WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN WYOMING, FISCAL YEAR 1985

Compiled By Sharon L. Green

U.S. Geological Survey

Open-File Report 85-562

Cheyenne, Wyoming

1985

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

FUNDING AGENCIES

State Agencies

Black Hills Conservancy Subdistrict
South Dakota Department of Water and Natural Resources
Utah State Engineer
Wyoming Department of Agriculture
Wyoming Department of Economic Planning and Development
Wyoming Department of Environmental Quality
Wyoming Highway Department
Wyoming State Engineer
Wyoming Water Development Commission

County Agency

Uinta County

Federal Agencies

U.S. Bureau of Indian Affairs
U.S. Bureau of Land Management
U.S. Bureau of Reclamation
U.S. Army, Corps of Engineers
U.S. Department of Energy
Federal Emergency Management Agency
National Park Service

For additional information
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U.S. Geological Survey
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Cheyenne, Wyoming 82003

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Conversion factors

Inch-pound units used in this report may be converted to metric units by the following conversion factors:

Multiply	By	To obtain
foot (ft)	0.3048	meter
acre-foot (acre-ft)	1,233	cubic meter
gallon per minute (gal/min)	0.06308	liter per second
mile	1.609	kilometer

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Compiled by Sharon L. Green

ABSTRACT

The Wyoming District, U.S. Geological Survey, water resources activities includes data collection at streamflow stations, reservoir stations, water quality stations, sediment stations, and ground-water observation wells as well as water resources appraisal projects that help evaluate or solve regional and local water problems. The activities are done in cooperation with other government agencies, and this report is one phase of the coordination effort with these and other agencies.

INTRODUCTION

The U.S. Geological Survey is the Federal agency responsible for appraising the quantity, quality, and distribution of our surface-water and ground-water resources. Through its Water Resources Division, the Survey conducts interpretive studies, supports hydrologic research, and maintains data-collection networks in every State. It also works through cooperative programs with State, local, and other Federal agencies to help evaluate or solve regional and local water problems. Results of these activities provide a basis for many major water-management decisions.

The Geological Survey, in cooperation with the State of Wyoming, the State of Utah, the State of South Dakota, Uinta County, and other Federal agencies has 4 data-collection programs and netowrks, and 41 water-resources appraisal projects in Wyoming during fiscal year 1985 (October 1, 1984, through September 30, 1985).

The data-collection programs and networks include (1) collecting records for stream-flow and reservoir storage; (2) sampling and chemical analysis of water from streams (3) sediment sampling and analysis of surface water; and (4) measuring water levels in wells. This report contains tables of monitoring sites for these four data-collection programs and networks.

Water-resources appraisal projects described in this report include the projects conducted during fiscal year 1985. Projects completed in previous fiscal years, but for which final reports were in preparation at the end of fiscal year 1985 also are included.

This report describes the water-resources activities being done in Wyoming. The report also provides information to cooperating officials and the public about the accomplishments in the various appraisal projects during the fiscal year 1984 (October 1, 1983, through September 30, 1984) and planned work for fiscal year 1985. It is one phase of an effort to coordinate the water-resources activities of the Geological Survey with those of other organizations.

MESSAGE FROM THE DISTRICT CHIEF

The U.S. Geological Survey, Water Resources Division, has a history of cooperation with the State of Wyoming. Initially, the cooperation was in the form of contributing dollars to assist in measuring streamflow in the State. The Washington, D.C. office of the Geological Survey paid the installation costs for the first streamflow-gaging station in Wyoming in 1888. That station, Laramie River at Woods Landing, was constructed and operated by the Territorial Engineer. Cooperation in the form of personnel also came early in the history of the Geological Survey in Wyoming. The first resident hydrographer for the Geological Survey was later appointed Wyoming State Engineer. Cooperation with the Wyoming State Engineer has continued since 1915.

This cooperative program continues today. During 1985, cooperatively funded efforts with 17 public agencies are ongoing in Wyoming. We continue to measure streamflow throughout the State. We also monitor ground-water levels and chemical quality of both ground water and surface water. Such data are the foundation of the current problem-oriented, multidiciplinary studies being conducted in the State. Major water-resource problems now being addressed by Wyoming District programs include the hydrology of energy-mineral areas, hydrologic effects of energy development, the effects of human activities on water quality, and the availability of ground water to meet the rapidly increasing demands of agriculture and industry.

We, in the Geological Survey, make the results of our work available to the public so that water-resource managers in the State can use the information in a rational process of problem solving and decision analysis. We are trying extremely hard to make our results available on a more timely basis as well.

The next few years promise an increase in new projects oriented toward assisting the local and Federal agencies in Wyoming with the management of our finite water resources. I look forward to a continued role of the U. S. Geological Survey in these activities.

Richard M. Bloyd
District Chief
U.S. Geological Survey
Water Resources Division
Cheyenne, Wyoming

ORIGIN OF THE U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey was established by an act of Congress on March 3, 1879, providing 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 intergral 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 Geological Survey has expanded and been modified to meet the changing needs of the Nation it serves. As part of that evolution, the Geological 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 geologic structure of the Nation.

Studying the geologic features, structure, processes, and history of the other planets of our solar system.

Conducting topographic surveys of the Nation, 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.

Conducting research in hydraulics and hydrology, and coordinating all Federal water-data acquisition.

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 expanding and changing earth-science needs of the Nation, the Geological 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.

Mission of the Water Resources Division

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

This is accomplished, in a 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 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 to understand hydrologic systems sufficiently well to quantitatively predict their response to stress, either natural or manmade.

Disseminating the water data and the results of these 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.

Providing scientific and technical assistance in hydrologic fields to other Federal, State and local agencies, to licensees of the Federal Power Commission, and to international agencies on behalf of the U.S. Department of State.

WYOMING DISTRICT ORGANIZATION CHART

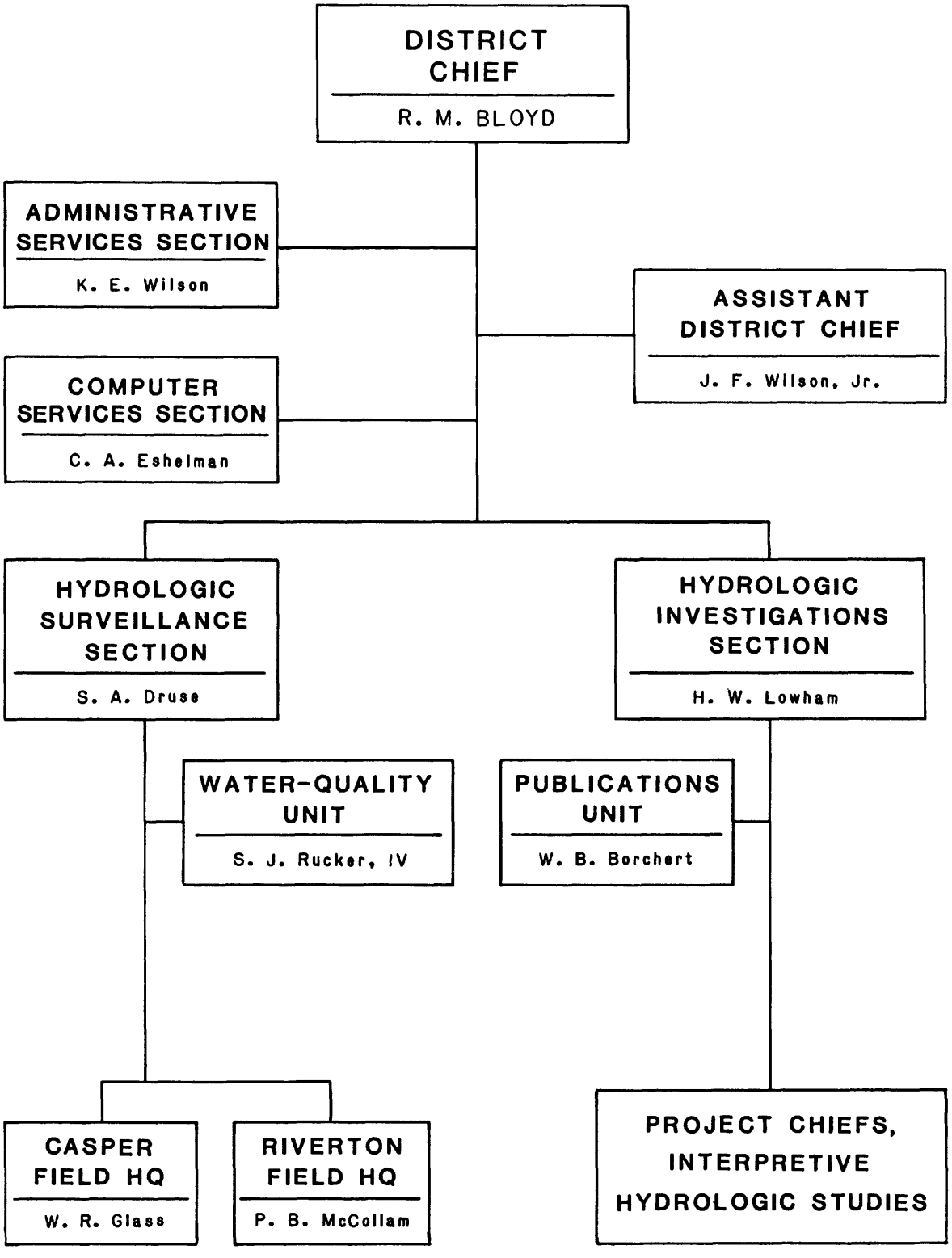


Figure 1.

DISTRICT OFFICE AND FIELD HEADQUARTERS ADDRESSES

Inquiries regarding projects described in this report may be directed to the District Office or Field Headquarters in which the work originated. (See figure 2 for locations.)

Wyoming District Office

U.S. Geological Survey
Water Resources Division
2120 Capitol Avenue
P.O. Box 1125
Cheyenne, WY 82003
(307) 772-2153
FTS 328-2153

Field Headquarters

2020 Fairgrounds Road
Plaza West, Suite 102
Casper, WY 82604
(307) 261-5485
FTS 328-5485

1225 Market Street
P.O. Box 431
Riverton, WY 82501
(307) 856-3771

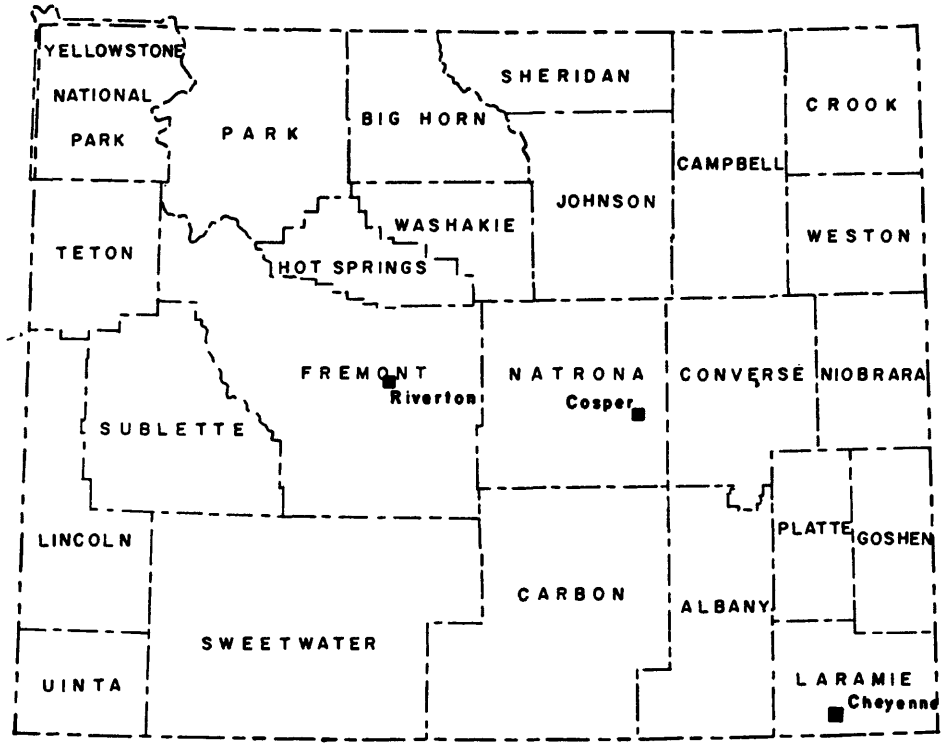
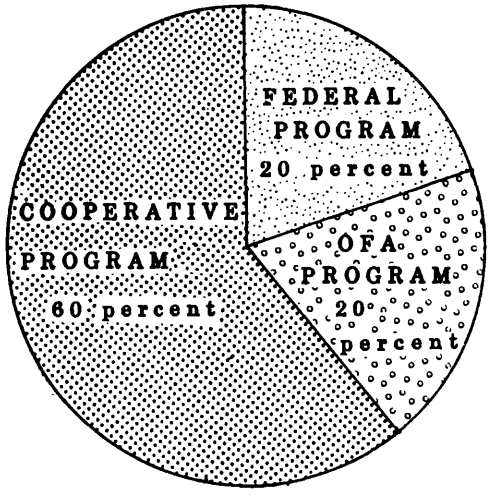


Figure 2.--Location of U.S. Geological Survey, Water Resources Division offices in Wyoming.

SOURCES OF FUNDING

Funds for carrying out the water-resources investigations of the Geological Survey in Wyoming are provided by many agencies. The agencies are classified by three major categories (fig. 3): (1) State and local agencies that provide funds or services or both generally matched on a 50-50 basis by Geological Survey funds (cooperative program); (2) other Federal agencies that transfer funds to Geological Survey (OFA program); and (3) Geological Survey funds received by direct appropriation for activities that are national in scope (Federal program). The diagram below shows the distribution of these funds by major category for Fiscal Year 1985. During 1985 about 66 percent of the funds were used for collection of hydrologic data and about 34 percent for interpretive hydrologic studies.



FISCAL YEAR 1985
TOTAL, ABOUT $2,520,000

Figure 3.--Sources of funding.

DATA-COLLECTION SITES

Lists of data-collection sites and the kinds of hydrologic data being collected at each are given as follows: Table 1, streamflow and reservoir stations; table 2, water-quality stations; table 3, sediment stations; and table 4, ground-water observation wells.

The station numbers for the stations listed in tables 1-3 conform with the standard downstream order for listing stations within each major river basin. The first two digits of the assigned eight-digit number, such as 06207500, identifies the major river basin in which the stream resides. The digits '06' refer to the Missouri River Basin. The remaining six digits identify the relative position of the station, with numbers increasing in the downstream direction. The section, township, and range location of each data station is given in the tables.

Table 3 also has two 15-digit station numbers. The first six digits are the latitude in degrees, minutes, and seconds. The next seven digits are the longitude in degrees, minutes, and seconds. The last two digits indicate a sequence number.

The well numbers listed in table 4, ground-water observation wells, are based on the Federal system of land subdivision. A detailed explanation of this system can be found on the page preceding table 4. The wells are listed in numerical order by county.

Abbreviations and codes are used to conserve space in the tables. Explanations of the abbreviations and codes precede each table.

The location of streamflow, reservoir, water-quality and sediment stations are shown in figure 3. The location of ground-water observation wells are shown in figure 4. The station numbers on the maps are abbreviated by not showing the two-digit basin number and the last two digits if zero.

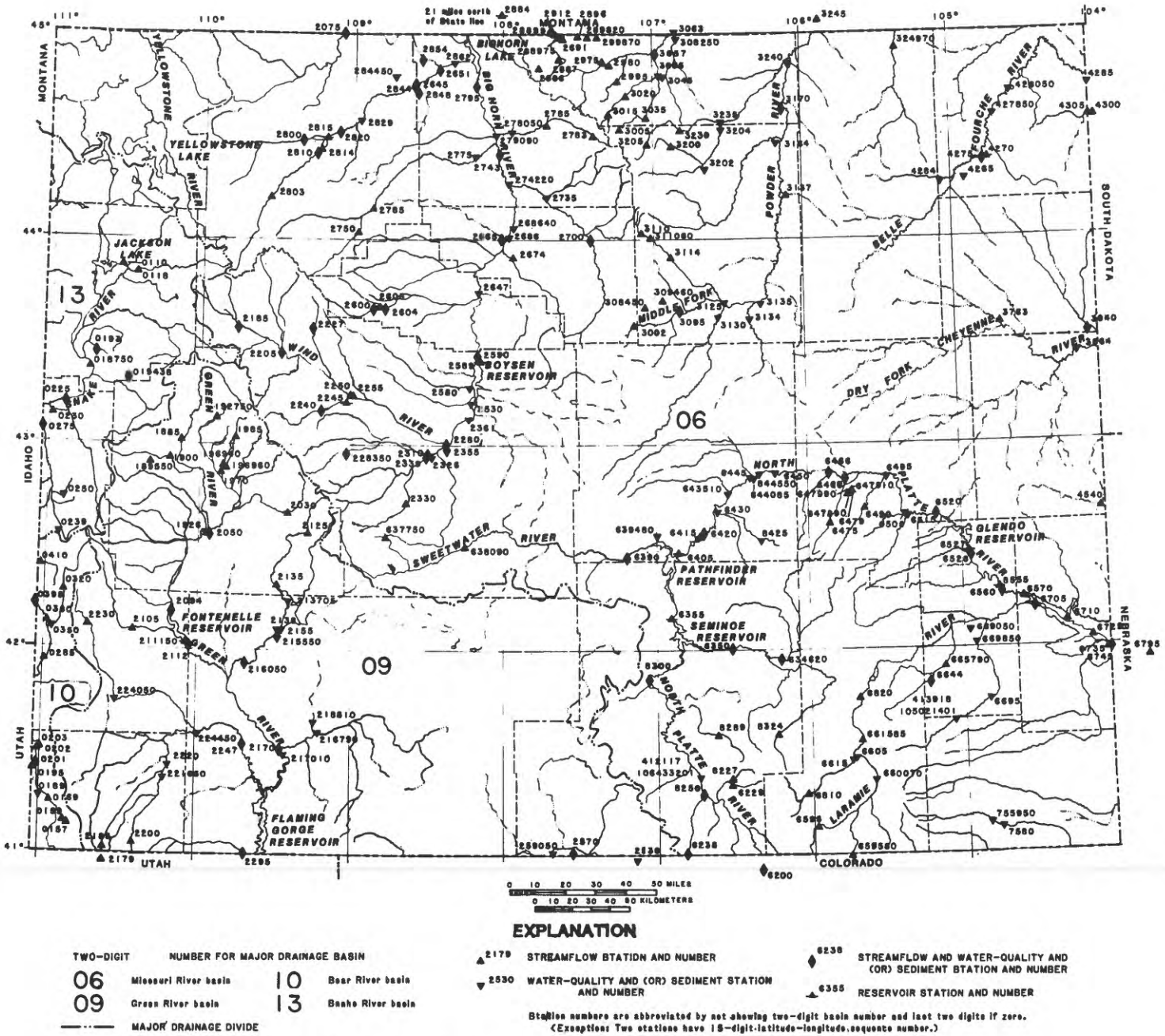


Figure 4.—Location of streamflow, reservoir, water-quality, and sediment stations, 1985 water year.

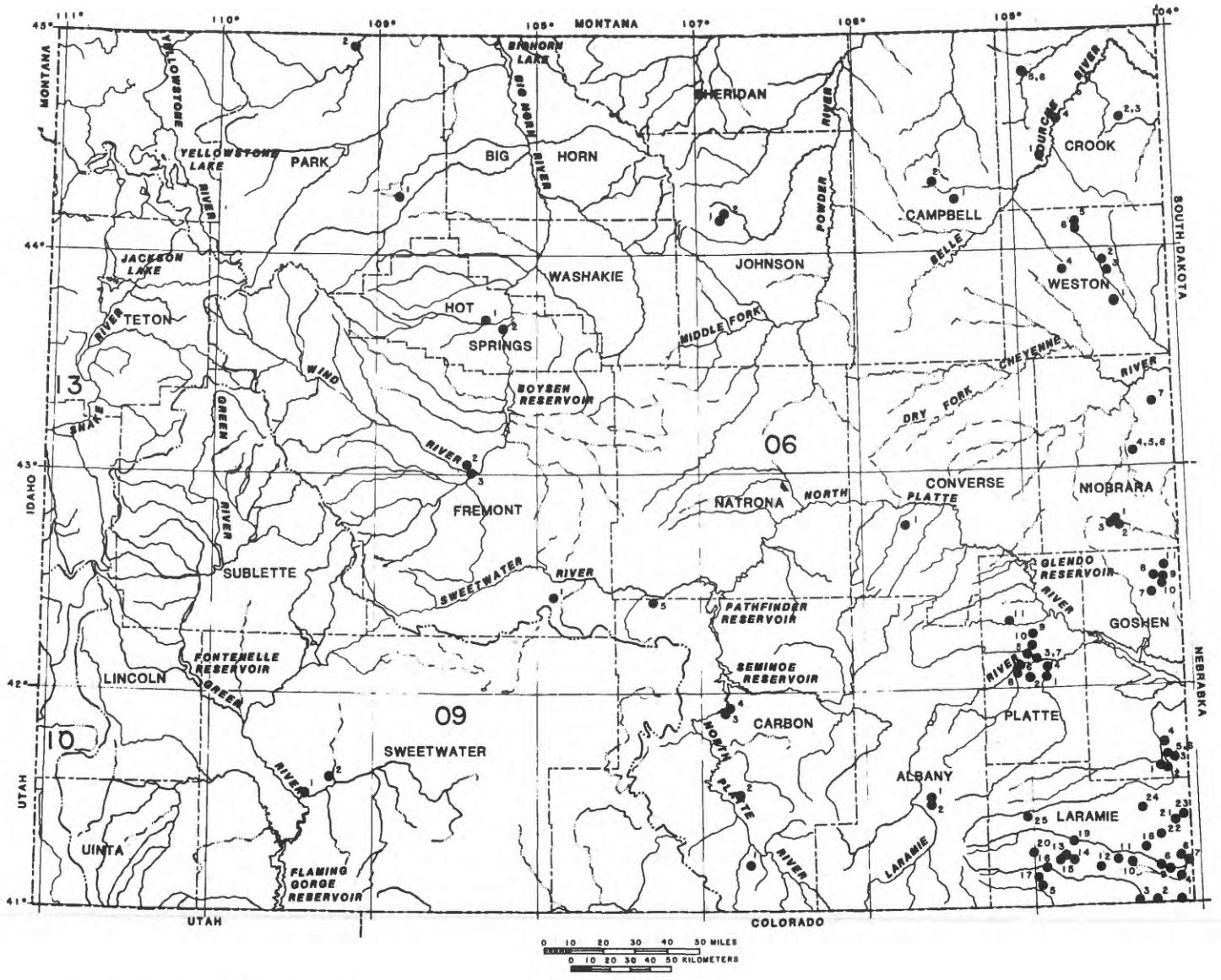


Figure 5.---Location of ground-water observation wells, 1985 water year.

Table 1.--Streamflow and reservoir stations

Explanation of abbreviations and codes used in table 1.

Purpose·

- B bench-mark or long-term-trend station
- C current-purpose station such as accounting, operation, forecasting, disposal, water quality, compact or legal, research or special study
- H hydrologic station
- P principal-stream station
- R regulated station

Period of record: The dates given are the calendar years in which records began or ended. Periods of no record of less than a year are not shown

Gage equipment:

- D digital recorder
- G graphic recorder
- M manometer gage
- P data-collection platform
- S staff gage
- W well gage

Current record type:

- S seasonal operation (no winter records)
- Y full-year operation

Field office:

- C Casper
- CO Colorado District
- ID Idaho District
- MT Montana District
- NE Nebraska District
- R Riverton
- S Wyoming State Engineer
- SD South Dakota District
- UT Utah District

Funding agency:

- BIA Bureau of Indian Affairs
- BRUC Bureau of Reclamation, Colorado Region
- BRUM Bureau of Reclamation, Upper Missouri Region
- CE Corps of Engineers
- MRB Geological Survey, Missouri River Basin Program
- UC Unita County
- USE Utah State Engineer
- USGS Geological Survey, Federal Program
- WDEQ Wyoming Department of Environmental Quality
- WSE Wyoming State Engineer
- WWDC Wyoming Water Development Commission

Remarks:

- AWG auxiliary well gage
- HBM hydrologic benchmark station
- USBR furnished by Bureau of Reclamation

Table 1.--Streamflow and reservoir stations

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
YELLOWSTONE RIVER BASIN												
*06207500	Clarks Fork Yellowstone River near Belfry, Mont.	C	1,154	1921-	32	9S	22E	--	Y	MT	--	
*06218500	Wind River near Dubois	C	232	1945-	25	42N	108W	D,W	Y	R	WSE	
*#06220500	East Fork Wind River near Dubois	C	427	1950-57, 1975-	34	6N	6W	D,M	Y	R	MRB	
*06222700	Crow Creek near Tipperary	H	30.2	1962-	20	7N	4W	D,G,M	Y	R	MRB	
*06224000	Bull Lake Creek above Bull Lake	H	187	1941-53, 1966-	2	2N	4W	D,M	Y	R	MRB	
06224500	Bull Lake near Lenore	C	210	1938-	30	3N	2W	--	--	--	BRUM	USBR
06225000	Bull Lake Creek near Lenore	C	213	1918-	17	3N	2W	D,G,M,P	Y	R	BRUM	
06225500	Wind River near Crowheart	C,P	1,891	1945-	16	3N	2W	D,G,W,P	Y	R	BRUM	
*06228000	Wind River at Riverton	C,R	2,309	1906-08, 1911-	2	1S	4E	D,G,M	Y	R	CE	
*06228350	South Fork Little Wind River above Washakie Reservoir, near Fort Washakie	H	90.3	1976-	18	1S	2W	D,W	Y	R	BIA	
*06231000	Little Wind River above Araphaoe	C	660	1979-	23	1S	3E	D,M	Y	R	BIA	
06233000	Little Popo Agie River near Lander	C	125	1946-	27	32N	99W	G,W	S	S	WSE	
*06233900	Popo Agie River near Arapahoe	C	--	1979-	27	1S	3E	D,M	Y	R	BIA	
*06235500	Little Wind River near Riverton	C,R	1,904	1941-	11	1S	4E	D,M,P	Y	R	CE, BRUM	
06258900	Boysen Reservoir	C	7,700	1951-	16	5N	6E	--	--	--	MRB	USBR
*#06259000	Wind River below Boysen Reservoir	C,R	7,701	1951-	9	5N	6E	D,M	Y	R	BRUM	
*06260000	South Fork Owl Creek near Anchor	C,H	85.5	1932, 1939-43, 1959-	28	43N	100W	D,G,M	Y	R	BRUM	
06260300	Anchor Reservoir	C	131	1960-	26	43N	100W	--	--	--	MRB	USBR
*06260400	South Fork Owl Creek below Anchor Reservoir	C,R	131	1959-	25	43N	100W	D,G,W	Y	R	BRUM	
06267400	East Fork Nowater Creek near Colter	H	149	1971-	31	46N	92W	D,G,M	Y	R	WSE	
#06268500	Fifteenmile Creek near Worland	C	518	1951-72, 1978-	27	47N	93W	D,G,M	Y	R	WDEQ	
*06270000	Nowood River near Tensleep	P	803	1938-43, 1950-55, 1972-	27	47N	88W	D,G,M	Y	R	WSE	
*06274300	Bighorn River at Basin	C	--	1984-	21	51N	93W	D,M	Y	R	WDEQ	
06275000	Wood River at Sunshine	C,H	194	1945-	15	47N	101W	D,G,M	Y	R	WSE	

* Also water-quality station.
\# Also sediment station.

Table 1.--Streamflow and reservoir stations--Continued

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
YELLOWSTONE RIVER BASIN--Continued												
06276500	Greybull River at Meeteetse	C,P	681	1897, 1903, 1920-	4	48N	100W	G,M	S	S	WSE	
06278300	Shell Creek above Shell Reservoir	B,C,H	23.1	1956-	1	52N	88W	D,W	Y	R	WSE	
06278500	Shell Creek near Shell	C,H	145	1940-	17	53N	90W	G,W	S	S	WSE	
*#06279500	Bighorn River at Kane	C,R	15,765	1928-	9	55N	94W	D,G,M,P	Y	R	MRB, CE	
*06280000	North Fork Shoshone River near Wapiti	C,H	775	1921-26, 1979-	15	52N	104W	D,G,M,P	Y	R	MRB, BRUM	
06280300	South Fork Shoshone River near Valley	B,H	297	1956-	24	49N	106W	D,G,M	Y	R	USGS	
*06281000	South Fork Shoshone River above Buffalo Bill Reservoir	P	585	1903, 1905-08, 1921-26, 1973-	33	52N	103W	D,G,M,P	Y	R	WSE, BRUM	
06281400	Diamond Creek near mouth, near Cody	C	7.34	1981-	29	52N	102W	S	Y	R	MRB	
06281500	Buffalo Bill Reservoir	C	1,498	1909-	12	52N	103W	--	--	--	MRB	USBR
*06282000	Shoshone River below Buffalo Bill Reservoir	C,R	1,538	1921-	3	52N	102W	D,W	Y	R	BRUM	
*06284500	Bitter Creek near Garland	C	80.5	1950-53, 1957-60, 1968-	75	5N	97W	D,W	Y	R	MRB	
*06284800	Whistle Creek near Garland	C	101	1958-60, 1968-	30	55N	97W	D,G,M	Y	R	MRB	
*06285100	Shoshone River near Lovell	C,R	2,350	1966-	16	56N	96W	D,G,M	Y	R	MRB	
*06285400	Sage Creek at Sidon Canal, near Deaver	C	341	1958-60, 1968-	34	57N	97W	D,G,M	Y	R	MRB	
06286400	Bighorn Lake near St. Xavier, Mont.	C	19,626	1965-	18	6S	31E	--	--	--	MRB	USBR
06288600	Little Bighorn River below Dayton Gulch, near Burgess Junction	C	15.9	1983-	12	56N	91W	D,G,M	S	C	WWDC	
06288700	Dry Fork below Lick Creek, near Burgess Junction	C	54.1	1983-	28	57N	89W	D,G,M,W	Y	C	WWDC	
06288975	Elkhorn Creek above Fuller Ranch Ditch, near Parkman	C	4.58	1983-	21	58N	89W	D,G,M	S	C	WWDC	
06288990	West Fork Little Bighorn River near Parkman	C	38.2	1983-	17	58N	89W	D,G,M	S	C	WWDC	
06289100	Red Canyon Creek near Parkman	C	3.2	1983-	27	58N	89W	D,G,M	S	C	WWDC	
06289600	West Pass Creek near Parkman	C	15.4	1983-	21	58N	88W	D,W	S	C	WWDC	
06289820	East Pass Creek near Dayton	C	21.7	1983-	24	58N	88W	D,W	Y	C	WWDC	

* Also water-quality station.
\# Also sediment station.

Table 1. Streamflow and reservoir stations--Continued

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
YELLOWSTONE RIVER BASIN--Continued												
06289870	Twin Creek near Parkman	C	27	1983-	22	58N	87W	D,W	S	C	WWDC	
06291200	Lodgegrass Creek at State line, near Wyola, Mont.	C	16.7	1983-	34	9S	32E	D,G,M	S	C	WWDC	
06297500	Highline Ditch near Dayton	C	--	1919-23, 1940-	11	56N	87W	G,W	S	C	WSE	
06298000	Tongue River near Dayton	B,C,H	204	1918-29, 1940-	11	56N	87W	D,W	Y	C	WSE	
06299500	Wolf Creek at Wolf	C,H	37.8	1945-	4	55N	86W	G,W	S	S	WSE	
06300500	East Fork Big Goose Creek near Big Horn	C,H	20.1	1953-	28	53N	86W	G,M	S	S	WSE	
06301500	West Fork Big Goose Creek near Big Horn	C	24.4	1953-	30	54N	86W	G,M	S	S	WSE	
06302000	Big Goose Creek near Sheridan	C	120	1929-	35	55N	86W	G,W	S	S	WSE	
06303500	Little Goose Creek in canyon, near Big Horn	C,H	51.6	1941-	1	53N	85W	G,W	S	S	WSE	
*06305700	Goose Creek near Acme	C	--	1984-	27	57N	84W	D,W	Y	C	WSE	
06309200	Middle Fork Powder River near Barnum	H	45.2	1961-	26	42N	86W	D,G,M,W	Y	C	WSE	
06309450	Beaver Creek below Bayer Creek, near Barnum	C	10.9	1974-	28	43N	85W	D,W	Y	C	WSE	
06309460	Beaver Creek above White Panther Ditch, near Barnum	C	24.2	1974-	16	43N	84W	D,W	Y	C	WSE	
*06309500	Middle Fork Powder River above Kaycee	C,H	450	1949-70, 1984-	34	43N	83W	D,W	Y	C	WWDC	
06311000	North Fork Powder River near Hazelton	B,C,H	24.5	1946-	21	47N	85W	G,M	Y	C	WSE	
06311060	North Fork Powder River below Bull Creek, near Hazelton	C	32.3	1974-	25	47N	85W	D,W	Y	C	WSE	
06311400	North Fork Powder River below Pass Creek, near Mayoworth	C,H	100	1974-	36	46N	84W	D,W	Y	C	WSE	
06313700	Dead Horse Creek near Buffalo	H	151	1971-	15	49N	77W	G,M	Y	C	WSE	
*06317000	Powder River at Arvada	C,P	6,050	1919-	21	54N	77W	G,M	Y	C	WSE	
06320000	Rock Creek near Buffalo	C,R	60.0	1941-	29	52N	83W	G,W	S	S	WSE	
06320500	South Piney Creek at Willow Park	C,R	33.6	1945-57, 1959-	24	52N	85W	G,W	S	S	WSE	
06323000	Piney Creek at Kearny	C,R	118	1902-06, 1910-17, 1919-23, 1940-	26	53N	83W	G,W	Y	S	WSE	
06324500	Powder River at Moorhead, Mont.	--	8,088	1929-72, 1974-	8	9N	48W	G,W	Y	MT	--	

* Also water-quality station.
# Also sediment station.

Table 1.--Streamflow and reservoir stations--Continued

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
YELLOWSTONE RIVER BASIN--Continued												
06324970	Little Powder River above Dry Creek, near Weston	P	1,235	1972-	13	57N	71W	D,G,M	Y	C	WSE	
CHEYENNE RIVER BASIN												
06376300	Black Thunder Creek near Hampshire	H	535	1972-	31	42N	65W	D,G,M	Y	C	WSE	
*06394000	Beaver Creek near Newcastle	B,P	1,320	1943-	18	41N	60W	D,G,W	Y	C	USGS	
06427000	Keyhole Reservoir near Moorcroft	C	2,000	1952-	27	51N	66W	--	--	--	MRB	USBR
*06427500	Belle Fourche River below Keyhole Reservoir	C,R	2,000	1951-	21	51N	66W	G,M	Y	C	BRUM	
06430000	Murray Ditch at Wyoming-South Dakota State line	C	--	1954-	7	7N	1E	G,W	S	SD	WSE	
06430500	Redwater Creek at Wyoming-South Dakota State line	C,H	471	1929-31, 1936-37, 1954-	18	7N	1E	G,W	Y	SD	WSE	
NIOBRARA RIVER BASIN												
06454000	Niobrara River at Wyoming-Nebraska State line	B,C,H	450	1955-	15	31N	60W	D,W	Y	NE	--	
PLATTE RIVER BASIN												
*06620000	North Platte River near Northgate, Colo.	H	1,431	1904, 1915-	11	11N	80W	D,M	Y	C	USGS	
06622700	North Brush Creek near Saratoga	H	37.4	1960-	8	16N	81W	D,G,M	Y	C	WSE	
06622900	South Brush Creek near Saratoga	C	22.8	1960-74, 1976-	20	16N	81W	G,W	S	S	WSE	
*#06623800	Encampment River above Hog Park Creek, near Encampment	B,H	72.7	1964-	10	12N	84W	G,M	Y	C	USGS	HBM
*06625000	Encampment River at mouth, near Encampment	C,H	265	1940-	3	15N	83W	D,W	Y	C	WSE	
06628900	Pass Creek near Elk Mountain	C,H	91.5	1957-	27	19N	82W	G,M	Y	C	WSE	
*06630000	North Platte River above Seminoe Reservoir, near Sinclair	C,P	4,175	1939-	13	22N	86W	G,W	Y	C	WSE	
06632400	Rock Creek above King Canyon Canal, near Arlington	B,C,H	62.9	1965-	25	19N	79W	G,M	Y	C,S	WSE	

* Also water-quality station.
\# Also sediment station.

Table 1.--Streamflow and reservoir stations--Continued

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
PLATTE RIVER BASIN--Continued												
*06634620	Little Medicine Bow River at Boles Spring, near Medicine Bow	P	--	1984-	17	23N	78W	D,M	Y	C	WSE	
*06635000	Medicine Bow River above Seminoe Reservoir, near Hanna	C,P	2,338	1939-	34	24N	81W	G,W	Y	C	WSE	
06635500	Seminoe Reservoir near Leo	C	7,230	1939-	8	25N	84W	--	--	--	MRB	USBR
06637750	Rock Creek above Rock Creek Reservoir	C,H	9.2	1962-	27	30N	100W	D,W	Y	R	WSE	
06638090	Sweetwater River near Sweetwater Station	P	849	1973-	12	29N	96W	D,M	Y	R	WSE	
*06639000	Sweetwater River near Alcova	C,P	2,327	1913-24, 1938-	25	29N	87W	G,W	S	S	WSE	
06640500	Pathfinder Reservoir near Alcova	C	10,711	1909-	24	29N	84W	--	--	--	MRB	USBR
06641500	Alcova Reservoir at Alcova	C	10,766	1938-	24	30N	83W	--	--	--	MRB	USBR
*#06642000	North Platte River at Alcova	C,R	10,812	1904-05, 1934-	17	30N	82W	D,W	Y	C	WSE	
*06646600	Deer Creek below Millar Wasteway, at Glenrock	C,H	213	1961-	4	33N	75W	D,G,M	Y	C,S	WSE	
*06646800	North Platte River near Glenrock	C,R	13,538	1959-	17	33N	74W	D,W,P	Y	C,S	WSE, CE	
06647500	Box Elder Creek at Boxelder	H	63.0	1946-51, 1961-67, 1971-	32	31N	75W	D,W	Y	C	WSE	
06647890	Little Box Elder Creek near Careyhurst	C	7.18	1974-	8	32N	74W	D,W	Y	C	WSE	
06647900	Little Box Elder Creek at Little Box Elder Cave, near Careyhurst	C	8.47	1974-	9	32N	74W	G,W	S	C	WSE	
06647910	Little Box Elder Spring near Careyhurst	C	--	1981-	3	32N	74W	D,W	Y	C	WSE	
06649000	La Prele Creek near Douglas	C	135	1919-	5	31N	73W	G,W	S	S	WSE	
*06652000	North Platte River at Orin	C,R	14,888	1895-99, 1917-18, 1924, 1958-	17	31N	69W	D,W	Y	C	WSE	
06652700	Glendo Reservoir near Glendo	C	15,545	1957-	24	29N	68W	--	--	--	MRB	USBR
*06652800	North Platte River below Glendo Reservoir	C,R	15,548	1957-	30	29N	67W	D,W	Y	C	WSE	
06655500	Guernsey Reservoir near Guernsey	C	16,224	1928-	27	27N	66W	--	--	--	MRB	USBR
*06656000	North Platte River below Guernsey Reservoir	C,R	16,237	1900-	27	27N	66W	D,M,W	Y	C	WSE	
06657000	North Platte River below Whalen Diversion Dam	C,R	16,425	1909-	12	26N	65W	G,M	Y	C	WSE	
06659500	Laramie River and Pioneer Canal near Woods	C,R	434	1912-24, 1926-27,	36	14N	77W	G,W	S	S	WSE	

* Also water-quality station.
\# Also sediment station.

Table 1. Streamflow and reservoir stations--Continued

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
PLATTE RIVER BASIN--Continued												
06659580	Sand Creek at Colorado-Wyoming State line	C	29.2	1968-	24	12N	75W	G,W	S	S	WSE	
06661000	Little Laramie River near Filmore	C,H	157	1902-03, 1911-26, 1932-	4	15N	77W	G,W	S	S	WSE	
06661585	Laramie River near Bosler	C,R	1,790	1972-	10	18N	74W	G,W	Y	S	WSE	
06662000	Laramie River near Lookout	C,R	2,174	1912-17, 1921-27, 1932-	27	21N	74W	G,W	S	S	WSE	
*06664400	Sybille Creek above Mule Creek, near Wheatland	C,H	194	1974-	27	22N	70W	G,W	S	S	WSE	
06665790	Sybille Creek above Canal No. 3, near Wheatland	C,R	--	1980-	4	22N	69W	G,W	S	S	WSE	
*06670500	Laramie River near Fort Laramie	C,R	4,564	1915-	28	26N	64W	G,M,P	Y	C	WSE, CE	
06671000	Rawhide Creek near Lingle	C	522	1928-	20	25N	62W	G,W	S	S	WSE	
06672500	Cherry Creek Drain near Torrington	C	356	1931-32, 1935-	23	24N	61W	G,W	S	S	WSE	
06673500	Katzer Drain near Henry, Nebr.	C	45.9	1928-	10	23N	60W	G,W	S	S	WSE	
*06674500	North Platte River at Wyoming-Nebraska State line	C,R	22,218	1929-	4	23N	58W	D,G,W,P	Y	C	WSE, CE	
06679500	North Platte River at Mitchell, Nebr.	C	24,300	1901-10, 1911, 1912-13, 1916-18, 1920-	33	33N	56W	D,G,W	Y	NE	--	
GREEN RIVER BASIN												
09188500	Green River at Warren Bridge, near Daniel	C	468	1931-	8	35N	111W	D,M,P	Y	R	WSE, BRUC	
09189550	South Horse Creek near Merna	C	33.3	1983-	22	34N	113W	D,M	S	R	WWDC	
09190000	Horse Creek near Daniel	C	106	1931-54, 1983-	2	33N	111W	D,G,M	Y	R	WWDC	
09192750	New Fork River above New Fork Lakes	C	--	1985-	5	36N	109W	D,M	S	R	WWDC	
09196500	Pine Creek above Fremont Lake	B,C,H	75.8	1954-	5	35N	108W	D,W	Y	R	USGS	
09196940	Fremont ditch near Pinedale	C,R	--	1985-	23	34N	109W	G,W	S	R	WWDC	
09196960	Highland ditch near Pinedale	C,R	--	1985-	23	34N	109W	D,G,W	S	R	WWDC	

* Also water-quality station.
# Also sediment station.

Table 1. Streamflow and reservoir stations--Continued

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
GREEN RIVER BASIN--Continued												
09197000	Pine Creek below Fremont Lake	C	114	1910-12, 1915-18, 1985-	27	34N	109W	D,G,M	S	R	WWDC	
09203000	East Fork River near Big Sandy	C	79.2	1938-	7	31N	105W	D,M	Y	R	WSE	
*09205000	New Fork River near Big Piney	P	1,230	1954-	22	30N	110W	D,M,P	Y	R	WSE, BRUC	
*09209400	Green River near La Barge	C,P	3,910	1963-	33	26N	112W	D,M	Y	R	WSE	
09210500	Fontenelle Creek near Herschler Ranch, near Fontenelle	C,H	152	1951-	2	24N	115W	D,M	Y	R	USGS	
09211150	Fontenelle Reservoir near Fontenelle	C	4,280	1964-	25	24N	112W	--	--	--	--	USBR
*09211200	Green River below Fontenelle Reservoir	C,R	4,280	1963-	31	24N	111W	D,G,M	Y	R	BRUC	
09212500	Big Sandy River at Leckie Ranch, near Big Sandy	C	94.0	1910-11, 1939-	17	30N	104W	D,M	S	R	WSE	
09213500	Big Sandy River near Farson	C,R	322	1914-17, 1920-24, 1926-34, 1935-	17	27N	106W	D,M	S	R	WSE	
*09215550	Big Sandy River below Farson	C,R	1,097	1981-	12	24N	107W	D,M	Y	R	BRUC	
*09216050	Big Sandy River at Gasson Bridge, near Eden	C,R	1,720	1972-	29	23N	108W	D,M	Y	R	BRUC	
*#09217000	Green River near Green River	C,R	14,000	1951-	26	18N	107W	G,M,P	Y	R	USGS, BRUC	
09217900	Blacks Fork near Robertson	H	130	1937-39, 1966-	27	3N	12E	D,M	Y	R	USE	
09218500	Blacks Fork near Millburne	C	152	1939-	11	12N	117W	D,M	Y	R	WSE	
09220000	East Fork of Smiths Fork near Robertson	C,H	53.0	1939-	5	12N	115W	G,M	S	S	WSE	
09223000	Hams Fork below Pole Creek, near Frontier	C,H	128	1952-	35	25N	117W	D,M	Y	R	USGS	
*09224700	Blacks Fork near Little America	C,R	3,100	1962-	15	18N	109W	D,M,P	Y	R	USGS, BRUC	
*09229500	Henrys Fork near Manila, Utah	C,P	520	1928-	23	12N	109W	D,M	Y	R	USGS	
*09257000	Little Snake River near Dixon	C,P	988	1910-23, 1938-	8	12N	90W	G,M	S	CO	WSE	
BEAR RIVER BASIN												
10015700	Sulphur Creek above reservoir, near Evanston	C,H	64.2	1957-	35	14N	119W	G,W	Y	UT	--	

* Also water-quality station.
\# Also sediment station.

Table 1. Streamflow and reservoir stations--Continued

Station number	Station name	Purpose	Drainage area (square miles)	Period of record	Location			Gage equipment	Current record type	Field office	Funding agency	Remarks
					Section	Township	Range					
BEAR RIVER BASIN												
10015900	Sulphur Creek below reservoir, near Evanston	C	69.2	1958-	28	14N	119W	D,W	Y	UT	--	
10016900	Bear River at Evanston	H	443	1984-	21	15N	120W	D,M	S	R	UC	
10019500	Chapman Canal at State line, near Evanston	C	--	1942-	36	17N	121W	G,W	Y	UT	--	
*10020100	Bear River above reservoir, near Woodruff, Utah	C,R	752	1961-	29	17N	120W	G,W	Y	UT	--	
10020200	Woodruff Narrows Reservoir near Woodruff, Utah	C	784	1965-	32	18N	120W	--	--	--	--	
10020300	Bear River below reservoir, near Woodruff, Utah	C,R	784	1961-	32	18N	120W	D,W	Y	UT	--	
10028500	Bear River below Pixley Dam, near Cokeville	C,R	2,032	1941-43, 1952-56, 1958-	25	23N	120W	G,W	S	UT	--	
10032000	Smiths Fork near Border	B,C,H	165	1942-	33	27N	118W	G,W	Y	UT	--	
10038000	Bear River below Smiths Fork, near Cokeville	C	2,447	1954-	28	25N	119W	G,W	Y	UT	--	
*10039500	Bear River at Border	C	2,490	1937-	15	14S	43E	G,W	Y	UT	--	
10041000	Thomas Fork near Wyoming-Idaho State line	C,H	113	1949-	19	28N	119W	D,W	Y	UT	--	
SNAKE RIVER BASIN												
13011000	Snake River near Moran	B,C,R	807	1903-	18	45N	114W	D,W	Y	ID	--	
13011900	Buffalo Fork above Lava Creek, near Moran	H	323	1965-	29	45N	113W	G,M	Y	ID	--	
*#13018300	Cache Creek near Jackson	B,H	10.6	1962-	1	40N	116W	G,W	Y	ID	USGS	HBM
13018750	Snake River below Flat Creek, near Jackson	C,R	2,627	1975-	3	39N	116W	D,G,M	Y	ID	USGS	
*#13019438	Little Granite Creek at mouth, near Bondurant	C	--	1982-	34	39N	114W	D,G,M	Y	ID	--	
*13022500	Snake River above reservoir, near Alpine	C,R	3,465	1917-18, 1937-39, 1953-	--	--	--	G,W	Y	ID	--	
13023000	Greys River above reservoir, near Alpine	C,P	448	1917-18, 1937-39, 1953-	34	37N	118W	G,M	Y	ID	--	
*13027500	Salt River above reservoir, near Etna	C,R	829	1953-	28	36N	119W	D,W	Y	ID	--	

* Also water-quality station.
\# Also sediment station.

Table 2.--Water-quality stations

Explanation of abbreviations and codes used in table 2.

Period of record: The dates given are the calendar years in which records began or ended. Periods of no record of less than a year are not shown

Funding agency:

BIA	Bureau of Indian Affairs
BRUC	Bureau of Reclamation, Upper Colorado Region
BRUM	Bureau of Reclamation, Upper Missouri Region
MRB	Geological Survey, Missouri River Basin Program
USGS	Geological Survey, Federal Program
WDA	Wyoming Department of Agriculture
WDEQ	Wyoming Department of Environmental Quality
WWDC	Wyoming Water Development Commission

Sampling frequency:

A	annual
BM	bimonthly
C	continuous (recorder)
D	daily
F	five times during the year
HL	high and low flow samples only
HLI	high flow, low flow, under ice, and one other sample
HLJ	high flow, low flow, under ice, and one during July or August
IS	every six weeks during irrigation season
M	every six weeks plus two events
MQ	monthly during May through October, quarterly during winter
Q	quarterly
SS	sample during spraying season (frequency determined in late spring)
T	twenty-four samples during April 15 to October 15

Analysis schedule:

1	salinity (major constituents)
2	specific conductance
3	daily temperature (observed or recorder)
4	chemical oxygen demand
5	field determinations of: pH, specific conductance, dissolved oxygen, temperature, and (or) turbidity
5A	field determinations of: pH, specific conductance, and temperature
6	fecal coliform, and (or) fecal streptococcus
7	nutrient
8	trace metals
9	pesticides
10	radiochemical
11	field determinations of specific conductance and temperature
12	specific conductance and temperature (continuous monitors)
13	stable isotopes
14	field alkalinity

Explanation of abbreviations and codes used in table 2--Continued

Field office:

C	Casper	ID	Idaho District
CH	Cheyenne Hydrologic Surveillance Section	MT	Montana District
		R	Riverton
CO	Colorado District	S	Wyoming State Engineer

Table 2.--Water-quality stations

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
YELLOWSTONE RIVER BASIN											
@06207500	Clarks Fork Yellowstone River near Belfry, Mont.	1,154	1965-	31	9S	22E	WDA WDA	HLI SS	1 9	MT	
@06218500	Wind River near Dubois	232	1947-50, 1965-	25	42N	108W	WDA	HLI	1	R	
#@06220500	East Fork Wind River near Dubois	427	1975-	34	6N	6W	MRB	M	11	R	
@06222700	Crow Creek near Tipperary	30.2	1974-	20	7N	4W	MRB	M	11	R	
@06224000	Bull Lake Creek above Bull Lake	187	1974-	2	2N	4W	MRB	M	11	R	
@06228000	Wind River at Riverton	2,309	1947-50, 1953, 1965-	2	1S	4E	WDA	HLI	1	R	
@06228350	South Fork Little Wind River above Washakie Reservoir, near Fort Washakie	90.3	1976-	18	1S	2W	BIA	M	1,11	R	
@06231000	Little Wind River above Arapahoe	660	1966-	23	1S	3E	WDA	HLI	1	R	
06232600	Popo Agie River at Hudson Siding, near Lander	--	1984-	30	2S	2E	WDEQ	M	5,6,7	R	
@06233900	Popo Agie River near Arapahoe	--	1979-	27	1S	3E	BIA WDA	M SS	1 9	R	
@06235500	Little Wind River near Riverton	1,904	1965-	11	15N	4E	WDA	HLI	1	R	
06236100	Wind River above Boysen Reservoir, near Shoshoni	4,390	1974-	25	2N	5E	WDEQ	M	5,6,7	R	
#06253000	Fivemile Creek near Shoshoni	418	1949-51, 1953, 1965-	19	3N	6E	WDA	HLI	1	R	
#@06259000	Wind River below Boysen Reservoir	7,701	1953-54, 1960-	9	5N	6E	USGS USGS WDEQ	BM BM BM	1,5,6,7, 8,13,14 1,5,6,7	R R R	
@06260000	South Fork Owl Creek near Anchor	85.5	1974-	28	43N	100W	BRUM	M	11	R	
@06260400	South Fork Owl Creek below Anchor Reservoir	131	1974-	25	43N	100W	BRUM	M	11	R	
06264700	Bighorn River at Lucerne	--	1966-	32	44N	94W	WDEQ	M	5,6,7	R	
06268600	Bighorn River at Worland	10,810	1966-	25	47N	93W	WDA	M	1	R	
06268640	Slick Creek near Worland	--	1981-	7	47N	92W	WDA	HLI	1	R	
@06270000	Nowood River near Ten Sleep	803	1967-	27	47N	88W	WDA WDA	HLI SS	1 9	R	
06273500	Paint Rock Creek near mouth, below Hyattville	376	1951-53, 1967-	19	49N	90W	WDA	SS	9	R	
06274220	Nowood River at Manderson	2,000	1965-	30	50N	92W	WDA	MQ	1	R	
@06274300	Bighorn River at Basin	--	1984-	21	51N	93W	WDEQ	M	5,6,7	R	

Also sediment station.
@ Also streamflow station.

Table 2.--Water-quality stations--Continued

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
YELLOWSTONE RIVER BASIN--Continued											
06277500	Greybull River near Basin	1,115	1951-53, 1965-	8	51N	94W	WDA WDA	MQ SS	1 9	R	
06279050	Shell Creek at Porter Gulch, near Greybull	--	1983-	33	53N	92W	WDA	SS	9	R	
06279090	Shell Creek near Greybull	560	1951, 1965-	4	52N	93W	WDA	HLI	1	R	
#@06279500	Bighorn River at Kane	15,765	1947-53, 1955-57, 1960-	9	55N	94W	MRB WDA WDA WDEQ	M M SS HLJ	11 1 9 5,6,7	R	
@06280000	North Fork Shoshone River near Wapiti	775	1979-	15	52N	104W	MRB WDA	C M	3 1	R	
@06281000	South Fork Shoshone River above Buffalo Bill Reservoir	585	1981-	33	52N	103W	MRB WDA	C HLI	3 1	R	
@06282000	Shoshone River below Buffalo Bill Reservoir	1,538	1947-49, 1964-	3	52N	102W	WDA	HLI	1	R	
06282900	Shoshone River above Dry Creek, near Cody	--	1974-	13	53N	101W	WDEQ	M	5,6,7	R	
06284400	Shoshone River near Garland	--	1974-	13	55N	98W	WDA	SS	9	R	
06284450	Bitter Creek below sewage lagoon, near Powell	--	1981-	36	56N	99W	WDEQ	M	5,6,7	R	
@06284500	Bitter Creek near Garland	80.5	1958-60, 1969-	7	55N	97W	WDEQ MRB	HLJ M	6 5A	R	
@06284800	Whistle Creek near Garland	101	1959-60, 1969-	30	55N	97W	MRB	M	5A	R	
@06285100	Shoshone River near Lovell	2,350	1966-	16	56N	96W	MRB	Q	1,7	R	
@06285400	Sage Creek at Sidon Canal, near Deaver	341	1958-60, 1969-	34	57N	97W	MRB	Q	1,7	R	
06286200	Shoshone River at Kane	2,989	1976-	6	56N	95W	WDEQ	HLJ	5,6,7	R	
06304500	Little Goose Creek near Sheridan	159	1979-	27	56N	84W	WDEQ WDA	HLJ SS	5,6 9	C	
06305500	Goose Creek below Sheridan	392	1959-60, 1961-64, 1967-	15	56N	84W	WDA WDEQ	M M	1 5,6,7	C	
@06305700	Goose Creek near Acme	--	1984-	27	57N	84W	WDEQ	M	5,6,7	C	
06306250	Prairie Dog Creek near Acme	358	1983-	23	58N	83W	WDA	SS	9	C	
06306300	Tongue River at State line, near Decker, Mont.	1,477	1965-	33	9S	40E	WDA WDA WDEQ	Q SS HLJ	1 9 5,6,7,8	MT	
@06309500	Middle Fork Powder River above Kaycee	450	1949-54, 1984-	34	43N	83W	WWDC	M	1,5,6,7	C	

Also sediment station.
@ Also streamflow station.

Table 2.--Water-quality stations--Continued

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
YELLOWSTONE RIVER BASIN--Continued											
06312500	Powder River near Kaycee	980	1968-	13	43N	81W	WDA	HLI	1	C	
							WDEQ	HLJ	5,6,7		
06313000	South Fork Powder River near Kaycee	1,150	1968-81, 1983-	9	42N	81W	WDEQ	M	1	C	
06313400	Salt Creek near Sussex	769	1967-81, 1983-	8	42N	79W	WDEQ	M	1	C	
06313500	Powder River at Sussex	3,090	1949-53, 1977-	13	43N	79W	WDEQ	M	1	C	
06316400	Crazy Woman Creek at upper station, near Arvada	945	1966-81, 1983-	18	52N	77W	WDA	SS	9	C	
@06317000	Powder River at Arvada	6,050	1946-53, 1967-	21	54N	77W	WDA	HLI	1	C	
							USGS	M	11		
06320200	Clear Creek below Rock Creek, near Buffalo	322	1975-	30	51N	81W	WDEQ	M	5,6,7	C	
							WDA	SS	9		
06320400	Clear Creek at Ucross	409	1975-81, 1983-	19	53N	80W	WDA	SS	9	C	
06323500	Piney Creek at Ucross	267	1975-80, 1983-	18	53N	80W	WDA	SS	9	C	
06324000	Clear Creek near Arvada	1,110	1950-54, 1966-	36	57N	77W	WDA	HLI	1	C	
							WDA	SS	9		
CHEYENNE RIVER BASIN											
06386400	Cheyenne River near Riverview	5,270	1975-	25	40N	61W	WDA	SS	9	C	
@06394000	Beaver Creek near Newcastle	1,320	1949-53, 1967-	18	41N	60W	WDA	HLI	1	C	
06426400	Donkey Creek near Moorcroft	--	1977-	30	50N	68W	WDEQ	HLJ	5,6,7	C	
06426500	Belle Fourche River below Moorcroft	1,670	1975-	24	50N	68W	WDEQ	M	5,6,7	C	
							WDA	SS	9		
@06427500	Belle Fourche River below Keyhole Reservoir	2,000	1984-	21	51N	66W	WDA	SS	9	C	
06427850	Belle Fourche River at Devils Tower	--	1967-	7	53N	65W	WDA	HLI	1	C	
							WDA	SS	9		
06428050	Belle Fourche River below Hulett	--	1981-	6	54N	64W	WDEQ	M	5,6,7	C	
							WDA	SS	9		
06428500	Belle Fourche River at Wyoming-South Dakota State line	3,280	1965-	18	9N	1E	WDA	HLI	1	C	

Also sediment station.
@ Also streamflow station.

Table 2.--Water-quality stations--Continued

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
PLATTE RIVER BASIN											
@06620000	North Platte River near Northgate, Colo.	1,431	1965-	11	11N	80W	WDA	M	1	C	
							WDA	SS	9		
412117 106433201	North Platte River at Highway 130, north of Saratoga		1977-78, 1984-				WDA	SS	9	C	
#@06623800	Encampment River above Hog Park Creek, near Encampment	72.7	1967-	10	12N	84W	USGS	Q	5,6,7, 13,14	C	
							USGS	HL	1,8		
							USGS	A	10		
@06625000	Encampment River at mouth, near Encampment	265	1965-	3	15N	83W	WDA	M	1	C	
@06630000	North Platte River above Seminoe Reservoir, near Sinclair	8,134	1960-	13	22N	86W	WDA	M	1	C	
							WDEQ	HLJ	5,6,7		
@06634620	Little Medicine Bow River at Boles Spring, near Medicine Bow	--	1985-	17	23N	78W	WDA	HLI	1	C	
							WDEQ	HLJ	10		
@06635000	Medicine Bow River above Seminoe Reservoir, near Hanna	2,338	1965-	34	24N	81W	WDA	HLI	1	C	
							WDEQ	HLJ	10		
@06639000	Sweetwater River near Alcova	2,327	1964-	25	29N	87W	WDA	HLI	1	C	
							WDEQ	HLJ	10		
06639480	Horse Creek at Highway 220, near Alcova	--	1983-	15	30N	85W	WDA	SS	9	C	
#@06642000	North Platte River at Alcova	10,812	1965-	17	30N	82W	USGS	BM	1,5,6,7 13,14	C	
							USGS	Q	8		
							WDEQ	BM	1,5,6,7		
06642500	Bates Creek near Freeland	129	1981-	29	30N	79W	WDA	HLI	1	C	
06643000	Bates Creek near Alcova	393	1970-	1	31N	82W	WDA	M	1	C	
06643510	North Platte River above Poison Spider Creek, near Goose Egg	--	1977-80, 1983-	3	32N	81W	WDEQ	HLJ	5,6,7	C	
06644085	North Platte River at Mills	--	1970-	7	33N	79W	WDEQ	HLJ	5,6,7	C	
							MRB	A	1		
							MRB	T	5		
06644500	Casper Creek at Casper	668	1970-	7	33N	79W	WDEQ	HLJ	5,6,7	C	
06644550	North Platte River at Casper	--	1971-	4	33N	79W	MRB	A	1	C	
							MRB	T	5		
							WDA	SS	9		
							WDEQ	HLJ	5,6,7		
06645000	North Platte River below Casper	12,574	1950-52, 1957-59, 1967-	4	33N	78W	WDA	M	1	C	
							WDEQ	M	5,6,7		
@06646600	Deer Creek below Millar Wasteway, at Glenrock	213	1967-	4	33N	75W	WDA	HLI	1	C	

Also sediment station.
@ Also streamflow station.

Table 2.--Water-quality stations--Continued

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
PLATTE RIVER BASIN--Continued											
@06646800	North Platte River near Glenrock	13,538	1960-	17	33N	74W	WDA	HLI	1	C,S	
06647990	Box Elder Creek below Interstate 25, near Careyhurst	--	1981-	13	33N	74W	WDA	HLI	1	C	
06649500	La Prele Creek near Orpha	--	1981-	15	33N	72W	WDA	HLI	1	C	
06650500	Wagonhound Creek near La Bonte	--	1981-	16	31N	71W	WDA	HLI	1	C	
06651500	La Bonte Creek near La Bonte	--	1981-	15	31N	71W	WDA	HLI	1	C	
@06652000	North Platte River at Orin	14,888	1966-	17	31N	69W	WDA	M	1	C	
							WDA	SS	9		
							WDEQ	M	5,6,7		
@06652800	North Platte River below Glendo Reservoir	15,548	1966-	30	29N	67W	WDA	M	1	C	
							WDA	SS	9		
@06656000	North Platte River below Guernsey Reservoir	16,237	1950-58, 1965-	27	27N	66W	WDA	HLI	1	C	
06660070	Laramie River above Howell	--	1980-	9	16N	73W	WDEQ	M	5,6,7	CH	
							WDA	HLI	1		
06660500	Laramie River at Two Rivers	1,224	1966-	5	17N	74W	WDA	SS	9	CH	
06661500	Little Laramie River at Two Rivers	376	1965-	6	17N	74W	WDA	HLI	1	CH	
							WDA	SS	9		
@06664400	Sybille Creek above Mule Creek, near Wheatland	194	1984-	27	22N	70W	WDA	SS	9	CH	
06669050	Wheatland Creek below Wheatland	--	1983-	1	24N	68W	WDEQ	M	5,6,7	CH	
413918 105021401	Chugwater Creek at Platte-Laramie County line, near Chugwater		1984-				WDA	SS	9	CH	
06669500	Chugwater Creek at Chugwater		1984-				WDA	SS	9	CH	
06669850	Chugwater Creek near Uva		1984-				WDA	SS	9	CH	
@06670500	Laramie River near Fort Laramie	4,495	1965-	25	26N	65W	WDA	M	1	C	
@06674500	North Platte River at Wyoming-Nebraska State line	22,218	1965-	4	23N	58W	WDA	M	1	C	
							WDEQ	HLJ	5,6,7		
06755950	Crow Creek at F. E. Warren AFB	--	1983-	36	14N	67W	WDA	SS	9	CH	
06756000	Crow Creek near Cheyenne	--	1983-	3	13N	66W	WDA	SS	9	CH	
GREEN RIVER BASIN											
09192600	Green River near Big Piney	1,260	1967-	21	30N	110W	WDA	HLI	1	R	
@09205000	New Fork River near Big Piney	1,230	1965-	22	30N	110W	WDA	HLI	1	R	
@09209400	Green River near La Barge	3,910	1963-	33	26N	112W	WDA	HLI	1	R	
							WDA	SS	9		
@09211200	Green River below Fontenelle Reservoir	4,280	1967-	31	24N	111W	WDA	M	1	R	
09213705	Big Sandy River below Big Sandy Reservoir	--	1981-	12	26N	106W	WDA	HLI	1	R	

Also sediment station.
@ Also streamflow station.

Table 2.--Water-quality stations--Continued

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
GREEN RIVER BASIN--Continued											
09213800	Big Sandy River at Farson	--	1981-	33	25N	106W	WDA	HLI	1	R	
09215500	Little Sandy Creek at Farson	--	1981-	34	25N	106W	WDA	HLI	1	R	
@09215550	Big Sandy River below Farson	--	1981-	12	24N	107W	BRUC	C	12	R	
							WDA	M	1		
@09216050	Big Sandy River at Gasson Bridge, near Eden	1,720	1975-	29	23N	108W	WDA	M	1	R	
							WDA	SS	9		
							BRUC	C	12		
09216790	Bitter Creek above Killpecker Creek, at Rock Springs	--	1983-	26	19N	105W	WDA	SS	9	R	
09216810	Killpecker Creek at Rock Springs	--	1975-80, 1982-	26	19N	105W	WDA	SS	9	R	
#@09217000	Green River near Green River	14,000	1951-	26	18N	107W	USGS	D	2,3	R	
							USGS	Q	8		
							USGS	BM	1,5,6,7, 13,14		
09217010	Green River below Green River	--	1973-	36	18N	107W	WDEQ	M	5,6,7	R	
							WDEQ	F	1,4		
09221650	Smiths Fork near Lyman	--	1974-	12	16N	114W	WDA	SS	9	R	
09222000	Blacks Fork near Lyman	821	1962-	15	17N	113W	WDA	SS	9	R	
09224050	Hams Fork near Diamondville	--	1975-	36	21N	116W	WDEQ	M	5,6,7	R	
							WDA	SS	9		
09224450	Hams Fork near Granger	670	1965-	30	19N	111W	WDA	HLI	1	R	
@09224700	Blacks Fork near Little America	3,100	1951-	15	18N	109W	BRUC	C	12	R	
							USGS	M	1		
@09229500	Henrys Fork near Manila, Utah	520	1951-	23	12N	109W	WDA	M	1	R	
							WDA	SS	9		
09253000	Little Snake River near Slater, Colo.	285	1978-	15	12N	87W	WDA	IS	1	CO	
@09257000	Little Snake River near Dixon	988	1975-	8	12N	90W	WDA	IS	1	CO	
							WDA	SS	9		
09259050	Little Snake River below Baggs	--	1981-	7	12N	92W	WDA	HLI	1	CO	
							WDA	SS	9		
							WDEQ	M	5,6,7		
BEAR RIVER BASIN											
10018900	Yellow Creek at mouth, near Evanston	--	1964-	1	15N	121W	WDEQ	M	5,6,7	R	
@10020100	Bear River above reservoir, near Woodruff, Utah	752	1968-	29	17N	120W	WDA	M	1	R	
							WDEQ	M	5,6,7		
10035000	Smiths Fork near Cokeville	--	1983-	4	24N	119W	WDA	SS	9	R	

Also sediment station.
@ Also streamflow station.

Table 2.--Water-quality stations--Continued

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
BEAR RIVER BASIN--Continued											
@10039500	Bear River at Border	2,490	1965-	15	14S	46E	WDA	BM	1	R	
SNAKE RIVER BASIN											
#@13018300	Cache Creek near Jackson	10.6	1965-	1	40N	116W	USGS	--	--	ID	
#@13019438	Little Granite Creek at mouth, near Bondurant	--	1982-	34	39N	114W	USGS	--	--	ID	
@13022500	Snake River above reservoir, near Alpine	3,465	1965-	--	--	--	WDA	HLI	1	R	
13023900	Salt River near Smoot	--	1981-	33	30N	118W	WDA	M	1	R	
13025000	Swift Creek near Afton	27.4	1981-	29	32N	118W	WDA	M	1	R	
@13027500	Salt River above reservoir, near Etna	829	1965-	28	36N	119W	WDA	M	1	R	
							WDA	SS	9	R	

Also sediment station.
@ Also streamflow station.

Table 3.--Sediment stations

Explanation of abbreviations and codes used in table 3.

Period of record: The dates given are the calendar years in which records began or ended. Periods of no record of less than a year are not shown

Funding agency:

BRUM	Bureau of Reclamation, Upper Missouri River Basin
MRB	Geological Survey, Missouri River Basin Program
USGS	Geological Survey, Federal Program
WDEQ	Wyoming Department of Environmental Quality

Sampling frequency:

BM	bimonthly
D	daily (observer)
HL	high and low flow samples only
HML	high, medium and low flow samples only
I	infrequent, whenever enough sediment in suspension to do analysis
M	every six weeks plus two events
P	PS69 sediment pump sampler
Q	quarterly

Analysis schedule:

1	suspended-sediment concentration
2	particle-size distribution
3	0.062-mm sieve analysis
4	bed material particle-size distribution

Field office:

C	Casper	R	Riverton
ID	Idaho District		

Table 3. Sediment stations

Station number	Station name	Drainage area (square miles)	Period of record	Location			Funding agency	Sampling frequency	Analysis schedule	Field office	Remarks
				Section	Township	Range					
YELLOWSTONE RIVER BASIN											
*@06220500	East Fork Wind River near Dubois	427	1975-	34	6N	6W	MRB MRB	M I	1 2	R	
*06253000	Fivemile Creek near Shoshoni	418	1948-75, 1978-	19	3N	6E	BRUM	M	1	R	
06258000	Muddy Creek near Shoshoni	332	1949-68, 1983-	34	4N	5E	BRUM	M	1	R	
*@06259000	Wind River below Boysen Reservoir	7,701	1979-	9	5N	6E	USGS	BM	1,3	R	
@06268500	Fifteenmile Creek near Worland	518	1949-72, 1979-	27	47N	93W	WDEQ WDEQ WDEQ	P Q HL	1 2 4	R	
*@06279500	Bighorn River at Kane	15,765	1946-64, 1969-	9	55N	94W	MRB MRB	M I	1 2	R	
PLATTE RIVER BASIN											
*@06623800	Encampment River above Hog Park Creek, near Encampment	72.7	1964-	10	12N	84W	USGS	Q	1,2,3	C	
*@06642000	North Platte River at Alcova	10,812	1979-	17	30N	82W	USGS	BM	1,3	C	
GREEN RIVER BASIN											
*@09217000	Green River near Green River	14,000	1951-	26	18N	107W	USGS USGS USGS USGS	D I BM HML	1 2 3 4	R	
SNAKE RIVER BASIN											
*@13018300	Cache Creek near Jackson	10.6	1968-	1	40N	116W	USGS	--	--	ID	
*@13019438	Little Granite Creek at mouth, near Bondurant	--	1982-	34	39N	114W	USGS	--	--	ID	

* Also water-quality station.
@ Also streamflow station.

Table 4.--Ground-water observation wells

Explanation of abbreviations and codes used in table 4.

Well number: The well-numbering procedure used is based on the Federal system land subdivision. The first segment of the number is the township (north); the second number segment is the range (west); the third number segment is the section, which is followed by a first letter designating the quarter section, a second letter, if shown, designating the quarter-quarter section, etc., (A-NE¼, B-NW¼, C-SW¼, D-SE¼). Well 30-108-05BCD2, for example, is in the SE¼ of the SW¼ of the NW¼ of sec. 5, T. 30 N., R. 108 W. The number 2 indicates it is the second well in the quarter-quarter-quarter section. Wells shown in Fremont County have an additional uppercase letter that begins the number. This letter designates the quadrant of the Wind River Meridian and Base Line System. The quadrants are lettered A, B, C, and D in a counter-clockwise direction beginning with A in the northeast quadrant

Lat-long-seq no.: The first six digits are the latitude in degrees, minutes, and seconds. The next seven digits are the longitude in degrees, minutes, and seconds. The last two digits indicate the sequence number of when the well was inventoried in the event more than one well has the same latitude and longitude

Geologic unit:

111 ALVM	Alluvium	124 WSTC	Wasatch Formation
111 SPBK	Spoil bank (reclaimed coal mine area)	125 FRRS	Ferris Formation
111 TRRC	Terrace deposits	211 FXHL	Fox Hills Sandstone
121 NRPK	North Park Formation[1]	217 LKOT	Lakota Formation
121 OGLL	Ogallala Formation	311 PRKC	Park City Formation
122 ARKR	Arikaree Formation	317 CSPR	Casper Formation
123 BRUL	Brule Formation	317 MNLS	Minnelusa Formation
123 WRVR	White River Formation or Group	317 TSLP	Tensleep Sandstone
124 WDRV	Wind River Foramtion	331 MDSN	Madison Limestone
124 WLWD	Willwood Formation	337 PHSP	Pahasapa Limestone
		374 FLTD	Flathead Quartzite or Sandstone

[1] Now designated at Miocene by the U. S. Geological Survey

The seven-character geologic unit code given above consists of two parts. The first three characters are numeric and identify the Era, System, and Series of the rock unit. The next four characters are in alpha-numeric code for the name of the rock-stratigraphic unit

Explanation of abbreviations and codes used in table 4--Continued

Numeric codes for geologic age identification

	Code		Code
Cenozoic	100	Paleozoic--Continued	
Quaternary	110	Pennsylvanian	320
Holocene	111	Upper	321
Pleistocene	112	Middle	324
Tertiary	120	Lower	327
Pliocene	121	Mississippian	330
Miocene	122	Upper	331
Oligocene	123	Lower	337
Eocene	124	Devonian	340
Paleocene	125	Upper	341
Mesozoic	200	Middle	344
Cretaceous	210	Lower	347
Upper	211	Silurian	350
Lower	217	Upper	351
Jurassic	220	Middle	354
Upper	221	Lower	357
Middle	224	Ordovician	360
Lower	227	Upper	361
Triassic	230	Middle	364
Upper	231	Lower	367
Middle	234	Cambrian	370
Lower	237	Upper	371
Paleozoic	300	Middle	374
Permian	310	Lower	377
Upper	311	Precambrian	400
Lower	317		

Funding agency:

SE/PD Wyoming State Engineer with support from Wyoming Department of Economic Planning and Development

USGS Geological Survey, Federal Program

Field office:

C Casper

CH Cheyenne Hydrologic Surveillance Section

P Project Personnel

R Riverton

S Wyoming State Engineer

Frequency of observation:

C continuous (graphic or digital recorder)

M monthly (12 visits per year)

Period of record: The dates given are the calendar years in which records began or ended. A record consists of one or more measurements during a calendar year

Remarks: Indicates a reference name of the well, or other pertinent information

Table 4.--Ground-water observation wells

Map number	Well number	Lat-long-seq no.	Geologic unit	Funding agency	Field office	Frequency of observation	Period of record	Name of owner	Remarks
	ALBANY COUNTY	MISSOURI RIVER BASIN							
1	15-073-01DBA	411751105312701	317CSPR	SE/PD	S	C	1983-	Wyo. Water Research Ctr.	
2	15-073-12DBB	411703105314001	317CSPR	SE/PD	S	C	1983-	Wyo. Water Research Ctr.	
	CAMPBELL COUNTY	MISSOURI RIVER BASIN							
1	49-070-31BBB01	441117105192901	211FXHL	SE/PD	S	C	1983-	Hampshire Energy	
2	50-072-21ABA01	441819105305701	124WSTC	SE/PD	S	C	1983-	City of Gillette	
	CARBON COUNTY	MISSOURI RIVER BASIN							
1	14-083-03CAB01	411234106424601	121NRPK	SE/PD	P	C	1980-	Robert Helmer	
2	18-083-17CDB01	413148106454801	121NRPK	SE/PD	P	C	1980-	Burton Tuttle	Tuttle Well
3	22-084-01BCB01	415430106493801	111SPBK	USGS	C	C	1983-	Arch Mineral Corp.	
4	23-083-31BBB01	415535106482301	125FRRS	USGS	C	C	1984-	Arch Mineral Corp.	
5	28-087-16CCA01	422338107145001	122ARKR	SE/PD	C	C	1981-	Wyo. Dept. of Planning & Development	
	CONVERSE COUNTY	MISSOURI RIVER BASIN							
1	32-074-08DBC01	424520105440501	331MDSN	SE/PD	C	C	1980-	Wm Barber, Panhandle Eastern	In Canyon
	CROOK COUNTY	MISSOURI RIVER BASIN							
1	51-066-06DCD	442540104493501	331MDSN	SE/PD	S	C	1981-	City of Gillette	Gillette
2	52-63-25DCD01	442734104215001	--	SE/PD	S	M	1985-	City of Sundance	Coal Well #3-A
3	52-63-25DCD02	442734104215002	--	SE/PD	S	M	1985-	City of Sundance	Coal 3B
4	53-065-18BBD02	443453104425602	337PHSP	SE/PD	C	M	1962-	National Park Service	
5	56-067-28AAB01	444854104534501	331MDSN	SE/PD	S	C	1983-	R. Jahnig	
6	56-067-28AAB02	444854104534502	331MDSN	SE/PD	S	C	1983-	R. Jahnig	
	FREMONT COUNTY	MISSOURI RIVER BASIN							
1	29-093-36DB	422632107540501	122ARKR	SE/PD	R	C	1974-	State of Wyoming	Jeffrey City
2	A 1-4-28ACC	430205108243201	124WDRV	SE/PD	R	M	1984-	Claud Fike	Brentwood #1
3	A 1-4-33DDB	430051108240901	124WDRV	SE/PD	R	C	1951, 1961-	Teton Studs Corp.	Teton S

Table 4.--Ground-water observation wells--Continued

Map number	Well number	Lat-long-seq no.	Geologic unit	Funding agency	Field office	Frequency of observation	Period of record	Name of owner	Remarks
	GOSHEN COUNTY	MISSOURI RIVER BASIN							
1	19-061-04ABC	413852104115801	111ALVM	SE/PD	S	C	1972-	Frank Sanders	
2	19-061-10AAB01	413810104102301	123BRUL	SE/PD	S	C	1980-	State of Wyoming	
3	20-060-30BBB	414049104074501	123BRUL	SE/PD	S	C	1980-	State of Wyoming	
4	20-061-03DAD01	414348104101301	123WRVR	SE/PD	S	C	1980-	State of Wyoming	
5	20-061-23BDB02	4141128104094502	123BRUL	SE/PD	S	C	1978-	John Meier & Son, Inc.	
6	20-061-23CCC01	414051104100701	111ALVM	SE/PD	S	C	1972-	John Meier & Son, Inc.	
7	28-061-06ABA	422512104135501	122ARKR	SE/PD	S	C	1979-	State of Wyoming	Goshen #2
8	29-061-17AAD	422928104121401	122ARKR	SE/PD	S	C	1980-	State of Wyoming	
9	29-061-23ABB	422849104090801	122ARKR	SE/PD	S	C	1979-	State of Wyoming	Goshen #1
10	29-061-26CBB01	422730104094801	122ARKR	SE/PD	S	C	1980-	State of Wyoming	Prairie Ctr #3
11	30-061-09BBB	423549104120901	122ARKR	SE/PD	S	C	1980-		Prairie Ctr #5
	HOT SPRINGS COUNTY	MISSOURI RIVER BASIN							
1	43-095-18CBA01	434136108183301	317TSLP	SE/PD	R	C	1983-	City of Thermopolis	
2	43-095-25CDD01	433933108121901	311PRKC	SE/PD	R	C	1983-	City of Thermopolis	
	JOHNSON COUNTY	MISSOURI RIVER BASIN							
1	48-083-05DCC	440912106512001	374FLTD	SE/PD	C	C	1974-	Mobil Oil	Flathead
2	49-083-27DBA02	441112106493502	331MDSN	SE/PD	C	C	1974-	Mobil Oil	Crazy Woman Canyon
	LARAMIE COUNTY	MISSOURI RIVER BASIN							
1	12-060-07DDD	410059104072401	123BRUL	SE/PD	S	C	1977-	State of Wyoming	Laramie #1
2	12-062-13BAA	410100104160301	111TRRC	SE/PD	S	C	1975-	State of Wyoming	
3	12-063-15AAA02	410111104223102	123BRUL	SE/PD	S	C	1973-	U.S. Geological Survey	
4	13-060-05CCB	410703104071201	123BRUL	SE/PD	S	C	1969-	Elmer Glantz	
5	13-068-13CCC	410530104574001	121OGLL	SE/PD	CH	C	1942-50, 1969-	City of Cheyenne	
6	14-060-05BCB	411238104070801	123BRUL	SE/PD	S	C	1957-	C. C. Gross	
7	14-060-10DBB	411131104041801	123BRUL	SE/PD	S	C	1973-	U.S. Geological Survey	
8	14-061-18DDD01	411022104141201	123WRVR	SE/PD	S	C	1977-	State of Wyoming	Laramie #2
9	14-061-22DCC	410900104110701	123BRUL	SE/PD	S	C	1975-	Sheril Brown	
10	14-063-15AAA	411114104242501	122ARKR	SE/PD	S	C	1977-	State of Wyoming	Laramie #3
11	14-064-01DCB	411214104293301	121OGLL	SE/PD	S	C	1977-	Andy Hollenbeck	Hollenbeck

Table 4.--Ground-water observation wells--Continued

Map number	Well number	Lat-long-seq no.	Geo-logic unit	Funding agency	Field office	Frequency of observation	Period of record	Name of owner	Remarks
	LARAMIE COUNTY--Continued	MISSOURI RIVER BASIN							
12	14-064-19BCC	411005104355001	121OGLL	SE/PD	S	C	1977-	State of Wyoming	Laramie #9
13	14-066-07ADC01	411149104483901	121OGLL	SE/PD	S	C	1984-	National Land Company	Nat'l Land Co. #1
14	14-066-10ABA	411210104452001	121OGLL	SE/PD	S	C	1977-	State of Wyoming	Laramie #8
15	14-067-12ABB01	411213104501401	121OGLL	SE/PD	S	C	1984-	State of Wyoming	
16	14-067-18DDC	411034104554001	121OGLL	SE/PD	CH	C	1956-	City of Cheyenne	
17	14-068-35DDC02	410757104582302	121OGLL	SE/PD	CH	C	1969-	Art King	King #3
18	15-062-20AAA	411531104194701	121OGLL	SE/PD	S	C	1977-	State of Wyoming	Laramie #4
19	15-066-10BAB	411725104454601	121OGLL	SE/PD	S	C	1977-	State of Wyoming	Laramie #7
20	15-068-27CCC01	411400104595901	121OGLL	SE/PD	S	C	1984-	State of Wyoming	
21	16-060-07BBB02	412227104081401	121OGLL	SE/PD	S	C	1975-	State of Wyoming	SW of Albin
22	16-061-17AAA01	411136104125301	121OGLL	SE/PD	S	C	1977-	Jim Miller	Laramie #5
23	17-060-33CBB	412343104053101	121OGLL	SE/PD	S	C	1975-	State of Wyoming	
24	17-062-17CCC	412605104203001	121OGLL	SE/PD	S	C	1982-	State of Wyoming	Laramie #6
25	17-067-33BAB01	412424104535401	121OGLL	SE/PD	S	C	1984-	State of Wyoming	
	NIOBRARA COUNTY	MISSOURI RIVER BASIN							
1	32-062-05BAA	424709104194101	122ARKR	SE/PD	S	C	1979-	State of Wyoming	
2	32-062-32BBB	424244104202001	122ARKR	USGS	C	C	1970-	Richard Pfister	Node
3	32-063-08DAA	424544104260601	122ARKR	SE/PD	S	C	1979-	State of Wyoming	
4	36-062-28AB 01	430422104183201	331MDSN	USGS	C	C	1974-	Energy Trans. Co.	Madison
5	36-062-28AB 02	430422104183202	217LKOT	SE/PD	C	C	1974-	Energy Trans. Co.	Lakota
6	36-062-28BBD01	430421104200701	317MNLS	SE/PD	S	C	1983-	Energy Trans. Co.	
7	38-061-35DCA01	431321104090001	317MNLS	SE/PD	S	C	1983-	Energy Trans. Co.	
	PARK COUNTY	MISSOURI RIVER BASIN							
1	51-099-26DD 01	442130108425301	124WLWD	SE/PD	CH	C	1984-	U.S. Bureau of Land Management	YU Bench Well
2	57-102-03CCD01	445638109102501	124WLWD	SE/PD	CH	C	1984-	Park County	
	PLATTE COUNTY	MISSOURI RIVER BASIN							
1	24-067-21AAB	420237104532101	111ALVM	SE/PD	S	C	1979-	Ed Preuit	
2	24-068-22AAB	420246104590301	122ARKR	SE/PD	S	C	1980-	State of Wyoming	Platte #1

Table 4.--Ground-water observation wells--Continued

Map number	Well number	Lat-long-seq no.	Geologic unit	Funding agency	Field office	Frequency of observation	Period of record	Name of owner	Remarks
	PLATTE COUNTY--Continued		MISSOURI RIVER BASIN						
3	25-067-19DDA01	420718104553901	122ARKR	SE/PD	P	C	1979-	Ed Wilhelm	Wilhelm
4	25-067-34CCD	420524104530201	122ARKR	SE/PD	S	C	1980-	State of Wyoming	Platte #2
5	25-068-12DDA	420859104565001	122ARKR	SE/PD	S	C	1980-	State of Wyoming	Platte #4
6	25-068-15BBD	420840105000401	122ARKR	SE/PD	S	C	1980-	State of Wyoming	Platte #6
7	25-068-24AAD	420748104565051	122ARKR	SE/PD	S	C	1980-	State of Wyoming	Platte #3
8	25-068-31AAA	420613105024401	122ARKR	SE/PD	P	C	1979-	Ernie Douglas	Platte #7
9	26-068-12CBD01	421443104574601	122ARKR	SE/PD	S	C	1980-	State of Wyoming	Rutherford
10	26-068-36BBB01	421128104575801	122ARKR	SE/PD	S	C	1981-	State of Wyoming	Platte #5
11	27-069-25ABC01	421722105042401	123WRVR	SE/PD	S	C	1981-		
	SWEETWATER COUNTY		GREEN RIVER BASIN						
1	18-106-16ADA01	413228109220801	124WSTC	USGS	R	C	1981-	Geological Survey	Oil Shale
2	19-105-10BBB01	413850109150601		SE/PD	R	C	1985-	City of Rock Springs	Rock Springs Golf Course
	WESTON COUNTY		MISSOURI RIVER BASIN						
1	44-063-26CAC	434544104233701	--	SE/PD	S	M	1984-	F. H. Merelli	WSW #1
2	46-063-10CDA	435822104243101	--	SE/PD	S	M	1984-		BHP #3
3	46-063-15ADD	435807104224901	--	SE/PD	S	M	1984-		BHP #4
4	46-066-25DBB01	435610104433001	331MDSN	SE/PD	S	C	1984-	Terra Resources	operated by manometer
5	47-065-01BAB	440633104364201	--	SE/PD	S	M	1985-	Town of Upton	Upton #6
6	48-065-35CCB	440530104381001	337PHSP	SE/PD	S	M	1984-	Town of Upton	Upton #4

WATER-RESOURCES PROJECTS

Water-resources projects being conducted by the U.S. Geological Survey in Wyoming are described on the following pages. The descriptions reflect project status as of February 1985. The project number is given following each title.

The funding agencies during the fiscal year 1985 are shown for each project. The area of each study, unless noted as statewide, is shown as either a shaded area or a large black dot on the index map near the title of each project. The area shown on the map covers only that portion of the project located in Wyoming, even though some projects include portions of surrounding states.

The paragraph "Progress and Significant Results" covers the period for fiscal year 1984. If the project ended in fiscal year 1984, a "Status" paragraph is shown instead of "Plans for fiscal year 1985." If the project ended in fiscal year 1983 or earlier, only a "Status" paragraph is shown.

Water-Resources Projects Conducted

by the Wyoming District

PROJECT TITLE: Surface-water stations (WY 00-001).

FUNDING AGENCIES: Wyoming State Engineer, Wyoming Department of Environmental Quality, Wyoming Water Development Commission, Utah State Engineer, Bureau of Indian Affairs, Bureau of Reclamation, Corps of Engineers, Uinta County, and Geological Survey.

PROJECT LEADER: Stanley A. Druse.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: Ongoing.

PROBLEM: Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water resources development. To provide this information, an appropriate data base is necessary.

OBJECTIVE: The objectives are to (1) 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) prediction of stage or discharge, (d) pollution controls and disposal of wastes, (e) discharge data to accompany water-quality measurements, (f) compact and legal requirements, and (g) research or special studies; and (2) collection of 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 estuaries for use in planning and design.

APPROACH: Standard methods of data collection will be used as described in the series, "Techniques of Water-Resources Investigations of the United States Geological Survey," and partial-record gaging will be used where it serves the required purpose instead of complete-record gaging.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Hydrologic-data compilation and completion of the 1983 data report was done on schedule. The project operated at a reduced level, with one gaging station reactivated, one new gage established, and 12 discontinued. Data-collection platforms were installed at 8 gages. The Interim Analog Digital Recorder (ADR) processing software was installed on the District's PRIME computer to enable the District to do all 1984 water year record computations in-house. Numerous requests for tables of daily flow and statistical summaries of flow were processed. The Green River Field Headquarters was officially closed September 30 and all activities were transferred to the Riverton Field Headquarters.

PLANS FOR FISCAL YEAR 1985: The streamgaging network will continue to show a reduction in activity because of continued de-emphasis of energy-related activities by State and Federal cooperators. The enhancement of in-house capabilities to process streamflow records should provide for the timely completion of record computations and the 1984 data report.

REPORTS PUBLISHED DURING FISCAL YEAR 1984:

Druse, S. A., Schuetz, J. R., and Rucker, S. J., IV, 1984, Water-resources data for Wyoming, water year 1983: U.S. Geological Survey Water-Data Report WY-83-1, 508 p.

Green, Sharon L., 1984, Water-resources investigations of the U.S. Geological Survey in Wyoming, fiscal year 1984: U.S. Geological Survey Open-File Report 84-622, 112 p.

PROJECT TITLE: Ground-water stations (WY 00-002).

FUNDING AGENCIES: Wyoming State Engineer, Wyoming Department of Economic Planning and Development, and Geological Survey.

PROJECT LEADER: Jess O. Ragsdale.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: Ongoing.

PROBLEM: (1) Long-term water-level records are needed to evaluate the effects of climatic variations on the recharge to and discharge from the ground-water systems to provide a data base from which to (a) measure the effects of development, (b) assist in the prediction of future supplies, and (c) provide data for management of the resource. (2) Short-term water-level records are also needed for (a) ground-water resources assesments, (b) areal investigations, and (c) water-use investigations.

OBJECTIVE: The objectives are to (1) collect water-level data sufficient to provide a minimum long-term data base so that the general hydrological response to climatic variations and induced stresses is known and potential problems can be defined early enough to allow planning and management; and (2) provide a data base against which short-term records acquired in areal studies can be analyzed. This analysis must provide (a) 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 ground-water management.

APPROACH: The most advantageous locations for long-term observations will be determined. This network will be refined as records become available and detailed areal studies of the ground-water system more closely define the aquifers, their properties, and the stresses to which they are subjected.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Sixteen wells were added to the network and were equipped with continuous digital recorders. The new network wells included one in a reclaimed coal spoil, one in an adjacent undisturbed area, and one at a deep (1000 ft) well, with the remainder in areas of heavy ground-water withdrawals. Most hand-measured wells were discontinued, leaving a total of 77 wells equipped with digital recorders and 9 hand-measured wells. Hydrograph retrievals were made for the planned open-file report, which will show changes in ground-water levels in Wyoming during the period 1974-83.

PLANS FOR FISCAL YEAR 1985: Wells will be added to the network in areas of the State where monitoring is determined to be needed. A project proposal will be developed, jointly with the water-quality station project (WY-003), to establish a ground-water quality monitoring network. The planned report on ground-water level changes in Wyoming will be completed and the review will be started.

REPORTS PUBLISHED DURING FISCAL YEAR 1984:

Druse, S. A., Schuetz, J. R., Rucker, S. J., IV, 1984, Water-resources data for Wyoming, water year 1983: U.S. Geological Survey Water-Data Report WY-83-1, 508 p.

PROJECT TITLE: Water-quality stations (WY 00-003).

FUNDING AGENCIES: Wyoming Department of Agriculture, Wyoming Department of Environmental Quality, Wyoming Water Development Commission, Bureau of Indian Affairs, Bureau of Reclamation, and Geological Survey.

PROJECT LEADER: Samuel J. Rucker, IV.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: Ongoing.

PROBLEM: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. For intelligent planning and realistic assessment of the water resource, the chemical and physical quality of the rivers and streams must be defined and monitored.

OBJECTIVE: The objectives are to provide a national bank of water-quality data for broad Federal planning and action programs and to provide data for State and Federal management of interstate waters.

APPROACH: A network of water-quality stations will be operated to provide data on average chemical concentrations, loads, and trends as required by planning and management agencies.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: The water-quality network changed very little during the year, with only one station being added. Sampling frequencies were decreased at several sites to compensate for no increases in funding. Selected water-quality sampling of two dilute-solution lakes, New Fork and Fremont, was conducted jointly with Central Region research personnel, in cooperation with the Wyoming Water Development Commission. All water-quality data collected during the 1983 water year were compiled and published in the 1983 water year data report.

PLANS FOR FISCAL YEAR 1985: The number of surface water stations in the water-quality monitoring network will remain little changed. Sampling frequency analyses and site locations will be modified to meet network needs and changes in sampling procedures. A project proposal will be developed, jointly with the ground-water station project (WY-002), to establish a ground-water quality monitoring network.

REPORTS PUBLISHED DURING FISCAL YEAR 1984:

Druse, S. A., Schuetz, J. R., Rucker, S. J., IV, 1984, Water-resources data for Wyoming, water year 1983: U.S. Geological Survey Water-Data Report WY-83-1, 508 p.

PROJECT TITLE: Sediment stations (WY 00-004).

FUNDING AGENCIES: Wyoming Department of Environmental Quality, Bureau of Reclamation, and Geological Survey.

PROJECT LEADER: Stanley A. Druse.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: Ongoing.

PROBLEM: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. Sediment concentrations and discharges in rivers and streams must be defined and monitored.

OBJECTIVE: The major objectives are to (1) provide a national bank of sediment data for use in broad Federal and State planning and action programs, (2) provide data for Federal and State management of interstate waters, and (3) provide data for interpretation in areal studies.

APPROACH: A network of sediment stations will be established and operated to provide data on areal and temporal averages and trends of sediment concentration, sediment discharges, and particle size distribution of sediment being transported by rivers and streams.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Sediment-data collection and processing continued at 15 gaging stations. Pumping samplers were in operation at 4 stations, daily samples were collected at 3 stations, and the remaining stations were special samples or infrequent. An initial draft of a report summarizing the reconnaissance-type sampling program was completed.

PLANS FOR FISCAL YEAR 1985: Data collection and processing will continue identical to the 1984 water year. New projects under consideration for the 1985 water year are (1) determine if a sediment load-peak discharge relation could be established, using the continuous record data in the files, and (2) establish continuous-record sediment stations at two sediment-problem locations and include bed-load sampling (record collection at each station will not to exceed 2 years).

REPORTS PUBLISHED DURING FISCAL YEAR 1984:

Druse, S. A., Schuetz, J. R., Rucker, S. J., IV., 1984, Water-resources data for Wyoming, water year 1983: U.S. Geological Survey Water-Data Report WY-83-1, 508 p.

PROJECT TITLE: Flood investigations (WY 84-006).

FUNDING AGENCY: Federal Emergency Management Agency.

PROJECT LEADER: Leslie W. Lenfest.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: February 1984 through September 1985.

PROBLEM: The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 provide for the operation of a flood insurance program. The Federal Emergency Management (FEMA) needs flood studies in selected areas to determine applicable flood insurance premium rates.

OBJECTIVE: The objective is to conduct the necessary hydrologic and hydraulic evaluations and studies of areas assigned by FEMA and to present the results in an appropriate format.

APPROACH: Evaluations or surveys will be conducted by ground or photogrammetric methods. Flood-discharge frequency relationships will be determined using local historical information, gaging station records, or other applicable information. Water-surface profiles will be determined using step-backwater models or by other acceptable methods and the results will be furnished in reports prepared to FEMA specifications.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Twenty-one communities were examined in the State of Wyoming that were proposed by the FEMA for flood insurance. Recommendations were made to Headquarters with regard to community priority and to the method of study to be used in determining flood-prone areas within the proposed community. Headquarters will prepare an open-file report summarizing the information for FEMA. Aerial photographs of Baggs, Wyoming were taken in May 1984 during an approximately 100-year frequency flood. These photographs will help delineate the extend of flooding in Baggs for the insurance study.

PLANS FOR FISCAL YEAR 1985: A proposal has been for $300,000 worth of work for the next 2 fiscal years. If the proposed work is approved, flood-prone studies will begin on high-priority communities.

PROJECT TITLE: Water-use data system for Wyoming (WY 84-007).

FUNDING AGENCIES: Wyoming State Engineer and Geological Survey.

PROJECT LEADER: Joel R. Schuetz.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: January 1984 through September 1987.

PROBLEM: The demand for water for a variety of competing uses in Wyoming is expected to continue to increase. Planners and managers at all levels of government need detailed, accurate water information in order to assure that maximum benefits are derived from the available water. Available water-use data for Wyoming may be incomplete or of doubtful accuracy. The Geological Survey has designed and implemented a program to develop a uniform national data base of water-use information. A water-use data system is needed in Wyoming, not only to meet national needs, but to provide State agencies with the detailed information needed for water planning and administration.

OBJECTIVE: The objective of the water-use program for Wyoming is to establish a water-use data system that is responsive to the needs of water planners at both the State and national levels. The system will provide for the collection, storage, retrieval, and dissemination of water-use data. The data base will include quantitative information about water rights, withdrawals, transfers, and returns.

APPROACH: The State Water Forum will be consulted and a detailed work plan will be developed. The State Water-Use Data System will be loaded on the Prime computer. Personnel with the Wyoming State Engineer's Office will assist with the coding and verification of data on the ground-water permits.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Wyoming State Engineer's permit file data was entered into the Ground-Water Site Inventory (GWSI) system. Preliminary work was started on analyzing the data in the GWSI system to obtain the number of wells by county and the groundwater withdrawals for Wyoming. Preliminary work was done on investigating methods to determine the irrigated acreage in the State.

PLANS FOR FISCAL YEAR 1985: The analysis of the data in the GWSI file will be continued and a report will be prepared based on these findings. The State Water Use Data System (SWUDS) program will be initialized and tested on the District's PRIME computer and data will be entered into the system as it becomes available. Data will be compiled for the 1985 report on estimated water use in the United States.

PROJECT TITLE: Flood investigations in Wyoming (WY 59-010).

FUNDING AGENCIES: Wyoming Highway Department and Geological Survey.

PROJECT LEADER: Stanley A. Druse.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: July 1958 through September 1985.

PROBLEM: The optimal design of highway drainage structures requires a knowledge of the magnitude and frequency of peak discharges expected at a given site. This knowledge may be derived either from data collected at the desired location or from regional analysis of peak-flow characteristics. The paucity of peak-flow data for small drainage basins in Wyoming, particularly for ephemeral streams, restricts the use of the regionalization techniques presently available. A network of peak-flow partial-record sites is needed to supplement the existing network of continuous-record streamflow stations.

OBJECTIVE: The main objective is to obtain sufficient basic hydrologic data to define the magnitude and frequency of floods on a regional basis for the entire State and to publish the interpretative analyses in easily usable form. On request from the cooperator, flood-flow characteristics of streams at specific sites will be determined by studying certain factors as: history of past floods, distribution of flow across the flood-plain and main channel, and mean velocities in the main channel and overflow areas.

APPROACH: Available flood data will be analyzed, and sites for crest-stage gages will be selected where they will best supplement the existing network of continuous-record stream-gaging stations. Stage-discharge relations will be defined for each crest-stage site by recording water stage and by making current-meter measurements, indirect measurements of peak flow, or by using the "step-backwater method." Basin characteristics that are pertinent in flood-frequency analysis will be determined. Frequency characteristics will be related to basin characteristics by regression analysis. Peak-flow measurements will be made at miscellaneous sites where unusual floods occur.

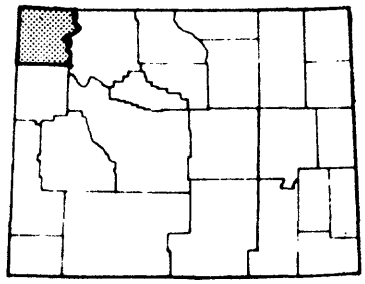
PROGRESS AND SIGNIFICANT RESULTS FOR 1984: The 33 crest-stage gages that remained in the program were discontinued September 30, 1984. An evaluation was started to determine the relative stability of the stage-discharge relation at each gage from surveys of the controlling features. The initial draft of the final project report was completed. The report will present the history of the project; flood-frequency relations; flood-volume frequency relations; techniques for estimating flood volumes, peaks, and discharge hydrographs; and historical flood information. A second report, which documents the use of paleoflood information to improve flood-frequency relations, was submitted for in-District review.

PLANS FOR FISCAL YEAR 1985: The evaluation of the stability of stage-discharge relations will be completed. The final project report and the paleoflood report will be completed and reviewed. Publication of the final project report is scheduled and will be done by the Wyoming Highway Department. Additional funding is expected to be sufficient to provide for investigation of special flood problems, such as extreme flood events.

REPORTS PUBLISHED DURING FISCAL YEAR 1984:

Druse, S. A., Schuetz, J. R., Rucker, S. J., IV., 1984, Water-resources data for Wyoming, water year 1983: U.S. Geological Survey Water-Data Report WY-83-1, 508 p.

PROJECT TITLE: Monitoring wastewater effluent in Yellowstone National Park, Wyoming (WY 74-027).



FUNDING AGENCY: National Park Service.

PROJECT LEADER: Edward R. Cox.

FIELD LOCATION: Northwestern Wyoming.

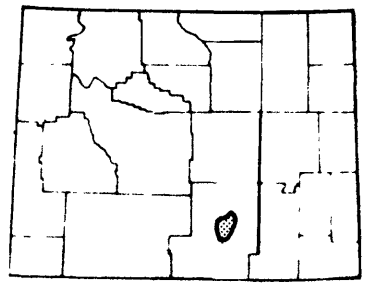
PERIOD OF PROJECT: June 1974 through September 1982 (completed December 6, 1984).

STATUS: Permission was given by the National Park Service to publish the report and it was approved by the Director for publication as a Water-Resources Investigations report.

REPORT COMPLETED DURING FISCAL YEAR 1985:

Cox, E. R., 1985, Wastewater movement near four treatment and disposal sites in Yellowstone National Park, Wyoming: U.S. Geological Survey Water-Resources Investigations Report 84-4356 (in press).

PROJECT TITLE: Impacts of economic development and water use on water resources in the Hanna Basin in Wyoming (WY 75-031).



FUNDING AGENCY: Geological Survey.

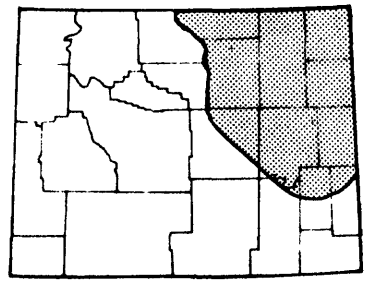
PROJECT LEADER: Pamela B. Daddow.

FIELD LOCATION: South-central Wyoming.

PERIOD OF PROJECT: July 1974 through September 1980 (complete except report).

STATUS: The one remaining report will be completed and released as an open-file hydrologic data report during fiscal year 1986.

PROJECT TITLE: Water resources of the Powder River structural basin in Wyoming in relation to energy development (WY 75-032).



FUNDING AGENCIES: Department of Energy and Geological Survey.

PROJECT LEADER: Marlin E. Lowry.

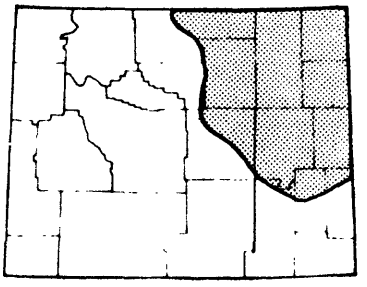
FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: November 1974 through September 1980 (complete except reports).

STATUS: Two reports were in process at the beginning of the year. The report on surface-water quality of the North Platte River was approved as Water Resources Investigations Report 84-4172. The report on ground-water/surface-water relations is being revised following colleague review.

REPORT COMPLETED DURING FISCAL YEAR 1984:

Larson, L. R., 1984, Water quality in the North Platte River, east-central Wyoming: U.S. Geological Survey Water-Resources Investigations Report 84-4172 (in press).



PROJECT TITLE: Hydrology of Paleozoic rocks in the Powder River basin and adjacent areas, northeastern Wyoming (WY 75-033).

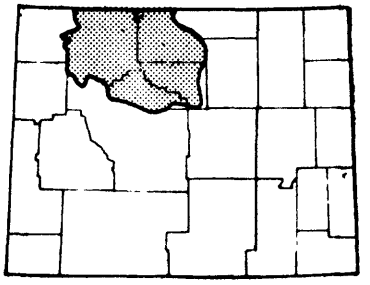
FUNDING AGENCY: Geological Survey.

PROJECT LEADER: (vacant).

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: November 1974 through September 1980 (complete except report).

STATUS: The one remaining report for this project, a compilation of ground-water and surface-water data for the Madison Limestone in Wyoming will be completed, receive colleague review, and approved as an open-file report.



PROJECT TITLE: Evaluation of Paleozoic and alluvial aquifers in the Bighorn Basin, Wyoming (WY 75-034).

FUNDING AGENCIES: Wyoming State Engineer and Geological Survey.

PROJECT LEADER: Maurice E. Cooley.

FIELD LOCATION: North-central Wyoming.

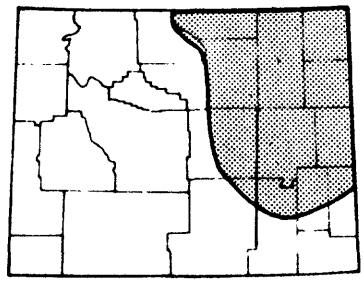
PERIOD OF PROJECT: December 1974 through September 1977 (completed August 2, 1984).

STATUS: The final report on Paleozoic aquifers was approved Aug. 2, 1984 for publication as a Water-Supply Paper, with interim release as Open-File Report 84-621.

REPORT COMPLETED DURING FISCAL YEAR 1984:

Cooley, M. E., 1984, Artesian pressures and water quality in Paleozoic aquifers in the Ten Sleep area, Bighorn basin, north-central Wyoming: U.S. Geological Survey Water-Supply Paper (in press) and Open-File Report 84-621 (in press).

PROJECT TITLE: Northern Great Plains regional aquifer-system analysis, Wyoming (WY 78-049).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Dwight T. Hoxie.

FIELD LOCATION: Northeastern Wyoming.

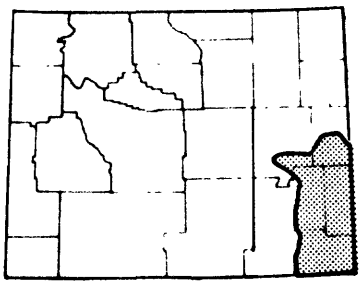
PERIOD OF PROJECT: October 1977 through September 1981 (complete except report).

STATUS: Six reports remained to be completed at the beginning of the year. During the year, linear-features maps for Wyoming, Montana, and North Dakota and a data report on ground-water quality were approved as open-file reports. A map showing showing distribution of potential fracture permeability in sedimentary rocks was approved as a Miscellaneous Investigations Map. The last report, the hydrology of the Dakota Sandstone, is being revised. Additional colleague review will be done after the revision, and the report will be submitted for approval as a Water-Supply Paper.

REPORT COMPLETED DURING LATE 1984:

Cooley, M. E., 1984, Divisions of potential fracture permeability based on distribution of structures and linear features in sedimentary rocks, Northern Great Plains--Rocky Mountains region of Montana, North Dakota, South Dakota, Wyoming, and northern Nebraska: U.S. Geological Survey Miscellaneous Investigations Map I-1687 (in press).

PROJECT TITLE: High Plains regional aquifer-system analysis, Wyoming (WY 78-050).[1]



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Charles F. Avery.

FIELD LOCATION: Southeastern Wyoming.

PERIOD OF PROJECT: October 1977 through September 1982 (complete except report).

STATUS: Four reports remained to be completed at the beginning of the year. During the year, the potentiometric-surface map was approved as a Water-Resources Investigations Report and linear-features maps for western Kansas and for the Texas-Oklahoma Panhandles were approved as open-file reports. The fracture-permeability map report was revised in order to start colleague review. It will then be submitted for approval as a Water-Resources Investigations Report.

REPORT COMPLETED DURING LATE FISCAL YEAR 1984:

Cooley, M. E., 1984, Linear features determined from Lansat imagery in the Texas and Oklahoma Panhandles: U.S. Geological Survey Open-File Report 84-589.

PROJECT TITLE: Precipitation, infiltration, and runoff relations for small basins in Wyoming (WY 80-054).

FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: James G. Rankl.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: January 1980 through September 1982 (complete except report).

STATUS: The final report, a computational method for computing infilitration, has been reviewed by two colleagues and the U.S. Bureau of Land Management. The report will be modified, review comments will be answered, and the final report will be submitted for approval.

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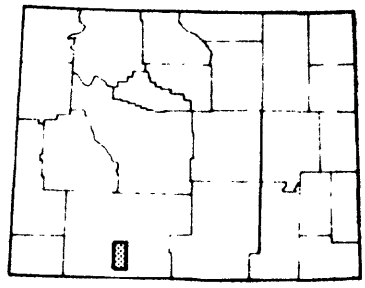
[1] This project is subsidiary to project CR 78-229, described on page 85.

PROJECT TITLE: Quality of runoff from small basins in plains areas--Wyoming (WY 80-055).



FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: Lewis L. DeLong.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: January 1980 through September 1981 (complete except report).

STATUS: The author, who transferred out of the District several years ago, was contacted and returned on a one-week detail during August 1984 to complete technical details of the report. Work on the report is in progress, and it is expected to be completed during 1985.

PROJECT TITLE: Streamflow characteristics of energy-mineral areas in Wyoming (WY 80-056).

FUNDING AGENCY: Bureau of Land Management.

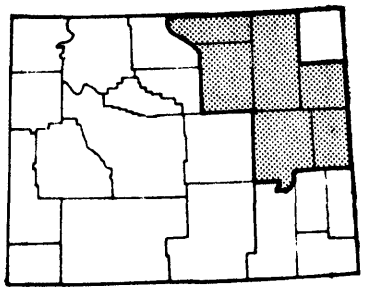
PROJECT LEADER: Hugh W. Lowham.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: March 1980 through September 1982 (complete except report).

STATUS: Updated regression computations were made of the final estimating relations, using new information and data for stations where historical evidence of flood records from another project study (WY 59-010) were used to refine flood-frequency analyses. The draft of the report is about 50 percent completed. The estimating equations for this project will also be used for project WY 59-010.

PROJECT TITLE: Biological communities of small streams in Wyoming (WY 80-057).



FUNDING AGENCY: Geological Survey.

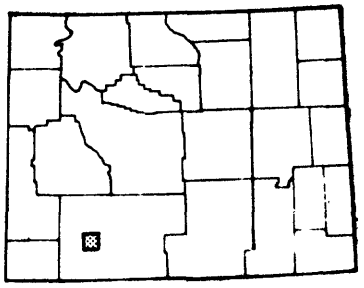
PROJECT LEADER: David A. Peterson.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: January 1980 through September 1981 (complete except report).

STATUS: The final report will be revised and submitted for colleague review during 1985. The report will be published in the Water-Resources Investigations series.

PROJECT TITLE: Hydrologic investigation of the in situ oil-shale retort area near White Mountain, southwestern Wyoming (WY 81-059).



FUNDING AGENCY: Geological Survey.

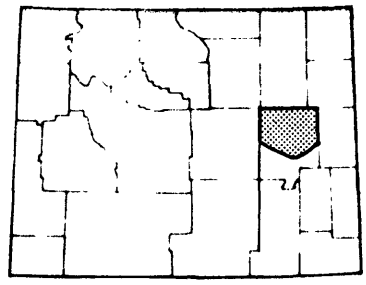
PROJECT LEADER: Kent C. Glover.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: October 1980 through September 1983 (complete except report).

STATUS: Four final reports are being processed. The reports on the solute-transport model and leachate migration from an in situ oil shale retort site were reviewed and submitted for approval. The report on monitoring techniques was written and started in review. The report on water chemistry is in preparation.

PROJECT TITLE: Ground-water hydrology of the Southern Powder River Uranium District, Wyoming (WY 81-060).



FUNDING AGENCIES: Wyoming State Engineer, Wyoming Department of Environmental Quality, and Geological Survey.

PROJECT LEADER: Marlin E. Lowry.

FIELD LOCATION: East-central Wyoming.

PERIOD OF PROJECT: October 1980 through September 1984 (complete except report).

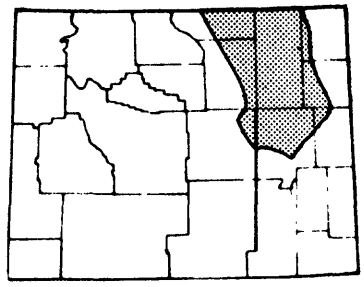
PROBLEM: Uranium exploration in the southern Powder River basin has resulted in thousands of test holes; many of which were poorly plugged. These poorly plugged test holes have resulted in flow between formerly isolated aquifers and uncontrolled flow at the surface. Development of uranium has resulted in impacts on the ground-water system from pumping for supplies and for dewatering mines. There are presently seven surface mines, four underground mines, and three in situ mines; additional mines are planned. Agriculture in the area is highly dependent on ground water. Therefore, the impacts of exploration and development are a concern.

OBJECTIVE: The objectives are to (1) determine the existing hydrologic system, (2) determine the impacts on the ground-water system of the past and present uranium exploration and development, and (3) predict effects that might result from continued or modified uranium development in the future.

APPROACH: The first phase of the project will be to analyze the data obtained from companies and to establish a data-collection network. Data analysis will include testing concepts of how the hydrologic system operates and describing the geologic framework. Consistency with water-quality data will be an additional test of the concepts. The second phase will be to construct a digital model and collect additional required data. After calibration of the model, the effects of mining in the area will be simulated.

STATUS: The final report was completed and submitted for preliminary review in March 1984. It will be processed for publication in the Water-Resources Investigations series.

PROJECT TITLE: Potentiometric maps of shallow aquifers in the Powder River basin, northeastern Wyoming (WY 81-062).



FUNDING AGENCY: Bureau of Land Management.

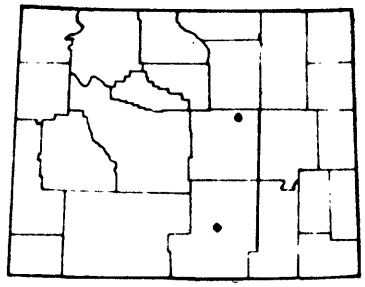
PROJECT LEADER: Pamela B. Daddow.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: March 1981 through September 1983 (complete except report).

STATUS: The potentiometric-surface map report for the Wyodak-Anderson coal has been completed and submitted for review. Comments from the reviewers will be acknowledged, reviewed, and answered. The report will be processed for publication in the Water-Resources Investigations series.

PROJECT TITLE: Sediment yield from natural and reclaimed small ephemeral stream basins in Wyoming (WY 81-066).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: James G. Rankl.

FIELD LOCATION: Central and southern Wyoming.

PERIOD OF PROJECT: April 1981 through September 1984 (complete except report).

PROBLEM: A recurring question in describing the impacts of energy development is, "What will be the change, if any, in sediment transport?" Although sediment data are being collected at a number of stations in the State, none of the stations are on an ephemeral stream of the size that will be impacted by surface mines. Information about potential changes in sediment transport caused by mining is needed for assessing the effects of proposed and active mining on or near ephemeral streams.

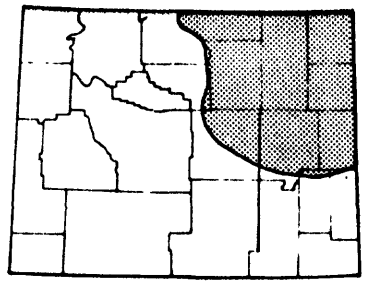
OBJECTIVE: The objectives are (1) to relate sediment yield to rainfall and runoff and determine if a significant difference can be attributed to surface mining; (2) to determine the relative importance of channel erosion and slope wash as sediment sources; and (3) if a Geological Survey transport model is approved by the Division during the period of study, the transport model will be added as a subroutine to the rainfall-runoff model of the Central Region research program, and the sediment transport calibrated.

APPROACH: Dugout Creek tributary, located in the Powder River Basin, will be instrumented for the collection of sediment and rainfall data. In 1982, a small basin, constructed from coal-mine spoil, was selected in the Hanna Basin and instrumented. Rainfall, runoff, and sediment-concentration data will be collected for each basin. Also, data will be collected on channel and upland erosional processes to determine the range of parameter values that can be expected for small natural and reclaimed basins. Provided that a sediment-transport model will be available, the data collected will be used to calibrate and test the model.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Data collection was completed for Dugout Creek and Big Ditch tributaries. Both streamflow stations were discontinued. The Precipitation-Runoff Modeling System model was used to evaluate the interaction between physical processes which control sediment yield. The greatest change in computed sediment load was caused by changing the parameter values for the sediment-transport equations. A relationship was developed between the peak of storm runoff and the total sediment load for that storm runoff. The standard error of the relationship is 34 percent with a 0.99 correlation coefficient. The first draft of the final report has been written, but has not been reviewed or published.

STATUS: The report will be submitted for review and publication during 1985.

PROJECT TITLE: Low flow of streams in the Powder River structural basin, Wyoming (WY 81-067).



FUNDING AGENCY: Geological Survey.

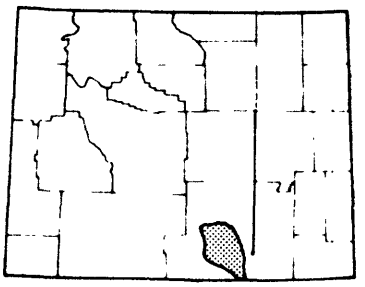
PROJECT LEADER: Gerald W. Armentrout, Jr.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: July 1981 through December 1981 (complete except report).

STATUS: The final report remained in rough-draft form. The report needs extensive revision, which will be completed during 1985. The final report will receive colleague review and be submitted for approval as a Water-Resources Investigations Report.

PROJECT TITLE: Hydrologic evaluation of the shallow aquifer system in Saratoga Valley, south-central Wyoming (WY 82-068).



FUNDING AGENCIES: Wyoming State Engineer and Geological Survey.

PROJECT LEADER: Marvin A. Crist.

FIELD LOCATION: South-central Wyoming.

PERIOD OF PROJECT: October 1981 through September 1984 (complete except report).

PROBLEM: Wells in the Saratoga Valley provide water to supplement surface water used for irrigation. About 30 irrigation wells were in use during 1981. Observation well records indicate water levels in parts of the valley declined as much as 13 feet between July 1980 and June 1981. The cause of this decline has not been identified. Development of large-capacity wells such as irrigation wells is not restricted. State water administrators need an evaluation of the effect of ground-water development upon water-levels and upon stream discharge.

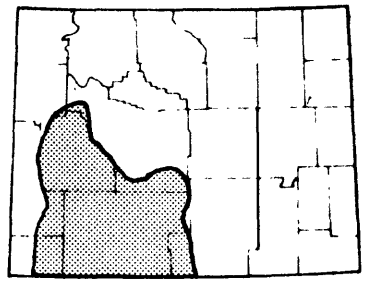
OBJECTIVE: The objectives are to (1) develop a concept of operation of the hydrologic system, (2) describe the effect of ground-water development upon water levels and (3) determine if a digital model can be used to help understand the operation of the stream-aquifer system.

APPROACH: Data collected during project WY 80-058 will provide the base for this study. The water-level monitoring network established by L. W. Lenfest will be continued. A quantitative analysis will be made of the data to determine if additional data are needed to prepare a digital model of the hydrologic system. It may be desirable to make more seepage runs to help define a water budget for the valley.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: The digital model was expanded to include a larger area. Recharge and discharge was recalculated for the area. The attempts made to calibrate the model to the natural hydraulic-head distribution revealed boundary conditions somewhat different than the imposed conditions. Without measured data, further attempts to improve calibration were not justified. The first draft of the report has been prepared.

STATUS: The final report will be completed during 1985 and published in the Water-Resources Investigations series.

PROJECT TITLE: Upper Colorado River Basin regional aquifer-system analysis, Wyoming (WY 82-070).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: Kent C. Glover.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: October 1981 through September 1985.

PROBLEM: Ground-water supplies are needed to augment surface-water supplies for mineral development in the Green River basin of Wyoming. The regional availability and quality of supply, hydrologic consequences of development and subsequent disposal of waste water need to be investigated. Overall operation knowledge of the three-dimensional ground-water-flow system and the interaction with the surface-water regime is required to assess the effects of ground-water development and to ensure such development does not impair compliance with compacts affecting the upper Colorado River and its tributaries.

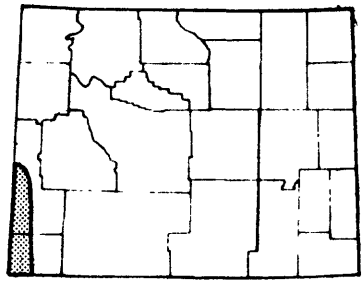
OBJECTIVE: The objectives are to (1) identify aquifer units within the overall hydrogeologic framework, (2) estimate quantitatively aquifer and confining-unit hydraulic properties and parameters, (3) identify structural settings favorable for the development of secondary permeability, (4) infer ground-water flow-system operation and its interaction with the surface-water flow regime, (5) assess regional distribution of ground-water quality and availability of supply, and (6) develop capability of assessing consequences of current and projected ground-water use.

APPROACH: Existing water-well, drill-stem-test, and geophysical data will be used to establish the overall hydrogeologic framework, to estimate aquifer and confining-bed hydraulic properties and parameters, and to infer spatial distribution of ground-water quality. Digital-modeling and parameter-estimation techniques will be employed to the extent feasible to develop and refine a conceptualization of overall ground-water flow-system operation. Current and historical ground-water-use data will be collected.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Structural, thickness, dissolved-solids and some potentiometric-surface maps were prepared for inclusion in a Hydrologic Atlas on Tertiary-age aquifers.

PLANS FOR FISCAL YEAR 1985: The maps for publication in the Hydrologic Atlas Series on Tertiary-age aquifers will be completed and submitted for review. Hydraulic-conductivity data will be compiled and the areal distribution of aquifer properties will be described. The distribution of hydrochemical facies for Tertiary-age aquifers will be identified and a flow model of Tertiary-age rocks will be started. Two reports describing aquifer properties and hydrochemical facies will be prepared.

PROJECT TITLE: Stream-aquifer interaction in the Upper Bear River Valley of Wyoming and Utah (WY 82-072).



FUNDING AGENCIES: Wyoming State Engineer and Geological Survey.

PROJECT LEADER: Kent C. Glover.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: January 1982 through September 1984 (complete except for report).

PROBLEM: Water of the Bear River drainage is allocated by interstate compact among the states of Idaho, Utah, and Wyoming. The compact has recently been interpreted to include ground-water withdrawals that result in streamflow depletion. However, insufficient information is available to quantify the contribution of the ground-water system to streamflows of the Bear River and its tributaries. Such information is needed before decisions can be made concerning the allocation of ground-water.

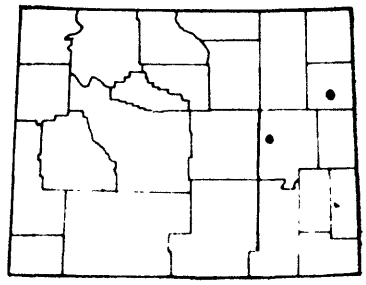
OBJECTIVE: The objectives are to (1) determine the effect of existing ground-water pumpage on streamflows, (2) determine the total amount of surface and subsurface water in alluvium flowing across the state boundaries, and (3) provide the methodology for evaluating the effect that future ground-water development may have on streamflow.

APPROACH: The Bear River valley upstream from the Idaho-Wyoming border will be studied. Work tasks include mapping the potentiometric surface of alluvium, conducting a pumpage inventory, measuring water levels and streamflow diversions periodically, estimating flow from ungaged drainages, conducting seepage runs, estimating evapotranspiration, and conducting surveys of channel geometry. Data will be used to calibrate a digital stream-aquifer model and establish error tolerances for model parameters. The model will be used to evaluate the effects of existing pumpage on streamflow and to predict the effects of additional pumpage during years of low streamflow.

PROGRESS AND SIGNIFICANT RESULTS DURING FISCAL YEAR 1984: The flow model of the northern Bear River valley was calibrated under transient-flow conditions of 1980 and 1981. The effects of pumping on streamflow during 1- and 10-year droughts was predicted. Two reports were written and review started.

PLANS FOR FISCAL YEAR 1985: The two final reports, one describing the model and one describing the applications of the model, will receive colleague review and be submitted for approval as Water-Resources Investigations reports.

PROJECT TITLE: Recharge of shallow aquifers through ephemeral stream channels in Wyoming (WY 82-073).



FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: Leslie W. Lenfest, Jr.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: October 1981 through September 1984 (complete except report).

PROBLEM: The Surface Mining Act requires the protection of the essential hydrologic function of alluvial valley floors by either preservation or reclamation. The concern is principally for protection of subirrigation and flood irrigation. However, another important function of the alluvium in some areas is its role in recharge to bedrock aquifers. Because alluvium often is more permeable than the upland soil, flow in ephemeral streams can infiltrate rapidly and be held in transient storage for recharge to underlying bedrock. The recharge function of alluvium in coal-producing areas is not known.

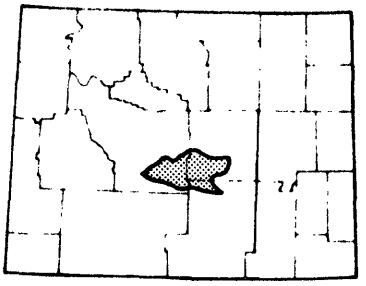
OBJECTIVE: The objectives are to (1) determine the relationship of water in the alluvium to streamflow, and the relationship of water in the alluvium to water in bedrock aquifers; and (2) evaluate the potential use of streamflow records to determine seepage from ephemeral streams.

APPROACH: A basin with an ephemeral reach will be selected and equipped with stage recorders and supplemental crest-stage gages. Observation wells will be drilled in the alluvial and bedrock aquifers adjacent to the streams. Hydrographs from a finite-difference-routing model will be compared with observed hydrographs for possible use in estimating recharge if corresponding changes occur in the wells. Water-level and soil-moisture measurements will be used to determine downward movement from the stream to the saturated zone. A second site with a single gage will be used to verify hydraulic properties of the alluvium.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Data collection was completed in December 1984. Ground-water levels in most of the observation wells rose when the streams contained water. Two methods were chosen for estimating ground-water discharge. Ground-water recharge was estimated from surface-water losses along the Cheyenne River as 13.0 acre-feet per mile or less. The report was completed in April 1984 and is currently in colleague review.

STATUS: The surface-water gages along the Cheyenne River study reach will be dismantled during fiscal year 1985. Recorders on the ground-water observation wells will be removed and the observation wells will be plugged. Review comments made in regard to the report will be considered and incorporated in the final version of the report. The report will be submitted for review and approval.

PROJECT TITLE: Preliminary digital model of the Arikaree Aquifer in the Sweetwater River basin, central Wyoming (WY 82-075).



FUNDING AGENCIES: Wyoming State Engineer, Wyoming Department of Economic Planning and Development, and Geological Survey.

PROJECT LEADER: William B. Borchert.

FIELD LOCATION: Central Wyoming.

PERIOD OF PROJECT: October 1981 through September 1983 (complete except report).

STATUS: Streamflow measurements made along seven northward flowing creeks were used to identify gaining and losing reaches. Water-level data from 105 wells were evaluated. The first draft of the water-level contour map was completed. The water-level contour map will be reviewed and published as a Water-Resources Investigations report. The ground-water-flow model was not started as the project was terminated by the cooperator.

PROJECT TITLE: Fluvial system in energy-mineral areas of Wyoming (WY 83-076).

FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: Hugh W. Lowham.

FIELD LOCATION: Statewide.

PERIOD OF PROJECT: October 1982 through September 1986.

PROBLEM: Considerable development of energy-mineral resources and an associated disturbance of significant amounts of land surface are occurring in Wyoming. These developments commonly affect stream channels and drainage networks. The result may be an undesirable modification of the stream channel and drainage network, and an increase in sedimentation and erosion. The Bureau of Land Management and other groups need information about the natural functions of fluvial systems and the responses of the systems to disturbances caused by changes in land use, including mining and reclamation.

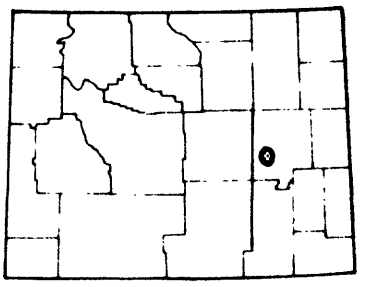
OBJECTIVE: The objective is to describe how the fluvial systems function in energy-mineral areas and how these systems can be expected to respond to various activities related to development of the resources. In particular, information will be presented for dealing with (1) crossing of streams by pipelines and roads, (2) disturbance of areas by oil-and-gas site locations, (3) disturbance and reclamation of areas that are strip mined, and (4) activities such as channelization and disposition of production waters that may create instability of stream channels.

APPROACH: A literature search of important concepts, and of guidelines and regulations applicable to the design of reclaimed drainages will be made. An investigation will be made of channel response to past developments, and case histories will be documented to highlight the need for planning and design. Current methods used by mining companies, for design of drainages disturbed by strip mining, will be reviewed and evaluated. Mathematical models of landform evaluation will be investigated to determine if they can be applied as an aid to initial contouring of reclaimed landscapes.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: A sample of 102 small basins in northeastern Wyoming was selected for determining physical characteristics of natural drainage networks. Twenty-two characteristics were measured for each of the basins using topographic maps and a digitizer. Graphs and relations were then developed among the characteristics found to be most important to landscape stability. A progress report was provided to the cooperator.

PLANS FOR FISCAL YEAR 1985: If funding is secured, basins in other areas of Wyoming will be selected for addition to the data base. The original work plan was reduced during 1984 due to a reduction in funding. It is planned to extend the study through 1986.

PROJECT TITLE: Hydrology of the Madison Limestone in the Glenrock area, east-central Wyoming (WY 83-077).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: David A. Peterson.

FIELD LOCATION: East-central Wyoming.

PERIOD OF PROJECT: January 1983 through September 1985.

PROBLEM: Water from the Madison Limestone may be used to supplement surface-water supplies for a proposed coal-gasification plant. Several deep wells (6,000 ft) have been drilled in an area near Glenrock where little is known about vertical movement of water in the Madison or about the magnitude of recharge from streams crossing Madison outcrops. The new wells and existing paired streamflow stations provide a rare opportunity to study the local hydrologic system and to test and improve previously developed concepts in the Madison regional study. Such knowledge is needed for the use of Madison water for energy-resource development.

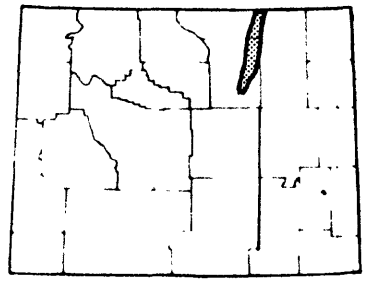
OBJECTIVE: The objectives will improve the understanding of: (1) movement of water between the shallow and deep parts of the Madison Limestone, (2) vertical velocity of water between the Madison and overlying rock, and (3) the relationship of water in the Madison Limestone to streamflow.

APPROACH: Wells and springs in Paleozoic aquifers will be inventoried. Existing water-level and water-quality data will be compiled and evaluated for two Madison wells and the Douglas City spring. Streamflow data will be compiled and evaluated for three pairs of gaging stations upstream and downstream from the Madison outcrop. Water-level data will be collected from a deep well in order to compare seasonal fluctuations of ground-water levels to the fluctuations of streamflow and of discharge of the Douglas spring. Isotope and salinity samples will be collected as possible indicators of water movement within the Madison. Vertical velocities will be measured from temperature profiles in a deep well.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Analyses of isotopes of carbon, sulphur, and hydrogen by U.S. Geological Survey laboratories show some similarities between water from the Madison Limestone and Casper Formation. Water-level measurements indicate connection between the shallow and deep Madison Limestone. A temperature profile of the Madison deep well indicates possible circulation within the Casper Formation.

PLANS FOR FISCAL YEAR 1985: The project was extended to September 1985 for completion of the report. The report will be submitted for colleague review and published in the Water-Resources Investigations series.

PROJECT TITLE: Hydrologic properties of the alluvial deposits along the Powder River between Sussex, Wyoming and Moorhead, Montana (WY 83-078).



FUNDING AGENCIES: Bureau of Land Management and Geological Survey.

PROJECT LEADER: Bruce H. Ringen.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: March 1983 through September 1985.

PROBLEM: The Powder River, a major drainage of the Powder River coal basin, is reported to be a "principal" aquifer; however, there are indications that the alluvium would yield less than 100 gallons per minute of poor-quality water at most places. Wyoming statutes recognize the interconnection between ground water and surface water, which may also limit the development of the aquifer. As energy development continues and additional water sources are considered, there will be a need for an assessment of the potential for development and the effect of development on surface-water supplies.

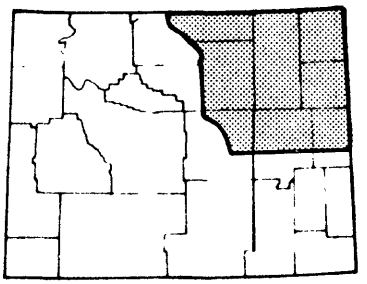
OBJECTIVE: The objective is to assess the potential for development of water supplies from the alluvium by determining (a) the availability of the water, (b) the quality of the water, and (c) the relations between water in the alluvium and water in the river and in the shallow bedrock.

APPROACH: Wells in the alluvium and selected bedrock wells will be inventoried and water levels measured. A few new wells will be drilled. The plane dimensions of the alluvial deposits will be measured on topographic maps and the thickness will be measured at selected locations by aquifer tests. One site will be instrumented with continuous water-level recorders to determine the relations between water-surface elevation in the Powder River, the alluvium, and the bedrock. Samples will be collected from selected wells to determine the quality of water in the alluvium.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Shallow wells in the study area were inventoried. Samples were collected and analyzed to determine the concentration of dissolved chemicals and results of the analyses were tabulated. Water samples from the river, taken at gaging stations located near the shallow wells and approximately at the same time, were analyzed and tabulated. Analyses of water samples from bedrock aquifer, selected to represent the area in which the above mentioned samples were taken, were tabulated for comparison with the shallow aquifer and the river. Computations were made to determine the aquifer characteristics. Other computations were made to determine the source of water to a shallow well located close to the river. All data, analyses, and computations were assembled, and initial draft of the report was completed.

PLANS FOR FISCAL YEAR 1985: The project was extended to September 1985 for completion of the report. The report will be submitted for colleague review. The final report will be published in the Water-Resources Investigations series.

PROJECT TITLE: Evaluation of the ground-water observation-well program for the Powder River Basin and adjacent area, northeastern Wyoming (WY 83-079).



FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: Marvin A. Crist.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: April 1983 through September 1985.

PROBLEM: The rapid development of energy minerals in northeastern Wyoming has changed the pattern of ground-water use from agricultural to a combination of agricultural, urban, and industrial uses. Because of these changes, the observation-well network needs to be evaluated and modified, to provide the basic hydrologic data needed for scientific, engineering, and management purposes.

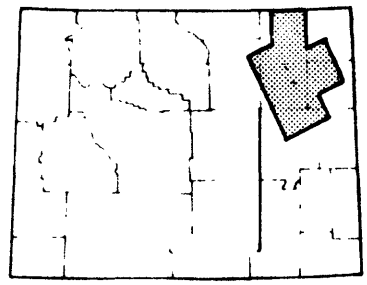
OBJECTIVE: The objective is to assess the existing observation-well program and recommend changes that will make the program responsive to present and future needs for ground-water water-level data. The procedures developed in this project may be applied to subsequent evaluations of the observation-well program in other parts of the State.

APPROACH: The concept of overlapping networks of observation wells will be applied. Each network of wells will be established to meet a separate hydrologic objective. New wells in the area will be inventoried and field-checked. Well records and water-level data for all wells will be tabulated, evaluated, and filed. Each network will be evaluated by checking and determining deficiencies of the network. Changes, including both additions and deletions, will be recommended. Procedures will be established for annual review of the networks.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: The procedure used to establish an observation well system has been outlined as a series of sequential steps. The procedure could be used to expand the observation well network statewide.

PLANS FOR FISCAL YEAR 1985: The procedure used to establish an observation well system will be published in the Water-Resources Investigations series. A second report is planned that will present the data obtained from the observation wells. This second report is to serve as an example for future biennial reports of observation well data prepared by the Wyoming District.

PROJECT TITLE: Evaluation of the individual and cumulative impacts of mine operations on the surface and ground-water hydrology in the eastern Powder River basin of Wyoming (WY 83-080).



FUNDING AGENCIES: Wyoming Department of Environmental Quality and Geological Survey.

PROJECT LEADER: Richard M. Bloyd.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: March 1983 through September 1985.

PROBLEM: Surface mining of coal may disrupt watersheds and may alter the quantity and quality of ground water and surface water. Federal and State regulations require assessment of the probable commulative impacts of all anticipated mining on the hydrology of the geologic/drainage basin each time an application for a permit to mine is filed. The Wyoming Department of Environmental Quality needs such an assessment immediately, because several new applications are pending for mines in the eastern Powder River Basin. The study area includes the Belle Fourche and Little Powder Rivers and their tributaries.

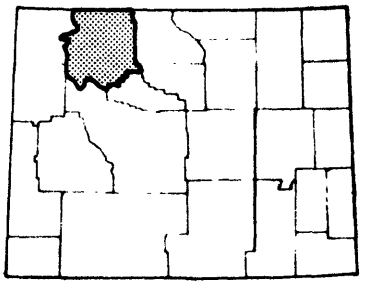
OBJECTIVE: The objective is to evaluate the probable individual and cumulative impacts of mine operations on the surface-water and ground-water hydrology of the area. This evaluation will be somewhat cursory because of time constraints; an in-depth evaluation should be done in a follow-on project.

APPROACH: Three tasks will be accomplished: (1) Pertinent information will be assembled from reports, permit documents, and State and Federal data files; (2) impacts, past or present, for each mine, will be identified, tabulated, and displayed on a map; and (3) cumulative impacts of the mines will be assessed separately for surface water and ground water, using mathematical simulation models calibrated to natural or existing conditions. Streamflow will be modeled for three cases: (a) Pre-mining, (b) during mining, and (c) post-mining. A series of ground-water model runs will be made, including worst- and best-case conditions. Water-quality aspects will be evaluated to the extent permitted by existing data.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: The ground-water model was completed but could not be calibrated. It was used to predict estimated water-level drawdowns. Ground-water quality data were presented in various illustrations in the report. A surface-water model for the Belle Fourche River basin was completed, including water-quality data. A landscape-stability analysis was presented for use in reclamation planning. Needs for additional study were presented. The progress report was approved November 1983, and the final report was sent to the cooperator for review in November 1983. The report was submited for colleague review in March 1984, after revisions were made.

PLANS FOR FISCAL YEAR 1985: The project was extended to September 1985 for completion of the report. Revision in response to colleague review will be completed and the final report will be submitted for WRD approval.

PROJECT TITLE: Water resources of Park County, Wyoming (WY 84-081).



FUNDING AGENCIES: Wyoming State Engineer and Geological Survey.

PROJECT LEADER: Marlin E. Lowry.

FIELD LOCATION: Park County, northwestern Wyoming.

PERIOD OF PROJECT: October 1983 through September 1986.

PROBLEM: There is increasing concern about water resources in Park County because of changes in land use, oil development, and increased outdoor recreation. The water supplies of municipalities such as Powell, and of ranchette developments, are dependent upon ground water that is recharged by irrigation. The Wyoming State Engineer needs more information than presently exists on the ground-water hydrology of the area to assess effects of new applications for water developments on existing supplies.

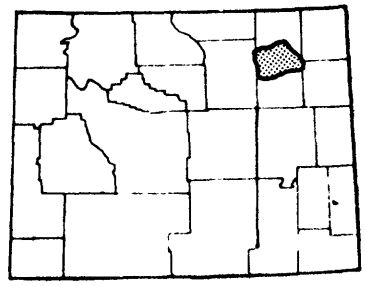
OBJECTIVE: The objectives are to (1) assess the hydrology of the terrace and flood-plain deposits, (2) determine the water quality of the Madison Formation as a potential municipal supply, and (3) improve overall information on the hydrology of the area in anticipation of future needs.

APPROACH: Hydrologic data and interpretations from previous investigations provide a base for the study. Well data in computer files of the Wyoming State Engineer are being entered into Ground Water Site Inventory. A literature search will be made of reports on the geology and hydrology of the area. The study of the irrigated-alluvial aquifers will be emphasized. Well logs will be examined to determine the geometry of the alluvium. A well inventory will be made and potentiometric maps will be drawn for the principal aquifers. Water samples will be obtained from wells tapping the Madison Formation.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: A literature search was completed. Data for more than 1,500 wells in the county were added to the District's computer files. Twenty water samples have been inventoried in about 75 percent of the area outside the National Forest. Twenty water samples have been collected to supplement existing chemical-quality data. An observation-well network was started. As a result of the literature search, a proposal was submitted for artificial recharge of a glacial aquifer to supplement flow of a principal stream, and it was brought to the attention of the State Engineer that radium might commonly occur in water from the Madison Limestone. The State Engineer requested a number of water samples be collected from the Madison and analyzed for radium because of the interest in developing municipal supplies of water from the Madison. Nine of the 22 samples collected contained radium in excess of that permissible in drinking water.

PLANS FOR FISCAL YEAR 1985: The well inventory will be continued during the winter during which time the observation-well network will be expanded and two recorders for conductance and temperature of water in alluvial aquifers will be installed. A preliminary report will be prepared by spring to serve as a basis for the final report and as a guide for the final summer's field work.

PROJECT TITLE: Effects of population growth and coal mining activity on the hydrologic system near Gillette, Wyoming (WY 85-082).



FUNDING AGENCIES: Wyoming State Engineer and Geological Survey.

PROJECT LEADER: Marvin A. Crist.

FIELD LOCATION: Northeastern Wyoming.

PERIOD OF PROJECT: October 1984 to September 1986.

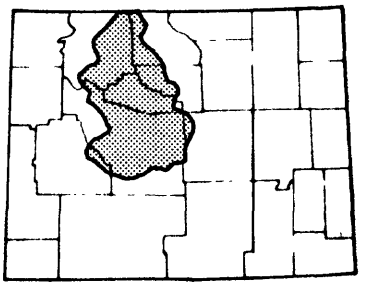
PROBLEM: Local water users near Gillette, Wyoming have complained that pumping of deep wells affects water levels in shallow aquifers. Water administrators need verification of the declines and identification of stratigraphic zones in which declines are occurring.

OBJECTIVE: The principal objective of this study is to test and improve concepts of ground-water flow on the Powder River structural basin by investigating the effects of pumping in a relatively small area. Specific objectives are (1) determine if ground-water pumping near Gillette, Wyoming has caused significant water-level declines; (2) if declines have occurred, attempt to relate wells, showing declines, to pumping wells stratigraphically and areally; and (3) attempt to evaluate the relative importance of local variations in aquifer properties, water levels, and other hydrologic characteristics to regional flow patterns.

APPROACH: This project is planned for two phases. Phase 1 will be a reconnaissance to verify if there are declining water levels and if so, determine where the declines are occurring. Phase 1 will include field work to inventory wells and measure water levels. Data collected during Phase 1 will be evaluated to determine the adequacy of this information for additional detailed study that would be done during Phase 2. After Phase 1 is completed, a new plan and cost estimate will be prepared for work recommended for Phase 2.

PLANS FOR FISCAL YEAR 1985: Well inventory will be compled and water levels will be measured. A potentiometric-surface contour map will be prepared if sufficient data are available. Additional data needed to complete a detailed study will be determined.

PROJECT TITLE: Hydrology of Area 51, Rocky Mountain Coal Province, Wyoming and Montana (WY 84-083).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: David A. Peterson.

FIELD LOCATION: North-central Wyoming.

PERIOD OF PROJECT: October 1983 through September 1984 (completed September 28, 1984).

PROBLEM: Coal Area 51 is rich in mineral resources--coal, oil and gas, uranium, bentonite, gypsum, and feldspar. Because much of the area is semi-arid, both water availability and protection of water resources are problems. Mining companies are required by law to analyze the hydrologic effects of proposed activities and to take appropriate measures to minimize adverse effects. There is a need for information about the water resources of the area that is both comprehensive in scope and easily understood.

OBJECTIVE: The objective is to describe the hydrology of Area 51 in a clear and concise manner that can be used by both the coal-mining industry and the regulatory agencies. Although specifically oriented to coal hydrology, the results should also be useful for other kinds of mineral development, such as uranium, oil and gas, and to other interest groups, such as environmental organizations.

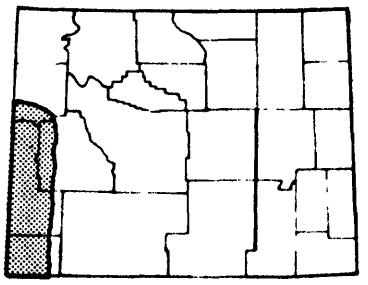
APPROACH: A topic outline will be developed, based on other Coal Area reports, but oriented to the hydrology and related problems of Area 51. Topics will be assigned to hydrologists for analysis and writing based on their discipline specialties. For each topic, all available information will be assembled and summarized or interpreted as needed. Records and other available information on hand are sufficient; no new data will be collected. Each topic will be discussed in a text not to exceed one page, accompanied by maps, graphs, and tables as needed (STOP format). Regional hydrology will be emphasized. Sources of more detailed information will be cited.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: The topic outline for the final report was prepared and topics assigned to several co-authors. The chapters were written and the report was assembled, reviewed technically, and submitted for approval.

REPORT COMPLETED DURING FISCAL YEAR 1984:

Peterson, D. A., and others, 1984, Hydrology of Area 51, Northern Great Plains and Rocky Mountain Coal Provinces, Wyoming and Montana: U.S. Geological Survey Water-Resources Investigations Open-File Report 84-734 (in press).

PROJECT TITLE: Water quality in the Overthrust area, southwestern Wyoming (WY 84-084).



FUNDING AGENCY: Bureau of Land Management.

PROJECT LEADER: L. Rodney Larson.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: October 1983 through September 1985 (suspended September 30, 1984).

PROBLEM: The Overthrust area in southwestern Wyoming is rich in mineral resources, including coal, oil and gas, and phosphate. Development in this area is currently the most aggressive that is occurring in the Rocky Mountain area. This development will impact the hydrologic resources of the area because of additional water demands and alteration of the water quality. Changes in surface-water flow and quality will be probable because of the disruption of large areas of land for mining; the increased utilization of surface water; the return of surface water with modified water-quality characteristics; and the possible decrease in spring discharges because of increases in ground-water usage.

To evaluate and plan for the proper utilization of surface-water resources in the area, water planners need an adequate information base. However, existing water-quality information is inadequate to meet these requirements. An expanded, systematic collection of basic surface-water-quality information, both in time and space, is essential to properly plan and develop the surface-water resources in this area and to evaluate the impacts of man's activities on these resources.

OBJECTIVES: The objectives of this study are to (1) provide baseline data on the present quality of water in streams and springs in the area, (2) determine the variability in water-quality due to seasonal change (high- and low-flow conditions) and natural downstream degradation, and (3) summarize the water-quality data collected for ease of interpretation by persons concerned with planning and managing water development and use.

APPROACH: Water samples of streams and springs will be intensively collected during 1984 and 1985, primarily from the drainages of the Bear, Hams Fork and Blacks Fork rivers. Because the area is remote, a helicopter, contracted and paid for by U.S. Bureau of Land Management, will be used for access to many of the sample-collection sites. A similar method of sampling was used successfully during 1976-78 in the Green River basin.

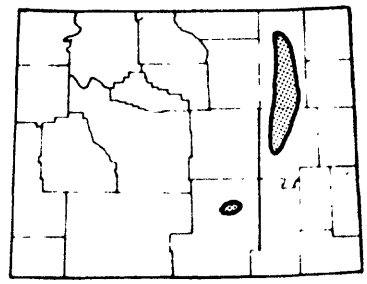
About 100 sites will be sampled during the spring snowmelt and again during the fall low flows. On-site measurements will be made of streamflow, spring discharge, specific conductance, water temperature, pH and dissolved oxygen. Laboratory analysis will include calcium, magnesium, sodium, potassium, total alkalinity, sulfate, chloride, nitrate plus nitrite, ammonia, fluoride, boron, silica, dissolved solids, and total-phosphorus concentrations. Trace elements included in the drinking-water standards (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, zinc, iron and manganese) will also be sampled at selected sites.

The data will be summarized through the use of statistical analyses and graphs, using computer programs available from Statistical Analysis Systems (SAS). Downstream and seasonal trends will be described.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: The sampling effort during 1984 had to be severely curtailed from that originally planned due to a mid-year reduction in funding. Several streams, springs, and wells in the area of the Riley Ridge oil and gas development area were sampled to gain baseline data prior to development.

PLANS FOR FISCAL YEAR 1985: Work on the project is dependent upon funding, which is uncertain. If funding is secured, an intensive program will be implemented during the spring months; otherwise, the project is suspended until additional funding is provided.

PROJECT TITLE: A study of the geochemical and hydrological processes in coal spoil, Wyoming (WY 84-085).



FUNDING AGENCIES: Bureau of Land Managment and Geological Survey.

PROJECT LEADER: L. Rodney Larson.

FIELD LOCATION: Campbell, Converse and Carbon counties, Wyoming.

PERIOD OF PROJECT: February 1984 through September 1985.

PROBLEM: A principal concern about the hydrologic impacts of coal mining in the western states is the nature of the aquifer that will remain in the reclaimed spoil. Some specific questions are (1) What will be the short-term and long-term chemical quality of water contained in the spoil? (2) What will be the impact of the water moving from the spoil on ground water and surface water? (3) How long will it take to recharge the spoil aquifer to a near steady-state condition? (4) What will be the aquifer properties of the spoil?

The greatest need for data is in the Powder River basin because of the extensive size of the spoil being created and the importance of the coal and adjacent aquifers. In the past, hydrologic study of reclaimed coal spoil has not been possible in the Powder River Basin because large-scale mining did not begin until 1973. Studies of water quality in the spoil were not possible in the past because the reclaimed spoil was not saturated.

Although to a lesser extent, data on the geochemistry of mine-spoil water also is needed in the Hanna coal field, Wyoming. Two mining companies in the Powder River basin and one mining company in the Hanna basin have indicated they may grant permission to conduct geochemistry studies at their mine sites.

OBJECTIVE: The objective of the study is to test a geochemistry model that predicts the quality of water of overburden mineralogy. This predictive tool will be used to evaluate the long-term impacts of the spoil aquifer on the hydrologic system.

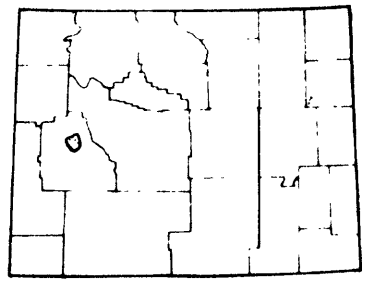
APPROACH: Mine permits on file with the Wyoming Department of Environmental Quality (DEQ) will be reviewed to determine the available data for each of the three mine sites. A visit to each of the mines will follow in order to supplement the data obtained from DEQ and to determine the predominate flow system. A plan for the sample collection of the necessary overburden material and the water chemistry then will be made.

The geochemistry-modeling system will be adjusted and tested for use in predicting the effects of the spoil aquifer on the natural hydrologic system in Wyoming. Special consideration will be given to mining methods and type of reclamation.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Overburden samples from two coal mines were obtained for paste-extract analysis, mineralogical identification, and batchmixing experiments. Water samples were collected and analyzed from the saturated spoils as well as the undisturbed coal aquifers. Existing water-quality data from postmining ground waters throughout the State were compiled and entered into a data base. Preliminary geochemical modeling was conducted along probable flow paths to define plausible chemical reactions needed for the observed changes in water quality. Multivariate statistics were applied to the spoil-water data to define the underlying geochemical processes causing the observed changes in spoil water quality as a result of mining.

PLANS FOR FISCAL YEAR 1985: Geochemical modeling and statistical analysis on the chemical information previously collected will be completed. Existing information on premining ground-water qualities within the State will be compiled. A basic data report will be prepared from the data collected and a Water-Resources Investigations report on spoil geochemistry will be prepared.

PROJECT TITLE: A comprehensive study of two dilute-solution lakes in western Wyoming (WY 85-086).



FUNDING AGENCIES: Wyoming Water Development Commission and Geological Survey.

PROJECT LEADER: David A. Peterson.

FIELD LOCATION: West-central Wyoming.

PERIOD OF PROJECT: October 1984 through September 1986.

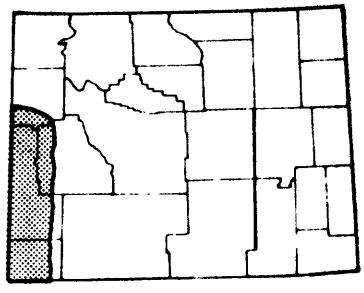
PROBLEM: Dilute-solution lakes in southwestern Wyoming are susceptible to a variety of influences, such as lake-shore development, water-level manipulation, and acid precipitation. Acid precipitation is of particular concern because of existing and planned sources of acidic emissions upwind of the lakes, such as natural gas sweetening plants. Too little information of the type necessary to predict the impact of these influences is available.

OBJECTIVE: The objectives are to (1) describe the physical, chemical, and biological composition of Fremont and New Fork Lakes; (2) determine the lakes' inorganic and organic chemical composition and attempt to describe their influence on the biological community; (3) compare the physical, chemical, and biological composition of inlet water with outlet water; (4) determine the sorption of materials on sediments, especially as a source or sink of nutrients to plants; (5) predict responses to man-caused changes in the lake environment; and (6) describe transfer value of these data to lakes with similar characteristcs.

APPROACH: Profiles of water temperature, dissolved oxygen, pH, and specific conductance with depth in the lakes will be made six to eight times per year. Chemical analyses from several dates, depths, and stations in the lakes, as well as in the inflow and outflow streams, will include principal ions, dissolved solids, nutrients, trace metals, and organic compounds such as hydrophobic, humic, and fulvic acids, and amino acids and sugars. Samples of phytoplankton, chlorophylls, zooplankton, and benthic invertebrates will be collected from several dates, depths, and stations. Sediments will be subjected to organic extraction analyses. Rain quantity and quality and snow quality will be sampled.

PLANS FOR FISCAL YEAR 1985: A work plan will be prepared. Samples for organics, trace metals, principal ions, nutrients, phytoplankton, chlorophylls, zooplankton, and benthos will be collected in October and November. Data collected previously will be examined, and further sampling will be planned. Streamflow gages will be installed and maintained at four stations. A progress report to the cooperator will be prepared.

PROJECT TITLE: Ground-water resources in the Overthrust area, Wyoming (WY 85-087).



FUNDING AGENCIES: Wyoming State Engineer and Geological Survey.

PROJECT CHIEF: L. Rodney Larson.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: October 1984 through September 1986.

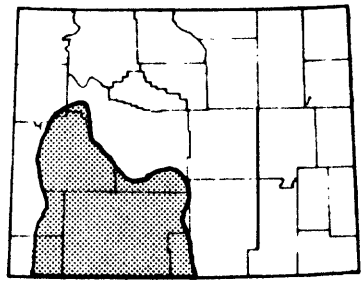
PROBLEM: The overthrust area of Wyoming is rich in mineral resources, including coal, oil and gas, and phosphate. Aggressive development of these resources is occurring now with much greater development planned for the future. Due to the accelerated development, the potential for adverse impacts on ground-water resources is high; however, the lack of baseline information makes it difficult to assess the magnitude of adverse impacts.

OBJECTIVES: The two principal objectives of the study are to gather sufficient hydrologic information to define the ground-water system in the area and to gather information on the types and locations of existing and planned minerals development in the area. Baseline conditions will be defined, then potential impacts on the ground-water system will be identified.

APPROACH: Collection of baseline hydrologic and water-quality data will be the major emphasis of this project. Water-quality data will be collected from all aquifers that will be affected by development in the Overthrust area. Once sufficient premining water-quality data have been collected and compiled from the aquifers within the Overthrust area, interpretation of the water-quality data will be made. The first step in data interpretation will consist of basic statistical analysis to define intra- and interformational chemical variance, data ranges, and significant subpopulations.

PLANS FOR FISCAL YEAR 1985: A work plan will be prepared for the study. A retrieval will be made of existing quality water data for the area, and a planning map will be prepared that shows existing and forecasted energy activities. Sampling of selected wells and springs is planned for the spring and summer months.

PROJECT TITLE: Summary of hydrologic studies pertaining to oil shale in Wyoming (WY 85-088).



FUNDING AGENCY: Geological Survey.

PROJECT CHIEF: James F. Wilson, Jr.

FIELD LOCATION: Southwestern Wyoming.

PERIOD OF PROJECT: January 1985 to September 1986.

PROBLEM: The response of the U.S. Geological Survey to the national energy crisis of the mid-1970's included a program of water-resources investigations and hydrologic research related to oil shale in Colorado, Utah, and Wyoming. The program will end in 1985. Results of the program are described in numerous scientific reports. A comprehensive summary of the oil-shale program is needed. The summary will serve as documentation of what was done, the principal findings, and problems identified for additional study, should interest in oil-shale hydrology be revived in the future.

OBJECTIVE: The objective is to summarize the accomplishments and findings of the Wyoming part of the Geological Survey's oil-shale hydrology program, 1974-85. The Wyoming summary will be combined with those for Colorado and Utah in a U.S. Geological Survey Professional Paper.

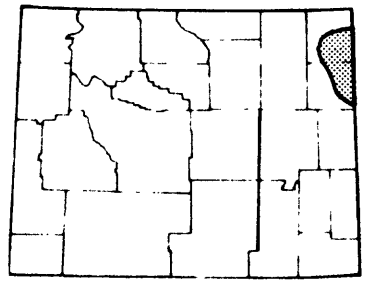
APPROACH: The report will be prepared during fiscal year 1985 and will be reviewed and processed for publication during fiscal year 1986. Principal topics include summary of hydrologic studies, physical setting, water resources, and water for oil-shale development. The Utah District will prepare the introductory sections and will merge the summaries for the three states into the final report. The summary for Wyoming will be drawn chiefly from the reports prepared for previous oil-shale hydrology projects: WY-030, Water and its relation to economic development in the Green River and Great Divide basins in Wyoming; WY-059, Hydrologic investigation of the in situ oil-shale retort area near White Mountain, southwestern Wyoming; and CR-181, Sorption of residual organic substances in retort waters by spent oil-shale residues. Information needed to describe the physical setting and water resources will be drawn from reports from coal-hydrology and other projects.

PLANS FOR FISCAL YEAR 1985: The report will be planned, assembled, and prepared for technical review. Activities will include preparation of an annotated outline, general literature search, detailed evaluation of results of previous studies, compilation of information, and preparation of illustrations.

Water-Resources Project Conducted

by Other District

PROJECT TITLE: Quality and availability of ground water in the Black Hills area, South Dakota and Wyoming (SD 81-059).



FUNDING AGENCIES: South Dakota Department of Water and Natural Resources, Black Hills Conservancy Subdistrict, and Geological Survey.

PROJECT LEADER: Kathy D. Peter.
(Rapid City, South Dakota)

FIELD LOCATION: Western South Dakota and northeastern Wyoming.

PERIOD OF PROJECT: May 1981 through September 1984 (complete except report).

PROBLEM: Increased development in the Black Hills area is placing greater demands on the ground-water system. The data and interpretations at the scale necessary to make specific management decisions are not available. There is concern about the effects of (1) unplugged or improperly plugged uranium test holes, (2) proposed withdrawals from the Madison Group on streams and aquifers in South Dakota, and (3) numerous septic systems on the water quality in the Minnelusa Formation (the principal aquifer supplying water to the residents in the area).

OBJECTIVE: The objectives are to (1) evaluate the quality and quantity of ground-water resources of the sedimentary aquifers in the Black Hills area of South Dakota and eastern Wyoming; (2) document, at a detailed scale, current water quality and head conditions of the sedimentary aquifers and determine recharge; (3) evaluate the effects of septic systems on the Minnelusa and Madison aquifers in the Piedmont Valley area; (4) develop the data base necessary for application of a digital model(s) to predict the effects of potential stress on the ground-water systems; and (5) evaluate the effects of selected ground-water management alternatives on the aquifers.

APPROACH: Streamflow and spring-discharge data will be obtained as needed to evaluate net aquifer recharge. Water samples from wells in the Piedmont Valley area will be collected and analyzed. Additional wells will be inventoried and evaluated for prospective water-quality and water-level observation networks. The Geological Survey three-dimensional model will be used to predict the effects of stresses on the system and simulate recharge. The feasibility of using a geochemical model to evaluate effects of septic systems in the Piedmont Valley area will be evaluated and if practical, implemented. Reports on quality and availability of ground water will be prepared.

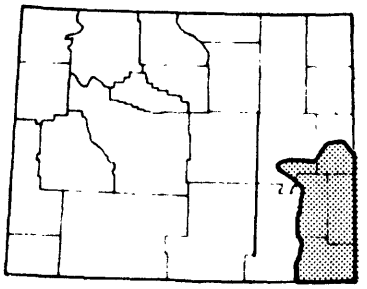
PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: The development of two digital models was continued. The calibration of all layers was not reached and it was concluded that the complexity of the aquifer system and the lack of data in some areas made modeling very difficult. The three major aquifers in the area, the Inyan Kara, the Minnelusa, and the Madison, have the potential of yielding more than 100 gal/min to wells. Water quality in all three aquifers is acceptable for most uses in general. In some areas, treatment for floride, radium-226, iron, manganese, sulfate, or hardness may be required before use.

STATUS: Difficulties with the digital models have delayed report preparation; therefore, it was decided to abandon further modeling efforts and expedite the report completions. One report is in review and four are near completion.

Water-Resources Project Conducted

by the Central Region Staff

PROJECT TITLE: High Plains regional aquifer-system analysis (CR 78-229).



FUNDING AGENCY: Geological Survey.

PROJECT LEADER: John B. Weeks.
(Lakewood, Colorado)

FIELD LOCATION: Southeastern Wyoming, south-central South Dakota, Nebraska, eastern Colorado, western Kansas, western Oklahoma, western Texas, and eastern New Mexico.

PERIOD OF PROJECT: October 1978 through September 1985.

PROBLEM: The High Plains aquifer is the principal source of water in parts of eight States. The aquifer contains about 3 billion acre-feet of drainable water; but it is being depleted by several million acre-feet per year. The High Plains RASA has provided the regional description of the aquifer system and developed a regional aquifer model. The study has found that information on transient stresses (pumpage, recharge, and irrigation return flow) are poorly known and critical for projecting the future state of the aquifer.

OBJECTIVE: The project will attempt to better define the relationships between total pumpage, return flow from applied water (irrigation plus precipitation) on irrigated lands, and recharge from precipitation on dryland agricultural areas. The results will be used to update the regional aquifer model. Ground-water management alternatives will be developed and simulated by the aquifer model. The model results will be reported for use by water managers.

APPROACH: Two sites, one in Texas and one in Nebraska, will be studied to better determine stresses. The period of analysis for each site will be 1972-84. Irrigated, dryland, and range-land acreage will be mapped for the sites for selected years using Landsat satellite imagery and compared to actual acreage. Irrigation demand will be calculated based on mapped acreage; and pumpage estimates will be compared to measured data. Management alternatives developed from U.S. Department of Agriculture and U.S. Department of Commerce information will be simulated using the regional aquifer model to predict future ground-water conditions that are likely to result from each alternative.

PROGRESS AND SIGNIFICANT RESULTS FOR FISCAL YEAR 1984: Crop type, crop acreage, time-of-operation, and miscellaneous information were collected from about 50 irrigation sites in each of the two test areas--Chase, Dundy, and Perkins Counties, Nebraska, and Castro and Parmer Counties, Texas. Discharge data collected using a portable sonic flowmeter was within a few percents of inline flowmeter measurements. Preliminary results indicate that the change in aquifer storage was about 60 percent of estimated pumpage for the period 1978-82. A report on the data collected in Nebraska during 1983 was completed and approved.

PLANS FOR FISCAL YEAR 1985: Pumpage estimate and aquifer storage change will be determined for the period 1974-83. Estimation of pumpage projections for the period 1980-2020 will be completed and the change in aquifer storage resulting from the projected pumpage will be simulated.

SELECTED REFERENCES ON WATER RESOURCES

General Information

Publications pertaining to water resources in Wyoming are listed below. The list includes all reports published during the last 10 years and selected older reports. Many of these publications are available for inspection at the Geological Survey offices in Cheyenne, Casper, and Riverton and also at large public and university libraries.

U.S. Geological Survey announces all its publications in a monthly report, "New Publications of the Geological Survey." Subscription to this monthly listing is available free upon request to the Mailing List Unit, U.S. Geological Survey, 582 National Center, Reston, Va. 22092. All publications are for sale unless specifically stated otherwise; prepayment is required. Prices, which are subject to change, are not included here. Information on price and availability should be obtained from listed sales offices before placing an order. A pamphlet entitled "List of Geological Survey Geologic and Water-Supply Reports and Maps for Wyoming" is available free upon request to the Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver, Colo. 80225.

Bulletins, Techniques of Water-Resources Investigations, Earthquake Information Bulletin, and popular leaflets, pamphlets, and booklets may be purchased from the Eastern Distribution Branch, Text Products Section, U.S. Geological Survey, 604 South Pickett Street, Alexandria, Va. 22304.

Additional information on Geological Survey products and sources where they may be obtained is given in "A Guide to Obtaining Information from the USGS, 1982," Geological Survey Circular 777, available without cost from the Eastern Distribution Branch, Text Products Section, U.S. Geological Survey, 604 South Pickett Street, Alexandria, Va. 22304, or Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver, Colo. 80225.

Requests for miscellaneous water information and information on programs in other States may be referred to Water Resources Division, U.S. Geological Survey, 440 National Center, Reston, Va. 22092.

The Geological Survey National Center maintains a library with an extensive earth-sciences collection. Local libraries may obtain books, periodicals, and maps through interlibrary loan by writing to U.S. Geological Survey Library, 950 National Center, Reston, Va. 22092, telephone (703) 860-6671.

Water-Resources Information.--A monthly summary of the national water situation is presented in the "National Water Conditions" that is available free upon request to the Hydrologic Information Unit, U.S. Geological Survey, 419 National Center, Reston, Va. 22092. Water-resources investigations folders are available for each of the 50 States, Puerto Rico, and the Virgin Islands. The folders are available free upon request to the Eastern Distribution Branch, Text Products Section, U.S. Geological Survey, 604 South Pickett Street, Alexandria, Va. 22304. The Wyoming folder also is available from the District Office in Cheyenne.

Records of streamflow, ground-water levels, and quality of water were published for many years as Geological Survey water-supply papers as explained below.

Streamflow records.--Records of daily flows of streams prior to 1971 were published in the Water-Supply Paper series "Surface-Water Supply of the United States," which was released in numbered parts as determined by natural drainage basins. Until 1961, this was an annual series; monthly and yearly summaries of these data were compiled in two reports: "Compilation of Records of Surface Waters of the United States through September 1950," and "Compilation of Records of Surface Waters of the United States, October 1950 to September 1960." For the period, 1961-70, 5-year compilations were published. Data for Wyoming are published in Parts 6, 9, 10, and 13.

Ground-water records.--Ground-water levels and artesian pressures in observation wells prior to 1975 were reported by geographic areas in a 5-year Water-Supply Paper series. Data for Wyoming are in "Ground-Water Levels in the United States, Northwestern States."

Quality-of-water records.--Data on quality of surface water prior to 1971 were published annually in the Water-Supply Paper series "Quality of Surface Waters of the United States," which also was released in numbered parts as determined by natural drainage basins. Data for Wyoming are in Parts 6, 9, 10, and 13.

Hydrologic data after 1970.--Beginning with the 1971 water year, the Water-Supply Paper series described above were replaced by a new publication series, "U.S. Geological Survey Water-Data Reports." For Water Years 1971-74 surface-water records and water-quality records were published in separate volumes. Beginning with 1975 this series combines under one cover streamflow data, water-quality data for surface and ground water, and ground-water level data for each State. For Wyoming the title is "Water Resources Data for Wyoming - Water Year (date): "U.S. Geological Survey Water-Data Report [WY-(year)-1 or 2]". Reports for 1971-74 are unnumbered.

Flood information.--Methods for estimating the magnitude and frequency of floods for streams in Wyoming are given in two reports: Water-Resources Investigations 76-112 and Water-Supply Paper 2056 (see listings that follow). The U.S. Geological Survey also outlines flood-prone areas on topographic maps as part of a nationwide Federal program for managing flood losses. In Wyoming 225 topographic maps have been completed. These maps are available from the District Office in Cheyenne.

Publications

Professional Papers

Professional papers are sold by the Eastern Distribution Branch, Text Products Section, U.S. Geological Survey, 604 South Pickett Street, Alexandria, Va. 22304.

P 492. Thermal springs of the United States and other countries of the world--a summary, by G. A. Waring. 1965.

P 501-D. Variation of permeability in the Tensleep Sandstone in the Bighorn Basin, Wyoming, as interpreted from core analyses and geophysical logs, by J. D. Bredehoeft, in Geological Survey Research 1964, Chap. D, by U.S. Geological Survey, p. D166-D170. 1964.

P 550-D. The White River Formation as an aquifer in southeastern Wyoming and adjacent parts of Nebraska and Colorado, by M. E. Lowry, in Geological Survey Research 1966, Chap. D, by U.S. Geological Survey, p. D217-D222. 1966.

P 622-A. The hydraulics of overland flow on hillslopes, by W. W. Emmett. 1970.

P 700-D. Synthesizing hydrographs for small semiarid drainage basins, by G. S. Craig, Jr., in Geological Survey Research 1970, Chap. D, by U.S. Geological Survey, p. D238-D243. 1970.

P 813-C. Summary appraisals of the Nation's ground-water resources--Upper Colorado Region, by Don Price and Ted Arnow. 1974.

P 813-G. Summary appraisals of the Nation's ground-water resources--Great Basin Region, by T. E. Eakin, Don Price, and J. R. Harrill. 1976.

P 813-Q. Summary appraisals of the Nation's ground-water resources--Missouri Basin Region, by O. J. Taylor. 1978.

P 813-S. Summary appraisals of the Nation's ground-water resources--Pacific Northwest Region, by B. L. Foxworthy. 1979.

P 1117. Scour and fill in a stream channel, East Fork River, western Wyoming, by E. D. Andrews. 1979.

P 1130. Hydrologic and human aspects of the 1976-77 Drought, by H. F. Matthai. 1979.

P 1139. A field calibration of the sediment-trapping characteristics of the Helley-Smith bedload sampler, by W. W. Emmett. 1980.

P 1164. Effects of coal mine subsidence in the Sheridan, Wyoming area, by C. R. Dunrud and F. W. Osterwald. 1980.

P 1242. Perennial-streamflow characteristics related to channel geometry and sediment in Missouri River basin, by W. R. Osterkamp and E. R. Hedman. 1982.

P 1244. Floods of May 1978 in southeastern Montana and northeastern Wyoming, by Charles Parrett, D. D. Carlson, G. S. Craig, Jr., and E. H. Chin.

P 1273-A. Stratigraphy and sedimentary facies of the Madison Limestone and associated rocks in parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming, by J. A. Peterson. 1984.

P 1273-C. Relationship of porosity and permeability to petrology of the Madison Limestone in rock cores from three test wells in Montana and Wyoming, by P. A. Thayer. 1983.

P 1273-D. Apparent water resistivity, porosity, and water temperature of the Madison Limestone and underlying rocks in parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming, by L. M. Maccary. 1984.

P 1273-E. Potentially favorable areas for large-yield wells in the Red River Formation and Madison Limestone in parts of Montana, North Dakota, South Dakota, and Wyoming, by L. M. MacCary, E. M. Cushing, and D. L. Brown. 1983.

P 1273-G. Geohydrology of the Madison and associated aquifers in parts of Montana, North Dakota, South Dakota, and Wyoming, by J. S. Downey. 1984.

P 1277-A. Hydrologic and morphologic changes in channels of the Platte River basin in Colorado, Wyoming, and Nebraska; a historical perspective, by H. R. Eschner, R. F. Hadley, and K. D. Crowley. 1983.

P 1277-B. Effects of water development on surface-water hydrology, Platte River basin in Colorado, Wyoming, and Nebraska upstream from Duncan, Nebraska, by J. E. Kircher, and M. R. Karlinger. 1983.

Journal of Research of the Geological Survey

The Journal of Research Series has been discontinued. Separate prints of the articles listed below are available from the District Chief, Cheyenne, Wyoming.

Iron in water near wastewater lagoons in Yellowstone National Park, Wyoming, by E. R. Cox. vol. 6, no. 3, p. 319-324. 1978.

Hydrologic characteristics of the Madison Limestone, the Minnelusa Formation, and equivalent rocks as determined by well-logging formation evaluation, Wyoming, Montana, South Dakota, and North Dakota, by W. J. Head and R. H. Merkel. vol. 5, no. 4, p. 473-485. 1977.

Water-Supply Papers

Water-Supply Papers are sold by the Eastern Distribution Branch, Text Products Section, U.S. Geological Survey, Alexandria, Va. 22304

W 1261. A postglacial chronology for some alluvial valleys in Wyoming, by L. B. Leopold and J. P. Miller. 1954.

W 1360-E. Geology and ground-water resources of the Kaycee irrigation project, Johnson County, Wyoming, by F. A. Kohout, with a section on Chemical quality of the water, by F. H. Rainwater. 1957.

W 1373. Sedimentation and chemical quality of surface waters in the Wind River basin, Wyoming, by B. R. Colby, C. H. Hembree, and F. H. Rainwater. 1956.

W 1375. Ground-water resources of the Riverton irrigation project area, Wyoming, by D. A. Morris, O. M. Hackett, K. E. Vanlier, and E. A. Moulder, with a section on Chemical quality of ground-water, by W. H. Durum. 1959.

W 1377. Geology and ground-water resources of Goshen County, Wyoming, by J. R. Rapp, F. N. Visher, and R. T. Littleton, with a section on Chemical quality of the ground water, by W. H. Durum. 1957.

W 1458. Geology and ground-water resources of the Rawlins area, Carbon County, Wyoming, by D. W. Berry. 1960.

W 1483. Geology and ground-water resources of the upper Lodgepole Creek drainage basin, Wyoming, by L. J. Bjorklund, with a section on Chemical quality of the water, by R. A. Krieger and E. R. Jochens. 1959.

W 1490. Geology and ground-water resources of Platte County, Wyoming, by D. A. Morris and H. M. Babcock, with a section on Chemical quality of the water, by R. H. Langford. 1960.

W 1531. Hydrology of the upper Cheyenne River basin: Part A. Hydrology of stock-water reservoirs in upper Cheyenne River basin, by R. C. Culler; Part B. Sediment sources and drainage-basin characteristics in upper Cheyenne River basin, by R. F. Hadley and S. A. Schumm. 1961.

W 1532-A. Hydrologic effects of water spreading in Box Creek basin, Wyoming, by R. F. Hadley, I. S. McQueen, and others. 1961.

W 1535-E. Chemical degradation on opposite flanks of the Wind River Range, Wyoming, by C. H. Hembree and F. H. Rainwater. 1961.

W 1539-V. Availability of ground water in the Bear River Valley, Wyoming, by C. J. Robinove and D. W. Berry, with a section on Chemical quality of the water, by J. G. Conner. 1963.

W 1576-I. Ground-water resources of the Wind River Indian Reservation, Wyoming, by L. J. McGreevy, W. G. Hodson, and S. J. Rucker IV. 1969.

W 1596. Geology and ground-water resources of the Greybull River--Dry Creek area, Wyoming, by C. J. Robinove and R. H. Langford. 1963.

W 1669-E. Ground-water resources and geology of the Lyman-Mountain View area, Uinta County, Wyoming, by C. J. Robinove and T. R. Cummings. 1963.

W 1698. Ground-water resources and geology of northern and western Crook County, Wyoming, by H. A. Whitcomb and D. A. Morris, with a section on Chemical quality of the ground water, by R. H. Langford. 1964.

W 1783. Hydrologic conditions in the Wheatland Flats area, Platte County, Wyoming, by E. P. Weeks. 1964.

W 1788. Ground-water resources and geology of Niobrara County, Wyoming, by H. A. Whitcomb, with a section on Chemical quality of the ground water, by T. R. Cummings. 1965.

W 1806. Ground-water resources and geology of northern and central Johnson County, Wyoming, by H. A. Whitcomb, T. R. Cummings, and R. A. McCullough. 1966.

W 1807. Ground-water resources of Sheridan County, Wyoming, by M. E. Lowry and T. R. Cummings. 1966.

W 1809-C. Ground water in the Upper Star Valley, Wyoming, by E. H. Walker. 1965.

W 1834. Geology and ground-water resources of Laramie County, Wyoming, by M. E. Lowry and M. A. Crist, with a section on Chemical quality of ground water and of surface water, by J. R. Tilstra. 1967.

W 1897. Ground-water resources of Natrona County, Wyoming, by M. A. Crist and M. E. Lowry. 1972.

W 2009-C. Chemical quality of surface water in the Flaming Gorge Reservoir area, Wyoming and Utah, by R. J. Madison and K. M. Waddell. 1973.

W 2023. Selenium in waters in and adjacent to the Kendrick Project, Natrona County, Wyoming, by M. A. Crist. 1974.

W 2039-A. Chemical quality and temperature of water in Flaming Gorge Reservoir, Wyoming and Utah, and the effects of the reservoir on the Green River, by E. L. Bolke and K. M. Waddell. 1975.

W 2056. Analysis of runoff from small drainage basins in Wyoming, by G. S. Craig, Jr. and J. G. Rankl. 1978.

W 2058. Dissolved-oxygen depletion and other effects of storing water in Flaming Gorge Reservoir, Wyoming and Utah, by E. L. Bolke. 1979.

W 2193. Streamflow characteristics related to channel geometry of streams in western United States, by E. R. Hedman and W. R. Osterkamp. 1982.

W 2199. Verification of step-backwater computations on ephemeral streams in northeastern Wyoming, by S. A. Druse. 1982.

W 2250. National water summary 1983 - hydrologic events and issues, by U.S. Geological Survey. 1984.

Circulars

Single copies of circulars still in print are available free from the Eastern Distribution Branch, Text Product Section, U.S. Geological Survey, 604 South Pickett Street, Alexandria, Va. 22304.

C 656. Index of surface-water records to September 30, 1970--Part 6, Missouri River basin. 1971.

C 659. Index of surface-water records to September 30, 1970--Part 9, Colorado River basin. 1971.

C 660. Index of surface-water records to September 30, 1970--Part 10, The Great Basin. 1971.

C 663. Index of surface-water records to September 30, 1970--Part 13, Snake River basin. 1971.

C 743. Land and natural resource information and some potential environmental effects of surface mining of coal in the Gillette area, Wyoming, by W. R. Keefer and R. F. Hadley. 1976.

C 777. A guide to obtaining information from the USGS, 1982, compiled by P. F. Clark, H. E. Hodgson, and G. W. North. 1982.

C 839. Assessment of impacts of proposed coal-resource and related economic development on water resources, Yampa River basin, Colorado and Wyoming--A summary, compiled and edited by T. D. Steele and D. E. Hillier. 1981.

C 1001. Estimated use of water in the United States in 1980, by W. B. Solley, E. B. Chase, and W. B. Mann, IV. 1983.

Water-Resources Investigations Reports

Reports in this series are available for inspection at the Wyoming and Reston, Va., offices of the U.S. Geological Survey. Selected reports may be purchased either as microfilm or hard copy from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, Va. 22161; the NTIS ordering number is given in parentheses at the end of the citation. Further information about these reports may be obtained from the District Chief, WRD, Cheyenne.

WRI 3-75. Hydrologic analysis of the valley-fill aquifer, North Platte River valley, Goshen County, Wyoming, by M. A. Crist. 1975. (PB-243 226/AS)

WRI 63-75. Preliminary digital model of ground-water flow in the Madison Group, Powder River basin and adjacent areas, Wyoming, Montana, South Dakota, North Dakota, and Nebraska, by L. F. Konikow. 1976.

WRI 8-76. Digital model to predict effects of pumping from the Arikaree aquifer in the Dwyer area, southeastern Wyoming, by G. C. Lines. 1976.

WRI 76-77. Hydrologic effects of hypothetical earthquake-caused floods below Jackson Lake, northwestern Wyoming, by W. R. Glass, T. N. Keefer, and J. G. Rankl. 1976.

WRI 76-112. Techniques for estimating flow characteristics of Wyoming streams, by H. W. Lowham. 1976. (PB-264 224/AS)

WRI 76-118. Geohydrology of the Albin and LaGrange areas, southeastern Wyoming, by W. B. Borchert. 1976.

WRI 77-72. Physical, chemical, and biological relations of four ponds in the Hidden Creek strip-mine area, Powder River Basin, Wyoming, by D. J. Wangsness. 1977. (PB-273 512/AS)

WRI 77-103. An analysis of salinity in streams of the Green River Basin, Wyoming, by L. L. DeLong. 1977. (PB-275 728/AS)

WRI 77-107. Preliminary model of the Arikaree aquifer in the Sweetwater River basin, central Wyoming, by W. B. Borchert. 1977.

WRI 77-111. Hydrologic evaluation of the Arikaree Formation near Lusk, Niobrara and Goshen counties, Wyoming, by M. A. Crist. 1977.

WRI 78-13. An analysis of stream temperatures, Green River Basin, Wyoming, by H. W. Lowham. 1978. (PB-284 062/AS)

WRI 78-70. Plan of study for the High Plains Regional Aquifer-System Analysis in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming, by J. B. Weeks. 1978. (PB-284 668/AS)

WRI 78-96. Preliminary applications of Landsat images and aerial photography for determining land-use, geologic, and hydrologic characteristics--Yampa River basin, Colorado and Wyoming, by F. J. Heimes, G. K. Moore, and T. D. Steele. 1978.

WRI 78-121. The biology of Salt Wells Creek and its tributaries, southwestern Wyoming, by M. J. Engelke, Jr. 1978. (PB-300 828/AS)

WRI 78-122. Traveltime, unit-concentration, longitudinal-dispersion, and reaeration characteristics of upstream reaches of the Yampa and Little Snake Rivers, Colorado and Wyoming, by D. P. Bauer, R. E. Rathbun, and H. W. Lowham. 1979. (PB-80 129 521/AS)

WRI 79-6. Hydrogeologic features of the alluvial deposits in the Greybull River valley, Bighorn Basin, Wyoming, by M. E. Cooley and W. J. Head. 1979.

WRI 79-34. Plan of study for the Northern Great Plains Regional Aquifer-System Analysis in parts of Montana, North Dakota, South Dakota, and Wyoming, by U.S. Geological Survey. 1979. (PB-298 141/AS)

WRI 79-47. Effect on sediment yield and water quality of a nonrehabilitated surface mine in north-central Wyoming, by B. H. Ringen, L. M. Shown, R. F. Hadley, and T. K. Hinkley. 1979. (PB-299 868/AS)

WRI 79-1291. Hydrogeologic features of the alluvial deposits in the Nowood River drainage area, Bighorn Basin, Wyoming, by M. E. Cooley and W. J. Head. 1979.

WRI 80-8. Analysis of stream quality in the Yampa River basin, Colorado and Wyoming, by D. A. Wentz and T. D. Steele. 1980. (PB-81 108 904/AS)

WRI 80-50. Kriging analysis of mean annual precipitation, Powder River Basin, Montana and Wyoming, by M. R. Karlinger and J. A. Skrivan. 1980. (PB-81 216 806/AS)

WRI 80-72. Calibration and testing of selected portable flowmeters for use on large irrigation systems, by R. R. Luckey, F. J. Heimes, and N. G. Gaggiani. 1980. (PB-81 121 345/AS)

WRI 80-85. Water resources of upper Separation Creek basin, south-central Wyoming, by L. R. Larson and E. A. Zimmerman. 1981. (PB-81 224 263/AS)

WRI 80-111. Evaluating methods for determining water use in the High Plains in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming, by F. J. Heimes and R. R. Luckey. 1980. (PB-81 205 270/AS)

WRI 80-729. 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, by R. W. Miller and S. A. Strausz. 1980.

WRI 80-730. 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, by W. R. Miller and S. A. Strausz. 1980.

WRI 80-1104. Effects of pumpage on ground-water levels as modeled in Laramie County, Wyoming, by M. A. Crist. 1980.

WRI 81-62. Hydrology of Salt Wells Creek--a plains stream in south-western Wyoming, by H. W. Lowham, L. L. DeLong, K. R. Collier, and E. A. Zimmerman. 1982. (PB-82 201 211/AS)

WRI 81-71. Streamflows and channels of the Green River Basin, Wyoming, by H. W. Lowham. 1982. (PB-82 207 416/AS)

WRI 81-72. Sediment transport and source areas of sediment and runoff, Big Sandy River basin, Wyoming, by J. E. Kircher. 1982. (PB-82 215 898/AS)

WRI 81-75. Methodology for hydrologic evaluation of a potential surface mine: the Red Rim site, Carbon and Sweetwater counties, Wyoming, by D. G. Frickel, L. M. Shown, R. F. Hadley, and R. F. Miller. 1981.

WRI 81-76. An empirical method for determining average soil infiltration rates and runoff, Powder River structural basin, Wyoming, by J. G. Rankl. 1982. (PB-82 201 732/AS)

WRI 81-692. Base flow and chemical quality of streams in the Northern Great Plains area, Montana and Wyoming, 1977-78, by S. A. Druse, K. A. Dodge, and W. R. Hotchkiss. 1981.

WRI 82-40. Method for estimating historical irrigation requirements from ground water in the high plains in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming, by F. J. Heimes and R. R. Luckey. 1982. (PB-82 245 796/AS)

WRI 82-682. Hydrology of Area 49, Northern Great Plains and Rocky Mountain Coal Provinces, Montana and Wyoming, by S. E. Slagle and others. 1983.

WRI 83-146. Hydrology of Area 54, Northern Great Plains and Rocky Mountain Coal Provinces, Colorado and Wyoming, by Gerhard Kuhn, P. B. Daddow, and G. S. Craig, Jr, and others. 1983 [1984].

WRI 83-545. Hydrology of Area 50, Northern Great Plains and Rocky Mountain Coal Provinces, Wyoming and Montana, by M. L. Lowry, J. F. Wilson, Jr., and others. In press.

WRI 83-761. Hydrology of Area 52, Northern Great Plains and Rocky Mountain Coal Provinces, Wyoming, Colorado, Idaho, and Utah, by H. W. Lowham and others. In press.

WRI 84-734. Hydrology of Area 51, Northern Great Plains and Rocky Mountain Coal Provinces, Wyoming and Montana, by D. A. Peterson and others. In press.

The following WRI reports may be purchased from the Open-File Services Section, Western Distribution Branch, U.S. Geological Survey, Box 25425, Federal Center, Denver, Colo. 80225. A report listed as "In press" is not yet available.

WRI 82-4003. Evaluation of selected surface-water-quality stations in Wyoming, by S. J. Rucker, IV and L. L. Delong. In press.

WRI 82-4007. Hydrologic features of the alluvial deposits in the Owl Creek valley, Bighorn Basin, Wyoming, by M. E. Cooley and W. J. Head. 1982.

WRI 82-4008. Water quality of streams and springs, Green River basin in Wyoming, by L. L. Delong. In press.

WRI 82-4068. Digital model of the Bates Creek alluvial aquifer near Casper, Wyoming, by K. C. Glover. 1983.

WRI 82-4072. A data-management system for areal interpretive data for the High Plains in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming, by R. R. Luckey and C. F. Ferrigno. 1982.

WRI 82-4103. Time of travel and dispersion of solutes in a 36.4-mile reach of the North Platte River downstream from Casper, Wyoming, by G. W. Armentrout, Jr., and L. R. Larson. 1984.

WRI 82-4105. Evapotranspiration rates of selected sites in alluvial valleys in the Powder River basin, Wyoming and Montana, by L. W. Lenfest, Jr. In press.

WRI 82-4107. Machine-readable data files from the Madison Limestone and Northern Great Plains Regional Aquifer System Analysis projects, Montana, Nebraska, North Dakota, South Dakota, and Wyoming, by J. S. Downey. 1982.

WRI 82-4117. Hydrology of the White Tail Butte area, northern Campbell County, Wyoming, by M. E. Lowry and J. G. Rankl. In press.

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The water-data reports listed below may be purchased as hard copy or microfiche only from the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, Va. 22161. They are available for inspection only at the Wyoming and Reston, Va., offices of the U.S. Geological Survey. The PB number in parentheses is the NTIS ordering number.

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WY-76-2. Water resources data for Wyoming--water year 1976, volume 2, Green River Basin, Bear River Basin, and Snake River Basin. 1977. (PB-285 744/AS)

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WY-82-1. Water resources data for Wyoming--water year 1982. 1983. (PB-84 114 669/AS)

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Hydrologic Investigations Atlases (and other maps of areas west of the Mississippi River) are sold by the Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver, Colo. 80225.

HA-217. General availability of ground water and depth to water level in the Missouri River basin, by G. A. LaRocque, Jr. 1966.

HA-219. Ground-water reconnaissance of the Great Divide and Washakie basins and some adjacent areas, southwestern Wyoming, by G. E. Welder and L. J. McGreevy. 1966.

HA-270. Ground-water resources and geology of the Wind River basin area, central Wyoming, by H. A. Whitcomb and M. E. Lowry. 1968.

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Miscellaneous Investigations Maps are sold by the Western Distribution Branch, U.S. Geological Survey, Box 25286, Federal Center, Denver, Colo. 80225.

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Open-file reports, which may be in manuscript form, generally are not reproduced and distributed in quantity. These reports are available for inspection in the Cheyenne, Wyo., and Reston, Va., offices of the U.S. Geological Survey. Most numbered open-file reports may be purchased from the Open-File Services Section (OFSS), Western Distribution Branch, U.S. Geological Survey, Box 25425, Federal Center, Denver, Colo. 80225. Information on the availability of the unnumbered reports may be obtained from the District Chief, Cheyenne, Wyoming.

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