THE STREAM-GAGING PROGRAM IN SOUTH DAKOTA

By John R. Little and Debra K. Matthews

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CONVERSION FACTORS

The following factors may be used to convert the inch-pound units in this report to the International System of Units (SI).

Multiply inch-pound unit	by	To obtain SI unit
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
foot	0.3048	meter
mile	1.609	kilometer
square mile (mi^2)	2.590	square kilometer

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ABSTRACT

This report documents the results of a study of the uses, funding, and availability of the streamflow information program in South Dakota. In 1983, 107 continuous-record surface-water gaging stations were being operated in South Dakota on a budget of $607,050. Data from most stations have multiple uses. Data uses and funding sources are identified for each station. All stations have sufficient justification for continuation although 10 are primarily used to provide data for short-term research studies. The continued operation of these 10 stations should be evaluated when the studies have been completed.

INTRODUCTION

The U.S. Geological Survey is the principal Federal agency collecting surface-water data in the Nation. The collection of these data is a major activity of the Water Resources Division of the U.S. Geological Survey. The data are collected in cooperation with State and local governments and other Federal agencies. In 1983, the U.S. Geological Survey operated approximately 8,000 continuous-record gaging stations throughout the Nation, with some of the records extending back into the nineteenth century.

Any long-term activity, such as the collection of surface-water data, should be re-examined periodically, if not continuously, because of changes in objectives or technology. The last systematic nationwide evaluation of the U.S. Geological Survey streamflow-data program is documented by Benson and Carter, 1973. The present nationwide evaluation of the U.S. Geological Survey stream-gaging program is to be completed over a 5-year period with twenty percent of the program to be analyzed each year. The objective of the overall analysis is to define and document the most cost-effective means of providing streamflow information to the data users.

This report identifies principal uses of the data and relates the uses to the funding sources for each continuous-record gaging station. In addition, gaging stations are categorized as to how the data are provided to the user (on a real-time, daily, periodic, or after the end of the water-year basis), and is patterned after a report for the State of Maine (Fontaine and others, 1984).

History of Stream Gaging in South Dakota

The stream-gaging program in South Dakota has evolved over the years as Federal, State, and local needs for surface-water data have increased. Surface-water data collection was started on the Missouri River by other Federal agencies in the 1870's. In August 1894, Congress appropriated funds for a nationwide stream-gaging program as an amendment to the Sundry Civil Bill. The systematic collection of streamflow data in South Dakota began in 1903 with the establishment of thirteen gaging stations in the Black Hills area (Larimer, 1970); however, these stations were discontinued in 1906. Four gaging stations were operated from 1912 to 1918 on the Standing Rock, Rosebud, and Pine Ridge Indian Reservations for the Indian Service.

After the Flood Control Act was passed by Congress in 1928, 18 gaging stations, located on the Missouri River and on major tributaries, were established by the U.S. Geological Survey in South Dakota for the U.S. Army Corps of Engineers. These stations form the long-term surface-water data network in the State; although, some have been relocated a few miles for various reasons.

In 1944, the Bismarck Surface-Water District, comprised of the two Dakotas, was created by the U.S. Geological Survey with the District office in Bismarck, North Dakota. South Dakota operations were managed from the new Subdistrict office in Pierre. In 1944, the cooperative program with the State was started.

With the advent of the Missouri River Basin (MRB) program in 1946, stream-gaging activities were expanded in areas where the U.S. Bureau of Reclamation was planning the development of irrigation projects.

In 1955, the crest-stage partial-record program was started in cooperation with the South Dakota Highway Commission to collect data to define peak-flow characteristics in small basins. In 1956, a network of low-flow partial-record stations was established.

In 1966, as part of the reorganization of the U.S. Geological Survey's Water Resources Division, South Dakota was separated from the Bismarck District. The new District office was in Huron with Subdistrict offices in Pierre and Rapid City and a Field Headquarters office in Yankton.

In 1969, daily-discharge records were being collected at 104 sites, and peak-flow records at 132 sites. Eighty of the peak-flow gaging-stations were recording continuous stage and rainfall data. In 1983, the South Dakota surface-water data-collection network consisted of 107 full-time continuous-record streamflow stations, and two part-time continuous-record stations.

The approximate number of streamflow records published by the U.S. Geological Survey for each year since 1903 is shown in figure 1.

Current Stream-Gaging Program in South Dakota

While South Dakota generally has an adequate supply of surface water that is suitable for most uses, the seasonal and areal distribution of precipitation is not uniform. Storage is necessary to contain spring runoff to be used later to augment low flows. The largest developments have been for flood control, hydroelectric power generation, and irrigation, with only minor development for industrial uses. In 1980, about 49 percent of the 472,000 irrigated acres in the State were irrigated using surface water. Recreation has been greatly enhanced by surface-water development. Many of the gaging stations in the State are being operated to monitor the streamflows affected by these developments or to provide data for potential developments under study.

The operation of the gaging stations, and the compilation and publishing of the data, is the responsiblity of the U.S. Geological Survey. The basin designations for the 13 river systems in South Dakota, along with the locations of the active gaging stations, are shown in figure 2. The distribution of stations by basin in 1983 was: Little Missouri-1, Grand-5, Moreau-2, Cheyenne-45, Bad-1, White-10, Niobrara-2, James-17, Vermillion-3, Big Sioux-16, and Missouri-5. The South Dakota District does not operate any gaging stations in the Red or Mississippi River basins in the northeast corner of the State. Thus, stations within these basins are not included in this report. The total cost of operating the 107 gaging stations in 1983 was $607,050.

The official U.S. Geological Survey station number and name, drainage area, period of record, and mean annual flow for the 107 gaging stations are given in table 1. Station identification numbers used throughout this report are either the U.S. Geological Survey's standard eight-digit downstream-order number or the last six digits of the eight-digit downstream-order station number (the first two digits of the downstream-order station number for all of the stations in this report are "06").

USES, FUNDING, AND AVAILABILITY OF CONTINUOUS STREAMFLOW DATA

The importance of a stream-gaging station is measured by the uses that are made of the data from the station. The uses of the data from each station in the South Dakota program were identified by a 1983 survey of the known data users. The survey documented the importance of each station and identified the gaging stations that should be considered for discontinuation.

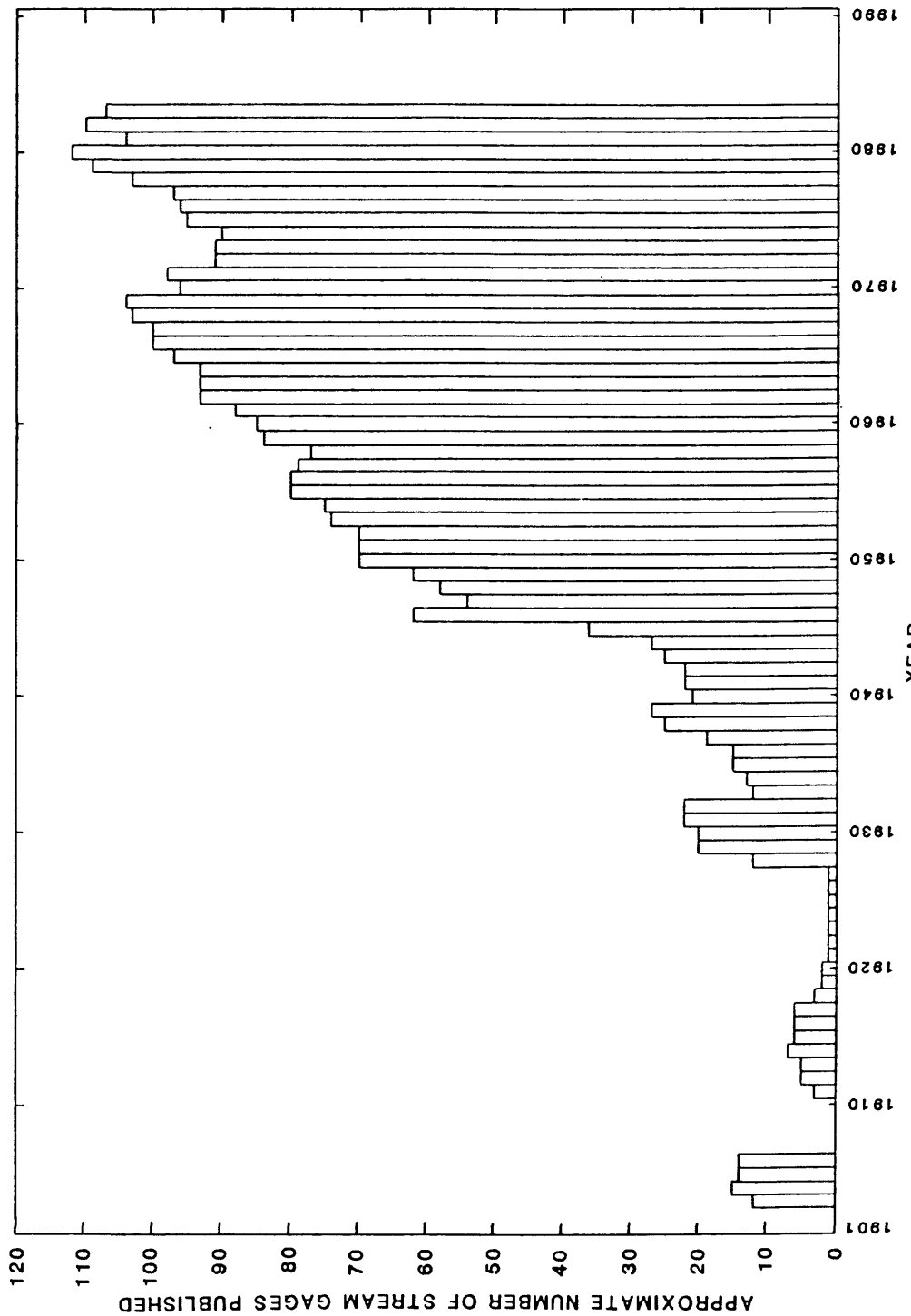

Figure 1.--History of stream gaging in South Dakota.

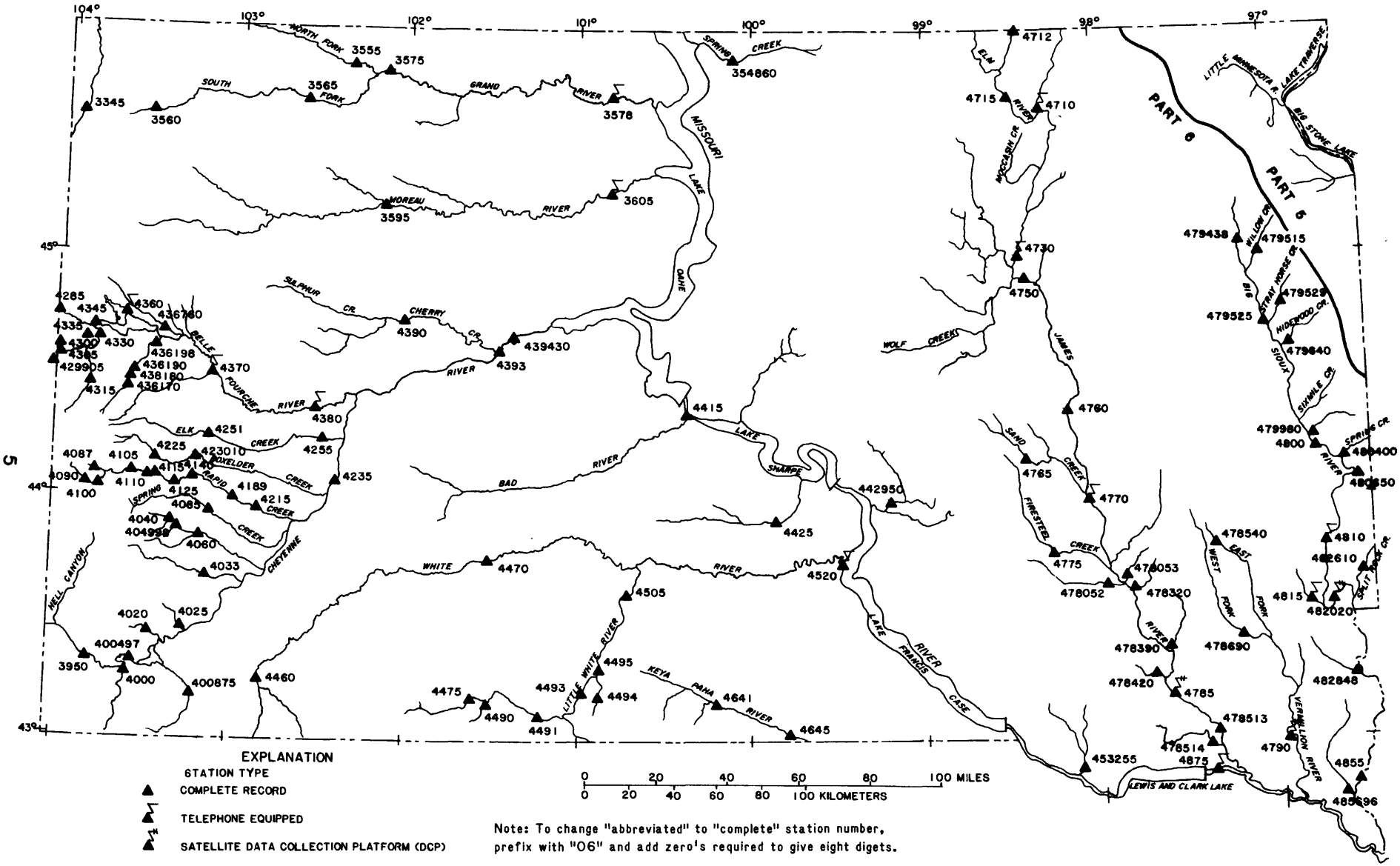

Figure 2.--Location of surface-water gaging stations, 1983 water year

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program

All stations are located in South Dakota except as noted

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06334500	Little Missouri River at Camp Crook	1,970	September 1903-November 1906 May 1956- 1/	136
06354860	Spring Creek near Herreid	440	October 1962-	8.70
06355500	North Fork Grand River near White Butte	1,190	October 1945- 1/	55.9
06356000	South Fork Grand River at Buffalo	148	August 1955-	8.52
06356500	South Fork Grand River near Cash	1,350	October 1945- 1/	54.1
06357500	Grand River at Shadehill	3,120	February 1943- 2/	115
06357800	Grand River at Little Eagle	5,370	July 1958-	238
06359500	Moreau River near Faith	2,660	March 1943- 3/	135
06360500	Moreau River near Whitehorse	4,880	June 1954-	202
06395000	Cheyenne River at Edgemont	7,143	June 1903-November 1906 April 1928-February 1933 October 1946-	98.3
06400000	Hat Creek near Edgemont	1,044	April 1905-September 1906 October 1950- 1/	18.7
06400497	Cascade Springs near Hot Springs	.47	July 1976-	20.0
06400875	Horsehead Creek at Oelrichs	136	June 1983-	4/

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program--Continued

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06402000	Fall River at Hot Springs	137	October 1937- 5/	21.0
06402500	Beaver Creek near Buffalo Gap	130	October 1937- 6/	7.03
06403300	French Creek above Fairburn	105	April 1982-	4/
06404000	Battle Creek near Keystone	66	July 1945-July 1947 October 1961-	7/ 9.19
06404998	Grace Coolidge Creek near Game Lodge, near Custer	25.2	October 1976-	3.25
06406000	Battle Creek at Hermosa	178	July 1949- 8/	9.06
06408500	Spring Creek near Hermosa	199	July 1949-	5.05
06408700	Rhoads Fork near Rochford	7.95	November 1981-	4/
06409000	Castle Creek above Deerfield Reservoir, near Hill City	83	June 1948- 9/	10.4
06410000	Castle Creek below Deerfield Dam	96	July 1946-	11.1
06410500	Rapid Creek above Pactola Reservoir, at Silver City	292	October 1953-	40.8
06411500	Rapid Creek below Pactola Dam	320	July 1946- 1/ 10/	44.2
06412500	Rapid Creek above Canyon Lake, near Rapid City	371	July 1946-	39.4
06414000	Rapid Creek at Rapid City	410	June 1903-November 1906 July 1942- 1/	61.2

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program--Continued

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06418900	Rapid Creek below sewage treatment plant, near Rapid City	452	October 1981-	4/
06421500	Rapid Creek near Farmingdale	602	July 1946-	55.5
06422500	Boxelder Creek near Nemo	96	July 1945-July 1947 May 1966-	11/ 18.8
06423010	Boxelder Creek near Rapid City	128	May 1978-	.77
06423500	Cheyenne River near Wasta	12,800	July 1914-June 1915 August 1928-June 1932 March 1934- 1/ 12/	13/ 346
06425100	Elk Creek near Rapid City	190	November 1978-	4/
06425500	Elk Creek near Elm Springs	540	July 1949-	23.0
06428500	Belle Fourche River at Wyoming-South Dakota State line	3,280	December 1946- 14/	90.0
06429905	Sand Creek near Ranch A, near Beulah, Wyoming	267	October 1976-September 1983	24.1
06430000	Murray Ditch at Wyoming-South Dakota State line	15/	June 1954-	15/
06430500	Redwater Creek at Wyoming-South Dakota State line	471	June 1954- 16/	36.0
06431500	Spearfish Creek at Spearfish	168	October 1946-	17/ 52.7

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program—Continued

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06433000	Redwater River above Belle Fourche	920	November 1945- 18/	137
06433500	Hay Creek at Belle Fourche	121	October 1954-	1.55
06434500	Inlet Canal near Belle Fourche	19/	October 1945- 19/	164
06436000	Belle Fourche River near Fruitdale	4,540	October 1945- 20/	87.8
06436170	Whitewood Creek at Deadwood	40.6	October 1981-	4/
06436180	Whitewood Creek above Whitewood	56.3	October 1982-	4/
06436190	Whitewood Creek near Whitewood	77.4	October 1981-	4/
06436198	Whitewood Creek above Vale	102	November 1982-	4/
06436760	Horse Creek above Vale	462	October 1980-	4/
06437000	Belle Fourche River near Sturgis	5,870	October 1945- 1/	276
06438000	Belle Fourche River near Elm Springs	7,210	August 1928-June 1932 March 1934- 1/	21/ 362
06439000	Cherry Creek near Plainview	1,190	October 1945- 22/	45.7
06439300	Cheyenne River at Cherry Creek	23,900	August 1960-	827
06439430	Cottonwood Creek near Cherry Creek	120	October 1982-	4/
06441500	Bad River near Fort Pierre	3,107	August 1928- 23/	147

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program--Continued

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06442500	Medicine Creek at Kennebec	465	July 1954-	16.4
06442950	Crow Creek near Gann Valley	670	October 1971-	17.6
06446000	White River near Oglala	2,200	May 1943-	53.1
06447000	White River near Kadoka	5,000	July 1942-	278
06447500	Little White River near Martin	310	February 1938-September 1940 July 1962-	19.3
06449000	Lake Creek below Refuge, near Tuthill	120	February 1938-September 1940 July 1962- 24/	15.8
06449100	Little White River near Vetal	590	August 1959- 25/	53.1
06449300	Little White River above Rosebud	890	October 1981-	4/
06449400	Rosebud Creek at Rosebud	50.8	October 1974-	7.29
06449500	Little White River near Rosebud	1,020	May 1943- 26/	110
06450500	Little White River below White River	1,570	October 1949- 27/	129
06452000	White River near Oacoma	10,200	August 1928-	531
06453255	Choteau Creek near Avon	602	October 1982-	4/
06464100	Keya Paha River near Keyapaha	466	October 1981-	4/
06464500	Keya Paha River at Wewela	1,070	November 1937-September 1940 October 1947- 28/	29/ 68.9

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program--Continued

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06467500	Missouri River at Yankton	279,500	October 1930- 1/ 30/	26,430
06471000	James River at Columbia	7,050	October 1945-	110
06471200	Maple River at North Dakota-South Dakota State line	750	June 1956-	20.2
06471500	Elm River at Westport	1,680	October 1945-	46.6
06473000	James River at Ashton	11,000	October 1945-	159
06475000	James River near Redfield	14,800	March 1950-	188
06476000	James River at Huron	16,800	August 1928-September 1932 August 1943- 1/ 31/	230
06476500	Sand Creek near Alpena	240	March 1950-	8.18
06477000	James River near Forestburg	18,600	March 1950-	270
06477500	Firesteel Creek near Mount Vernon	540	September 1955-	19.5
06478052	Enemy Creek near Mitchell	181	October 1975-	4.74
06478053	Pierre Creek near Alexandria	72.7	October 1981-September 1983	4/
06478320	Plum Creek near Milltown	35.4	October 1981-September 1983	4/
06478390	Wolf Creek near Clayton	386	October 1975-	23.3
06478420	Lonetree Creek at Olivet	112	October 1981-September 1983	4/

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program--Continued

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06478500	James River near Scotland	21,550	September 1928- 1/	372
06478513	James River near Yankton	21,800	October 1981-	4/
06478514	Beaver Creek near Yankton	144	October 1981-September 1983	4/
06478540	Little Vermillion River near Salem	51.0	October 1966-	2.90
06478690	West Fork Vermillion River near Parker	370	August 1961-	24.7
06479000	Vermillion River near Wakonda	1,680	October 1945-September 1983	125
06479438	Big Sioux River near Watertown	1,025	October 1972-	17.4
06479515	Willow Creek near Watertown	125	September 1971-	11.6
06479525	Big Sioux River near Castlewood	1,592	October 1976-	40.6
06479529	Stray Horse Creek near Castlewood	73.7	October 1968-	10.5
06479640	Hidewood Creek near Estelline	164	October 1968-	22.6
06479980	Medary Creek near Brookings	232	October 1980-	4/
06480000	Big Sioux River near Brookings	4,420	August 1953-	162
06480400	Spring Creek near Flandreau	61.0	October 1982-	4/
06480650	Flandreau Creek above Flandreau	100	October 1981-	4/
06481000	Big Sioux River near Dell Rapids	5,060	May 1948-	261

Table 1.--Selected hydrologic data for stations in the South Dakota surface-water program--Continued

Station number	Station name	Drainage area (mi^2)	Period of record	Mean annual flow (ft^3/s)
06481500	Skunk Creek at Sioux Falls	570	May 1948- 32/	51.9
06482020	Big Sioux River at North Cliff Avenue, at Sioux Falls	5,770	October 1971- 33/	342
06482610	Split Rock Creek at Corson	475	October 1965- 34/	78.4
06482848	Beaver Creek at Canton	129	October 1982-	4/
06485500	Big Sioux River at Akron, Iowa	9,030	October 1928-	901
06485696	Brule Creek near Elk Point	205	October 1982-	4/

1/ Monthly discharge only for some periods, published in Water-Supply Paper 1309.

2/ July 1904 to October 1906 collected at site 4 miles upstream and published as "at Seim" in Water-Supply Paper 130, 172, and 208 have been found to be unreliable and should not be used.

3/ June 1903 to November 1906 no winter records.

4/ Less than five years of records.

5/ October 1937, monthly discharge only, published in Water-Supply Paper 1309.

6/ October, November 1937, monthly discharge only, published in Water-Supply Paper 1309.

7/ Water years 1946, 1962-83.

8/ August to December 1903, gage heights only.

9/ Prior to October 1953, published as "above Deerfield Reservoir, near Deerfield."

10/ October 1928 to September 1932, combined records of Creek and Dakota Power and Light Co. flume. Prior to October 1953, published as "near Pactola."

11/ Water years 1946, 1967-83.

12/ Records for February 19-28, 1930, published in Water-Supply Paper 701, have been found to be unreliable and should not be used.

13/ Water years 1929-31, 1935-83.

14/ Records for water year 1947 incomplete, yearly estimate published in Water-Supply Paper 1729.

15/ Ditch diverts water from left bank of Redwater Creek, 2.0 miles upstream, for irrigation of about 700 acres. Flow maintained during irrigation season only.

16/ April 1929 to September 1931 and February 1936 to July 1937, published as "near Beulah, Wyoming."

17/ Upstream diversions out of basin into Whitewood Creek basin average about 10 cubic feet per second.

18/ Records for water year 1946 incomplete, yearly discharge published in Water-Supply Paper 1309. Prior to October 1960, published as "Redwater Creek above Belle Fourche."

19/ Monthly diversions from Inlet Canal between station and reservoir for some periods, published in Water-Supply Paper 1309.

20/ Monthly discharge only for October 1945, published in Water-Supply Paper 1309.

21/ Water years 1929-31, 1935-83.

22/ Monthly discharge only for October and November 1945, published in Water-Supply Paper 1309.

23/ Monthly discharge only for July 1932 to February 1934, published in Water-Supply Paper 1309.

24/ Prior to October 1965, published as "South Fork White River near Martin."

25/ Prior to October 1965, published as "South Fork White River near Vetal."

26/ Prior to October 1965, published as "South Fork White River near Rosebud."

27/ Prior to October 1965, published as "South Fork White River below White River."

28/ Monthly discharge only for October 1947, published in Water-Supply Paper 1309.

29/ Water years 1939-40, 1948-83.

30/ Gage-height records collected at same site March 1873 to November 1886, March 1905 to May 1908 (fragmentary), August 1921 to September 1950 (except winter months prior to 1932), are contained in reports of the National Weather Service.

31/ Gage-height records collected at site about 100 feet downstream from period of open water each year July 1902 to June 1914 and for period March to June 1915-23 are in reports of the National Weather Service.

32/ May 1948 to September 1971, published as "near Sioux Falls."

33/ March 1962 to September 1971, gage heights and discharge measurements only in files of U.S. Army Corps of Engineers.

34/ February 1951 to September 1965 gage heights and discharge measurements only in files of U.S. Army Corps of Engineers.

Data uses identified by the survey were categorized into eight classes, which are defined below and listed in table 2. The sources of funding for each station, and the frequency at which the data are provided to users, were compiled and listed.

Data-Use Classes

The following definitions were used to categorize use of streamflow data for each active continuous-record stream-gaging station.

Regional Hydrology

For data to be useful in defining regional hydrology, streamflow at the gaging station must be largely unaffected by manmade storage or diversion. In this use class, the effects of man on streamflow are not necessarily small, but the effects are limited to those caused primarily by land-use. These stations are useful in developing regionally transferable information about the relationship between basin characteristics and streamflow.

Seventy-three stations in the South Dakota network are classified in the regional-hydrology category. Of these, Castle Creek above Deerfield Reservoir near Hill City (station 06409000) and Little Vermillion River near Salem (station 06478540) are hydrologic bench-mark stations; and the Bad River near Fort Pierre (station 06441500) and the Big Sioux River near Akron, Iowa (station 06485500) are index stations. Hydrologic bench-mark stations are part of a national network of 56 gaging stations that are monitoring long-term trends in streamflow from watersheds that are relatively free from manmade alterations. Data from index stations are used to prepare a monthly summary of national water conditions.

Hydrologic Systems

Hydrologic systems stations are those whose data are used for accounting, to define current hydrologic conditions and to monitor the origin and movement of water through hydrologic systems, including regulated systems. They include stations that monitor diversions and return flows, and stations that provide data useful for defining the interaction of water systems.

The bench-mark and index stations are included in this category also because they are accounting for the long-term and current conditions of the hydrologic systems that they gage. Many of the stations in this category are used by the South Dakota Department of Water and Natural Resources, Division of Water Rights, for the administration of users rights to water.

Table 2.--Data use, funding, and data availability for stations in the surface-water program

[RH, Regional Hydrology; HS, Hydrologic Systems; LO, Legal Obligations; P&D, Planning and Design; PO, Project Operation; HF, Hydrologic Forecasts; WM, Water-Quality Monitoring; R, Research; FP, Federal Program; OFA, Other Federal Agencies Program; CO-OP, Federal-State Cooperative Program. Frequency of data availability: A, annual data report; P, periodic release of provisional data; C, telephone calls; T, telemetry. All stations are in South Dakota except as noted.]

Station number	Data use								Funding			Frequency
	RH	HS	LO	P&D	PO	HF	WM	R	FP	OFA	CO-OP	
06334500	1	2				3					4	A,P
06354860	1	2									4	A,P
06355500		2			5,6						4	A,P
06356000	1	2				3					4	A,P
06356500	1	2			5,6	3				7		A,P
06357500		2,8		8	6,9					10		A,P
06357800		2,8		8	6		7,11			7		A,C,P
06359500	1	2,8		8	6	3				7		A,P
06360500	1	2,8		8	6	3	7,8,11			7		A,C,P
06395000	1	2,12		12	6,13	3	12	14			4	A,P
06400000	1	2,12		12		3					4	A,P
06400497		2						14			4	A
06400875	1	2				3					4	A,P
06402000		2			6			14		7		A,P

Table 2.--Data use, funding, and data availability for stations in the surface-water program--Continued

Station number	Data use								Funding			Frequency
	RH	HS	LO	P&D	PO	HF	WM	R	FP	OFA	CO-OP	
06402500	1	2				3		14			4	A,P
06403300	1	2						14			4	A,P
06404000	1	2				3		14			4	A,P
06404998	1	2				3		14			15	A,P
06406000	1	2				3		14			4	A,P
06408500	1	2				3		14			4	A,P
06408700	1	2				3		14			4	A,P
06409000	1	2,16			17	3	16	14	18			A,P
06410000		2			19			14		10		A,P
06410500		2			20	3		14			4	A,P
06411500		2			21	3		14		10		A,P
06412500		2			22	3		14			4	A,P
06414000		2		7,10	22,23	3,7		14		7		A,C,P
06418900		2		10	22,23	3	24	14			4	A,P
06421500		2		10	6,22,23	3		14		10		A,C,P
06422500	1	2				3		14			4	A,P
06423010	1	2			6	3		14			4	A,P

Table 2.--Data use, funding, and data availability for stations in the surface-water program--Continued

Station number	Data use								Funding			Frequency
	RH	HS	LO	P&D	PO	HF	WM	R	FP	OFA	CO-OP	
06423500		2			6	3,7				7		A,C,P
06425100	1	2				3		14			4	A,P
06425500	1	2			6	3					4	A,P
06428500		2	25		26	3			18			A,P
06429905	1	2		27	27			14		27		A,P
06430000		2			26		28				4,28	A,P
06430500		2			26		28				4,28	A,P
06431500	1	2			26,27	3		14			4	A,P
06433000		2			26	3					4	A,P
06433500	1	2		7,10	26	3			18	7		A,P
06434500		2			26		10			10		A,P
06436000		2			26	3	29	29			4	A,C,P
06436170	1					3	29,30	29			4	A,P
06436180	1						29	29			4	A,P
06436190	1	2				3	29	29			4	A,P
06436198	1						29	29			4	A,C,P
06436760	1	2		10	26	3	10		31			A,P

Table 2.--Data use, funding, and data availability for stations in the surface-water program--Continued

Station number	Data use								Funding			Frequency
	RH	HS	LO	P&D	PO	HF	WM	R	FP	OFA	CO-OP	
06437000		2		7,10	26	3	10,29	29			4	A,C,P
06438000		2		7	6,26	3	11,29	29		7		A,C,P
06439000	1	8		8	6	3				7		A,P
06439300		2,8		7,8	6	3	11,29	29		7		A,C,P
06439430	1	8		8						8		A,P
06441500	1	2		7	6	3	7			7		A,P
06442500	1	2		7	6	3				7		A,P
06442950	1	2		8		3				8		A,P
06446000	1	2		8,10		3					4	A,P
06447000	1	2,8		7,8	6	3				7		A,P
06447500	1	2,8		8		3					4	A,P
06449000		2		8,10	27						4	A,P
06449100	1	2		8,10		3			31			A,P
06449300	1	2		8,10		3	8			8		A,P
06449400	1	2,8		8		3			31			A,P
06449500	1	2,8		8		3					4	A,P
06450500	1	2,8		8	6	3					4	A,P

Table 2.--Data use, funding, and data availability for stations in the surface-water program--Continued

Station number	Data use								Funding			Frequency
	RH	HS	LO	P&D	PO	HF	WM	R	FP	OFA	CO-OP	
06452000	1	2,7		7	6	3,7	7,11			7		A,C,P
06453255	1	2		8,10	6	3	10			8		A,P
06464100	1	2,8				3					4	A,P
06464500	1	2			6	3					4	A,P
06467500		2		7	6	3,7	7		18	7		A,C,P
06471000		2,10,27		10	10,25	3	10,11				4	A,C,P
06471200	1	2,10		10		3					4	A,P
06471500		2,10		10		3					4	A,P
06473000		2,10		10		3			31			A,C,P
06475000		2,10		10		3	10		31			A,P
06476000		2,10		10	10,32	3	10,32		31			A,P
06476500	1	2		10		3					4	A,P
06477000		2		7,10,33	6	3	33				4	A,C,P
06477500	1	2			34	3					4	A,P
06478052	1	2		33		3	33		31			A,P
06478053	1	2		33		3	33				33	A,P
06478320	1	2		33		3	33				33	A,P

Table 2.--Data use, funding, and data availability for stations in the surface-water program--Continued

Station number	Data use								Funding			Frequency
	RH	HS	LO	P&D	PO	HF	WM	R	FP	OFA	CO-OP	
06478390	1	2		10		3			31			A,P
06478420	1	2		33		3	33				33	A,P
06478500		2,7,10		7,10,33	6	3,7	6,11,33			7		A,C,P,T
06478513		2,7,10		7,10,33	6	3,7	33				4	A,P
06478514	1	2		33		3	33				33	A,P
06478540	1	2,17				3			17			A,P
06478690	1	2				3					4	A,P
06479000		2			6	3,7				7		A,C,P,T
06479438	1	2		35		3	36	37			35,36	A,P
06479515	1	2		35		3		37			35	A,P
06479525	1	2,10		10,35		3		37			35	A,P
06479529	1	2,10		10,35		3		37	31			A,P
06479640	1	2,10		10,35		3		37	31			A,P
06479980	1	2		35		3		37			35	A,P
06480000	1	2,10		35		3		37			4	A,P
06480400	1	2		35		3		37			35	A,P
06480650	1	2		35		3		37			35	A,P

Table 2.--Data use, funding, and data availability for stations in the surface-water program--Continued

Station number	Data use								Funding			Frequency
	RH	HS	LO	P&D	PO	HF	WM	R	FP	OFA	CO-OP	
06481000	1	2,10		7,10,35	6,38,39	3,7	10	37		7		A,C,P
06481500	1	2,7,10		7,35	6,38	3,7		37		7		A,C,P
06482020	1	2,7,10		7,10,35	6,38,39	3,7	39	37		7		A,C,P,T
06482610	1	2,10		10,35	6	3		37	31			A,P
06482848	1	2		35		3		37			35	A,P
06485500	1	2,7		7,35	6,40	3,7	11	37		7		A,C,P,T
06485696	1	2		35		3		37			35	A,P

EXPLANATION

1. For providing general hydrologic knowledge and defining trends
2. South Dakota Department of Water and Natural Resources, Water Rights Division, water rights administration
3. National Weather Service, flood forecasting
4. South Dakota Department of Water and Natural Resources
5. U.S. Bureau of Reclamation, inflow into Shadehill Reservoir
6. U.S. Army Corps of Engineers, operation of Missouri River system
7. U.S. Army Corps of Engineers
8. U.S. Bureau of Indian Affairs

9. U.S. Bureau of Reclamation, outflow from Shadehill Reservoir

10. U.S. Bureau of Reclamation

11. National Stream-Quality Accounting Network station

12. Tennessee Valley Authority

13. U.S. Bureau of Reclamation, inflow into Angostura Reservoir

14. Quality and Availability of Ground Water in the Black Hills Area, South Dakota and Wyoming

15. Black Hills Conservancy Sub-District

16. Hydrologic bench-mark station

17. U.S. Bureau of Reclamation, inflow into Deerfield Reservoir

18. U.S. Geological Survey

19. U.S. Bureau of Reclamation, outflow from Deerfield Reservoir

20. U.S. Bureau of Reclamation, inflow into Pactola Reservoir

21. U.S. Bureau of Reclamation, outflow from Pactola Reservoir

22. U.S. Bureau of Reclamation, Rapid Valley Irrigation Project

23. Rapid Valley Water Conservancy District

24. City of Rapid City

25. Belle Fourche River Compact, Wyoming-South Dakota

26. U.S. Bureau of Reclamation, Belle Fourche Irrigation Project

27. U.S. Fish and Wildlife Service

28. Wyoming State Engineer

29. Investigation of Hazardous Wastes along Whitewood Creek and the Belle Fourche and Cheyenne Rivers, South Dakota
30. South Dakota Department of Water and Natural Resources, Division of Water Quality
31. U.S. Geological Survey, Missouri River Basin Program
32. City of Huron
33. Lower James Conservancy Sub-District
34. City of Mitchell
35. East Dakota Conservancy Sub-District
36. City of Watertown
37. Water Resources of the Big Sioux River basin, South Dakota
38. U.S. Army Corps of Engineers, Sioux Falls Flood Control Project
39. City of Sioux Falls
40. City of Akron, Iowa

Other stations in this category are those used for the accounting of flows in the Belle Fourche, Angostura, and Rapid Valley irrigation projects developed by the U.S. Bureau of Reclamation; and the Missouri River, Rapid City and Sioux Falls flood-control projects developed by the U.S. Army Corps of Engineers.

Legal Obligations

Some stations provide records of flows for the verification or enforcement of existing treaties, compacts, or decrees. This category contains the stations that the USGS is required to operate to satisfy legal responsibilities. The USGS operates station 06428500, Belle Fourche River at the Wyoming-South Dakota State Line, for this purpose.

Planning and Design

Data from gaging stations in this category are used in the planning and design of specific projects (dams, levees, water-supply diversions, hydropower plants, waste-treatment facilities, bridges, etc.). This category is limited to those stations installed for such purposes and where this purpose is still valid.

Data from stations in this category are being used by the U.S. Bureau of Indian Affairs, the Tennessee Valley Authority, the U.S. Bureau of Reclamation, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the South Dakota Department of Transportation, the Lower James Conservancy Subdistrict, and the East Dakota Conservancy Subdistrict for studies in the Grand, Moreau, Cheyenne, Bad, Missouri, White, James, and Big Sioux River basins.

Project Operations

Data from gaging stations in this category are used, on an ongoing basis, to assist water managers in making operational decisions for reservoir releases, hydropower operations, or diversions. The project operation use may require that the data be available to the project managers on a rapid-reporting basis such as monthly, daily, or near real-time.

Most of the stations in the network are included in this category. Users of data in this category include the South Dakota Department of Water and Natural Resources, Water Rights Division; the U.S. Bureau of Reclamation; the U.S. Army Corps of Engineers; the U.S. Fish and Wildlife Service; the Angostura and Belle Fourche Irrigation Districts; the Rapid Valley Water Conservancy District, and the city of Sioux Falls.

Hydrologic Forecasts

Data from gaging stations in this category are regularly used by other agencies to help predict future hydrologic conditions. This might include flood forecasting or flow-volume forecasts for a

specific site or region. All of the stations in the state network are not included in this category, although during an extreme flood event, data from every station in the affected area will usually be used. The "Hydrologic Forecasts" use usually requires that the data be available on a rapid-reporting basis (21 stations in the network currently provide near real-time data). The main user of data from stations in this category is the National Weather Service.

Water-Quality Monitoring

Gaging stations where regular water quality or sediment-transport monitoring is being conducted, or where the availability of streamflow data contributes to the utility or is essential to the interpretation of the water-quality or sediment data, are designated as water-quality monitoring sites. Stations operated as part of the National Stream-Quality Accounting Network (NASQAN) are included in this category. NASQAN stations are operated to define both areal variability and long-term trends in stream quality.

One station in this category is a bench-mark station and eight are NASQAN stations. Water-quality data from bench-mark stations are used to indicate the chemical characteristics of streams that are expected to continue to be relatively free from the effects of man's activities.

Other stations in this category are being funded by the MRB program, the U.S. Bureau of Reclamation, the U.S. Bureau of Indian Affairs, and the Lower James Conservancy Subdistrict for project planning purposes.

Research

Gaging stations in this category are operated to provide data for a particular research or water-investigations study. Typically, these stations are only operated for a few years. Data from 23 gaging stations were being used to support the Quality and Availability of Groundwater in the Black Hills Area, South Dakota and Wyoming project, eight gaging stations were providing data for the Investigation of Hazardous Wastes along Whitewood Creek and the Belle Fourche Rivers, South Dakota project, and 16 for the Water Resources of the Big Sioux basin, South Dakota project.

Funding

The sources of funding for the streamflow data-collection program are:

1. Federal program.-- Funds that have been allocated directly to the U.S. Geological Survey. The Missouri River Basin (MRB) program is in this category.

2. Other Federal Agency (OFA) program.--Funds that are transferred to the U.S. Geological Survey by other Federal agencies.

3. Federal-State cooperative program.--Funds that originate jointly from the U.S. Geological Survey's cooperative-designated funding and from a state or local cooperating agency. The cooperating agency funds may be in the form of cash or direct services in leiu of cash.

4. Other non-Federal.--Funds that come from a State or local government agency and are not matched by U.S. Geological Survey cooperative funds.

In all four categories, the identified funding pertains only to the collection of the streamflow data; funding for other activities at the gaging stations, such as the collection of water-quality samples, may or may not come from the same sources. Funding sources for each gaging station are listed in table 2.

Frequency of Data Availability

Frequency of data availability refers to the schedules at which the streamflow data are provided to the users. Data can be provided by four methods: (1) By direct-access telemetry for real-time use by telephone-accessed equipment, and by near real-time use by satellite-accessed data-collection platforms; (2) by telephone calls from on-site observers; (3) by periodic provisional release; or (4) by publishing in the annual data report "Water Resources Data-South Dakota". These four categories are designated T, C, P, and A in table 2. Data from all 107 stations are published in the annual report, data from 21 stations are available on a real-time or near real-time basis, and data from nearly all stations are available to users provisionally in time of special need.

SUMMARY

In 1983, 107 continuous-record full-time gaging stations were operated by the U.S. Geological Survey in South Dakota at a cost of $607,050. Financial support to the program came from 10 Federal, State, and local agencies.

Surface-water data collection started in South Dakota in 1903. Until 1928 the number of stations in operation did not exceed 15; in 1946, there were 62 stations in the network, and by 1969 the program included 104 gaging stations.

For the eight categories of data use identified, nearly all of the 107 gaging stations provided data that were required by multiple categories of use. All of the stations have sufficient justification for continued operation.

Data from all of the stations are published in the annual report series "Water Resources Data-South Dakota"; much of the data are available on a provisional basis before publication; and data from 21 of the stations are available on a near real-time basis.

REFERENCES CITED

Benson, M. A., and Carter, R. W., 1973, A national study of the streamflow data-collection program: U.S. Geological Survey Water-Supply Paper 2028, 44 p.

Fontaine, R. A., Moss, M. E., Smath, J.A., and Thomas, W. O., Jr., 1984, Cost-effectiveness of the stream-gaging program in Maine: U.S. Geological Water-Supply Paper 2244, 39 p.

Larimer, O. J., 1970, A proposed streamflow data program for South Dakota: U.S. Geological Survey Open-File Report, 65 p.

U.S. Geological Survey, 1983, Water Resources Data-South Dakota, water year 1983: U.S. Geological Survey Water Data Report SD-83-1, 275 p.