Holter Dam, near Wolf Creek	FERC	DGWPS
06075000	Smith River Reservoir near White Sulphur Springs	MDNRC	O
06076690	Smith River near Fort Logan	MDFWP	DGM
06078200	Missouri River near Ulm	USAE	DGW
06079500	Gibson Reservoir near Augusta	MDNRC	O
06080500	Pishkun Reservoir near Augusta	MDNRC	O
06082000	Willow Creek Reservoir near Augusta	MDNRC	O
06083000	Nilan Reservoir near Augusta	MDNRC	O
06088000	Muddy Creek near Power	MBMG	DGM
06088100	Spring Coulee near Power	MBMG	GW
06088200	Tank Coulee near Power	MBMG	GW
06088300	Muddy Creek near Vaughn	USGS	DGW
06088500	Muddy Creek at Vaughn	USGS	DGM
06089000	Sun River near Vaughn	FERC	DGWP
06090200	Morony Reservoir near Great Falls	FERC	O
06090300	Missouri River near Great Falls	FERC	DGMPS
06090610	Belt Creek near Portage	FERC	DGMA
06090720	Highwood Creek near Portage	FERC	DGMA
06090800	Missouri River at Fort Benton	USGS	DGWPT
06090900	Lower Two Medicine Lake near East Glacier	MDNRC	O
06091700	Two Medicine River below South Fork, near Browning	BIA	DGM
06091800	Two Medicine Canal near Browning	BIA	GW
06092600	Four Horns Canal near Browning	BIA	GW
06093000	Four Horns Lake near Heart Butte	MDNRC	O
06093200	Badger Creek below Four Horns Canal, near Browning	BIA	DGWP
06094000	Swift Reservoir near Dupuyer	MDNRC	O
06095500	Lake Frances near Valier	MDNRC	O
06098100	Birch Creek near Valier	USGS	DGM
06099000	Cut Bank Creek at Cut Bank	BIA	DGM
06099500	Marias River near Shelby	USGS	DGMPC
06101300	Lake Elwell near Chester	USGS	O
06101500	Marias River near Chester	USBR	DW
06101560	Pondera Coulee near Chester	MDNRC	DGM
06108000	Teton River near Dutton	USGS	DGMP
06109500	Missouri River at Virgelle	USAE	DGWPCR
06110500	Ackley Lake near Hobson	MDNRC	O
06112500	Deadmans Basin Reservoir near Shawmut	MDNRC	O
06115200	Missouri River near Landusky	USAE	DGMWPCR
06116500	Bair Reservoir near Delpine	MDNRC	O

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Gage equipment
	Part 6--Continued		
06119000	Martinsdale Reservoir near Martinsdale	MDNRC	O
06120500	Musselshell River at Harlowton	MDNRC	DGWT
06126470	Half Breed Creek near Klein	USGS	GM
06126500	Musselshell River near Roundup	MDNRC	DGWP
06127500	Musselshell River at Musselshell	MDNRC	DGW
06130500	Musselshell River at Mosby	MDNRC	DGM
06131000	Big Dry Creek near Van Norman	USAE	GM
06131120	Timber Creek near Van Norman	MDSL	GM
06131200	Nelson Creek near Van Norman	USGS	GM
06131500	Fort Peck Lake at Fort Peck	USAE	GW
06131800	Missouri River stage station No. 1 at Fort Peck	USAE	DWP
06132000	Missouri River below Fort Peck Dam	USAE, USGS	DGM
06132200	South Fork Milk River near Babb	WWT	GWP
06133000	Milk River at western crossing of international boundary	WWT	GW
06133500	North Fork Milk River above St. Mary Canal, near Browning	WWT	GWP
06134000	North Milk River near international boundary	WWT	GW
06134500	Milk River at Milk River, Alberta	WWT	GWPT
06135000	Milk River at eastern crossing of international boundary	WWT	DGWPT
06135500	Sage Creek at Q Ranch, near Wild Horse, Alberta	WWT	GW
06136000	Sage Creek at international boundary	WWT	GW
06136500	Fresno Reservoir near Havre	MDNRC	O
06137400	Big Sandy Creek at reservation boundary, near Rocky Boy	BIA	DGM
06137570	Boxelder Creek near Rocky Boy	BIA	DGWP
06140500	Milk River at Havre	USAE	DGM
06144260	Altawan Reservoir near Govenlock, Saskatchewan	WWT	GM
06144270	Spangler Ditch near Govenlock, Saskatchewan	WWT	GW
06144350	Middle Creek near Saskatchewan boundary	WWT	GW
06144360	Middle Creek Reservoir near Battle Creek, Saskatchewan	WWT	GM
06144395	Middle Creek below Middle Creek Reservoir, near Govenlock, Saskatchewan	WWT	GW
06145500	Lodge Creek below McRae Creek, at international boundary	WWT	GWTP
06147950	Gaff Ditch near Merryflat, Saskatchewan	WWT	GW
06148500	Cypress Lake west inflow canal near West Plains, Saskatchewan	WWT	GW

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Sup-ported by	Gage equip-ment
	Part 6--Continued		
06148700	Cypress Lake west inflow canal drain near Oxarat, Saskatchewan	WWT	GW
06149000	Cypress Lake west outflow canal near West Plains, Saskatchewan	WWT	GWP
06149100	Vidora Ditch near Consul, Saskatchewan	WWT	GW
06149200	Richardson Ditch near Consul, Saskatchewan	WWT	GW
06149300	McKinnon Ditch near Consul, Saskatchewan	WWT	GW
06149400	Nashlyn Canal near Consul, Saskatchewan	WWT	GW
06149500	Battle Creek at international boundary	WWT	DGWC
06151000	Lyons Creek at international boundary	WWT	GW
06154100	Milk River near Harlem	MDNRC	GDM
06154400	Peoples Creek near Hays	BIA	DGW
06154410	Little Peoples Creek near Hays	USGS	GM
06154500	Peoples Creek near Dodson	BIA	GWM
06155000	Nelson Reservoir near Saco	MDNRC	O
06155030	Milk River near Dodson	MDNRC	GDM
06156500	Belanger Creek diversion canal near Vidora, Saskatchewan	WWT	GWP
06157000	Cypress Lake near Vidora, Saskatchewan	WWT	GW
06157500	Cypress Lake east outflow canal near Vidora, Saskatchewan	WWT	GWP
06158500	Eastend Canal at Eastend, Saskatchewan	WWT	GW
06159000	Eastend Reservoir at Eastend, Saskatchewan	WWT	GM
06159500	Frenchman River below Eastend Reservoir, near Eastend, Saskatchewan	WWT	GWP
06161300	Huff Lake pumping canal near Val Marie, Saskatchewan	WWT	GW
06161500	Huff Lake gravity canal near Val Marie, Saskatchewan	WWT	GW
06162000	Huff Lake near Val Marie, Saskatchewan	WWT	GM
06162500	Newton Lake main canal near Val Marie, Saskatchewan	WWT	GW
06163000	Newton Lake near Val Marie, Saskatchewan	WWT	GM
06163050	Frenchman River below Newton Lake, near Val Marie, Saskatchewan	WWT	GW
06164000	Frenchman River at international boundary	WWT	GWPT
06164510	Milk River at Juneberg Bridge, near Saco	USBR	DGMP
06166000	Beaver Creek below Guston Coulee, near Saco	USGS	GM
06169500	Rock Creek below Horse Creek, near international boundary	USGS	DGWP
06172000	Milk River near Vandalia	MDNRC	GDM
06174000	Willow Creek near Glasgow	USGS	GM
06174500	Milk River at Nashua	USAE	DGWMPCR
06175000	Porcupine Creek at Nashua	BIA	GM

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Gage equipment
	Part 6--Continued		
06175100	Missouri River stage station No. 3 at West Frazer pumping plant, near Frazer	USAE	DWP
06175510	Missouri River stage station No. 4 at East Frazer pumping plant, near Frazer	USAE	DWP
06175520	Missouri River stage station No. 5 near Oswego	USAE	GM
06175540	Prairie Elk Creek near Oswego	USGS	GM
06176500	Wolf Creek near Wolf Point	BIA	GWM
06177000	Missouri River near Wolf Point	USAE	DGMPACWR
06177400	McCune Creek near Circle	MDSL	GW
06177500	Redwater River at Circle	USGS	GWP
06177650	Redwater River near Richey	MDSL	GM
06177700	Cow Creek tributary near Vida	MDSL	GW
06177825	Redwater River near Vida	USGS	GM
06178000	Poplar River at international boundary	MDNRC	DGMWPC
06178500	East Poplar River at international boundary	MDNRC	DGWPCA
06181000	Poplar River near Poplar	BIA	GW
06181995	Beaver Creek at international boundary	WWT	GWP
06183450	Big Muddy Creek near Antelope	USGS	DGMP
06185110	Big Muddy Creek near mouth, near Culbertson	BIA	GM
06185500	Missouri River near Culbertson	USAE	DGMCR
06191500	Yellowstone River at Corwin Springs	USAE	DGWPC
06191800	Big Creek near Emigrant	MDFWP	GW
06192500	Yellowstone River near Livingston	USAE	DGWPAT
06195600	Shields River near Livingston	MDFWP	DGM
06197500	Boulder River at Contact	MBMG	DGW
06198000	East Fork Boulder River near McLeod	MBMG	O
06200000	Boulder River at Big Timber	MDNRC	DGWPT
06202510	Stillwater River above Nye Creek, near Nye	MDFWP	O
06204000	Mystic Lake near Roscoe	FERC	O
06204050	West Rosebud Creek near Roscoe	FERC	DGWP
06205000	Stillwater River near Absarokee	USAE	DGMWT
06207500	Clarks Fork Yellowstone River near Belfry	MDNRC, WSE	GMP
06208800	Clarks Fork Yellowstone River near Silesia	MDNRC, WSE	DGMA
06211000	Red Lodge Creek above Cooney Reservoir, near Boyd	MDNRC	DGW
06211500	Willow Creek near Boyd	MDNRC	GW
06212000	Cooney Reservoir near Boyd	MDNRC	O
06212500	Red Lodge Creek below Cooney Reservoir, near Boyd	MDNRC	DWP
06214500	Yellowstone River at Billings	USAE	DGWPT
06216000	Pryor Creek at Pryor	USGS	DWP
06216900	Pryor Creek near Huntley	USGS	GM

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Gage equipment
	Part 6--Continued		
06217950	Buffalo Creek near Custer	USGS	O
06286400	Bighorn Lake near St. Xavier	USGS	GW
06286490	Bighorn Canal near St. Xavier	USBR	GW
06287000	Bighorn River near St. Xavier	USBR	DGWP
06289000	Little Bighorn River at State line, near Wyola	USGS	DGW
06290000	Pass Creek near Wyola	BIA	DGM
06290500	Little Bighorn River below Pass Creek, near Wyola	USGS	GW
06291000	Owl Creek near Lodge Grass	BIA	DGM
06291200	Lodge Grass Creek at State line, near Wyola	WSE	CDGM
06291500	Lodge Grass Creek above Willow Creek diversion, near Wyola	BIA	DGM
06294000	Little Bighorn River near Hardin	MDNRC, WSE	DW
06294500	Bighorn River above Tullock Creek, near Bighorn	MDNRC, WSE	DGM
06294600	East Cabin Creek tributary near Hardin	MDSL	GW
06294940	Sarpy Creek near Hysham	USGS	DGW
06294950	Starve to Death Creek near Sanders	USGS	O
06294995	Armells Creek near Forsyth	USGS	GW
06295000	Yellowstone River at Forsyth	MDNRC	DGM
06295100	Rosebud Creek near Kirby	MDSL	GW
06295113	Rosebud Creek at reservation boundary, near Kirby	USGS	DGM
06295250	Rosebud Creek near Colstrip	USGS	DGM
06296003	Rosebud Creek at mouth, near Rosebud	USGS	DGM
06296100	Snell Creek near Hathaway	MDSL	GW
06306100	Squirrel Creek near Decker	USGS	DGM
06306300	Tongue River at State line, near Decker	MDNRC	DGWP
06306950	South Fork Leak Rock Creek near Kirby	MDSL	GW
06307000	Tongue River Reservoir near Decker	MDNRC	O
06307500	Tongue River at Tongue River Dam, near Decker	MDNRC	DGW
06307525	Prairie Dog Creek above Jack Creek, near Birney	USGS	GM
06307528	Prairie Dog Creek near Birney	USGS	GM
06307600	Hanging Woman Creek near Birney	BLM	GW
06307616	Tongue River at Birney Day School Bridge, near Birney	USGS	DGWP
06307717	Otter Creek below Fifteenmile Creek, near Otter	MDSL	DGM
06307740	Otter Creek at Ashland	BLM	DGWP
06307830	Tongue River below Brandenberg Bridge, near Ashland	MDNRC	DGW

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Gage equipment
	Part 6--Continued		
06308400	Pumpkin Creek near Miles City	USGS	DGWP
06308500	Tongue River at Miles City	MDNRC, WSE	GMWA
06309000	Yellowstone River at Miles City	USAE	DGMPACR
06309075	Sunday Creek near Miles City	MDNRC	DGM
06324500	Powder River at Moorhead	MDNRC	DGWP
06324710	Powder River at Broadus	USGS	GM
06326300	Mizpah Creek near Mizpah	USGS	GM
06326500	Powder River near Locate	MDNRC, WSE	DGMWP
06326600	O'Fallon Creek near Ismay	USGS	DGM
06326952	Clear Creek near Lindsay	MDSL	GW
06328200	Lower Sevenmile Creek near Bloomfield	MDSL	GW
06329200	Burns Creek near Savage	USGS	GMP
06329500	Yellowstone River near Sidney	USAE	DGMPAC
06336447	Duck Creek near Wibaux	MDSL	DGM
06336500	Beaver Creek at Wibaux	BLM	DGMP
	Part 12		
12301300	Tobacco River near Eureka	USAE	GWA
12301920	Lake Koocanusa near Libby	USAE	GW
12301933	Kootenai River below Libby Dam, near Libby	USAE	DGMP
12302055	Fisher River near Libby	USAE	GWAP
12303000	Kootenai River at Libby	USAE	DGWPU
12303100	Flower Creek near Libby	MSU	GW
12303500	Lake Creek at Troy	FERC	DGM
12304500	Yaak River near Troy	USAE	GWAP
12324200	Clark Fork at Deer Lodge	MDFWP	DGMA
12324590	Little Blackfoot River near Garrison	MDNRC	DGM
12324680	Clark Fork at Goldcreek	MDFWP	DGM
12325000	Georgetown Lake near Southern Cross	FERC	O
12325500	Flint Creek near Southern Cross	FERC	ODW
12329500	Flint Creek at Maxville	MDNRC	DGW
12330000	Boulder Creek at Maxville	MDNRC	DGW
12331600	Clark Fork at Drummond	MDNRC	O
12331900	Clark Fork near Clinton	MDFWP	OA
12332000	Middle Fork Rock Creek near Philipsburg	MDNRC	DGW
12332500	East Fork Rock Creek Reservoir near Philipsburg	MDNRC	O
12334510	Rock Creek near Clinton	MDNRC	DGWAPC
12335500	Nevada Creek above reservoir, near Finn	MDNRC	DGM
12336500	Nevada Lake near Finn	MDNRC	O
12338690	Monture Creek near Ovando	MDNRC	DGW

Table 1.--Surface-water gaging stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Gage equipment
	Part 12--Continued		
12339450	Clearwater River near Clearwater	MDNRC	DGW
12340000	Blackfoot River near Bonner	USGS	DGWTP
12340500	Clark Fork above Missoula	USAE	DGWTAP
12342000	Painted Rocks Lake near Conner	MDNRC	O
12342500	West Fork Bitterroot River near Conner	MDNRC	DGWP
12344000	Bitterroot River near Darby	MDNRC	DGWCP
12344500	Lake Como near Darby	MDNRC	O
12353000	Clark Fork below Missoula	MDHES	DGWTAP
12353280	Ninemile Creek near Huson	MDNRC	DGW
12353820	Dry Creek near Superior	MDH	DGW
12354500	Clark Fork at St. Regis	USGS	DGWPU
12355000	Flathead River at Flathead, British Columbia	WWT	GMA
12355500	North Fork Flathead River near Columbia Falls	USGS	GMAU
12358500	Middle Fork Flathead River near West Glacier	BPA	GWPU
12362000	Hungry Horse Reservoir near Hungry Horse	USBR	GW
12362500	South Fork Flathead River near Columbia Falls	USBR	DGWAPS
12363000	Flathead River at Columbia Falls	FERC	DGWAPU
12365000	Stillwater River near Whitefish	MDNRC	GWA
12366000	Whitefish River near Kalispell	MDNRC	GWA
12369200	Swan River near Condon	MDNRC	GW
12370000	Swan River near Bigfork	BPA	GWPT
12370900	Teepee Creek near Polson	BIA	GW
12371500	Flathead Lake at Somers	FERC	GW
12371550	Flathead Lake at Polson	FERC	GWTP
12372000	Flathead River near Polson	FERC	GWAPS
12374250	Mill Creek above Bassoo Creek, near Niarada	BIA	GM
12374800	Cromwell Creek near Niarada	BIA	GM
12375900	South Fork Crow Creek near Ronan	BIA	DGM
12377150	Mission Creek above Reservoir, near St. Ignatius	BIA	DGM
12381400	South Fork Jocko River near Arlee	BIA	DGM
12383500	Big Knife Creek near Arlee	BIA	DGM
12387450	Valley Creek near Arlee	BIA	GW
12388400	Revais Creek below West Fork, near Dixon	BIA	DGM
12388650	Camas Creek near Hot Springs	BIA	GM
12389000	Clark Fork near Plains	FERC	DGWUP
12389500	Thompson River near Thompson Falls	FERC	GWP
12390000	Thompson Falls Reservoir at Thompson Falls	FERC	O
12390700	Prospect Creek at Thompson Falls	FERC	GWP
12391300	Noxon Rapids Reservoir near Noxon	FERC	GW
12391400	Clark Fork below Noxon Rapids Dam, near Noxon	FERC	O

Table 2.--Surface-water-quality stations in operation as of October 1982

Station number

Stations are listed in downstream order by standard drainage basin number: Part 5 (Hudson Bay basin), Part 6 (Missouri River basin) and Part 12 (Upper Columbia River basin). Each station number contains a 2-digit part number plus a 6-digit downstream order number. Locations of the stations are shown in figure 3.

Supported by

MGO	Office of the Governor (Montana)
BIA	U.S. Bureau of Indian Affairs
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USGS	U.S. Geological Survey
WWT	U.S. Department of State-International Joint Commission (Waterways Treaty)
MDSL	Montana Department of State Lands
WSE	Wyoming State Engineer

Sampling frequency

0	Once-daily, continuous
1	Once-daily, seasonal
2	Semimonthly
3	Monthly
4	Bimonthly
5	Quarterly
6	Miscellaneous
7	Continuous record

Table 2.--Surface-water-quality stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Sampling frequency: Chemical	Sediment	Temperature	Biological	Specific conductance
		Part 5					
05019000	St. Mary Canal at Hudson Bay Divide, near Browning	WWT	6	-	-	-	-
05020500	St. Mary River at international boundary	USGS	4	4	-	4	4
		Part 6					
06025500	Big Hole River near Melrose	MDFWP	-	-	7	-	-
06041000	Madison River below Ennis Lake, near McAllister	MDFWP	-	-	7	-	-
06052500	Gallatin River at Logan	MDFWP	-	-	7	-	-
06054500	Missouri River at Toston	USGS	5	5	7	5	5
06058502	Missouri River below Canyon Ferry Dam, near Helena	USGS	3	-	0	-	0
06089000	Sun River near Vaughn	USGS	3	-	0	-	0
06090610	Belt Creek near Portage	FERC	3	3	7	-	3
06090720	Highwood Creek near Portage	FERC	3	3	7	-	3
06090800	Missouri River at Fort Benton	USGS	4	4	-	4	4
06098100	Birch Creek near Valier	USGS	3	-	0	-	0
06099000	Cut Bank Creek at Cut Bank	BIA	6	-	-	-	6
06101500	Marias River near Chester	USGS	4	4	-	4	4
06109500	Missouri River at Virgelle	USGS	4	4	-	4	4
06115200	Missouri River near Landusky	USGS, USAE	4	0	0	4	4
06130500	Musselshell River at Mosby	USGS, USAE	5	0	0	5	5
06132000	Missouri River below Fort Peck Dam	USGS	5	5	-	5	5
06133500	North Fork Milk River above St. Mary Canal, near Browning	WWT	6	-	-	-	6
06137400	Big Sandy Creek at reservation boundary, near Rocky Boy	BIA	6	-	-	-	3
06154410	Little Peoples Creek near Hays	USGS	5	5	-	5	5
06154500	Peoples Creek near Dodson	BIA	6	-	-	-	3
06164510	Milk River at Juneburg Bridge, near Saco	USGS	3	-	0	-	0
06166000	Beaver Creek below Guston Coulee, near Saco	USGS	3	-	-	-	-
06167100	Beaver Creek above dam, near Saco	USGS	3	-	-	-	-
06169500	Rock Creek below Horse Creek, near international boundary	USGS	5	5	-	5	5

Table 2.--Surface-water-quality stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Sampling frequency: Chemical	Sediment	Temperature	Biological	Specific conductance
		Part 6--Continued					
06174500	Milk River at Nashua	USGS	4	4	-	4	4
06175000	Porcupine Creek at Nashua	BIA	6	-	-	-	3
06176500	Wolf Creek near Wolf Point	BIA	6	-	-	-	3
06177000	Missouri River near Wolf Point	MDFWP	-	-	7	-	-
06177500	Redwater River at Circle	USGS	3	3	0	-	0
06177650	Redwater River near Richey	MDSL	3	3	0	-	0
06177825	Redwater River near Vida	USGS	3	3	0	-	0
06178000	Poplar River at international boundary	MGO	3	3	-	-	3
06178500	East Poplar River at international boundary	MGO	4	4	7	-	0
06179000	East Fork Poplar River near Scobey	MGO	3	3	-	-	3
06179500	West Fork Poplar River at international boundary	WWT	6	-	-	-	6
06180400	West Fork Poplar River near Bredette	BIA	3	3	-	-	3
06181995	Beaver Creek at international boundary	WWT	5	5	-	-	5
06183450	Big Muddy Creek near Antelope	USGS	3	3	-	-	3
06185110	Big Muddy Creek near mouth, near Culbertson	BIA	6	-	-	-	3
06185150	Hardscrabble Creek near Culbertson	BLM	3	3	-	-	3
06185500	Missouri River near Culbertson	USGS	4	4	-	4	4
06192500	Yellowstone River near Livingston	USGS	4	4	7	4	4
06207500	Clarks Fork Yellowstone River near Belfry	WSE	3	-	-	-	3
06208800	Clarks Fork Yellowstone River near Silesia	MDFWP	-	-	7	-	-
06214500	Yellowstone River at Billings	USGS	5	5	-	5	5
06294700	Bighorn River at Bighorn	USGS	4	4	-	4	4
06294920	East Fork Sarpy Creek near Colstrip	BLM	3	3	-	-	3
06294940	Sarpy Creek near Hysham	USGS	3	3	0	-	0
06294980	East Fork Armells Creek near Colstrip	MDSL	3	3	-	-	3
06294995	Armells Creek near Forsyth	BLM	3	3	0	-	0
06295113	Rosebud Creek at reservation boundary, near Kirby	USGS	3	3	0	-	0
06295250	Rosebud Creek near Colstrip	BLM	3	3	0	-	0
06295380	Cow Creek near Colstrip	BLM	3	3	-	-	0

Table 2.--Surface-water-quality stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Sampling frequency: Chemical	Sediment	Temperature	Biological	Specific conductance
		Part 6--Continued					
06296003	Rosebud Creek at mouth, near Rosebud	BLM	3	3	-	-	3
06296120	Yellowstone River near Miles City	USGS	3	3	0	-	0
06306100	Squirrel Creek near Decker	USGS	3	3	-	-	3
06306300	Tongue River at State line, near Decker	WSE	3	3	0	3	0
06307500	Tongue River at Tongue River Dam, near Decker	BLM	3	3	0	-	0
06307525	Prairie Dog Creek above Jack Creek, near Birney	USGS	3	3	-	-	3
06307528	Prairie Dog Creek near Birney	USGS	3	3	-	-	3
06307540	Hanging Woman Creek at State line, near Otter	BLM	3	3	-	-	3
06307545	Waddle Creek near Otter	BLM	3	3	-	-	3
06307550	Trail Creek near Otter	BLM	3	3	-	-	3
06307563	Corral Creek near Otter	BLM	3	3	-	-	3
06307567	Horse Creek near Birney	BLM	3	3	-	-	3
06307570	Hanging Woman Creek below Horse Creek, near Birney	MDSL	3	3	-	-	3
06307600	Hanging Woman Creek near Birney	USGS	3	3	0	-	0
06307616	Tongue River at Birney Day School Bridge, near Birney	USGS	3	3	-	-	3
06307665	Otter Creek near Otter	MDSL	3	3	-	-	3
06307717	Otter Creek below Fifteenmile Creek, near Otter	MDSL	3	3	-	-	3
06307735	Home Creek near Ashland	MDSL	3	3	-	-	3
06307737	East Fork Otter Creek near Ashland	MDSL	3	3	-	-	3
06307740	Otter Creek at Ashland	USGS	3	3	0	-	0
06308400	Pumpkin Creek near Miles City	BLM	3	3	0	-	0
06308500	Tongue River at Miles City	USGS	5	0	7	5	5
06309000	Yellowstone River at Miles City	MDFWP	-	-	7	-	-
06324500	Powder River at Moorhead	USGS	3	1	1	-	3
06324710	Powder River at Broadus	USGS	-	1	1	-	-
06326300	Mizpah Creek near Mizpah	USGS	3	3	-	-	3
06326500	Powder River near Locate	USGS	4	0	0	4	4
06326507	Locate Creek near Ismay	BLM	3	3	-	-	3
06326520	Powder River at mouth, near Terry	MDFWP	-	-	7	-	-
06326530	Yellowstone River near Terry	USGS	3	3	-	-	3
06326600	O'Fallon Creek near Ismay	USGS	3	3	-	-	3
06329500	Yellowstone River near Sidney	USGS, USAE	4	0	0	4	4

Table 2.--Surface-water-quality stations in operation as of October 1982--Continued

Station number	Station name	Supported by	Sampling frequency: Chemical	Sediment	Temperature	Biological	Specific conductance
		Part 6--Continued					
06329520	Fox Creek near Lambert	BLM	3	3	-	-	3
06329540	Lone Tree Creek near Sidney	BLM	3	3	-	-	3
06336500	Beaver Creek at Wibaux	BLM	3	3	-	-	3
		Part 12					
12300110	Lake Koocanusa at international boundary	USAE	3	-	3	3	3
12301300	Tobacco River near Eureka	USAE	-	-	7	-	-
12301830	Lake Koocanusa at Tenmile Creek, near Libby	USAE	3	-	3	3	3
12301919	Lake Koocanusa at Forebay, near Libby	USAE	3	-	3	3	3
12301933	Kootenai River below Libby Dam, near Libby	USAE	3	-	-	-	3
12302055	Fisher River near Libby	USAE	-	-	7	-	-
12304500	Yaak River near Troy	USAE	-	-	7	-	-
12324200	Clark Fork at Deer Lodge	MDFWP	-	-	7	-	-
12331900	Clark Fork near Clinton	MDFWP	-	-	7	-	-
12334510	Rock Creek near Clinton	MDFWP	-	-	7	-	-
12340500	Clark Fork above Missoula	MDFWP	-	-	7	-	-
12353000	Clark Fork below Missoula	USGS	4	4	-	4	4
12355000	Flathead River at Flathead, British Columbia	USGS	5	5	7	5	5
12355500	North Fork Flathead River near Columbia Falls	MDFWP	-	-	7	-	-
12362500	South Fork Flathead River near Columbia Falls	MDFWP	-	-	7	-	-
12363000	Flathead River at Columbia Falls	USGS	5	5	7	5	5
12365000	Stillwater River near Whitefish	MDFWP	-	-	7	-	-
12366000	Whitefish River near Kalispell	MDFWP	-	-	7	-	-
12370900	Teepee Creek near Polson	BIA	4	4	-	-	4
12372000	Flathead River near Polson	MDFWP	-	-	7	-	-
12374250	Mill Creek above Bassoo Creek, near Niarada	BIA	4	4	-	-	4
12374800	Cromwell Creek near Niarada	BIA	4	4	-	-	4
12375900	South Fork Crow Creek near Ronan	BIA	4	4	-	-	4
12377150	Mission Creek above reservoir, near St. Ignatius	BIA	4	4	-	-	4
12381400	South Fork Jocko River near Arlee	BIA	4	4	-	-	4
12383500	Big Knife Creek near Arlee	BIA	4	4	-	-	4

Table 2.--Surface-water-quality stations in operation as of October 1982--Continued

Station number	Station name	Funding	Sampling frequency: Chemical	Sediment	Temperature	Biological	Specific conductance
		Part 12--Continued					
12387450	Valley Creek near Arlee	BIA	4	4	-	-	4
12388400	Revais Creek below West Fork, near Dixon	BIA	4	4	-	-	4
12388650	Camas Creek near Hot Springs	BIA	4	4	-	-	4

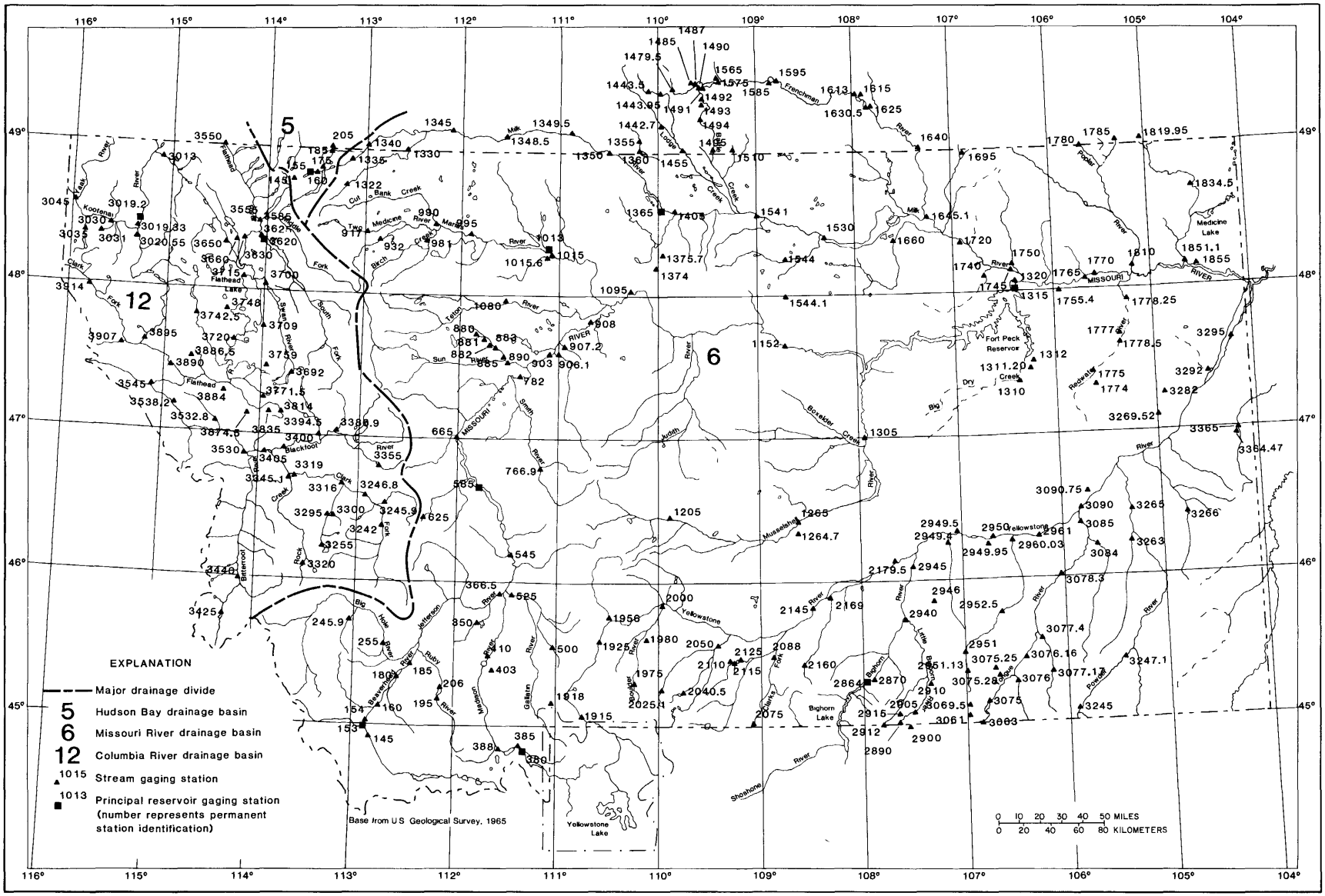

Figure 2.--Location of surface-water gaging stations, October 1982.

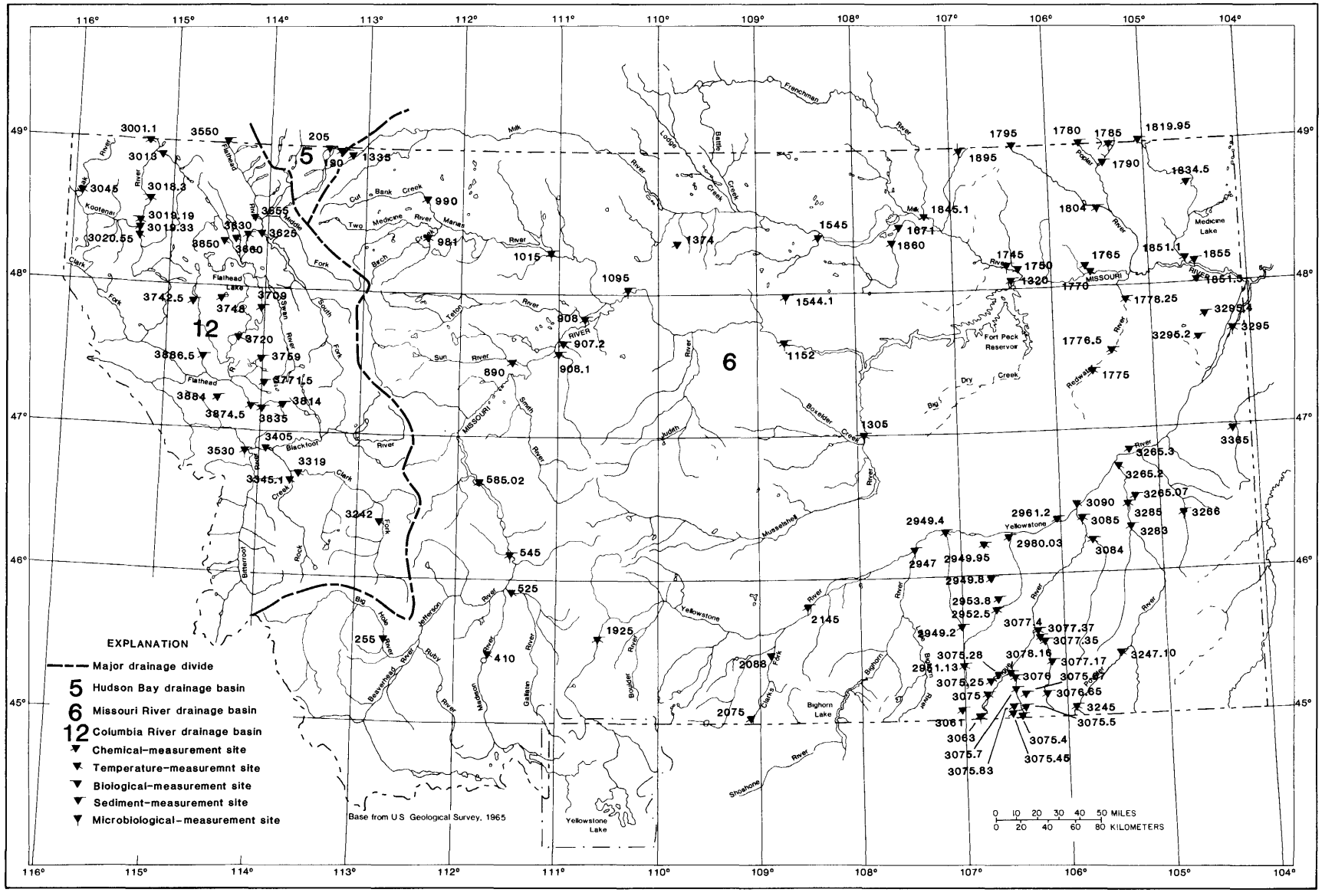

Figure 3.--Location of surface-water-quality stations, October 1982.