Sedimentation and Chemical Quality of Surface Waters in the Wind River Basin, Wyoming

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By B. R. Colby, C. H. Hembree, and F. H. Rainwater

ABSTRACT

This report gives results of an investigation by the U. S. Geological Survey of chemical quality of surface waters and sedimentation in the Wind River Basin, Wyo. The sedimentation study was begun in 1946 to determine the quantity of sediment that is transported by the streams in the basin; the probable sources of the sediment; the effect of large irrigation projects on sediment yield, particularly along Fivemile Creek; and the probable specific weight of the sediment when initially deposited in a reservoir. The study of the chemical quality of the water was begun in 1945 to obtain information on the sources, nature, and amounts of dissolved material that is transported by streams and on the suitability of the waters for different uses. Phases of geology and hydrology pertinent to the sedimentation and chemical quality were studied. Results of the investigation through September 30, 1952, and some special studies that were made during the 1953 and 1954 water years are reported.

The rocks in the Wind River Basin are granite, schist, and gneiss of Precambrian age and a thick series of sedimentary strata that range in age from Cambrian to Recent. Rocks of Precambrian and Paleozoic age are confined to the mountains, rocks of Mesozoic age crop out along the flank of the Wind River and Owl Creek Mountains and in denuded anticlines in the floor of the basin, and rocks of Tertiary age cover the greater part of the floor of the basin. Deposits of debris from glaciers are in the mountains, and remnants of gravel-capped terraces of Pleistocene age are on the floor of the basin. The lateral extent and depth of alluvial deposits of Recent age along all the streams are highly variable.

The climate of the floor of the basin is arid. The foothills probably receive a greater amount of intense rainfall than the areas at lower altitudes. Most precipitation in the Wind River Mountains falls as snow. The foothill sections, in general, are transitional zones between the cold, humid climate of the high mountains and the warmer, drier climate of the basin floor.

Average annual runoff in the basin is about 3.6 inches on the basis of adjusted streamflow records for the Bighorn River near Thermopolis. Runoff from the mountains is high and is mostly from melting of snow and from spring and early summer rains. It does not vary greatly from year to year because annual water losses are small in comparison to annual precipitation. In the areas on the floor of the basin, where runoff is low, the runoff is mostly the result of storms in late spring and early summer. The annual water losses nearly equal the annual precipitation; therefore, runoff is extremely variable, in terms of percentage changes, from year to year and from point to point during any 1 year.

Large areas of the Wind River Basin contribute little sediment. Streams rising in the Wind River Mountains carry negligible amounts of sediment in large volumes of water. After these streams leave the mountains, they pick up some sediment from their channels, from irrigation return flows, and from inflow of tributaries on the basin floor. At the junction of the Wind and Popo Agie Rivers, the streamflow averages about 86 percent of the flow at Thermopolis, but the sediment discharge averages only about 16 percent of the sediment discharge at Thermopolis. In contrast, about 7 percent of the water and 56 percent of the average sediment discharge of the Bighorn River at Thermopolis come from Fivemile Creek. Nearly all the sediment discharged by Fivemile Creek comes from within the Riverton irrigation project; during 1949 and 1950 about 87 percent came from the bed and banks of Fivemile Creek.

Relative sediment yields from the different geologic areas and from different tributary drainage basins were estimated and were expressed in percentages of the average sediment discharge of the Bighorn River at Thermopolis. The area underlain by Precambrian rocks covers 14 percent of the basin, yields 59 percent of the water, and yields much less than 1 percent of the sediment. In contrast, the area underlain by rocks of Quaternary age covers 16 percent of the basin, yields about 63 percent of the sediment, but only about 2.5 percent of the water.

Measured suspended-sediment discharge of the Bighorn River at Thermopolis from October 1, 1946, to September 30, 1951, totaled 23,510,800 tons, an average of 4,702,000 tons per year. The maximum measured yearly sediment discharge was 5,733,000 tons (1947 water year), and the minimum before the closure of Boysen Dam on October 11, 1951, was 3,606,000 tons (1949 water year). Maximum monthly measured sediment discharge for the same period was 1,652,000 tons (June 1948), and the minimum was 8,044 tons (January 1951).

The median particle size of depth-integrated sediment samples collected at Thermopolis and analyzed in a dispersion media ranged from 0.145 to 0.001 millimeter. According to an unweighted average, 74 percent of the measured sediment load at Thermopolis is finer than 0.062 millimeter.

The specific weight of a relatively uncompacted deposit that might be formed from the measured suspended sediment that was discharged by the Bighorn River at Thermopolis from March 1946 to September 1951 was computed by a method based on the median particle size of the sediment. The computed specific weight of 58 pounds per cubic foot would convert the sediment load to an average of 3,700 acre-feet per year.

Computations of total sediment discharge for 8 sediment stations cover a range in streamflow of 20 to 8,360 cfs (cubic feet per second) and a range of measured suspended-sediment discharge of 194 to 366,000 tons per day. Ratios of computed instantaneous total sediment discharge to measured suspended-sediment discharge were as low as 1.05 and as high as 1.75. The results of the computations were used to estimate average ratios of total sediment discharge to measured suspended-sediment discharge for most of the stations in the basin. A plot of unmeasured sediment discharges (the difference between computed total sediment discharge and measured suspended-sediment discharge) against water discharges shows that the unmeasured sediment discharge increased in approximate proportion to water discharge for 3 streams, as about the 1.2 power of the water discharge for 2 streams, and as about the 1.5 power for another stream. The percentage of unmeasured sediment discharge becomes small for large flows that contain high concentrations of suspended sediment. Computed size distributions of the total sediment discharge were about the same as those of the measured suspended sediment at the contracted sections but usually indicated much coarser sizes than those of the measured suspended sediment at the normal sections.

The chemical quality of the surface water in the Wind River drainage basin differs widely from one stream to another and is variable in many streams from headwaters to mouth. Geologic factors, runoff and streamflow characteristics, and irrigation practices largely determine the nature and amount of the dissolved minerals that are transported by the Wind River and its tributaries.

Chemical analyses of the water at 22 selected locations depict the effect of geology on the quality of the waters. These waters ranged from a dilute (specific conductance of 50 micromhos), calcium bicarbonate type in a mountain stream to a highly mineralized (specific conductance of 4,420 micromhos), calcium and sodium sulfate type in a creek in the more arid region. Three and four years of water-quality records for the Wind River at Riverton and the Bighorn River at Thermopolis, respectively, established the relationships between salinity and water discharge at these locations. In general, the periods of low dissolved-mineral concentration were associated with periods of high runoff, whereas higher dissolved-mineral concentrations corresponded with days of lower flow. However, maximum salinity did not coexist with minimum water discharge but occurred at somewhat higher flows. The water-quality relations in drains of the Riverton project show that the mineral content and geochemical character of the applied water are altered appreciably by evapotranspiration, by dissolving accumulated salts in the irrigated lands, and by solution of sodium and calcium sulfates from the soil and mantle rock.

During the period included in this investigation before the closure of Boysen Dam, streamflow removed about 748,000 tons of dissolved material from the Wind River drainage basin annually. Computations of discharges of material in solution from five drainage areas within the basin show that the rate of dissolving and of discharge of dissolved material is more dependent on precipitation and runoff than on the mineral and physical properties of the soil and rocks. Irrigation is particularly effective in dissolving and transporting large quantities of salt.

Because of their low salinity and other favorable characteristics, many of the waters are suitable for domestic and some industrial uses. Four different methods for classifying water for irrigation were applied to results of analyses from several of the present sources of supply. All methods concurred in showing that the waters were of good quality for irrigation. Most of the waters were so dilute that little leaching would be required with their application.

INTRODUCTION

PURPOSE AND SCOPE OF INVESTIGATION

The investigation of sedimentation and of the chemical quality of surface waters in the Wind River Basin in west-central Wyoming was undertaken as a part of the program of the Department of the Interior for development of the Missouri River basin. The overall plan for the Missouri River basin includes the development of irrigation and hydroelectric power and the storage and regulation of floodwaters. One of the requirements for successful planning of economically feasible projects in the basin is reliable information on fluvial sediments and on the chemical quality of the water.

This study of sedimentation was made to determine the quantity of sediment that is transported by the streams in the Wind River drainage basin, the probable sources of the sediment, and the probable specific weight of the sediment when initially deposited in a reservoir. The chemical quality of the water was investigated to obtain information concerning the nature and amounts of dissolved material in the waters and the suitability of the waters for different uses. This report summarizes the results of the study to September 30, 1952, and, in addition, includes some special studies that were made during the 1953 and 1954 water years.

On March 15, 1946, the Geological Survey installed a sediment station on the Bighorn River at Thermopolis, Wyo. Since that time, 31 additional sediment stations have been established and operated on a daily basis for different periods of time on the streams in the Wind River drainage basin.

The records of measured suspended-sediment discharge do not, of course, show the total sediment discharge of most streams. Hence, a few computations of unmeasured sediment discharge were made for each of eight stations. The results of these computations were used as the basis for estimating average percentages of unmeasured sediment discharge at the different sediment stations.

Sediment discharges at the sediment stations, even for the short periods of available record, give a measure of the quantity of sediment that is transported by the streams at the points of measurement. Particle-size analyses of suspended-sediment samples furnished information that aids in computing the amount of unmeasured sediment discharge and the probable initial specific weight of the sediments after deposition.

The network of sediment stations in the Wind River Basin was arranged so that the sediment loads at the stations would delineate the source areas as well as the approximate amount of sediment that each area contributes to the total sediment load as measured in the Bighorn River at Thermopolis, Wyo., about 21 miles downstream from Boysen Dam.

The purpose of the chemical-quality section of this report is to present the available information on the water quality of the

Wind River Basin that will further proper development, control, and use of the water resources of the area. In the study the following items were considered: the nature and amounts of mineral constituents in solution; the geologic, hydrologic, and cultural factors that influence and determine the water quality; the amount and probable source of the salts discharged by the streams; and the suitability of the water for domestic, industrial, and irrigational uses.

Basic chemical-quality data were obtained at 10 scheduled sampling stations, which were operated from $1\frac{1}{2}$ to $5\frac{1}{2}$ years. These data were supplemented with 85 analyses of water from 48 other locations. The records for the station near Dubois furnish information on the quality of the water near the headwaters, and the records for the station at Thermopolis furnish information on the quality of the water that leaves the basin. The stations on Fivemile and Muddy Creeks were established for collection of data on the relationship of irrigation to water quality.

The field studies made during the investigation provided a background of information that was essential to the understanding and interpretation of the sediment and chemical-quality base data. Pertinent published reports were reviewed in the study of the geology and its relationship to the sediment and minerals that are carried in suspension and in solution by the streams of the Wind River Basin.

PREVIOUS INVESTIGATIONS

In 1938 the Corps of Engineers, U. S. Army, started a study of suspended sediment in the Bighorn River and its tributaries. This study continued through 1944, and some results of the study are contained in a report on the Yellowstone River and tributaries.1/ The stations at which sediment discharges were measured for areas in the Wind River drainage basin and the periods of operation were as follows:

Bighorn River at Thermopolis..........April 1938 to May 1945
Wind River at Riverton.................May 1940 to May 1945
Fivemile Creek near Shoshoni..December 1939 to October 1940

1/ United States Army, Corps of Engineers, 1946, Review report on flood control and other purposes, Yellowstone River and tributaries, Wyoming, Montana, and North Dakota, supplement VI, Silt studies.

Data for these years cannot be compared directly with measurements made after 1946 because of the difference in methods of sampling, types of samplers, and procedures for computing monthly sediment discharges.

Results of the sediment, erosion, and quality-of-water investigations made by the Geological Survey from 1946 to 1948 were made available in a preliminary unpublished report. 2/ Chemical quality of ground water in the Riverton irrigation project has been discussed by Durum (Morris and others, 1956).

PERSONNEL AND ACKNOWLEDGMENTS

This investigation was made by the Geological Survey in cooperation with other agencies of the Department of the Interior. The investigation was conducted by the Water Resources Division of the Geological Survey, under the general supervision of P. C. Benedict, regional engineer. The investigation of sediment accumulations in small reservoirs was made under the supervision of H. V. Peterson, staff geologist.

Chemical analyses of water samples were made under the supervision of H. A. Swenson, Lincoln, Nebr. The chemical-quality, sediment, and streamflow stations were operated under the supervision of T. F. Hanly, Worland, Wyo.

Unpublished records of water discharge were furnished by F. M. Bell, district engineer, Denver, Colo.

WIND RIVER BASIN

GEOGRAPHY

The Wind River drainage basin in west-central Wyoming (pl. 1) occupies most of Fremont County and small parts of Natrona and Hot Spring Counties. The Wind River drainage basin almost coincides with the Wind River Basin, which is a distinct topographic basin about 150 miles long and 70 miles wide and which has an area of about 7,800 square miles. Runoff and the sediment

2/ Hembree, C. H., and others, Sedimentation and chemical quality of water in the Bighorn River drainage basin, Wyoming and Montana. [Manuscript report in open files of U. S. Geol. Survey.]

and dissolved mineral discharge from the basin are measured at Thermopolis, which is downstream from the "wedding of the waters" where the name of the river changes from Wind to Bighorn. The drainage area upstream from this station is 8,080 square miles. The Wind River Basin is bounded on the north by the Owl Creek Mountains, the southern tip of the Bighorn Mountains, and the eastward extension of the Absaroka Mountains, on the west and southwest by the Wind River Mountains, on the south by Beaver Rim, and on the east by the Rattlesnake Range and a region of high plains (fig. 1). The Wind River Basin comprises approximately one-fourth of the Bighorn River drainage basin. Riverton, population 4,142, and Lander, population 3,349, are the 2 principal centers of population. Lander is the county seat of Fremont County. Other incorporated towns and their populations are Hudson 293, Shoshoni 891, Pavillion 241, Dubois 279, and Lost Cabin 73. (All population figures are from the 1950 published records of the Bureau of the Census.)

The Chicago, Burlington & Quincy Railroad passes through the northeastern part of the basin. A spur line of the Chicago and North Western Railway runs from Bonneville through Riverton to Lander. It connects with the Chicago, Burlington & Quincy Railroad at Bonneville. Several buslines and the Frontier Airlines serve the basin.

Three United States highways and two State routes form a good network of paved roads in the basin. U. S. Highways 20 and 26 from Casper enter the basin from the east. At Shoshoni U. S. Highway 20 turns north down the Wind River and leaves the basin through the Wind River Canyon. U. S. Highway 26 roughly parallels the Wind River from Shoshoni upstream and passes out of the basin toward Teton National Park over Togwotee Pass. U. S. Highway 287 from Rawlins enters the basin from the southeast, passes through Lander, and joins U. S. Highway 26 at the Wind River Diversion Dam. From this junction, the two U. S. Highways follow the same route up the Wind River. State Route 320 connects Lander and Shoshoni through Riverton. State Route 28 from historic South Pass enters the basin from the south and joins U. S. Highway 287 at Perrin, a few miles southeast of Lander. These highways are oil-surfaced, all-weather roads. In addition, the basin has several county roads, some of which are hard surfaced.

In terms of yearly monetary value, the oil-and-gas industry is the most important industry in the basin. The yearly gross value of oil and gas produced in the basin is usually double the gross value of the products of farming and ranching. Revenue from the tourist trade is important in the economy of the basin. Mineral industries based on coal, gold, radioactive ores, tungsten, and phosphate are potentially important.

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Figure 1. --Map of the landforms of the Wind River Basin and surrounding areas.

Agriculture is the most important industry to the majority of the people who live in the basin. Livestock raising is the principal agricultural pursuit. Because of the low rainfall, there is little dry farming; most cultivated crops are irrigated.

TOPOGRAPHY

The Wind River Basin is a structural basin surrounded mainly by the anticlinal Wind River and Owl Creek Mountains. The interior or floor of the basin is underlain by flat-lying beds of poorly consolidated sediment. The synclinal nature of the basin is reflected in its topography.

The altitude of the basin ranges from about 4,600 feet at Boysen Dam to 13,785 feet at the top of Gannett Peak in the Wind River Mountains. (See pl. 2.) The Owl Creek Mountains rise to altitudes exceeding 9,000 feet, and the Beaver Rim escarpment reaches an altitude of 7,000 feet. Along the divide between the Wind River and Powder River drainage basins, the area of high relief reaches an altitude of 6,000 feet.

EROSIONAL FEATURES

The main streams are the Wind and Popo Agie Rivers. These rivers and their principal tributaries rise in the Wind River Mountains. The Popo Agie River joins the Wind River a short distance downstream from Riverton. The combined flow enters Boysen Reservoir about 10 miles northeast of Riverton. Boysen Dam is at the upstream end of the Wind River Canyon where the Wind River leaves the basin.

The floor of the basin is essentially a dissected erosional plain, whose principal topographic features are the valleys of the streams and their associated stream terraces. (See fig. 2.) In many places, particularly in the areas of badlands, buttes are common. The gently rolling plains that stand high above the valleys are the remnants of an old erosional plain. In the foothills of the Wind River Mountains a series of hogbacks were formed subsequent to the removal of horizontal sedimentary rocks that once covered the steeply dipping older formations (fig. 3).

Figure 2.--The Wind River valley near Ocean Lake. The Wind River Mountains are in the background.

Figure 3.--Hogbacks in steeply tilted strata along Red Canyon near Perrin. The flat-topped mountain in the background is an erosional remnant of Tertiary rocks.

GEOLOGY

The rocks exposed in the Wind River Basin are granite, schist, and gneiss of Precambrian age and a thick series of sedimentary strata that range in age from Cambrian to Recent. (See table 1.) The oldest rocks are exposed in the mountains, and successively younger rocks crop out with distance from the mountains toward the axis of the basin. (See pl. 3.)

Rocks of Precambrian and Paleozoic age are confined to the mountains. Igneous and metamorphic rocks of Precambrian age are exposed near the crests of the mountains and in the deep canyons that are cut into the flanks or, like the Wind River Canyon, through the mountains. The Paleozoic rocks are mostly limestones and sandstones. These rocks crop out along the flanks of the Wind River and Owl Creek Mountains and in a few small areas on the floor of the basin.

Rocks of Mesozoic age crop out along the flank of the Wind River and Owl Creek Mountains and in denuded anticlines in the floor of the basin. On the basis of their composition and area of outcrop, the rocks of Mesozoic age may be roughly divided into three groups. The first group is comprised of the formations of Triassic and Jurassic age and the Cloverly formation of Cretaceous age. This group is composed of shale, siltstone, and limestone. Gypsum is present in many of the beds. The second group is comprised of a great thickness of alternating thin beds of sandstone and thick beds of shale that have been divided into the Thermopolis and Mowry shales, the Frontier formation, and the Cody shale. The third group, comprised of the Mesaverde and other post-Cody Cretaceous rocks, is a series of interbedded sandstones and shales.

Rocks of Tertiary age cover the greater part of the floor of the Wind River Basin. The Fort Union formation of Paleocene age crops out in only a few places and consists of sandstone, shale, siltstone, and some coal. The oldest rocks of Eocene age in the basin have been named the Indian Meadows formation. These rocks crop out in a small area near the Wind River in the northwestern part of the basin. The Wind River formation of Eocene age covers most of the floor of the basin and consists mainly of shale, siltstone, and standstone (fig. 4). Rocks of Tertiary age that are stratigraphically above the Wind River formation crop out in the northwestern part of the basin and along Beaver Rim in the southeastern part. They are mostly siltstone and other fine-grained rocks.

Deposits of glacial debris (fig. 5) are in the mountains and along the base of the mountains, and remnants of gravel-capped terraces of Pleistocene age (fig. 2) are on the floor of the basin. The glacial deposits are limited in area, but the terrace remnants occupy a large part of the basin.

Table 1.--Summary of exposed rock formations in the Wind River Basin
[Branson and Branson, 1941; Brown, 1949; Hares and others, 1946; King, 1947; Love, 1939 and 1948; Love and others, 1945 and 1955; Reeside, 1944; Thomas, 1934 and 1948; Thompson and others, 1949; Tourtelot, 1948; Van Houten, 1950; and Weller and others, 1948]

Age			Formation and member	Remarks
Cenozoic	Quaternary	Recent		Glacial deposits in the mountains. Terrace and flood-plain deposits of gravel, sand, silt, and clay along the streams. Some areas of wind-blown deposits.
		Pleistocene		
			Unconformity	
	Tertiary	Miocene		White massive soft tuffaceous sandstone and marl.
			(?)	
		Oligocene	Wiggins formation	Gray to brown coarsely bedded volcanic conglomerate interbedded with white blocky tuffaceous claystone.
			White River formation	White to pale-pink blocky tuffaceous claystone, siltstone, sandstone, and lenticular arkosic conglomerate.
			(?)	
		Eocene	Tepee Trail formation	Green and olive-drab andesitic conglomerate, sandstone, and claystone.
			Aycross formation	Brightly variegated tuffaceous claystone and sandstone grading laterally into greenish-gray sandstone and shale.
			Wind River formation: Lost Cabin member	Assemblage of interbedded yellowish, red, tan, and gray siltstones, sandstones, shales, and claystones.
			Wind River formation: Lysite member	
			Indian Meadows formation	Red to variegated claystone, shale, sandstone, and beds of large boulders. Some algal ball limestone.
			Unconformity	
		Paleocene	Fort Union formation	Gray and buff sandstone, siltstone, shale, thin interbedded subbituminous coal, and carbonaceous shale.
			Unconformity	
Mesozoic	Cretaceous		Lance formation	Light-gray and brown sandstones and interbedded gray shales, claystone, and carbonaceous shale.
			Lewis shale	Gray soft marine shale, with many gray and brown lenticular sandstone beds; many concretions.
			Meeteetse formation	Light-gray shale, sandstone, and carbonaceous shale; thin seams of coal in the upper half of the formation.
			Mesaverde formation	Alternating white to buff massive and thin-bedded sandstones and shales; sometimes crossbedded.
			Cody shale	Shaly sandstone, dark-gray marine shales, calcareous shale, and a few thin beds of bentonite.
			Frontier formation	Gray and black interbedded sandstone and shale. Thin subbituminous coal beds are present.
			Mowry shale	Soft black nonsiliceous shales at base grade up into hard siliceous shale; contains beds of bentonite and quartzitic sandstone.

Table 1.--Summary of exposed rock formations in the Wind River Basin--Continued

Age			Formation and member		Remarks
Mesozoic	Cretaceous		Thermopolis shale	Muddy sandstone member	Black shale with thin bentonite beds and shaly sandstone. Muddy sandstone member is a coarse sandstone.
Mesozoic	Cretaceous		Cloverly formation		Conglomerates, gray sandstones and silty shales, lilac claystones and limestone concretions, and variegated silty shales and siltstones.
			(?)		
Mesozoic	Jurassic		Morrison formation		Variegated shale and claystones, siltstones, silty sandstones, and conglomerates.
Mesozoic	Jurassic		Sundance formation		Gray and greenish-gray calcareous shales, sandstones, and limestones.
Mesozoic	Jurassic		Gypsum Spring formation		Siltstone with interbedded gypsum of irregular thickness and distribution.
			Unconformity		
Mesozoic	Jurassic		Nugget sandstone		Red and gray massive to coarsely bedded sandstone; sometimes crossbedded.
			Unconformity		
Mesozoic	Triassic		Chugwater formation	Popo Agie member	Ocher-colored claystone, purple to red siltstone, and limestone conglomerates.
Mesozoic	Triassic		Chugwater formation	Alcova limestone member	Thin crinkly light-gray limestone.
Mesozoic	Triassic		Chugwater formation	Red Peak member	Reddish siltstone.
Mesozoic	Triassic		Dinwoody formation		Yellow-brown sandy shales, thin-bedded dark-gray shale, and gypsiferous slabby dolomite and limestones.
			Unconformity		
Paleozoic	Permian		Phosphoria formation		Limestones, red shales, sandstone, cherts, and phosphate rock.
			Unconformity		
Paleozoic	Carboniferous	Pennsylvanian	Tensleep sandstone		Crossbedded sandstone, with some limestone at the base. Most of the sandstone is calcareous and has chert nodules in the upper part.
Paleozoic	Carboniferous	Pennsylvanian and Mississippian	Amsden formation		A heterogeneous series of red shales, white limestone, and cherty and sandy limestone.
			Unconformity		
Paleozoic	Carboniferous	Mississippian	Madison limestone		Massive and thin-bedded gray limestone and dolomite with cherty layers.
			Unconformity		
Paleozoic	Devonian		Darby formation		Dark-brown granular dolomites, red and green shales, and sandstones.
			Unconformity		
Paleozoic	Ordovician		Bighorn dolomite		Massive, buff-colored, porous dolomite, which forms prominent cliffs in the walls of the canyons. In some localities, a thin quartzitic sandstone is at the base.
			Unconformity		
Paleozoic	Cambrian		Gallatin limestone		Dolomitic limestone, shingle conglomerate, shales, and sandy shales; some glauconite present.
Paleozoic	Cambrian		Gros Ventre formation		Greenish micaceous shales, sandy micaceous shales, and greenish sandstone; some dolomite and limestone locally.
Paleozoic	Cambrian		Flathead sandstone		Red shaly sandstone and quartzitic sandstone; arkosic sandstone at the base of the formation.
			Unconformity		
Precambrian					Granite, schist, and gneiss.

Figure 4.--Badlands formed by erosion of the Wind River formation near Lysite. Sagebrush and other semiarid vegetation in foreground.

Figure 5.--North Popo Agie River near Milford. The shrub-covered ridge in middle background is glacial debris, and the large boulders at the left edge of the stream were transported by glacial ice. Vegetation of different types.

Recent alluvial deposits are along all the streams in the basin. The lateral extent and the depth of these deposits are highly variable, but, in general, the thickness and areal extent increase downstream.

RESUME OF THE PHYSIOGRAPHIC DEVELOPMENT OF THE WIND RIVER BASIN

Orogenic movements that created the Rocky Mountains started late in Mesozoic time and continued into the Tertiary. The building of the mountains coupled with attendant and subsequent erosion determined the present-day topography of the Wind River Basin. Aggradation in the Central Plains east of the mountains and in the intermontane basins occurred during and after the uplift of the mountains. In the Wind River Basin, isolated remnants of late Tertiary rocks (fig. 3) and the basinward sloping surfaces of these remnants indicate that the aggradation culminated in deposits of sediment that were about 3, 500 feet thick. Projection of the sloping surfaces across and above the present floor of the basin defines in a general way the altitude of the floor at the time of maximum fill (Darton, 1906).

The high sediment concentration and the dissolved-mineral load of the Bighorn River at Thermopolis, before the construction of Boysen Dam, and of many of the tributaries to the Wind River reveal that, in general, degradation of the basin, which began in Tertiary time, still continues. At present, waste water from the irrigation projects and the runoff from storms gather up and transport large quantities of the easily eroded or dissolved sedimentary deposits that compose much of the surface of the basin floor.

The present course of the Wind River has been interpreted to mean that, at some time in the past, the upper part of the Wind River was tributary to the Sweetwater River (Branson and Branson, 1941, p. 147). The former course of the Wind River is apparently delineated by a low gap in Beaver Rim, southeast of Lander. The present Wind River turns abruptly northward near Riverton and leaves the basin through the Wind River Canyon. One explanation of the peculiar bend is the assumption of capture of the Wind River by a tributary of the ancestral Bighorn River.

CLIMATE

The Wind River Basin, owing to the large increase in altitude between the basin floor and the mountains, has wide local differences in temperature and precipitation. These differences in climate greatly affect the amount of sediment and dissolved minerals carried by the streams and in conjunction with other factors partly determine the areas that will furnish most of the sediment and salts to the streams.

Precipitation in the Wind River Mountains is relatively high and falls mostly as snow. Climatological data are not available for the areas of medium and high altitudes, but precipitation at some localities in the Wind River Mountains probably exceeds 40 inches a year (Oltman and Tracy, 1949, p. 7). The distribution of average annual runoff (pl. 2) gives an indication of the increase in precipitation with altitude.

Oltman and Tracy (1949, p. 8) have shown that annual precipitation in the Wind River Mountains increases rapidly with increase in altitude. The relationship that they determined for a line passing through Riverton and Lander to the top of the range was an increase of precipitation of 6 inches per 1,000-foot increase in altitude.

The climate of the floor of the basin is arid. For the water years 1924 to 1952 the U. S. Weather Bureau Stations at Diversion Dam, Pavillion, and Riverton recorded annual precipitation that averaged 9.81, 9.26, and 9.32 inches, respectively. During this same period the annual precipitation ranged from 5.75 to 15.54 inches at Diversion Dam, 5.23 to 15.04 inches at Pavillion, and 5.72 to 13.21 inches at Riverton. The records show that there were more years of below average precipitation than there were years of above average precipitation. (See table 2.)

The foothill areas probably receive a greater amount of high intensity rainfall, with resultant higher rates of runoff, than the areas at lower altitudes. The foothill sections, in general, are transitional zones between the cold, humid climate of the high mountains and the warmer, drier climate of the plains.

The average distribution of precipitation within the year in the interior of the basin is rather uniform. Almost 50 percent of the annual precipitation on the floor of the basin falls during April, May, and June, which is also the time of the melting of most of the snow in the mountains. An additional 20 percent of the precipitation falls in September and October. About 19 percent of the annual precipitation occurs in May, which is the

Table 2.--Annual precipitation by water years at selected U. S. Weather Bureau Stations

/Figure in parentheses is altitude, in feet/

Water year	Precipitation, in inches						
	Dubois (6,917)	Fort Washakie (5,583)	Lander (5,562)	Diversion Dam (5,574)	Pavillion (5,440)	Riverton (4,954)	Middle Fork (6,275)
1918	10.24	....	13.05	....	....	....	18.68
1919	....	....	7.47	....	....	7.39	10.58
1920	....	....	17.88	....	....	....	....
1921	....	....	19.58	11.98	....	....	....
1922	....	....	11.61	6.70	....	....	....
1923	....	....	19.90	13.09	....	17.25	....
1924	7.22	....	16.72	9.93	9.69	9.83	19.12
1925	8.15	....	8.46	8.87	9.14	9.94	11.65
1926	8.24	....	12.90	5.75	8.21	10.65	20.53
1927	....	....	14.72	11.25	12.04	10.21	17.13
1928	7.88	....	10.12	8.29	5.70	7.39	15.19
1929	5.09	....	17.24	10.33	7.01	9.30	23.61
1930	9.70	17.10	17.58	12.73	13.12	10.30	20.89
1931	7.47	14.76	12.97	10.62	7.72	7.62	15.39
1932	9.20	10.24	8.78	6.88	5.23	6.20	13.21
1933	7.89	12.49	15.13	8.90	9.16	9.86	18.28
1934	8.46	9.77	10.89	6.31	6.35	6.59	12.72
1935	6.49	12.57	13.98	9.31	6.86	8.97	18.88
1936	7.87	11.55	11.74	8.45	6.42	7.24	18.90
1937	8.33	14.33	17.08	9.21	9.71	10.97	22.00
1938	9.65	9.85	11.80	8.73	8.68	9.38	17.44
1939	8.34	10.41	11.04	7.77	8.45	8.10	15.02
1940	8.56	9.97	10.51	9.70	7.82	7.82	15.68
1941	15.28	15.54	18.94	12.33	12.20	13.21	23.94
1942	9.68	12.14	14.41	8.30	8.73	9.99	16.53
1943	....	10.38	14.66	7.22	7.12	10.60	19.44
1944	....	17.32	19.57	14.75	15.04	12.07	22.42
1945	15.09	13.56	15.75	13.10	14.07	11.78	20.36
1946	8.89	10.47	11.50	8.87	9.57	9.09	17.21
1947	11.37	19.03	19.91	15.54	14.38	12.77	29.63
1948	8.82	10.38	11.76	10.75	8.58	7.48	16.60
1949	9.26	10.38	12.98	10.77	8.12	5.72	18.46
1950	14.09	15.31	18.39	12.42	10.21	11.10	24.26
1951	9.67	9.45	13.20	8.20	9.15	7.54	17.42
1952	6.01	9.58	13.15	9.19	9.95	8.70	20.22

month of greatest rainfall. Few recorded data are available on intensity of rainfall in the basin, but the available records indicate the possibility of rainfall of moderately high intensity during the summer months.

SOILS AND VEGETATION

The effect of altitude on climate, which in turn affects the soils and vegetation, is evident in the Wind River Basin. The great variety of soils in the basin is due to the differences in climate and in kinds of parent material. The soils range from the types formed in the arid climate of the basin floor to the types formed in the subhumid climate of the mountains. Thorp (1931, p. 283-302), from his study of the effect of climate on soils in northern and northwestern Wyoming, divided the soils of the region into several major soil groups. He found that the soils in the foothills and semiarid plains are mainly Chernozem and Chestnut, that Brown soils are present in the more arid part of the plains, and that the Chernozems are restricted mainly to areas of subhumid climate in the foothills. In the higher parts of the Wind River Mountains the better developed soils occur in only small areas. Most of these true soils are Gray-Brown Podzolic, but some are Alpine Meadow and Podzols.

The soils of the flood plains are developed from water-deposited silts, sands, clays, and gravels; all are somewhat calcareous. These soils are usually light gray, but near the mountains they range from reddish brown to very dark grayish brown, owing to organic material.

The soils of the terraces and alluvial fans range in color from light grayish brown to black. These soils are but slightly leached and are rich in mineral plant nutrients but low in organic material. The soils of the older terraces and alluvial fans have a claypan immediately underlain by a thick accumulation of gypsiferous and calcareous material. In contrast, the soils of the younger terraces and alluvial fans have little clay in the upper subsoil layers and only a moderate accumulation of lime in the subsoil. 3/

In the areas of the basin floor away from the streams, residual soils have developed on bedrock. These soils are mostly

3/ United States Bureau of Indian Affairs, 1950, Detailed land planning and classification report on the Indian Reservation lands in the Wind River Basin: Missouri River Inv. Staff Rept. 102, p. 6-11.

shallow, and their color and texture depend on the parent materials. Large areas in the uplands, like the mountains, have no true soil cover but have only bare rock at the surface.

The native vegetation of the Wind River Basin, like the soils, changes with altitude. In the mountains, especially in the Wind River Mountains, large areas are covered with forests, which consist mainly of coniferous trees. The most common tree is the lodgepole pine, but there are many other kinds, such as limber pine, Engelman spruce, Douglas fir, and aspen. (See fig. 5.) The mountain parks are covered with many kinds of meadow grasses. Willows grow along most of the streams in the mountain meadows.

The floor of the basin is characterized by semiarid types of vegetation, of which sagebrush is the predominant type. (See fig. 4.) The most abundant grasses are bluegrass, niggerwool, junegrass, wheatgrass, gramma, Indian ricegrass, and needle-and-thread grass. Growths of willows and cottonwoods are scattered along the streams.

HYDROGRAPHY

PHYSICAL CHARACTERISTICS OF THE STREAMS

The physical characteristics of a stream are controlled by many factors. Outstanding among them are types of rock material, climate, topography, and vegetation. Although the factors are interdependent, types of rock material and climate are particularly important in determining the characteristics of a stream; type and density of vegetation as well as minor topographic features are dependent on these two factors.

WIND RIVER

The Wind River rises in the northwestern end of the Wind River Mountains and flows southeastward for more than 100 miles to its junction with the Popo Agie River a short distance downstream from Riverton, Wyo. The Wind River begins as a mountain stream and maintains the characteristics of a mountain stream over most of its length. From its source at Togwotee Pass to 81 miles downstream, the Wind River has an average slope of about 200 feet per mile. (See pl. 4.) From this point to Diversion Dam the mean fall of the river is more than 25 feet per mile. From Diversion Dam to its junction with the Popo Agie River, the Wind River has an average slope of 15 feet per mile. The Wind River flows in a valley that gradually widens from canyonlike proportions in the headwaters to substantial flood plains in the lower reaches. Over most of its length upstream from Riverton the Wind River flows over a stream bed of gravels and boulders, which tend to prevent channel erosion.

Tributaries of the Wind River upstream from Riverton include the Du Noir River, Horse Creek, North Fork, Crow Creek, two Dry Creeks, Dinwoody Creek, and Bull Lake Creek. Dry Creek is the only one of these tributaries that enters the Wind River between Diversion Dam and Riverton. (See pl. 1.)

The streams that enter the Wind River from the south drain the northern side of the Wind River Mountains. Most of these streams originate in the summit area of the mountains, which is underlain by granitic rocks, and flow through an area underlain by rocks of Paleozoic and Mesozoic age. (See fig. 5.) The stream channels are cut in gravels of Quaternary age and appear to erode very slowly.

The North Fork and the East Fork Wind River rise in the high areas of the Absaroka Mountains. They have characteristics that are similar to those of the streams that enter the Wind River from the south. (See fig. 6.) The average slope of the North and East Forks and of the streams that enter the Wind River from the south is about the same as that of the upper $8\frac{1}{2}$ miles of Wind River, about 200 feet per mile.

Streams that are tributary to the Wind River from the north and that enter the Wind River downstream from the North Fork and upstream from Riverton differ considerably from the streams that enter from the south. Most of these streams from the north rise in the Absaroka Mountains and flow through areas underlain by Tertiary volcanic and sedimentary rocks. The Tertiary sedimentary rocks are easily eroded, and in some areas they have been dissected into badlands. The streams generally carry little flow, but heavy rainfalls occasionally cause high discharges of short duration.

Downstream from its confluence with the Popo Agie River, the Wind River flows northward and leaves the basin through the Wind River Canyon. Before the completion of Boysen Dam at the head of the Wind River Canyon, the Wind River downstream from Riverton followed a meandering course on an average slope of 8 feet per mile to the head of Wind River Canyon. From this point to Thermopolis the Wind-Bighorn River has an average slope of 15 feet per mile. However, its gradient at the upper

Figure 6.--North Fork Wind River at the sampling section near Dubois. The gravel- and boulder-lined channel is typical of the streams in the upper reaches.

end of the canyon exceeds 17 feet per mile. Closure of Boysen Dam early in October 1951 created Boysen Reservoir, which extends up the Wind River a short distance beyond the mouth of Muskrat Creek.

BOYSEN RESERVOIR

Boysen Reservoir 4/ was formed by the construction of an earthfill dam across the Wind River at the head of Wind River Canyon. The dam has a structural height of 220 feet and stands 150 feet above the stream bed. The crest of the dam has an altitude of 4,758 feet and is 1,143 feet in length. The tops of control storage, conservation storage, inactive storage, and dead storage are at altitudes of 4,732, 4,725, 4,685, and 4,657 feet, respectively. The reservoir has a total storage capacity including storage for flood control of 970,000 acre-feet and a maximum surface area of 22,200 acres.

4/ Information from unpublished data furnished by the Bureau of Reclamation.

POPO AGIE RIVER

The Popo Agie River and its tributaries drain the north and east flanks of the southeastern end of the Wind River Mountains. All its major tributaries except Beaver Creek rise high in the mountains in areas underlain by granitic rocks and flow through narrow canyons cut in Paleozoic rocks before they leave the mountains to join the Popo Agie. The characteristics of these streams are almost identical to those of the streams that drain the northern part of the Wind River Mountains. They all have steep gradients and flow in gravel- and boulder-lined channels that are well protected from sediment erosion. (See fig. 5.) From near the mouth of the canyons to near the mouth of the Little Popo Agie, the Popo Agie and its tributaries flow through areas underlain by Mesozoic rocks. Downstream from the mouth of the Little Popo Agie the Popo Agie flows in an alluvial channel underlain by rocks of Tertiary age.

Beaver Creek rises at the south end of the Wind River Mountains in an area underlain by Precambrian metamorphic rocks. From the mountains to its junction with the Popo Agie River near Riverton it flows through an area underlain by Mesozoic and Tertiary rocks. Most tributaries that join Beaver Creek between the point where it turns north and the mouth drain areas of badlands and broken topography that are underlain, for the most part, by Tertiary rocks. In this reach the channel of Beaver Creek and its tributaries are in alluvium, which the streams are eroding.

MUSKRAT CREEK

Muskrat Creek, which flows on an average slope of 26 feet per mile from the east and into the upstream end of Boysen Reservoir, drains a large area of rolling and broken terrain in the southeast part of the basin. The drainage basin of Muskrat Creek is underlain almost entirely by the Wind River formation of Tertiary age. The stream channel is in alluvial material for most of its course, and its almost vertical cut banks (fig. 7) indicate that erosion of the banks is rapid during the infrequent periods of streamflow. A large alluvial fan that covers an areal expanse of more than a square mile at its mouth is further indication of the tremendous loads that have been carried by the stream and is positive evidence of aggradation of the stream in the lower reaches.

Figure 7.--Muskrat Creek at the sampling section near Shoshoni. The steep erodible banks and the wide, flat stream bed are typical of ephemeral streams on the floor of the basin.

FIVEMILE CREEK

Fivemile Creek rises in the vicinity of Circle Ridge anticline northwest of Pavillion, Wyo. The upper part of its drainage basin is underlain by Mesozoic rocks, and the lower part is underlain by the Wind River formation. The stream flows on an average slope of more than 32 feet per mile in a valley filled with alluvium for almost all its length. The streambanks are nearly vertical and are being actively eroded. Erosion of the banks in the lower 25 miles of its course, where the gradient is 24 feet per mile, is especially severe (fig. 8). Because this stream is so important as a sediment carrier, its characteristics will be discussed more in detail in the section, "Sediment yields by drainage areas."

POISON CREEK

Poison Creek rises southeast of Shoshoni and flows through an area of rolling topography (fig. 9) that is underlain, for the

Figure 8.--Fivemile Creek downstream from the gaging station near Riverton. The newly slumped banks are caused by erosion.

Figure 9.--Poison Creek near its mouth. The stream has an aggraded appearance and low banks.

most part, by the Wind River formation. Small areas at the head of Canyon and Deer Creeks, headwater tributaries, are underlain by Mesozoic and Paleozoic rocks, respectively. In general, the topographic relief of Poison Creek drainage basin is lower than the relief of the other basins tributary to the Wind River. The average slope of Poison Creek is about 22 feet per mile.

Poison Creek, like most of the streams that entered the Wind River downstream from Riverton, has been generally aggrading from its mouth to some distance upstream (fig. 9). The formation of Boysen Reservoir, which Poison Creek now enters west of Shoshoni, will probably increase the distance that aggradation extends upstream. Aggradation may not have been continuous before the construction of Boysen Dam. Probably much of the aggradation in the lower reaches of Poison Creek, as well as in other streams that drain the floor of the basin, represents a temporary storage of sediment between major storms. If this is true, then the bed of the stream undergoes gradual aggradation followed by very rapid degradation. Whether the net result for a period of say 100 to 200 years is aggradation or degradation is unknown. However, the lake behind Boysen Dam will certainly cause aggradation in the lower reaches of Poison Creek by decreasing the gradient.

BADWATER CREEK

Badwater Creek drains the southern slopes of the Owl Creek Mountains and flows into Boysen Reservoir opposite the mouth of Muddy Creek. All but one of the tributaries of Badwater Creek drain areas north of the stream. Alkali Creek, an intermittent stream that rises north of Arminto and flows westward, joins Badwater Creek near Lysite. Bridger Creek, which joins Badwater Creek downstream from Lysite, is, on the basis of runoff, the principal tributary of Badwater Creek. In the mountains, Badwater Creek and its tributaries drain areas that are mostly underlain by resistant Precambrian and Paleozoic rocks. The streams, consequently, are relatively clear until they leave the mountains. Badwater Creek and its tributaries that rise in the mountains are slowly eroding the upper reaches of their valleys. The downstream parts of the valleys are underlain by Tertiary rocks and Quaternary flood-plain material.

Badwater Creek has an average slope of 34 feet per mile and forms a rectangular drainage pattern. (See pl. 1.) Little runoff enters from the south. Probably as the ancestral stream eroded downward, it was pushed southward by the unequal and decidedly preponderant supply of alluvial material from the southern slopes of the Owl Creek Mountains. Slow southward migration of the stream is probably continuing.

Flow in the upper reaches of the stream and tributaries is sustained by snowmelt and ground-water inflow, but appreciable flow in the lower reaches of the main stream is only in direct response to heavy rainstorms. Most base flow of the stream is used for irrigation along the upper reaches, and there is little return flow. For considerable periods no flow passes the gaging station at Bonneville.

MUDDY CREEK

Muddy Creek rises in the Owl Creek Mountains and flows southeast on an average slope of 24 feet per mile along a course about 5 miles northeast and essentially parallel to Fivemile Creek. Before 1950 Muddy Creek was an intermittent stream in its lower reaches. However, in 1950 the Bureau of Reclamation completed an addition to the Riverton irrigation project, and since that time waste water has been released into the channel of Muddy Creek.

Throughout most of its length, the channel of Muddy Creek is cut in alluvial deposits. Most of the upper part of its drainage is underlain by Mesozoic rocks, and the lower part is underlain by the Wind River formation. Muddy Creek contributed large sediment loads to the Wind River even before waste water from irrigation entered its channel. Some sediment was carried during periods of snowmelt; much sediment was carried during stormflows, which are usually of short duration though sometimes of high intensity. However, when waste water started flowing down the channel, the sediment load was increased greatly. The stream is now (1954) widening its channel by eroding the banks.

DRY COTTONWOOD CREEK

Dry Cottonwood Creek rises in the Owl Creek Mountains and flows eastward on an average slope of 57 feet per mile to enter Boysen Reservoir about 2 miles upstream from the dam. The lower 7 miles of the stream has a gradient of 17 feet per mile. Almost all the flow of Dry Cottonwood Creek comes from tributaries that rise on the southern slopes of the Owl Creek Mountains and that flow southward to join the parent stream at the foot of the mountains. Most of the tributaries start as springs and do not exceed 10 miles in length. Dry Cottonwood is an ephemeral stream, which is usually dry. Most of its yearly natural flow comes in 2 or 3 days and is the result of storms. Beginning in 1951 waste water from irrigation has entered the creek channel several miles upstream from the gaging station.

TRIBUTARIES DOWNSTREAM FROM BOYSEN RESERVOIR

Red Canyon Creek and Buffalo Creek, tributaries that are not a part of the Wind River drainage basin, empty into the Bighorn River upstream from the gaging station at Thermopolis. These streams enter the Bighorn River just downstream from the "wedding of the waters," where the name of the river changes from Wind to Bighorn. Buffalo Creek heads along the north slope of the Owl Creek Mountains and flows across an area underlain mostly by Paleozoic rocks. Red Canyon Creek derives its name from the red color of the Chugwater formation and other closely related formations of Mesozoic age that underlie most of its drainage area. Because of their relatively small drainage areas, the creeks have only small amounts of streamflow. However, the erodible nature of the alluvium along the streams and their steep gradients plus other factors cause the sediment concentration to be rather high when flow does occur. Nevertheless, the total sediment load contributed by these two streams and by minor tributaries in the canyon is probably not great.

RUNOFF

Average annual runoff in the Wind River drainage basin is about 3.6 inches on the basis of adjusted streamflow records for the Bighorn River near Thermopolis. The adjustments were for net loss owing to irrigation and for estimated runoff between Wind River Canyon and Thermopolis. Within the basin, average annual runoff ranges from less than 0.25 inch to more than 40 inches. Lowest annual runoff is from areas below 6,000 feet in the basin, where precipitation averages less than 10 inches annually. The highest runoff is from the mountains at altitudes above 11,000 feet, where annual precipitation probably averages more than 45 inches and moisture losses are low. A few small glaciers are on the slopes of high mountains at the headwaters of Dinwoody and Bull Lake Creeks in the areas from which runoff is highest. Oltman and Tracy (1949) discussed the runoff in the Wind River drainage basin in detail and showed the distribution of average annual runoff by lines of equal runoff that are reproduced on plate 2.

Runoff from the mountains is generated mostly by melting of snow and by spring and early summer rains. Because annual water losses are small in comparison to annual precipitation, runoff from the mountains does not vary greatly from year to year. In the valley areas, where runoff is low, the runoff is generated mostly by storms in late spring and early summer. The annual water losses nearly equal the annual precipitation; therefore, in terms of percentage changes, runoff is extremely variable from year to year and from point to point during any year.

During many years runoff from the basin floor is negligible, but a general intense rain like that of July 1923 produced runoff from the basin floor as well as from higher areas. Flow of the Wind River at Riverton increased from about 4,500 cfs on July 22 to a peak of 11,400 cfs on July 25. Peak discharge at Thermopolis was 29,800 cfs on July 24. Estimated peak discharges on Muddy and Badwater Creeks were 16,300 and 18,600 cfs, respectively. Such a flood as that of July 1923 may occur only once in many years, but it does increase considerably the long-time average runoff and sediment yields from drainage areas on the basin floor.

STREAMFLOW RECORDS

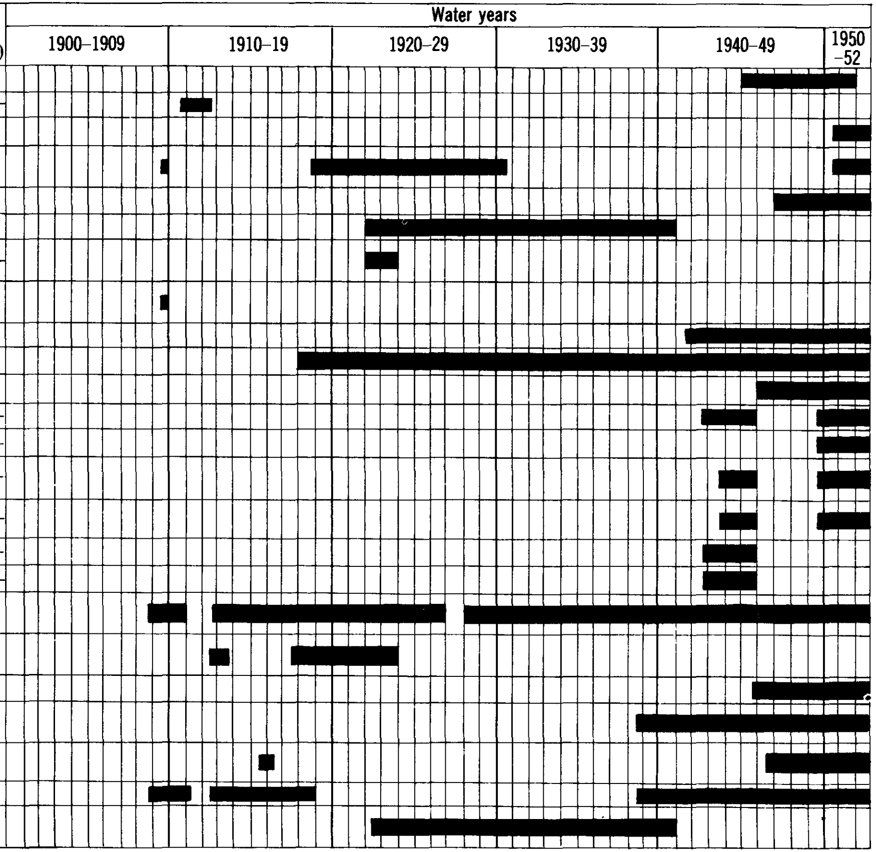
Many published records of streamflow for the Wind River drainage basin are available. Periods of record totaling 417 station years are shown by the bar graphs on chart 1. (Not all these records are continuous during the winter.) In addition, records of flow were obtained during 1949 and 1950 on many drains and wasteways along Fivemile Creek in connection with the measurement of sediment discharges. Locations of the streamflow stations are shown on plates 1 and 5. Some short periods, usually less than about $1\frac{1}{2}$ years, of streamflow records on natural streams were omitted from chart 1. A few small diversions tabulated in special reports of the State Engineer of Wyoming on diversions from the Wind and Bighorn Rivers also are not shown. All the records of streamflow that are mentioned above have been released or are being prepared for publication by the Geological Survey or by the State Engineer of Wyoming or by both. A detailed inventory of published streamflow records before October 1, 1944, is given in Water-Supply Paper 1077 (Colby and Oltman, 1948, p. 54-56, 136-138). The inventory lists periods of streamflow record together with all published sources of the records and gives average annual discharges for many of the gaging stations. Periods of gaging-station operation to September 30, 1950, have been tabulated by Oltman and Tracy (1951).

In the Wind River Basin streamflow does not vary greatly from year to year on major streams, because these streams receive most of their flow from the mountains. (See fig. 10.) In a period of 35 years the annual flow of Bull Lake Creek near Lenore (adjusted for storage in Bull Lake Reservoir since 1936) ranged only from 490 to 1,290 acre-feet per square mile. The annual flow of the Bighorn River at Thermopolis ranged from 61 to 288 acre-feet per square mile during a period of 46 years. In contrast, the streamflow that originates from areas at lower altitudes is known to be extremely variable from year to year. The short record, water years 1948-52 only, for Badwater Creek at Bonneville has a range in annual discharge from 3.6 to 22.2 acre-feet per square mile. Unfortunately, no long-term records of flow of streams that are not fed principally by precipitation in the mountains and foothills are available. The lack of such records is, in itself, an indication of the low and undependable flow of streams that rise at low altitudes in the Wind River drainage basin.

An overall picture of the relative amounts of streamflow at principal gaging stations in the basin is given by plate 6. The figures in the circles are approximations of the average flow in terms of average streamflow of the Bighorn River at Thermopolis. They are not based entirely on measured streamflow at the gaging stations; they are intended to represent the average flow at the respective points after depletions for the irrigated acreages that existed at the end of the 1951 water year, just before Boysen Dam was closed. The measured average flow at Thermopolis during a 41-year period from October 1, 1910, to September 30, 1951, was 1,360,000 acre-feet annually.

Of course, many of the streams, particularly those that drain the drier parts of the drainage basin, have very short periods of record. Wherever the records were too short to establish dependable averages or the diversions for irrigation have been changing rapidly, the average streamflow was partly estimated and may, therefore, be somewhat inaccurate. However, the figures of average percentages do indicate the relative contributions of water from the different parts of the Wind River drainage basin. The percentages do not represent undepleted flow of the streams; they represent expected average discharges at the respective points under present development of irrigation and storage.

Reference no.	Gaging station	Drainage area (sq. miles)
1	Wind River near Dubois	233
2	Horse Creek at Dubois	------
3	North Fork Wind River near Dubois	439
4	Dinwoody Creek near Burris (Crowheart, Lenore)	114
5	Wind River near Burris	1,220
6	Dry Creek near Burris (Crowheart, Lenore)	57
7	Meadow Creek near Lenore (J. K. Ranch Post Office)	------
8	Willow Creek near Crowheart (J. K. Ranch Post Office, Lenore)	50
9	Bull Lake Creek above Bull Lake Reservoir	178
10	Bull Lake Creek near Lenore	222
11	Wind River near Crowheart	1,920
12	Wyoming Canal near Lenore	------
13	Pilot wasteway near Morton	------
14	Pilot Canal (diversion from Wyoming Canal) near Morton	------
15	Wyoming Canal 2d Division, near Morton, (below Pilot diversion)	------
16	Le Clair-Riverton Canal No. 2 near Riverton	------
17	Wyoming Canal No. 2 near Riverton	------
18	Wind River at (near) Riverton (near Arapahoe Agency)	2,320
19	Middle Popo Agie River (Popo Agie River) near Lander	84
20	North Popo Agie River near Milford	99
21	North (North Fork) Popo Agie River near Lander	140
22	Little Popo Agie River near Lander (at Dallas)	108
23	Little Popo Agie River at Hudson	331
24	(South Fork) Little Wind River near Fort Washakie	118



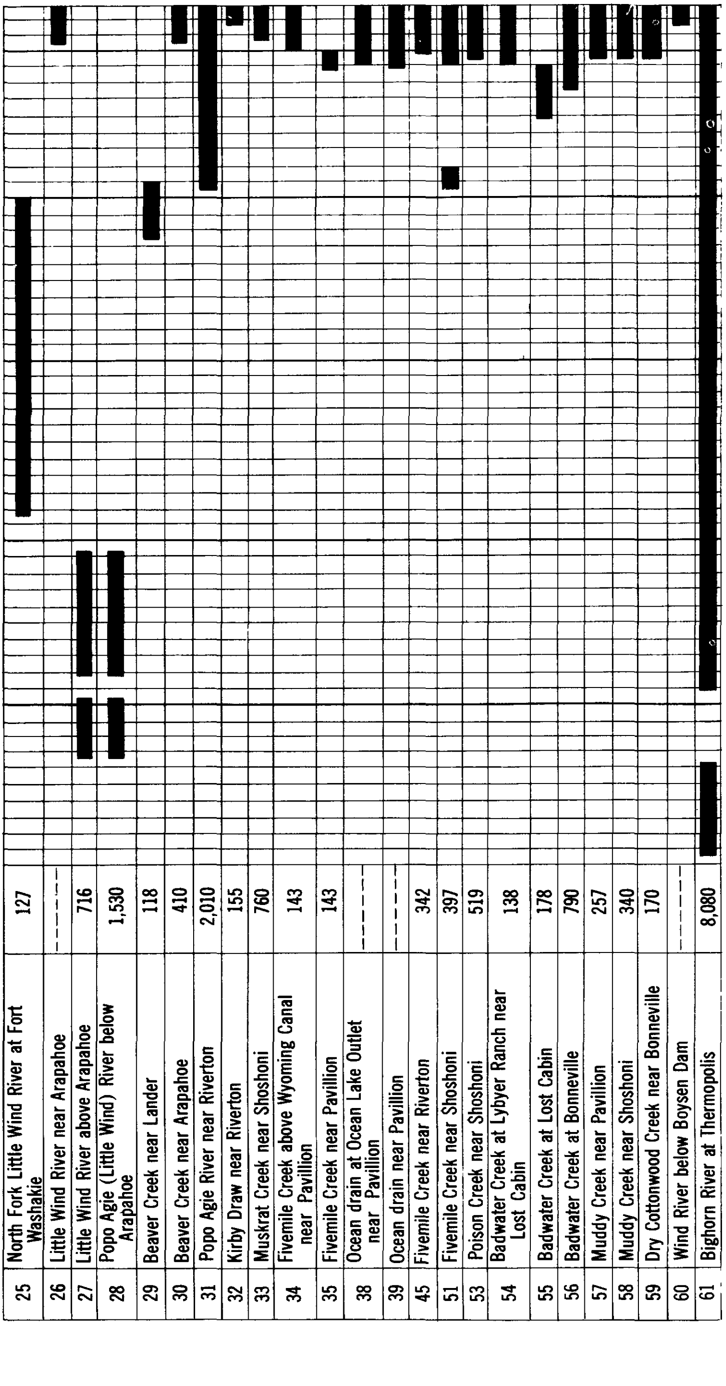


Chart 1. --Periods of operation of gaging stations in the Wind River drainage basin.

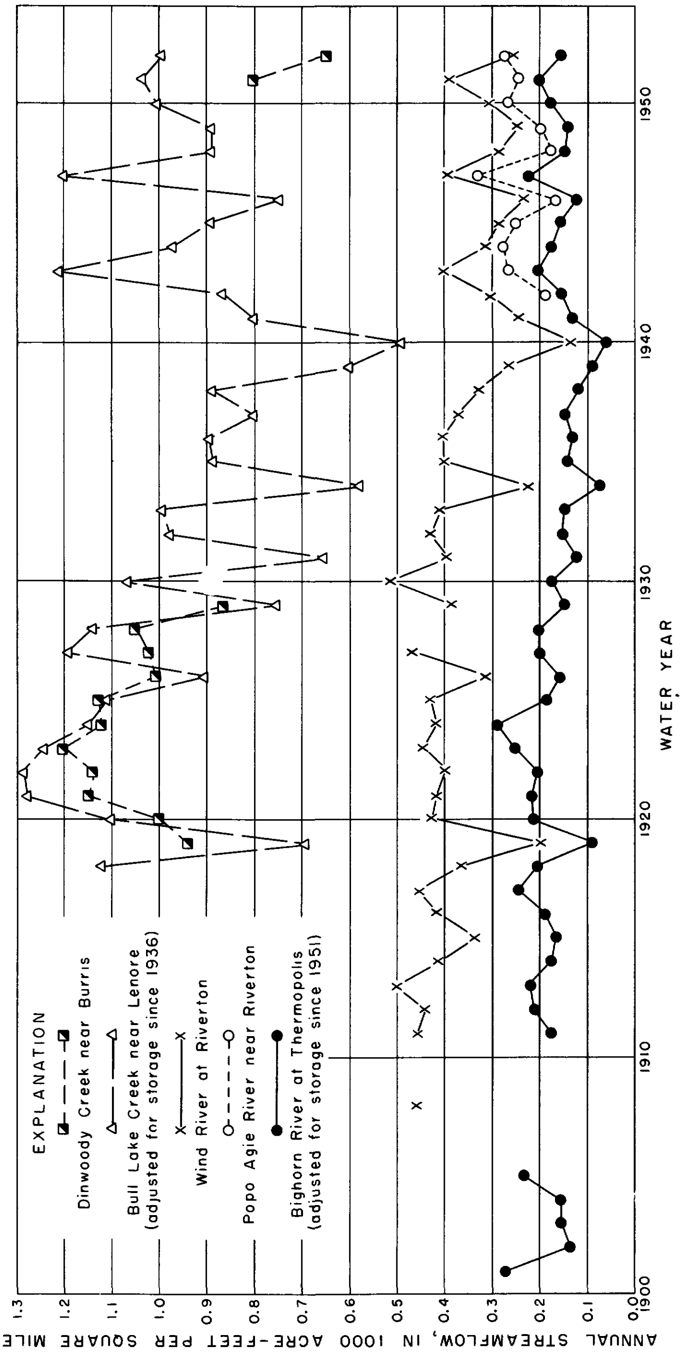


Figure 10. --Streamflow in acre-feet per square mile of drainage area at key stations for Wind River drainage basin.

Plate 6 shows that most streamflow in the Wind River drainage basin originates in the mountainous areas that are drained by the upper Wind River, by Wind River tributaries from the south, and by the Popo Agie River and tributaries. The average estimated combined flows of the Wind River near Crowheart and the Popo Agie River near Riverton slightly exceed the average flow of the Bighorn River at Thermopolis. Thus, exclusive of the inflow from the Popo Agie River, the Wind-Bighorn River from the Crowheart gaging station to Thermopolis loses more water than it gains. From the mouth of the Popo Agie River to the present site of Boysen Dam, the natural inflow to the Wind River probably is only 2 or 3 percent of the flow at Thermopolis. (Most of the flow of Fivemile Creek near Shoshoni and part of the flow of Muddy Creek near Shoshoni are not natural flows but are waste and return flows from irrigation.)

Flow of most streams in the Wind River drainage basin is regulated very little by storage in reservoirs. Bull Lake Creek from the reservoir to its mouth is the principal exception. The flow of Bull Lake Creek below Bull Lake Reservoir, which has a usable capacity of 152,000 acre-feet, is almost entirely regulated by reservoir storage. Storage in this reservoir also regulates appreciably the flow of the Wind River from the mouth of Bull Lake Creek to Diversion Dam about 4½ miles downstream.

Pilot Butte Reservoir (usable capacity 31,500 acre-feet) stores some of the water that is diverted through the Wyoming Canal by Diversion Dam for irrigation and for power development.

Ray Lake, an offstream reservoir having a usable capacity of 7,500 acre-feet (Harbeck, 1948, p. 72), and Washakie Reservoir, which has a usable capacity of 7,940 acre-feet (U. S. Geol. Survey, 1952, p. 196), impound water from the South Fork Little Wind River. Shoshone Lake on Shoshone Creek is a relatively small reservoir that has little effect on the flow of the North Popo Agie River.

Where the Wind River leaves the Wind River Basin at the entrance to Wind River Canyon, the flow has been controlled since October 11, 1951, by Boysen Reservoir (p. 21).

Many small lakes in the mountains provide natural storage and a few of them have small dams to furnish controllable artificial storage, but they have little effect on the flow of the streams. In the valley, small reservoirs and water-spreading works, usually on intermittent streams, control small flows and have some local effect on streamflows.

Flow of many streams in the Wind River drainage basin is greatly affected by diversions for irrigation and by return flow from irrigated areas. In the foothills, many scattered meadows and pastures are irrigated; but the individual projects are small, and the net diversions do not appreciably change the flow of any but small streams. Much more extensive acreages are irrigated on the valley floor near Lander and Riverton. According to the Bureau of Reclamation 5/ the growth of irrigation in the Wind River drainage basin by decades can be summarized by the following table:

Development of irrigation in the Wind River drainage basin

Year	Acres irrigated
1880	5,400
1890	17,625
1900	22,260
1910	54,195
1920	65,693
1930	72,920
1940	121,605
1950	134,413

About one-third of the irrigation in the Wind River drainage basin during the past 30 years has been from the Popo Agie River main stem and tributaries. Only a few thousand acres have been irrigated from the Wind River and its tributaries below the mouth of the Popo Agie River. (See table 3.) During 1949 about 14,000 acres were irrigated upstream from the Diversion Dam on the Wind River. Slightly more than half of the total irrigation in the basin was with water that was diverted from the Wind River into the Wyoming Canal and into other canals between the the Crowheart gaging station and Riverton.

Nearly half the irrigated acreage in the entire Wind River drainage basin was irrigated either from the Wind River above the canal at Diversion Dam or from the Popo Agie River and tributaries. Irrigation from these sources probably has no great effect on the yield of sediment in the basin although it does regulate streamflow to an appreciable degree. In contrast, the irrigation of land north and west of Riverton by water that is diverted from the Wind River at the Diversion Dam and between the dam and Riverton does greatly increase the sediment production and also affects streamflow markedly.

5/ United States Bureau of Reclamation, 1950, Summary of accomplishments on Interior Missouri Basin Field Committee program for Wind River Basin, Wyo.: Big Horn Dist., Cody, Wyo.

Table 3.--Irrigated acreages in the Wind River drainage basin from reports of the Bureau of the Census, U. S. Department of Commerce

Source of water	Acres irrigated			
	1919	1929	1939	1949
Irrigation water diverted from--				
Wind River upstream from the Popo Agie River...............	43,620	51,789	73,157	a 83,000
Popo Agie River.......	22,073	21,131	48,448	40,219
Wind River downstream from the Popo Agie River..............	......	......	b 6,300	b 4,000
Approximate total in basin................	c 69,000	c 76,000	a 128,000	a 127,000

a Irrigated acreage based on combination of published figures and acreages indicated by map.

b Irrigated acreage based on map published by Bureau of the Census.

c Includes estimated acreage irrigated by diversions downstream from the Popo Agie River.

Major irrigation development in this area north and west of Riverton began in 1905 and 1906 when the Indian Service started projects that were later extended and developed into the Riverton Valley Irrigation District and the LeClair-Riverton Irrigation District (U. S. Cong., 1934, p. 37-38). In 1920 the Bureau of Reclamation began construction of the Riverton project. Irrigation began in 1925 but was developed slowly, and only 15,000 acres in the project were irrigated in 1935.6/ By 1950 the irrigable land served by the project was 52,000 acres. Since then, the project has been extended considerably.

Return flows and waste water from the Riverton project collected in a large bowl-shaped depression about 20 miles west of Riverton and formed Ocean Lake. In 1942 7/ a channel was dug from Ocean Lake so that the lake would drain into Fivemile Creek about 12 miles southeast of Pavillion (pl. 5). Since the outlet channel was dug, the depth and area of Ocean Lake have been relatively stable. Topographic maps prepared in 1950 show a lake surface of 9.6 square miles. Annual outflow from Ocean Lake averaged 14,630 acre-feet during the 4-year period that ended September 30, 1952.

6/ Schroeder, K. B., and Miller, C. R., 1953, A plan of channel erosion control, Fivemile Creek, Riverton project, Wyoming: U. S. Bur. Reclamation Proj. Plan. Div., p. 2.

7/ Idem, p. 20.

The flow of the Wind River between Diversion Dam and Riverton is considerably augmented by return to the channel of water that had been diverted for irrigation or power production. This return flow ranges in quantity from small ground-water flow and small surface wastes to the major flow of Pilot waste-way, which returned 124,700 acre-feet of water to the Wind River during the 1950 water year (U. S. Geol. Survey, 1953, p. 216).

Since 1935 Fivemile Creek has been more affected by return flow and waste water from irrigation than any other stream in the drainage basin, although Muddy Creek beginning in 1950 and Cottonwood Creek beginning in 1951 have also carried large amounts of return flow in proportion to their natural flows. During 4 years of record, the average annual discharge of Fivemile Creek above the irrigation project was about 1,270 acre-feet (drainage area, 143 square miles) compared to about 83,360 acre-feet (drainage area, 222 square miles) at the Shoshoni gaging station about 2 1/4 miles upstream from the mouth. Flow of Fivemile Creek is discussed in more detail in the section, "Sediment yields by drainage areas."

FLUVIAL SEDIMENT

Complete information on the fluvial sediment of a basin or stream would include all the physical and chemical properties of the sediment as well as information on quantities of sediment. Complete information is always desirable though not often obtained. However, the minimum information required for a satisfactory analysis of the effects of sediment on streams or structures on streams includes rates and quantities of discharge of measured suspended sediment and of bed-load sediment, particle-size distribution and mineral composition of the sediment, approximate specific weight of deposits that might be formed from the sediments, and sources of the sediment. After definition of terms and a brief explanation of procedure for obtaining the sedimentation data, the data collected by the Geological Survey before October 1, 1952, are presented and discussed.

DEFINITION OF TERMS

As the definitions of terms that relate to fluvial sediment are not completely standardized, some of the terms in this report are defined as follows:

Sediment is fragmental material that originates mostly from rocks and is transported by, suspended in, or deposited from water or air, or is accumulated in beds by other natural agencies.

Fluvial sediment is sediment that is transported by, suspended in, or deposited from water.

Parts per million (ppm) is a unit for expressing concentration of sediment. It is computed as one million times the ratio of the weight of sediment to the weight of water-sediment mixture. Note that this definition is not exactly comparable to the definition of parts per million in chemical-quality terminology; the weight of the water-dissolved solids-sediment mixture is used as the base for sediment concentration, whereas the weight of clear water-dissolved solids solution is used in chemical computations.

Suspended sediment or suspended load is sediment that moves in suspension in water and is maintained in suspension by the upward components of turbulent currents or as a colloid.

Bed load or sediment discharged as bed load includes both the sediment that moves along in essentially continuous contact with the stream bed (contact load) and the material that bounces along the bed in short skips or leaps (saltation load).

Sediment sample is a quantity of water-sediment mixture that is collected to represent the average concentration of suspended sediment, the average particle-size distribution of suspended or deposited sediments, or the specific weight of deposited sediment.

Depth-integrated sediment sample is a suspended-sediment sample that is accumulated continuously in a sampler that moves vertically at a constant transit rate and that admits the water-sediment mixture at a velocity about equal to the stream velocity at every point of its travel. Present depth-integrating samplers normally collect a water-sediment mixture only from the surface to a point about 0.3 foot from the stream bed. The part of the stream traversed by depth-integrating samplers is called in this report the "sampling zone" or the "sampled zone."

Sediment discharge is (a) rate at which dry weight of sediment passes a section of a stream or (b) quantity of sediment, as measured by dry weight or by volume, that is discharged in a given time.

Measured suspended-sediment discharge is the sediment discharge that can be computed directly from the water discharge and the concentration of depth-integrated sediment samples.

The water discharge includes not only the water discharged through the sampling zone but also the water discharged below the sampled zone.

Unmeasured sediment discharge is the difference between the total sediment discharge of a stream and the measured suspended-sediment discharge. It includes sediment that is discharged as bed load and part of the suspended sediment that is discharged below the sampling zone.

Normal section, for want of a better term to contrast with a contracted section at which total or nearly total sediment discharge of a stream is measured, is any relatively unconfined section of a stream, even though one or both banks may be somewhat stabilized and parts of the bed may be cohesive material rather than unconsolidated sediment. Ideally, a normal section should be in an alluvial reach of the stream.

Specific weight of sediment deposit is weight of solids per unit volume of deposit in place.

The particle-size classification is the classification recommended by the American Geophysical Union Subcommittee on sediment terminology (Lane and others, 1947, p. 937). According to this classification, clay-size particles have diameters between 0.0002 and 0.004 millimeter, silt-size particles have diameters between 0.004 and 0.062 millimeter, and sand-size particles have diameters between 0.062 and 2.0 millimeters.

According to Twenhofel and Tyler (1941, p. 110): "The median, or median diameter, is the mid-point in the size distribution of a sediment of which one-half of the weight is composed of particles larger in diameter than the median and one-half of smaller diameter. The median diameter may be read directly from the cumulative curve by noting the diameter value at the point of intersection of the 50 percent line and the curve."

Water discharge of a stream is the flow of the stream and includes the sediment and dissolved solids that are contained in in the water.

COLLECTION AND ANALYSIS OF SEDIMENT SAMPLES

Gilbert (1914) divided the sediment load of streams into two general groups, bed load and suspended load. He clearly showed that suspension of sediment particles is due to the "upward component of motion in parts of a complex current." This has since been developed as the turbulence-suspension theory. He further showed that bed load includes both sediment that is forced along in essentially continuous contact with the bed (contact load) and the sediment that bounces along the bed in short skips or leaps (saltation load).

Total load cannot be measured directly at most sediment stations because no accurate sampler for measuring bed-load discharge has been devised and because depth-integrating suspended-sediment samplers do not collect a water-sediment mixture from the zone of the most concentrated suspended sediment, which is near the stream bed. The total load may be computed by formulas based on laboratory and small-stream investigations. In order to compute the load, samples of bed material are necessary as well as measurements of water and suspended-sediment discharges. At some stations, such as Fivemile Creek near Riverton and Fivemile Creek near Shoshoni, the total load is forced into suspension and the unmeasured load at a normal section can be computed by comparison of the load at the contracted section with the measured load at a normal section.

SAMPLING PROCEDURE

The suspended-sediment discharge of a stream is computed from the product of the water discharge, the suspended-sediment concentration, and an appropriate constant. The daily water discharge of streams is usually obtained from records of stage and current-meter measurements. The procedure for the measurement of water discharge is described in detail in Water-Supply Paper 888 (Corbett and others, 1943).

Suspended-sediment concentrations for computing sediment discharges were determined from depth-integrated samples that were collected with one of the several standard samplers used by the Geological Survey. A depth-integrating sampler is moved vertically through the sampling zone at a constant transit rate and admits a water-sediment mixture at a velocity about equal to the stream velocity at every point of its travel; U. S. D-43 and U. S. DH-48 samplers are of this type (fig. 11), and the U. S. P-46 sampler can be easily used as a depth-integrating sampler. Depth-integrated samples are usually taken at verticals that are laterally spaced across the stream at the centers of equal segments of water discharges. The number of verticals that are sampled depends on the variation of the concentration in the cross section. Suspended-sediment concentrations for the verticals are averaged to obtain the mean concentration for the entire flow of the stream.

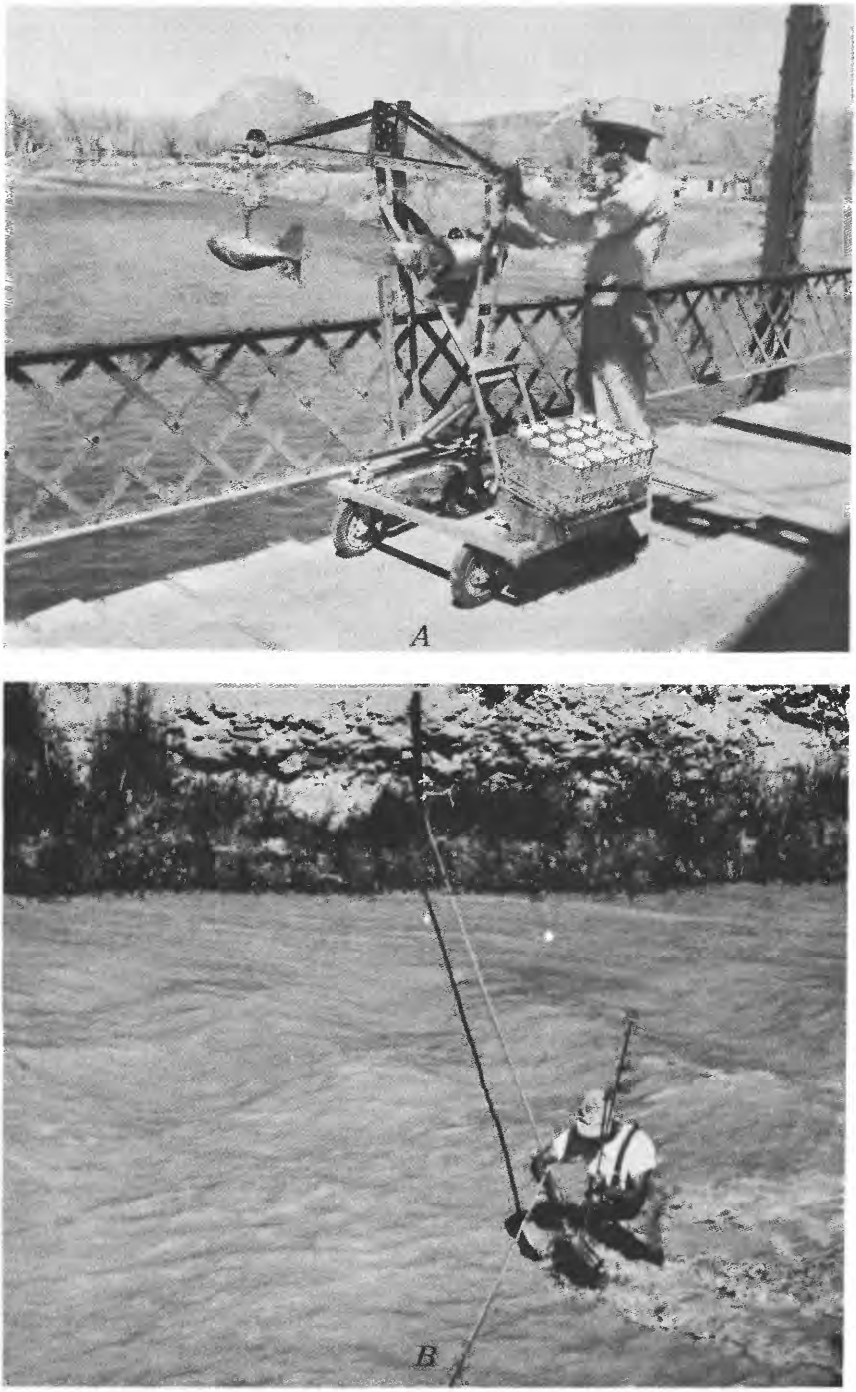


Figure 11. --Depth-integrating sediment samplers.
A. U. S. D-43 depth-integrating sampler attached to portable crane.
B. U. S. DH-48 depth-integrating sampler attached to wading rod.

Some suspended-sediment samples were collected to define the vertical variations in sediment concentrations and in particle sizes. These samples generally were obtained for studies of bed-load discharge and were of two types. One type of samples was point integrated. These samples were collected with the U. S. P-46 sampler or a modified U. S. DH-48 sampler, either of which can be used to collect a sample continuously at a point. Samples of the other type were collected with the Tait-Binckley sampler, which traps an instantaneous sample of the water-sediment mixture at a point, or with a Bureau of Reclamation special sampler of the Tait-Binckley type.

Samples of bed material for particle-size studies of bed-load movement were collected near several of the sediment stations. The samples were taken in several places in the cross section, and each sample was analyzed individually. Most samples were collected with a cylinder, 2 inches in diameter, that contains a movable piston which can be raised as the cylinder is pushed into the stream bed (fig. 12). Other samples were collected by pushing a cylindrical carton into the stream bed.

LABORATORY PROCEDURE

The suspended-sediment concentration in parts per million by weight was determined in the laboratory by filtration or evaporation of the samples. Each sample was weighed, the supernatant liquid was drawn off, and the residue was washed into a Gooch crucible or an evaporating dish. Sediment on an evaporating dish was dried on a hotplate for 2 or 3 hours. The evaporating dish or crucible was then placed in an electric oven for 1 hour at 110°C. The samples were cooled in a desiccator before final weighing of the sediment. If the evaporating dish was used, the weight of the sediment was corrected for any appreciable weight of dissolved solids, which was previously determined by evaporating a measured sample of the supernatant liquid. The particle sizes of the sediment were determined by various standard methods, most of which are based on the fall velocity of the particles. The method of analysis is shown in the tables of particle-size distribution.

Daily mean concentrations were computed by plotting on the gage-height chart the concentrations of sediment samples from the daily sampling vertical, drawing a smooth curve through the plotted points, and determining the mean daily concentration from this curve. If the concentration determined from samples taken at the daily sampling vertical differed appreciably from the average concentration in the cross section, a coefficient was

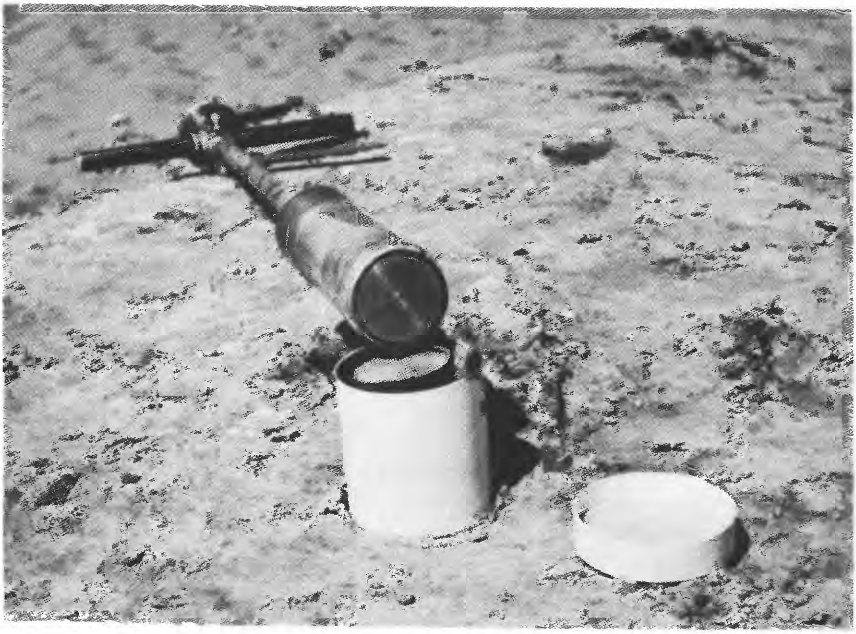


Figure 12.--Bed-material sampler. Movable piston is flush with open end of sampler.

applied to adjust the concentration determined at the daily station to conform with the concentration of the cross section of the stream.

Daily discharges of suspended sediment in tons were computed by multiplying daily mean concentrations in parts per million by daily mean water discharge in cubic feet per second and by 0.0027. The constant 0.0027 was changed when the weight of the water-sediment mixture, as shown by the concentration, varied appreciably from 62.5 pounds per cubic foot. On days when both concentration and water discharge were changing rapidly, each day was subdivided, and sediment discharge was computed separately for parts of the day and then totaled for the daily discharge. For days when no samples were collected, the daily discharges of suspended sediment were estimated on the basis of water discharge, concentration for adjacent days, weather records, and records for other stations.

SUSPENDED SEDIMENT

Since March 1946, the Geological Survey has collected sediment samples from the Bighorn River at Thermopolis, Wyo. A total of 31 additional stations in the Wind River drainage basin has been established and operated for different periods of time. (See chart 2.) Unscheduled sediment samples have also been

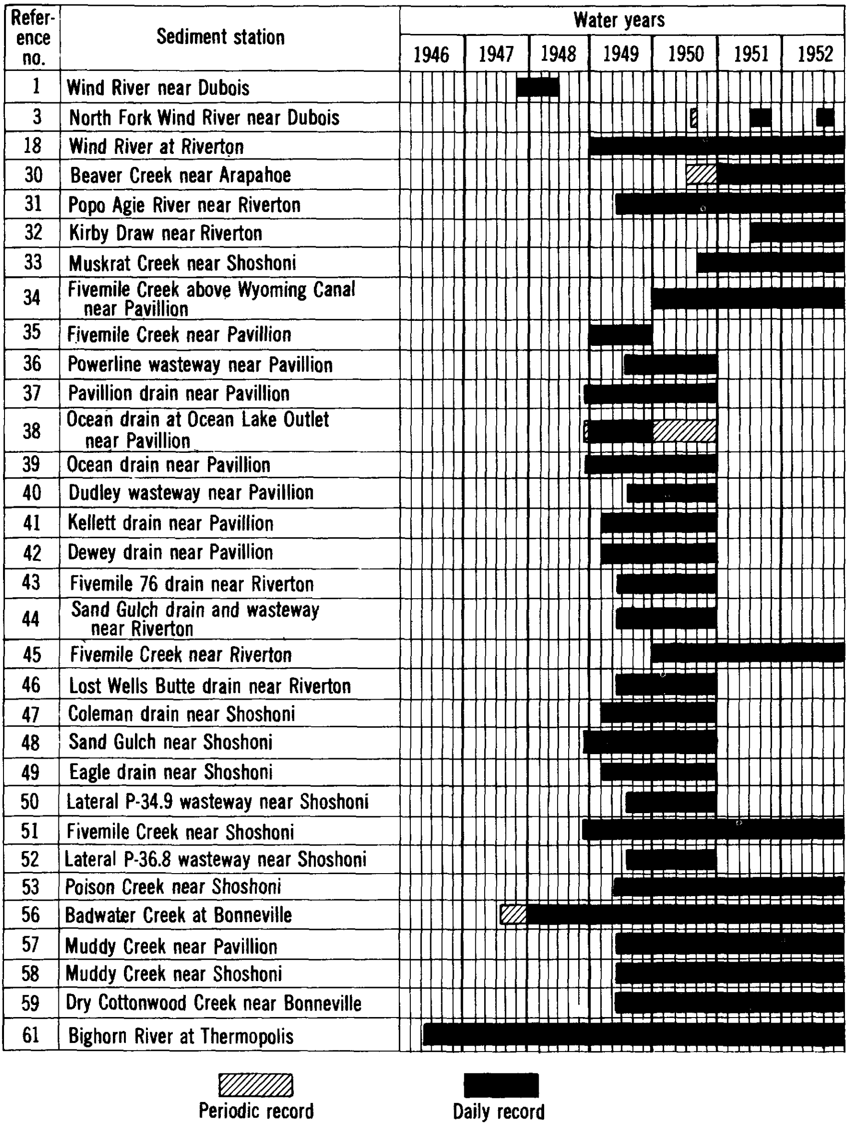


Chart 2.--Periods of operation of scheduled sediment stations in the Wind River drainage basin.

collected on other tributary streams (tables 4 and 5). Periods of operation of the scheduled stations to September 30, 1952, are shown on chart 2. Monthly and annual figures of suspended-sediment discharge are given in tables 6 to 37. Suspended-sediment discharges by days, months, and water years are presented or will appear in the U. S. Geological Survey Water-Supply Paper series, "Quality of Surface Waters of the United States." Locations of the stations are shown on plates 1 and 5.

Suspended-sediment discharge depends on many interrelated physical phenomena. Probably the most important of these are water discharge, turbulence, temperature of the water, and the particle size of available material. The interaction and variability of these and other phenomena cause wide fluctuations in discharge of suspended sediment. A plot of suspended-sediment discharge versus water discharge for the Bighorn River at Thermopolis (fig. 13) shows only a general relationship between the variables. Before the closure of Boysen Dam, the sediment discharge at Thermopolis and, hence, the concentration, increased rapidly with discharge to about 1,500 cfs. Above a water discharge of about 1,500 cfs the suspended-sediment load and water discharge increased at about the same rate. Usually the suspended-sediment concentration of a stream increases at a faster rate at the lower water discharges because the transporting power of a stream increases with rising stage at a power greater than one. As long as the supply of sediment particles of a size that the stream is competent to transport is sufficient to meet the carrying capacity of the stream, the increase in concentration will be at a rapid rate. The transporting power of a stream is undoubtedly always more than can be utilized because of the limited sediment supply of a size that the stream can transport. The deficiency in the sediment supply probably explains the tendency of the plot of sediment discharge versus water discharge to approach a 45-degree slope above 1,500 cfs.

Measured suspended-sediment discharge of the Bighorn River at Thermopolis from October 1, 1946, to September 30, 1951, totaled 23,510,800 tons, an average of 4,702,000 tons per year. The maximum measured yearly discharge was 5,733,000 tons for the 1947 water year, and the minimum measured yearly discharge, before the closure of Boysen Dam, was 3,606,000 tons for the 1949 water year. (See table 37.) Maximum monthly suspended-sediment discharge for the same period was 1,652,000 tons for June 1948, and the minimum was 8,044 tons for January 1951. The maximum daily load was 330,000 tons in September 1950, and the minimum was 6 tons in January 1950.

The drainage area of 8,080 square miles upstream from Thermopolis is large enough to impart some regularity to the water and sediment discharge at Thermopolis. The cyclic

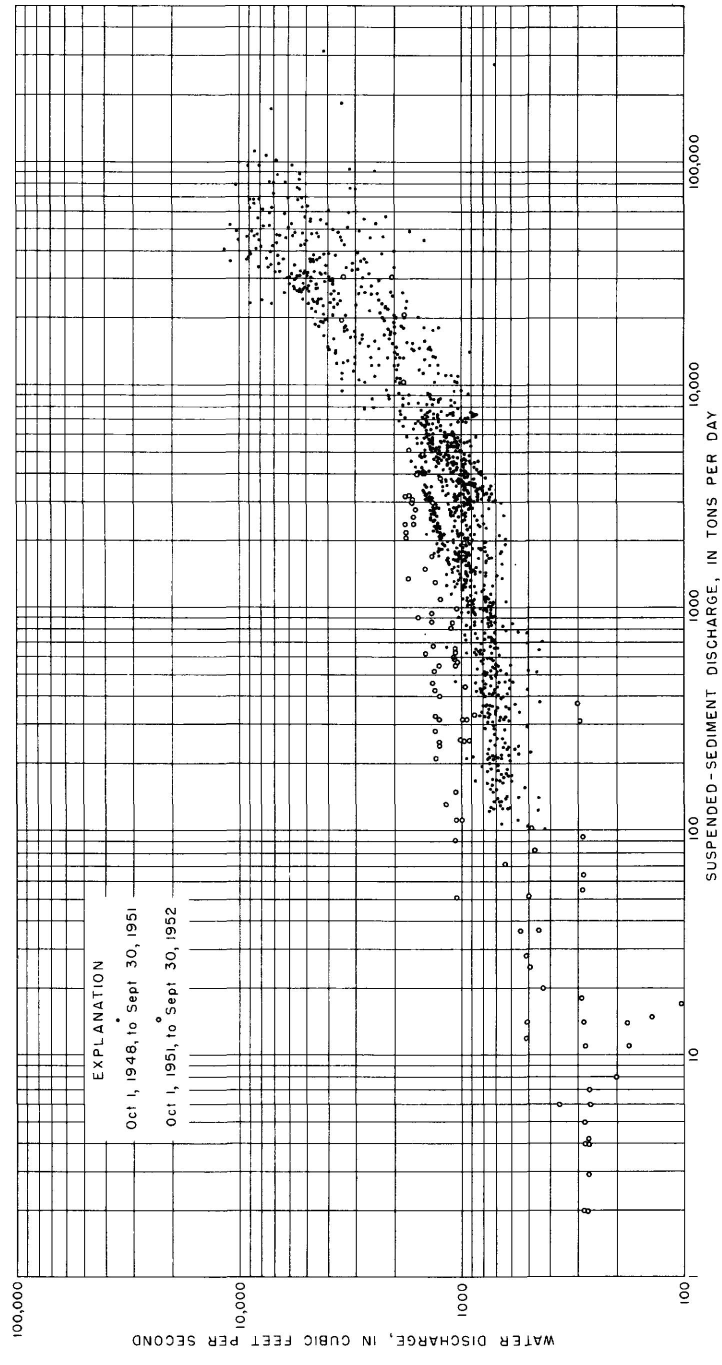


Figure 13.--Relation of suspended-sediment discharge to water discharge, Bighorn River at Thermopolis.

pattern of water and sediment discharge and weighted mean concentration is readily apparent from plate 7. This pattern also reflects the effect of runoff from the mountains. The runoff from the mountains fluctuates very little from year to year and is characterized by maximum flows in the late spring and by minimum flows in the winter. (See p. 28.) The trap efficiency of Boysen Reservoir is well illustrated by the large decrease in sediment discharge after October 1951. The increase in sediment discharge during the spring of 1952 is probably the result of the flushing action of clear water released from Boysen on sediment deposits along the river downstream from the dam. Part of the increase is due perhaps to stormflow from Red Canyon and Buffalo Creeks.

The uniformity of flow and sediment discharge shown by plate 7 immediately suggests the possibility of some type of rating curve (fig. 14). Yearly loads at Thermopolis may be approximated from figure 14.

Weighted annual mean concentrations for Thermopolis before the closure of Boysen Dam varied from 2,140 ppm during the 1951 water year to 2,890 ppm during the 1948 water year. The weighted average from October 1, 1946, to September 30, 1950, was 2,510 ppm. The water discharge at the station in the 1951 water year was 807,157 cfs days. If the weighted mean concentration of 2,510 ppm is applied to the water discharge for 1951, the sediment discharge would be 5,470,000 tons. This is compared to 4,667,000 measured tons. If a long-term weighted mean concentration is used, the error in the computed load in this one example is not large in comparison with the possible error in measured daily sediment loads.

SIZE COMPOSITION OF SEDIMENT

Particle-size analyses of sediment samples were an integral part of the sediment investigation. (See tables 38 to 72). During the period June 20, 1946, to June 11, 1952, a total of 134 suspended-sediment samples was collected at the Thermopolis station specifically for particle-size analysis. These depth-integrated samples are representative of the average concentration and particle sizes at the cross section for the time of collection. Representative depth-integrated samples were also collected and analyzed for most sediment stations in the basin. In addition, depth-integrated samples for particle-size analysis were collected at several unscheduled sediment stations (table 71).

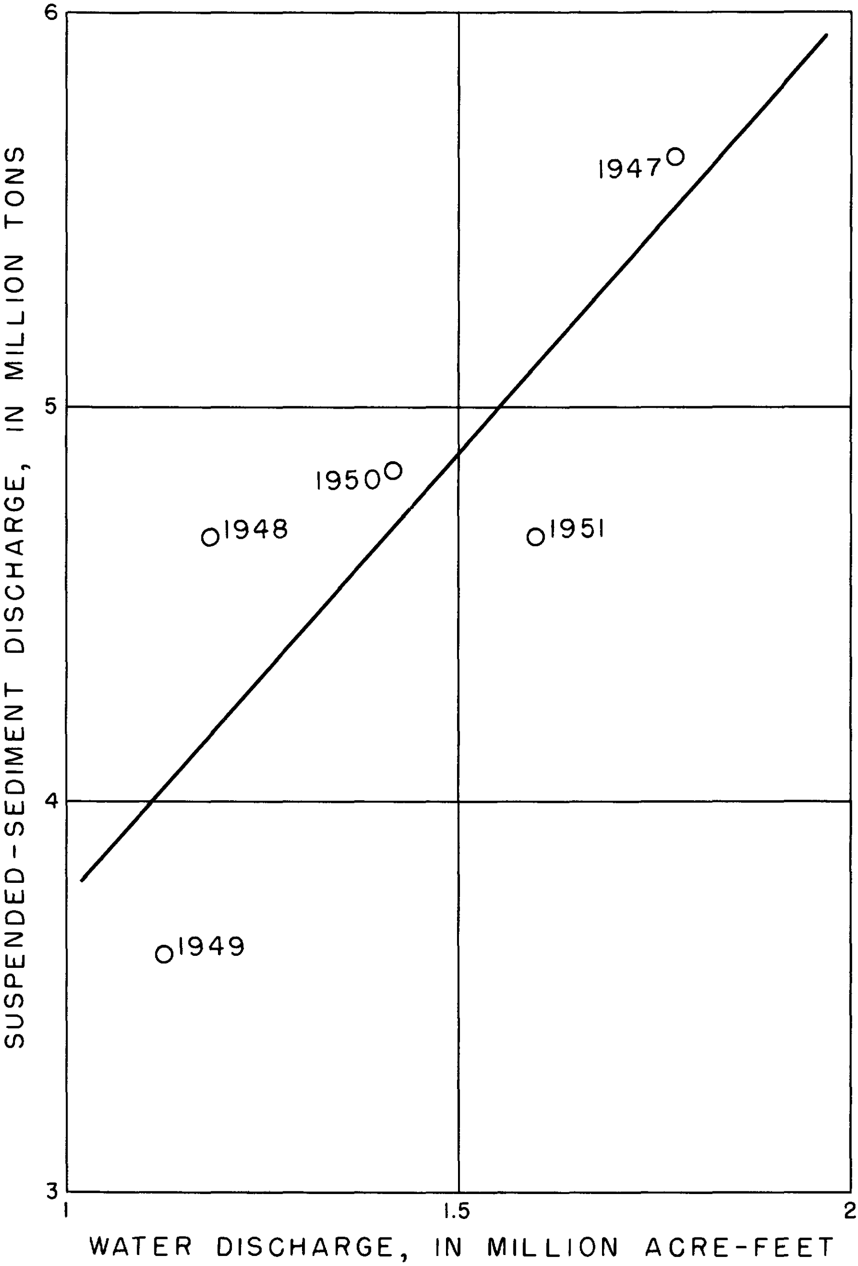


Figure 14.--Relation of streamflow to suspended-sediment discharge by water years, Bighorn River at Thermopolis.

During special studies on Fivemile Creek near Riverton and near Shoshoni, point-integrated samples were collected and analyzed for size (tables 48, 54, 60, and 62). Some of the analyses of the point-integrated samples were used in studies of bed-material transport. They also help show the efficiency of the artificial flume at Fivemile near Shoshoni and of the natural contracted section at Fivemile near Riverton to suspend the total sediment discharge of the stream.

Bed-material samples were collected at selected sediment stations and were analyzed for particle size. In the computation by the method of Colby and Hembree (1955, p. 66-111) of total load at a normal section, the size distribution of the bed material must be known. Particle-size analyses of bed-material samples are listed in tables 46, 52, 57, 63, and 72.

A study of the particle-size analyses of depth-integrated samples collected at Thermopolis (table 70) shows that the median particle size of the samples analyzed in a dispersion media ranged from 0.145 to 0.001 millimeter. According to an unweighted average, 74 percent of the measured sediment load at Thermopolis is finer than 0.062 millimeter, which is the lower limit of sand. Almost half, or 11 percent, of the sand fraction is very fine sand (from 0.062 to 0.125 mm).

The percentages of suspended sediment finer than 0.062 millimeter are given in table 73 for most of the sampling stations in the Wind River drainage basin. The number of samples used to compute the average is an indication of whether or not the figure shown in the "Percent-finer" column is representative of the stream at the station. A single sample from a station is not likely to be representative of the stream, though it might be.

In August 1952 an artificial contraction was built upstream from the sampling station at Fivemile Creek near Shoshoni. The increased turbulence created at the sampling station by the artificial contraction caused an apparent increase in the average sand fraction of the measured suspended sediment from 37 to 50 percent. Assume that these averages are accurate and that the method of sampling and the size distribution of total sediment discharge of the stream at the station were the same when both averages were established, then the percentage of sediment finer than sand sizes was decreased from 63 to 50 by the increase in the sand fraction. Hence, 63 divided by 50, or 1.26, indicates that the additional sediment load that was measured after the contraction was constructed was about 26 percent of the measured sediment load without the contraction. Thus the unmeasured load at the gaging station before the construction of the flume must have been a significant fraction of the total load.

Table 73.--Average percentages of measured suspended sediment finer than 0.062 millimeter, Wind River drainage basin [Percent finer is not weighted with water or sediment discharge]

Station	Number of samples	Percent finer than 0.062 mm
Bighorn River at Thermopolis............	100	74
Dry Cottonwood Creek near Bonneville....	6	89
Muddy Creek near Shoshoni...............	96	74
Muddy Creek near Pavillion..............	38	80
Badwater Creek at Bonneville............	51	86
Fivemile Creek near Shoshoni............	173	a 63
Do..................................	b 29	c 50
Fivemile Creek near Riverton............	b 128	63
Fivemile Creek above Wyoming Canal near Pavillion..........................	36	85
Poison Creek near Shoshoni..............	13	96
Muskrat Creek near Shoshoni.............	2	98
Popo Agie River near Riverton...........	20	80
Beaver Creek near Arapahoe..............	7	84
Little Wind River near Arapahoe.........	1	30
Little Popo Agie River at Hudson........	1	77
Wind River at Riverton..................	21	61
Dry Creek near Morton...................	1	93
Wind River near Crowheart...............	1	74
Crow Creek near Crowheart...............	1	44
Wind River near Burris..................	1	50
North Fork Wind River near Dubois.......	1	58
East Fork Wind River near Duncan........	1	32
North Fork Wind River near Duncan.......	1	56
Wind River below Dubois.................	3	84
Horse Creek at Dubois...................	1	45
Wind River near Dubois..................	1	72

a Percentage based on samples collected before construction of an artificial contraction upstream.

b Samples probably represent total load.

c Percentage based on samples collected subsequent to construction of an artificial contraction upstream.

In general, the median particle size of the suspended sediment transported by the Wind River decreases in a downstream direction. In the Wind River Basin, streams draining areas of high sediment yield transport sediment finer than that from areas of lower sediment yield. Fivemile Creek is an exception because it is undergoing an adjustment to an unnatural volume of streamflow and much of its sediment load comes from the deposited material of the flood plains in the lower reaches.

SPECIFIC WEIGHT BASED ON MEDIAN PARTICLE SIZE

The diameter of the sediment particles of a sediment deposit, along with other factors, largely determines the specific weight of the deposit. If a deposit were made up of spheres of uniform size, the specific weight would vary with the arrangement of the particles and not with their size. However, it is highly improbable that a natural deposit will be of uniform particle sizes; usually a sediment deposit is a mixture of particles of many different sizes.

Particle sizes in deposits tend to become more uniform with a decrease in median size. Therefore, deposits of material whose sediment particles approach clay size usually have greater porosity and smaller initial specific weight than do deposits that are composed mostly of sand sizes. Also, the smaller initial specific weight of deposits that are composed mostly of particles of clay size are probably due in part to the low specific gravity of some of the clay minerals and the colloidal properties of the particles. Deposits of sand usually are composed of nonuniform particle sizes and, consequently, are more likely to have the voids between the larger particles filled with particles of smaller size.

A relationship of specific weight of sediments deposited in reservoirs to median particle size is shown in figure 15. The samples on which the relation is based were collected from reservoirs in several drainage basins. All or nearly all these samples were collected near the surface of submerged deposits and, as such, are representative of natural deposits that have not been compacted to any great degree by overlying deposits. Additional information on these samples is given by Hembree and others (1952, p. 82-87).

The specific weight of a deposit that might be formed from the measured suspended sediment that was discharged by the

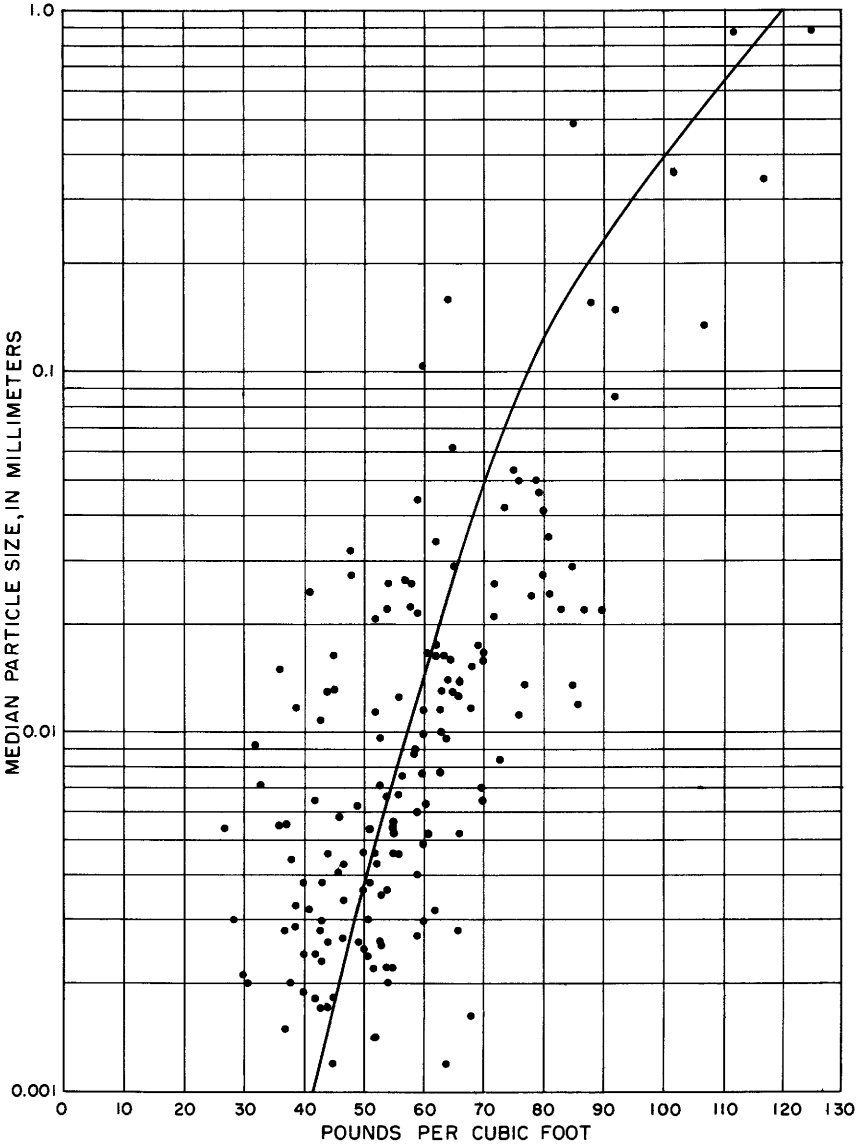


Figure 15. --Relation of specific weight of sediments deposited in reservoirs to median particle size.

Bighorn River at Thermopolis from March 1946 to September 1951 was computed by a method that is based on the median particle size of the sediment. The median particle size of each set of depth-integrated samples that were analyzed in a dispersion media was plotted against the instantaneous sediment discharge in tons per day (fig. 16). The curve in this figure was so drawn that about 50 percent by weight of the particles of all samples within each of several ranges of sediment discharge would be finer than the median size that is indicated by the curve. The median particle sizes for corresponding class intervals of suspended-sediment discharge were taken from the curve of figure 16 and were listed in table 74.

The specific weight of a relatively uncompacted deposit that might be formed from the suspended sediment discharged by the Bighorn River at Thermopolis was determined from the relationships shown by figures 15 and 16. The computation procedure is indicated by table 74. The computed specific weight of 58 pounds per cubic foot can be used to convert tons of suspended sediment, measured at Thermopolis, to acre-feet of sediment. The volume of relatively uncompacted sediment that might be formed from the 23,510,800 tons of suspended sediment that was measured at Thermopolis from October 1, 1946, to September 30, 1951, is 18,600 acre-feet and averages about 3,700 acre-feet per year.

Table 74.--Initial specific weight based on median particle size, Bighorn River at Thermopolis, March 1946 through September 1951

Suspended-sediment discharge		Median particle size (mm)	Specific weight (lb per cu ft)	Total tons divided by specific weight
Middle of class interval (tons per day)	Total tons in class interval			
74	3,182	0.0230	63	50
194	17,266	.0220	62	278
358	34,368	.0200	62	554
660	91,080	.0190	61	1,493
1,214	201,524	.0175	61	3,304
2,250	594,000	.0160	60	9,900
4,170	1,547,070	.0150	60	25,784
7,705	1,826,085	.0140	59	30,952
14,250	2,579,250	.0130	59	43,716
26,350	5,559,850	.0120	58	95,859
48,600	7,047,000	.0115	58	121,500
90,000	6,300,000	.0110	57	110,526
166,000	2,158,000	.0110	57	37,860
306,500	613,000	.0110	57	10,754
....	28,571,675	....	....	492,530

$$\text{Specific weight, in lb per cu ft} = \frac{28{,}571{,}675}{492{,}530} = 58$$

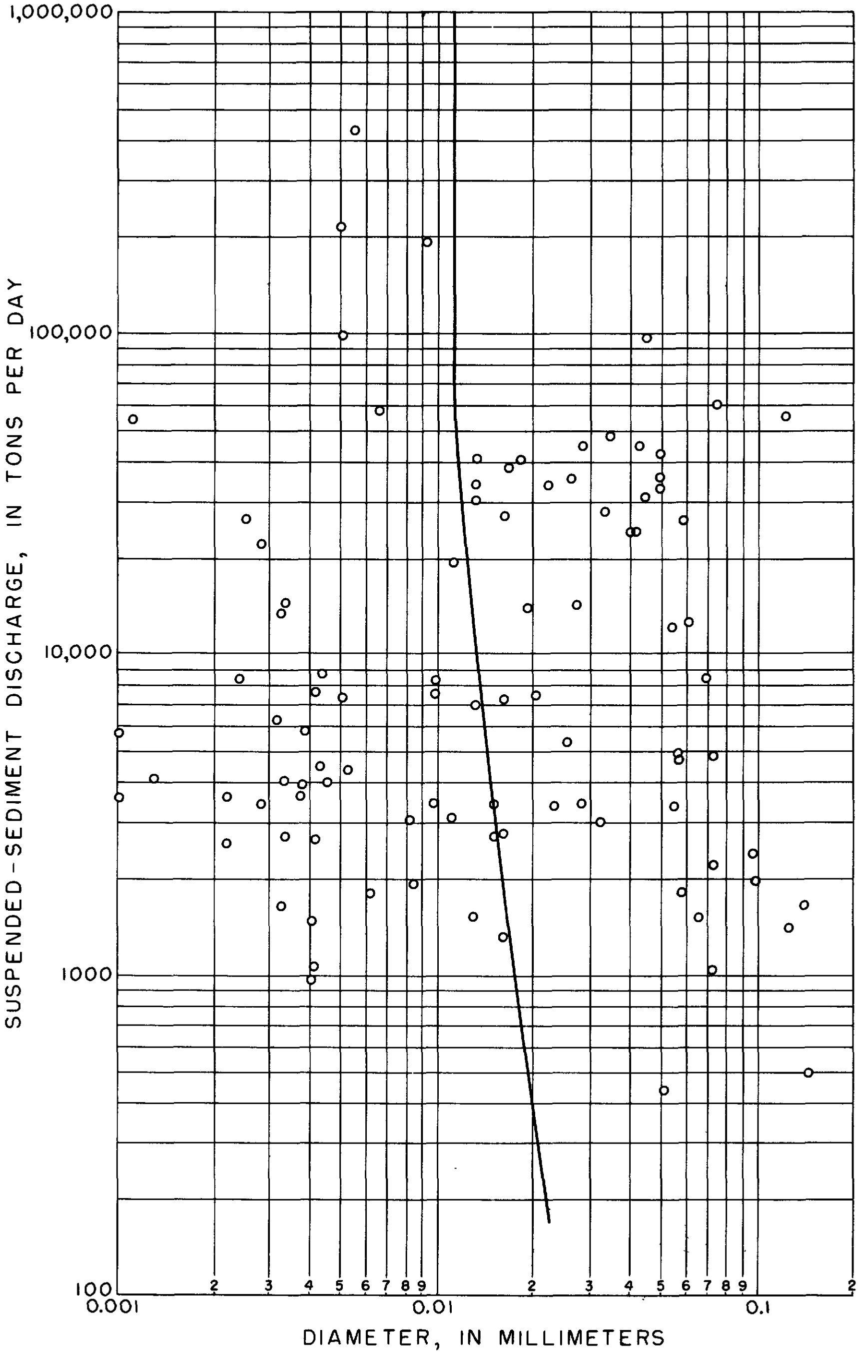


Figure 16. --Median particle size versus suspended-sediment discharge, Bighorn River at Thermopolis.

SEDIMENT ACCUMULATIONS IN SMALL RESERVOIRS

BY N. J. KING AND K. R. MELIN

A full understanding and evaluation of the erosion and the long-term movement of sediment in the Wind River Basin require some quantitative data on the upland sources of sediment; therefore, studies have been made of several pilot upland areas. In planning these studies, emphasis was placed on (1) delineation and comparison of the areas of erosion and sources of sediment, (2) the relative influence of the local and areal factors in the progress of erosion, and (3) the processes by which sediment is moved from the upland to the main streams. Results of these studies are a prerequisite for effective action on conservation of land and on protection of downstream developments. However, for the Wind River Basin, as well as other areas, little information is available. Because the Bureaus of Land Management and Indian Affairs have active land-conservation programs on the extensive area in the Wind River Basin under their management, basic information of this kind has been much in demand.

As conditions are diversified and erosion processes are complex in areas as large as those of the major subbasins on which the sediment stations are maintained, detailed investigations could not be made on such areas in the Wind River Basin. Therefore, studies were made in several small basins, each typical of a part of the upland, so that some approximate indexes might be formulated for appraisal of the upland. These smaller areas conform closely in size and conditions to those in which an erosion control structure in upland areas is usually built. Generally, the study units are small enough and sufficiently homogeneous that the influence of precipitation, topography, geology, soil, vegetation, and other factors can be determined with reasonable accuracy.

Studies were based on sediment accumulations in stock-water and other small reservoirs. Records of runoff and sediment deposition are maintained on the reservoirs and are correlated with the records pertaining to characteristics of the reservoir's drainage basin. In an intensive study, such as that of Graham Draw, determinations are made of runoff by maintaining records of water stage in the reservoir and of sediment yield by making recurrent surveys on established ranges. In the drainage basin, progress of erosion is measured on established ranges, precipitation is determined by the conventional gages, and an index of each of the other factors is obtained by appropriate, systematic, and recurrent observations.

GRAHAM DRAW EROSION STUDY

Graham Reservoir, which lies about a mile north of the Moneta Post Office, has a catchment area of 3.12 square miles. It is on Graham Draw, which is a tributary of Poison Creek in the east-central part of the Wind River Basin. (See pl. 1.)

The drainage area is roughly rectangular and is about $2\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles wide. Its maximum relief is about 430 feet. Typical of many basins of this size, the Graham drainage area contains two rather distinct units that have contrasting topography and erosional features: a belt of dissected bedrock tableland, buttes, and cliffs along the basin boundaries; and a central area of slight relief, which slopes gradually to the valley of Poison Creek. Surface runoff from the upper dissected slopes converges into three main forks, called in this study the East, Middle, and West Forks. All three forks have cut meandering channels across the alluvial slope to their junction, which is in the desilting basin of the main reservoir. The channels, for the most part, are steep-banked gullies, though in some short reaches they are wide and shallow. The channels carry flow only in direct response to rainstorms or melting of snow. The annual precipitation in the Graham catchment area, as determined from records for the nearest Weather Bureau Stations and from those obtained in this study, averages about 8 inches.

The drainage basin is underlain by the Wind River formation, which consists of shale, siltstone, and sandstone. In the central area, the bedrock is covered by a blanket of alluvium, 5 to 10 feet thick, which was derived from erosion of the boundary area. Soils in the drainage basin, like some of those on the uplands of the Wind River Basin, have not developed a recognizable structure or profile, and except for being unconsolidated they are scarcely distinguishable from the underlying rock. Thus the soils range in character from rather coarse grained and highly permeable on the areas of sandstone to fine grained and relatively impermeable on the areas of shale or of alluvium from shale.

Vegetation is generally sparse. Examinations made by the Bureau of Land Management show that the density ranges from less than 1 percent to about 20 percent and averages about 15 percent. The type of vegetation varies with type of soil and rock and consists mainly of big sage and grass on the sandy or medium-textured soil and of salt sage and dwarf sage on the fine-textured soil. Because the drainage basin is crossed by a public-stock driveway, which was heavily used in the past, the vegetation probably has been somewhat depleted and, in general, is sparser than that of adjacent areas.

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The Graham study at present (1954) includes maintenance of records on three reservoirs--Graham Reservoir, on the main stream at the lower end of the drainage basin; and one reservoir each on the East Fork and West Fork. When the study was started in 1946, only the Graham Reservoir had been built. The West Fork Reservoir was built in 1947 and the East Fork in 1949.

Graham Reservoir was built in 1940 and had an initial capacity of 25.6 acre-feet. Its capacity in 1947 was 19.2 acre-feet. The reservoir has no outlet except an overflow spillway. At the head of the reservoir is a low, auxiliary dam, which forms a desilting basin in the channel upstream. The West Fork Reservoir had an initial capacity of 3.1 acre-feet, and the area of its drainage basin is 0.38 square mile. The East Fork Reservoir had an initial capacity of 12.6 acre-feet, and the area of its drainage basin is 0.81 square mile. The only outlets from these reservoirs are overflow spillways.

The reservoirs are equipped with staff gages on which water stages are read. Changes in stage are applied to capacity curves to ascertain the amount of runoff from the basin. The sediment level in the reservoirs is determined by soundings or rod readings along established ranges, and the volume of sediment is computed.

A system of permanent ranges was established on which level readings are made periodically to determine the amount of erosion or deposition. These ranges cover both channels and colluvial slopes. Also, several are spaced successively on the main drainage courses so that erosion and movement of sediment can be traced from the head of the drainage basin to the reservoir.

During most of the period of study, three nonrecording precipitation gages have been maintained in the drainage basin. In addition to these, a recording precipitation gage has been maintained since 1950. Gages are maintained for only part of the year, generally from April to October.

When the study was started, a line transect, 300 feet long, was established for vegetation counts. In 1949, the observational system was expanded to include 14 additional locations, which were distributed a quarter of a mile apart along the legal landlines. Each plot consists of 4 quadrants, 1 foot square. Recurrent counts are made of all the plants in each of the quadrants. The vegetation counts are made by the Bureau of Land Management.

RAINFALL AND RUNOFF

During the 7 years of record, flow into the reservoirs has been limited to the period from April through October, and appreciable amounts of inflow have occurred only during the period from June through September. Although winter storms infrequently may cause small flows in the channels, no inflow to the reservoirs has occurred. Therefore, for this report, precipitation for only the 7 months, April through October, is considered.

The records of precipitation and runoff for 1947-53 and classification of the daily precipitation for each season are summarized in table 75. Also, a hydrograph showing the precipitation and the fluctuations of the reservoir contents for 1947 and 1948 indicates the rainfall-runoff relations in the basin. (See fig. 17.) The total runoff included outflow through the spillway of Graham Reservoir. Outflow occurred three times in 1948. The volumes of outflow were estimated on the basis of observations of the spillway and probable duration of flow. The estimates are subject to some error.

Precipitation varies considerably from season to season. Runoff, although consistently representing a small fraction of the seasonal precipitation, does not fluctuate in conformity with the seasonal precipitation. Rather, the runoff is dependent on the size of the storms and probably even more on short-period intensities within a storm.

Table 75.--Classified seasonal precipitation in Graham drainage basin and runoff into Graham Reservoir, April through October

Year	Total precipitation (inches)	Number of days in which precipitation exceeded designated amount in inches					Runoff	
		0.25	0.50	1.0	1.5	2.0	Acre-feet per square mile	Inches
1947	9.18	14	6	2	1	.....	5.2	0.10
1948	4.64	4	3	1	1	1	a 16.9	.32
1949	7.48	10	3	1	1	.....	a 15.4	.29
1950	4.06	4	1	0	0	.....	2.0	.04
1951	3.83	2	0	0	0	.....	0	0
1952	4.16	3	1	0	0	.....	0	0
1953	2.97	1	0	0	0	.....	0	0

a Includes an estimate of water spilled from Graham Reservoir.

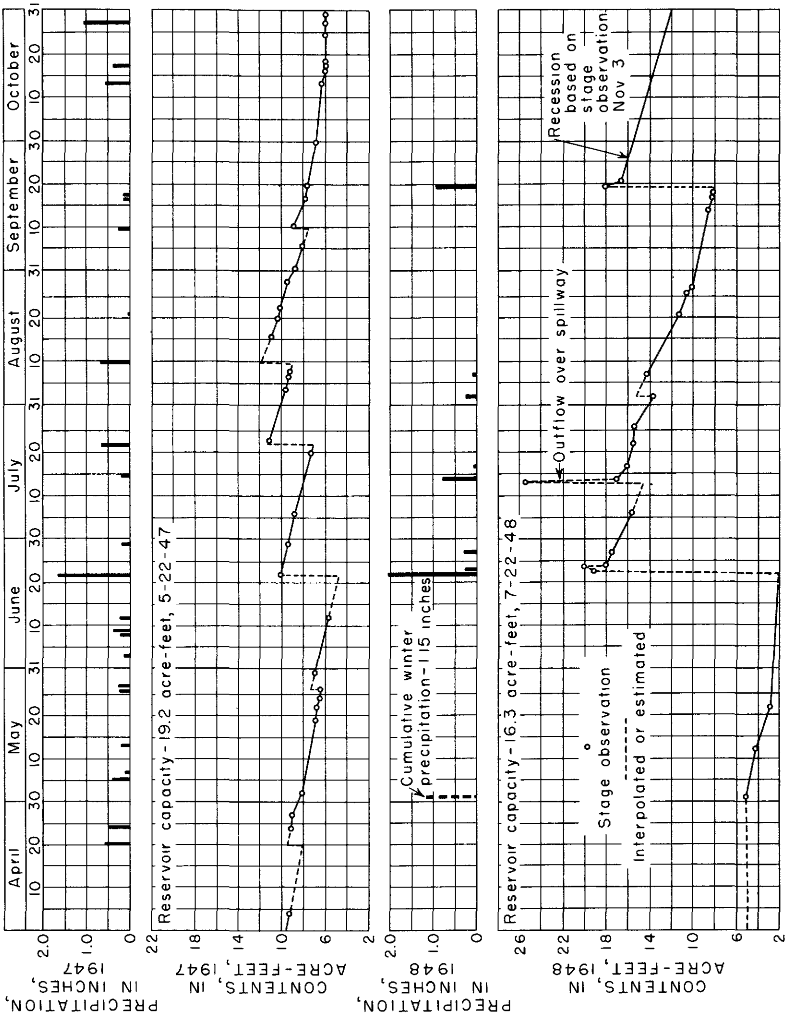


Figure 17. --Relationship of precipitation in Graham Draw drainage basin to volume of water in Graham Reservoir.

The sediment yields determined by surveys of the reservoirs are summarized in table 76. Quantities are given for the period 1940-53, which represents the period of observation of Graham Reservoir. The total volume of sediment deposited in the reservoir was determined by probing to reconstruct the original bottom of the reservoir and then by computing the difference between the original reservoir capacity and that in 1952. In November 1949, the volume of the sediment deposit was the maximum observed; since that time, sediment inflow has not been significant, and earlier deposits have compacted. A profile of the Graham Reservoir, showing the reconstructed original bottom and successive surfaces of the sediment deposit, is presented in figure 18. The profile for August 1953 so closely coincides with that for May 1952 that it is not shown on figure 18.

Because the total volume of sediment for the period 1940-53 includes some compacted sediment, this quantity is not comparable with the quantities for the shorter periods. Also, because the sediment surveys were not made at the same time each year, determination of the annual sediment yields for the periods May 1947 to July 1948 and July 1948 to November 1949 required adjustment for amounts of deposition between observations. The adjustment was made on the basis of the runoff events during these seasons. Despite uncertainties involved in these adjustments, results show that fluctuations in sediment yields are large from year to year; long-term records are necessary to obtain reliable information for areas like the Graham drainage basin. The annual unit sediment yields for the period May 1947 to November 1949 are much greater than sediment yields for the Poison Creek drainage area, of which Graham Draw is a part. Evidently, sediment yielded by other tributary basins similar to the Graham drainage basin, but not controlled by reservoirs, is held in deposits along the channels of Poison Creek or lower reaches of the tributaries. Although these deposits may become temporarily stable or even essentially permanent, they are subject to movement when a flood occurs on Poison Creek. This stream, like several others that drain the eastern part of Wind River Basin, has not had large flows for several years. Thus, movement of a large accumulation of sediment is probable at some future time.

Table 76.--Sediment observations in Graham drainage basin

	1940 to May 1947 [a]	May 1947 to July 1948 [b]	July 1948 to November 1949 [b]	November 1949 to May 1951 [c]	May 1951 to May 1952 [c]	May 1952 to August 1953 [o]	November 1949 to August 1953 [c]	Total 1940 to August 1953 [a]
Deposit in Graham Reservoir...acre-ft..	5.8	2.9	3.1	d -0.8	d -1.4	d -0.3	d -2.5	9.3
Deposit in silt basin.........acre-ft..	11.8	3.5	5.1	0	0	0	0	20.4
Deposit by overflow..........acre-ft..	....	.5	.5	0	0	0	0	1.0
Total sediment yield to lower end of basin..........acre-ft..	17.6	6.9	8.7	-0.8	-1.4	-0.3	-2.5	30.7
Deposit in West Fork Reservoir......................acre-ft..	....	.3	.2	0	0	0	0	.5
Deposit in East Fork Reservoir......................acre-ft..	....	....	.6	0	0	0	0	.6
Total sediment yield including upstream reservoirs...acre-ft..	17.6	7.2	9.5	-0.8	-1.4	-0.3	-2.5	31.8
Unit sediment yield of drainage basin (3.12 sq miles) for period.........acre-ft per sq mile..	5.6	2.3	3.1	-0.26	-0.4	-0.1	-0.8	10.2
Annual unit sediment yield..........acre-ft per sq mile..	.8	1.4	2.3	-.2	-.4	-.05	-.2	.7

a Alternate deposition and compaction during period.
b Little or no compaction during period.
c Compaction with little or no deposition during period.
d Represents volume decrease in sediment owing to compaction.

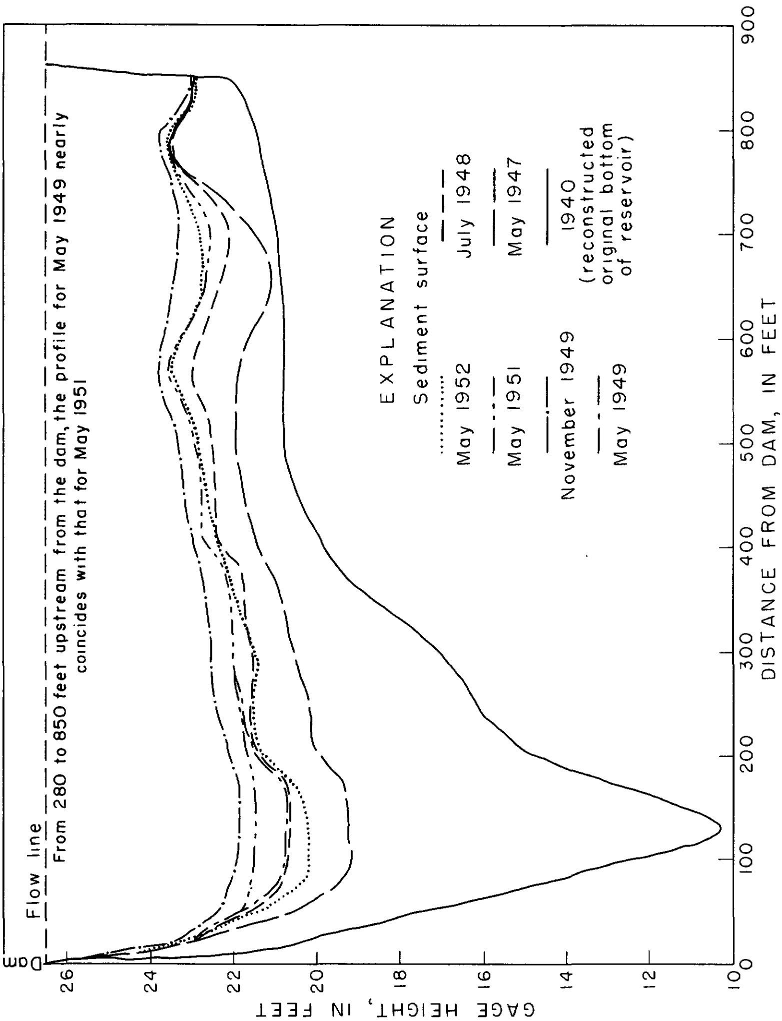


Figure 18.--Longitudinal profiles of Graham Reservoir showing sediment deposition and subsequent compaction.

The decrease in volume of the sediment deposit between the observations of November 1949 and May 1952 amounted to 21 percent of the volume in 1949. During most of this period, the reservoir was dry. Figure 18 indicates that the compaction varied from place to place; it was greatest generally where the the deposit was thickest, but it did not follow a uniform relationship with the thickness. Near the dam where the thickness was 9 feet or greater, the compaction amounted to about 15 percent; whereas, near the spillway where the thickness averaged only about 3 feet, the compaction ranged from 22 to 33 percent. The greater compaction presumably was due to the concentration of fine-grained sediment in the spillway area. In contrast, the deposit at the head of the reservoir, which was about equally as thick but was made up largely of coarse-grained material, showed compaction of only 13 to 17 percent.

Erosion and deposition

Over the period of record, observations of changes at reference points and erosion-measurement ranges yielded little conclusive data on the details of erosion or sediment movement, but they suggest some general trends. First, the quantity of sediment delivered to the lower end of the drainage basin, even in as small a unit as the 3.12 square miles upstream from the Graham Reservoir, does not show all the erosion that is occurring; part of the eroded material is not carried but is deposited at various places in the basin. Areas of local deposition, whether in defined channels or on open slopes, seem to be controlled by the size of the transporting stream and by breaks in gradient rather than absolute gradient. For example, gravel reaching the desilting basin of the Graham Reservoir is transported in the larger gullies on gradients of only 1 percent, whereas fine sand is deposited in some channels on gradients of 2 percent. The deposition generally is associated with a reduction in gradient.

Sheet erosion was detected by instrumental observations only on the steep shale slopes and in a few other local areas, and even in these places the amount was generally less than the limit of possible instrumental error. Observations of gully progress indicate that, except for one headcut that advanced 40 feet during the summer of 1949, the growth of the gullies was not conspicuous, but moderate widening occurred generally. Because the total length of the gullies in the Graham drainage basin is relatively great, widening could account for a large quantity of sediment. On the basis of the available data and because material in the silt basin appears far too coarse grained to have been derived by sheet erosion under existing conditions in the basin, an estimated 75 percent of the sediment delivered to the reservoirs and desilting basin was derived by gullying.

Because vegetation was sparse during the period of observation, its influence on local erosion or deposition was not clearly shown. Ranges where vegetation was relatively abundant showed practically no erosion, but some of the other ranges that were almost devoid of any protective cover also showed little or no erosion. Hence, the results are inconclusive. Establishment of comparative ranges in other drainage basins, where contrast in vegetative cover is greater, may be necessary to obtain conclusive data.

SIGNOR DRAW

The study of Signor Draw included measurement of sediment yield from a reservoir drainage basin of 8.2 square miles. Signor Draw is a tributary of Conant Creek, which in turn is a tributary of Muskrat Creek. The reservoir, which was built in 1946, is in sec. 6, T. 33 N., R. 92 W., about 25 miles southwest of Moneta. The drainage basin differs from the Graham drainage basin in having a gently rolling terrain that has practically no barren escarpments. For the most part, it is underlain by relatively permeable rock and soil; it probably has a relatively low runoff factor.

The study included probing of the sediment deposit in the reservoir and computing the volume of sediment. The annual unit sediment yield from the drainage basin determined for the period 1946-51 is 0.03 acre-foot per square mile.

MAHONEY DRAW

The study of Mahoney Draw is similar to that of Signor Draw and is on a reservoir drainage basin of 15.5 square miles. Mahoney Draw is tributary to Muskrat Creek, and the reservoir lies about 18 miles south of Moneta. The drainage basin, for the most part, is gently rolling, is fairly well vegetated, and appears to have a moderately low runoff factor.

The average annual sediment yield for this basin, determined for the deposit in the reservoir for the period 1941-51, is 0.03 acre-foot per square mile, the same as that determined for Signor Draw.

Both the Signor and Mahoney areas show very low sediment yields, particularly in comparison with data available for other small areas in the west.

PAINTPOT DRAW

Paintpot Draw is tributary to Coal Draw, which in turn is tributary to Maverick Spring Draw. It drains an area in the Wind River Indian Reservation about 20 miles northwest of Pavillion. Measurement of the sediment deposit was made on a reservoir on one of the forks of Paintpot Draw. The drainage area is 3.7 square miles and is occupied largely by badlands of the Wind River formation. The sediment deposit, which completely filled the reservoir, is reported to have accumulated in a period of 3 years (1938-41). The measurement of the deposit showed an annual sediment yield of about 2 acre-feet per square mile. Actually, the yield may have been somewhat greater, because the reservoir had been breached and some sediment may have been carried out.

BLUE DRAW

Blue Draw drains a small basin a few miles north of the Paintpot drainage basin and is tributary to Dry Muddy Creek, which is one of the main tributaries of Muddy Creek. The basin is alined along steep, barren slopes of Mowry shale. A series of reservoirs on the draw are filled with sediment, which is reported to have accumulated within a period of 3 years (1938-41). Although accurate measurements could not be made of these sediment deposits, estimates show a sediment yield of 2 to 3 acre-feet per square mile while the reservoirs were functioning.

INTERPRETATION OF DATA

The data that have been collected, although not complete, show that a wide range of sediment yields occur in the Wind River

Basin and provide some information for evaluation of the causative factors. Of the causative factors, the types of rock and soil seem to have the greatest influence on runoff and erosion. This fact is shown by the sediment yields of Signor and Mahoney Draws as contrasted with those of Paintpot and Blue Draws. In all these basins the vegetation is closely related to the rock and soil types. It is generally very sparse on the areas of shale, which are the least permeable and have the highest runoff factor, and is moderately dense on the areas of the more permeable rocks.

UNMEASURED SEDIMENT DISCHARGE

Standard methods and equipment for measuring the suspended-sediment discharge of streams determine only part of the suspended-sediment discharge and, of course, none of the bed-load discharge. For swift, shallow streams that flow on sand beds, the unmeasured sediment discharge may be an appreciable fraction of the total sediment discharge. Also, this fraction may change rather rapidly from point to point along a stream. Accordingly, some determination of the unmeasured sediment discharge of streams in the Wind River drainage basin is necessary as a basis for comparison of sediment discharges at different points in the basin. Also, sediment yields obviously should be based on total sediment discharges rather than on measured suspended-sediment discharges. Some measurements of total sediment discharge have been made on Fivemile Creek near Riverton and near Shoshoni, and some computations of total sediment discharges at sediment stations on several streams in the basin have been made. Although these measurements and computations are far from adequate to determine yearly unmeasured sediment discharges with good accuracy, they give enlightening information on these unmeasured sediment discharges.

Nearly total sediment discharge of Fivemile Creek is measured at the sediment station near Riverton. The sediment is forced into suspension by the turbulence created in a natural contracted section, and the measurements made at the sediment station are considered to be of nearly total load. On 4 days during 1951, sediment concentrations were determined at about the same times at a normal section about three-eighths of a mile upstream from the gaging station and at the daily sampling section, which is also the contracted section. As the streamflow is essentially the same at both sections, the concentration ratios may be considered to be equal to the ratios of suspended-sediment discharge. Ratios of suspended-sediment discharge (or concentration) at the daily sampling section to suspended-sediment discharge (or concentration) at the normal section ranged from 1.07 to 1.44 and averaged 1.31 for the 4 days. (See table 77.) These ratios indicate that the measured sediment discharge at the normal section must be increased by 7 to 44 percent to equal the sediment discharges that were measured on the 4 days at the daily sampling station where the creek is confined to a narrow, steep channel in which the flow is very turbulent.

Similar ratios of suspended-sediment discharge at a contracted section to sediment discharge at a normal section were determined on Fivemile Creek near Shoshoni for 2 days in August 1953. The measured sediment discharges in an artificially confined section were 1.43 and 1.56 times the measured sediment discharges at a normal section 400 to 500 feet upstream from the contracted section. (See table 77.) Of course, these 2 determinations for Fivemile Creek near Shoshoni as well as the 4 determinations for Fivemile Creek near Riverton are inadequate to define satisfactory average ratios with which to compute total sediment discharge from the measured sediment discharge. Also, an unweighted average ratio may be unsatisfactory.

The total instantaneous sediment discharge of a stream can be computed from the concentration and the size distribution

Table 77.--Comparison of computed total sediment discharge and measured sediment discharge, Fivemile Creek near Riverton and near Shoshoni

[Q_c, measured sediment discharge at a contracted section; Q_n, measured sediment discharge at a normal section; and Q_t, computed total sediment discharge]

Date	Water discharge (cfs)	Concentration (ppm)		Ratios of sediment discharge		
		Normal section	Contracted section	$\frac{Q_c - Q_n}{Q_c}$	$\frac{Q_c}{Q_n}$	$\frac{Q_t}{Q_n}$
Fivemile Creek near Riverton						
1951						
May 1	71	51,000	54,400	0.06	1.07	1.22
July 6	157	19,500	25,700	.24	1.32	1.32
19	179	24,000	33,300	.30	1.44	1.33
Aug. 3	174	18,000	25,300	.29	1.40	1.50
Fivemile Creek near Shoshoni						
1953						
Aug. 12	289	7,600	10,900	0.30	1.43	1.42
27	259	5,450	8,510	.36	1.56	1.75

of measured suspended sediment at a normal section plus a streamflow measurement, water temperature, and particle-size distribution of bed material at the same section. These data have been obtained at several sediment stations on streams in the Wind River drainage basin, but only occasionally has enough information been obtained at any one time. Bed-material samples were rarely collected for particle-size analyses. Also, of course, many of the sediment stations, such as the station Wind River at Riverton, are operated at cross sections that are not normal sections. The stream bed at these sections may be mostly heavy gravel, cobblestones, or consolidated material. Some data that were available for suitable cross sections have been used to compute total sediment discharge.

Only at two stations on Fivemile Creek, at each of which there is a contracted section, can a direct check be made on the accuracy of the computed total sediment discharges. These checks can be made for only the 6 days that are listed in table 77. The last column of this table gives the ratios of computed total sediment discharge to measured sediment discharge at comparable times at a normal section. These ratios agree reasonably well with and average slightly higher than the ratios in the preceding column. Ratios in these two columns would be equal if measured and computed sediment discharges were precisely correct and if all the sediment discharge of the stream were measured at the contracted section. If not all the total sediment discharge was measured at the contracted sections, the ratios in the last column should exceed those in the preceding column by a small amount.

Agreement between the ratios in the last two columns of table 77 is good and may be partly fortuitous, particularly in view of the facts that any suspended-sediment concentration that is listed in the table is subject to chance error of several percent and that the average depth in the normal section near Riverton was only about 0.4 foot. This depth is too shallow to sample satisfactorily by usual methods and is also too shallow to have relatively uniform hydrologic characteristics across the section. The agreement (fig. 19) probably can be taken to mean that the computed total sediment discharges are reasonably accurate even when based on some relatively unsatisfactory measuring and sampling sections.

The procedure (called the modified Einstein procedure) used to compute these total sediment discharges is based on a method that was suggested by Einstein (1950) for the computation of sediment discharge of particles of sizes that are found in appreciable quantities in the stream bed. The modified procedure was developed (Colby and Hembree, 1955) to use measurements of

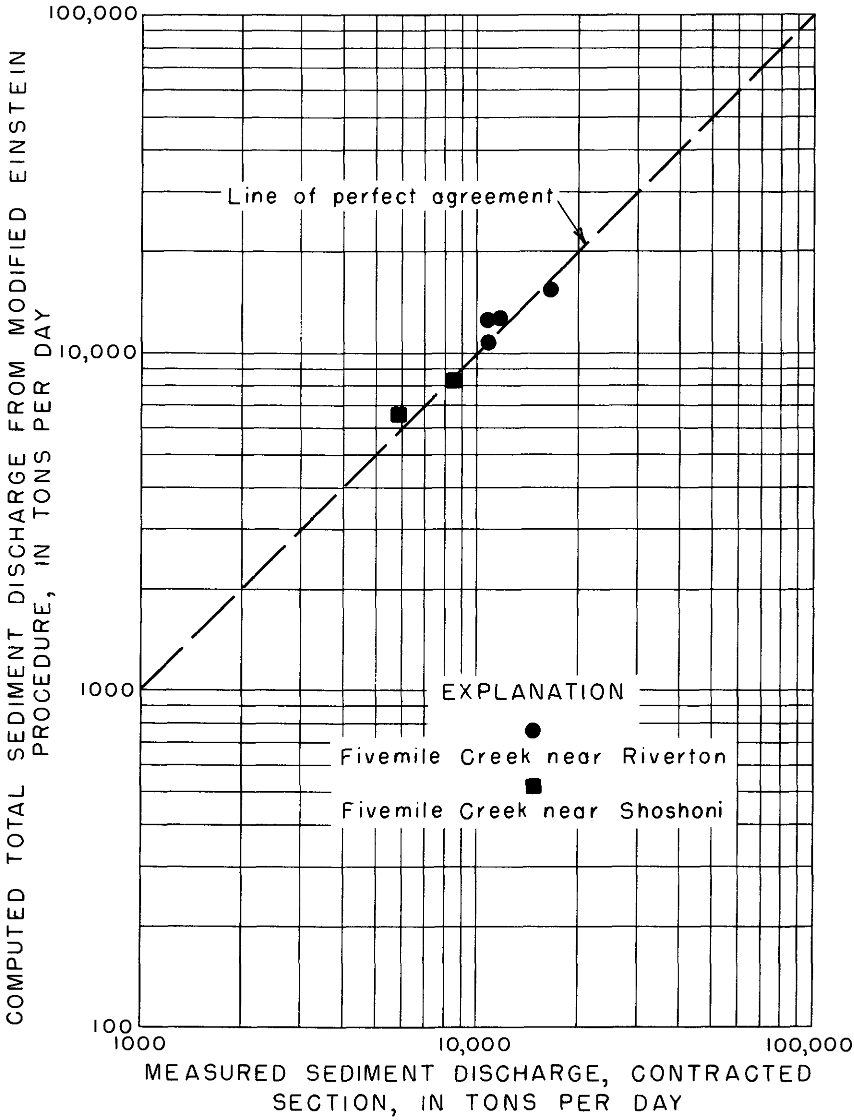
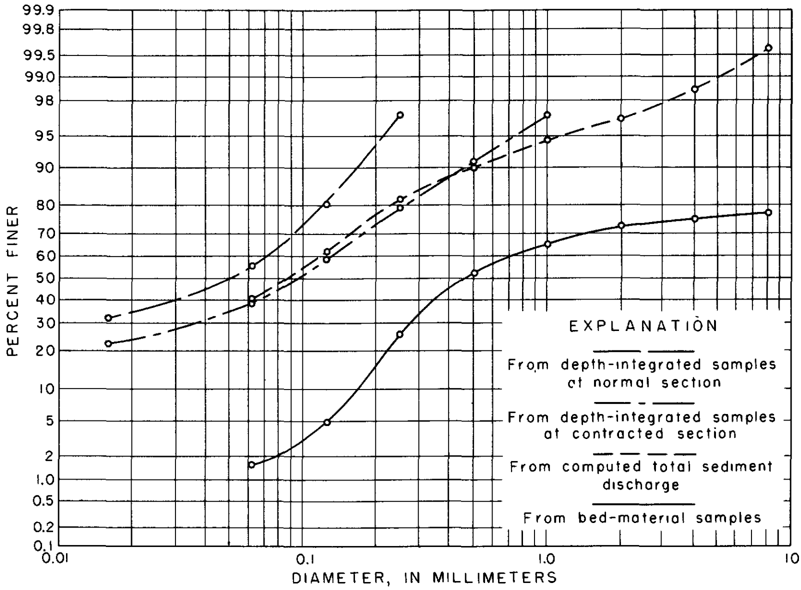


Figure 19. --Comparison of computed sediment discharge from modified Einstein procedure for a normal section with measured sediment discharge at a contracted section.

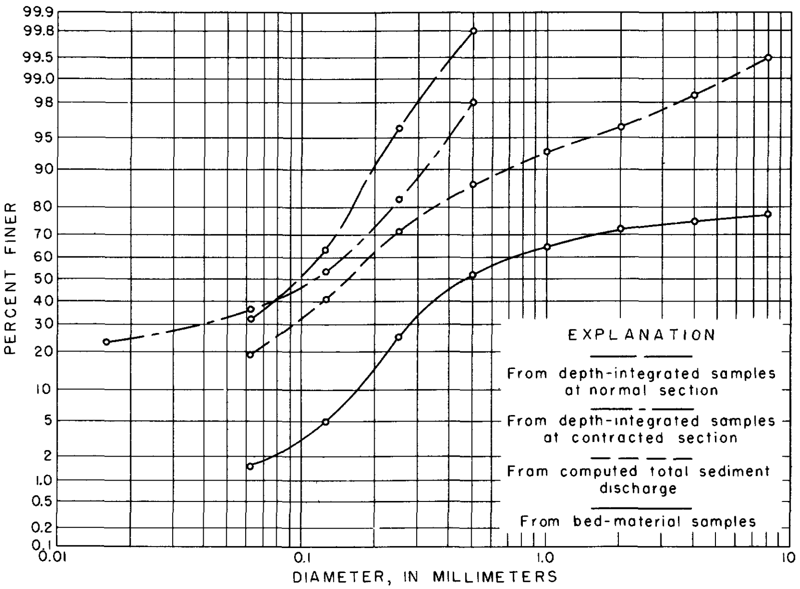
streamflow and of measured suspended-sediment concentration and particle-size distributions in combination with the Einstein method so that readily measurable data from one cross section of an alluvial stream could be used to compute the total sediment discharge of the stream.

The modified procedure is based on an equation for the vertical distribution of velocity plus a trial-and-error method of approximating the vertical distribution of suspended-sediment concentration of several particle-size fractions. For each range of particle sizes, the vertical distributions of velocity and of sediment concentration are combined into a vertical distribution of suspended-sediment discharge. With graphical aids, the suspended-sediment discharge can be integrated from the water surface to the top of the bed layer to obtain the total discharge of suspended sediment. For some of the smaller particle sizes, the vertical distribution of suspended-sediment discharge is based largely on concentration in the sampling zone as determined by depth-integrated samples; for the larger particle sizes it is based to a considerable degree on the bed-material discharge concept of Einstein (1950), but the method of computing bed-load discharge has been changed to obtain better size distributions in the computed total sediment discharge. For each size range, computed bed-load discharges are added to the total suspended-sediment discharges to get figures of total sediment discharge of the stream by size ranges. Finally, the computed discharges of sediment of all size ranges are added to obtain the computed total sediment discharge of the stream.

Particle-size distributions of the computed total sediment discharge are necessarily somewhat inexact. They contain inaccuracies in determinations of the size distributions of the suspended and bed-material sediments as well as the errors inherent in the complex mathematical procedure that is based on uncertain assumptions. However, they frequently approximate fairly closely the size distributions as shown by the analyses of suspended-sediment samples that were collected at a contracted section. (See figs. 20-22.) Usually they show appreciably more sediment in the coarser sizes than the size distributions of analyses of depth-integrated samples for the contracted sections. Samples that were collected near the stream bed at the contracted sections with a Tait-Binckley or a Bureau of Reclamation sampler seem to indicate that some coarse material sometimes moves through the section without being adequately sampled with a depth-integrating sampler. (See tables 49, 50, 55, and 56.)

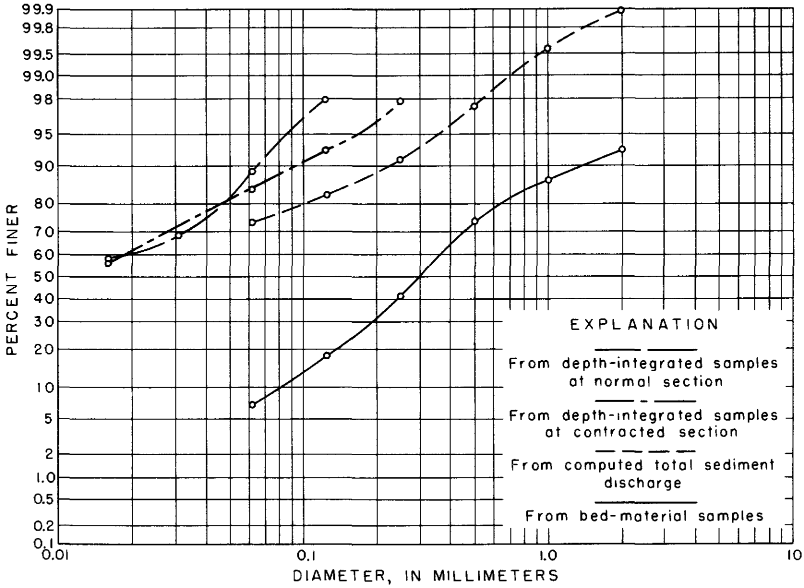


A.--Fivemile Creek near Shoshoni, August 12, 1953

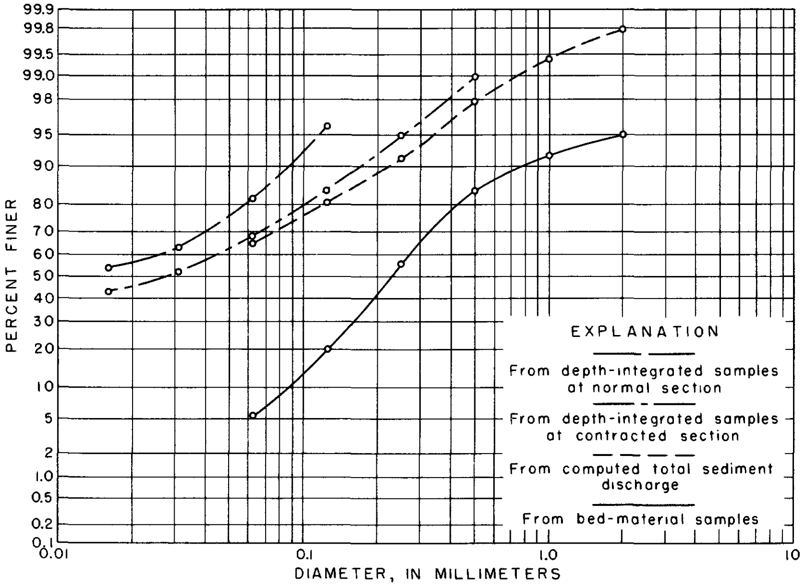


B.--Fivemile Creek near Shoshoni, August 27, 1953

Figure 20.--Particle-size distributions of sediment samples.

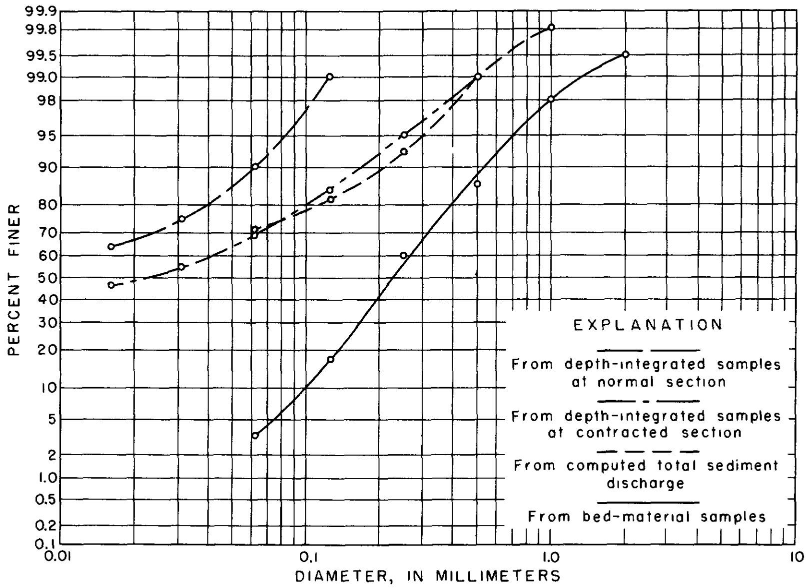


A.--Fivemile Creek near Riverton, May 1, 1951

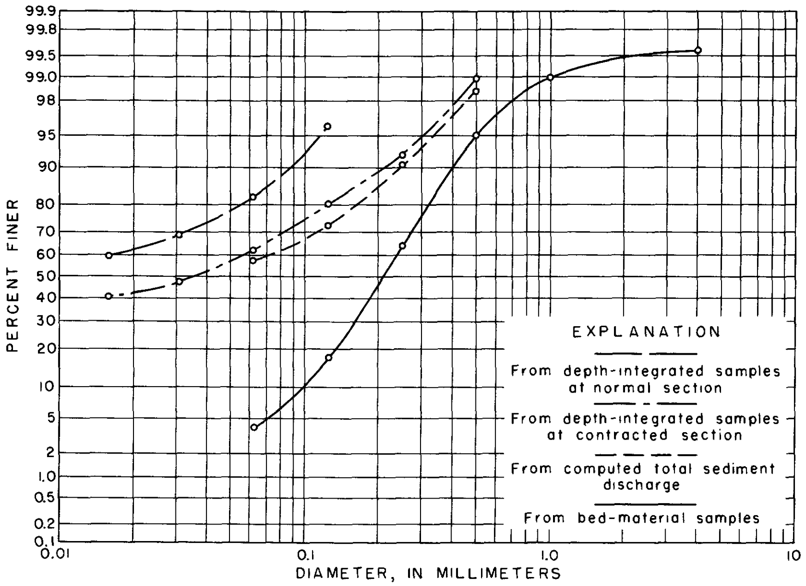


B.--Fivemile Creek near Riverton, July 6, 1951

Figure 21.--Particle-size distributions of sediment samples.



A.--Fivemile Creek near Riverton, July 19, 1951



B.--Fivemile Creek near Riverton, August 3, 1951

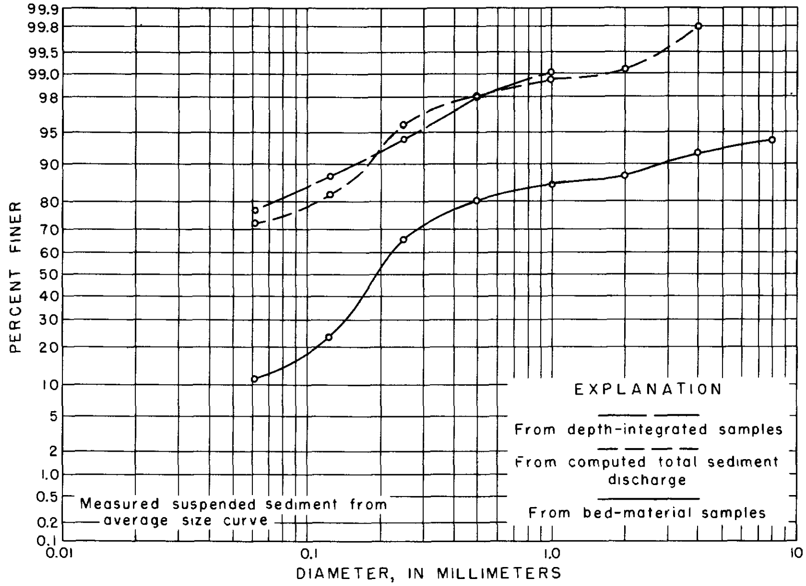
Figure 22.--Particle-size distributions of sediment samples.

Relatively large differences between particle-size distributions of the total sediment discharge as measured and as computed for May 1, 1951, for Fivemile Creek near Riverton (fig. 21A) were due directly to the computed total sediment discharge exceeding the measured sediment discharge by 15 percent. Large differences for Fivemile Creek near Shoshoni for August 27, 1953 (fig. 20B) are due to the fact that the size analyses of the sediment samples are not representative.

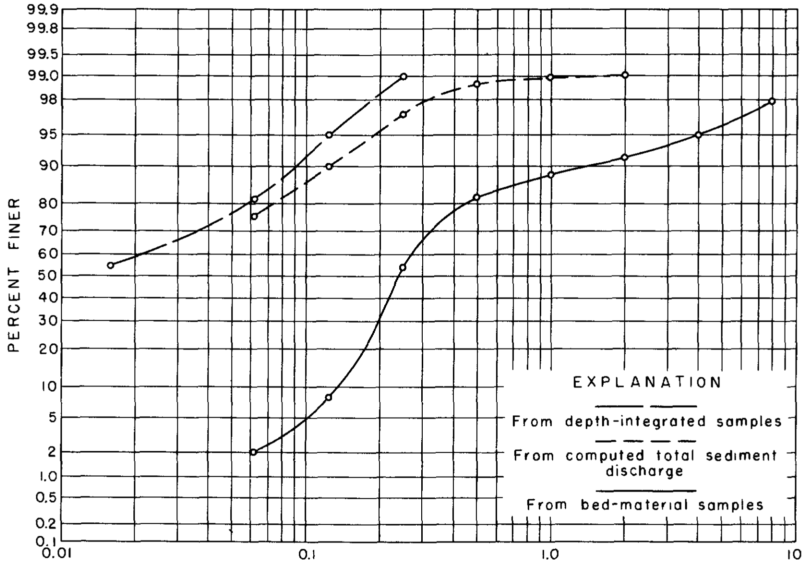
For almost every computation, the particle sizes of the computed total sediment discharge were appreciably coarser than the particle sizes of the suspended sediment in the sampling zone at a normal section (figs. 20-25). In fact, for some of the shallow cross sections of Fivemile Creek near Riverton, the size distribution of the suspended sediment from depth-integrated samples gives very little idea of the size distribution of the total sediment discharge.

Computations of total sediment discharge were made 1 to 4 times for each of 8 sediment stations. (See table 78.) Except for the two Fivemile Creek stations that were used for special studies and have already been discussed, the computations were based on sections at which the daily samples of suspended sediment were collected. Thus, except for Fivemile Creek, the computed total sediment discharges and the computed unmeasured sediment discharges were for the same cross sections as the measured suspended-sediment discharges.

These computations of total sediment discharge cover a range in streamflow of 20 to 8,360 cfs and a range of measured suspended-sediment discharge of 194 to 366,000 tons per day (table 78). Ratios of computed total sediment discharge to measured suspended-sediment discharge were as low as 1.05 and as high as 1.75. Although these ratios tend to be low when the measured suspended-sediment discharge is high, they have an overall appearance of being somewhat random or inconsistent. For example, the ratios for the Bighorn River at Thermopolis do not seem to vary with a change in water discharge, whereas for Muddy Creek near Shoshoni they increase rapidly with decreasing water discharge. However, the unmeasured sediment discharges when plotted against water discharge, as on figure 26, follow a generally logical pattern in spite of inherent inaccuracies in the computations and a lack of complete and accurate base data. The unmeasured sediment discharges increased in approximate proportion to water discharge for the Popo Agie River near Riverton, Fivemile Creek near Riverton, and the Bighorn River at Thermopolis. They increased as about the 1.2 power of the water discharge for Beaver Creek near Arapahoe and Muddy Creek near Shoshoni and as about the 1.5 power for Badwater Creek at Bonneville. Scatter of points from the lines is caused, in part at least, by differences in the size distribution of the suspended sediment.

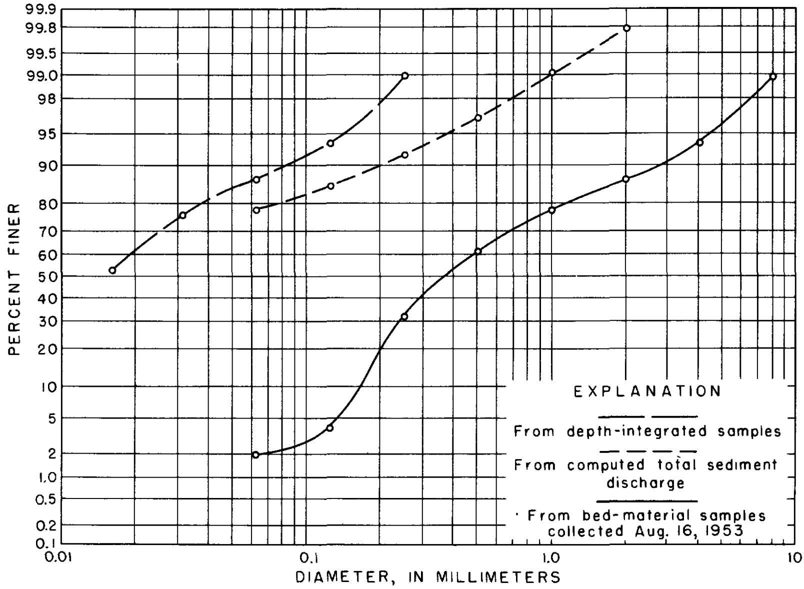


A.--Bighorn River at Thermopolis, September 29, 1949

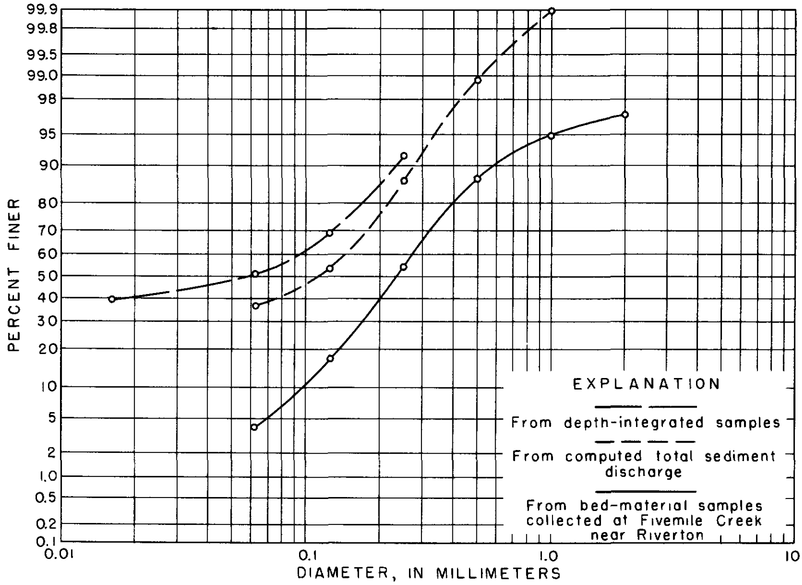


B.--Muddy Creek near Shoshoni, July 22, 1951

Figure 23.--Particle-size distributions of sediment samples.

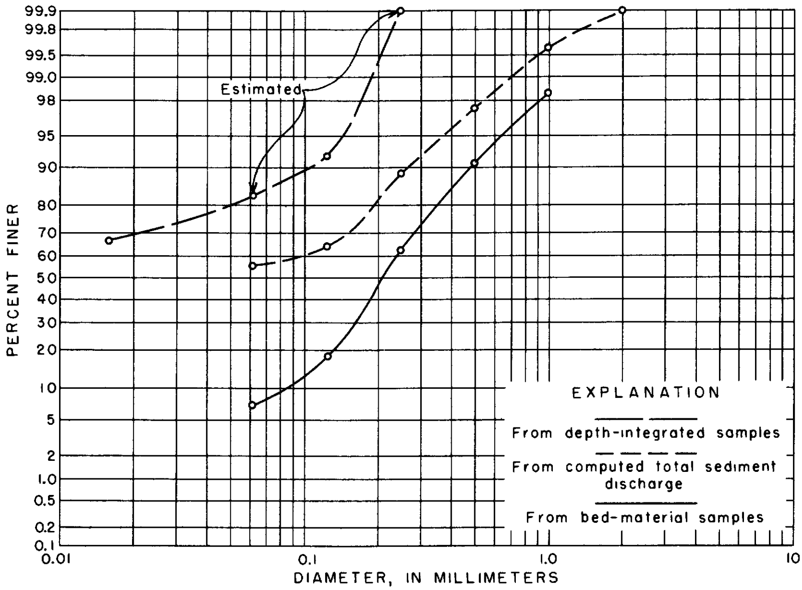


A.--Badwater Creek at Bonneville, July 11, 1949

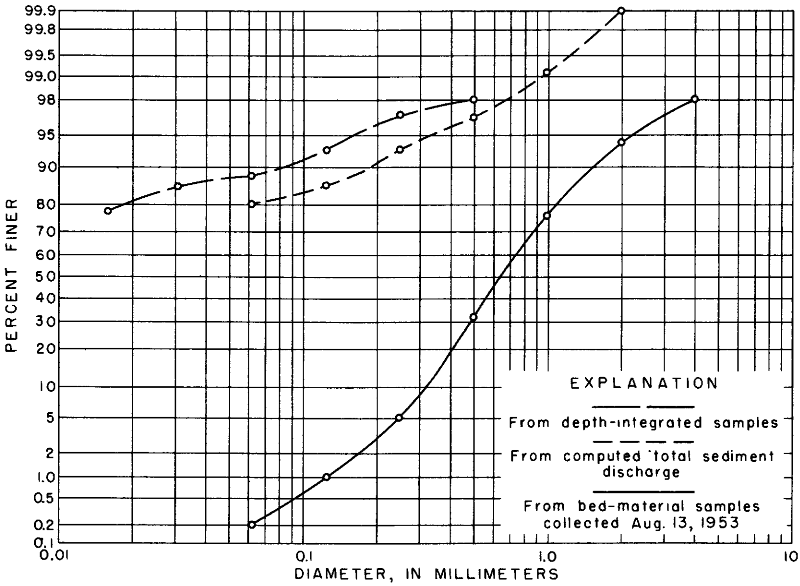


B.--Pavillion drain near Pavillion, July 21, 1950

Figure 24.--Particle-size distributions of sediment samples.



A.--Beaver Creek near Arapahoe, April 9, 1952



B.--Popo Agie River near Riverton, April 8, 1952

Figure 25.--Particle-size distributions of sediment samples.

Table 78.--Ratios of computed total sediment discharge to measured sediment discharge for streams in the Wind River drainage basin

Sediment station	Date	Approximate water discharge (cfs)	Normal section: Measured concentration (ppm)	Normal section: Measured suspended-sediment discharge (tons per day)	Computed total sediment discharge (tons per day)	Ratio (column 6 divided by column 5)
1	2	3	4	5	6	7
Beaver Creek near Arapahoe.....	Apr. 9, 1952	68	5,100	934	1,440	1.54
Do......................	May 22, 1952	271	20,200	14,800	17,500	1.18
Popo Agie River near Riverton..	Apr. 8, 1952	367	344	341	381	1.12
Do......................	June 11, 1952	5,600	284	4,290	4,900	1.14
Pavillion drain near Pavillion.	July 21, 1950	24	5,180	338	483	1.43
Fivemile Creek near Riverton...	May 1, 1951	71	51,000	10,200	12,400	1.22
Do......................	July 6, 1951	157	19,500	8,260	10,900	1.32
Do......................	July 19, 1951	179	24,000	11,600	15,400	1.33
Do......................	Aug. 3, 1951	174	18,000	8,460	12,700	1.50
Fivemile Creek near Shoshoni...	Aug. 12, 1953	289	7,600	5,930	8,400	1.42
Do......................	Aug. 27, 1953	259	5,450	3,810	6,650	1.75
Badwater Creek at Bonneville...	Mar. 25, 1948	340	17,200	15,800	22,600	1.43
Do......................	May 6, 1949	41	22,500	2,490	2,910	1.17
Do......................	July 11, 1949	178	90,000	46,400	53,200	1.15
Muddy Creek near Shoshoni......	July 22, 1951	902	140,000	366,000	386,000	1.05
Do......................	.....do.......	184	77,300	39,800	43,000	1.08
Do......................	Aug. 4, 1952	151	34,400	14,500	16,400	1.13
Do......................	Aug. 12, 1953	20	3,540	194	316	1.63
Bighorn River at Thermopolis...	June 21, 1949	8,360	a 3,540	80,000	89,000	1.11
Do......................	Sept. 29, 1949	1,010	a 1,650	4,500	4,990	1.11
Do......................	July 31, 1950	3,110	a 3,820	32,000	35,700	1.12

a Computed from average relationship of daily sediment discharge to daily water discharge.

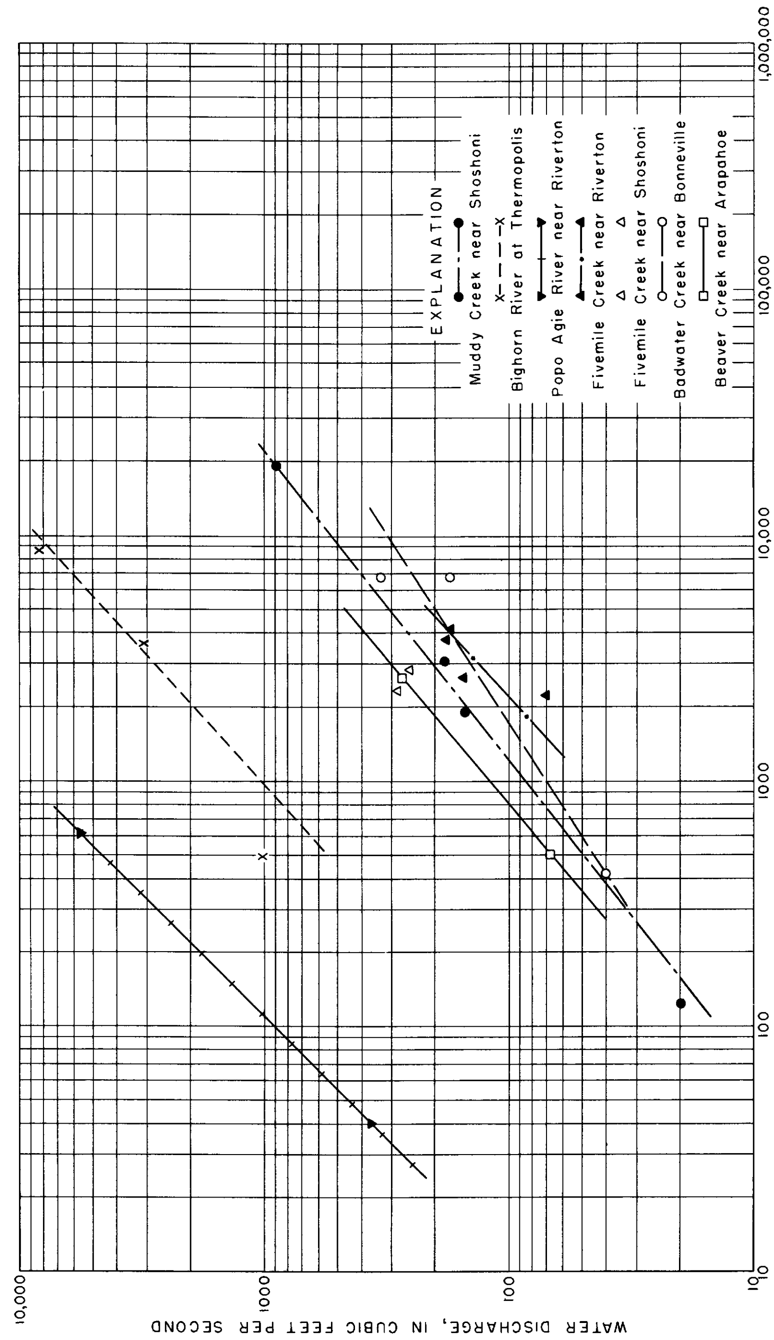


Figure 26. --Relation of unmeasured sediment discharge to water discharge for several streams in the Wind River drainage basin.

The line for Badwater Creek on figure 26 was used to compute roughly the unmeasured sediment discharge during the water years 1948 through 1952. Sediment discharges from the line were used with groups of days rather than with each individual day throughout each year. Annual computed unmeasured sediment discharges ranged from 15,000 tons during the 1952 and 1951 water years to 165,000 tons during the 1948 water year. (See table 79.) Ratios of computed total sediment discharge to measured sediment discharge by years also are shown in table 79. These ratios were determined from total annual measured and unmeasured sediment discharges and are thus weighted with sediment discharge.

Average computed ratios for 1949, 1951, and 1952 are about equal and are not far from 1.2. However, the ratios are 1.43 for 1950 and 1.65 for 1948. These higher computed ratios are due to low suspended-sediment concentrations for given water discharges. Much of the sediment in these 2 years, especially 1948, was carried by water from snowmelt. Unmeasured sediment discharge, at least as computed here, is principally a function of water discharge, is to some extent a function of size distribution, and is relatively independent of suspended-sediment concentration. Hence, it is relatively constant for a given water discharge and velocity, whereas the suspended-sediment discharge for a given water discharge is directly proportional to the suspended-sediment concentration.

The general decrease in proportion of unmeasured sediment with increasing concentration at other sediment stations is shown by plotting suspended-sediment concentration against the ratio of computed total sediment discharge to measured suspended-sediment discharge. (See fig. 27.) Besides inherent errors in the computation of unmeasured sediment discharge, many factors, such as changing relative depth of sampling zone, changing local stream slopes, and changing size distributions of the suspended and bed sediments, may cause the points of figure 27 to scatter somewhat. However, except for the Bighorn River at

Table 79.--Ratios of computed total sediment discharge to measured sediment discharge by water years for Badwater Creek at Bonneville

Water year	Sediment discharge		Ratio of total to measured sediment discharge
	Unmeasured (tons)	Measured (tons)	
1948	165,000	252,300	1.65
1949	41,000	232,700	1.18
1950	27,000	62,700	1.43
1951	15,000	79,042	1.19
1952	15,000	58,625	1.26

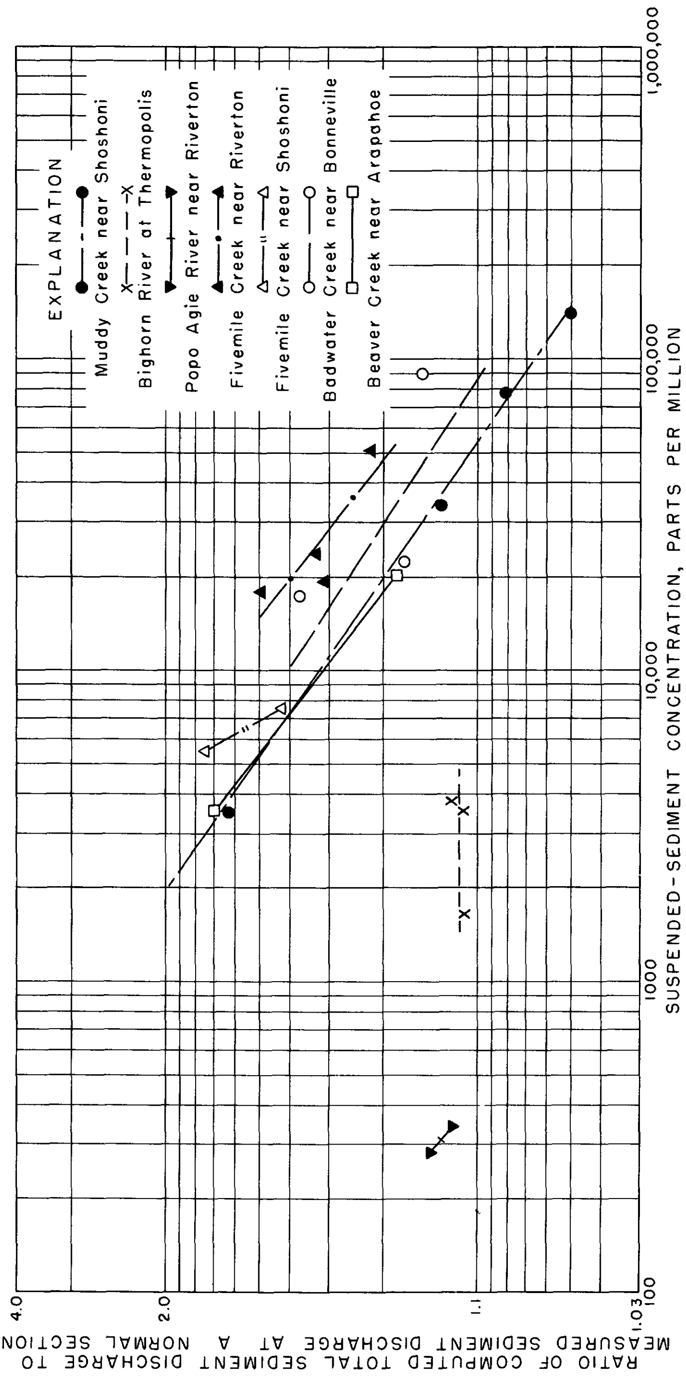


Figure 27. --Relation of suspended-sediment concentration to the ratio of computed total sediment discharge to the measured sediment discharge at a normal section.

Thermopolis, for which all the computed ratios are nearly the same, a tendency for the ratio to increase with decreasing concentration is shown. The conclusion from figure 27 is that the percentage of the unmeasured sediment discharge becomes small for large flows that contain high concentrations of suspended sediment. Nevertheless, at such large flows the unmeasured tonnage is much higher than at small flows (fig. 26).

Available information on unmeasured sediment discharge was used to estimate average ratios of total sediment discharge to measured suspended-sediment discharge for most sediment stations in the Wind River drainage basin. In making such estimates the fact was considered that much of the sediment discharge of tributaries of the Wind River downstream from Riverton is discharged at times when the suspended-sediment discharge is very high, and the relative proportion of unmeasured sediment is low. The estimates are, of course, for ratios that are weighted with sediment discharge. Estimated ratios weighted with time would be very much higher. Also, sediment stations, like the Wind River at Riverton and the Bighorn River near Thermopolis and at many times Fivemile Creek near Shoshoni, have beds of cobblestones or consolidated rock rather than finer alluvial material. Logically, the ratios for such stations will be appreciably lower than for similar streams with alluvial beds of finer particle sizes. Those average estimated ratios that entered directly into computations of sediment yields in tons will be shown where they are used.

SOURCES OF THE SEDIMENT

Streams and the mass-wasting processes (mass movement of rock debris) with which they are so intimately associated are the most important agents of erosion known (Longwell and others, 1950, p. 71). Of course, the streams are the ultimate means of transporting the products of weathering to the sea, but a large part of the waste is made available to the streams by the processes of mass wasting. In the mountains where the slopes are steep, mass movement of rock waste is relatively rapid, and material is sometimes delivered directly to the larger streams and tributaries faster than it can be removed. The results are local but short-lived aggradation. In areas of lower elevation where the slopes are more gentle, creep, which is the principal process of mass wasting, is still effective but operates at a much slower rate, and the slumping of the alluvial banks of streams is the most noticeable form of mass wasting. The removal of the debris by the streams prevents the stoppage of the processes of mass wasting and keeps the means of sediment supply in operation.

The size and shape of a stream channel and the local slope of the stream bed constantly undergo adjustments to changes in both water and sediment discharge. Streamflow and sediment discharge fluctuate through a range, usually a wide range, and the characteristics of the stream within this range may be considered to be the regimen of the stream. If the profile and the cross section of a stream were completely adjusted to the flow and to the particle sizes and quantities of sediment, the stream would be at equilibrium. However, changes in the environment of a stream prevent the actual attainment of equilibrium. Equilibrium is merely the goal that all streams tend to approach. If a stream approaches equilibrium, it is said to be graded. All graded streams are degrading streams; that is, downcutting continues but the profile remains essentially constant. Local slopes of a stream bed are constantly being adjusted so that the stream can just transport the sediment load. Adjustments in local slopes and cross sections occur with every flood. Local aggradation in a reach, although usually caused by a decrease in the transporting power of a stream from the upstream to the downstream end of the reach, has the net effect of an attempt by the stream to increase its slope, and hence its carrying capacity, downstream from the point of deposition and to decrease its slope, and hence its carrying capacity, upstream from the point of deposition.

An increase in water discharge brings an increase in the capacity of a stream to do work. Consequently, the total amount as well as the size of the sediment transported by a stream usually increases as the water discharge increases. Most of the increase in sediment load may come from the beds and banks of the stream. In general, streams that have steep gradients and low sediment concentrations are degrading streams, especially in their upper reaches. Conversely, streams with low gradients and high sediment concentrations are usually aggrading streams in their lower reaches.

Rates of erosion vary widely within the Wind River drainage basin. In the highest mountain areas, the average annual sediment yield is perhaps 10 or 20 tons per square mile and 0.01 ton per acre-foot of water. On the floor of the valley, the amount of erosion is limited principally by the quantity of runoff. In some years and in some areas the runoff, and hence the erosion, may be so small as to be unmeasurable. In other years, runoff, although by no means the maximum possible, may be 0.25 inch, and accompanying sediment yield may be as much as 1,600 tons per square mile. This tonnage corresponds to an average concentration of about 120 tons per acre-foot of water or 80,000 ppm. The fact is noteworthy that high sediment yields do not come from areas where annual runoff is very high nor from areas where annual runoff is very low. Where runoff is very high, the readily available sediment has already been eroded; where runoff is very low, the quantity of water is too small to transport much sediment, even at high concentrations. Some of the highest sediment yields are from areas, such as Fivemile Creek, to which water is artifically supplied and in which sediment is readily available under a climate that produces very low natural runoff.

One of the principal objectives of the sedimentation study by the Geological Survey was to determine the major source areas of the sediment that is eroded in the basin and is transported to Boysen Reservoir. Practical measures to control erosion should be concentrated in those areas from which most of the sediment is being eroded or along those channels through which most of the sediment is being transported.

The network of sediment stations was established to delineate sediment discharge from different areas in the Wind River drainage basin. These stations, except for the special study along Fivemile Creek, were maintained only on streams that carry appreciable quantities of sediment or have high concentrations of sediment. Supplementary spot determinations of suspended-sediment discharges were made during 1953 at many places at a time of high flow and at a time of low flow to obtain information on the sediment discharges at places other than regular sediment sampling stations. Streamflow, concentration of suspended sediment, and discharge of sediment are given in table 4 for each of these spot determinations. Locations of the sampling points are shown on plate 1.

One of the difficulties in determining the principal sources of the sediment in the basin is that sediment, unlike the water in which it is carried, may move intermittently along stream channels. Another way of stating the problem is that changes in storage of sediment between two places along a stream may represent large percentages of the eroded sediment and the changes in storage of the sediment usually cannot be measured by practical methods. In spite of the incomplete coverage by sediment stations and the alternate deposition and pickup of sediment along a stream, a reasonable approximation was made of the quantities of sediment from different areas according to kind of underlying rocks and according to individual streams.

Relative sediment yields from the different geologic areas and from the different drainage areas are expressed in percentages of the average sediment discharge of the Bighorn River at Thermopolis during the period of sediment records by the Geological Survey before the closing of Boysen Dam. The average measured suspended-sediment discharge during this period was 4,702,000 tons per year. Unmeasured sediment discharge was estimated to average 8 percent of the measured sediment discharge (p. 89). Hence, the average sediment discharge at Thermopolis was used as 5,080,000 tons per year. Because of deposition along the Wind River and its tributaries below Riverton, the average annual sediment discharge at upstream points probably totals more than 100 percent of the sediment discharge at Thermopolis.

SEDIMENT YIELDS BY GEOLOGIC AREAS

Within a broad stratigraphic classification the different formations will by no means have equal rates of erosion even for equal quantities and distributions of precipitation. However, such a broad stratigraphic classification may eliminate large areas of the drainage basin from consideration as significant sources of sediment. One approach to estimating the total sediment yield from areas that are underlain by rocks of different geologic types can be made by determining the amount of runoff from these areas and by estimating the average concentration of sediment in the runoff. Another approach is to make crude estimates of average annual sediment yield per square mile and to apply these estimates to an area. Estimates by either approach would be easier to make if the geologic areas were each in one continuous area rather than scattered around the Wind River Basin.

The Wind River Basin was divided into five groups of areas that are underlain by Precambrian, Paleozoic, Mesozoic, Tertiary, and Quaternary rocks. Lines of average annual runoff from plate 2 were transposed on a copy of the geologic map of plate 3, and the areas underlain by each rock type were planimetered between each set of adjacent lines of equal runoff. Cross products of area and runoff were totaled for each geologic area to obtain the approximate runoff from each. As a check on the work, the total runoff from all areas was found to represent 3.7 inches or 1,590,000 acre-feet per year at Thermopolis. On the basis of adjusted streamflow records at Thermopolis, the measured average annual runoff from the drainage area upstream from Thermopolis was 3.6 inches. The comparison is good.

In table 80 the amounts of runoff in percentage of the total runoff are given for the five geologic areas. For comparison, the percentages of area underlain by the five rock types are also shown. Estimates of sediment yield from these different geologic areas are based partly on information in table 4.

Table 80.--Yields of water and sediment[1] from five geologic areas in percentage of total water and sediment discharges of the Bighorn River at Thermopolis

Types of underlying rocks	Areas (percent)	Total yield	
		Water (percent)	Sediment (percent)
Precambrian..............	14	59	0.5
Paleozoic................	10	9	.5
Mesozoic.................	12	2.5	8
Tertiary.................	48	27	28
Quaternary...............	16	2.5	63
Total..............	100	100	100

1 The yield of water is based on runoff (virgin flow); the sediment yield is estimated on the basis of net yield under the development of irrigation and reservoir storage at the end of the 1951 water year just before Boysen Dam was closed.

AREAS UNDERLAIN BY PRECAMBRIAN ROCKS

The Precambrian rocks have a very incomplete soil mantle, and the rocks themselves erode very slowly. Consequently, the runoff from the areas of Precambrian rocks contains little sediment. For example, the Little Wind River near Fort Washakie, the North Fork Little Wind River near Fort Washakie, Dry Creek at Burris, Meadow Creek near Crowheart, and the Middle Popo Agie River near Lander are streams whose flow comes mostly from areas that are underlain by Precambrian rocks. However, each of these streams flows across areas that are underlain by rocks of younger age and presumably collects additional sediment before reaching the points where the measurements of suspended sediment (table 4) were made. Probably even with an allowance for small amounts of bed-load discharge, the average concentration of suspended sediment in these 5 streams when they leave the areas that are underlain by Precambrian rocks is not more than 20 ppm. Flow from the highest areas in the mountains may, on the average, contain considerably lower sediment concentrations. A concentration of 20 ppm in the total outflow from the areas that are underlain by Precambrian rocks amounts to only about 25,000 tons of sediment per year or about 0.5 percent of the average annual sediment discharge of 5,080,000 tons (estimated unmeasured sediment discharge included) at Thermopolis from October 1, 1946, to September 30, 1951.

Although the estimated sediment yield of 25,000 tons may be considerably in error, it does show clearly the slow rate of erosion from approximately 1,100 square miles of area that is underlain by the Precambrian rocks. This area, which covers 14 percent of the drainage basin, yields 59 percent of the water and much less than 1 percent of the sediment.

AREAS UNDERLAIN BY PALEOZOIC ROCKS

In general, the Paleozoic rocks erode slowly. Few areas of true soil have been developed on them. Runoff from the areas that are underlain by the Paleozoic rocks averages between 3 and 4 inches annually but fails to cause much erosion. Streams flowing across these areas are clear mountain streams. Their beds are composed of cobblestones, boulders, and small amounts of gravel. The larger streams carry flow that originates principally on the areas that are underlain by Precambrian rocks. Many of the streams have cut deep canyons in the Paleozoic rocks over long periods of time, but the rate of cutting was obviously very slow, and the steep gradients of the canyons indicate slow erosion.

Quantitative estimates of the average sediment yields are difficult to make because the Paleozoic rocks underlie narrow areas that many streams cross but few streams drain exclusively. However, sediment concentrations in runoff from these areas are obviously low. Streams such as Meadow and Willow Creeks obtain much larger proportions of their flow from these areas than do the Little Wind River near Fort Washakie, the North Fork Little Wind River near Fort Washakie, and the Middle Popo Agie River, but they do not have appreciably higher concentrations than the three rivers. An overall estimate of 150 ppm average sediment concentration may be reasonable for runoff from areas that are underlain by Paleozoic rocks. This concentration indicates that about 0.5 percent of the average sediment yield from the Wind River drainage basin comes from these areas.

AREAS UNDERLAIN BY MESOZOIC ROCKS

Areas that are underlain by Mesozoic rocks differ widely in susceptibility to erosion. The large area along the foothills of the Wind River Mountains may not yield more than 100 or 200 tons of sediment per square mile to the Popo Agie River and tributaries. A reservoir on Mahoney Draw accumulated sediment at a rate of only about 0.03 acre-foot per square mile per year over a period of 10 years from a drainage area that, according to the geologic map (pl. 3), is mostly underlain by Mesozoic rocks. This rate is on the order of 40 tons annually per square mile. On the other hand, the rate of sediment accumulation in a series of reservoirs on Blue Draw, whose drainage area is mostly underlain by Mowry shale of Early Cretaceous age, indicates that the sediment yield from some small areas is 2 to 3 acre-feet per square mile per year (p. 64). Although sediment yields from small areas may not be representative of yields from larger areas, the annual yield of perhaps 3,000 tons per square mile on Blue Draw indicates a high potential sediment yield from some of the areas that are underlain by Mesozoic rocks. An average sediment yield of 400 tons per square mile annually from all the areas that are underlain by the Mesozoic rocks may be a logical estimate. This rate when applied to the total area that is underlain by the Mesozoic rocks indicates that the sediment discharge from these areas is about 8 percent of the average sediment discharge at Thermopolis.

AREAS UNDERLAIN BY TERTIARY ROCKS

Both runoff and sediment yield vary greatly within the areas that are underlain by Tertiary rocks. These areas comprise nearly half of the Wind River drainage basin. They predominate on the basin floor and also include much of the drainage area near the headwaters of the Wind River. Large parts of the drainage areas of the Wind River near Dubois, the East Fork Wind River near Duncan, and Crow Creek near Crowheart are underlain by Tertiary rocks. At high flows, these streams may have sediment concentrations of 1,000 to 2,500 ppm; at low flows, the sediment concentrations are very low. (See table 4.) The areas having the highest runoff seem to yield water that contains the lowest concentrations of sediment. Some sediment comes from alluvial deposits along the stream. For about 1,000 square miles of area that is underlain by Tertiary rocks and is upstream from the Diversion Dam on the Wind River, the average concentration is estimated to be 700 ppm of sediment in 390,000 acre-feet of water. The estimated tonnage per year is, therefore, about 370,000 tons.

In the remaining 2,800 square miles that is underlain by Tertiary rocks, the runoff is generally low, but sediment concentrations during periods of stormflow are usually high. During a period of 13 years the sediment accumulations in reservoirs on a drainage area of 3.12 square miles equaled 0.7 acre-foot or perhaps about 900 tons per square mile annually. (See table 76.) In contrast, the average sediment yield during nearly 4 years of record from the Poison Creek drainage area of 519 square miles was about 6,000 tons annually or about 12 tons per square mile per year. The small drainage area is underlain by Tertiary rocks as is most of the drainage area of Poison Creek. Average annual runoff for the 2,800 square miles is estimated to be about 0.15 inch, and average sediment concentration in the runoff is estimated to be about 3.5 percent. Annual sediment discharge would be about 1,070,000 tons. For the entire area that is underlain by Tertiary rocks, the estimated annual sediment yield would be the sum of 370,000 and 1,070,000 tons or 1,440,000 tons, which is 28 percent of the average sediment discharge of the Bighorn River at Thermopolis before Boysen Dam was closed.

AREAS UNDERLAIN BY QUATERNARY DEPOSITS

Much sediment that is carried to the Wind River by its tributaries comes from the Quaternary deposits along many of the streams in the Wind River Basin. Along streams in the foothills, these deposits are usually coarse textured and contribute little sediment; but along streams on the floor of the basin, the deposits are much finer textured and erode readily where sufficient water is available. Because the rates of erosion vary greatly and the Quaternary deposits occur in streaks and patches, the total contribution of sediment from these deposits can be estimated only by difference. In some areas these deposits are being gradually increased by natural deposition of sediment. Also, sediment diverted in irrigated water and deposited on land surfaces may be 5 percent of the average sediment discharge at Thermopolis. As the estimated sediment yields from the other 4 geologic areas total 37 percent, the estimated net sediment yield from the areas of Quaternary deposits is 100 minus 37 percent or 63 percent of the average sediment discharge of the Bighorn River at Thermopolis.

Although this estimate as well as those for the other geologic areas is only a rough approximation, the large sediment contributions from the areas of Quaternary deposits are evident. The relative areas, volumes of runoff, and yields of sediment of the five geologic groups are entirely different. (See table 80.)

SEDIMENT YIELDS BY DRAINAGE AREAS

Another way of delineating the general source areas of sediment is by the sediment yield of drainage areas upstream from sediment stations. Principal difficulties in such a delineation are that the sediment station network is incomplete, the available records cover much too short a time to define dependable averages, and not all the sediment is measured at most stations. Other difficulties include changes during the period of sediment records in irrigation, channel stabilization, and canal and reservoir operation. Also, net degradation or net aggradation in a reach often may prevent sediment records at upstream stations from being consistent with those at downstream stations. In spite of these difficulties, an attempt was made to estimate within approximate limits the probable average total sediment yield at many places in the Wind River drainage basin in terms of the average sediment discharge at the Bighorn River at Thermopolis. This average sediment discharge at Thermopolis was computed to be 4,702,000 measured tons per year plus 8 percent, or 5,080,000 tons per year. Unmeasured sediment yield was estimated as 8 percent of the measured sediment discharge. Estimates of sediment yield at Thermopolis and at all other sediment stations were intended to represent averages under the regimen of manmade control works and practices that existed at the end of the 1951 water year just before the closing of Boysen Dam.

Estimates of average sediment discharge for individual drainage areas upstream from gaging stations were based principally on sediment records, if such records were available for an area. Averages indicated by the records usually were increased somewhat for streams that have low and variable flows. On such streams, occasional floods may considerably raise the average sediment discharges above the normal sediment discharges. For example, the flood of 1923 might, if averaged over a period of 50 years, increase computed average sediment discharges of Muddy Creek near Shoshoni by 50,000 tons per year or about 8 percent of the average sediment discharge for the water years 1950 through 1952.

Average sediment yields at some streamflow stations were estimated from fragmentary sediment records or from a very few sediment samples. For these stations the average streamflow was first computed or estimated. Average flows of streams that derive most of their water from the mountains are fairly accurately defined by records; average flows of streams that rise at low altitudes and have variable and usually intermittent flow generally had to be estimated or partly estimated from available records, the runoff map (pl. 2), Bureau of Reclamation estimates of peak discharges of 10-, 25-, and 50-year floods, and general information on the drainage basin. Most estimated averages were appreciably larger than the averages for short available records of streamflow.

After amounts of average streamflow were obtained and were entered on plate 6 in percentage of average flow of the Bighorn River at Thermopolis, sediment concentrations or sediment discharge per square mile or both were estimated. Usually, estimates of sediment discharge per square mile were given little weight because sediment discharges per square mile from small areas of the Wind River drainage basin vary greatly from year to year and from place to place in the basin. (See p. 87.) From the available data, the average sediment discharges were estimated in percentage of the average sediment discharge at Thermopolis before Boysen Dam was closed. All the percentage estimates are shown on plate 6. Of course, because of scour or deposition, the sum of upstream sediment discharges does not necessarily equal the sediment discharge at Thermopolis.

Average sediment yields (pl. 6) show clearly that large areas of the Wind River drainage basin contribute little sediment. Streams rising in the Wind River Mountains carry negligible amounts of sediment in large volumes of water. After these streams leave the mountains, they pick up some sediment from their channels, from irrigation return flows, and from inflow of tributaries on the basin floor. Thus the Popo Agie River at its mouth contributes about 35 percent of the water at Thermopolis but carries only about 6 percent as much sediment as the Bighorn River at Thermopolis, and most of this sediment seems to come from the stream channels and low-altitude drainage areas of the Little Popo Agie River and Beaver Creek. Although the Wind River tributaries that flow from the Wind River Mountains have very low concentrations of sediment, the Wind River near Crowheart is estimated from meager data to carry 14 percent as much sediment as the Bighorn River at Thermopolis. Some of this sediment comes from stream channels, but appreciable amounts also come from tributaries that enter the Wind River from the north. Between the Crowheart and the Riverton gaging stations, the Wind River has a net loss of about 4 percent of the average sediment discharge at Thermopolis, according to the estimated average sediment discharges. In this reach of the Wind River, large quantities of water and its sediment load are diverted for irrigation and power.

At the junction of the Wind and Popo Agie Rivers near Riverton, the streamflow averages about 86 percent of the flow at Thermopolis, but the sediment discharge averages only about 16 percent of the Thermopolis sediment discharge. Thus, most sediment that was discharged past Thermopolis before Boysen Dam was closed came from areas and from stream channels downstream from Riverton even though natural inflow in this reach is a very small percentage of the streamflow at Thermopolis. For water years 1949 through 1952, an annual summary of records of streamflow, measured suspended-sediment discharge, and computed total sediment discharge was prepared for the Wind-Bighorn River from Riverton to Thermopolis (tables 81 and 82). In addition to the natural tributaries, several drains and wasteways discharge unmeasured amounts of sediment and water into the Wind River downstream from Riverton. Water discharge and sediment discharge in table 81 and 82 are shown both as quantities and as percentages of the discharges at Thermopolis. The basis for the average ratios that were used to compute total sediment discharges from measured sediment discharges was discussed on pages 65 to 81. In general, the relative sediment discharges are not much different whether they are based on computed total sediment discharges or on measured sediment discharges. The summary (table 82) covers only a short period of record, particularly for Kirby Draw, Muskrat Creek, and Lateral P-36.8 wasteway. However, it gives helpful information on the sediment yields of the streams. For most stations the longtime average percentages of total sediment discharge on plate 6 agree closely with the average percentages in table 82. The amount of departure in the percentages for any one station is a measure of how representative the average percentages for total sediment discharge for a 3-year period of record are considered to be.

During 1950 the computed total sediment discharges of the streams for which sediment was measured totaled 102 percent of the computed total sediment discharge at Thermopolis in spite of the fact that the sediment yields of some streams were not included in the total. Also, the estimated average total sediment discharges on plate 6 from Riverton downstream add up to more than 100 percent. This fact may be attributed to inaccuracies in the estimates for the tributaries, to an average sediment discharge at Thermopolis that is too low for a correct longtime average, or to the deposition of sediment along the Wind River downstream from Riverton. The last reason may be the most significant of the three. Before Boysen Reservoir was in existence, sediment deposition was obviously occurring, at least at times, at the mouths of Fivemile Creek and Muddy Creek. Muskrat Creek has deposited large quantities of sediment along its channel a short distance upstream from its mouth and downstream from the sediment and gaging station.

Table 81.--Summary of annual streamflow for gaging stations upstream from Thermopolis

Station	Drainage area (sq mile)	Streamflow							
		Acre-feet				Percent of flow at Thermopolis			
		1949	1950	1951	1952	1949	1950	1951	Average
Wind River at Riverton.................	2,320	561,200	708,400	900,100	589,500	50	50	56	52
Popo Agie River near Riverton..........	2,010	401,100	534,200	491,170	547,920	36	38	31	35
Kirby Draw near Riverton...............	155	....	....	a 29	59	......	......	.002	....
Muskrat Creek near Shoshoni............	760	....	....	1,700	40	......	......	.1	....
Fivemile Creek near Shoshoni...........	397	67,650	87,380	85,990	92,420	6.0	6.2	5.4	5.9
Lateral P-36.8 wasteway near Shoshoni..	....	a 1,500	1,380	....	....	.1	.1	......	....
Poison Creek near Shoshoni.............	519	b 450	464	326	307	.04	.03	.02	.03
Badwater Creek at Bonneville...........	790	6,810	5,090	3,000	2,880	.6	.4	.2	.4
Muddy Creek near Shoshoni..............	340	b 4,300	7,360	18,150	21,890	.4	.5	1.1	.7
Dry Cottonwood Creek near Bonneville...	170	a 274	79	1,360	5,110	.02	.01	.08	.04
Total measured above Thermopolis.	7,461	1,043,284	1,344,353	1,501,825	1,260,126	93	95	94	94
Bighorn River at Thermopolis...........	8,080	1,124,000	1,417,000	1,601,000	....	100	100	100	100

a Based on incomplete record.
b Partly estimated.

Table 82.--Summary of annual sediment discharge for stations upstream from Thermopolis

Station	Estimated average ratio a/	1,000 tons				Percent of sediment discharge at Thermopolis			
		1949	1950	1951	1952	1949	1950	1951	Average
Measured suspended-sediment discharge									
Wind River at Riverton.................	....	317	376	718	289	8.8	7.8	15	11
Popo Agie River near Riverton..........	....	b 304	280	197	305	8.4	5.8	4.2	6.1
Kirby Draw near Riverton...............	....	....	....	c 2.4	d 5.8	......	......	.05	....
Muskrat Creek near Shoshoni............	....	....	....	241	d 1.6	......	......	5.2	....
Fivemile Creek near Shoshoni...........	....	1,669	3,406	2,384	2,011	46	70	51	56

Lateral P-36.8 wasteway near Shoshoni..	....	c .6	.8	....	....	.02	.02	......	....
Poison Creek near Shoshoni............	....	b 4.1	d 13	e 1.1	e 4.5	.1	.3	.02	.1
Badwater Creek at Bonneville..........	....	233	d 63	d 79	59	6.5	1.3	1.7	3.2
Muddy Creek near Shoshoni.............	....	b 545	d 546	755	d 718	15	11	16	14
Dry Cottonwood Creek near Bonneville...	....	c 10	e 1.1	d 78	d 232	.3	.02	1.7	.7
Total measured above Thermopolis..	....	3,082	4,685	4,455	3,626	85	97	95	92
Bighorn River at Thermopolis..........	....	3,606	4,837	4,667	....	100	100	100	100
Computed total sediment discharge									
Wind River at Riverton................	1.08	342	406	775	312	8.8	7.8	15	11
Popo Agie River near Riverton.........	1.12	340	314	221	342	8.7	6.0	4.4	6.4
Kirby Draw near Riverton..............	1.06	....	....	2.5	6.1	......	......	.05	....
Muskrat Creek near Shoshoni...........	1.06	....	....	255	1.7	......	......	5.1	....
Fivemile Creek near Shoshoni..........	f 1.15	1,919	3,917	2,742	2,313	49	75	54	59
Lateral P-36.8 wasteway near Shoshoni..	1.10	.7	.9	....	....	......	......	......	....
Poison Creek near Shoshoni............	1.10	4.5	14.3	1.2	5.0	.1	.3	.02	.1
Badwater Creek at Bonneville..........	g 1.20	280	91	95	71	7.2	1.7	1.9	3.6
Muddy Creek near Shoshoni.............	h 1.12	572	573	846	819	15	11	17	14
Dry Cottonwood Creek near Bonneville...	1.12	11	1.2	87	260	.3	.02	1.7	.7
Total measured above Thermopolis..	....	3,469	5,317	5,025	4,130	89	102	100	97
Bighorn River at Thermopolis..........	1.08	3,894	5,224	5,040	....	100	100	100	100

a Ratio of total sediment discharge at sampling station to measured suspended-sediment discharge at sampling station.
b Includes a small amount of estimated sediment discharge during winter.
c Based on incomplete record.
d Partly estimated.
e Estimated.
f Not applicable after 1952 water year.
g 1.45 for 1950.
h 1.05 for 1949 and 1950 before return water from irrigation flowed past station and 1.14 for 1952.

Because tributaries in the Wind River Basin downstream from Riverton discharge large amounts of sediment into the Wind River, these tributaries are discussed individually. Each of these tributaries has at least short periods of sediment records at a sediment station near its mouth.

KIRBY DRAW

All the drainage area of Kirby Draw is at comparatively low altitudes. Streamflow is in response to relatively intense summer precipitation plus perhaps an occasional very small flow from snowmelt. Even at low flow, the sediment concentrations are high (table 11), but quantity of sediment discharge is limited by the low runoff. Probably an infrequent storm runoff may some day yield more sediment than several years of more normal runoff.

The drainage area upstream from the sediment station is about 155 square miles. Even an annual runoff of a few hundredths of an inch in which the sediment concentration averages perhaps 8 percent will give an estimated sediment discharge of about 20,000 tons per year, which is equivalent to an estimated 0.4 percent of the average sediment discharge of the Bighorn River near Thermopolis.

MUSKRAT CREEK

The branching patterns of Muskrat Creek and of its tributary, Conant Creek, indicate that much of the flow of the creek originates near Beaver Rim in an area where the runoff is greater and altitudes (pl. 2) are higher than on the floor of the Wind River Basin. The drainage area upstream from the gaging station, which is $1\frac{1}{2}$ miles upstream from the mouth, is 760 square miles. The channel of lower Muskrat Creek is several hundred feet wide (fig. 7), has vertical banks in many places, and has built up an alluvial fan near the Wind River. The stream channel has the appearance of carrying large sediment loads at infrequent flows.

Records for 2 water years, 1951 and 1952, show widely different sediment yields (table 12). For 1952, less than 2,000 tons of suspended sediment was reported; for 1951, the suspended-sediment discharge was given as 241,000 tons (estimated total sediment discharge 255,000 tons), which was transported in only 1,700 acre-feet of water. Thus, more than 5 percent of the average sediment discharge at Thermopolis was transported in a flow of only 2.24 acre-feet of water per square mile, which is little more than 0.04 inch of runoff per year. Average annual runoff is likely to be on the order of magnitude of 0.08 or 0.10 inch or about double the runoff during the 1951 water year. Although concentrations may not average so high as during the 1951 water year, the sediment yield from Muskrat Creek may, as shown by plate 6, average 8 percent of the average sediment discharge at Thermopolis before Boysen Dam was closed. An appreciable fraction of the estimated sediment discharge at the gaging station may be deposited between the gaging station and the Wind River.

POISON CREEK

Nearly all the drainage area of Poison Creek is at relatively low altitudes in an area where runoff is very low. Except near the headwaters, the drainage area of the creek is narrow, and tributaries are very small. Both peak discharges and volumes of water in many stormflows are likely to decrease as the flows move downstream along the channel. Probably, the average annual runoff per square mile from the Poison Creek drainage basin is lower than for any other named tributary of the Wind River downstream from Riverton with the possible exception of Kirby Draw. During a period of nearly 5 years, including the 1953 water year for which provisional records are available, the discharge of Poison Creek near Shoshoni has averaged less than 400 acre-feet per year from a drainage area of about 519 square miles or between 0.01 and 0.02 inch of runoff per year. This amount of runoff is certainly below a longtime average. Estimated 10-, 25-, and 50-year peak flood discharges for Poison Creek have been given by the Bureau of Reclamation 8/ as 2,730, 6,460, and 9,690 cfs, respectively. Although these estimated flood peaks may be too high and certainly seem to be inconsistent with the short available records of flow, they do indicate that average annual runoff is likely to be considerably higher than the average runoff during the period of record. The longtime average runoff of Poison Creek near Shoshoni is estimated to be about 0.1 percent of the average flow at Thermopolis, or about 1,400 acre-feet, equivalent to 0.05 inch, annually.

8/ Filaseta, Leonard, 1952, Sediment in the Wind River drainage basin: Unpublished report in files of U. S. Bur. of Reclamation.

Sediment concentrations weighted with water discharge have averaged less than 2 percent by weight (table 32). On May 28, 1953, when the average flow for the day, from provisional records, was 31 cfs, the average concentration was reported as about 4 percent by weight. Thus, the average concentration during minor stormflows seems to be much lower for Poison Creek than for Muskrat Creek or Kirby Draw. An estimated average concentration of 4 percent in 1,400 acre-feet of runoff would be 76,000 tons, or slightly less than $1\frac{1}{2}$ percent of the average sediment discharge at Thermopolis. Poison Creek is, therefore, estimated on the average to yield 1 percent of the average sediment discharge at Thermopolis. The appearance of the channel supports the estimates of low sediment and water discharges. (See fig. 9.)

Some uncertainties in determining sediment yields from areas of low runoff are brought out by comparison of sediment yields from Poison Creek and from Graham Draw, a tributary of Poison Creek. The drainage area of Poison Creek near Shoshoni is about 519 square miles, and the average sediment yield as measured during a continuous period of nearly 5 years, including provisional records for the 1953 water year, was about 6,000 tons per year (table 32). The drainage area of 3.12 square miles on Graham Draw yielded 16.7 acre-feet (table 76) of uncompacted sediment or 5.6 acre-feet per season during the summer seasons of 1947 through 1949. At an estimated weight of 40 pounds per cubic foot of the sediment deposit, the yield per season would be about 4,880 tons. This is nearly as much as the average sediment discharge that was measured from 519 square miles. During the 3 summer seasons 1951 through 1953, no runoff was reported from the drainage area of 3.12 square miles (table 75). Therefore, there was no sediment yield.

Average sediment accumulation from the drainage area of 3.12 square miles from 1940 to 1953 was 31.8 acre-feet or 2.27 acre-feet per year. At an estimated weight of 60 pounds per cubic foot in 1953, the annual sediment yield would be about 2,970 tons or nearly 1,000 tons per square mile, whereas the average yield from about 519 square miles during the period of sediment records was about 6,000 tons. An average sediment yield of 1,000 tons per square mile from the entire 519 square miles of area would indicate that Poison Creek should discharge more than 10 percent of the average sediment discharge at Thermopolis during the period of sediment records or 10 times what it was estimated to discharge. These relationships indicate, as Brune (1950) has shown, a probable error in using sediment yields from small areas as a measure of sediment yields from much larger drainage areas.

If a total of many thousand tons of sediment had been retained on very small tributaries of Poison Creek, the measured sediment discharges of Poison Creek near Shoshoni probably would have been decreased only 1 or 2 thousand tons per year. In a year of high flow, the reduction might be much greater. However, only a small fraction of the sediment that might be retained on very small tributaries would have reached the mouth under the unregulated regimen of the stream. Of course, naturally deposited sediment along stream channels may be susceptible to later scour; a fact that may have little significance if the stream channels already have an abundance of alluvium available for transport. Also, on a stream like Poison Creek, retention of sediment during small or very local storms cannot be expected to reduce appreciably the sediment yield of the entire drainage basin within a period of many years. Major reductions in sediment yield of Poison Creek and similar streams require regulation of sediment and water during the rare, large floods. The upstream removal of sediment from water of these floods is likely to be less effective than regulation of the flow in reducing sediment yields at the mouth of Poison Creek. Clear water, if released at high rates of flow into the channel of Poison Creek or most of its tributaries, would rapidly scour the channels. The scouring is likely to be much more rapid than it would have been if the original sediment had been left in the water.

FIVEMILE CREEK

Sediment discharge from Fivemile Creek equals about half of the average sediment discharge of the Bighorn River at Thermopolis. Because the sediment discharges are so high, sediment production of the stream has been studied in detail. Three sediment and streamflow stations were maintained on Fivemile Creek for 3 or 4 years before October 1, 1952. During the 1949 water year, the station near Pavillion was downstream from the Bureau of Reclamation's Wyoming Canal. It was moved a short distance upstream from the Wyoming Canal at the beginning of the 1950 water year. Another station is near Riverton and is about 3 miles downstream from the mouth of Ocean drain. The third is near Shoshoni (fig. 28) and is about $2\frac{1}{2}$ miles upstream from the mouth of Fivemile Creek. In addition to the 3 stations on the creek, 14 sediment and streamflow stations were maintained from the spring of 1949 to the fall of 1950 near the mouths of tributaries, mostly drains or wasteways. (See pl. 5.)

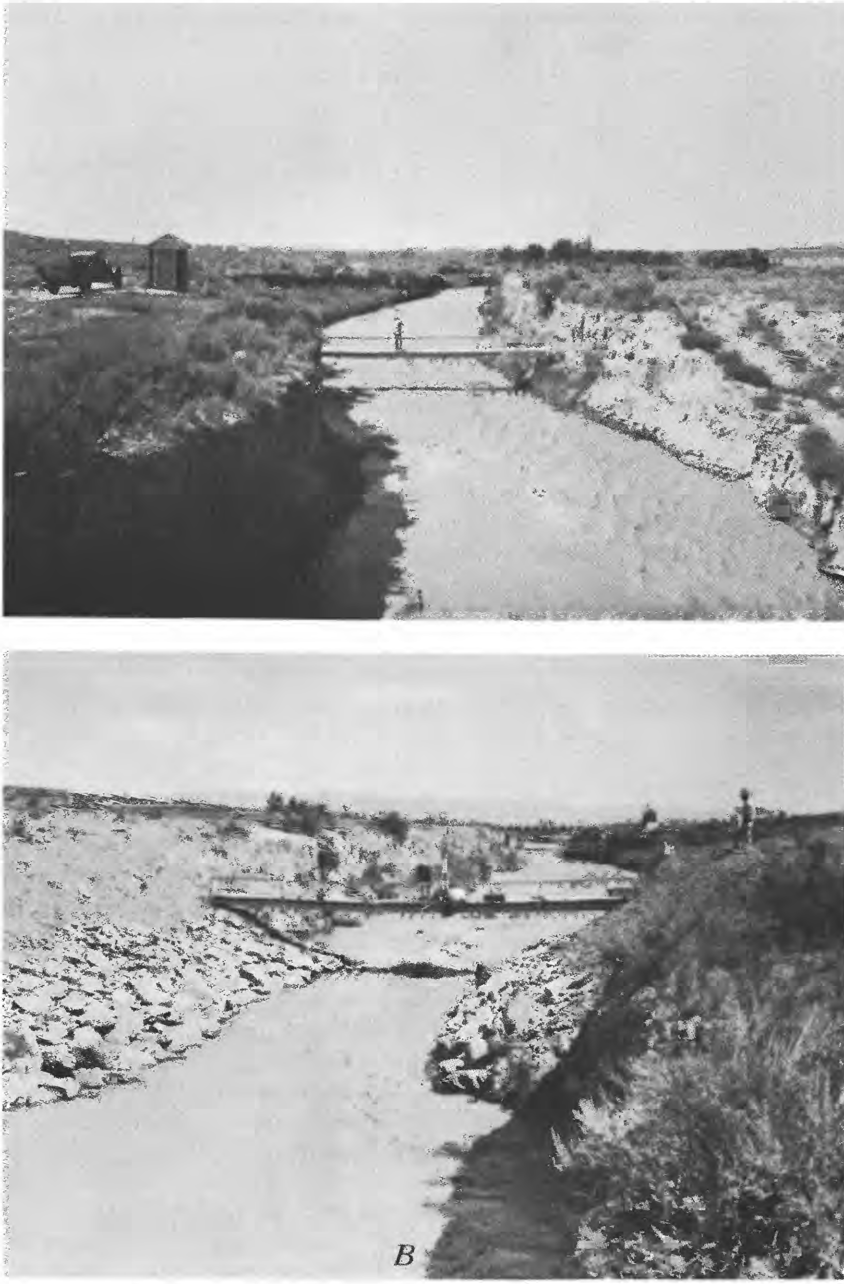


Figure 28. --Sediment-sampling sections, Fivemile Creek near Shoshoni. A. Gaging-station section, August 15, 1952. The engineer is collecting a sediment sample with a sampler DH-48 at one of the several daily sampling verticals. B. Contracted section, August 28, 1952. The engineers are collecting sediment samples with a sampler P-46 attached to a portable crane.

The drainage basin of Fivemile Creek is long and narrow. Headwaters of the creek do not reach the Owl Creek Mountains. Flows from snowmelt are usually low. During the summer, storms occasionally produce streamflow at the gaging station near Pavillion, but during much of each year there is no flow at the station. Tributary inflow downstream from the station near Pavillion would be very low except for irrigation. However, even without irrigation, the sediment discharge near the mouth of Fivemile Creek probably would be greater than at the station near Pavillion because of erosion from the channel. On Muddy Creek (p. 109) the increase in measured sediment discharge between the upstream and the downstream gaging stations during the spring and summer of 1949 before irrigation affected the regimen of the stream was 53 percent of the sediment discharge at the upstream station. Assume that for the period of record the increase in measured sediment discharge between the upstream and the downstream stations on Fivemile Creek would be 50 percent of the measured sediment discharge at the upstream station if irrigation did not affect the flow of the creek. The total measured tonnage of sediment at the station near Pavillion if increased by 50 percent equals 528,000 tons for the 4-year period that ended September 30, 1952. During the same period, the measured sediment discharge at the station near Shoshoni was 9,470,000 tons. According to this computation, an average of 2,236,000 tons of measured sediment per year may be attributed to the effect of irrigation.

A parallel computation based on total sediment discharge rather than measured sediment discharge indicates even larger tonnages. Unmeasured sediment discharge is assumed to be 8 percent of measured sediment discharge at the station near Pavillion and 15 percent of the measured sediment discharge at the station near Shoshoni. Then (9,470,000 x 1.15) - (528,000 x 1.08) = 10,320,000 tons during a 4-year period, or 2,580,000 tons per year, that may be attributed to the effect of irrigation in augmenting the sediment yields from Fivemile Creek. The increase in streamflow between the two stations averaged about 82,000 acre-feet per year. Thus, an acre-foot of return flow from irrigation may be considered to increase the sediment discharge past the Shoshoni gaging station by about 30 tons during the water years 1949 through 1952.

According to Schroeder and Miller,9/ 27,000 acre-feet of sediment has been removed from the channel and banks of Fivemile Creek since the creek has been used as a wasteway, and

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9/ Schroeder, K. B., and Miller, C. R., 1953, A plan of channel erosion control, Fivemile Creek, Riverton project, Wyoming: U. S. Bur. of Reclamation, Proj. Plan. Div., p. 2.

nearly all this sediment was eroded between 1935 and 1950. (See figs. 29 and 30.) This estimate is, presumably, for the reach of channel downstream from the Wyoming Canal and the Pavillion gage. Thus the estimate represents 1,800 acre-feet of sediment that is eroded from the reach downstream from the Pavillion gage per year. If the average weight per cubic foot of the sediment in place is assumed to be 100 pounds, which is a good average of several samples of material from the stream bed and from the banks, 3,900,000 tons of sediment per year would have been eroded from the channel downstream from the station near Pavillion. This is 50 percent more sediment than the computed 2,580,000 tons during a 4-year period of record and may be an indication that sediment discharges from Fivemile Creek during the period of sediment records were not abnormally high.

More exact and detailed information on the erosion and sediment yields of Fivemile Creek is available for a period from about March 1, 1949, to September 30, 1950. (See tables 83 and 84.) During this period, most inflows of water and sediment to Fivemile Creek between the Pavillion station and the Shoshoni station were measured at 13 sediment and streamflow stations

Figure 29.--Fivemile Creek downstream from the crossing of Wyoming Canal before accelerated erosion began. Compare the low banks and moderately stabilized appearance with these features in figure 30. Photograph by U. S. Bureau of Reclamation.

Figure 30.--Fivemile Creek downstream from the gaging station near Shoshoni, October 1947. The extreme width of the channel and the high vertical banks are the results of accelerated erosion.

near the mouths of tributaries. Measured inflows and computed unmeasured flows are tabulated by months in table 83 and are shown on figure 31. From March through September 1949 only about 10 percent of the flow at the Shoshoni gage was not measured at the Pavillion station or at the mouths of tributaries. Measurements of inflow were less complete during the 1950 water year when about 21 percent of the flow at the Shoshoni gaging station was not measured as inflow to the reach of channel. Ocean drain near Pavillion and Sand Gulch near Shoshoni are the two largest inflows. These streams carried more flow during 1949 and 1950 than all the other 11 measured inflows.

In contrast to the almost complete measurement of flow at upstream stations, only a small percentage of the sediment discharge at the Shoshoni station was measured at the Pavillion station on Fivemile Creek and at the 13 sediment stations on tributaries. Measured sediment discharges are shown by months and years on figure 32. Measured sediment discharges and computed total sediment discharges that are based on estimates of unmeasured sediment discharge are summarized by months in table 84 for sediment stations on Fivemile Creek and for stations near the mouths of tributaries. Both types of sediment discharge

Table 83.--Summary of streamflow for Fivemile Creek, upstream from the gaging station, near Shoshoni

Stations	Streamflow (acre-feet)													
	October	November	December	January	February	March	April	May	June	July	August	September	Water year	March through September
1949 water year														
Fivemile Creek near Pavillion	0	0	0	0	99	284	54	154	352	386	145	23	1,500	1,400
Measured flow of eight tributaries	...	...	...	...	...	a 1,297	1,062	1,757	4,111	5,583	6,044	4,735	...	24,590
Measured flow of five tributaries	...	...	...	...	...	572	521	3,377	4,080	4,592	6,293	4,168	...	23,600
Total unmeasured inflow--Pavillion to Shoshoni	...	...	...	...	...	1,167	223	112	1,417	1,079	688	804	...	5,490
Fivemile Creek near Shoshoni	4,630	2,340	1,990	1,820	1,790	3,320	1,860	5,400	9,960	11,640	13,170	9,730	67,650	55,080
1950 water year														
Fivemile Creek above Wyoming Canal near Pavillion	120	57	0.6	9.5	116	67	82	124	166	304	3.0	651	1,700	...
Measured flow of eight tributaries	1,930	1,449	1,062	459	876	1,124	1,742	2,903	4,946	6,784	6,844	4,371	34,490	...
Unmeasured inflow--Pavillion to Riverton	350	274	27	21	58	69	-14	-147	2,150	3,310	3,620	2,410	12,130	...
Fivemile Creek near Riverton	2,400	1,780	1,090	490	1,050	1,260	1,810	2,880	7,260	10,400	10,470	7,430	48,320	...
Measured flow of five tributaries	1,440	986	695	588	448	647	552	2,960	6,730	7,540	6,560	3,650	32,800	...
Unmeasured inflow--Riverton to Shoshoni	120	124	25	62	402	583	308	1,220	1,070	1,650	-10	710	6,260	...
Total unmeasured inflow--Pavillion to Shoshoni	470	398	52	83	460	652	294	1,070	3,220	4,960	3,610	3,120	18,390	...
Fivemile Creek near Shoshoni	3,960	2,890	1,810	1,140	1,900	2,490	2,670	7,060	15,060	19,590	17,020	11,790	87,380	...

a Partly estimated.

Table 84.--Summary of sediment discharge for Fivemile Creek, upstream from the gaging station, near Shoshoni

Stations	Estimated average ratio a	October	November	December	January	February	March	April	May	June	July	August	September	Water year	March through September
		Tons													
Measured suspended-sediment discharge--1949 water year															
Fivemile Creek near Pavillion	...	0	0	0	0	b 1,400	4,590	584	1,680	c 70,150	36,060	217	115	114,800	113,400
Measured load of eight tributaries	...	...	...	...	...	...	2,560	2,270	12,600	26,390	38,080	21,330	10,140	...	113,400
Measured load of five tributaries	...	...	...	...	...	...	178	76	5,090	7,560	8,120	12,240	2,730	...	35,990
Estimated sediment in unmeasured inflow--Pavillion to Shoshoni	...	...	...	...	...	...	1,710	330	386	5,780	4,900	1,870	1,160	...	16,140
Computed net sediment eroded from channel--Pavillion to Shoshoni	...	...	...	...	...	...	67,590	27,070	84,140	303,700	340,900	289,500	171,200	...	1,284,000
Fivemile Creek near Shoshoni	...	c 66,800	b 25,900	b 4,400	b 2,100	b 6,720	76,630	30,330	103,900	413,600	428,100	325,200	185,300	b 1,669,000	1,563,000
Measured suspended-sediment discharge--1950 water year															
Fivemile Creek above Wyoming Canal near Pavillion	...	b 1,400	b 310	(c t)	c 15	b 1,200	b 360	b 1,500	b 2,200	b 2,200	b 28,650	b 1	b 123,800	b 161,600	...
Fivemile Creek near Pavillion	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Measured load of eight tributaries	...	1,590	1,130	436	86	816	2,800	9,700	9,280	23,860	32,020	29,530	8,140	119,380	...
Estimated sediment in unmeasured inflow--Pavillion to Riverton	...	198	154	9	6	46	124	0	0	6,560	10,500	10,410	3,270	31,280	...

Computed net sediment eroded from channel--Pavillion to Riverton...	....	5,660	3,240	555	86	2,160	15,000	6,310	51,010	459,800	561,100	469,900	317,500	1,892,000	....
Fivemile Creek near Riverton.......	....	b 8,850	b 4,830	b 1,000	b 193	b 4,220	b 18,280	b 17,510	b 62,490	492,400	b 632,300	509,900	452,700	2,205,000	....
Measured load of five tributaries..	....	317	244	164	215	234	387	104	3,720	11,790	13,560	9,030	2,740	42,500	....
Estimated sediment in unmeasured inflow--Riverton to Shoshoni.....	....	68	70	9	18	319	1,050	1,320	2,700	3,270	5,250	0	960	15,030	....
Estimated sediment in unmeasured inflow--Pavillion to Shoshoni....	....	266	224	18	24	365	1,170	1,260	2,370	9,830	15,780	10,390	4,230	45,930	....
Computed net sediment eroded from channel--Riverton to Shoshoni....	....	38,560	19,850	4,770	520	5,870	22,730	21,560	75,090	174,900	424,900	242,400	112,200	1,143,000	....
Computed net sediment eroded from channel--Pavillion to Shoshoni..	....	44,220	23,100	5,320	606	8,030	37,730	27,870	126,100	634,700	986,000	712,300	429,700	3,035,000	....
Fivemile Creek near Shoshoni.......	....	47,790	24,990	5,940	946	10,640	42,450	40,490	144,000	682,400	1,076,000	761,300	568,600	3,406,000	....
Computed total sediment discharge--1949 water year															
Fivemile Creek near Pavillion......	1.08	0	0	0	0	1,510	4,960	631	1,810	75,760	38,940	234	124	124,000	122,500
Measured load of eight tributaries.	1.20	....	....	....	....	....	3,070	2,720	15,120	31,670	45,700	25,600	12,170	....	136,100
Measured load of five tributaries..	1.20	....	....	....	....	....	214	91	6,110	9,070	9,740	14,690	3,280	....	43,200
Estimated sediment in unmeasured inflow--Pavillion to Shoshoni....	1.20	....	....	....	....	....	2,050	396	463	6,940	5,880	2,240	1,390	....	19,360
Computed net sediment eroded from channel--Pavillion to Shoshoni...	....	....	....	....	....	....	77,830	31,040	96,000	352,200	392,000	331,200	196,100	....	1,477,000
Fivemile Creek near Shoshoni.......	d 1.15	76,820	29,790	5,060	2,420	7,730	88,120	34,880	119,500	475,600	492,300	374,000	213,100	1,919,000	1,798,000
Computed total sediment discharge--1950 water year															
Fivemile Creek above Wyoming Canal near Pavillion..................	1.08	1,510	335	(t)	16	1,300	389	1,620	2,380	2,380	30,940	1	133,700	174,600	....
Measured load of eight tributaries.	1.20	1,910	1,360	523	103	979	3,360	11,640	11,140	28,630	38,420	35,440	9,770	143,300	....
Estimated sediment in unmeasured inflow--Pavillion to Riverton....	1.20	238	185	11	7	55	149	0	0	7,870	12,600	12,490	3,920	37,520	....
Computed net sediment eroded from channel--Pavillion to Riverton...	....	5,190	2,950	466	67	1,890	14,380	4,250	48,970	453,500	550,300	462,000	305,300	1,850,000	....
Fivemile Creek near Riverton.......	1.00	8,850	4,830	1,000	193	4,220	18,280	17,510	62,490	492,400	632,300	509,900	452,700	2,205,000	....
Measured load of five tributaries..	1.20	380	293	197	258	281	464	125	4,460	14,150	16,270	10,840	3,290	51,000	....
Estimated sediment in unmeasured inflow--Riverton to Shoshoni.....	1.20	82	84	11	22	383	1,260	1,580	3,240	3,920	6,300	0	1,150	18,030	....
Estimated sediment in unmeasured inflow--Pavillion to Shoshoni....	1.20	319	269	22	29	438	1,400	1,510	2,840	11,800	18,940	12,470	5,080	55,120	....
Computed net sediment eroded from channel--Riverton to Shoshoni....	....	45,650	23,530	5,620	617	7,360	28,820	27,340	95,410	274,300	582,100	354,800	196,800	1,642,000	....
Computed net sediment eroded from channel--Pavillion to Shoshoni...	....	50,840	26,480	6,090	684	9,250	43,200	31,600	144,400	727,800	1,132,000	816,800	502,100	3,492,000	....
Fivemile Creek near Shoshoni.......	d 1.15	54,960	28,740	6,830	1,090	12,240	48,820	46,560	165,600	784,800	1,237,000	875,500	653,900	3,916,000	....

a Ratio of total sediment discharge at sampling station to measured suspended-sediment discharge at sampling station.
b Partly estimated.
c Estimated.
d Not applicable after 1952 water year.
t Trace.

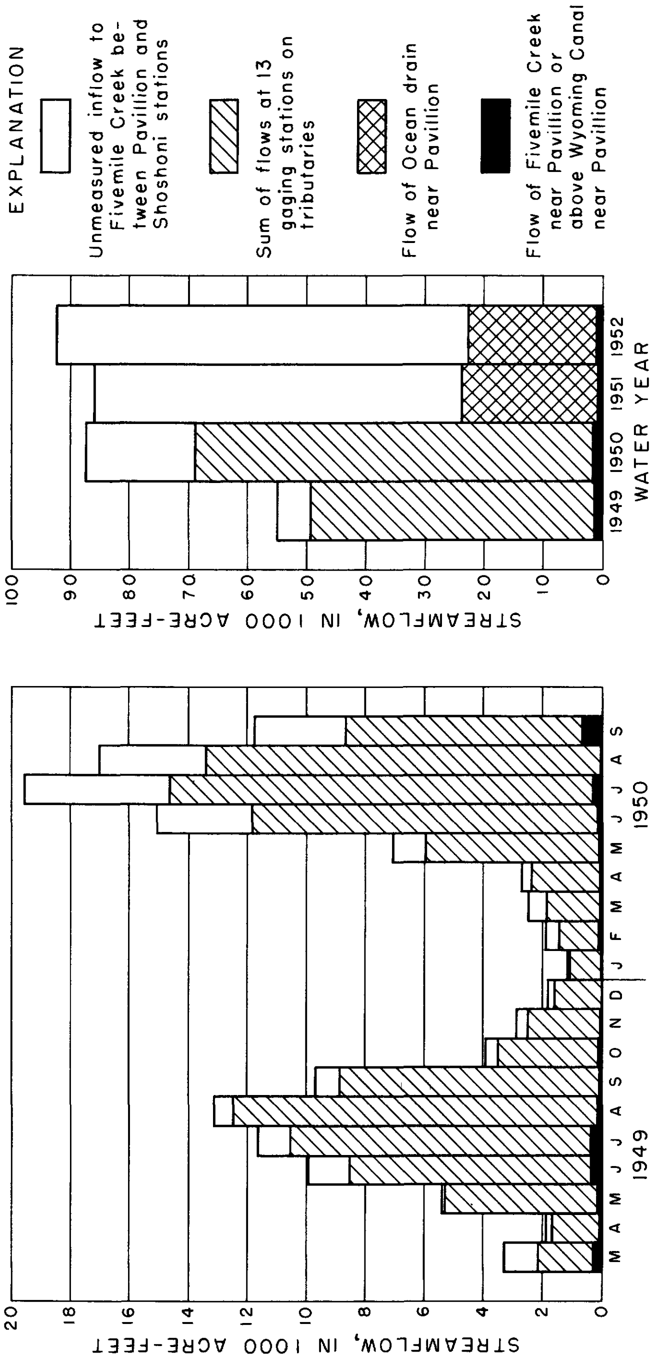

Figure 31. --Summary of streamflow for Fivemile Creek.

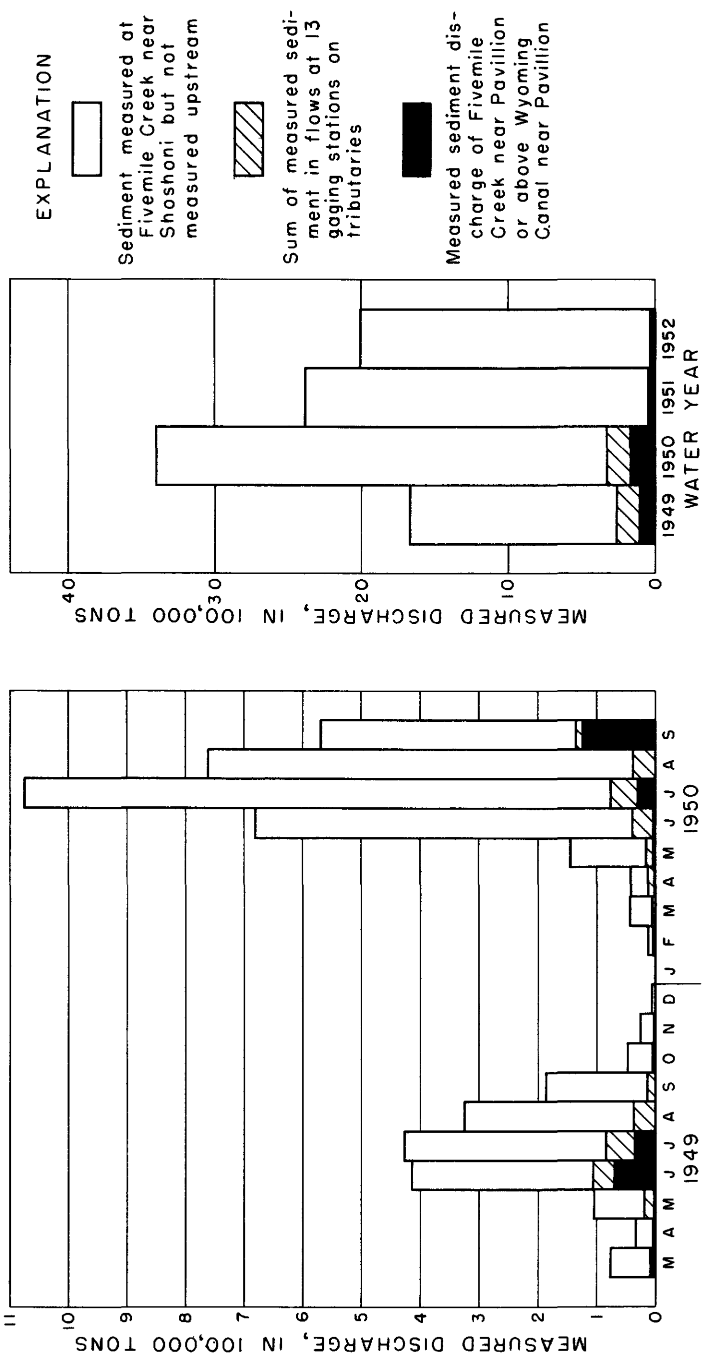

Figure 32. --Summary of measured sediment discharge for Fivemile Creek.

are tabulated because each has its own advantages and disadvantages. Measured sediment discharges do not contain the inaccuracies that are involved in estimates of unmeasured discharge, but they can only be used with the understanding that they do not include all the sediment discharge at most stations. Total sediment discharges are theoretically more correct, but they contain the inaccuracies of the computations of unmeasured sediment discharge.

Tables 83 and 84 are mostly self-explanatory. Tributary inflows of water and sediment are totaled for the 8 tributaries between the Pavillion and the Riverton gages on Fivemile Creek and for the 5 tributaries between the Riverton and the Shoshoni gages. Most tributary discharges of sediment are small (tables 15-16, 18-23, and 25-29), but Pavillion drain near Pavillion, Ocean drain near Pavillion, and Sand Gulch near Shoshoni each discharges measured sediment at a rate in the range of 10,000 to 100,000 tons per year.

In the section of table 84 in which measured sediment discharges are listed, the estimated sediment loads in the unmeasured inflow are estimates based on the unmeasured water inflow and on monthly measured sediment concentrations (table 85), weighted with water discharge, in the 13 tributary inflows. Concentrations in the inflows are low. Estimated sediment discharges in the unmeasured inflow are small, but they are included to make the computations complete and to show the relative insignificance of the sediment that is carried to Fivemile Creek in the unmeasured inflow. From March through September 1949, 1,284,000 tons of sediment out of 1,563,000 tons that were

Table 85.--Monthly suspended-sediment concentration, weighted with water discharge, in water of 13 tributaries to Fivemile Creek

Month	Suspended-sediment concentration (ppm)	
	1949 water year	1950 water year
October	....	210
November	....	209
December	....	126
January	....	106
February	....	294
March	543	667
April	549	1,580
May	1,280	821
June	1,540	1,130
July	1,680	1,180
August	1,010	1,070
September	535	502

measured at the Shoshoni station are not accounted for except by erosion from the channel. During the 1950 water year 3,035,000 tons out of the 3,406,000 tons that were measured at the Shoshoni station are not accounted for except by erosion from the channel.

In the section of table 84 on total sediment discharge, the same type of data is given as in the section on measured sediment discharge. The only difference is that the computations were adjusted to include estimated unmeasured sediment discharges. Measured sediment discharges were increased by 8 percent for Fivemile Creek near Pavillion, were not increased for Fivemile Creek near Riverton because approximately total sediment discharge is measured, and were increased by 15 percent for Fivemile Creek near Shoshoni. (See tables 77 and 78 and p. 79.) Unmeasured sediment discharge of the tributary inflows was estimated at a flat 20 percent of measured sediment discharges. One computation for Pavillion drain near Pavillion showed a ratio of computed total sediment discharge to measured discharge of 1.43. Nearly total sediment is measured at stations on some drains and wasteways. The estimate of 20 percent is highly questionable but does not involve large tonnages of sediment.

The total sediment discharge at the Shoshoni station from March through September 1949 was computed to be 1,798,000 tons. Of this amount, about 1,477,000 tons, or 82 percent, came from the reach of channel between the sediment stations near Pavillion and near Shoshoni. During the 1950 water year the total tonnages near Shoshoni and near Pavillion were 3,916,000 tons and 174,600 tons, respectively. In the 1950 water year the computed net sediment eroded from the channel between the Pavillion and Riverton stations was 1,850,000 tons. Between the Riverton and Shoshoni stations the computed net sediment from the channel was 1,642,000 tons (table 84). A total of about 3,492,000 tons, or 89 percent of the computed total sediment load for the Shoshoni station, was eroded from the channel between the Pavillion and Shoshoni stations. About 47 percent of the computed total load for Shoshoni was eroded from the channel between the Riverton and Pavillion stations. A comparable figure for the reach between the Riverton and the Shoshoni stations would be 42 percent.

BADWATER CREEK

The southern end of the Bighorn Mountains and the southern slopes of about a third of the Owl Creek Mountains are drained by the headwaters of Badwater Creek and by tributaries that enter the creek from the north. The upper ends of some of these streams reach high enough altitudes (pl. 2) to collect appreciable amounts of snowmelt and to have well-sustained low flow. Much of the low flow is used for irrigation, and little return flow from irrigated land reaches the stream channels. At the streamflow and sediment station at Bonneville where the drainage area is about 790 square miles, Badwater Creek carries no flow for many days each year.

On the basis of sediment concentration, the water discharged by Badwater Creek is of two general classes. The water of one class has relatively low suspended-sediment concentrations of about 10,000 ppm or less (table 33) and comes from snowmelt and light rains on the slopes of the mountains. The water of the other class comes from summer and fall rains, which may be on the valley floor as well as in the mountains. Water discharge of this second class has suspended-sediment concentrations that are roughly 100,000 ppm and that are comparable with the concentrations in water discharge from Muskrat Creek during summer storms. (See tables 12 and 33.)

During the 5 water years of sediment records that are summarized in table 33, approximate average annual discharge of water was 7,070 acre-feet and of measured sediment was 137,000 tons. Estimated average unmeasured sediment discharge based on information from table 79 is about 53,000 tons per year. Thus, during the 5-year period, the water discharge was about 0.5 percent and the total sediment discharge was nearly 4 percent of the longtime average water and sediment discharges at Thermopolis. These figures are only slightly greater than the average percentages for the 1949, 1950, and 1951 water years. (See tables 81 and 82.) Because an occasional year of high water and sediment discharge may increase the averages appreciably, the longtime average water and sediment yields from Badwater Creek are estimated to be 0.7 and 6 percent, respectively, of the water and sediment yields at Thermopolis before storage in Boysen Reservoir.

MUDDY CREEK

The branching headwaters of Muddy Creek rise high along the south side of the Owl Creek Mountains. During the spring, snowmelt contributes appreciable quantities of water at relatively low rates of flow. Later in the year, the flow is mostly in response to rainfall along the south slopes of the Owl Creek Mountains. Storm runoff is usually of short duration, but the peak discharges may be relatively high. Concentrations of sediment are high during the stormflows. Since the summer of 1950, waste water and return flow from irrigation have entered the channel of Muddy Creek.

Since early 1949, two sediment stations have been maintained on Muddy Creek. One is 9½ miles northeast of Pavillion and upstream from the irrigated lands of the Riverton project; the other is 9 miles northwest of Shoshoni and about 5 miles upstream from the mouth. Before water from irrigation was wasted into the channel of Muddy Creek, recorded streamflow was usually lower at the gaging station near Shoshoni than at the gaging station upstream near Pavillion. (See tables 34 and 35.) Sediment discharge increased, however, in a downstream direction because of channel erosion. From March to September 1949 the weighted mean concentration was about 6 percent by weight at the upstream station and about 10 percent by weight at the downstream station. During this period, the measured sediment discharge at the station near Shoshoni was 1.53 times the measured sediment discharge at the station near Pavillion. Annual measured sediment discharges at the Pavillion station for the 1950, 1951, and 1952 water years were multiplied by this ratio. The resulting products when subtracted from the measured sediment loads at the Shoshoni gaging station indicated that 105,000, 571,000, and 352,000 tons of sediment at this downstream station might be attributed to irrigation water during the 1950, 1951, and 1952 water years, respectively. These sediment tonnages would be increased several percent if adjustments were applied for estimated unmeasured sediment discharge. The increases in water discharge between the Pavillion and the Shoshoni stations by water years were 2,580, 14,530, and 15,150 acre-feet. An overall average of something less than about 35 tons of sediment at the Shoshoni station seems to be the sediment discharge that can be attributed to each acre-foot of water that is wasted or returned from irrigated lands during the water years 1950 through 1952. Since irrigation return flows have been carried by Muddy Creek, the creek has unquestionably become second only to Fivemile Creek as a contributor of sediment to the Wind River (fig. 33).

Before irrigation water was wasted into Muddy Creek, appreciable tonnages of sediment were eroded from the channel during periods of flow. The erosion contrasts sharply with the deposition that was assumed to occur along the channel of Poison Creek during the period of sediment records. The difference in behavior of the two streams is not due to channel slopes, which are approximately equal (pl. 4). Probably it is due mostly to differences in runoff. Except near the mouth of Poison Creek, the channel is dry most of the time. Flows, when they do occur,

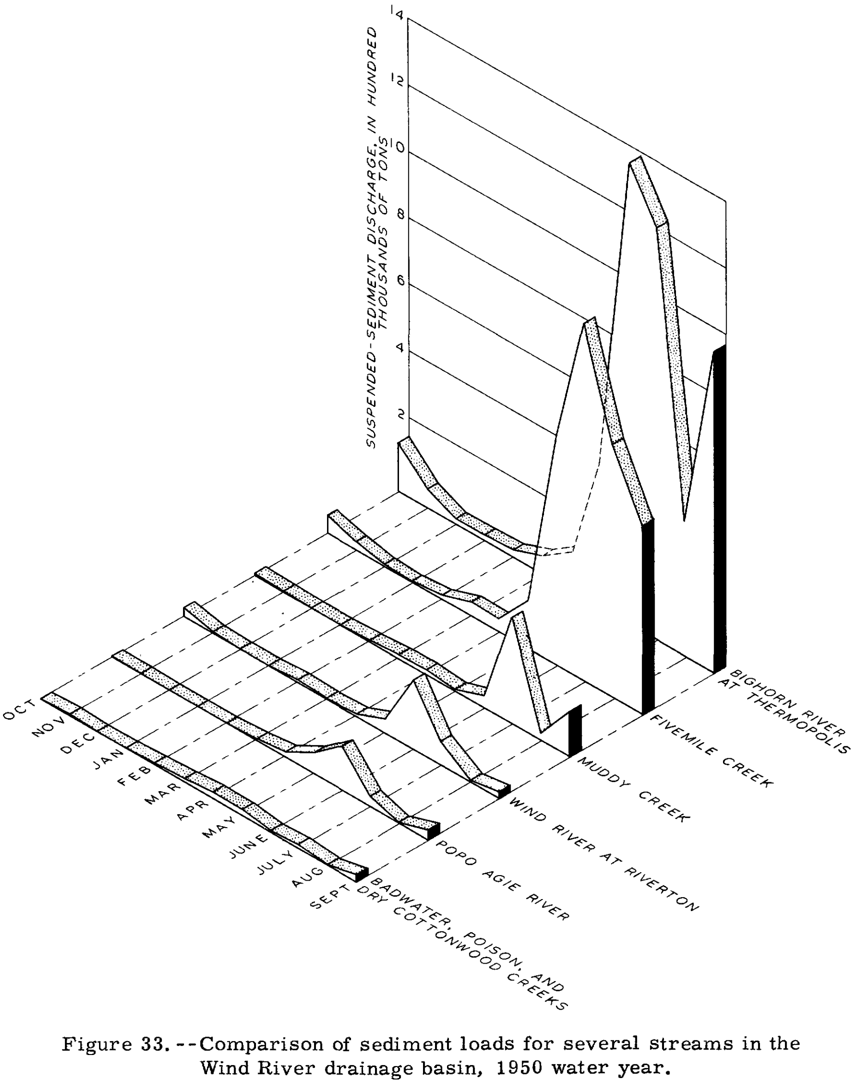

Figure 33.--Comparison of sediment loads for several streams in the Wind River drainage basin, 1950 water year.

are usually low, and they move down a channel that has usually been dry for many weeks. The flows are too small and too infrequent to maintain many cutbanks. The channel tends to stabilize between periods of active erosion. Thus, both flows and sediment discharges seem to decrease downstream along much of the Poison Creek channel.

In contrast, flow in the upper reaches of Muddy Creek is nearly continuous, stormflows are relatively frequent, and many of the stormflows are moderately high. In the reach between the two sediment stations, volumes of stormflows may be decreased by losses to the banks and bed of the channel; but these water losses, expressed as percentage of flow, are probably small as compared with losses along Poison Creek. Storm rises are frequent enough to keep much of the channel actively eroding; even the low flows from snowmelt erode some sediment from the channel.

For the irrigation development at the end of 1951, the water discharge is estimated to average 1.4 percent and the sediment discharge 16 percent of the average water and sediment discharges at Thermopolis before Boysen Dam was closed.

DRY COTTONWOOD CREEK

The drainage area of Dry Cottonwood Creek is about 170 square miles. The headwaters of the creek (pl. 4) and the tributaries fall rapidly from the flanks of the Owl Creek Mountains to the floor of the valley. Some of the snowmelt enters the creek, but in many years all the snowmelt enters the ground before reaching the gaging and sediment station near the mouth of Dry Cottonwood Creek. Before the summer of 1951, water flowed past the station on only a few days each year. The flows usually resulted from local thunderstorms along the Owl Creek Mountains. Measured discharge of suspended sediment for the storm season of the 1949 water year was 10,090 tons (table 36) and for the entire 1950 water year was estimated to be 1,120 tons, of which 1,000 tons was discharged during 1 day. Because natural runoff from the drainage area of the creek is very low, the natural potential sediment yield of the creek is also rather low even though a rare flood may sometimes produce a high sediment discharge for a day or two.

In the summer of 1951, return water from irrigation was first wasted into Dry Cottonwood Creek, and since that time the average sediment yield of the stream has been somewhat increased. However, the 78,000 and 232,000 tons of sediment that were reported for the 1951 and 1952 water years, respectively, were mostly discharged during periods of storm runoff. Irrigation return flows probably amounted to only about 500 acre-feet during the 1951 water year and to perhaps 2,300 acre-feet during the 1952 water year. Monthly weighted concentrations during months without storm runoff indicate that the average concentration in the irrigation flows is probably not more than 4,000 ppm. This concentration in 2,300 acre-feet of water is only 12,500 tons of sediment. No estimate is made of possible increase in sediment discharges that might be caused during stormflow by the effect on the channel of water from irrigation.

The longtime average sediment yield from Dry Cottonwood Creek with only a small amount of return flow from irrigation is estimated to be 3 percent of the average sediment discharge at Thermopolis before Boysen Dam was closed. (See pl. 6.)

DISSOLVED MINERAL CONSTITUENTS

DEFINITION OF TERMS

Most terms used in the field of water chemistry are common and readily understandable. Some are more limited in usage, and still others have been used to convey a variety of meanings. As an aid to the clarity of this section of the report, some of the terms that are not completely standardized are defined as follows:

Scheduled sampling station is a location at which water samples are collected on a systematic basis for chemical study. Three types of stations, dependent on the sampling frequency, were operated in this investigation: daily station--water sampled once or more each day; periodic--water sampled about once a month; infrequent--water sampled less frequently, usually at 3- to 4-month intervals.

Unscheduled sampling point is a location at which samples are collected less frequently and systematically than at a scheduled station; usually only 1 or 2 samples were collected for a specific purpose.

Salinity is the dissolved mineral content or total concentration of solids in solution.

Alkalinity is caused primarily by the presence of carbonates and bicarbonates and less frequently by hydroxides, borates, silicates, and phosphates. These components are determined collectively by titration with a standardized solution of a strong acid and are reported as carbonate and bicarbonate.

Parts per million (ppm) is a unit for expressing the concentration of chemical constituents by weight, usually as grams of constituents per million grams of solution.

Equivalents per million (epm) is a unit for expressing the concentration of chemical constituents in terms of the interreacting values of the electrically charged particles, or ions, in solution. One equivalent per million of a positively charged ion will react with one equivalent per million of a negatively charged ion. Parts per million are converted to equivalents per million by multiplying by the reciprocal of the combining weight of the ion.

Cations	Factor	Anions	Factor
Calcium (Ca^{++})-------	0.0499	Carbonate (CO_3^{--})----	0.0333
Magnesium (Mg^{++})----	.0822	Bicarbonate (HCO_3^{-})--	.0164
Sodium (Na^{+})---------	.0435	Sulfate (SO_4^{--})-------	.0208
Potassium (K^{+})-------	.0256	Chloride (Cl^{-})--------	.0282
		Fluoride (F^{-}) --------	.0526
		Nitrate (NO_3^{-}) -------	.0161

Composite is a mixture of two or more water samples. Complete analysis of individual daily samples is impractical; therefore, analyses are usually made on composites of several daily samples.

Equal-volume composite is a composite made of equal volumes from each daily sample.

Discharge composite is a composite for which the volume that is taken from each individual sample is proportional to the water discharge when the sample was collected.

Weighted average represents approximately the chemical character of the water if all the water passing a point in the stream during the year were impounded and mixed in a reservoir. It is calculated by dividing the sum of the products of water discharge and concentration of individual analyses by the sum of the water discharges for the period that the analyses represent.

Specific conductance is a measure of the ability of a water to conduct an electrical current and is expressed in micromhos at 25°C. Because the specific conductance is related to the number and specific chemical types of ions in solution, it can be used for approximating the salinity of the water. The following general relations are applicable:

$$\text{Specific conductance} \times (0.65 \pm 0.05) = \text{ppm dissolved solids}$$

$$\frac{\text{Specific conductance}}{100} = \frac{\text{total epm}}{2}$$

Salt discharge is the rate at which dry weight of dissolved mineral solids passes a section of a stream or the quantity that is discharged in a given time.

Percent sodium is the ratio, expressed in percentage, of sodium to the sum of the positively charged ions (calcium, magnesium, sodium, and potassium)--all ions in equivalents per million.

Sodium-adsorption-ratio is related to the adsorption of sodium by the soil and is an index of the sodium, or alkali, hazard of the water. Concentrations of constituents are in equivalents per million.

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

Leaching percent is the ratio, expressed in percentage, of the amount of water that passes downward through the root zone to the amount of water that is applied to the land surface.

"Residual sodium carbonate" (Eaton, 1950) is the amount of carbonate plus bicarbonate, expressed in equivalents per million, that would remain in solution if all the calcium and magnesium were precipitated as the carbonate.

$$\text{Residual sodium carbonate} = (CO_3 + HCO_3) - (Ca + Mg)$$

CHEMICAL-QUALITY RECORDS

Beginning in 1945, data on the quality of surface waters have been collected in the Wind River Basin. This report includes all the data for scheduled stations through the 1952 water year and information from unscheduled sampling points through the 1953 and 1954 water years. The periods of record and the sampling frequency at the scheduled sampling stations are shown in chart 3. In addition, 85 water samples from 48 other locations have been collected and analyzed. The locations of the sampling points are shown on plates 1 and 5.

Long-term, daily records of analyses are always desirable for defining the chemical-quality characteristics of a stream. Unfortunately, such records seldom have been obtained. However, the available records for the Wind River Basin are considered to be adequate for predicting long-term and average quality traits because (1) the concentration of salts in solution in

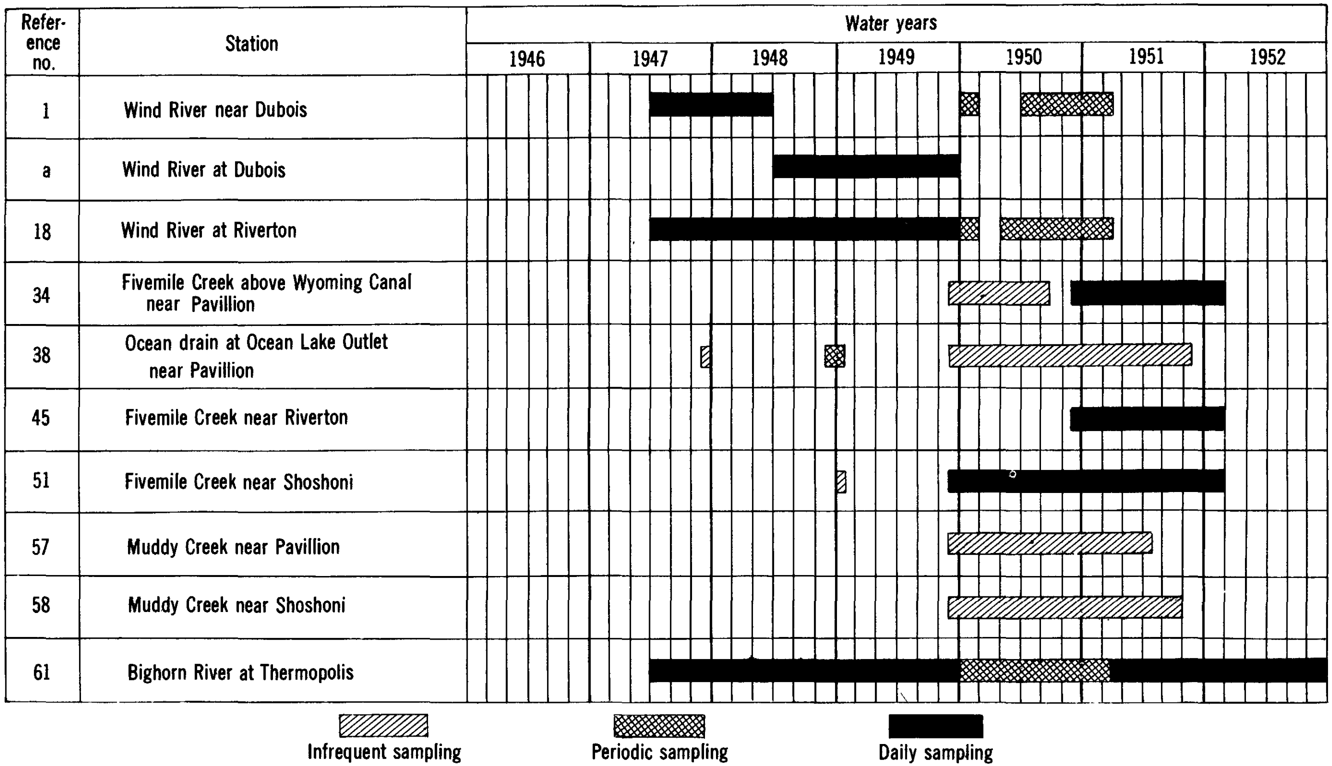

Chart 3.--Duration of chemical-quality records and sampling frequency at scheduled stations.

the main streams fluctuates over relatively narrow ranges when compared with other rivers in the semiarid parts of the Great Plains and (2) the runoff during the sampling period approximated the 39-year average runoff measured at Thermopolis. The average water discharge at Thermopolis for the 1947-49 period, during which time daily stations were operated on the main stem, was 1,883 cfs; whereas the 39-year average from 1910 to 1949 was 1,910 cfs. The water-year discharges at Thermopolis for 1947, 1948, 1949, and 1951 averaged 1,962 cfs.

Boysen Dam was closed October 11, 1951, and the filling of the reservoir began. Although analyses of water at Thermopolis for 1952 are presented in the tabular data, they are not included in the discussion and computations of chemical characteristics because records obtained during reservoir filling are representative of neither preimpoundment flows nor reservoir outflow during normal operation. They provide a historic record.

CHEMICAL ANALYSES

Chemical analyses of water from scheduled sampling stations are presented in tables 86 to 95. Two weighted averages appear at the foot of most of the tables; the first represents only the sampled period, and the second includes estimated concentrations for nonsampled periods. The chemical analyses of water from unscheduled sampling points are presented in table 96.

METHODS

The daily samples were collected in 12-ounce, soft-glass bottles that have pressure-seal caps. Two compositing procedures were used in the Wind River study. During the initial stages of the program equal-volume composites were prepared, and specific conductance of the sample was used to determine the composite periods. When the specific conductance indicated that the total mineralization of the water was changing, a new composite was begun. Later, discharge composites were prepared. Probably the discharge method is superior when the quality of water to be impounded is in question, as the composite contains a higher percentage of high-discharge water than low-discharge water. Other than daily samples were collected in pyrex bottles with either tinfoil-wrapped corks or rubber stoppers.

Specific conductance, percent sodium, and boron were determined as these qualities have a direct bearing on the rating or classification of the water for irrigation. Silica, iron, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, fluoride, and nitrate, together with pH and hardness, affect the suitability of the water for general use. All samples were analyzed by methods in general use by the Geological Survey.

The weighted averages that appear at the foot of the tables were determined by weighting each analysis in proportion to the water discharge for the period the analysis represents. The weighted-average concentrations at any station should be about representative of the total flow for the year. Actually, the weighted average for a part of a year may be misleading if the streamflow or chemical concentration during the omitted part of the year was much higher or much lower than average. This may be true even though the flow during the omitted part of the year was a relatively small percentage of the annual flow. Hence, before considering the quality of water in the Wind River Basin in terms of the amount of salts transported and usage of the water, adjustments were made on some of the records to include estimates of concentrations of chemical constituents for periods without samples. These estimates were made on the basis of all available chemical and hydrologic data.

FACTORS AFFECTING THE CHEMICAL QUALITY OF THE WATER

Rainwater or snow is relatively devoid of contamination except for small quantities of dissolved atmospheric gases. As soon as the water from rain or melting snow and ice comes in contact with the earth's crust, it begins to dissolve materials. The water may run off into streams quickly and dissolve only a small amount of material, or it may travel more slowly over the surface or infiltrate to ground-water reservoirs and eventually be discharged into a stream. The latter movement favors solution of material, and the resultant water is usually more mineralized. The chemical character and concentration of a surface water may fluctuate widely. Some of the factors that affect the chemical quality of a water are variations in climate, impoundment and diversion, tributary inflow, geology, and industrial, municipal, and agricultural effluents. Size and topography of the drainage basin may often modify or intensify the effect of these factors. Thus the chemical quality of the water is the resultant of its overall environment.

CHEMICAL QUALITY IN RELATION TO GEOLOGY

The chemical character of a river water is dependent primarily on the mineral and physical properties of the geologic formations that are traversed and on the time the water is in contact with the rocks. The river carries the soluble products of weathering in ionic solution or as colloidal dispersions. The amount of these materials varies according to the climate and to the chemical composition and physical properties of the rocks and soils in the catchment area. Clarke (1924, p. 69) points out that a river water is the average, or composite, of all its tributaries. River water is thus in unstable equilibrium and is undergoing continuous change by chemical reactions.

Granitic rocks and well-leached sands and gravels yield water of low mineralization. However, in arid regions sands and gravels often contain large amounts of soluble material. Fine-grained rocks, such as siltstone and shale, expose considerable surface to the solvent action of the water; water in contact with such material may become highly mineralized. Certain types of cementing materials in sandstones and indurated shales are easily dissolved during the weathering process. Calcium carbonate dissolves rather easily in water that contains carbon dioxide.

Plate 8 shows the geochemical character and ionic concentrations of some surface waters in the Wind River Basin. Most samples used for this illustration were collected during low flow when the effect of geology on the chemical quality is more evident than during high flows.

The equiaxial quadrilaterals in plate 8 diagramatically depict the concentration and geochemical relations of the ions in solution, and the size and shape of the "kite" diagrams show pictorially the suitability of the water for irrigation. The total ionic concentration in equivalents per million is equal to twice the length of either the vertical or horizontal axis. Potassium has been included with sodium in the lower vertical axis to show the geochemical character of the water. This grouping is not in absolute agreement with the agricultural definition of percent sodium, but potassium is present in such small quantities that its inclusion with sodium is insignificant in percent-sodium interpretations from the illustration. If the major part of the quadrilateral is in the upper half, the water has low percent sodium. The percent sodium is the ratio of the length of the sodium line to the total length of the vertical axis. If the major part is in the upper left quarter, the water is the most desirable type for irrigation; sulfates and chlorides of calcium and magnesium predominate. If the figure shifts to the upper right quarter, percent sodium is low but residual sodium carbonate is a possibility. The slope of the line joining the plots of calcium plus magnesium and carbonate plus bicarbonate is the ratio of these constituents and indicates the presence or absence of residual sodium carbonate. If the slope is greater than 45°, there is no residual sodium carbonate; conversely, residual sodium carbonate increases as the slope decreases from 45°. Percent sodium is high if the major part of the diagram tends toward the lower half. Location of the larger area in the lower right quarter indicates water least desirable for irrigation; high percent sodium and residual sodium carbonate are both present. The significance of these water-quality characteristics are discussed in the section "Criteria for rating irrigation waters."

Headwaters of the Wind River rise primarily on the Wiggins formation of Tertiary age, which is composed of volcanic conglomerate interbedded with tuffaceous sandstone and marl. Water from this area, sampled 7 miles northwest of Dubois, is generally dilute, comparatively high in content of silica, and calcium bicarbonate in type. The Wind River at Dubois is influenced by the inflow of Horse Creek, whose salt load comes principally from rocks of Mesozoic age. The North Fork Wind River drains areas of varietal geology, and the quality of the water is similar to the Wind River upstream from Dubois. Inflow of the North Fork Wind River and tributaries to the Wind River from the south dilutes the water in the main stem by the time it reaches Burris. Samples from Dinwoody Creek and Dry Creek collected downstream from outcrops of rocks of Mesozoic age show the pickup of calcium sulfate and carbonate (as bicarbonate), which are associated with some of the formations of this era. Salinity further decreases between the stations near Burris and near Crowheart. This dilution and counteraction of some of the effect of relatively mineralized tributaries are attributed to inflow of Bull Lake Creek. Bull Lake Creek heads high in the mountains on Precambrian rocks, traverses a narrow band of Paleozoic rocks, and is protected from contact with Mesozoic rocks by channel alluvium. The sample collected near Lenore, downstream from Bull Lake Reservoir, had only 48 ppm dissolved solids and 2.1 ppm silica and was principally a calcium bicarbonate type water.

Spot samples from the Popo Agie River and tributaries show the progressive trend and water-quality changes in relation to the geology of the area. The Little Popo Agie River upstream from Red Canyon Creek and the South Fork Little Wind River are dilute, low-silica, calcium bicarbonate type waters and are typical of runoff from areas underlain by Precambrian and Paleozoic rocks. Red Canyon Creek, whose quality reflects the influence of the Chugwater formation, had a specific conductance

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of 909 micromhos and large quantities of calcium sulfate and bicarbonate. The pickup of salts, principally calcium and sodium sulfates, from the Mesozoic rocks is also apparent from the analyses of waters from the Little Wind River near Arapahoe and the Little Popo Agie River at Hudson. Much of the drainage area of Beaver Creek is underlain by the Wind River formation, but the sample from Beaver Creek near Arapahoe was very similar in type to the samples from the lower Little Wind River and the Little Popo Agie River.

At low stage, waters of different geochemical character mix where the Wind River and the Popo Agie River join near Riverton. Calcium carbonate predominates in the Wind River water and calcium and sodium sulfate in the Popo Agie River water. (See pl. 8.)

Badwater Creek heads in the Owl Creek Mountains in the northeast part of the Wind River Basin. The geology is analogous to that in the upper Wind River drainage basin, and the chemical character of Badwater Creek at Lybyer's Ranch near Lost Cabin closely resembled that of the Wind River near Burris. Silica was a predominant constituent of the water at Lybyer's Ranch and probably comes from the decomposition of andesitic tuff and siliceous limestones in the White River formation and other upper Tertiary rocks. Between Lybyer's Ranch and Bonneville, Badwater Creek drains a large area underlain by the Wind River formation and older formations; at Bonneville, Badwater Creek was very similar in chemical character to Beaver Creek near Arapahoe and the Popo Agie River near Riverton. The Wind River formation is a continental deposit of erosional debris from older rocks and is, therefore, a complex mixture of many types of rocks. Probably water from no single location in the Wind River formation can be said to be typical of the formation; but, in general, the quality of water from areas underlain by the Wind River formation will be similar to a mixture of water from areas underlain by Precambrian, Paleozoic, and Mesozoic rocks.

The Cody shale of Mesozoic age crops out over a wide area in the catchment basin of Fivemile Creek above the Wyoming Canal near Pavillion. The water at this station was definitely the calcium and sodium sulfate type and was so highly mineralized that the "kite" diagram is drawn to only half scale on plate 8. Part of the runoff of Muddy Creek near Pavillion is over Mesozoic rocks and part from the Wind River formation of Tertiary age. The mixed water, therefore, has geochemical characteristics of both sources. This is evident by comparing the diagrams on plate 8 for Fivemile Creek above Wyoming Canal and Badwater Creek at Bonneville with Muddy Creek near Pavillion.

In summation, surface waters in the Wind River Basin are of many types and vary in concentration over wide ranges. The types of rock play a large role in determining the chemical characteristics of the waters. Water from Precambrian and Paleozoic rocks is generally very dilute, and calcium bicarbonate is the major constituent. Some of the formations of Mesozoic age contain much readily soluble material, and water in contact with them dissolves appreciable quantities of calcium and sulfate and lesser amounts of sodium and carbonate. Water from Tertiary rocks of volcanic origin is generally siliceous, dilute, and the calcium bicarbonate type. Streams that drain the Wind River formation are geochemically similar to streams that traverse Precambrian, Paleozoic, and Mesozoic rocks. The approximately equilateral diagram on plate 8 shows that the water released from Boysen Reservoir is a mixture of many waters and has no pronounced geochemical types.

CHEMICAL QUALITY IN RELATION TO STREAMFLOW

Runoff and streamflow have a definite influence on the chemical characteristics of water in any drainage area. The first factor influencing the quality of the water is velocity. Whereas high stream velocity is generally associated with increased sediment concentration, the opposite is more likely with dissolved constituents. This is true because the solution of minerals is much more dependent on time of contact between the rocks and the water than on the energy relationships. In the mountainous areas of the Wind River Basin rain and snowmelt have little opportunity to dissolve material before reaching the stream and cascading to the valley plain. The slower runoff and streamflow on the flatter areas are naturally more favorable for solution of salts. These trends modify the effect of geology in determining the salinity of the water.

The second factor is stream discharge. The chemical quality of water in a flowing stream varies from day to day and from hour to hour in relation to the stage of the river. As a general rule, the low, or base, flow of the stream is sustained by groundwater inflow that has leached the soluble minerals of rocks and soil particles before reaching the stream. At high stages, and during floods, the salt concentration of the base flow is diluted by snowmelt and surface runoff. This relationship is generally applicable, with some reservations, to the waters of the Wind River Basin. Figure 34 shows the chemical characteristics of some of the streams during relatively high and relatively low stages.

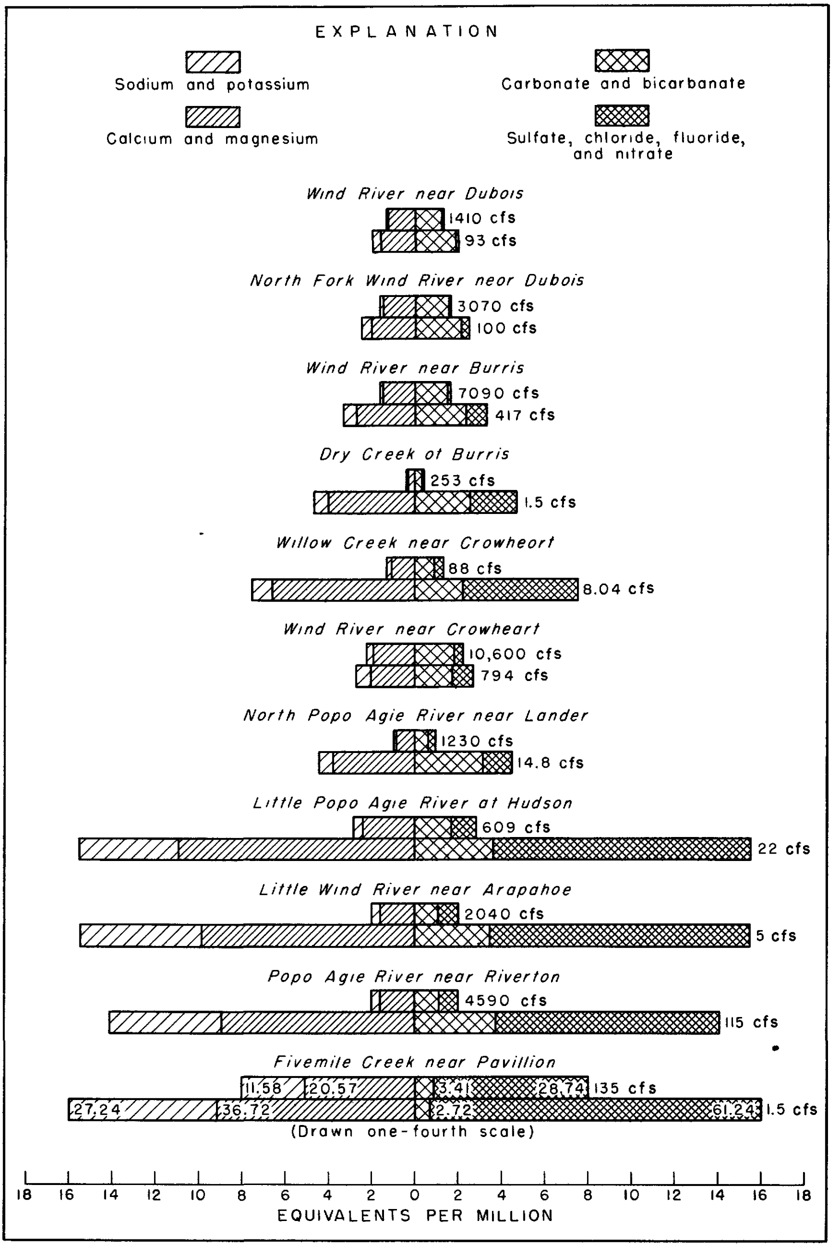

Figure 34. --Quality of water at high and low stream discharges.

The general streamflow-quality pattern is modified somewhat by the diversified geology and runoff characteristics of the Wind River Basin. Figure 35 shows the relationship of dissolved solids to water discharge for the Wind River at Riverton. Obviously, the salt content has varied over relatively wide ranges, and the probability of obtaining accurate results by using water discharge to estimate chemical quality at a specific time is poor. However, the mean concentration within selected discharge ranges shows a definite trend in quality. Salinity is maximum during low but not during lowest flow periods. On the basis of average concentrations, the Wind River at Riverton is most saline when the discharge is about 400 cfs, whereas the water has about the same dissolved solids at 250 cfs as at 700 cfs. Release of the very dilute water from Bull Lake Reservoir probably has considerable bearing on the wide range of salinity between 300 and 600 cfs. The reversal of the curve at minimum flow is attributed to the fact that during very dry periods much of the flow originated from snowmelt or rain high in the mountains.

The average discharge-salinity pattern at Thermopolis is similar to that at Riverton, but the percentage deviation of individual analyses from the average is somewhat less. (See fig. 36.) Outflow from Ocean Lake is not significant in the changes in the quality of the water at Thermopolis because the rate of release was relatively uniform and the quantity is negligible. Snowmelt and runoff during the winter months make up the minimum flow, and the water is relatively dilute. Maximum salinity probably accompanies low precipitation on, or ground-water discharge from, the Mesozoic and Tertiary rocks. At high stages and during floods, the normal low and base flows are diluted by overland runoff.

The quantity of different ions in the low-flow water at Thermopolis substantiates the foregoing general observations. Figure 37 shows average calcium, sodium, bicarbonate, and sulfate content of the water for discharges less than 2,000 cfs. In this range sodium increases more with decreasing discharge than calcium, although both decrease at very low flow. Sulfate, which is a characteristic constituent of Mesozoic and Tertiary rocks, rapidly increases in concentration as discharge falls to about 900 cfs and then decreases appreciably as the discharge decreases further. In contrast, the increase in bicarbonate, an ion which is associated more with Precambrian and Paleozoic rocks, is very slow as discharge decreases to 1,000 cfs but becomes more rapid with continued lessening discharge.

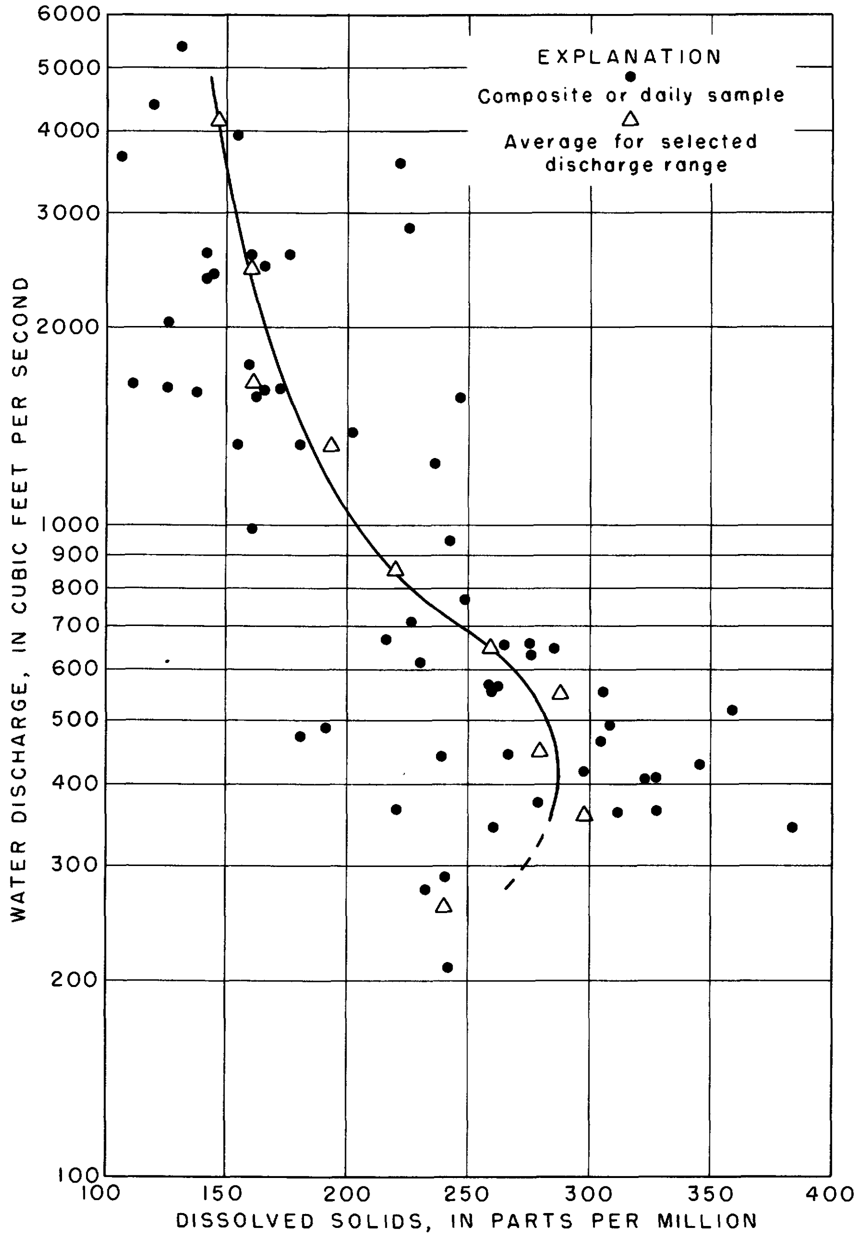

Figure 35. --Relation of salinity to water discharge, Wind River at Riverton.

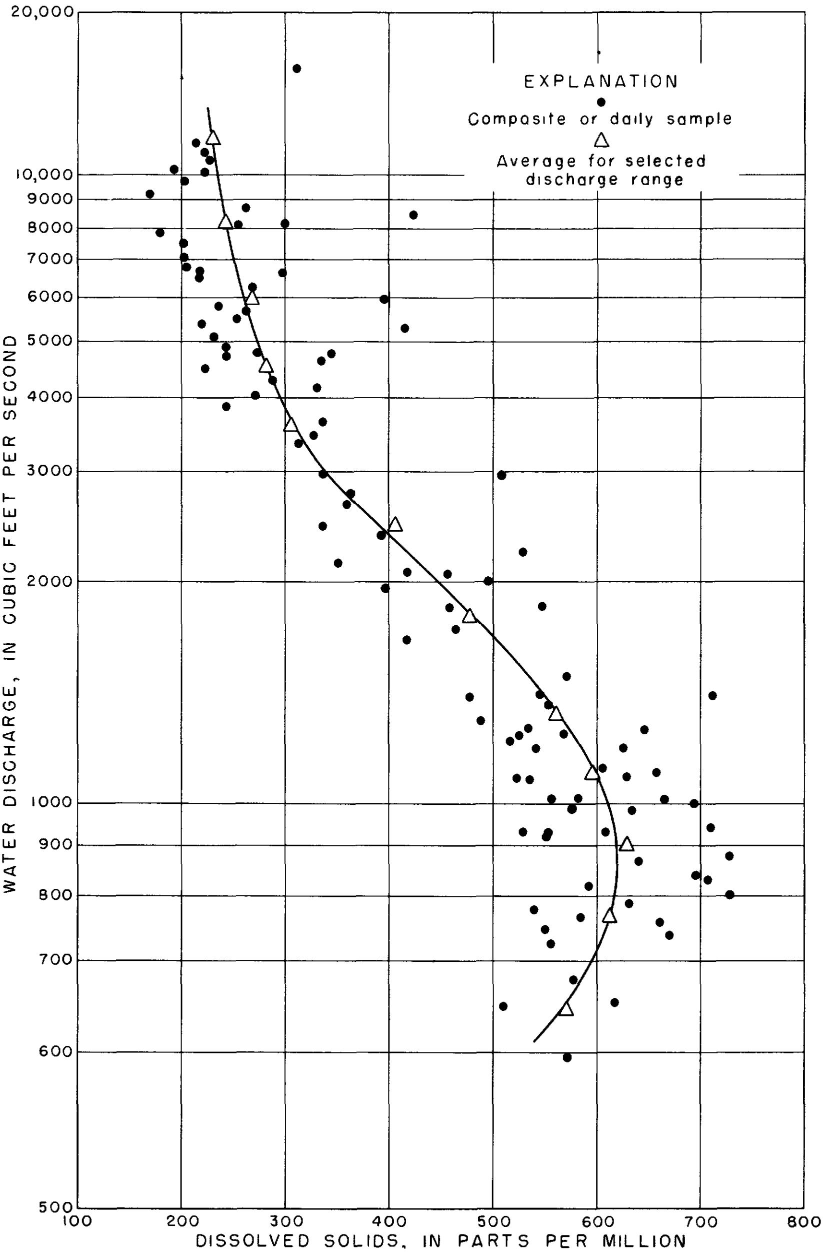

Figure 36.--Relation of salinity to water discharge, Bighorn River at Thermopolis.

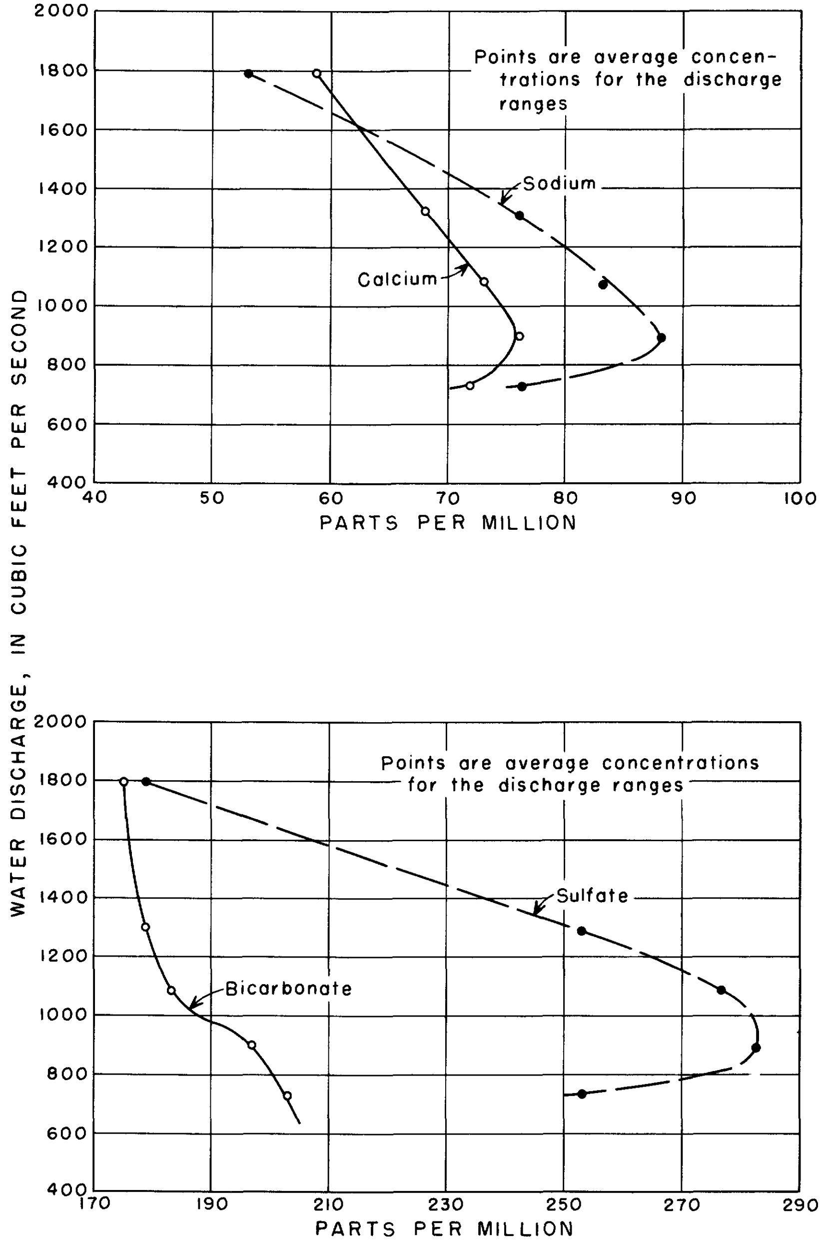

Figure 37.--Concentrations of specific ions at low stage, Bighorn River at Thermopolis.

CHEMICAL QUALITY IN RELATION TO IRRIGATION

Stream water is widely used in the Wind River Basin to irrigate small meadows in the mountains or large tracts on the valley floor. (See pl. 9.) The Riverton project is the largest irrigation development in the basin and has been more intensely studied in respect to water quality than any other. (See pl. 5.) However, the trends and magnitudes shown by the studies in this area are also generally applicable to other areas in the basin where geology, soil, climate, and irrigation practices are similar.

Irrigation water from the Wind River, as determined from nine samples collected at the gaging station near Crowheart, above Diversion Dam, and from the Wyoming Canal below Diversion Dam from 1948 to 1953, is very uniform in character, dilute, and calcium bicarbonate in type. Residue on evaporation ranged from 106 to 262 ppm and averaged 153 ppm. This water is applied to an area covered by the Wind River formation and alluvial terrace deposits. These deposits contain appreciable soluble material--principally sulfates of sodium and calcium--that is readily leached. The tendency of the water to dissolve minerals from soils of the canal bed is discernible even in the Wyoming Canal. Quality of the canal water on August 18, 1953, was as follows:

Analyses of Wyoming Canal
[Results in parts per million except as indicated]

Location	Specific conductance (micromhos at 25°C)	Ca + Mg (as Ca)	Na + K (as Na)	Alkalinity (as HCO_3)	SO_4
Near Lenore..........	235	37	11	92	34
At Fivemile Creek wasteway...........	238	....	....	......	...
At Muddy Creek wasteway................	248	....	....	......	...
In Dry Cottonwood Creek basin[1].......	395	47	36	98	100

1 SW¼ sec. 20, T. 4 N., R. 4 E.

These data show that in the oldest reach of the canal bed, which has been subjected to leaching for a long time, change in quality is negligible; in the newer section between Fivemile Creek and Muddy Creek, salinity increases slightly; but in the recently completed canal into Dry Cottonwood Creek basin, calcium and sodium sulfate are being rapidly dissolved from the canal bed.

A somewhat similar increase in mineralization occurs along the Pilot Canal system. Specific conductance, as measured in Pilot Canal below Pilot Butte Reservoir near the head of the project and in Lateral P-34.9 on the eastern border, increased from 234 to 307 micromhos, and sodium sulfate about doubled in concentration.

When the irrigation water is applied to the land and infiltrates the soil, the opportunity for solution of minerals may be increased further by the greater surface area of soil particles exposed and by the longer time that the water is in contact with the soil and mantle rock. Contact time, particularly, is dependent on the permeability of the deposits; that is, water flows rapidly through coarse-grained material and has little time to dissolve minerals, whereas the movement through fine-grained material is slow and a large amount of soluble matter may be dissolved. Mineral salts dissolved from irrigated land add to the salt load of the streams draining the region and affect the quality and usability of the water downstream.

Fivemile Creek receives most of the waste water and drainage of the Riverton project. Some of the drains and wasteways flow directly into the creek; whereas others enter Ocean Lake, and the water eventually reaches Fivemile Creek via Ocean Lake drain. Changes in chemical character and concentration as the Wind River water passes through the Riverton project are shown in figure 38. The water is described on the basis of percentage composition in equivalents per million. The plotting does not show differences in total salinity; a water containing 100 ppm dissolved solids will plot at the same point as one containing 1,000 ppm if the two have identical percentage composition. Consequently, the specific conductance of each sample is shown on figure 38. Figure 38A shows that increase in total mineralization of drains into Fivemile Creek is accompanied by a decided and relatively uniform change in percentage composition. The fact that all the plotted samples from drains fall close to a straight line indicates singularity of the geochemical progression. The dilute, calcium bicarbonate type water from the Wyoming Canal dissolves appreciable quantities of sodium and calcium sulfates and, to a lesser extent, carbonates from the Wind River formation and terrace deposits. The drains carry mixtures

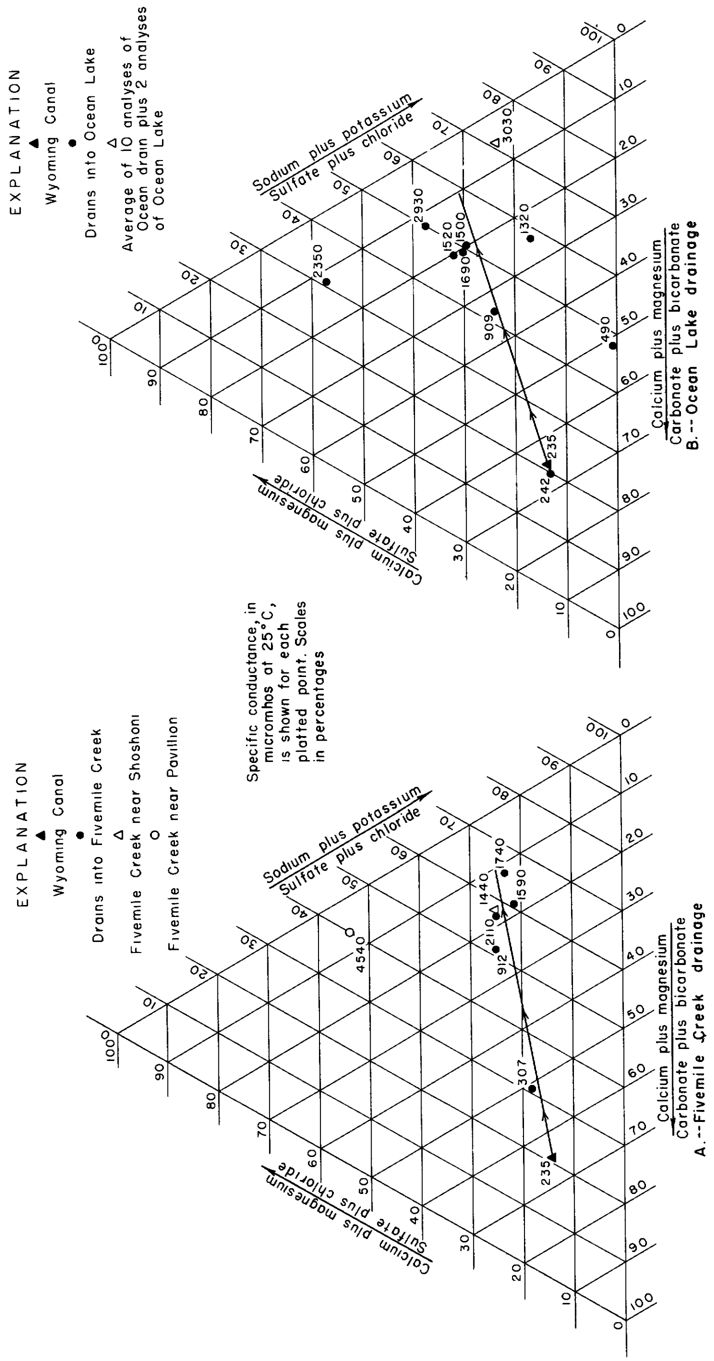

Figure 38.--Geochemical characteristics of surface waters in the Riverton project.

of infiltrated water and unapplied waste water. The chemical quality of the water of Fivemile Creek near Shoshoni is the resultant of irrigation and bears little, if any, similarity to the quality of the stream near Pavillion.

Comparable conditions and reactions determine the quality of the water of the Ocean Lake drainage system. However, factors other than simple solution of minerals modify the quality of the water of Ocean Lake. Analyses of water from Ocean Lake and Ocean drain near Pavillion, 1947-50 and 1953, indicate a uniformity of concentration and percentage composition. (See tables 90 and 96.) Ocean Lake is a large and relatively shallow body of water on the arid basin floor. The dissolved salts in the lake may be expected to become more concentrated by loss of water through evaporation, and the specific conductance of sampled drains and lake water (see fig. 38B) suggests that the dissolved salt content of the lake is notably higher than average drain water.

During the concentration of salts by evaporation, precipitation of sparingly soluble calcium carbonate also occurs. Figure 38B shows that Ocean Lake water is characterized by more sodium salts of strong acids than would be expected from the average trend (indicated by the arrow) of the drains that enter the lake. A companion indication of precipitation of salts is the low carbonate-bicarbonate content of the lake water. Alkalinity, expressed as bicarbonate, of the drains into Ocean Lake ranged from 98 to 278 ppm; whereas the alkalinity of 18 samples collected from the lake or the drain out of the lake ranged from 55 to 172 ppm--a decrease rather than an increase. (See tables 90 and 96.) Simple evaporation would increase the concentration of all constituents proportionally. The loss of calcium carbonate by precipitation is probably attributable to several factors. Aquatic flora and fauna abound in Ocean Lake, and these organisms accelerate calcium carbonate precipitation by depletion of dissolved carbon dioxide and by excretion of ammonia. Carbon-dioxide content of the water may also be reduced by increasing the temperature; the surface and shallow bays are particularly subjected during the summer to warming from the sun. Another commonly occurring phenomenon is the depression of solubility or "salting out" of a sparingly soluble salt by high concentrations of other salts.

No quantitative measurement of the load of dissolved salts that enter or leave Ocean Lake has been made. However, the amount of calcium carbonate precipitation can be estimated with fair assurance by (1) assuming that, if no precipitation occurs, the alkaline earths (calcium and magnesium) and alkalis (sodium and potassium) would be present in the same proportions in both the water entering the lake and the water leaving the lake; (2) computing the calcium carbonate necessary (that precipitated) to satisfy these conditions; (3) multiplying the deficient calcium carbonate per unit volume by the water discharge from Ocean Lake. When the water discharges of 1949 and 1950 are used, 10,000 tons of calcium carbonate per year are roughly estimated to be removed from solution and deposited in Ocean Lake.

Specific conductance of daily samples collected near Pavillion, Riverton, and Shoshoni give information concerning the effect of irrigation on the quality of Fivemile Creek. Plate 10 shows the specific conductance of these samples compared with the average specific conductance of samples collected from the Wind River near Crowheart and at points along the distribution system. During the nonirrigation season the base flow of Fivemile Creek near Riverton and Shoshoni is principally irrigation drainage, whether it be outflow from Ocean Lake or seepage into the drains that enter the creek. The water near Riverton is a little more dilute than near Shoshoni, particularly during the irrigation season. This relation exists because Ocean Lake drain empties into Fivemile Creek upstream from the Riverton station and carries water that is more dilute (average specific conductance of about 3,000 micromhos) than the water of other drains.

In summation, the changes in both salinity and percentage composition show that irrigation appreciably alters the chemical quality of some streams in the Wind River Basin. Ocean Lake, by means of the chemical reaction therein, acts as a differentiating agent in retaining some of the calcium carbonate and in increasing the sodium sulfate percentage of the emitted water. However, this retention is of little consequence in relation to the combined salt discharges from the project and is insignificant in the basinwide considerations.

DISSOLVED MINERAL TRANSPORT

CHEMICAL QUALITY OF THE WIND-BIGHORN RIVER

From its headwaters to Thermopolis, the Wind-Bighorn River traverses about 190 miles and drains an area of 8,080 square miles, about 7,800 of which are in the Wind River Basin. The cumulative concentrations of mineral constituents are shown in figure 39. On the basis of the three station records on the main stem, the river water increases in total concentration in an approximately straight-line relationship with the drainage area.

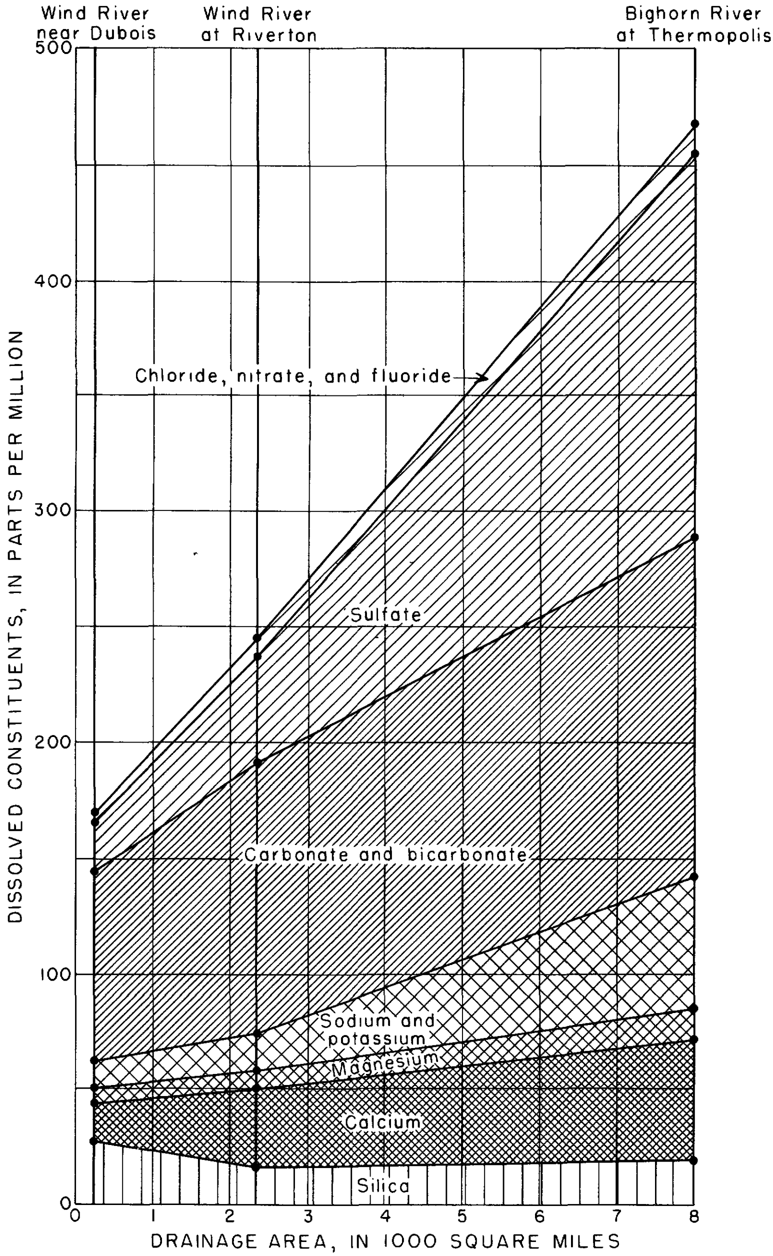

Figure 39.--Cumulative quantities of constituents in Wind River water, 1947-49.

This means that the inflow for one section is probably more concentrated than upstream inflow and more dilute than downstream inflow; or, stated in another way, a given volume of water dissolves more salt from a unit area in a lower part of the basin than in the upper part. If this were not true, the total salt concentration, represented by the topline of figure 39, would be horizontal or slope downward to the right. This is a very general relationship and summarizes several areas that are known to yield different concentrations of dissolved material.

Variations in the concentrations of individual constituents are noteworthy and are indicative of the major source of these constituents. The silica content of the water is highest near the headwaters and remains constant between Riverton and Thermopolis. Calcium increases rather rapidly between Dubois and Riverton but only slightly downstream from Riverton, the change in bicarbonate approximately parallels that of calcium. Sodium and sulfate are the most significant additions between Riverton and Thermopolis.

The foregoing discussion is purely qualitative and should not be construed to refer to rate of solution or total quantity of material in transport. These latter items are dependent on the quantity of water in addition to concentration and are discussed in the section "Salt discharge."

BOYSEN RESERVOIR

At the time of the preparation of this report (1954), Boysen Reservoir had not been in operation long enough for the water to have obtained chemical-quality characteristics that would be representative of routine operation. However, a reconnaissance-type salinity survey of the reservoir made on June 29, 1954, is probably indicative of water-quality patterns during periods of rapid filling. Abnormally high temperatures were rapidly melting the snow and ice in the Wind River Mountains, and two cloudbursts had occurred in the upper Wind River Basin. During the 24-hour period preceding the sampling, 15,700 acre-feet of water is reported by the Bureau of Reclamation to have entered the reservoir; and at midnight on June 28, the water surface was 3.9 feet below the top of the spillway; spilling was being considered for the first time since closure of the dam.

The location of the three cross sections and the specific conductance of the water at each point in the verticals are shown on plate 11. Analyses of the samples are given in table 97. The

Table 97.--Chemical analyses of Boysen Reservoir, salinity survey, June 29, 1954 (water-surface altitude 4,721.10 feet)

Location	Depth (ft)	Temperature (°F)	Silica (SiO_2)	Sodium (Na)	Hardness as $CaCO_3$ (calcium, magnesium)	Percent sodium	Specific conductance (micromhos at 25°C)	Sodium-adsorption-ratio
			Parts per million					
Range line 1:								
Station 1.....	2	60	4.2	67	212	41	705	2.0
Do..........	10	64	4.2	67	214	40	705	2.0
Do..........	20	63	4.2	68	212	41	707	2.0
Do..........	30	63	4.2	68	213	41	709	2.0
Do..........	40	61	3.9	70	219	41	728	2.0
Station 2.....	2	64	4.3	67	214	40	704	2.0
Do..........	15	62	4.3	66	211	40	704	2.0
Do..........	25	63	4.3	68	214	41	710	2.0
Do..........	35	63	4.2	68	212	41	710	2.0
Do..........	45	59	3.6	70	220	41	728	2.0
Do..........	55	58	3.9	70	221	41	737	2.0
Do..........	65	56	3.9	72	225	41	741	2.1
Do..........	75	53	4.5	77	243	41	798	2.1
Station 3.....	3	63	4.3	67	211	41	700	2.0
Do..........	15	64	4.3	67	210	41	703	2.0
Do..........	25	63	4.1	67	214	40	706	2.0
Do..........	35	64	3.8	67	213	41	708	2.0
Do..........	45	60	3.8	70	219	41	727	2.0
Do..........	55	58	3.7	70	222	41	740	2.0
Do..........	65	58	3.7	71	224	41	739	2.1
Do..........	75	54	4.2	76	237	41	779	2.2
Do..........	85	52	4.5	77	246	41	805	2.1
Station 4.....	3	63	3.8	68	213	41	701	2.0
Do..........	15	64	3.9	68	215	41	709	2.0
Do..........	25	64	3.7	68	214	41	709	2.0
Do..........	35	64	4.3	68	214	41	709	2.0
Do..........	45	61	3.0	70	219	41	725	2.0
Do..........	55	58	2.9	71	225	41	737	2.1
Do..........	65	57	3.2	72	226	41	743	2.1
Range line 2:								
Station 1.....	3	64	5.2	55	176	40	590	1.8
Do..........	15	63	5.0	57	179	41	603	1.9
Do..........	35	62	4.4	63	201	41	668	1.9
Do..........	50	59	4.0	67	210	41	699	2.0
Station 2.....	3	64	5.5	56	173	41	584	1.9
Do..........	18	63	5.0	57	185	40	617	1.8
Do..........	38	61	3.6	66	208	41	689	2.0
Do..........	58	58	5.9	68	217	41	705	2.0
Station 3.....	3	64	6.1	56	177	41	592	1.8
Do..........	15	63	5.7	57	184	40	615	1.8
Do..........	30	62	4.3	65	204	41	682	2.0
Do..........	50	58	7.7	68	219	40	712	2.0
Station 4.....	3	63	5.7	57	181	41	604	1.8
Do..........	20	63	4.3	66	204	41	674	2.0
Do..........	35	62	4.4	66	206	41	685	2.0
Station 5.....	3	63	5.4	60	189	41	624	1.9
Do..........	15	63	5.2	59	189	40	633	1.9
Do..........	26	62	4.3	66	209	41	688	2.0
Range line 3:								
Station 1.....	.....	63	9.5	16	86	29	248	.8

dissolved-salt content was very uniform horizontally in each section but increased appreciably with depth. The increase in concentration with depth was relatively uniform at range line 1 near the dam; but the zones of quality demarcation, or stratification, at range line 2 was more pronounced, particularly at about 20 to 30 feet. The slightly higher conductance of the left-side samples at range line 2 possibly reflects the inflow of highly mineralized irrigation return flow from Fivemile and Muddy Creeks. During periods of low flow on the Wind River the effect of these creeks would probably be very noticeable, but at the time of the survey the effect was almost completely obliterated by the preponderant mountain runoff.

Apparently the water from dilute snowmelt and surface runoff was both pushing ahead and overriding the more concentrated residual reservoir water. Wind River water entering the reservoir was diluting the stored water near the surface more rapidly than the water near the bottom, and although only the lower 10 feet at range line 2 was more concentrated than 700 micromhos, all the water below 25 feet at range line 1 was more mineralized.

The water temperatures in the longitudinal cross section along the axis of maximum sampled depth, figure 40A, decreased at the deepest vertical from 63° or 64°F in the top 35 feet to 52°F at 85 feet and were almost completely uniform horizontally. The apparent relation between water temperature and salinity, as shown in figure 40B, is very good. This is not to say that either temperature or salinity are dependent on the other, but the correlation of lower temperature and higher salinity with increasing depth suggests that the deeper, colder, more mineralized water has been affected less by inflow than the water near the surface. Similar overriding by dilute spring inflow has been reported in Lake Mead, Ariz. and Nev., by Howard 10/ and has been observed in Shadehill Reservoir, S. Dak. Such flows are considered to be a type of density current; the differences in density are caused by differences in suspended-sediment load, dissolved-mineral content, and temperature, all of which make the water lighter or heavier than the surrounding water. In Boysen Reservoir, the suspended sediment either settled rapidly or was present in insufficient concentration to prevent the overriding by the dilute, warm inflow.

10/ Howard, C. S., 1954, Physical and chemical characteristics of the inflowing water, in Smith, W. O., and others, Lake Mead comprehensive survey of 1948-49, v. 2, p. VII-174 (advance report for official use).

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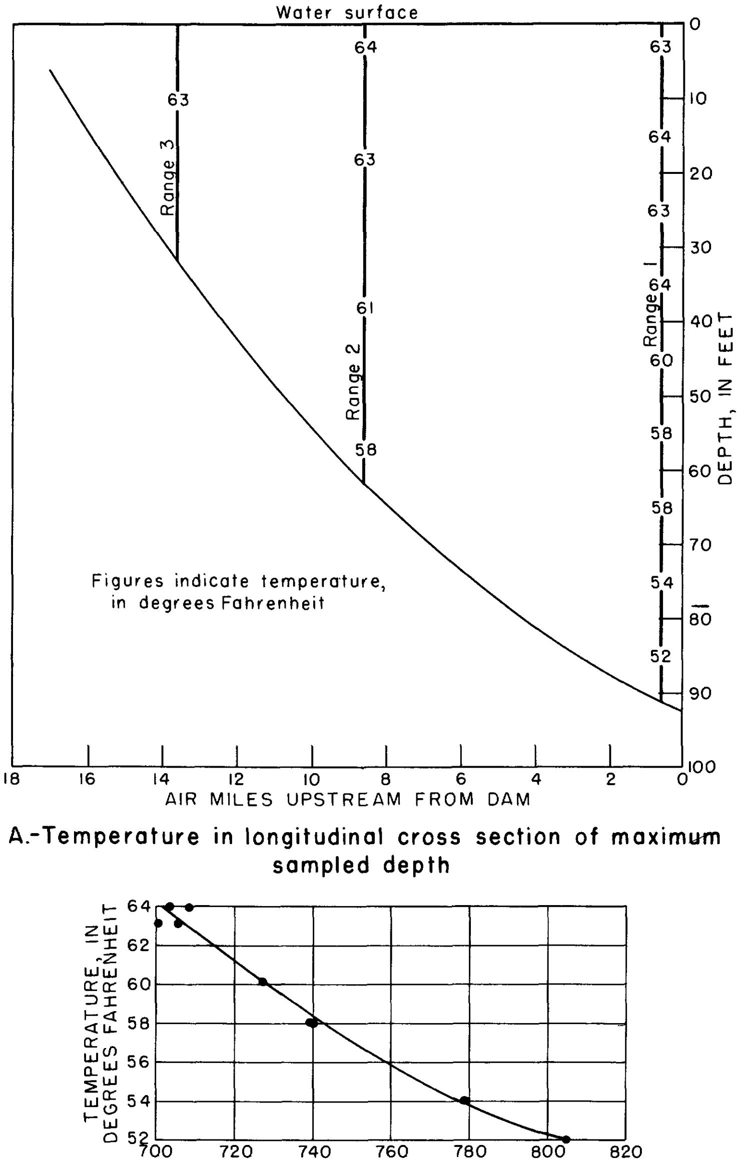

A.-Temperature in longitudinal cross section of maximum sampled depth

B.-Specific conductance and temperature at range line 1, station 3

Figure 40. --Specific conductance and temperature relations in Boysen Reservoir, June 29, 1954.

The survey of June 29, 1954, shows the chemical characteristics only at one time and under a single environmental pattern. Complete appraisal of the water-quality behavior of Boysen Reservoir would require extensive study over a long period. Nevertheless, at this time the loss of silica in the reservoir is obvious. The minimum silica content of analyzed samples from the Bighorn River at Thermopolis from 1947 to 1951 was 9.0 ppm, and the mean of the weighted averages was 18 ppm. (See table 95.) During the summer of 1953, four samples were collected from the reservoir. A sample from the upstream end of the reservoir had 9.5 ppm silica, and 3 samples collected near the dam contained 3.4, 4.4, and 4.1 ppm. (See table 96.) A decrease in the silica content of impounded water has been observed in other localities. The precipitation mechanism is not completely understood, and little published information on the subject is available. Some investigators believe it to be correlated with plankton activity.

SALT DISCHARGE

The quantity of soluble material transported by a stream is proportional to the product of the concentration of the soluble materials and the water discharge. Figure 41 shows the cumulative discharges of dissolved salts and of water for a typical year at Thermopolis. During the winter months the base flow is relatively more mineralized than in other periods, and the percentage of annual salt discharge exceeds the percentage of water; high flows of dilute surface runoff in May and June reverse this trend. Salt discharge at this station is more uniform with respect to time than water runoff.

One ordinarily thinks of the dissolved minerals in water as very minute quantities, or impurities. This is true when considering a glassful or other small volume of water, but when the volume of water in a flowing stream is considered, the movement of material in solution becomes one of the important mechanisms for modifying landforms and molding surface topography. Transport of salt is often associated with sediment movement because consolidated deposits that are leached of their cementing material are much more susceptible to the mechanical forces of erosion. Furthermore, the deposition of certain kinds of salts from circulating water may cause changes in the structure of the soils; these changes may decrease the resistance of the soils to erosion. The annual salt discharges at daily quality-of-water sampling stations are given in table 98. The average quantity passing Thermopolis annually during 1947, 1948, 1949, and 1951 was 748,000 tons, about 13 percent of the estimated yearly total sediment and dissolved-solids load.

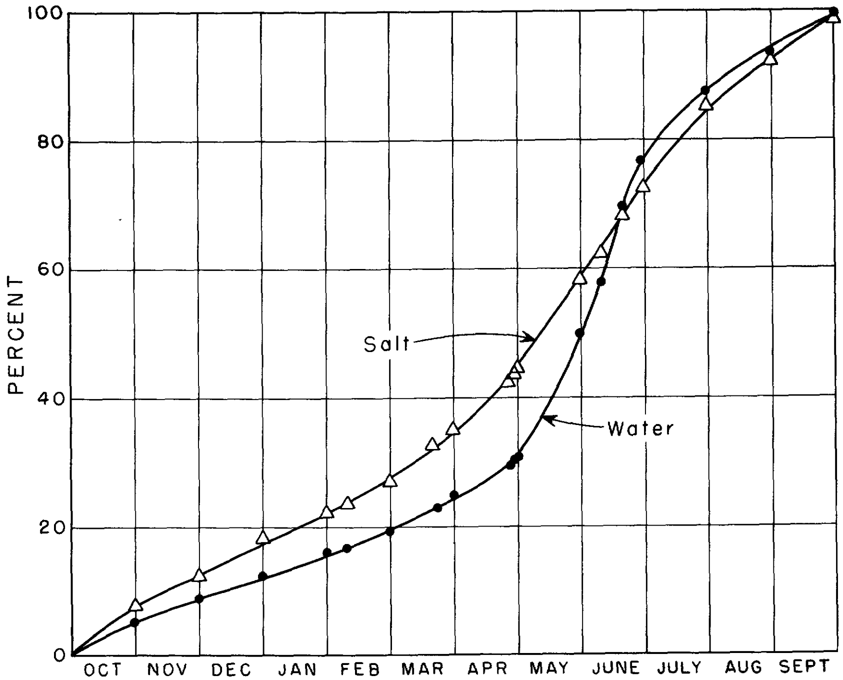

Figure 41.--Cumulative salt and water discharge, Bighorn River at Thermopolis, 1949.

Table 98.--Annual salt discharges

Station	Year	Acre-feet	Tons per acre-foot	Tons	Tons, 1947-49 average
Wind River near Dubois........	April 1947-March 1948	146,400	0.15	22,000	....
Wind River at Riverton......	1947	913,300	.23	210,000	179,000
Do..........	1948	665,700	.24	160,000	
Do..........	1949	561,200	.30	168,000	
Fivemile Creek near Shoshoni.	1950	87,380	2.33	204,000	....
Bighorn River at Thermopolis...	1947	1,784,000	.47	838,000	730,000
Do..........	1948	1,185,000	.59	699,000	
Do..........	1949	1,124,000	.58	652,000	
Do..........	1951	1,601,000	.50	801,000	....
Do..........	1952	a 542,300	.58	a 315,000	....

a Flow controlled by Boysen Reservoir.

Minerals are being dissolved and removed from all parts of the Wind River Basin, but the rates at which this process is proceeding are far from uniform. Plate 12 shows the Wind River Basin divided into five areas and the average tons of salt per square mile that are being eroded from each area. The percentages approximate the total salt discharge at Thermopolis that originates in each area. The quantities of salt for areas A, B, and D were determined from satisfactory quality-of-water and streamflow records. The average annual salt load from the Popo Agie River basin (area C) was estimated from specific conductance versus water discharge relationships of miscellaneous sediment and chemical-quality samples, which were collected over several years and were fairly equally distributed throughout the normal range of streamflow. The salt discharge from area E was computed as the difference between the quantities measured at Thermopolis and from the other areas. These estimated figures from areas C and E are compatible with known geology, runoff characteristics, and chemical quality of the water; therefore, they are probably of the proper magnitude. The salts carried by the Wyoming Canal into area D originated from area B and, consequently, have been included with the quantities measured in the Wind River at Riverton and deducted from the basins of Fivemile, Muddy, and Dry Cottonwood Creeks.

Plate 12 illustrates several important erosion-by-solution characteristics in the Wind River Basin. Precipitation and runoff are very important factors. Although the streams in areas A, B, and C are generally dilute, these mountainous and foothill areas that are subjected to heavy precipitation are undergoing chemical erosion about twice as fast as the arid region in the eastern section. The fact that the Popo Agie River basin is apparently being leached a little more rapidly than the upper and middle Wind River drainage basins is probably the result of the extensive outcrops (about 500 square miles) of more soluble Mesozoic rocks.

Areas D and E are similar in geology, climate, elevation, topography, and stream gradient and, under natural conditions, should be similar in salt discharge. The dissimilar environmental factor is the manmade modification of the natural regimen, irrigation. Irrigation, by simulating heavy precipitation and increasing the surface and ground-water runoff, has increased the speed of solution in area D. The salt load from the irrigated section cannot be completely segregated from the nonirrigated part, but much of the increased load comes from irrigation drainage into lower Fivemile and Muddy Creeks. In 1951 Fivemile Creek basin between the upper station near Pavillion and the lower station near Shoshoni, an area of 254 square miles, discharged about 140,000 tons of dissolved minerals in excess of the quantity entering the area via the Wyoming Canal. This is about 500 to 600 tons per square mile, or more than 10 times the load that would be expected without irrigation.

WATER QUALITY AND USE

Water is one of the most widely used resources of our land. However, the chemical quality of water is often a limiting factor in determining the effective utility or worth of a water supply to the consumer. Surface waters of many types and concentrations flow in the Wind River Basin; but, except for some tributary streams, mostly minor, the water is of generally good quality for many uses. To present water-quality criteria for all purposes would be an endless task; therefore, only the major water uses will be included in the following discussion.

DOMESTIC PURPOSES

Any water supply for domestic use should be clear, pleasant to the taste, of reasonable temperature, neither corrosive nor scale forming, and free from pathogenic organisms. To meet this ideal, departments of health have from time to time established standards for the quality of water. The only nationwide standards pertaining to the quality of potable water supplies are the Drinking Water Standards of the U. S. Public Health Service (1946). These standards were first enacted in 1914 under the provisions of the Interstate Quarantine Regulations and have since been revised in 1925, 1942, and 1946. Specifically, these standards apply only to the waters that are used for drinking and culinary purposes on railroad cars, aircraft, and vessels in interstate traffic. However, they have been adopted by the American Water Works Association as recommended limitations for public water supplies. Those standards that pertain to chemical constituents are reproduced, in part, in the following table:

Allowable limits, in parts per million, for potable water

Constituents	Limiting concentrations
Iron and manganese together.........	0.3
Magnesium	125
Chloride............................	250
Fluoride............................	1.5
Sulfate	250
Dissolved solids....................	a 500

a 1,000 ppm permitted if no other water is available.

Some concentrations of certain chemical constituents may be very undesirable. Iron and manganese in high concentrations are objectionable for domestic uses because they may stain porcelain, enamel, clothing, and other fabrics. Water containing large quantities of magnesium in conjunction with sulfate (Epsom salts) has saline cathartic properties. Chloride in concentrations much more than 500 ppm imparts a characteristic salty taste.

High fluoride concentration in water is known to be associated with the dental effect known as mottled enamel if the water is used for drinking by children during calcification, or formation of the teeth. However, the consumption of water that contains small quantities of fluoride during the same period has been shown to lessen or prevent the incidence of dental caries in teeth. The American Dental Association and many State and local health agencies recommend about 1.0 ppm of fluoride in the drinking water for children during the calcification period of the teeth.

Nitrate in water may indicate previous contamination by sewage or other organic matter as it represents the final stage of oxidation in the nitrogen cycle. Cyanosis in infants (blue babies) has been attributed to drinking water that had a high nitrate content.

Hardness is the characteristic of water usually recognized by the increased quantity of soap required to produce a lather or by the deposits of insoluble salts formed when the water is heated or evaporated. Calcium and magnesium are the principal causes of hardness of water. Other constituents, such as iron, aluminum, strontium, barium, zinc, or free acid, also cause hardness; however, they are not present in sufficient quantities, as a rule, to have any appreciable effect. Specific limits cannot be set on hardness, but the following gradations are generally recognized and are convenient for classification and description:

Hardness (ppm)	Rating and usability
Less than 60	Soft--suitable for many uses without further softening.
61-120	Moderately hard--usable except in some industrial applications. Softening profitable for laundries.
121-200	Hard--softening required by laundries and some other industries.
More than 200	Very hard--requires softening for most purposes.

The suitability of the water from each source, within the limits of the completeness of record, can be determined from the chemical analyses in tables 86-96.

INDUSTRY

Industry uses water in many ways. The quality of the water is often of more concern to industry than the quantity; to treat the water may cost more than to develop the original supply. When the water is used in processing a product, its quality is a critical consideration and must be adapted to suit the particular requirement. Often uniformity in quality of the water is as necessary as special chemical characteristics. The extremes given in tables 86, 88, and 95 show that the water of the main stem of the Wind-Bighorn River is relatively uniform in chemical quality throughout the year, when compared with other surface waters of the Missouri River basin. The requirements of water quality for different types of industry and processes are given in table 99.

Turbidity of water is due to suspended material, such as silt, clay, finely divided organic material, and microscopic organisms. In addition to the obvious objections to turbidity, the abrasive action on pumps, valves, and turbine blades may be very costly.

Hardness is objectionable because of the formation of scale in boilers, water heaters, radiators, and pipes, with the resultant loss in heat transfer, boiler failure, and loss of flow. However, some calcium carbonate in water does advantageously form protective coatings on pipes and other equipment. Calcium salts are often added to increase the hardness in water used by the brewing industry. Iron and manganese are objectionable in water for several reasons. Oxidized iron and manganese are very slightly soluble in alkaline solutions; consequently, the precipitation of these oxides may interfere with a process by producing turbidity. Iron and manganese also form colored complexes with several organic and inorganic radicals or compounds. Aluminum, iron, and certain other metals are objectionable for the manufacture of photographic film. High dissolved-solids concentration may be closely associated with the corrosive property of a water, particularly if chloride is present in appreciable quantities. Water containing high concentrations of magnesium chloride may be very corrosive because the hydrolysis of this unstable salt yields hydrochloric acid.

Table 99.--Water-quality tolerances for industrial applications 1/
[Allowable limits in parts per million except as indicated]

Industry	Turbidity	Color	Color + O_2 consumed	D. O. (ml/l)	Odor	Hardness	Alkalinity (as $CaCO_3$)	pH	Total solids	Ca	Fe	Mn	Fe + Mn	Al_2O_3	SiO_2	Cu	F	CO_3	HCO_3	OH	$CaSO_4$	Na_2SO_4 to Na_2SO_3 ratio	General 2/
Air conditioning 3/	...	...	...	...	...	...	...	...	...	...	0.5	0.5	0.5	...	...	...	...	...	...	...	...	...	A, B
Baking	10	10	...	...	...	(4)	...	...	...	...	.2	.2	.2	...	...	...	...	...	...	...	...	...	C
Boiler feed:																							
0-150 psi	20	80	100	2	...	75	...	8.0+	3,000-1,000	...	...	...	...	5	40	...	...	200	50	50	...	1 to 1	...
150-250 psi	10	40	50	.2	...	40	...	8.5+	2,500-500	...	...	...	...	.5	20	...	...	100	30	40	...	2 to 1	...
250 psi and up	5	5	10	0	...	8	...	9.0+	1,500-100	...	...	...	...	.05	5	...	...	40	5	30	...	3 to 1	...
Brewing: 5/																							
Light	10	...	...	...	Low	...	75	6.5-7.0	500	100-200	.1	.1	.1	...	...	...	1	...	...	...	100-200	...	C, D
Dark	10	...	...	...	Low	...	150	7.0→	1,000	200-500	.1	.1	.1	...	...	...	1	...	...	...	200-500	...	C, D
Canning:																							
Legumes	10	...	...	...	Low	25-75	...	...	...	...	.2	.2	.2	...	...	...	...	...	...	...	...	...	C
General	10	...	...	...	Low	...	...	...	...	...	.2	.2	.2	...	...	...	1	...	...	...	...	...	C
Carbonated beverages 6/	2	10	10	...	0	250	50	...	850	...	.2	.2	.3	...	...	...	.2	...	...	...	...	...	C
Confectionary	...	...	...	...	Low	...	...	(7)	100	...	.2	.2	.2	...	...	...	...	...	...	...	...	...	...
Cooling 8/	50	...	...	...	...	50	...	...	...	...	.5	.5	.5	...	...	...	...	...	...	...	...	...	A, B
Food, general	10	...	...	...	Low	...	...	...	...	...	.2	.2	.2	...	...	...	...	...	...	...	...	...	C
Ice (raw water) 9/	1-5	5	...	...	...	...	30-50	...	300	...	.2	.2	.2	...	10	...	...	...	...	...	...	...	C
Laundering	...	...	...	...	...	50	...	...	...	...	.2	.2	.2	...	...	...	...	...	...	...	...	...	...
Plastics, clear, undercolored	2	2	...	...	...	...	...	...	200	...	.02	.02	.02	...	...	...	...	...	...	...	...	...	...
Paper and pulp: 10/																							
Groundwood	50	20	...	...	...	180	...	...	...	...	1.0	.5	1.0	...	...	...	...	...	...	...	...	...	A
Kraft pulp	25	15	...	...	...	100	...	...	300	...	.2	.1	.2	...	...	...	...	...	...	...	...	...	...
Soda and sulfite	15	10	...	...	...	100	...	...	200	...	.1	.05	.1	...	...	...	...	...	...	...	...	...	...
Light paper, HL-Grade	5	5	...	...	...	50	...	...	200	...	.1	.05	.1	...	...	...	...	...	...	...	...	...	B

See footnotes at end of table.

Table 99.--Water-quality tolerances for industrial applications 1/--Continued

Industry	Turbidity	Color	Color + O_2 consumed	D. O. (ml/1)	Odor	Hardness	Alkalinity (as $CaCO_3$)	pH	Total solids	Ca	Fe	Mn	Fe + Mn	Al_2O_3	SiO_2	Cu	F	CO_3	HCO_3	OH	$CaSO_4$	Na_2SO_4 to Na_2SO_3 ratio	General 2/
Rayon (viscose) pulp:																							
Production	5	5	...	...	...	8	50	...	100	...	0.05	0.03	0.05	<8.0	<25	<5	...	...	...	...	...	...	...
Manufacture	.3	...	...	...	...	55	...	7.8-8.3	...	...	.0	.0	.0	...	...	...	...	...	...	...	...	...	...
Tanning 11/	20	10-100	...	...	...	50-135	135	8.0	...	...	.2	.2	.2	...	...	...	...	...	...	...	...	...	...
Textiles:																							
General	5	20	...	...	...	20	...	...	...	...	.25	.25	...	...	...	...	...	...	...	...	...	...	...
Dyeing 12/	5	5-20	...	...	...	20	...	...	...	...	.25	.25	.25	...	...	...	...	...	...	...	...	...	...
Wool scouring 13/	...	70	...	...	...	20	...	...	...	...	1.0	1.0	1.0	...	...	...	...	...	...	...	...	...	...
Cotton bandage 13/	5	5	...	...	Low	20	...	...	...	...	.2	.2	.2	...	...	...	...	...	...	...	...	...	...

1 American Water Works Association, 1950.
2 A--No corrosiveness; B--No slime formation; C--Conformance to Federal drinking water standards necessary; D--NaCl, 275 ppm.
3 Waters with algae and hydrogen sulfide odors are most unsuitable for air conditioning.
4 Some hardness desirable.
5 Water for distilling must meet the same general requirements as for brewing (gin and spirits mashing water of light-beer quality; whiskey mashing water of dark-beer quality).
6 Clear, odorless, sterile water for syrup and carbonization. Water consistent in character. Most high quality filtered municipal water not satisfactory for beverages.
7 Hard candy requires pH of 7.0 or greater, as low value favors inversion of sucrose, causing sticky product.
8 Control of corrosiveness is necessary as is also control of organisms, such as sulfur and iron bacteria, which tend to form slimes.
9 $Ca(HCO_3)_2$ particularly troublesome. $Mg(HCO_3)_2$ tends to greenish color. CO_2 assists to prevent cracking. Sulfates and chlorides of Ca, Mg, Na should each be less than 300 ppm (white butts).
10 Uniformity of composition and temperature desirable. Iron objectionable as cellulose adsorbs iron from dilute solutions. Manganese very objectionable, clogs pipelines and is oxidized to permanganates by chlorine, causing reddish color.
11 Excessive iron, manganese or turbidity creates spots and discoloration in tanning of hides and leather goods.
12 Constant composition; residual alumina 0.5 ppm.
13 Calcium, magnesium, iron, manganese, suspended matter, and soluble organic matter may be objectionable.

Water to be used for boiler feeding must meet the most exacting quality requirements. High-pressure boilers require water from which almost all organic and inorganic solids and dissolved gases have been removed.

Water for industry is usually withdrawn at a rather uniform rate, which is not dependent on the river stage. For this reason, discharge composites (the type used most in this investigation) are not altogether satisfactory for defining the average water quality of a composite period, nor are the annual weighted averages in tables 86, 88, 89, 91, and 92 truly applicable. Constituent concentrations determined on discharge composites or calculated as weighted averages are generally lower than the concentrations that would be obtained from equal-volume composites and annual arithmetical averages or by uniform withdrawal from the stream. For example, for the sampled period of the Wind River at Riverton in 1949, the weighted-average specific conductance was 315 micromhos, whereas the arithmetical average of conductances of daily samples was 374 micromhos. On the other hand, if a large reservoir is upstream from the withdrawal point and mixing is complete, the user receives a water that has been mixed in proportion to the discharge of the water that enters the reservoir. In this case, discharge-weighted averages of chemical constituents compiled before impoundment are desirable data for predicting average quality characteristics. The chemical-quality record at Thermopolis is an example, and the weighted-average concentrations in table 95 are probably representative of the average quality of water available to users between Boysen Reservoir and the major hot-springs inflow downstream from the sampling station at Thermopolis.

The Wind River at Riverton is generally suitable for many industrial purposes, without or with minor treatment. The water has a low salinity and a low chloride content, and it is moderately hard. The pH of composited samples ranged from 8.4 to 7.2. Because of its low temperature, the water is well suited for cooling. The frequency distribution of water temperatures, determined once daily, is shown in figure 42. Ninety percent of the readings of water temperature were less than 68°F; 70 percent, less than 60°F; and 50 percent, less than 50°F.

IRRIGATION

Irrigation is an integral part of the agrarian economy in some sections of the Wind River Basin. In 1950, 134,413 acres

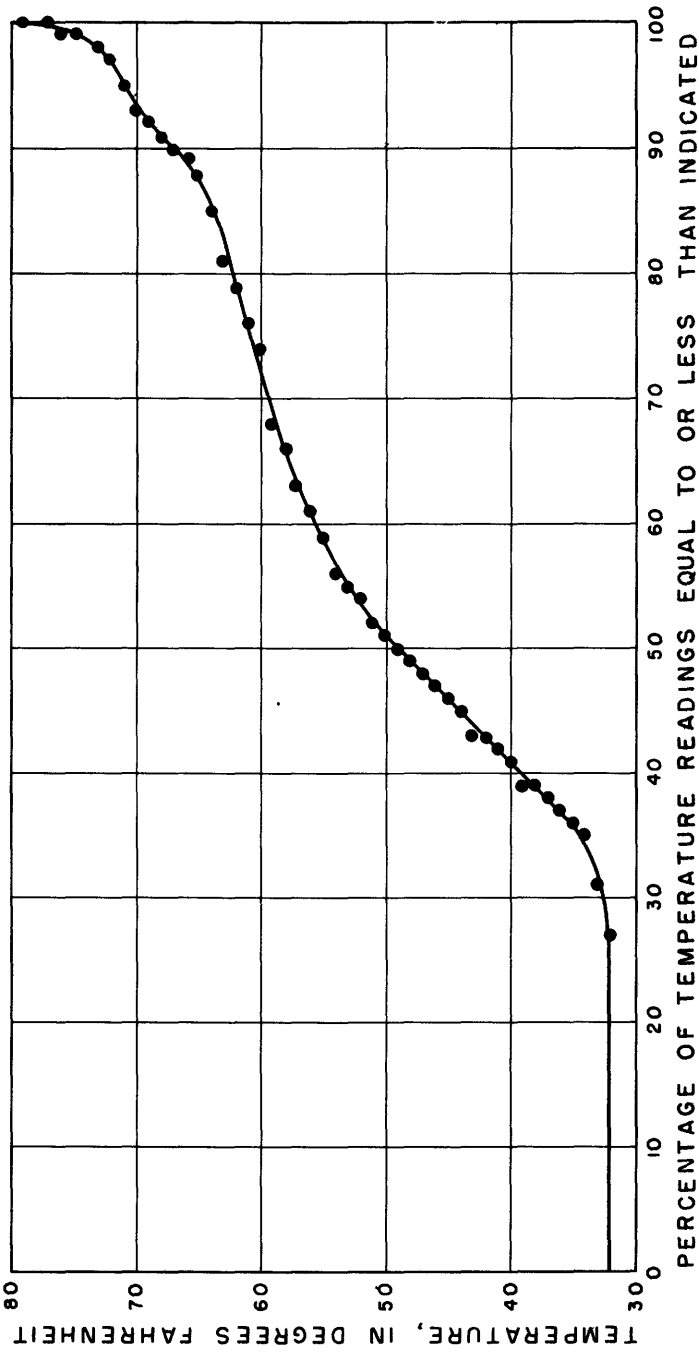

Figure 42. --Frequency distribution of water temperatures, Wind River at Riverton, 1948-49.

of land were under irrigation. 11/ One of the major features of the program of development in the basin is the extension of irrigation to additional available lands and the delivery of supplemental water to some land now being irrigated. The location and extent of irrigated and irrigable lands are shown on plate 9. Water impounded by Boysen Dam is also used for irrigation downstream.

CRITERIA FOR RATING IRRIGATION WATERS

Irrigationists have long recognized that the success or economic feasibility of irrigation is closely associated with water quality, and a better understanding of the subject is developing rapidly. The interpretation of the analysis of an irrigation water has been described as empirical in the sense that an explanation of the analysis is based on field observation, experience, and plant tolerance research. Thus the rating and classification of an irrigation water under such circumstances would appear to be wholly arbitrary; but, although different avenues of approach are often used, the agreement among workers in this field is good. The following statements have been drawn largely from publications in the field of irrigation, particularly the subject of quality of water for irrigation (Wilcox, 1948; Scofield, 1936; Israelsen, 1950; Chem. and Eng. News, 1951; Eaton, 1950; Thorne and Thorne, 1951; Eaton, 1954; U. S. Salinity Laboratory Staff, 1954; U. S. Bureau of Reclamation, 1953; Wilcox, Blair, and Bower, 1954).

Chemical-quality factors that determine the suitability of a water for irrigation are (1) the total salt content and amount of some constituents of the original water, (2) the relative proportions of some of the ions in the solution, and (3) the concentration of salts and the chemical changes that take place in the soil because of evapotranspiration. Poor irrigation practice or application of water of unsuitable quality may often decrease the productivity of the land. It has long been recognized that without adequate drainage and (or) application in excess of normal requirements, water classified as excellent for irrigation has resulted in saline and relatively impervious soils. Conversely, relatively saline waters, when applied in excess of normal

11/ United States Bureau of Reclamation, 1950, Summary of accomplishments on Interior Missouri Basin Field Committee program for Wind River Basin, Wyo.: Big Horn Dist., Cody, Wyo.

requirements to permeable, well-drained soil, have been used successfully. The net effect of applying water that has seemingly adverse quality characteristics has often been adjusted or controlled by increasing the drainage, by applying sufficient water in excess of crop needs to maintain a healthy soil structure and crop environment, or by applying chemicals.

Investigations have shown that a high concentration of dissolved salts in the soil or root zone is generally undesirable. However, varieties of plants differ, not only in tolerance of total salts but also in their tolerances of various ions that are in the soil solution. Plants take more water from dilute than from concentrated solutions because of lower osmotic pressure in the dilute soil solution.

Boron in small amounts is essential for the normal growth of all plants; however, it is toxic to certain plants in concentrations that are required for the optimum growth of others. Wilcox (1948, p. 27) recommends the following limits for boron in an irrigation water:

Permissible limits of boron for several classes of irrigation water

Classes of water		Sensitive crops	Semitolerant crops	Tolerant crops
Rating	Grade	Parts per million		
1	Excellent...	< 0.33	< 0.67	< 1.00
2	Good........	0.33 to 0.67	0.67 to 1.33	1.00 to 2.00
3	Permissible.	.67 to 1.00	1.33 to 2.00	2.00 to 3.00
4	Doubtful....	1.00 to 1.25	2.00 to 2.50	3.00 to 3.75
5	Unsuitable..	> 1.25	> 2.50	> 3.75

The nature and concentration of the cations (positively charged ions) in a water are significant in determining the suitability of the water for irrigation, because the reactions of the cations with the soil affect the soil texture. Calcium and magnesium tend to keep a soil permeable and in good tilth; unfavorable physical conditions can result if sodium is the predominant cation. Waters that have high ratios of sodium salts (percent sodium) adversely affect the soil through the chemical process of base exchange, in which sodium replaces calcium and magnesium in the soil complex. Studies in base exchange in the soil show that the soil particles may become dispersed when the percent sodium exceeds 50 or 60 in the irrigation water.

Wilcox (1948) has developed an empirical diagram that has been widely used to rate waters for irrigation on the basis of salinity and percent sodium. (See fig. 43.) Classification is made by this method on the assumption that irrigation practice, soil characteristics, and drainage are normal. On Wilcox's diagram the effects of high percent sodium and high salt content are combined into a single rating system, even though the effects of the two factors are largely independent.

Thorne and Thorne (1951) have gone a step further in developing a rating diagram that shows salinity hazard and sodium hazard independently and that includes soil texture and drainage in the interpretation. (See fig. 44.)

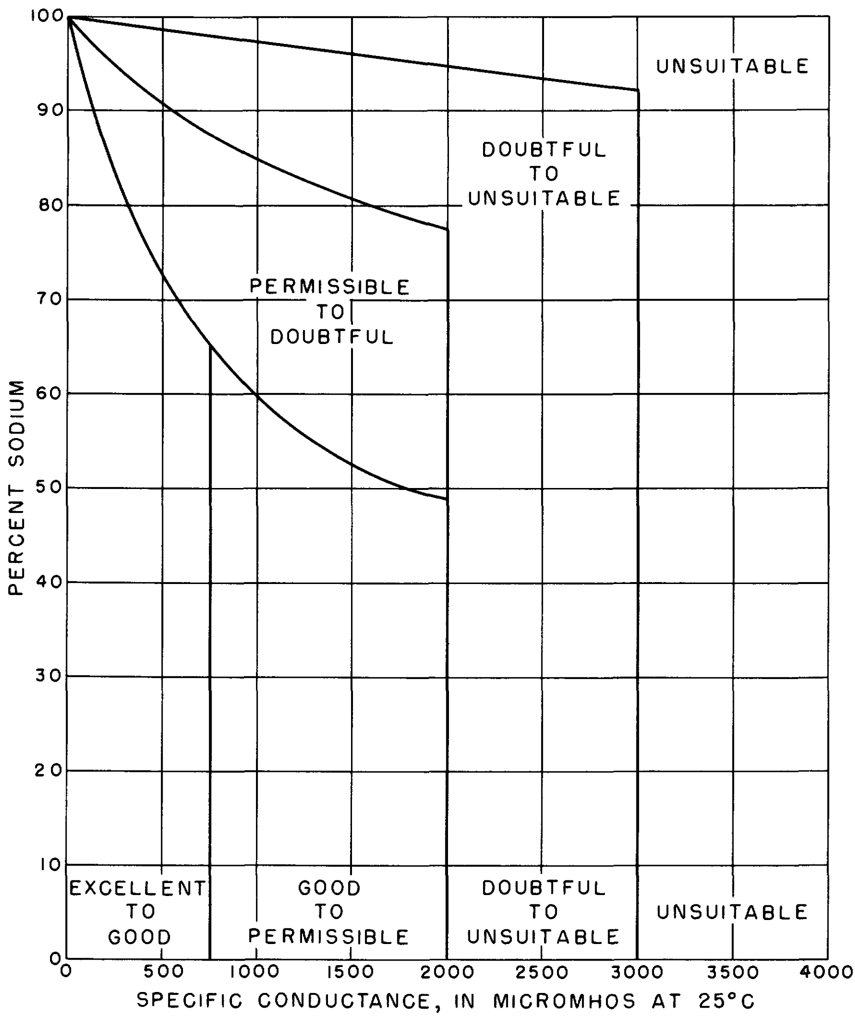

Figure 43.--Diagram by Wilcox for classification of irrigation waters.

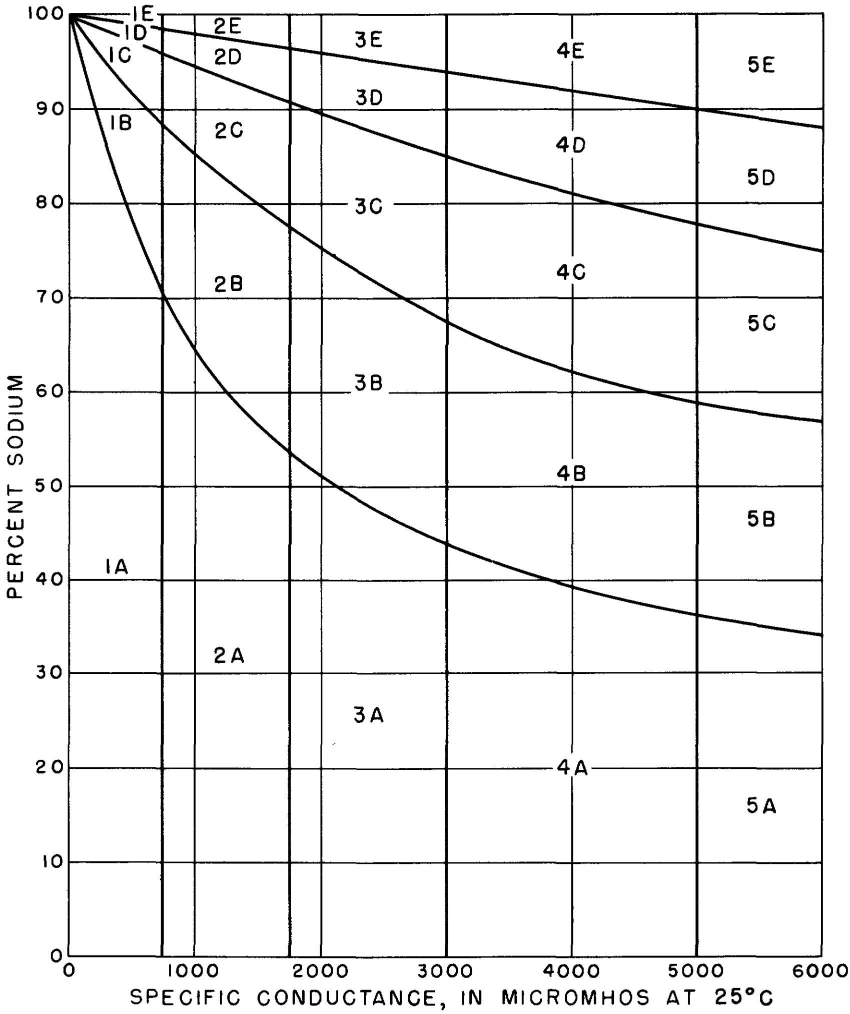

Figure 44. --Diagram by Thorne and Thorne for classification of irrigation waters.

Interpretation of the Thorne and Thorne diagram (1951) is as follows:

Class	Rating
1	Water can be used safely on all soils.
2	It can be expected to cause salt problems where drainage is poor and leaching of residual salts from previous irrigation is not consistently practiced.
3	Water can be used on medium to high salt tolerance crops, on soils of good permeability, and with irrigation practices which provide some leaching.

Class	Rating
4	It can only be used in successful farming with crops of high salt tolerance, on permeable and well-drained soils, and with carefully devised and conducted irrigation and soil management practices.
5	Waters are generally unsuitable and should be used for irrigation only under special situations.

Group	Rating
A	There should be no difficulty from sodium accumulation in soils.
B	Where soils are of fine texture and do not contain gypsum or lime, where drainage is poor, and where small quantities of water are applied with each irrigation, there may be some evidence of sodium accumulation but usually not enough to injure seriously soils or crops. Serious sodium accumulation may occur in waters high in carbonates or bicarbonates.
C	Serious alkali formation should not occur on permeable soils (sands to silt loams), unless poor drainage, residual carbonates in waters, or limited water use are problems. Fine-textured soils must be managed with care.
D	Some alkali formation should be expected in all soils irrigated with group D waters. Sandy or permeable soils high in gypsum might be irrigated with such waters without highly injurious sodium accumulations. Loams or finer textured soils irrigated for some time with 3D or 4D waters and then irrigated with waters of low salt content would probably puddle and require gypsum for reclamation.
E	Generally unsatisfactory for irrigation.

Note.--1C, 1D, and 1E waters often can be improved in quality by treating with gypsum to reduce the sodium percentage.

The sodium-adsorption-ratio (SAR) has also been proposed as a method for predicting the sodium, or alkali, hazard involved in the use of irrigation water (U. S. Salinity Laboratory Staff, 1954). This method is dependent on the equilibrium relations between the exchangeable cations on the soil and the cations in the water. For example, the chemical reaction between a soil saturated with calcium and a water containing sodium ions is

$$Ca^{++}X_2 + 2Na^+ \rightleftharpoons 2Na^+X + Ca^{++}$$

where X designates the soil exchange complex. This reaction is reversible and will not go to completion in either direction, because as long as soluble calcium exists in the solution phase there will be adsorbed calcium on the exchange complex and vice versa. Instead, an equilibrium is established between the ions adsorbed by the soil and the ions in solution. Normal methods and equations for the determination of equilibrium constants that are applicable to relatively simple solutions cannot be satisfactorily applied to soil-water reactions. The difficulties arise in part from the presence of mixtures of different kinds of cation exchange material in the soil and mixtures of different cations in solution. The formula for calculating SAR is empirical. Laboratory analysis has shown that when a soil is leached with a solution containing sodium and calcium until equilibrium is established, the proportions of sodium adsorbed by the soil is dependent both on the quantity of sodium and on the total cation concentration (sodium plus calcium) in the leaching water. (Magnesium reacts similarly to calcium.) Several investigators have proposed that the influence of total concentration is taken into account when the concentration of sodium (epm) is divided by the square root of one-half the calcium and magnesium (epm).

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

On the basis of the relationship between exchangeable sodium percentage of soil samples and calculated SAR, the U. S. Salinity Laboratory Staff (1954) reports that SAR appears to be a useful index for designating the sodium hazard of irrigation water. Figure 45 shows the diagram recommended by the U. S. Salinity Laboratory Staff (1954) for the classification of irrigation waters. The curves have a negative slope to compensate for the dependence of sodium hazard on total concentration. The designers of the diagram point out that:

> In the classification of irrigation waters, it is assumed that the water will be used under average conditions with respect to soil texture, infiltration rate, drainage, quantity of water used, climate and salt tolerances of crop. Large deviations from the average for one or more of these variables may make it unsafe to use what, under average conditions, would be a good water; or may make it safe to use what, under average conditions, would be a water of doubtful quality.

Selection of class demarcation is discussed in detail in the publication by the U. S. Salinity Laboratory Staff (1954). Interpretation of the diagram is as follows:

Salinity Hazard

LOW-SALINITY WATER (C_1) can be used for irrigation with most crops on most soils with little likelihood that soil salinity will develop. Some leaching is required, but this occurs under normal irrigation practices except in soils of extremely low permeability.

MEDIUM-SALINITY WATER (C_2) can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most cases without special practices for salinity control.

HIGH-SALINITY WATER (C_3) cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected.

VERY HIGH SALINITY WATER (C_4) is not suitable for irrigation under ordinary conditions, but may be used occasionally under very special circumstances. The soils must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching, and very salt-tolerant crops should be selected.

Sodium Hazard

The classification of irrigation waters with respect to SAR is based primarily on the effect of exchangeable sodium on the physical condition of the soil. Sodium-sensitive plants may, however, suffer injury as a result of sodium accumulation in plant tissues when exchangeable sodium values are lower than those effective in causing deterioration of the physical condition of the soil.

LOW-SODIUM WATER (S_1) can be used for irrigation on almost all soils with little danger of the development of harmful levels of exchangeable sodium. However, sodium-sensitive crops such as stone-fruit trees and avocados may accumulate injurious concentrations of sodium.

MEDIUM-SODIUM WATER (S_2) will present an appreciable sodium hazard in fine-textured soils having high cation-exchange-capacity, especially under low-leaching conditions, unless gypsum is present in the soil. This water may be used on coarse-textured or organic soils with good permeability.

HIGH-SODIUM WATER (S_3) may produce harmful levels of exchangeable sodium in most soils and will require special soil management--good drainage, high leaching, and organic matter additions. Gypsiferous soils may not develop harmful levels of exchangeable sodium from such waters. Chemical amendments may be required for replacement of exchangeable sodium, except that amendments may not be feasible with waters of very high salinity.

VERY HIGH SODIUM WATER (S_4) is generally unsatisfactory for irrigation purposes except at low and perhaps medium salinity, where the solution of calcium from the soil or use of gypsum or other amendments may make the use of these waters feasible.

Regardless of the method of expressing the relative proportion of sodium, continued application of water that contains a high sodium ratio may cause the soil to become relatively impermeable to the downward movement of water and may ultimately bring about serious drainage problems, saline soils, and crop damage. The phrase "Hard water makes soft land and soft water makes hard land" is an accurate summation of cationic relations.

In studies of water quality for irrigation, the concentrating action of evapotranspiration and the chemical changes that take place in the water through precipitation of some salts and selective plant uptake must also be considered. Surface evaporation

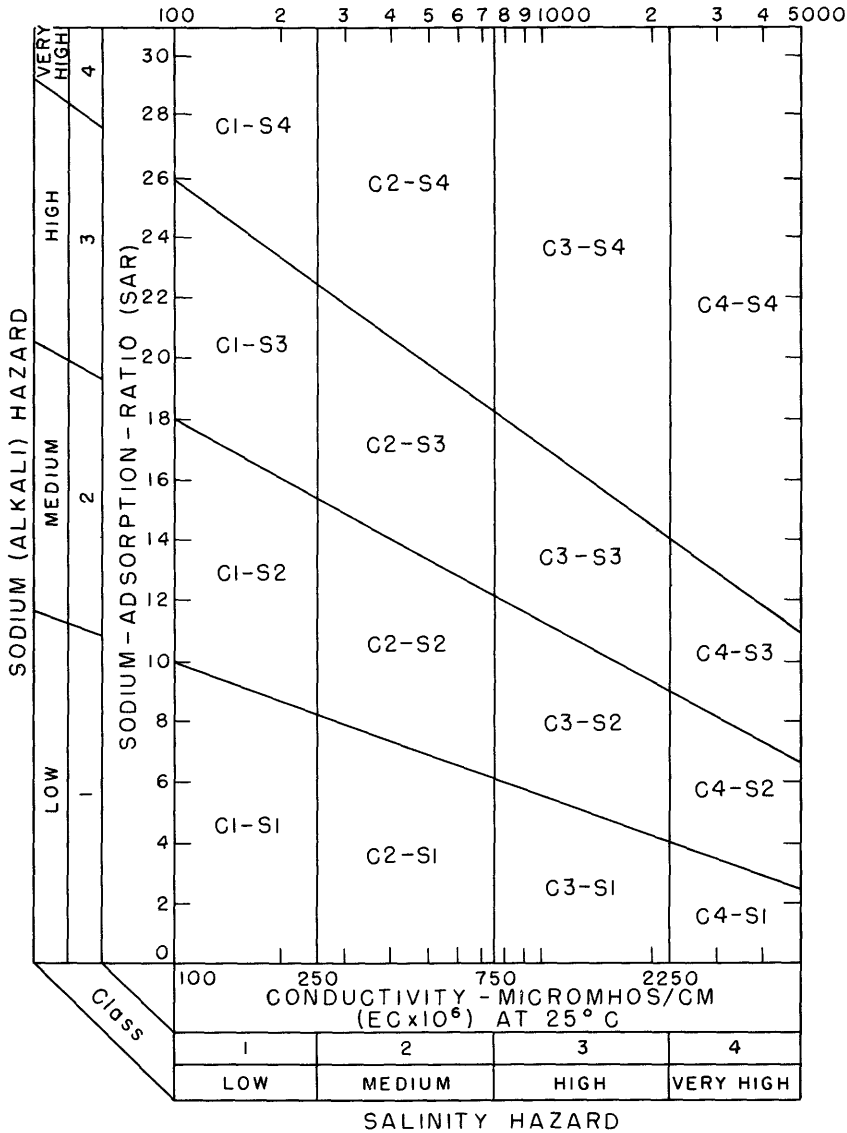

Figure 45. --Diagram by U. S. Salinity Laboratory Staff for classification of irrigation waters.

and plant extraction of water (H_2O), almost always in excess of the intake of salt, increase the concentration of salts in the soil solution. The concentration usually increases with depth through the root zone. Carbonates, because of their ability to form sparingly soluble salts with calcium and magnesium, are the principal constituents influencing changes in percentage composition. In the following discussion the term "carbonate" is used for both carbonate and bicarbonate collectively. As the water solution becomes increasingly concentrated, the changes in chemical quality may follow three general patterns: (1) If little or no carbonate is present, there will be a proportional increase in the quantity per unit volume of all the dissolved constituents until the limit of solubility of any salt is exceeded. (2) If carbonate is present in chemically equal proportions (equivalents per million) to calcium plus magnesium, calcium and magnesium carbonate may precipitate and the percent sodium of the resultant solution will increase. (3) If the carbonate content of the original water exceeds that of calcium plus magnesium, residual sodium carbonate will accompany the increase in percent sodium. The residual sodium carbonate, being the salt of a strong base (sodium) and a weak acid (carbonic), has strong alkaline properties. The organic material of the soil is dissolved by strong alkaline solutions (pH 8.4 or higher), and the soil takes on a grayish or blackish color; such a soil condition is referred to as "black alkali." Wilcox, 12/ from experiments with Rhoades grass and drainages of 25 and 6.25 percent, reports:

> The importance of bicarbonate in irrigation waters has been under investigation at the laboratory for several years. It has been found that bicarbonate waters are less desirable for irrigation purposes than chloride or sulfate waters. Eaton defined the term "residual sodium carbonate" as the excess of bicarbonate over calcium plus magnesium expressed in milliequivalents per liter. Based on the findings of this experiment, it is thought that waters with more than 2.5 meq/l "residual sodium carbonate" are not suitable for irrigation purposes. Waters with from 1.25-2.5 meq/l are marginal and those with less than 1.25 meq/l "residual sodium carbonate" are probably safe. In connection with the marginal group of waters, good management practices and proper use of amendments might make it possible to use some of these waters successfully for irrigation. These conclusions are based on limited data and are, therefore, tentative.

12/ Wilcox, L. V., 1952, Salinity and alkali problems as they relate to the use of western irrigated land, and the relationship of these problems to water quality: Minutes of the 18th mtg. of the Pacific Southwest Federal Interagency Tech. Comm., Dec. 3-4, 1952, attachment 2.

In dilute irrigation water, the percent sodium may be appreciably increased by the preferential assimilation of calcium and magnesium by plants.

Eaton (1954) has used another approach to the irrigation-water subject. Rather than rating a water as good or unsuitable, he has developed formulas that, when applied to any water, define the leaching and amount of chemical additives required. The formulas estimate (1) the percentage of the applied water (irrigation water retained on the land) that should be leached downward beyond the root zone as drainage to maintain low enough salt concentrations in the soil for reasonable yields, and (2) the quantity of gypsum required to prohibit unfavorable sodium ratios. The required gypsum is the amount that must be added to the water to limit the percent sodium to 70, to replace carbonate precipitation of calcium and magnesium, and to replace calcium and magnesium removed by crops. "Good yield" designates, for crops with intermediate salt tolerances, a production level that is between 85 and 90 percent of yields in a semiarid climate obtained on nonsaline land; "reasonable yield," 70 to 80 percent. A summary of Eaton's formulas (1954) in the order of use and the designations used in the formulas are as follows:

Sw--Salinity of irrigation waters expressed as meq/l (or equivalents per million) of Cl plus $\frac{1}{2}SO_4$.

d% and D%--Tentative (d) and final (D) percentage of applied irrigation water passed through the root zone as drainage.

Mss--Salinity of mean soil solution measured as Cl plus $\frac{1}{2}SO_4$, meq/l. The value 40 is taken as a Mss concentration that is expected to produce reasonable yields, and 20 to produce good yields, of crops of intermediate salt tolerance grown in a semiarid climate, such as Riverside, Calif.

Required leaching--tentative

$$\frac{Sw \times 100}{2 \times Mss - Sw} = d\%$$

$$\text{or} \quad \frac{Sw \times 100}{2 \times 40 - Sw} = d\%$$

Calcium requirements--Ca in meq/l

a. To adjust water to 70 percent sodium:

$$Na \times 0.429 - (Ca + Mg) = Ca \text{ (retain plus or minus sign)}$$

b. To offset HCO_3 precipitation:

$$\frac{HCO_3 \times (100 - d\%)}{100} = Ca$$

c. To supply Ca plus Mg taken by plants in excess of Na:

$$\frac{0.30 \times (100 - d\%)}{100} = Ca$$

$$\text{"Total Ca"} = a + b + c$$

Multiply "total Ca" by 234 to get pounds of gypsum per acre-foot of irrigation water.

Required leaching--final

$$\frac{(Sw + \frac{1}{2}\text{"total Ca"}) \times 100}{2 \times Mss - (Sw + \frac{1}{2}\text{"total Ca"})} = D\%$$

In developing the leaching formulas, Eaton expresses the salinity of the irrigation water, soil solution, and drainage water as $Cl + \frac{1}{2}SO_4$ in milliequivalents per liter (equivalents per million). This method was adopted because sulfate is about one-half as toxic to many plants as chloride. The figure for the mean soil solution is empirical; 40 is expected to produce reasonable yields and 20 to produce good yields.

If no salt is lost by precipitation or plant use, the percentage of leaching can be calculated from the increase in salt content of the irrigation water solution as it loses water (H_2O) by evapotranspiration.

$$\text{Leaching } (\%) = 100 \times \frac{\text{applied water concentration}}{\text{leached water concentration}}$$

Because the soil solution increases in concentration with depth, Eaton has assumed that the mean soil-solution concentration (Mss) is the average of the irrigation water and the effluent at the bottom of the root zone.

$$Mss = \frac{\text{applied water concentration} + \text{leached water concentration}}{2}$$

and

$$\text{Leached water concentration} = 2 \times Mss - \text{applied water concentration}$$

When the desired mean soil-solution concentration is inserted in the leaching-percent equation, leaching becomes "required leaching."

Precipitation of calcium and magnesium carbonate and the assimilation of calcium and magnesium in excess of sodium for a unit volume of water decrease as the rate of movement through the soil increases. Hence, the factor (100 - d)/100 is used in the equations for calculating these calcium requirements. The 0.30 milliequivalent per liter to supply calcium taken up by plants in excess of sodium is also empirical; the basis for its selection is discussed in detail in Eaton's paper (1954).

Sulfate added with the calcium ($CaSO_4$) also exerts a toxic effect on the plants and must be included in the final required leaching computations. Because calcium and sulfate are added in equal proportions as gypsum, the quantity of $\frac{1}{2}$ "total Ca" is synonymous with $\frac{1}{2}SO_4$ in expressing salinity.

SUITABILITY OF THE WATERS FOR IRRIGATION

Present irrigators in the Wind River Basin are fortunate in having water of very good quality. Table 100 gives the classifications of water samples from most of the streams that supply irrigation water. When rated by Wilcox's diagram, all the waters, except the low-flow sample from the Little Wind River near Arapahoe, are classed as "excellent to good." Similarly, Thorne and Thorne would rate these waters as "1A," which means that the water could be used safely on all soils and without difficulty from sodium accumulation in the soils. All the samples have a low sodium hazard and all but one have a low or medium salinity hazard when classified by the method of the U. S. Salinity Laboratory Staff. Calculations of required leaching by Eaton's formulas show that the waters are generally so dilute that very little leaching is required to maintain a satisfactory soil-solution concentration for even the best yields if the water were the only source of salt. No additional calcium is required to maintain a percent sodium of less than 70 or to offset bicarbonate precipitation. The required gypsum for some of the more dilute waters is needed to replace plant uptake. The amounts of gypsum shown on table 100 are based on the assumption that all calcium for plant assimilation would come from the irrigation water. This assumption is, of course, not totally applicable in the Wind River Basin because of the generally gypsiferous nature of B-zone soils derived from the Wind River formation and terrace deposits on the floor of the basin. The amount of gypsum required is very small, and if it were not added, the soil calcium would probably be depleted at only a slow rate. Variations in individual crop requirement for calcium per acre-foot of water exceed most of the calcium requirements in table 100. Supplying needed calcium by the application of water in excess is often an alternative to adding gypsum. However, this process has little promise with the dilute waters of the Wind River Basin. Experimental computation with Eaton's formulas indicate that high leaching percentages would be required to supply needed calcium and still maintain a satisfactory mean soil-solution concentration.

The reader should note that the sampling station on the Bighorn River at Thermopolis during the time of this study was above the major hot-springs inflow. Also, the stream traverses and receives drainage from a rather wide expanse of Mesozoic rocks downstream from Thermopolis. For these reasons the chemical-quality records may not be truly representative of the water available to users downstream from the Thermopolis station.

Waterlogging, ponding, lake formation, and surface salt deposits are present in some irrigation projects of the Wind River Basin. The water classifications in table 100 show that these conditions are not caused directly by the dissolved constituents of the applied water but probably arise from one or more other factors, such as permeability of the surficial deposits, salinity of the soil, or irrigation practices.

Little information is available on the practices or conditions relating to quality of water in the privately operated irrigation projects. Most investigations in the Wind River Basin have been in connection with the Riverton project, which is managed by the Bureau of Reclamation. Most quality-of-surface-water data pertaining to irrigation practices were collected in this area. A report entitled "Ground-water resources of the Riverton irrigation project area, Wyoming, with a section on the chemical quality of the ground water" has been prepared. In this report, Morris and others (1956) state that

> The rate of movement of water to properly constructed drains is dependent upon the permeability of the adjacent surficial deposits. The greater the permeability, the more efficient the drain; if the deposits are relatively impermeable, either because of a high content of sodium salts or because of the fine-grained texture, the drain receives water from only a short distance. In many parts of the Riverton irrigation project the permeability of the waterlogged material is low and, although the hydraulic gradient is steep, the drains are ineffective except for short distances on either side. The low permeability of the waterlogged material is the principal obstacle to drainage of many waterlogged areas within the Riverton project.

The salt content of the irrigation water that infiltrates is increased by transpiration and solution of minerals from the soil. During the irrigation season Fivemile Creek carries a mixture of infiltrated water and overland runoff or waste. Overland

Table 100.--Suitability of waters for irrigation

[Calcium a: To adjust water to 70 percent sodium; Calcium b: To offset bicarbonate precipitation; and Calcium c: To supply calcium plus magnesium taken by plants in excess of sodium]

Source	Date	Specific conductance (micromhos at 25°C)	Percent sodium	Sodium-adsorption-ratio	Residual sodium carbonate	Classification: After Wilcox, 1948	Classification: After Thorne and Thorne, 1951	Classification: After U. S. Salinity Laboratory Staff, 1954	After Eaton, 1954: Calcium a (Milliequivalents per liter)	After Eaton, 1954: Calcium b [1] (Milliequivalents per liter)	After Eaton, 1954: Calcium c (Milliequivalents per liter)	After Eaton, 1954: Required leaching (percent) [1]	Required gypsum (lb per acre-ft)
	1953												
Wind River near Burris....	June 14..	170	7	0.1	0	E-G	1A	C1-S1	-1.47	1.43	0.30	0.6	61
Do..................	Sept. 8..	325	18	.5	0	E-G	1A	C2-S1	-2.46	2.33	.30	1.5	40
Wind River near Crowheart.	June 14..	230	13	.3	0	E-G	1A	C1-S1	-1.82	1.78	.30	.9	61
Do..................	July 13..	175	17	.3	0	E-G	1A	C1-S1	-1.28	1.19	.3C	.9	49
Do..................	Aug. 28..	246	24	.6	0	E-G	1A	C1-S1	-1.68	1.57	.30	1.7	44
Do..................	Sept. 8..	262	24	.6	0	E-G	1A	C2-S1	-1.76	1.72	.30	1.7	61
Do..................	Sept. 21.	255	25	.7	0	E-G	1A	C2-S1	-1.68	1.65	.30	1.7	63
	1948												
Wind River above Diversion Dam..................	Oct. 14..	397	20	.6	0	E-G	1A	C2-S1	-2.91	2.68	.29	2.3	14
Wyoming Canal below Diversion Dam..........	Sept. 4..	212	20	.5	0	E-G	1A	C1-S1	-1.60	1.36	.30	1.4	14
	1949												
Do..................	Sept. 16.	248	16	.4	0	E-G	1A	C1-S1	-1.95	1.62	.30	1.3	0
	1953												
Do..................	Aug. 18..	235	21	.5	0	E-G	1A	C1-S1	-1.65	1.49	.30	1.3	33
	1949												
Pilot Butte Reservoir.....	Sept. 16.	294	20	.7	0	E-G	1A	C2-S1	-2.05	1.84	.29	1.8	19

Pilot Canal...............	...do....	288	28	.8	0	E-G	1A	C2-S1	-1.74	1.67	.29	2.1	51
	1953												
Do..................	Aug. 18..	234	18	.4	0	E-G	1A	C1-S1	-1.70	1.52	.30	1.2	28
	1948												
Do..................	Sept. 4..	271	20	.5	0	E-G	1A	C2-S1	-1.88	1.54	.30	1.5	0
	1953												
Lateral P-34.9...........	June 16..	307	31	.9	0	E-G	1A	C2-S1	-1.72	1.54	.29	2.2	26
	1948												
Wind River at Le Clair Diversion Dam..........	Oct. 15..	411	21	.7	0	E-G	1A	C2-S1	-3.00	.89	.29	2.6	0
Wind River at Riverton:													
Weighted average.....	1947	270	15	.4	0	E-G	1A	C2-S1	-2.14	1.76	.30	1.4	0
Do..............	1948	282	25	.7	0	E-G	1A	C2-S1	-1.92	1.89	.30	1.8	63
Do..............	1949	329	26	.8	0	E-G	1A	C2-S1	-2.19	2.01	.29	2.1	26
South Fork Little Wind River:	1945												
SW¼ sec. 6, T. 1 S., R. 1 W............	May 19...	50	13	.2	0	E-G	1A	C1-S1	-.39	.36	.30	.5	63
	1953												
Little Wind River near Arapahoe...............	June 14..	211	20	.5	0	E-G	1A	C1-S1	-1.41	1.04	.30	1.3	0
Do..................	Sept. 10.	1,360	36	2.5	0	G-P	2A	C3-S1	-7.47	2.79	.24	19	0
Bighorn River at Thermopolis:													
Weighted average.....	1947	506	31	1.3	0	E-G	1A	C2-S1	-2.95	2.16	.29	4.5	0
Do..............	1948	590	36	1.6	0	E-G	1A	C2-S1	-3.13	2.33	.28	5.7	0
Do..............	1949	616	37	1.7	0	E-G	1A	C2-S1	-2.95	2.35	.28	5.7	0
Do..............	1951	536	34	1.4	0	E-G	1A	C2-S1	-2.78	2.16	.29	4.6	0

1 For good yield.

runoff becomes more concentrated only by evaporation and surface contact with the soil; this water is much more dilute than infiltrated water. Although it is recognized that soils of low permeability are difficult to irrigate without waste by surface runoff, infiltrated water (except for losses by seepage from canals) is generally productive, and overland runoff and waste are unproductive.

Plate 10 shows the coincidence of the irrigation season with the striking dilution of the base flow of Fivemile Creek by overland runoff and waste water. The salinity of the nonirrigation season drainage measured near Shoshoni was about 3,800 micromhos, and the average salinity of the applied water was about 260 micromhos. When irrigation was begun, the concentration of dissolved salts decreased rapidly and the conductance reached 1,400 to 1,500 micromhos in 1950 and 1951. At the Shoshoni station the average salinity from May to September was about 1,800 micromhos. Discontinuance of irrigation in September is accompanied by a similarly sharp return to high mineralization.

If the base-flow salinity is considered to represent the maximum concentration for infiltrated water and if the salinity of the applied water is considered to represent the minimum concentration for surface runoff and waste, then during the irrigation season the water of Fivemile Creek more closely resembles the latter.

In summation, the irrigation water is of such quality that it may be used rather sparingly without danger of accumulation of harmful salts from the applied water. However, in some sections the low soil permeability and the application of large quantities of water are generally incompatible and are conducive to waterlogging, surface encrustations, and salinization of the soil.

CONCLUSIONS

Large areas in the Wind River Basin contribute little sediment. Streams rising in the Wind River Mountains carry negligible amounts of sediment in large volumes of water. After these streams leave the mountains, they pick up some sediment from their channels, from irrigation return flows, and from inflow of tributaries on the basin floor. Mineral salts are dissolved from rocks and soils throughout the basin. The type of material in solution depends primarily on geology, whereas the quantity of material being transported is more closely related to the quantity of water that comes in contact with the soil and rocks.

Average annual runoff in the basin is about 3.6 inches on the basis of adjusted streamflow records for the Bighorn River near Thermopolis. The runoff originates mostly in mountain areas from melting snow plus spring and early summer rains. Because annual water losses are small in comparison to annual precipitation, runoff from the mountains does not vary greatly from year to year. On the floor of the basin runoff is low and is generated mostly by storms in the late spring and summer. The annual water losses nearly equal the annual precipitation; therefore, runoff is extremely variable, in terms of percentage changes, from year to year and from place to place during any 1 year.

Measured suspended-sediment discharge of the Bighorn River at Thermopolis from October 1, 1946, to September 30, 1951, totaled 23,510,800 tons, an average of 4,702,000 tons per year. The estimated total sediment discharge for this same period was 5,080,000 tons per year. The suspended sediment measured at Thermopolis from October 1, 1946, to September 30, 1950, if converted to acre-feet by using a computed specific weight of 58 pounds per cubic foot, would equal 18,600 acre-feet; an average of about 3,700 acre-feet per year of relatively uncompacted sediment.

Ratios of computed instantaneous total sediment discharge to measured suspended-sediment discharge obtained from computations for 8 sediment stations were as low as 1.05 and as high as 1.75. The computations of total sediment discharge cover a range in water discharge of 20 to 8,360 cfs and a range of measured sediment discharge of 194 to 366,000 tons per day. Unmeasured sediment discharge increased in approximate proportion to water discharge for 3 streams, as about the 1.2 power of the water discharge for 2 streams, and as about the 1.5 power for another stream. The percentage of unmeasured sediment discharge becomes small for large flows that contain high concentrations of suspended sediment. However, at such large flows the unmeasured tonnage is much higher than at small flows.

Particle-size distributions of the computed total sediment discharge, although subject to large computation errors, seemed to be fairly good approximations of the particle-size distributions of suspended sediment at contracted sections. Computed particle sizes of the total sediment discharge usually showed far coarser sediment than was collected in depth-integrated samples at normal sections.

The area underlain by Precambrian rocks covers 14 percent of the basin; it yields 59 percent of the water and much less than 1 percent of the sediment. In contrast, the area underlain by rocks of Quaternary age covers 16 percent of the basin; it yields about 63 percent of the sediment but only about 2.5 percent of the water.

At the junction of the Wind and Popo Agie Rivers, the streamflow averages about 86 percent of the flow at Thermopolis, but the sediment discharge averages only about 16 percent of the sediment discharged past Thermopolis. Fivemile Creek alone contributes about 56 percent of the average sediment discharge but only 7 percent of the average water discharge of the Bighorn River at Thermopolis. Only a few percent of the sediment discharge of Fivemile Creek comes from outside the Riverton irrigation project. On the basis of records during 1949 and 1950, about 87 percent of the sediment discharge comes from the bed and banks of Fivemile Creek within the project area. Since the summer of 1950, return flows from irrigation have increased the sediment yields from Muddy Creek. Its sediment yield now (1954) exceeds the sediment yield of any other Wind River tributary except Fivemile Creek. Muskrat and Badwater Creeks also discharge much sediment during some years.

Sediment yields from different tributary drainage basins, particularly those from Graham Draw and Poison Creek, indicate that much sediment in transport in small headwater tributaries may never, or only after long periods of time, reach the mouths of the larger streams under the unregulated regimen of the stream. Major reductions in sediment yield on streams whose natural regimen is not affected by irrigation would require regulation of sediment and water during the rare, large floods. The impoundment of sediment during these floods is likely to be less effective than the regulation of flow in reducing sediment yields.

Surface waters of the Wind River drainage basin differ widely in total dissolved-solids concentrations and proportions of individual constituents. The chemical quality of each stream is the resultant of individual environment. Climate and runoff characteristics, geology, and irrigation practices are the major factors that determine the quality of these waters.

Water that flows over only Precambrian and Paleozoic rocks is generally very dilute, and calcium bicarbonate is the principal dissolved salt. Some of the formations of Mesozoic age contain much readily soluble material, and water in contact with them dissolves appreciable quantities of calcium and sulfate and lesser amounts of sodium and carbonate. Water that drains from Tertiary rocks of volcanic origin is generally high in silica, dilute, and of the calcium bicarbonate type. Some streams rise high in the mountains and, in turn, traverse Precambrian, Paleozoic, and Mesozoic rocks; these streams are geochemically similar to streams that drain the Wind River formation.

Streamflow has a marked effect on water quality. Water during high river stage is generally more dilute than during low stage, but the differences in quality from time to time for a given water-discharge range can be very great. However, the highest concentrations of salts do not accompany the lowest water discharges. The water at very low stage, or base flow, originates primarily from snowmelt or precipitation high in the mountains and is dilute; maximum salinity probably results from mild precipitation on, or ground-water discharge from, the highly mineralized Mesozoic and Tertiary materials.

When the dilute calcium carbonate-type water from the Wyoming Canal is diverted onto the Riverton project, its salt content and geochemical character are altered by evaportranspiration, by picking up accumulated salts in the irrigated lands, and by solution of minerals from the soil and mantle rock. Samples collected from drains into Fivemile Creek and Ocean Lake indicate that the geochemical processes are similar throughout the area--sodium and calcium sulfate, and to a lesser extent carbonate, become the predominant ions in solution. Ocean Lake, by means of the chemical reactions therein, acts as a differentiating agent in retaining some of the calcium carbonate and thereby increases the percentage of sodium sulfate in the effluent water. An estimated 10, 000 tons per year of calcium carbonate is being removed from solution and deposited in Ocean Lake. However, this retention is of little consequence in relation to the combined salt discharges from the project and is insignificant in basin-wide considerations.

The average annual discharge of minerals in solution from the Wind River Basin measured at Thermopolis, before closure of Boysen Dam, was 748, 000 tons. The quantity of material leached from soils and rocks is more dependent on the quantity of water that the land is subjected to than on the amount or solubility of the salts. Because of the heavy precipitation in the Wind River Mountains, the annual rate of erosion-by-solution in the Wind River Basin upstream from Riverton and in the Popo Agie River basin is about 100 tons per square mile. This is about twice the quantity dissolved from a square mile of the more arid region in the nonirrigated eastern part of the basin. Most of the salt load from the Fivemile-Muddy-Dry Cottonwood Creeks system comes from the irrigated section; in 1951 about 140, 000 tons of dissolved minerals, in excess of the load brought in by the Wyoming Canal, was discharged from the Fivemile Creek drainage area between the Wyoming Canal and the station near Shoshoni. This amount represents removal of 500 to 600 tons per square mile per year, or approximately 10 times the solution rate that would be expected without irrigation.

Most of the surface waters are generally satisfactory for domestic use. Because of low salinity and chemical character, much of the water is also of good quality for some industrial uses. The Wind River at Riverton has desirable cooling properties; 90 percent of daily water-temperature readings were less than 68°F.

Present sources of irrigation supply are of very good quality. When rated by Wilcox's diagram on the basis of salinity and percent sodium, these waters are classified as "excellent to good." Similarly, Thorne and Thorne's system for rating, which is for normal drainage and irrigation practices, indicates that the water could be used safely on all soils without difficulty of sodium accumulation. Low sodium hazards and low or medium salinity hazards are predicted by the method of classification recommended by the U. S. Salinity Laboratory Staff. Calculation of required leaching by Eaton's formulas shows that the waters are generally so dilute that very little leaching is required to maintain a satisfactory soil-solution concentration for even the best crop yields if the water were the only source of the salt. Quality of the irrigation water indicates that the salt accumulation and drainage problems, which are present in some of the irrigated areas, have not been caused by the application of poor- or questionable-quality water.

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TABLES OF BASIC DATA

Table 4.--Suspended-sediment data for unscheduled stations in the Wind River Basin during high and low flows

Station	High flow				Low flow			
	Date of collection	Water discharge (cfs)	Concentration (ppm)	Suspended-sediment discharge (tons per day)	Date of collection	Water discharge (cfs)	Concentration (ppm)	Suspended-sediment discharge (tons per day)
	1953				1953			
Wind River near Dubois	June 14	1,410	1,170	4,450	Sept. 9	93	13	3.3
Horse Creek at Dubois	15	454	632	775	9	29.6	8	.6
North Fork Wind River near Duncan	15	1,240	709	2,370	9	73.7	6	1.2
East Fork Wind River near Duncan	15	692	1,330	2,480	9	14.4	11	.4
Wind River near Burris	14	7,090	1,670	32,000	8	417	8	9.0
Dry Creek at Burris	16	253	38	26	8	a 1.5	2	.01
Crow Creek near Crowheart	16	203	2,390	1,310	9	a .4	12	.01
Meadow Creek near Crowheart	16	22	66	3.9	8	6.92	15	.3
Willow Creek near Crowheart	16	88	164	39	8	8.04	12	.3
Bull Lake Creek near Lenore	15	94	9	2.3	8	359	5	4.8
Wind River near Crowheart	14	10,600	1,600	45,800	8	794	10	21
Dry Creek near Morton	15	32	1,620	140	9	0	....	....
North Fork Popo Agie River near Lander	14	1,230	64	213	8	14.8	4	.2
Middle Fork Popo Agie River near Lander	15	1,040	91	256	8	1.12	14	.04
Little Popo Agie River at Hudson	14	609	1,290	2,120	8	22	25	1.5
South Fork Little Wind River near Fort Washakie	15	1,040	32	90	8	2.51	3	.02
North Fork Little Wind River near Fort Washakie	15	1,130	29	88	8	31.4	66	5.6
Little Wind River near Arapahoe	14	2,040	647	3,560	10	5	22	.3
Badwater Creek at Lybyer Ranch near Lost Cabin	16	12	48	1.6	8	....	....	....

a Estimated.

Table 5.--Periodic determinations of suspended-sediment discharge at scheduled and unscheduled stations

Date	Instantaneous water discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Instantaneous discharge (tons per day)
Wagon Gulch near Dubois			
1948			
Apr. 2	a 8	33,900	700
Wind River below Dubois			
1951			
Apr. 9	b 316	194	166
May 7	b 630	526	895
May 31	b 3,040	660	5,420
June 14	b 3,050	649	5,340
July 17	b 2,180	220	1,290
1952			
May 26	b 1,330	714	2,560
June 23	b 840	39	88
July 23	b 607	21	34
Wind River, 800 feet upstream from mouth of North Fork Wind River, near Dubois			
1949			
Sept. 16	350	225	213
North Fork Wind River near Dubois			
1950			
May 1	65	184	32
Do	83	221	50
May 2	80	40	8.6
Do	86	453	105
May 3	91	179	44
Do	80	256	55
May 4	80	172	37
Do	69	286	53
May 5	66	62	11
Do	86	890	207
May 8	93	606	152
Do	68	702	129
May 9	68	276	51
Do	83	416	93
May 10	60	316	51
May 11	94	1,220	310
Do	77	67	14
May 12	229	650	402
Do	136	76	28
May 15	625	755	1,270
May 16	597	486	783
Do	466	284	357
May 17	700	750	1,420
May 18	788	774	1,650

See footnotes at end of table.

Table 5.--Periodic determinations of suspended-sediment discharge at scheduled and unscheduled stations--Continued

Date	Instantaneous water discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Instantaneous discharge (tons per day)
North Fork Wind River near Dubois--Continued			
1950			
May 18	590	492	784
Do	708	448	856
May 19	392	154	163
Sept. 16	216	114	66
Wind River near Burris (just upstream from mouth of Dinwoody Creek)			
1949			
Sept. 16	720	210	408
Beaver Creek near Arapahoe			
1950			
Apr. 13	37	5,000	500
Apr. 17	72	5,310	1,030
Apr. 20	105	8,500	2,410
Apr. 25	110	6,700	1,990
May 10	89	11,600	2,790
May 17	110	4,680	1,390
June 21	56	1,670	253
July 11	16	1,300	56
July 18	5.5	332	4.9
July 24	9.9	9,840	263
July 26	4.1	4,210	47
Sept. 22	20	6,600	356
Sept. 27	9.2	1,620	40
Fivemile Creek near Pavillion			
1948			
Sept. 20	a 3	11,400	92
Ocean drain at Ocean Lake Outlet near Pavillion			
1949			
Oct. 3	28	2	0.15
Oct. 4	28	5	.38
Oct. 5	27	316	23
Oct. 7	24	7	.45
Oct. 11	24	180	12
Oct. 12	23	12	.75
Oct. 19	24	22	1.4
Oct. 21	25	6	.40
Oct. 26	25	6	.40
Nov. 2	23	8	.50
Nov. 4	23	6	.37
Nov. 16	16	22	.95
Nov. 23	17	89	4.1
Nov. 28	15	186	7.5

See footnotes at end of table.

Table 5.--Periodic determinations of suspended-sediment discharge at scheduled and unscheduled stations--Continued

Date	Instantaneous water discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Instantaneous discharge (tons per day)
Ocean drain at Ocean Lake Outlet near Pavillion--Continued			
1949			
Dec. 7	14	3	0.11
Dec. 14	13	2	.07
Dec. 21	13	2	.07
Dec. 23	12	2	.06
Dec. 28	9.8	2	.05
1950			
Jan. 4	8.2	1	.02
Jan. 18	3.2	1	.01
Feb. 15	16	2	.09
Feb. 22	14	16	.60
Feb. 28	14	5	.19
Mar. 10	15	4	.16
Mar. 17	15	12	.49
Mar. 23	15	21	.85
Mar. 29	12	370	12
Apr. 4	22	17	1.0
Apr. 12	31	3	.25
June 29	17	16	.73
July 27	19	16	.82
July 31	19	11	.56
Sept. 27	28	45	3.4
Oct. 2	26	7	.5
Nov. 13	25	6	.4
Nov. 27	27	3	.2
Dec. 11	26	1	.1
Dec. 26	25	2	.1
1951			
Jan. 8	26	4	.3
July 12	17	5	.2
Aug. 17	40	3	.3
Ocean drain near Pavillion			
1947			
Aug. 20	a 50	4,810	600
1951			
June 7	21	932	53
July 12	68	2,880	529
Aug. 17	71	1,620	311
Aug. 31	66	1,320	235
Sand Gulch near Shoshoni			
1951			
July 12	51	520	72
Aug. 17	52	552	78

See footnotes at end of table.

Table 5.--Periodic determinations of suspended-sediment discharge at scheduled and unscheduled stations--Continued

Date	Instantaneous water discharge (cfs)	Suspended sediment	
		Mean concentration (ppm)	Instantaneous discharge (tons per day)
Fivemile Creek near Shoshoni			
1947			
June 20	a 750	23,700	48,000
Aug. 26	a 250	18,600	13,000
1948			
Mar. 26	a 50	16,000	2,000
Apr. 17	...	12,200	...
Apr. 26	...	9,180	...
May 19	a 50	7,940	1,000
June 3	a 100	24,000	6,000
July 28	...	25,900	...
Aug. 18	a 275	21,300	16,000
Badwater Creek at Bonneville			
1947			
May 7	158	7,270	3,100
June 20	109	20,100	5,910
July 2	49	2,100	278
July 17	29	8,140	638
Do	18	4,720	229
July 22	35	37,600	3,550
July 23	1.8	15,800	77
Do	1.7	14,500	67
Aug. 11	1.6	18,600	80
Do	1.6	20,700	89
Aug. 12	1.6	27,400	118
Sept. 18	2.9	44,400	347
Do	1.5	41,200	167
Wyoming Canal spillway into Muddy Creek near Pavillion			
1951			
May 9	b 44	77	9.1
Muddy Creek near Shoshoni			
1947			
May 1	a 30	19,300	2,000
1948			
Mar. 26	a 25	7,070	500
Apr. 17	...	16,100	...
Apr. 26	...	10,400	...
May 17	a 5	1,860	20
June 3	a 25	10,400	700
Wind River below Boysen Dam			
1951			
June 7	4,530	2,420	29,600

a Estimated.
b Streamflow measurement.

Table 6.--Monthly and annual summary of water and suspended-sediment discharge, Wind River near Dubois, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1947								
August	6,602	13,090	1,880	61	509	6	105	650
September	3,379	6,700	158	5.3	54	1	17	119
Aug. 1 to Sept. 30	9,981	19,790	2,038	33.4	509	1	76	650
October	2,955	5,860	66	2.1	8	1	8	37
November	2,362	4,680	100	3.3	23	1	16	103
December	2,556	5,070	116	3.7	10	1	17	....
1948								
January	1,997	3,960	a 20	.6	....	....	4	....
February	1,865	3,700	a 30	1.0	....	....	6	....
March	1,850	3,670	74	2.4	7	1	15	....
Oct. 1 to Mar. 31	13,585	26,940	406	2.2	23	1	11	103

a Estimated.

Table 7.--Monthly and annual summary of water and suspended-sediment discharge, North Fork Wind River near Dubois, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1951								
Apr. 9-30	4,403	8,730	2,143	97	260	21	180	320
May	27,715	54,970	59,961	1,930	11,000	14	801	2,500

Table 7.--Monthly and annual summary of water and suspended-sediment discharge, North Fork Wind River near Dubois, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1951								
June	40,109	79,560	218,742	7,290	50,000	....	2,020	5,300
July 1-18	26,220	52,010	40,680	2,260	5,100	840	575	1,000
Apr. 9 to July 18	98,447	195,300	321,526	3,180	50,000	14	1,210	5,300
1952								
May	22,751	45,130	12,572	406	2,100	....	205	600
June	37,224	73,830	172,794	5,760	50,000	74	1,720	5,500
July	15,667	31,080	6,907	223	2,400	....	163	950
May 1 to July 31	75,642	150,000	192,273	2,090	50,000	....	941	5,500

Table 8.--Monthly and annual summary of water and suspended-sediment discharge, Wind River at Riverton, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
October	17,535	34,780	a 1,600	52	....	....	34	....
November	12,805	25,400	2,290	76	784	....	66	374
December	14,021	27,810	a 1,020	33	....	....	27	....

1949								
January	11,815	23,430	b 580	19	....	....	18	....
February	9,935	19,710	c 840	30	....	....	31	....
March	16,051	31,840	a 9,920	320	1,140	40	229	795
April	19,817	39,310	15,440	515	4,080	36	289	1,210
May	45,215	89,680	103,400	3,340	22,100	62	847	2,780
June	67,118	133,100	160,400	5,350	25,500	366	885	2,190
July	36,149	71,700	15,310	494	1,090	22	157	240
August	10,047	19,930	a 1,140	37	70	12	42	69
September	22,439	44,510	a 4,790	160	686	20	79	312
Water year 1948-49	282,947	561,200	a 316,700	868	25,500	12	415	2,780
October	32,229	63,930	c 24,000	774	8,700	....	276	2,600
November	20,359	40,380	c 1,300	43	....	....	24	....
December	13,565	26,910	c 830	27	....	....	23	....
1950								
January	13,975	27,720	b 800	26	....	....	21	....
February	13,100	25,980	c 4,300	154	....	....	122	....
March	10,987	21,790	c 1,900	61	....	....	64	....
April	13,693	27,160	a 4,940	165	1,130	....	134	664
May	25,826	51,230	38,760	1,250	5,230	13	556	1,120
June	90,350	179,200	208,400	6,950	18,100	1,790	854	1,890
July	77,230	153,200	69,530	2,240	10,500	216	333	943
August	16,200	32,130	2,480	80	380	19	57	160
September	29,614	58,740	18,330	611	2,790	16	229	867
Water year 1949-50	357,128	708,400	a 375,600	1,030	18,100	....	390	2,600
October	33,625	66,690	17,546	566	3,080	....	193	793
November	21,078	41,810	a 2,221	74	....	....	39	....
December	14,635	29,030	3,107	100	....	....	79	....
1951								
January	14,623	29,000	2,909	94	....	....	74	....
February	14,185	28,140	a 5,141	184	....	....	134	....

See footnotes at end of table.

Table 8.--Monthly and annual summary of water and suspended-sediment discharge, Wind River at Riverton, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1951								
March	14,661	29,080	a 4,386	141	....	....	111	....
April	18,474	36,640	9,563	319	1,700	....	192	620
May	68,804	136,500	257,747	8,310	26,700	....	1,390	2,350
June	104,470	207,200	264,937	8,830	30,100	797	939	1,750
July	96,020	190,500	121,530	3,920	8,520	1,050	469	937
August	40,349	80,030	25,407	820	3,340	....	233	489
September	12,867	25,520	3,012	100	270	....	87	....
Water year 1950-51	453,791	900,100	a 717,506	1,970	30,100	....	586	2,350
October	46,493	92,220	27,557	889	4,940	....	220	680
November	18,887	37,460	c 5,260	175	b 1,500	....	103	....
December	13,345	26,470	b 2,305	74	....	....	64	....
1952								
January	14,690	29,140	b 930	30	....	....	23	....
February	13,380	26,540	b 1,160	40	....	....	32	....
March	11,945	23,690	c 2,799	90	....	....	87	....
April	35,728	70,870	41,926	1,400	5,770	....	435	880
May	52,599	104,300	46,393	1,500	8,440	107	327	950
June	53,390	105,900	143,911	4,800	24,000	103	998	1,860
July	13,055	25,890	4,569	147	1,440	....	130	448
August	11,891	23,590	11,055	357	5,700	....	344	3,100
September	11,816	23,440	878	29	....	....	28	....
Water year 1951-52	297,219	589,500	a 288,743	789	24,000	....	360	3,100

a Includes estimated loads for a few days.
b Estimated.
c Includes estimated loads for many days.

Table 9.--Monthly and annual summary of water and suspended-sediment discharge, Beaver Creek near Arapahoe, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1950								
October	325.3	645	a 769	25	....	b 9	876	1,020
November	411.4	816	a 418	14	....	....	376	....
December	216.4	429	a 82	2.6	....	....	140	192
1951								
January	44.9	89	a 6	.2	....	(t)	49	133
February	153.6	305	a 16	.6	....	(t)	39	74
March	494.5	980	318	10	....	....	238	843
April	1,151	2,280	a 14,037	468	b 1,000	b 120	4,520	13,000
May	1,992	3,950	a 35,820	1,160	11,000	b 200	6,660	34,100
June	1,308.2	2,590	a 23,052	768	b 5,000	14	6,530	13,200
July	100.7	200	86	2.8	c 16	0	316	648
August	0	0	0	0	0	0	....	....
September	0	0	0	0	0	0	....	....
Water year 1950-51	6,198.0	12,280	a 74,604	204	11,000	0	4,530	34,100
October	117.0	232	c 170	5.5	....	0	538	721
November	135.3	268	c 130	4.3	....	....	356	348
December	79.4	157	c 33	1.1	....	(t)	154	168
1952								
January	3.8	7.5	c 1	.03	....	(t)	97	102
February	134.7	267	c 23	.8	....	(t)	63	160
March	443.2	879	c 110	3.5	....	(t)	92	86
April	1,254	2,490	c 23,600	787	2,300	38	6,970	12,300

See footnotes at end of table.

Table 9.--Monthly and annual summary of water and suspended-sediment discharge, Beaver Creek near Arapahoe, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1952								
May................	4,002	7,940	a 141,000	4,550	b 28,000	608	13,000	29,700
June...............	1,216	2,410	a 12,500	417	2,030	23	3,810	9,120
July...............	424	841	c 40,600	1,310	b 35,000	0	34,200	9,400
August.............	0	0	0	0	0	0	....	78
September..........	4.1	8.1	c 4	.1	....	0	361	271
Water year 1951-52.	7,813.5	15,500	a 218,171	596	b 35,000	0	10,300	29,700

a Includes estimated loads for many days.
b Estimated.
c Mostly estimated.
t Sediment discharge less than 0.50 ton.

Table 10.--Monthly and annual summary of water and suspended-sediment discharge, Popo Agie River near Riverton, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
Mar. 10-31............	6,288	12,470	a 5,020	228	651	95	296	713
April.................	12,353	24,500	27,400	913	3,520	151	822	1,400

May	46,218	91,670	139,000	448	11,100	1,830	1,110	2,000
June	76,170	151,100	120,900	4,030	17,000	518	588	1,530
July	23,008	45,640	7,020	226	1,930	4	113	395
August	4,666	9,250	a 214	6.9	13	2	17	29
September	4,887	9,690	b 101	3.4	10	1	8	16
Mar. 10 to Sept. 30	173,590	344,300	a 299,700	1,460	17,000	1	639	2,000
October	9,548	18,940	b 1,900	61	....	....	74	....
November	8,894	17,640	b 1,100	37	....	....	46	....
December	6,543	12,980	b 440	14	....	....	25	....
1950								
January	5,060	10,040	c 350	11	....	....	26	....
February	6,255	12,410	b 240	8.6	....	....	14	....
March	7,190	14,260	b 2,500	81	....	....	129	....
April	9,903	19,640	b 14,330	478	1,160	157	536	1,080
May	27,194	53,940	62,680	2,020	5,100	310	854	1,920
June	99,580	197,500	135,400	4,510	10,000	1,960	504	1,380
July	60,882	120,800	31,430	1,010	3,550	143	191	351
August	11,800	23,400	732	24	84	7	23	50
September	16,482	32,690	28,780	959	12,500	11	647	2,900
Water year 1949-50	269,331	534,200	a 279,900	767	12,500	....	385	2,900
October	16,477	32,680	1,108	36	....	....	25	....
November	12,334	24,460	820	27	....	....	25	....
December	9,127	18,100	571	18	....	....	23	....
1951								
January	5,905	11,710	355	11	....	....	22	....
February	6,200	12,300	b 204	7.3	....	....	12	....
March	7,456	14,790	578	19	....	....	29	....
April	8,951	17,750	6,747	225	566	39	279	635
May	42,079	83,460	98,620	3,180	11,700	118	868	2,600

See footnotes at end of table.

Table 10.--Monthly and annual summary of water and suspended-sediment discharge, Popo Agie River near Riverton, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1951								
June	73,350	145,500	76,778	2,560	8,780	550	388	1,290
July	40,748	80,820	8,325	269	677	83	76	128
August	16,003	31,740	1,900	61	323	....	44	104
September	9,002	17,860	570	19	....	....	23	....
Water year 1950-51	247,632	491,170	a 196,576	539	11,700	....	294	2,600
October	12,088	23,980	911	29	131	....	28	90
November	9,381	18,610	b 813	27	....	....	32	....
December	7,326	14,530	b 479	15	....	....	24	....
1952								
January	6,290	12,480	c 620	20	....	....	37	....
February	6,100	12,100	c 290	10	....	....	18	....
March	7,930	15,730	b 937	30	165	....	44	178
April	15,117	29,980	22,999	767	4,270	79	563	1,100
May	66,900	132,700	159,130	5,130	24,000	1,390	881	3,650
June	100,210	198,800	102,483	3,420	9,250	512	379	654
July	32,126	63,720	14,601	471	6,800	....	168	1,600
August	8,631	17,120	999	32	132	....	43	102
September	4,119	8,170	340	11	....	....	31	....
Water year 1951-52	276,218	547,920	a 304,602	832	24,000	....	408	3,650

a Includes estimated loads for a few days.
b Includes estimated loads for many days.
c Estimated.

Table 11.--Monthly and annual summary of water and suspended-sediment discharge, Kirby Draw near Riverton, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1951								
Apr. 23-30	0	0	0	0	0	0	....	....
May	4.7	9.3	a 1,300	42	b 1,000	0	95,400	59,800
June	10.2	20	a 1,100	35	b 500	0	38,500	61,400
July	0	0	0	0	0	0	....	....
August	0	0	0	0	0	0	....	....
September	0	0	0	0	0	0	....	....
Apr. 23 to Sept. 30	14.9	29	a 2,400	15	b 1,000	0	57,500	61,400
October	0	0	0	0	0	0	....	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1952								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	0	0	0	0	0	0	....	....
April	0	0	0	0	0	0	....	....
May	23.2	46	a 4,200	135	b 1,700	0	64,700	4,680
June	.2	.4	b 10	.3	....	0	18,500	....
July	0	0	0	0	0	0	....	....
August	6.5	13	a 1,600	52	b 1,300	0	87,900	38,400
September	0	0	0	0	0	0	....	....
Water year 1951-52	29.9	59	5,810	16	b 1,700	0	69,400	38,400

a Mostly estimated.
b Estimated.

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Table 12.--Monthly and annual summary of water and suspended-sediment discharge, Muskrat Creek near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1950								
June 19-30	0.1	0.2	(t)	....	(t)	0	630	630
July	69	137	a 7,400	239	a 4,500	0	38,300	....
August	0	0	0	0	0	0	....	....
September	384.4	762	b 70,400	2,350	34,700	0	65,400	92,400
June 19 to Sept. 30	453.5	899	b 77,800	748	34,700	0	61,300	92,400
October	0	0	0	0	0	0	....	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1951								
January	0	0	0	0	0	0	....	....
February	9.1	18	c 2	.1	....	0	81	202
March	9.4	19	c 5	.2	....	(t)	197	478
April	2.4	4.8	c 1	.03	....	0	154	354
May	16.1	32	a 1,820	59	a 1,300	0	40,400	44
June	62.1	123	c 8,720	291	a 3,500	0	50,100	59,700
July	755	1,500	a 230,400	7,430	a 150,000	0	105,000	....
August	0	0	0	0	0	0	....	....
September	0	0	0	0	0	0	....	....
Water year 1950-51	854.1	1,700	c 240,948	660	a 150,000	0	97,300	59,700
October	0	0	0	0	0	0	....	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Load (tons)	Mean	Maximum	Minimum	Weighted mean	Maximum daily
1952								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	0	0	0	0	0	0	....	....
April	3	6.0	a 300	10	a 200	0	35,700	....
May	12.9	26	a 940	30	a 300	0	27,000	....
June	4.1	8.1	a 350	12	a 350	0	31,600	646
July	0	0	0	0	0	0	....	....
August	0	0	0	0	0	0	....	....
September	0	0	0	0	0	0	....	....
Water year 1951-52	20.0	40	a 1,590	4.3	a 350	0	29,400	646

a Estimated.
b Includes estimated loads for a few days.
c Includes estimated loads for many days.
t Sediment discharge less than 0.50 ton.

Table 13.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile Creek above Wyoming Canal near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
October	60.5	120	a 1,400	45	b 150	0	8,570	....
November	28.8	57	a 310	10	....	0	3,990	....
December	.3	.6	(b t)	(t)	(b t)	0	....	....

See footnotes at end of table.

Table 13.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile Creek above Wyoming Canal near Pavillion, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1950								
January	4.8	9.5	b 15	0.5	....	0	1,160	....
February	58.5	116	a 1,200	43	....	0	7,600	....
March	33.9	67	a 360	12	80	(t)	3,930	....
April	41.4	82	a 1,500	50	b 400	1	13,400	....
May	62.6	124	a 2,200	71	b 300	0	13,000	....
June	83.5	166	c 2,200	73	1,600	0	9,760	7,680
July	153.3	304	c 28,650	924	24,600	0	66,700	46,300
August	1.5	3.0	a 1	.03	....	0	246	....
September	328.3	651	c 123,800	4,130	123,000	0	130,000	77,400
Water year 1949-50	857.4	1,700	a 161,600	443	123,000	0	67,300	77,400
October	37.9	75	c 103	3.3	18	....	1,010	....
November	28.2	56	a 43	1.4	14	....	565	1,280
December	37.0	73	a 124	4.0	b 34	0	1,240	....
1951								
January	0	0	0	0	0	0	....	....
February	41.2	82	a 78	2.8	15	0	701	....
March	53.2	106	c 316	10	42	(t)	2,200	....
April	43.1	85	1,505	50	917	2	12,900	16,700
May	76.8	152	c 4,721	152	3,600	0	22,800	62,000
June	35.4	70	1,230	41	422	0	12,900	26,100
July	11.8	23	c 731	24	600	0	22,900	19,000
August	.6	1.2	c 38	1.2	b 20	0	23,500	....
September	65.5	130	c 35,008	1,170	35,000	0	178,000	30,000
Water year 1950-51	430.7	853	a 43,897	120	35,000	0	36,400	62,000

October..............	90.7	180	a 12,473	402	b 12,000	(t)	49,100	44,000
November.............	11.2	22	a 51	1.7	18	0	1,690	3,400
December.............	.3	.6	(b t)	.003	(b t)	0	111	....
1952								
January..............	0	0	0	0	0	0	....	....
February.............	35.4	70	42	1.4	13	0	439	640
March................	148.1	294	c 1,596	51	317	0	3,990	5,720
April................	122.6	243	4,040	135	1,660	(t)	12,200	16,200
May..................	78.5	156	c 2,693	87	839	0	12,700	22,200
June.................	1.3	2.6	c 28	.9	19	0	7,980	9,180
July.................	.8	1.6	c 23	.7	13	0	10,600	....
August...............	34.0	67	c 11,050	356	11,000	0	112,000	23,000
September............	0	0	0	0	0	0	....	....
Water year 1951-52.	522.9	1,040	a 31,996	87	b 12,000	0	22,700	44,000

a Includes estimated loads for many days.
b Estimated.
c Includes estimated loads for a few days.
t Sediment discharge less than 1 ton during 1950 water year and less than 0.50 ton thereafter.

Table 14.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile Creek near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
October................	0	0	0	0	0	0	....	....
November...............	0	0	0	0	0	0	....	....
December...............	0	0	0	0	0	0	....	....

Table 14.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile Creek near Pavillion, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
January	0	0	0	0	0	0	....	....
February	50.0	99	a 1,400	50	356	0	10,400	....
March	143.4	284	4,590	148	431	5	11,900	17,300
April	27.4	54	584	19	98	3	7,890	12,900
May	77.4	154	1,680	54	363	0	8,040	17,100
June	177.3	352	b 70,150	2,340	64,000	0	132,000	....
July	194.7	386	36,060	1,160	30,000	0	66,100	44,900
August	73.2	145	217	7.0	97	0	1,100	1,300
September	11.6	23	115	3.8	58	0	3,670	8,560
Water year 1948-49	755.0	1,500	c 114,800	315	64,000	0	54,300	....

a Includes estimated loads for a few days.
b Estimated.
c Includes estimated loads for many days.

Table 15.--Monthly and annual summary of water and suspended-sediment discharge, Powerline wasteway near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment: Load (tons)	Daily load (tons): Mean	Daily load (tons): Maximum	Daily load (tons): Minimum	Concentration (ppm): Weighted mean	Concentration (ppm): Maximum daily
1949								
May	37.6	75	9.7	0.3	2.0	0	96	250
June	51.5	102	8.9	.3	1.0	(t)	64	....
July	23.5	47	2.0	.1	.3	(t)	32	....
August	134.6	267	9.0	.3	.9	(t)	25	43
September	98.7	196	a 5.7	.2	1.5	(t)	21	65
May 1 to Sept. 30	345.9	687	35.3	0.2	2.0	0	38	250
October	0	0	0	0	0	0	....	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1950								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	0	0	0	0	0	0	....	....
April	0	0	0	0	0	0	....	....
May	134.7	267	b 72	2.3	c 12	0	198	....
June	338.8	672	b 1,990	66	158	c 6.0	2,180	....
July	488.7	969	b 1,620	52	202	11	1,230	....
August	506.1	1,000	b 918	30	65	c 6.0	672	....
September	332.3	659	b 299	10	c 42	0	333	....
Water year 1949-50	1,800.6	3,570	b 4,900	13	202	0	1,010	....

a Includes estimated loads for a few days.
b Includes estimated loads for many days.
c Estimated.
t Sediment discharge less than 0.1 ton.

Table 16.--Monthly and annual summary of water and suspended-sediment discharge, Pavillion drain near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment: Load (tons)	Daily load (tons): Mean	Daily load (tons): Maximum	Daily load (tons): Minimum	Concentration (ppm): Weighted mean	Concentration (ppm): Maximum daily
1948								
September	340.8	676	a 3,370	112	b 436	b 36	3,660	....
October	149.5	297	b 500	16.1	....	(t)	1,240	....
November	26.3	52	b 50	1.6	....	(t)	704	....
December	13.2	26	b 7	.2	....	(t)	196	....
1949								
January	9.0	18	b 1	.03	....	(t)	41	....
February	9.4	19	a 6	.2	1	(t)	236	....
March	33.0	65	137	4.4	10	b 1	1,540	3,180
April	23.8	47	90	3.0	8	2	1,400	2,200
May	246.8	490	7,950	256	978	(t)	11,900	21,300
June	463.6	920	10,550	352	708	140	8,430	15,400
July	616	1,220	19,190	619	1,360	279	11,500	21,000
August	483.7	959	6,510	210	548	44	4,980	9,020
September	280.4	556	890	29.7	74	4	1,180	2,480
Water year 1948-49	2,354.7	4,670	45,880	126	1,360	(t)	7,220	21,300
October	52.2	104	a 43	1.4	12	(t)	305	1,180
November	36.5	72	a 34	1.1	2	(t)	345	....
December	13.1	26	a 5	.2	....	(t)	141	....
1950								
January	7.4	15	a 6	.2	....	(t)	300	....
February	9.6	19	a 8	.3	....	(t)	309	....
March	27.0	54	a 83	2.7	8	(t)	1,140	....
April	37.1	74	c 300	10	167	1	2,990	7,460
May	107.9	214	1,160	37	308	2	3,980	9,030

June........................	584.1	1,160	12,880	429	951	102	8,170	12,600
July........................	790	1,570	15,460	499	1,000	258	7,250	10,300
August......................	826	1,640	14,810	478	1,070	109	6,640	10,100
September...................	347.2	689	2,190	73	252	(t)	2,340	4,450
Water year 1949-50........	2,838.1	5,640	46,980	129	1,070	(t)	6,130	12,600

a Includes estimated loads for many days.
b Estimated.
c Includes estimated loads for a few days.
t Sediment discharge less than 1 ton.

Table 17.--Monthly and annual summary of water and suspended-sediment discharge, Ocean drain at Ocean Lake Outlet near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1948								
October........................	693	1,370	3	0.1	....	....	2	....
November.......................	547	1,080	a 8	.3	....	....	5	....
December.......................	634	1,260	a 8	.3	....	....	5	....
1949								
January........................	619	1,230	a 7	.2	....	....	4	....
February.......................	484	960	a 12	.4	....	....	9	....
March..........................	548	1,090	a 11	.4	....	....	7	....
April..........................	427.1	847	a 15	.5	....	(t)	13	....

See footnotes at end of table.

Table 17.--Monthly and annual summary of water and suspended-sediment discharge, Ocean drain at Ocean Lake Outlet near Pavillion, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1949								
May	12.6	25	b 3.0	0.1	1.3	0	88	110
June	548.2	1,090	a 47	1.6	c 6.5	0	32	....
July	991	1,970	b 57	1.8	14	(t)	21	165
August	1,010	2,000	a 16.1	.5	1.2	(t)	6	14
September	938	1,860	a 29.9	1.0	14	....	12	160
Water year 1948-49	7,451.9	14,780	217	0.6	14	0	11	....

a Includes estimated loads for many days.
b Includes estimated loads for a few days.
c Estimated.
t Sediment discharge less than 0.1 ton.

Table 18.--Monthly and annual summary of water and suspended-sediment discharge, Ocean drain near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Maximum	Weighted mean	Maximum daily
1948								
September	1,240	2,460	a 6,260	209	b 506	b 75	1,870	....
October	815	1,620	a 1,100	35	....	....	500	....
November	601	1,190	a 570	19	....	....	351	....

December	624	1,240	a 490	16	....	....	291	....
1949								
January	576.1	1,140	a 870	28	b 48	4	559	....
February	522	1,040	c 748	27	48	b 14	531	930
March	590	1,170	2,250	72	119	40	1,410	2,000
April	482.6	957	2,040	68	131	14	1,570	2,060
May	452.6	898	4,420	143	718	1	3,620	7,330
June	1,280.6	2,540	15,170	506	950	35	4,390	5,450
July	1,894	3,760	17,680	570	936	248	3,460	5,980
August	2,007	3,980	13,400	432	596	230	2,470	3,450
September	1,746	3,460	9,050	302	671	94	1,920	3,150
Water year 1948-49	11,590.9	23,000	c 67,790	186	950	1	2,170	7,330
October	866	1,720	1,530	49	96	33	654	970
November	646	1,280	1,070	36	58	19	613	899
December	487	966	c 407	13	27	2	310	590
1950								
January	197.4	392	c 47	1.5	6	(t)	88	203
February	410.0	813	a 765	27	129	(t)	691	....
March	510	1,010	a 2,660	86	b 170	53	1,930	....
April	810	1,610	a 9,380	313	552	b 55	4,290	7,050
May	1,138	2,260	8,010	258	412	189	2,610	3,780
June	1,300	2,580	8,540	285	377	164	2,430	2,970
July	1,703	3,380	13,420	433	886	221	2,920	4,290
August	1,804	3,580	12,470	402	597	248	2,560	3,400
September	1,317	2,610	5,300	177	315	62	1,490	2,400
Water year 1949-50	11,188.4	22,200	c 63,600	174	886	(t)	2,110	7,050

a Includes estimated loads for many days.
b Estimated.
c Includes estimated loads for a few days.
t Sediment discharge less than 1 ton.

Table 19.--Monthly and annual summary of water and suspended-sediment discharge, Dudley wasteway near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
May	67.1	133	65.4	2.1	12	0	361	1,400
June	112.6	223	75.2	2.5	15	0	247	466
July	68.9	137	32.4	1.0	5.2	0	174	358
August	121.7	241	60.0	1.9	6.3	(t)	183	280
September	99.1	197	21.0	.7	2.2	(t)	78	160
May 1 to Sept. 30	469.4	931	254	1.7	15	0	200	1,400
October	1.7	3.4	a 0.2	......	a 0.2	0	44	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1950								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	0	0	0	0	0	0	....	....
April	0	0	0	0	0	0	....	....
May	40.2	80	b 23.2	.7	3.4	0	214	....
June	107.6	213	b 108	3.6	a 13	(t)	372	....
July	93.8	186	b 87.7	2.8	34	.1	346	....
August	100.9	200	b 22.8	.7	2.3	(t)	84	....
September	74.6	148	b 15.7	.5	3.5	0	78	....
Water year 1949-50	418.8	830	b 258	0.7	34	0	228	....

a Estimated.
b Includes estimated loads for many days.
t Sediment discharge less than 0.1 ton.

Table 20.--Monthly and annual summary of water and suspended-sediment discharge, Kellett drain near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
December	33.4	66	a 57	1.8	....	....	632	....
1949								
January	22.6	45	a 46	1.5	4.9	....	754	2,600
February	21.2	42	a 84	3.0	9.1	0.5	1,470	3,600
March	18.4	36	166	5.4	9.0	3.3	3,340	4,770
April	17.6	35	142	4.7	7.2	2.9	2,990	3,840
May	23.8	47	131	4.2	14	.7	2,040	4,100
June	42.0	83	364	12	29	2.8	3,210	6,420
July	74.6	148	714	23	44	2.7	3,540	4,890
August	93.1	185	528	17	51	6.1	2,100	4,730
September	34.3	68	21.9	.7	5.1	(t)	236	1,040
Dec. 1 to Sept. 30	381	755	b 2,250	7.4	51	(t)	2,200	6,420
October	23.3	46	a 10	0.3	....	(t)	158	....
November	21.1	42	a 9.5	.3	....	....	167	....
December	19.4	38	a 16	.5	....	....	305	....
1950								
January	15.1	30	a 27	.9	....	....	662	....
February	11.4	23	a 34	1.2	....	....	1,100	....
March	16.0	32	a 35	1.1	2.9	.4	810	....
April	16.8	33	a 13	.4	....	....	287	....
May	19.3	38	a 13.2	.4	....	....	253	....
June	45.2	90	a 247	8.2	33	.3	2,020	4,170

See footnotes at end of table.

Table 20.--Monthly and annual summary of water and suspended-sediment discharge, Kellett drain near Pavillion, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1950								
July	86.7	172	a 920	30	305	c 7.5	3,930	11,200
August	78.1	155	a 1,230	40	94	11	5,830	....
September	44.8	89	a 310	10	c 50	1.5	2,560	....
Water year 1949-50	397.2	788	a 2,860	7.8	305	(t)	2,670	....

a Includes estimated loads for many days.
b Includes estimated loads for a few days.
c Estimated.
t Sediment discharge less than 0.1 ton.

Table 21.--Monthly and annual summary of water and suspended-sediment discharge, Dewey drain near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
December	7.2	14	a 1.1	0.04	0.11	....	57	....

1949								
January	6.6	13	a 1.1	.04	....	....	62	....
February	5.6	11	b .54	.02	.05	(t)	36	....
March	5.2	10	.48	.02	.03	(t)	34	....
April	4.4	8.7	.12	.004	....	(t)	10	....
May	5.3	11	2.3	.07	1.3	(t)	160	582
June	23.4	46	49.0	1.6	10	.12	776	4,320
July	34.2	68	42.9	1.4	7.6	.08	464	1,890
August	46.0	91	33.4	1.1	4.1	.15	269	838
September	23.0	46	b 4.2	.14	1.6	....	68	264
Dec. 1 to Sept. 30	160.9	319	b 135	0.44	10	(t)	311	4,320
October	11.9	24	a 1.8	0.06	c 0.19	0.03	56	....
November	8.8	17	a 3.3	.11	.46	.04	139	....
December	6.9	14	a 1.0	.03	.06	.02	54	....
1950								
January	5.4	11	a 1.9	.06	.12	(t)	130	....
February	4.7	9.3	a 1.2	.04	.08	(t)	95	....
March	5.6	11	a 1.0	.03	.05	.02	66	....
April	3.7	7.3	a .5	.02	.03	(t)	50	....
May	3.6	7.1	a .4	.01	.07	(t)	41	....
June	14.7	29	a 1.6	.05	c .18	(t)	40	....
July	38.5	76	b 15	.48	8.2	.05	144	629
August	44.2	88	a 13	.42	1.1	.04	109	....
September	29.3	58	a 3.4	.11	c .5	.02	43	....
Water year 1949-50	177.3	352	a 44	0.12	8.2	(t)	92	....

a Includes estimated loads for many days.
b Includes estimated loads for a few days.
c Estimated.
t Sediment discharge less than 0.01 ton.

Table 22.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile 76 drain near Riverton, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
Mar. 16-31	3.3	6.5	1.29	0.08	0.25	0.03	145	455
April	5.6	11	.90	.03	.07	(t)	60	135
May	10.0	20	8.39	.27	2.59	(t)	311	930
June	18.3	36	32.1	1.1	8.86	(t)	650	4,100
July	15.9	32	3.24	.10	.38	.03	75	160
August	23.9	47	12.5	.40	1.90	.04	194	780
September	18.3	36	a 9.75	.32	1.74	....	197	390
Mar. 16 to Sept. 30	95.3	188	b 68.2	0.34	8.86	(t)	265	4,100
October	11.2	22	a 3.2	0.1	0.24	0.03	106	....
November	12.6	25	a 3.6	.1	.22	.05	106	....
December	7.1	14	a 4.5	.1	.54	.03	235	....
1950								
January	5.5	11	a 4.0	.1	.25	.07	269	....
February	5.8	12	a 6.4	.2	c .39	.07	409	....
March	6.1	12	a 13	.4	.66	.13	789	....
April	6.0	12	a 4.4	.1	c .49	.02	272	....
May	6.2	12	a 1.7	.05	.14	(t)	102	....
June	14.2	28	a 14	.5	c 5.0	(t)	365	....
July	18.6	37	a 16	.5	c 6.0	.03	319	....
August	17.9	36	a 5.9	.2	.44	.02	122	....
September	18.0	36	a 7.6	.3	c 2.0	.02	156	....
Water year 1949-50	129.2	257	a 84.3	0.2	c 6.0	(t)	242	....

a Includes estimated loads for many days.
b Includes estimated loads for a few days.
c Estimated.
t Sediment discharge less than 0.01 ton.

Table 23.--Monthly and annual summary of water and suspended-sediment discharge, Sand Gulch drain and wasteway near Riverton, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
Mar. 14-31	3.2	6.3	6.5	0.4	1.5	(t)	752	2,870
April	1.4	2.8	.8	.03	.2	0	212	656
May	41.7	83	11.0	.4	1.7	0	98	510
June	81.4	161	138	4.6	41	0	628	5,800
July	86.4	171	420	13.6	54	(t)	1,800	5,030
August	138.0	274	781	25.2	97	.7	2,100	8,000
September	88.5	176	135	4.5	18	(t)	565	2,060
Mar. 14 to Sept. 30	440.6	874	1,490	7.4	97	0	1,250	8,000
October	5.5	11	a 3	0.1	....	(t)	202	....
November	6.5	13	a 6	.2	....	(t)	342	....
December	2.1	4.2	a 2	.1	....	0	353	....
1950								
January	0	0	0	0	0	0	....	....
February	.1	.2	1.0	.03	1.0	0	3,700	3,600
March	2.7	5.4	a 8.3	.3	2.9	0	1,140	5,370
April	3.0	6.0	a .7	.02	....	(t)	86	....
May	12.8	25	b 3.4	.1	.8	(t)	98	360
June	87.5	174	a 77.4	2.6	c 8.5	.5	328	....
July	198.4	394	a 479	15	293	c 1.2	894	3,200
August	73.1	145	a 58.7	1.9	4.8	.1	298	980
September	41.5	82	a 14.5	.5	2.0	2.0	129	....
Water year 1949-50	433.2	860	a 654	1.8	293	0	559	5,370

a Includes estimated loads for many days.
b Includes estimated loads for a few days.
c Estimated.
t Sediment discharge less than 0.1 ton.

Table 24.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile Creek near Riverton, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
October	1,211	2,400	a 8,850	285	661	147	2,710	4,990
November	898	1,780	a 4,830	161	b 340	73	1,990	3,310
December	551	1,090	c 1,000	32	146	5	672	....
1950								
January	247	490	a 193	6.2	12	3	289	....
February	528	1,050	a 4,220	151	1,120	6	2,960	18,800
March	635	1,260	a 18,280	590	b 1,200	221	10,700	....
April	912	1,810	c 17,510	584	b 1,500	270	7,110	10,700
May	1,453	2,880	c 62,490	2,020	9,970	380	15,900	40,000
June	3,659	7,260	492,400	16,400	94,300	2,780	48,100	....
July	5,241	10,400	a 632,300	20,400	b 120,000	8,170	43,100	....
August	5,278	10,470	509,900	16,400	21,200	9,690	34,500	42,500
September	3,744	7,430	452,700	15,100	199,000	1,350	43,200	89,500
Water year 1949-50	24,357	48,320	c 2,205,000	6,040	199,000	3	33,500	89,500
October	925	1,830	23,947	772	1,920	150	9,590	16,200
November	1,152	2,280	8,842	295	1,760	30	2,840	16,700
December	1,071	2,120	18,729	604	1,550	80	6,480	15,500
1951								
January	833	1,650	1,652	53	212	8	735	....
February	733	1,450	7,914	283	809	34	4,000	11,300
March	859	1,700	19,190	619	1,450	285	8,270	14,500

April	649	1,290	20,897	697	9,240	83	11,900	38,600
May	1,757	3,480	144,200	4,650	18,100	1,070	30,400	71,800
June	2,899	5,750	208,060	6,940	17,000	1,980	26,600	36,300
July	5,393	10,700	454,750	14,700	24,500	8,600	31,200	38,100
August	4,741	9,400	310,870	10,000	19,400	5,270	24,300	32,900
September	3,431	6,810	217,630	7,250	35,000	2,400	23,500	52,000
Water year 1950-51	24,443	48,460	1,436,681	3,940	35,000	8	21,800	71,800
October	1,298	2,570	a 57,241	1,850	b 16,000	259	16,300	....
November	240.8	478	a 1,679	56	151	....	2,580	....
December	789	1,560	a 1,165	38	....	....	547	....
1952								
January	744	1,480	5,110	165	....	....	2,540	....
February	613	1,220	a 4,368	151	....	....	2,640	....
March	805	1,600	a 21,154	682	2,330	....	9,730	....
April	936	1,860	a 48,501	1,620	7,900	370	19,200	35,000
May	2,480	4,920	a 175,160	5,650	20,000	1,680	26,200	57,000
June	3,601	7,140	a 190,600	6,350	16,100	1,740	19,600	26,000
July	4,569	9,060	a 254,210	8,200	b 15,000	4,100	20,600	26,000
August	4,946	9,810	a 261,440	8,430	38,000	2,420	19,600	37,000
September	3,611	7,160	146,130	4,870	7,420	3,210	15,000	18,500
Water year 1951-52	24,632.8	48,860	a 1,166,758	3,190	38,000	....	17,500	57,000

a Includes estimated loads for many days.
b Estimated.
c Includes estimated loads for a few days.

Table 25.--Monthly and annual summary of water and suspended-sediment discharge, Lost Wells Butte drain near Riverton, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
Mar. 14-31	5.1	10	a 6.3	0.4	2.6	(t)	458	2,400
April	3.5	6.9	1.4	.05	.4	0	148	360
May	180.4	358	b 969	31	119	0	1,990	4,830
June	298.3	592	1,900	63	328	5.1	2,360	6,400
July	140.0	278	416	13	69	(t)	1,100	1,970
August	262.0	520	678	22	48	6.5	958	1,430
September	267.5	531	322	11	32	2.4	446	988
Mar. 14 to Sept. 30	1,156.8	2,300	4,290	21	328	0	1,370	6,400
October	59.8	119	a 18	0.6	7.2	....	111	265
November	33.9	67	a 7	.2	....	(t)	76	....
December	12.9	26	a 3	.1	.9	0	86	....
1950								
January	0	0	0	0	0	0	....	....
February	.5	1.0	b .1	.003	....	0	74	....
March	7.0	14	a 4	.1	....	0	212	....
April	2.4	4.8	a .6	.02	....	0	93	....
May	131.4	261	a 247	8.0	52	0	696	....
June	346.4	687	a 673	22	50	5.9	720	....
July	447.1	887	b 2,570	83	943	9.2	2,130	6,050
August	440.0	873	a 1,170	38	99	1.9	985	2,450
September	255.1	506	431	14	70	(t)	626	1,440
Water year 1949-50	1,736.5	3,450	a 5,120	14	943	0	1,090	6,050

a Includes estimated loads for many days.
b Includes estimated loads for a few days.
t Sediment discharge less than 0.1 ton.

Table 26.--Monthly and annual summary of water and suspended-sediment discharge, Coleman drain near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
Dec. 15-31	38.7	77	a 14.3	0.8	1.6	0.4	137	245
1949								
January	69.3	137	b 13.2	.4	....	....	71	....
February	64.4	128	a 11.5	.4	.7	.1	66	....
March	50.4	100	9.6	.3	.5	.2	71	95
April	50.2	100	7.4	.2	.4	.1	55	94
May	112.8	224	68.3	2.2	12	.1	224	540
June	259.7	515	565	19	55	.2	806	1,270
July	446.9	886	1,540	50	105	6.1	1,280	1,850
August	546	1,080	1,910	62	90	24	1,300	1,860
September	307.7	610	563	19	95	3.7	678	3,520
Dec. 15 to Sept. 30	1,946.1	3,860	4,700	16	105	0.1	894	3,520
October	183.5	364	b 90	2.9	5.5	2.0	182	260
November	115.1	228	b 60	2.0	2.5	1.7	193	....
December	89.5	178	b 47	1.5	....	....	194	....
1950								
January	67.8	134	b 50	1.6	....	....	273	....
February	48.9	97	b 22	.8	....	(t)	167	....
March	55.6	110	b 28	.9	....	(t)	186	....
April	56.2	111	b 14	.5	....	(t)	92	....
May	107.6	213	253	8.2	64	(t)	871	3,950

See footnotes at end of table.

Table 26.--Monthly and annual summary of water and suspended-sediment discharge, Coleman drain near Shoshoni, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1950								
June	336.7	668	2,090	70	179	8.6	2,300	4,510
July	619	1,230	b 3,420	110	c 290	50	2,050	....
August	552	1,090	b 2,000	65	....	....	1,340	....
September	300.1	595	b 314	10	c 50	2.8	388	....
Water year 1949-50	2,532.0	5,020	b 8,390	23	c 290	(t)	1,230	....

a Includes estimated loads for a few days.
b Includes estimated loads for many days.
c Estimated.
t Sediment discharge less than 1 ton.

Table 27.--Monthly and annual summary of water and suspended-sediment discharge, Sand Gulch near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
September	1,219	2,420	a 1,260	42	100	7	383	....
October	599.5	1,190	a 310	10	....	....	192	....

November	229.6	455	a 33	1.1	3	....	53	123
December	187	371	a 36	1.2	....	....	71	....
1949								
January	155.0	307	a 41	1.3	....	....	98	....
February	138.7	275	a 63	2.2	6	....	168	....
March	157.6	313	113	3.6	10	2	266	600
April	142.3	282	48	1.6	3	1	126	208
May	1,049.1	2,080	b 3,820	123	797	2	1,350	5,450
June	1,087.0	2,160	4,260	142	430	2	1,450	2,690
July	1,008.5	2,000	b 3,210	104	252	2	1,180	2,280
August	1,408	2,790	5,970	193	762	61	1,570	5,880
September	1,024	2,030	1,060	35	235	3	383	1,530
Water year 1948-49	7,186.3	14,250	b 18,960	52	797	....	977	5,880
October	361.8	718	a 130	4.2	32	....	133	....
November	241.1	478	a 77	2.6	....	....	118	....
December	169.5	336	a 68	2.2	....	....	149	....
1950								
January	159.3	316	a 130	4.2	....	....	302	....
February	114.2	227	a 160	5.7	....	....	519	....
March	180.4	358	a 291	9.4	28	3	597	....
April	131.9	262	a 59	2.0	....	....	166	....
May	1,046.3	2,080	3,140	101	678	1	1,110	5,930
June	2,003	3,970	7,870	262	1,410	35	1,460	4,650
July	1,659	3,290	b 3,960	128	384	40	884	1,950
August	1,499	2,970	b 2,470	80	204	18	610	1,080
September	848	1,680	a 1,400	47	c 400	....	611	....
Water year 1949-50	8,413.5	16,680	a 19,760	54	1,410	....	870	5,930

a Includes estimated loads for many days.
b Includes estimated loads for a few days.
c Estimated.

Table 28.--Monthly and annual summary of water and suspended-sediment discharge, Eagle drain near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
Dec. 15-31	39.0	77	a 11.6	0.7	1.5	0.3	110	215
1949								
January	78.2	155	b 11.0	.4	....	....	52	....
February	62.3	124	a 11.6	.4	1.1	....	69	197
March	75.3	149	48.6	1.6	2.3	1.1	239	337
April	66.6	132	19.4	.6	1.2	.3	108	199
May	217.8	432	171	5.5	25	.2	291	985
June	342.5	679	807	27	67	.1	873	1,500
July	611.7	1,210	2,910	94	165	1.1	1,760	2,540
August	767	1,520	3,640	117	219	38	1,760	2,800
September	287.9	571	764	26	73	4.8	983	1,700
Dec. 15 to Sept. 30	2,548.3	5,050	8,390	30	219	0.1	1,220	2,800
October	111.9	222	b 78	2.5	c 5.0	1.5	258	....
November	107.3	213	b 100	3.3	5.1	2.1	345	....
December	78.0	155	b 46	1.5	....	....	218	....
1950								
January	69.4	138	b 35	1.1	....	....	187	....
February	61.9	123	b 52	1.9	....	....	311	....
March	83.3	165	b 64	2.1	2.5	1.7	287	....
April	87.6	174	b 30	1.0	....	....	127	....
May	139.8	277	b 60	1.9	c 8.0	.5	160	....
June	545.5	1,080	1,060	35	114	4.7	720	1,360

July	778	1,540	a 3,420	110	166	28	1,630	2,380
August	593	1,180	3,300	106	160	49	2,060	3,960
September	285.9	567	533	18	81	1.2	690	2,300
Water year 1949-50	2,941.6	5,830	b 8,780	24	166	....	1,110	3,960

a Includes estimated loads for a few days.
b Includes estimated loads for many days.
c Estimated.

Table 29.--Monthly and annual summary of water and suspended-sediment discharge, Lateral P-34.9 wasteway near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
May	142.7	283	60	1.9	5.4	0	154	344
June	67.8	134	27	.9	3.2	0	147	610
July	110.1	218	48	1.5	8.9	0	161	1,100
August	193.0	383	37	1.2	3.5	.4	71	125
September	214.7	426	22	.7	1.4	.4	38	59
May 1 to Sept. 30	728.3	1,440	194	1.3	8.9	0	99	1,100
October	8.9	18	a 1.1	0.04	a 1.1	0	46	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....

See footnotes at end of table.

Table 29.--Monthly and annual summary of water and suspended-sediment discharge, Lateral P-34.9 wasteway near Shoshoni, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1950								
January........................	0	0	0	0	00	00	....	....
February......................	0	0	0	0	00	00	....	....
March..........................	0	0	0	0	0	0	....	....
April...........................	0	0	0	0	0	0	....	....
May............................	67.1	133	b 18	.6	4.2	0	99	204
June...........................	164	325	b 95	3.2	6.9	a .3	215	....
July............................	300.3	596	b 185	6.0	a 15	a 2.4	228	....
August........................	225.9	448	b 87	2.8	a 7.5	a 1.0	143	....
September....................	150.1	298	b 67	2.2	a 11	0	165	....
Water year 1949-50.........	916.3	1,820	b 450	1.2	a 15	0	182	....

a Estimated.
b Includes estimated loads for many days.

Table 30.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile Creek near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
Aug. 28-31..........	961	1,910	a 35,200	8,800	10,500	b 7,300	13,600	....

September..........	6,501	12,870	a 645,000	21,500	b 350,000	3,660	35,400	....
Aug. 28 to Sept. 30.	7,462	14,800	a 680,000	20,000	b 350,000	3,660	35,400	....
October..........	2,335	4,630	b 66,800	2,150	....	....	10,600	....
November..........	1,178	2,340	a 25,900	863	2,210	....	8,140	....
December..........	1,005	1,990	a 4,400	142	....	8	1,620	....
1949								
January..........	920	1,820	a 2,100	68	107	41	845	1,470
February..........	902	1,790	c 6,720	240	713	85	2,760	5,120
March..........	1,676	3,320	76,630	2,470	5,350	700	16,900	26,200
April..........	939	1,860	30,330	1,010	1,770	373	12,000	16,000
May..........	2,721	5,400	103,900	3,350	9,550	196	14,100	20,900
June..........	5,022	9,960	413,600	13,800	150,000	1,330	30,500	136,000
July..........	5,868	11,640	428,100	13,800	101,000	3,210	27,000	85,300
August..........	6,638	13,170	325,200	10,500	17,300	7,090	18,100	27,800
September..........	4,906	9,730	185,300	6,180	9,460	2,600	14,000	18,700
Water year 1948-49.	34,110	67,650	c 1,669,000	4,570	150,000	8	18,100	136,000
October..........	1,997	3,960	47,790	1,540	4,090	921	8,860	15,800
November..........	1,455	2,890	24,990	833	1,380	476	6,360	9,250
December..........	915	1,810	5,940	192	877	19	2,400	7,550
1950								
January..........	574	1,140	946	31	62	12	610	1,150
February..........	960	1,900	10,640	380	1,980	27	4,100	10,500
March..........	1,253	2,490	42,450	1,370	3,180	285	12,500	21,000
April..........	1,348	2,670	40,490	1,350	2,480	721	11,100	15,300
May..........	3,561	7,060	144,000	4,650	10,400	1,070	15,000	25,500
June..........	7,591	15,060	682,400	22,700	78,700	9,750	32,100	71,100
July..........	9,877	19,590	1,076,000	34,700	166,000	16,500	38,900	83,400
August..........	8,581	17,020	761,300	24,600	38,100	13,800	31,700	40,300
September..........	5,945	11,790	568,600	19,000	182,000	3,280	34,200	76,700
Water year 1949-50.	44,057	87,380	3,406,000	9,330	182,000	12	28,600	83,400

See footnotes at end of table.

Table 30.--Monthly and annual summary of water and suspended-sediment discharge, Fivemile Creek near Shoshoni, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1950								
October	1,715	3,400	c 50,890	1,640	b 3,200	1,040	11,000	17,000
November	1,744	3,460	31,744	1,060	2,000	152	6,740	14,700
December	1,475	2,930	28,199	910	1,940	180	7,080	12,600
1951								
January	1,112	2,210	8,052	260	707	(t)	2,680	6,380
February	1,100	2,180	13,599	486	1,860	10	4,580	14,400
March	1,310	2,600	50,215	1,620	2,720	609	14,200	21,900
April	971	1,930	39,022	1,300	10,000	463	14,900	34,500
May	3,636	7,210	217,920	7,030	21,300	3,060	22,200	54,500
June	5,790	11,480	344,190	11,500	23,300	4,570	22,000	30,500
July	9,127	18,100	709,900	22,900	45,600	15,500	28,800	35,000
August	8,534	16,930	511,580	16,500	26,100	9,220	22,200	27,900
September	6,836	13,560	378,800	12,600	65,000	6,010	20,500	50,000
Water year 1950-51.	43,350	85,990	2,384,111	6,530	65,000	(t)	20,400	54,500
October	2,445	4,850	84,209	2,720	16,000	909	12,800	31,000
November	1,099	2,180	12,999	433	1,030	30	4,380	7,500
December	1,187	2,350	5,420	175	774	11	1,690	4,940
1952								
January	1,074	2,130	c 4,125	133	279	24	1,420	2,950
February	962	1,910	7,279	251	513	53	2,800	5,000
March	1,477	2,930	34,276	1,110	4,300	164	8,590	20,000
April	1,377	2,730	74,311	2,480	14,000	491	20,000	47,000

May................	4,489	8,900	271,100	8,750	23,600	2,390	22,400	49,900
June...............	6,840	13,570	358,820	12,000	33,800	1,980	19,400	31,000
July...............	9,593	19,030	476,400	15,400	25,600	10,400	18,400	22,800
August.............	9,118	18,090	439,030	14,200	55,000	6,110	17,800	39,000
September..........	6,930	13,750	242,850	8,100	11,700	5,950	13,000	17,000
Water year 1951-52.	46,591	92,420	2,010,819	5,490	55,000	11	16,000	49,900

a Includes estimated loads for many days.
b Estimated.
c Includes estimated loads for a few days.
t Sediment discharge less than 0.50 ton.

Table 31.--Monthly and annual summary of water and suspended-sediment discharge, Lateral P-36.8 wasteway near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
May......................	163.2	324	177	5.7	21	0	401	620
June.....................	84.4	167	43.5	1.4	5.4	0	191	315
July.....................	77.3	153	26.2	.8	5.9	0	126	307
August...................	287.2	570	226	7.3	18	2.1	291	522
September................	146.0	290	86.9	2.9	24	(t)	220	902
May 1 to Sept. 30........	758.1	1,500	560	3.7	24	0	274	902

See footnotes at end of table.

Table 31.--Monthly and annual summary of water and suspended-sediment discharge, Lateral P-36.8 wasteway near Shoshoni, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
October	7.0	14	a 5	0.2	....	0	265	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1950								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	0	0	0	0	0	0	....	....
April	0	0	0	0	0	0	....	....
May	76.0	151	b 190	6.1	....	0	926	c 4,200
June	80.9	160	b 83	2.8	....	....	380	c 662
July	181.6	360	b 260	8.4	....	....	530	c 835
August	213.1	423	b 210	6.8	....	....	365	c 368
September	139.4	276	b 98	3.3	....	0	260	c 536
Water year 1949-50	698.0	1,380	b 850	2.3	....	0	451	c 4,200

a Estimated.
b Includes estimated loads for many days.
c Maximum observed.
t Sediment discharge less than 0.1 ton.

Table 32.--Monthly and annual summary of water and suspended-sediment discharge, Poison Creek near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1949								
Mar. 5-31	35.3	70	249	9.2	48	1	2,610	a 6,800
April	19.2	38	52.7	1.8	16	.3	1,020	a 4,400
May	40.4	80	722	23	230	0	6,620	a 14,200
June	46.0	91	2,320	77	1,200	0	18,700	a 27,000
July	22.6	45	b 677	22	280	0	11,100	a 38,000
August	5.1	10	b 2.7	.1	.2	0	196	a 800
September	9.7	19	4.0	.1	.5	0	153	a 495
Mar. 5 to Sept. 30	178.3	353	b 4,030	19	1,200	0	8,370	a 38,000
October	10.7	21	c 4.5	0.1	....	(t)	156	230
November	15.4	31	c 4.3	.1	....	(t)	103	175
December	9.3	18	c 2	.1	....	(t)	80	134
1950								
January	3.1	6.1	c 2	.1	....	(t)	239	347
February	9.0	18	c 13	.5	....	(t)	535	1,940
March	14.9	30	c 130	4.2	....	....	3,230	16,400
April	39.2	78	c 860	29	....	....	8,120	16,000
May	67.2	133	b 2,040	66	460	(t)	11,200	15,400
June	10.2	20	290	9.7	270	(t)	10,500	3,680
July	36.7	73	c 9,200	297	d 8,000	(t)	89,500	108,000
August	4.0	7.9	c 1.2	.04	....	0	111	262
September	13.9	28	480	16	280	0	12,800	30,400
Water year 1949-50	233.6	464	c 13,000	36	d 8,000	0	20,600	108,000

See footnotes at end of table.

Table 32.--Monthly and annual summary of water and suspended-sediment discharge, Poison Creek near Shoshoni, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum observed
1950								
October	12.4	25	d 6	0.2	....	....	179	6,960
November	12.0	24	d 6	.2	....	....	185	551
December	10.8	21	d 4	.1	....	....	137	323
1951								
January	6.2	12	d 1	.03	....	0	60	141
February	28.0	56	d 50	1.8	....	0	661	2,620
March	31.0	61	d 200	6.5	....	....	2,390	2,710
April	19.5	39	d 480	16	....	....	9,120	29,800
May	31.0	61	d 360	12	....	....	4,300	12,000
June	7.0	14	d 2	.07	....	....	110	187
July	3.1	6.1	(t)	.01	....	....	40	60
August	1.5	3.0	(t)	.003	....	0	25	82
September	2.2	4.4	(t)	.003	....	0	25	26
Water year 1950-51	164.7	326	d 1,110	3.0	....	0	2,500	29,800
October	10.8	21	d 1	0.03	....	....	34	36
November	7.5	15	d 1	.03	....	....	49	122
December	4.6	9.1	d 1	.03	....	....	81	118
1952								
January	1.6	3.2	(t)	.01	....	0	93	84
February	10.1	20	d 3	.1	....	....	110	136
March	14.0	28	d 10	.3	....	....	265	830
April	36.0	71	d 700	23	....	....	7,200	9,490

May........................	49.5	98	d 1,800	58	....	....	13,500	16,200
June........................	18.1	36	d 2,000	67	....	....	39,500	950
July........................	.5	1.0	(t)	.003	....	0	74	61
August......................	0	0	0	0	0	0	....	....
September...................	2.1	4.2	(t)	.01	....	0	71	68
Water year 1951-52........	154.8	307	d 4,500	12	....	0	10,800	16,200

a Maximum daily.
b Includes estimated loads for a few days.
c Includes estimated loads for many days.
d Estimated.
t Sediment discharge less than 0.1 ton during 1950 water year and less than 0.5 ton thereafter.

Table 33.--Monthly and annual summary of water and suspended-sediment discharge, Badwater Creek at Bonneville, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1947								
October...............	100.7	200	a 1,670	53.9	238	0	6,140	22,000
November..............	240.4	477	b 637	21.2	72	....	981	3,900
December..............	92.0	182	c 40	1.3	....	....	161	....

See footnotes at end of table.

Table 33.--Monthly and annual summary of water and suspended-sediment discharge, Badwater Creek at Bonneville, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1948								
January	27.9	55	c 6	0.2	....	....	80	....
February	283.0	561	b 300	10.3	61	....	393	1,125
March	3,846	7,630	a 67,440	2,180	12,100	16	6,500	15,000
April	2,668	5,290	a 52,790	1,760	5,450	364	7,330	15,300
May	396.2	786	a 4,920	159	1,000	12	4,600	25,200
June	917.8	1,820	a 70,770	2,360	19,800	0	28,600	44,500
July	192.6	382	c 36,780	1,190	c 35,000	0	70,800	....
August	0	0	0	0	0	0	....	....
September	95	188	a 16,920	564	15,200	0	66,000	76,000
Water year 1947-48	8,859.6	17,570	b 252,300	689	35,000	0	10,500	76,000
October	0	0	0	0	0	0	....	....
November	10	20	c 50	1.7	....	0	1,850	....
December	0	0	0	0	0	0	....	....
1949								
January	0	0	0	0	0	0	....	....
February	130	258	a 1,300	46	530	0	3,700	7,800
March	738.1	1,460	11,150	360	1,120	10	5,590	7,850
April	691	1,370	b 12,350	410	700	170	6,620	....
May	580.9	1,150	20,190	651	1,820	9	12,900	31,900
June	985.4	1,950	107,700	3,590	69,800	0	40,500	68,800
July	299.7	594	79,940	2,580	38,300	0	98,800	108,000
August	1.0	2.0	c 5	.2	....	0	1,850	....
September	2.6	5.2	c 15	.5	....	0	2,140	....
Water year 1948-49	3,438.7	6,810	a 232,700	638	69,800	0	25,100	108,000

October	0.6	1.2	c 1	0.03	....	0	617	....
November	8.3	16	b 75	2.5	38	0	3,350	....
December	0	0	0	0	0	0	....	....
1950								
January	0	0	0	0	0	0	....	....
February	157.6	313	b 2,600	93	c 380	0	6,110	....
March	332.8	660	b 5,400	174	580	0	6,010	....
April	1,014.2	2,010	b 17,800	593	3,800	25	6,500	....
May	922.3	1,830	b 15,000	484	c 1,800	49	6,020	....
June	42.7	85	b 610	20	300	0	5,290	11,000
July	.5	1.0	c 5	.2	c 5	0	3,700	....
August	0	0	0	0	0	0	....	....
September	85	169	21,200	707	14,000	0	89,100	73,000
Water year 1949-50	2,564.0	5,090	b 62,700	172	14,000	0	9,060	73,000
October	2.8	5.6	620	20	555	0	79,100	43,700
November	1.2	2.4	a 13	.4	5	0	4,010	9,650
December	.3	.6	1	.03	(t)	0	1,230	700
1951								
January	0	0	0	0	0	0	....	....
February	155.4	308	a 1,816	65	307	0	4,330	....
March	566.3	1,120	a 12,160	392	2,630	1	7,950	19,200
April	424.7	842	7,795	260	2,000	23	6,800	18,500
May	195.1	387	2,867	92	964	0	5,440	10,200
June	0	0	0	0	0	0	....	....
July	0	0	0	0	0	0	....	....
August	0	0	0	0	0	0	....	....
September	167.7	333	d 53,770	1,790	d 50,000	0	111,000	82,000
Water year 1950-51	1,513.5	3,000	d 79,042	217	d 50,000	0	19,300	82,000

See footnotes at end of table.

Table 33.--Monthly and annual summary of water and suspended-sediment discharge, Badwater Creek at Bonneville, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1951								
October	3	6.0	473	15	473	0	56,300	56,300
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1952								
January	0	0	0	0	0	0	....	....
February	20.7	41	b 295	10	c 100	0	5,280	....
March	218.5	433	3,910	126	408	0	6,630	8,060
April	663.0	1,320	14,967	499	1,870	14	8,360	14,100
May	411.4	816	16,998	548	4,380	0	15,300	27,900
June	107.6	213	19,655	655	19,300	0	65,200	49,400
July	2.5	5.0	837	27	518	0	115,000	59,600
August	23.8	47	1,490	48	1,450	0	23,200	....
September	0	0	0	0	0	0	....	....
Water year 1951-52	1,450.5	2,880	a 58,625	160	19,300	0	15,000	59,600

a Includes estimated loads for a few days.
b Includes estimated loads for many days.
c Estimated.
d Partly estimated.
t Sediment discharge less than 0.50 ton.

Table 34.--Monthly and annual summary of water and suspended-sediment discharge, Muddy Creek near Pavillion, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment						
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
Mar. 7-31	280.7	557	6,340	254	567	7	8,370	14,000
April	368.5	731	8,640	288	624	50	8,680	17,300
May	187.5	372	8,570	276	5,270	10	16,900	38,500
June	518.1	1,030	a 164,000	5,470	b 77,000	1	109,000	....
July	509.1	1,010	165,200	5,330	90,400	(t)	112,000	65,900
August	14.4	29	a 2	.06	....	(t)	51	....
September	115.3	229	c 1,310	44	1,020	(t)	4,210	15,200
Mar. 7 to Sept. 30.	1,993.6	3,960	c 354,100	1,700	90,400	(t)	63,400	65,900
October	156.7	311	a 676	22	115	....	1,600	....
November	149.8	297	a 820	27	....	....	2,030	....
December	27.8	55	a 120	3.9	75	(t)	1,600	....
1950								
January	48.9	97	a 16	.5	....	(t)	121	....
February	150.1	298	a 390	13	....	(t)	962	....
March	343.2	681	a 5,790	187	580	20	6,250	....
April	257.8	511	a 7,220	241	b 550	75	10,400	....
May	195.4	388	a 2,300	74	234	17	4,360	....
June	147.7	293	c 23,940	798	20,500	2	57,900	47,000
July	492.3	976	b 189,600	6,120	b 140,000	3	133,000	....
August	78.8	156	b 2,450	79	b 2,000	(t)	11,500	....
September	363.1	720	b 54,600	1,820	b 42,000	0	53,700	....
Water year 1949-50.	2,411.6	4,780	a 287,900	789	b 140,000	0	42,600	....

See footnotes at end of table.

Table 34.--Monthly and annual summary of water and suspended-sediment discharge, Muddy Creek near Pavillion, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1950								
October	187.6	372	427	14	....	....	883	....
November	154.8	307	a 224	7.5	....	....	536	....
December	143.0	284	c 178	5.7	....	....	461	....
1951								
January	47.8	95	27	.9	....	(t)	209	....
February	191.3	379	c 194	6.9	....	(t)	376	....
March	262.5	521	a 2,043	66	b 600	....	2,880	....
April	215.4	427	a 7,405	247	b 1,100	80	12,700	....
May	149.4	296	c 6,835	220	4,520	19	16,900	45,200
June	96.0	190	a 936	31	259	11	3,600	14,900
July	253.7	503	94,492	3,050	90,000	0	128,000	39,900
August	8.7	17	c 3	.1	....	0	128	....
September	114.9	228	c 7,758	259	4,830	(t)	25,000	19,000
Water year 1950-51	1,825.1	3,620	c 120,522	330	90,000	0	23,600	45,200
October	428.1	849	b 71,736	2,310	b 60,000	....	59,800	....
November	130.1	258	b 763	25	b 200	....	2,170	....
December	39.8	79	a 42	1.4	....	(t)	391	....
1952								
January	7.9	16	b 3	.1	....	(t)	141	....
February	106.6	211	a 77	2.7	....	(t)	268	....
March	289.8	575	a 459	15	63	....	587	....
April	999	1,980	a 101,761	3,390	b 20,000	80	36,400	65,000

May................	750.2	1,490	30,526	985	14,000	28	15,100	42,000
June...............	177.0	351	665	22	78	....	1,390	2,990
July...............	39.8	79	124	4.0	26	(t)	1,150	7,700
August.............	291.9	579	a 33,386	1,080	b 20,000	....	40,800	b 33,000
September..........	137.2	272	222	7.4	....	....	599	....
Water year 1951-52.	3,397.4	6,740	a 239,764	655	b 60,000	(t)	26,100	....

a Includes estimated loads for many days.
b Estimated.
c Includes estimated loads for a few days.
t Sediment discharge less than 1 ton before 1951 water year, less than 0.50 ton during 1951 and 1952 water years.

Table 35.--Monthly and annual summary of water and suspended-sediment discharge, Muddy Creek near Shoshoni, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
March..............	364.3	723	13,310	429	1,020	17	13,500	24,000
April..............	347.2	689	16,120	537	896	97	17,200	23,700
May................	135.7	269	9,290	300	5,370	8	25,400	72,000
June...............	487.8	968	195,400	6,510	130,000	(t)	138,000	128,000
July...............	530.0	1,050	307,400	9,920	159,000	0	193,000	171,000
August.............	0	0	0	0	0	0	....	....
September..........	2.1	4.2	206	6.9	115	0	35,000	32,000
Mar. 1 to Sept. 30.	1,867.1	3,700	541,700	2,530	159,000	0	100,000	171,000

See footnotes at end of table.

Table 35.--Monthly and annual summary of water and suspended-sediment discharge, Muddy Creek near Shoshoni, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
October	145.7	289	a 1,600	52	b 500	(t)	4,070	....
November	97.1	193	a 900	30	183	(t)	3,430	....
December	7.9	16	a 10	.3	b 5	0	469	....
1950								
January	0	0	0	0	0	0	....	....
February	72.2	143	a 1,200	43	b 300	0	6,160	....
March	354.2	703	a 10,500	339	1,100	4	11,000	....
April	249.4	495	a 12,600	420	b 1,400	36	18,700	....
May	187.8	372	a 5,590	180	656	3	11,000	....
June	219.8	436	36,680	1,220	28,700	0	59,600	130,000
July	1,272.1	2,520	a 321,300	10,400	b 200,000	7	87,200	....
August	563.8	1,120	19,330	624	3,560	2	12,700	32,000
September	539.5	1,070	a 136,100	4,540	95,000	(t)	87,000	127,000
Water year 1949-50.	3,709.5	7,360	a 545,800	1,500	b 200,000	0	52,500	....
October	111.0	220	c 814	26	87	9	2,720	4,600
November	120.7	239	a 255	8.5	b 28	(t)	782	....
December	52.3	104	c 41	1.3	8	(t)	290	....

1951								
January	6.6	13	5	.2	....	0	281	....
February	104.2	207	c 87	3.1	b 24	0	309	....
March	204.1	405	a 5,731	185	b 800	....	10,400	....
April	161.2	320	c 7,951	265	690	79	18,300	27,000
May	1,609.9	3,190	130,088	4,200	12,000	100	29,900	48,700
June	1,416.5	2,810	49,552	1,650	4,930	158	13,000	21,700
July	2,564	5,090	475,261	15,300	193,000	499	66,200	119,000
August	1,573	3,120	42,137	1,360	5,580	104	9,920	21,300
September	1,227	2,430	43,408	1,450	14,600	158	13,100	38,600
Water year 1950-51	9,150.5	18,150	c 755,330	2,070	193,000	0	30,600	119,000
October	734.1	1,460	a 120,378	3,880	94,000	9	58,600	91,000
November	60.5	120	a 162	5.4	24	(t)	992	2,000
December	11.4	23	a 10	.3	....	0	325	....
1952								
January	0	0	0	0	0	0	....	....
February	27.0	54	a 21	.7	....	0	288	....
March	339.2	693	a 5,373	173	b 1,000	(t)	5,870	20,000
April	963	1,910	a 121,109	4,040	20,400	540	44,900	70,000
May	1,157	2,290	c 85,356	2,750	20,900	249	27,300	58,000
June	1,282	2,540	a 46,106	1,540	6,650	125	13,300	22,800
July	2,341	4,640	c 75,181	2,430	4,900	242	11,900	16,900
August	3,460	6,860	c 255,056	8,230	77,000	180	27,300	85,000
September	666.8	1,320	a 9,637	321	1,760	25	5,350	9,900
Water year 1951-52	11,042.0	21,890	a 718,389	1,960	94,000	0	24,100	91,000

a Includes estimated loads for many days.
b Estimated.
c Includes estimated loads for a few days.
t Sediment discharge less than 1 ton before 1951 water year, less than 0.50 ton during 1951 and 1952 water years.

Table 36.--Monthly and annual summary of water and suspended-sediment discharge, Dry Cottonwood Creek near Bonneville, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1949								
Mar. 5-31	1.2	2.4	12	0.4	11	0	3,700	4,000
April	0	0	0	0	0	0	....	....
May	5.5	11	a 70	2.3	a 50	0	4,700	....
June	114.3	227	b 8,600	287	6,880	0	27,900	27,700
July	17.1	34	1,410	45	1,210	0	30,500	11,700
August	0	0	0	0	0	0	....	....
September	0	0	0	0	0	0	....	....
Mar. 5 to Sept. 30	138.1	274	b 10,090	48	6,880	0	27,100	27,700
October	0	0	0	0	0	0	....	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1950								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	.2	.4	a 1	.03	a 1	0	1,850	....
April	0	0	0	0	0	0	....	....
May	.2	.4	(a t)	....	(a t)	0	....	....
June	5.4	11	a 90	3.0	a 60	0	6,170	....
July	3.5	6.9	a 30	1.0	a 11	0	3,170	....
August	0	0	0	0	0	0	....	....
September	30.3	60	a 1,000	33	a 1,000	0	12,200	....
Water year 1949-50	39.6	79	a 1,120	3.1	a 1,000	0	10,500	....

October	0	0	0	0	0	0	....	....
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1951								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	0	0	0	0	0	0	....	....
April	0	0	0	0	0	0	....	....
May	28.7	57	c 451	15	a 150	0	5,820	....
June	42.0	83	c 528	18	a 130	0	4,660	7,200
July	196.7	390	a 21,869	705	a 13,000	0	39,700	....
August	36.1	72	c 126	4.1	15	0	1,290	....
September	379.5	753	d 54,763	1,830	a 33,000	0	51,500	....
Water year 1950-51	683	1,360	d 77,737	213	a 33,000	0	40,600	....
October	156.0	309	d 24,559	792	a 20,000	0	56,200	a 30,000
November	0	0	0	0	0	0	....	....
December	0	0	0	0	0	0	....	....
1952								
January	0	0	0	0	0	0	....	....
February	0	0	0	0	0	0	....	....
March	0	0	0	0	0	0	....	....
April	110.0	218	a 14,018	467	a 14,000	0	45,500	a 21,000
May	1,249.4	2,480	c 181,178	5,840	100,000	0	51,800	44,000
June	238.0	472	c 4,437	148	3,200	0	6,900	13,000
July	187.1	371	c 1,690	55	a 190	0	3,350	a 5,300
August	332.4	659	c 3,370	109	530	23	3,750	12,000
September	301.2	597	c 2,737	91	a 240	1	3,370	5,300
Water year 1951-52	2,574.1	5,110	c 231,989	634	100,000	0	32,200	44,000

a Estimated.
b Includes estimated loads for a few days.
c Includes estimated loads for many days.
d Mostly estimated.
t Sediment discharge less than 1 ton.

Table 37.--Monthly and annual summary of water and suspended-sediment discharge, Bighorn River at Thermopolis, Wyo.

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1946								
Mar. 15-31	16,660	33,050	73,400	4,320	7,530	2,300	1,630	2,610
April	38,628	76,620	210,500	7,020	19,100	1,160	2,020	3,070
May	52,998	105,100	400,400	12,900	37,700	3,640	2,800	5,100
June	128,500	254,900	1,417,000	47,200	203,000	13,800	4,080	10,600
July	71,370	141,600	743,600	24,000	94,000	6,000	3,860	7,860
August	24,966	49,520	215,300	6,950	23,700	3,540	3,190	5,400
September	37,616	74,610	401,300	13,400	148,000	3,340	3,950	19,700
Mar. 15 to Sept. 30	370,738	735,400	3,462,000	17,300	203,000	1,160	3,460	19,700
October	42,150	83,600	245,300	7,910	36,400	2,080	2,150	6,340
November	25,970	51,510	39,700	1,320	2,400	518	565	956
December	21,036	41,720	26,190	845	1,630	42	461	714
1947								
January	17,896	35,500	15,740	508	1,160	33	326	631
February	19,603	38,880	16,980	606	1,150	161	320	558
March	28,195	55,920	148,200	4,780	19,700	165	1,940	4,650
April	31,906	63,280	238,900	7,960	23,200	2,310	2,770	5,260
May	153,800	305,100	1,621,000	52,300	137,000	13,800	3,900	10,800
June	259,780	515,300	1,595,000	53,200	125,000	13,900	2,270	5,210
July	194,360	385,500	1,093,000	35,300	104,000	15,000	2,080	5,630
August	71,312	141,400	573,200	18,500	102,000	3,740	2,980	9,720
September	33,327	66,100	119,800	3,860	6,320	3,070	1,330	1,740
Water year 1946-47	899,335	1,784,000	5,733,000	15,700	137,000	33	2,360	10,800
October	41,350	82,020	128,900	4,160	20,300	1,440	1,150	3,810
November	32,690	64,840	63,060	2,100	5,200	278	714	1,820
December	23,438	46,490	32,880	1,060	6,160	96	520	2,260

1948								
January	25,351	50,280	103,700	3,350	10,400	261	1,520	3,700
February	28,693	56,910	82,740	2,850	17,300	144	1,070	4,080
March	36,226	71,850	212,300	6,850	40,000	132	2,170	7,150
April	36,422	72,240	169,000	5,630	11,300	2,500	1,720	2,950
May	82,857	164,300	1,003,000	32,350	186,000	1,100	4,480	9,000
June	169,240	335,700	1,652,000	55,100	250,000	15,500	3,610	15,800
July	66,030	131,000	566,700	18,300	152,000	4,600	3,180	25,600
August	24,758	49,110	232,900	7,510	60,100	2,120	3,480	17,400
September	30,508	60,510	420,400	14,000	188,000	2,000	5,100	30,800
Water year 1947-48	597,563	1,185,000	4,668,000	12,800	250,000	96	2,890	30,800
October	26,853	53,260	86,100	2,780	14,200	830	1,190	5,760
November	22,015	43,670	30,120	1,000	5,500	352	507	1,960
December	20,106	39,880	14,600	471	1,890	91	269	890
1949								
January	18,445	36,590	13,000	419	1,760	93	261	980
February	19,930	39,530	34,380	1,350	2,990	360	639	1,700
March	31,786	63,050	95,980	3,100	7,530	958	1,120	2,130
April	36,081	71,570	238,000	7,930	28,200	3,110	2,440	4,700
May	103,390	205,100	1,024,000	33,000	97,800	5,510	3,670	6,350
June	153,800	305,100	1,273,000	42,400	113,000	10,300	3,070	5,290
July	72,494	143,800	524,300	16,900	92,600	3,140	2,680	11,000
August	26,019	51,610	128,700	4,150	5,900	3,020	1,830	2,560
September	35,667	70,740	143,900	4,800	9,840	1,890	1,490	2,760
Water year 1948-49	556,586	1,124,000	3,606,000	9,880	113,000	91	2,360	11,000
October	44,770	88,800	144,700	4,670	11,300	2,460	1,200	2,860
November	34,530	68,490	56,080	1,870	2,760	1,200	602	786
December	21,779	43,200	16,340	527	1,690	55	278	860
1950								
January	20,822	41,300	17,590	567	8,640	6	313	1,920
February	22,687	45,000	20,240	723	3,090	125	330	1,080
March	26,851	53,260	54,230	1,750	3,770	406	748	1,410
April	29,576	58,660	113,200	3,770	8,420	1,260	1,420	3,000

Table 37.--Monthly and annual summary of water and suspended-sediment discharge, Bighorn River at Thermopolis, Wyo.--Continued

Month	Water discharge (cfs-days)	Runoff (acre-feet)	Suspended sediment					
			Load (tons)	Daily load (tons)			Concentration (ppm)	
				Mean	Maximum	Minimum	Weighted mean	Maximum daily
1950								
May	60,170	119,300	425,600	13,700	53,100	1,850	2,620	4,930
June	200,040	396,800	1,386,000	46,200	81,800	27,800	2,570	4,510
July	157,150	311,700	1,234,000	39,800	185,000	15,500	2,910	19,000
August	42,630	84,560	402,800	13,000	26,200	6,880	3,500	4,600
September	53,600	106,300	965,800	32,200	330,000	6,930	6,670	28,000
Water year 1949-50	714,605	1,417,000	4,837,000	13,300	330,000	6	2,510	28,000
October	53,300	105,700	241,090	7,780	25,400	2,680	1,680	3,910
November	36,725	72,840	62,063	2,070	3,260	177	626	881
December	26,570	52,700	21,954	708	2,000	93	306	643
1951								
January	23,500	46,610	8,044	259	994	56	127	520
February	26,795	53,150	36,399	1,300	2,230	297	503	713
March	31,514	62,510	84,841	2,740	7,530	812	997	2,020
April	35,068	69,560	153,440	5,120	14,600	3,140	1,620	3,280
May	121,250	240,500	1,375,450	44,400	104,000	3,970	4,200	7,970
June	194,060	384,900	971,700	32,400	59,200	14,800	1,850	3,520
July	149,810	297,100	1,091,000	35,200	172,000	19,200	2,700	9,000
August	71,680	142,200	404,120	13,000	36,800	3,950	2,090	2,920
September	36,885	73,160	216,690	7,220	44,700	1,520	2,180	11,100
Water year 1950-51	807,157	1,601,000	4,666,791	12,800	172,000	56	2,140	11,100
October	20,106	39,880	84,895	2,740	32,600	....	1,560	5,950
November	13,378	26,530	570	19	....	....	16	....
December	15,963	31,660	660	21	....	....	15	....

1952								
January..................	13,819	27,410	1,194	39	....	....	32	....
February.................	8,004	15,880	105	3.6	....	....	5	....
March....................	8,380	16,620	786	25	340	....	35	430
April....................	13,112	26,010	1,637	55	370	....	46	450
May......................	26,314	52,190	10,367	335	1,940	....	146	723
June.....................	36,736	72,860	70,978	2,370	30,800	....	716	3,360
July.....................	44,520	88,300	42,345	1,370	3,500	....	352	740
August...................	38,832	77,020	20,513	662	4,000	....	196	854
September................	34,240	67,910	5,142	171	540	....	56	160
Water year 1951-52....	273,404	542,300	239,192	654	32,600	....	324	5,950

Table 38.--Particle-size analyses of suspended sediment, depth-integrated samples, Wind River below Dubois, Wyo.

[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; S, sieve; and P, pipette]

Date	Time	Water discharge (cfs)	Suspended sediment											Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters									
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	
1951														
May 7......	1:40 p.m.	a 630	526	1,260	24	29	33	40	51	67	85	93	98	BWCM
1952														
May 26.....	4:05 p.m.	a 1,330	714	3,250	.....	50	.....	78	.....	90	.....	.....	.....	SPWCM
July 12....	5:00 p.m.	b 840	4,840	3,940	.....	41	.....	69	.....	95	.....	.....	.....	SPWCM

a Streamflow measurement.
b Estimated.

Table 39.--Particle-size analyses of suspended sediment, depth-integrated samples, North Fork Wind River near Dubois, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment									Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters							
					0.004	0.016	0.062	0.125	0.250	0.500	1.000	
1952												
June 5..........	11:05 a.m.	1,820	1,790	2,210	11	28	58	74	91	99	100	SPWCM

Table 40.--Particle-size analyses of suspended sediment, depth-integrated samples, Wind River at Riverton, Wyo.
[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; C, chemically dispersed; S, sieve; P, pipette; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment												Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters										
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	
1949															
May 14......	7:10 p.m.	1,780	681	1,710	......	......	24	33	46	54	68	90	99	......	BW
May 21......	2:55 p.m.	1,640	427	614	......	......	......	......	......	46	57	91	100	......	BW
June 1......	4:35 p.m.	1,970	567	538	......	......	......	17	22	33	45	96	100	......	BW
Sept. 4.....	5:55 p.m.	749	346	273	......	58	69	77	82	89	91	98	100	......	BW
Oct. 19.....	4:40 p.m.	1,250	2,840	1,120	41	64	84	92	93	95	96	96	97	......	BW
1950															
May 20......	12:32 p.m.	821	261	571	13	19	26	38	41	50	57	64	67	......	BWC
June 21.....	6:30 p.m.	4,420	984	606	14	32	37	50	61	71	80	94	100	......	BWC
1951															
May 25......	4:30 p.m.	4,740	2,020	2,860	......	17	......	29	......	53	71	89	99	100	SPWCM
May 30......	5:30 p.m.	5,770	1,130	2,940	10	17	23	31	40	56	69	96	100	......	BWCM
June 18.....	6:30 p.m.	7,650	1,510	2,550	......	29	......	41	......	58	72	90	99	100	SPWCM
June 29.....	11:05 a.m.	1,860	231	1,900	16	20	26	33	42	52	60	87	100	......	BWCM
Oct. 4......	3:00 p.m.	1,120	225	628	36	45	51	58	69	76	80	86	90	......	BWCM

Oct. 11.....	9:00 a.m.	1,730	628	1,290	19	20	26	32	46	61	76	93	97	......	BWCM
Oct. 12.....	9:50 a.m.	2,660	678	1,650	17	21	28	36	50	68	78	90	94	......	BWCM
1952															
Apr. 9......	11:10 a.m.	723	276	567	17	26	33	39	49	58	71	82	88	......	BWCM
Apr. 24.....	10:15 a.m.	1,330	222	1,110	12	14	16	21	27	37	46	83	97	......	BWCM
May 4.......	6:25 p.m.	3,570	1,560	1,630	13	18	22	30	43	62	77	97	......	......	BWCM
June 6......	9:20 a.m.	3,130	878	2,420	......	19	......	37	......	61	74	91	98	100	SPWCM
June 10.....	1:50 p.m.	4,020	1,190	1,810	......	9	......	22	......	51	64	79	95	......	SPWCM
June 13.....	10:20 a.m.	1,660	344	1,840	21	27	32	41	49	57	63	78	91	......	BWCM
Aug. 4......	9:00 a.m.	554	4,910	5,590	53	71	83	92	94	96	98	99	......	......	BWCM
Aug. 5......	7:40 a.m.	602	3,400	1,920	.....	80	94	98	......	......	......	......	......	......	BWCM

Table 41.--Particle-size analyses of suspended sediment, depth-integrated samples, Beaver Creek near Arapahoe, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; N, in native water; and B, bottom-withdrawal tube]

Date	Time	Water discharge (cfs)	Suspended sediment											Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters									
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	
1951														
May 16...	4:12 p.m.	170	34,100	8,630	45	56	65	75	82	89	....	....	....	SPWCM
1952														
Apr. 9...	5:00 p.m.	57	4,800	5,220	....	49	....	67	....	83	....	....	....	SPWCM
May 8....	4:00 p.m.	128	3,750	5,150	....	42	....	59	....	90	....	....	....	SPWCM
May 22...	4:15 p.m.	285	20,200	19,100	....	1	....	68	....	82	90	97	100	SPNM
Do.....	4:15 p.m.	285	20,200	9,360	....	45	....	63	....	81	....	....	....	SPWCM
June 18..	3:30 p.m.	16	628	907	....	58	....	69	....	85	....	....	....	SPWCM
June 25..	10:55 a.m.	18	536	1,550	43	49	54	61	66	75	82	97	100	BWCM

Table 42.--Particle-size analyses of suspended sediment, depth-integrated samples, Popo Agie River near Riverton, Wyo.

[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment												Methods of analysis
			Concentration of sample (ppm)	Concentration in suspension analyzed (ppm)	Percent finer than indicated size, in millimeters										
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	
1949															
Apr. 6......	3:15 p.m.	292	338	332	......	52	80	96	......	100	......	......	......	......	BW
May 7.......	4:45 p.m.	957	1,880	629	32	47	62	75	86	91	95	97	98	......	BW
June 1......	12:05 p.m.	2,060	559	721	12	18	24	32	40	50	60	78	86	......	BW
1950															
Apr. 18....	6:40 p.m.	364	698	440	......	59	......	75	......	100	......	......	......	......	SPWCM
Apr. 27....	6:30 p.m.	382	608	392	......	63	......	70	......	98	......	......	......	......	SPWCM
May 20......	11:50 a.m.	1,110	842	1,290	......	36	......	49	......	79	94	98	99	100	SPWCM
Sept. 20....	6:30 p.m.	2,000	5,640	3,650	......	56	......	76	......	95	......	......	......	......	SPWCM
Sept. 22....	3:30 p.m.	808	767	1,680	......	80	86	93	96	98	99	100	......	......	BWC
1951															
Apr. 6......	10:00 a.m.	285	370	1,050	55	72	86	95	99	100	......	......	......	......	BWCM
May 8.......	11:40 a.m.	458	186	613	56	67	76	87	97	100	......	......	......	......	BWCM
May 28......	12:15 p.m.	3,440	989	2,430	19	25	29	37	46	64	74	94	99	......	BWCM
June 6......	11:25 a.m.	2,030	686	1,670	40	50	58	64	70	80	88	97	100	......	BWCM
1952															
Apr. 8......	11:30 a.m.	395	320	539	32	56	68	78	85	88	93	97	98	......	BWCM
Apr. 24.....	11:20 a.m.	480	913	2,290	......	70	......	90	......	99	......	......	......	......	SPWCM
May 19......	2:25 p.m.	1,820	264	1,300	30	36	40	49	56	71	81	......	......	......	BWCM
June 5......	2:20 p.m.	4,210	519	1,280	22	27	30	37	51	64	73	......	......	......	BWCM
June 10.....	11:10 a.m.	6,210	358	1,950	19	25	29	34	40	50	58	75	89	......	BWCM
June 11.....	11:40 a.m.	5,520	288	1,910	21	26	28	34	40	44	51	57	75	......	BWCM
June 13.....	11:40 a.m.	3,970	307	1,430	20	27	32	39	47	61	68	86	98	......	BWCM
June 24.....	10:50 a.m.	1,290	115	493	......	37	......	51	......	74	......	......	......	......	SPWCM

Table 43.--Particle-size analyses of suspended sediment, depth-integrated samples, Muskrat Creek near Shoshoni, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	Methods of analysis
1950											
Sept. 11	1:55 p.m.	a 0.5	28,200	9,100	96	99	100	....	....	....	SPWCM
Sept. 20	10:45 a.m.	240	60,400	5,740	55	78	95	98	99	100	SPWCM

a Streamflow measurement.

Table 44.--Particle-size analyses of suspended sediment, depth-integrated samples, Fivemile Creek above Wyoming Canal near Pavillion, Wyo.
[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; M, mechanically dispersed; and N, in native water]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	Methods of analysis
1949															
Sept. 4	2:55 p.m.	2.3	8,470	1,580	61	82	94	94	95	96	98	100	......	......	BW
1950															
Mar. 6	11:00 a.m.	a 1	1,580	980	34	47	57	62	70	82	92	96	98	......	BW
Mar. 15	12:10 p.m.	a .5	7,700	3,090	......	13	......	23	......	53	75	94	99	......	SPWCM
Mar. 27	4:45 p.m.	a 1	7,980	3,370	......	40	......	62	......	75	92	99	100	......	SPWCM
Apr. 4	1:10 p.m.	.8	3,940	2,370	......	72	......	83	......	95	......	......	......	......	SPWCM
Apr. 17	12:30 p.m.	1.4	15,800	3,080	74	80	92	98	98	99	100	......	......	......	BWC

See footnotes at end of table.

Table 44.--Particle-size analyses of suspended sediment, depth-integrated samples, Fivemile Creek above Wyoming Canal near Pavillion, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment												Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters										
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	
1950															
Apr. 27.....	3:00 p.m.	1.7	4,530	2,650	......	72	......	85	......	93	......	......	......	......	SPWCM
May 9.......	4:25 p.m.	6.5	24,800	7,070	......	48	......	67	......	87	......	......	......	......	SPWCM
May 25......	12:10 p.m.	1.2	6,680	3,310	......	68	......	82	......	88	......	......	......	......	SPWCM
June 2......	2:55 p.m.	1.5	1,580	741	......	81	......	85	......	89	......	......	......	......	SPWCM
June 19.....	5:00 p.m.	135	24,700	14,400	......	35	......	61	......	88	......	......	......	......	SPWCM
July 25.....	10:30 a.m.	a 7	26,800	10,700	......	67	......	90	......	96	......	......	......	......	SPWCM
Do.........	8:10 p.m.	240	110,000	4,840	......	34	......	53	......	83	......	......	......	......	SPWCM
Sept. 20....	12:20 p.m.	280	78,400	16,100	21	30	38	47	60	74	90	99	100	......	BWCM
Sept. 21....	10:20 a.m.	5.5	9,820	3,810	......	72	84	90	93	96	98	100	......	......	BWCM
Nov. 27.....	2:50 p.m.	b 5.0	1,320	1,080	......	43	50	55	61	70	80	89	96	......	BWCM
1951															
Feb. 8......	5:10 p.m.	a 12	4,780	3,050	......	34	......	55	......	82	......	......	......	......	SPWCM
Mar. 19.....	5:30 p.m.	c .5	35,000	4,810	......	19	......	31	......	64	86	96	99	100	SPWCM
Apr. 3......	6:15 p.m.	1.7	11,200	7,830	......	60	......	78	......	90	......	......	......	......	SPWCM
Apr. 5......	5:30 p.m.	1.6	12,600	4,240	......	60	......	74	......	91	......	......	......	......	SPWCM
Apr. 9......	11:00 a.m.	.9	14,200	5,780	......	68	......	86	......	93	......	......	......	......	SPWCM
Apr. 14.....	5:00 p.m.	.8	6,130	4,930	......	86	......	92	......	95	......	......	......	......	SPWCM
Apr. 18.....	7:20 p.m.	.6	8,170	6,920	......	84	......	96	......	98	......	......	......	......	SPWCM
Apr. 24.....	8:20 a.m.	2.3	17,800	9,650	......	35	......	52	......	68	84	96	100	......	SPWCM
Apr. 26.....	5:15 p.m.	9.5	40,000	6,530	......	32	......	55	......	84	......	......	......	......	SPWCM
Apr. 30.....	4:40 p.m.	45	35,400	5,560	......	32	......	51	......	84	......	......	......	......	SPWCM
May 21......	6:10 p.m.	21	70,600	10,700	......	51	......	73	......	90	97	100	......	......	SPWCM
June 23.....	6:00 p.m.	1.2	37,800	6,830	......	69	......	89	......	94	98	100	......	......	SPWCM
1952															
Apr. 7......	1:25 p.m.	b 1.3	7,180	4,950	......	33	......	64	......	87	......	......	......	......	SPWCM
May 2.......	12:15 p.m.	1.6	6,600	4,470	......	68	......	85	......	94	......	......	......	......	SPWCM
May 10......	8:15 a.m.	4.7	9,960	8,030	......	......	0	23	75	84	......	......	......	......	SPNM

Do........	8:15 a.m.	4.7	9,960	5,140	38	46	58	67	76	87	......	......	......	SPWCM
May 15......	6:40 p.m.	3.8	9,830	6,260	......	41	......	56	......	76	90	99	100	......	SPWCM
May 22......	6:40 p.m.	16	23,700	7,180	......	40	......	57	......	77	88	93	98	100	SPWCM
May 26......	4:30 p.m.	9.0	20,400	6,710	......	38	......	55	......	72	80	87	96	99	SPWCM
June 26.....	8:40 a.m.	.9	11,900	9,650	......	84	......	94	......	95	......	......	......	......	SPWCM

a Estimated.
b Streamflow measurement.
c Mean daily discharge.

Table 45.--Particle-size analyses of suspended sediment, depth-integrated samples, normal section, Fivemile Creek near Riverton, Wyo.
[Methods of analysis: S, sieve; P, pipette; N, in native water; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; and B, bottom-withdrawal tube]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	Methods of analysis
1951														
Mar. 26............	12:22 p.m.	a 22	6,290	4,840	2	2	11	41	58	73	......	......	......	SPN
Do............	12:22 p.m.	a 22	6,290	6,910	25	33	40	48	60	76	91	98	100	SPWCM
Mar. 27............	4:30 p.m.	34	10,300	7,470	......	0	36	53	66	80	92	98	100	SPN
Do............	4:30 p.m.	34	10,300	7,000	31	41	49	58	67	80	92	98	100	SPWCM
Do............	4:30 p.m.	34	10,300	9,440	......	3	5	64	68	77	88	100	......	BWN
Do............	4:30 p.m.	34	10,300	4,360	36	43	51	62	68	80	92	98	100	BWCM
May 1............	12:35 p.m.	72	51,000	42,500	......	......	0	60	76	90	98	100	......	SPN
Do............	12:35 p.m.	72	51,000	9,770	30	40	49	59	69	89	98	100	......	SPWCM
July 6............	12:32 p.m.	154	19,500	6,880	26	35	45	54	64	82	96	100	......	SPWCM
July 19 b..........	1:52 p.m.	173	24,000	....	34	44	53	64	75	90	99	100	......	SPWCM
Aug. 3 b..........	3:32 p.m.	182	18,000	....	29	38	49	59	68	82	96	100	......	SPWCM

a Streamflow measurement.
b Composite of size distributions determined by particle-size analyses of samples from individual verticals.

Table 46.--Particle-size analyses of stream-bed material, Fivemile Creek near Riverton, Wyo.
[Method of analysis: Sieve]

Date	Station	Stream-bed material										Remarks
		Percent finer than indicated size, in millimeters										
		0.031	0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.000	
1951												
Mar. 26	8	....	3	14	35	74	92	96	....	....	....	
	11	....	1	4	20	70	92	98	....	....	....	
	14	....	0	5	41	93	98	98	....	....	....	
	19	....	2	11	49	82	87	91	....	....	....	
May 1	13	....	4	19	58	87	95	98	....	....	....	Normal section.
	30	10	21	40	62	84	92	95	....	....	....	Do.
	45	....	4	11	29	61	77	86	....	....	....	Do.
	....	....	1	5	22	71	88	95	....	....	....	Bank at left edge of water.
	....	....	5	15	35	66	81	91	....	....	....	Bank at right edge of water.
July 6	15	....	2	8	32	75	89	94	97	....	....	150 ft upstream from normal section.
	50	....	7	48	94	99	100	....	....	....	....	Do.
	50	....	7	11	51	93	99	100	....	....	....	Normal section.
	80	....	8	20	55	77	89	95	97	....	....	Do.
	100	....	2	7	31	77	92	96	98	....	....	Do.
	50	....	5	13	53	83	91	95	97	....	....	150 ft downstream from normal section.
	100	....	4	12	47	72	79	82	84	....	....	Do.
	150	....	8	32	74	94	98	99	....	....	....	Do.
July 19	50	....	2	9	41	90	98	98	100	....	....	150 ft upstream from normal section.
	100	....	3	8	45	90	97	98	99	....	....	Do.
	176	....	4	26	71	94	98	100	....	....	....	Do.
	24	....	4	9	43	87	97	98	99	....	....	Normal section.
	40	....	2	10	46	90	97	98	98	....	....	Do.
	130	....	2	10	65	96	99	100	....	....	....	Do.
	60	....	2	15	68	95	99	100	....	....	....	150 ft downstream from normal section.
	90	....	3	32	79	96	99	99	99	....	....	Do.
	260	....	8	31	81	96	98	98	99	....	....	Do.
Aug. 3	55	....	2	19	70	90	96	98	98	....	....	150 ft upstream from normal section.
	120	....	3	9	44	93	99	100	....	....	....	Do.
	185	....	1	10	60	95	98	99	99	....	....	Do.
	34	....	2	21	82	99	100	....	....	....	....	Normal section.

	52	....	3	10	55	96	99	99	100	....	....	Do.
	170	....	6	20	69	97	99	99	99	....	....	Do.
	20	....	9	34	76	97	99	100	....	....	....	150 ft downstream from normal section.
	185	....	6	26	76	97	99	100	....	....	....	Do.
	315	....	2	6	51	95	99	99	100	....	....	Do.
<u>1953</u>												
July 16......	....	....	....	2	15	47	66	77	83	93	100	Normal section, right half.
	....	....	1	7	50	97	100	....	....	....	....	Normal section, left half.

Table 47.--Particle-size analyses of suspended sediment, depth-integrated samples, contracted section, Fivemile Creek near Riverton, Wyo.
[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; N, in native water; S, sieve; P, pipette; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
<u>1949</u>																
Oct. 1.......	6:05 p.m.	76	3,810	1,580	......	19	29	40	50	59	66	81	96	......	......	BW
Oct. 8.......	10:30 a.m.	34	2,370	1,240	3	6	8	12	15	17	28	56	85	......	......	BW
Oct. 26......	10:45 a.m.	37	3,290	1,600	6	9	12	16	19	23	29	62	77	......	......	BW
Nov. 30......	4:05 p.m.	23	1,300	706	......	20	27	32	41	53	72	84	92	......	......	BN
<u>1950</u>																
Feb. 27......	3:15 p.m.	a 22	23,600	1,880	22	27	36	48	62	78	92	98	100	......	......	BW
Mar. 6.......	12:00 m.	27	14,200	8,230	......	35	......	57	......	78	87	94	99	100	......	SPWCM
Mar. 16......	10:50 a.m.	18	7,260	2,340	......	22	......	34	......	54	76	90	99	100	......	SPWCM
Mar. 29......	3:25 p.m.	27	17,900	6,950	......	18	......	28	......	49	60	72	90	98	100	SPWCM
Apr. 10......	2:00 p.m.	35	8,040	5,330	......	36	......	51	......	72	86	93	98	100	......	SPWCM
Apr. 23......	2:35 p.m.	24	6,190	3,650	......	2	8	40	50	60	78	90	96	99	100	SPNM
Do.......	2:35 p.m.	24	6,190	5,260	......	30	36	42	50	60	......	......	......	......	......	SPWCM
May 7........	5:45 p.m.	42	12,100	10,500	......	33	......	57	......	78	89	96	99	100	......	SPWCM
May 8........	4:45 p.m.	51	26,100	4,470	......	45	......	60	......	86	94	98	99	100	......	SPWCM

See footnotes at end of table.

Table 47.--Particle-size analyses of suspended sediment, depth-integrated samples, contracted section, Fivemile Creek near Riverton, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1950																
May 21	5:10 p.m.	45	11,000	6,140	......	32	......	46	......	66	79	90	97	99	......	SPWCM
May 28	11:35 a.m.	60	28,200	4,100	......	40	......	58	......	86	95	98	100	......	......	SPWCM
May 29	1:30 p.m.	89	39,000	14,900	......	32	......	52	......	83	......	......	......	......	......	SPWCM
June 2	3:40 p.m.	50	18,800	5,120	......	29	......	44	......	71	87	94	98	99	100	SPWCM
June 10	11:35 a.m.	100	30,300	6,870	......	29	......	46	......	75	92	98	100	......	......	SPWCM
June 14	4:20 p.m.	97	40,100	6,160	......	35	......	54	......	84	......	......	......	......	......	SPWCM
June 19	8:00 p.m.	640	132,000	8,550	......	27	......	43	......	77	......	......	......	......	......	SPWCM
June 22	10:50 a.m.	132	41,400	4,510	......	32	......	49	......	74	......	......	......	......	......	SPWCM
June 29	1:45 p.m.	137	32,200	4,820	......	33	......	50	......	77	......	......	......	......	......	SPWCM
July 1	9:50 a.m.	160	26,200	5,570	......	29	......	42	......	70	86	95	98	99	100	SPWCM
July 8	1:40 p.m.	165	37,200	8,540	......	21	......	40	......	65	83	97	100	......	......	SPWCM
July 19	8:40 a.m.	134	34,000	3,830	......	30	......	44	......	68	87	97	100	......	......	SPWCM
July 21	4:55 p.m.	134	34,300	9,140	......	33	......	51	......	75	88	95	98	100	......	SPWCM
July 25	1:00 p.m.	211	53,500	7,740	......	1	5	47	57	74	89	97	100	......	......	SPNM
Do	1:00 p.m.	211	53,500	3,980	29	33	41	52	61	76	89	96	100	......	......	SPWCM
Do	5:00 p.m.	530	87,400	5,800	......	26	......	39	......	68	88	98	100	......	......	SPWCM
Do	7:45 p.m.	718	70,900	5,750	......	30	......	45	......	72	91	99	100	......	......	SPWCM
July 27	2:10 p.m.	165	45,000	6,730	......	30	......	45	......	71	89	96	99	100	......	SPWCM
Aug. 3	11:55 a.m.	185	38,500	5,480	......	32	......	46	......	71	87	96	100	......	......	SPWCM
Aug. 9	6:15 p.m.	182	39,400	25,500	......	......	1	44	53	68	86	96	100	......	......	SPNM
Do	6:15 p.m.	182	39,400	2,630	23	29	37	43	51	70	88	97	100	......	......	SPWCM
Aug. 10	3:25 p.m.	180	36,700	25,300	......	......	1	43	56	70	86	96	100	......	......	SPNM
Do	3:25 p.m.	180	36,700	6,020	22	30	40	47	56	72	88	97	100	......	......	SPWCM
Aug. 11	11:05 a.m.	193	35,500	24,100	......	......	1	42	53	68	86	96	99	100	......	SPNM
Do	11:05 a.m.	193	35,500	5,010	23	30	36	44	50	69	87	96	99	100	......	SPWCM
Aug. 13	7:20 a.m.	187	42,200	5,280	......	30	......	46	......	73	87	94	98	99	100	SPWCM
Aug. 14	9:10 a.m.	195	41,400	5,620	......	28	......	40	......	65	84	94	98	99	100	SPWCM
Aug. 17	9:05 a.m.	178	38,800	9,340	1	3	3	41	50	65	86	96	100	......	......	SPNM
Do	9:05 a.m.	178	38,800	5,150	25	30	36	43	54	71	88	97	100	......	......	SPWCM
Aug. 20	5:45 p.m.	183	35,600	4,620	......	30	......	42	......	67	88	97	100	......	......	SPWCM

Aug. 23.......	9:45 a.m.	163	34,800	22,300	......	......	1	36	48	60	81	96	100	......	......	SPNM
Do........	9:45 a.m.	163	34,800	2,440	20	26	32	39	44	58	......	......	......	......	......	SPWCM
Aug. 29.......	9:15 a.m.	165	57,700	7,760	......	36	......	54	......	74	89	98	100	......	......	SPWCM
Sept. 20......	9:20 a.m.	401	67,100	5,010	......	40	......	64	......	82	96	100	......	......	......	SPWCM
Do........	3:10 p.m.	916	239,000	3,160	......	22	......	33	......	59	84	98	100	......	......	SPWCM
Sept. 27......	2:15 p.m.	52	15,100	3,670	......	26	......	40	......	57	70	85	98	100	......	SPWCM
Sept. 29......	11:00 a.m.	51	19,800	8,860	1	1	3	30	36	49	72	89	96	99	100	SPNM
Do........	11:00 a.m.	51	19,800	3,960	17	21	27	32	39	49	73	90	97	99	100	SPWCM
Oct. 9........	1:45 p.m.	30	11,400	10,700	......	19	......	29	......	49	70	88	97	99	100	SPWCM
Oct. 16.......	1:45 p.m.	28	10,000	9,130	......	16	......	24	......	41	64	82	95	99	100	SPWCM
Oct. 23.......	1:40 p.m.	28	7,590	7,890	......	......	......	25	31	43	66	87	96	99	99	SPNM
Oct. 30.......	1:30 p.m.	29	5,920	7,520	......	24	......	36	......	55	79	96	100	......	......	SPWCM
Nov. 6........	1:00 p.m.	30	9,990	7,280	......	16	......	23	......	37	58	80	94	98	100	SPWCM
Nov. 13.......	2:50 p.m.	b 42	2,700	1,740	......	26	......	32	......	40	56	84	98	100	......	SPWCM
Dec. 5........	3:00 p.m.	a 35	7,060	3,300	......	14	......	18	......	24	41	86	99	100	......	SPWCM
Dec. 11.......	12:40 p.m.	34	15,800	6,820	......	1	3	21	28	42	70	93	99	100	......	SPNM
Do........	12:40 p.m.	34	15,800	2,890	24	26	30	34	39	49	68	90	100	......	......	BWCM
1951																
Jan. 25.......	1:35 p.m.	a 24	4,220	....	......	......	......	......	......	28	36	64	94	97	100	S
Feb. 13.......	4:45 p.m.	a 22	4,380	1,160	......	23	......	29	......	38	50	88	100	......	......	SPWCM
Feb. 23.......	5:45 p.m.	a 26	11,200	5,820	......	27	......	42	......	63	74	90	98	100	......	SPWCM
Mar. 21.......	11:30 a.m.	28	13,100	6,200	......	23	......	33	......	51	64	84	96	99	......	SPWCM
Mar. 26.......	5:02 p.m.	35	18,900	14,400	1	1	2	53	66	74	84	94	99	100	......	SPN
Do........	5:02 p.m.	35	18,900	6,300	33	40	50	60	66	76	85	95	99	100	......	SPWCM
Mar. 27.......	11:45 a.m.	20	8,990	4,680	1	1	6	29	39	53	71	88	98	100	......	SPN
Do........	11:45 a.m.	20	8,990	4,040	19	25	29	36	42	56	72	88	97	100	......	SPWCM
Apr. 24.......	9:40 a.m.	18	3,920	2,800	......	47	......	70	......	88	......	......	......	......	......	SPWCM
Apr. 25.......	9:40 a.m.	20	14,500	9,220	......	43	......	60	......	70	79	90	99	100	......	SPWCM
Apr. 28.......	9:20 a.m.	39	21,900	5,660	......	36	......	53	......	74	75	91	99	100	......	SPWCM
May 1.........	9:30 a.m.	74	58,000	8,370	26	33	40	49	58	76	86	94	99	100	......	SPWCM
Do. c.....	12:45 p.m.	70	54,400	8,380	30	38	47	57	......	85	93	98	100	......	......	SPWCM
Do........	3:55 p.m.	67	54,300	7,870	30	37	45	54	66	81	89	96	99	100	......	SPWCM
Do........	4:10 p.m.	64	54,100	6,460	30	38	47	58	68	85	93	97	99	100	......	SPWCM
May 9.........	3:45 p.m.	41	30,600	23,100	......	......	2	45	59	73	89	98	100	......	......	SPNM
Do........	3:45 p.m.	41	30,600	16,000	23	31	38	47	55	70	88	99	100	......	......	BWCM
May 15........	10:00 a.m.	46	17,800	11,900	......	1	9	37	48	68	90	98	100	......	......	SPNM

See footnotes at end of table.

Table 47.--Particle-size analyses of suspended sediment, depth-integrated samples, contracted section, Fivemile Creek near Riverton, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1951																
May 15.......	10:00 a.m.	46	17,800	3,660	22	27	33	36	48	71	94	98	100	......	......	SPWCM
June 12.......	1:30 p.m.	45	16,000	11,300	......	......	2	44	53	66	86	97	100	......	......	SPNM
Do.......	1:30 p.m.	45	16,000	4,490	21	29	36	41	50	62	75	97	100	......	......	BWCM
July 6 c......	12:40 p.m.	154	25,700	6,590	22	29	36	43	52	68	84	95	99	100	......	SPWCM
July 12.......	1:40 p.m.	232	34,600	7,710	......	35	......	50	......	76	89	96	100	......	......	SPWCM
July 16.......	3:50 p.m.	162	29,000	5,380	......	34	......	......	......	72	87	95	99	100	......	SPWCM
July 19 c.....	1:55 p.m.	168	33,300	9,030	23	32	38	46	55	69	85	95	99	100	......	SPWCM
July 23.......	4:25 p.m.	211	32,300	23,000	......	1	2	52	64	75	89	96	99	100	......	SPNM
Do.......	4:25 p.m.	211	32,300	7,630	25	33	41	50	60	70	78	93	99	......	......	BWCM
July 31.......	4:20 p.m.	180	27,200	5,350	......	42	......	62	......	87	......	......	......	......	......	SPWCM
Aug. 3 c......	3:52 p.m.	182	25,300	6,680	21	27	33	40	47	62	81	92	99	100	......	SPWCM
Aug. 7.......	1:20 p.m.	228	28,400	4,660	......	30	......	42	......	62	82	93	99	100	......	SPWCM
Aug. 13.......	3:50 p.m.	147	23,300	5,390	20	28	34	40	49	62	76	96	99	......	......	BWCM
Aug. 14 c.....	12:28 p.m.	154	22,000	7,980	20	25	30	36	43	56	75	92	99	100	......	SPWCM
Aug. 14 c d...	12:38 p.m.	154	19,200	....	22	29	35	42	50	65	88	99	100	......	......	SPWCM
Aug. 20.......	4:40 p.m.	145	21,400	13,900	......	25	......	39	......	62	81	94	99	100	......	SPWCM
Aug. 27.......	4:30 p.m.	137	20,300	10,100	......	23	......	34	......	52	70	88	98	100	......	SPWCM
Sept. 6.......	2:00 p.m.	145	17,500	10,900	......	25	......	37	......	56	73	90	98	99	100	SPWCM
Sept. 14 c....	1:28 p.m.	119	19,800	....	21	27	33	39	47	60	76	91	99	100	......	SPWCM
Sept. 14 c d..	1:42 p.m.	119	17,700	....	......	31	38	45	55	68	86	98	100	......	......	SPWCM
Sept. 21......	3:00 p.m.	92	15,900	8,750	......	22	......	31	......	49	71	91	99	100	......	SPWCM
Sept. 28......	2:20 p.m.	91	15,100	7,800	......	1	4	32	40	54	73	88	96	98	100	SPNM
Do.......	2:20 p.m.	91	15,100	2,130	26	30	33	38	45	56	69	87	96	......	......	BWCM
Oct. 2 c......	10:40 a.m.	63	12,800	4,190	17	22	26	31	36	47	66	85	94	97	......	SPWCM

1952																
Mar. 27.......	1:50 p.m.	63	24,500	5,700	......	24	......	38	......	61	80	95	98	99	......	SPWCM
Apr. 8........	3:00 p.m.	45	18,000	4,260	......	27	......	38	......	63	78	91	99	......	......	SPWCM
Apr. 17.......	10:30 a.m.	37	18,800	5,450	......	38	......	55	......	77	87	95	99	......	......	SPWCM
May 6.........	1:25 p.m.	125	48,600	8,640	......	36	......	53	......	81	92	98	100	......	......	SPWCM
June 18.......	9:00 a.m.	159	21,000	6,900	......	27	......	39	......	62	79	93	99	100	......	SPWCM
June 24.......	1:40 p.m.	209	22,500	15,100	......	1	......	39	......	66	82	94	99	100	......	SPNM
Do........	1:40 p.m.	209	22,500	7,500	......	29	34	41	49	66	......	......	......	......	......	SPWCM
June 30.......	1:55 p.m.	159	19,200	9,060	......	28	......	41	......	63	80	94	99	100	......	SPWCM
July 14.......	2:10 p.m.	209	27,000	18,500	......	0	......	40	......	65	82	95	100	......	......	SPNM
Do........	2:10 p.m.	209	27,000	10,500	......	26	......	41	......	65	......	......	......	......	......	SPWCM
Aug. 6........	10:55 a.m.	205	20,700	7,430	......	24	......	34	......	55	77	92	99	100	......	SPWCM
Do........	12:20 p.m.	201	21,200	8,750	......	23	......	35	......	55	88	92	99	100	......	SPWCM
Do. c.....	3:00 p.m.	192	20,200	....	......	25	......	40	......	64	80	93	98	99	100	SPWCM
Do........	3:55 p.m.	196	21,900	9,630	......	25	......	40	......	62	79	92	99	100	......	SPWCM
Aug. 13.......	5:10 p.m.	153	16,100	15,700	......	24	......	38	......	58	75	91	98	100	......	SPWCM
Aug. 26.......	11:45 a.m.	118	11,700	5,630	......	1	......	25	......	45	67	87	97	99	......	SPNM
Do........	11:45 a.m.	118	11,700	5,530	......	24	......	33	......	50	......	......	......	......	......	SPWCM
Sept. 22......	11:50 a.m.	140	12,600	6,890	......	8	......	30	......	49	70	90	98	100	......	SPNM
Do........	11:50 a.m.	140	12,600	6,370	......	20	......	30	......	48	......	......	......	......	......	SPWCM
1953																
July 16.......	11:04 a.m.	....	e 12,900	....	......	19	......	25	......	45	66	91	99	100	......	SPWCM
Do........	11:27 a.m.	....	e 10,100	....	......	25	......	32	......	57	77	94	99	100	......	SPWCM
Do........	12:20 p.m.	....	e 12,900	....	......	21	......	29	......	49	67	89	96	98	......	SPWCM
Do........	12:34 p.m.	....	e 16,200	....	......	18	......	25	......	41	56	80	97	100	......	SPWCM
Do. c.....	11:49 a.m.	b 214	e 13,000	....	......	21	......	28	......	48	66	88	98	100	......	SPWCM
Do........	12:36 p.m.	b 214	e 12,300	....	......	26	......	30	......	51	70	89	98	100	......	SPWCM
Do........	12:38 p.m.	b 214	e 12,600	....	......	24	......	30	......	48	66	87	97	99	......	SPWCM

a Mean daily discharge.
b Streamflow measurement.
c Composite of size distributions determined by particle-size analyses of samples from individual verticals.
d 200 ft upstream from contracted section.
e Concentration from analyses of size samples.
Note--Data for 1953 include only those collected as part of special studies.

Table 48.--Particle-size analyses of suspended sediment, point-integrated samples, contracted section, Fivemile Creek near Riverton, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1951																			
May 1.....	3:35 p.m.	67	6	0.7	7.7	0.2	52,900	32	41	49	58	69	88	96	99	.....	.....	.....	SPWCM
	3:35 p.m.	67	6	.7	11.0	.5	58,700	30	38	46	55	66	80	90	97	100	.....	.....	SPWCM
	3:40 p.m.	67	9	1.5	10.1	.4	55,600	28	37	45	55	65	81	88	94	100	.....	.....	SPWCM
	3:40 p.m.	67	9	1.5	11.9	.9	56,600	30	38	45	55	66	83	91	97	100	.....	.....	SPWCM
	3:40 p.m.	67	9	1.5	6.4	1.3	71,000	25	31	37	44	56	66	75	83	92	97	.....	SPWCM
	3:40 p.m.	67	12	.6	8.5	.2	52,200	34	41	50	60	72	88	96	100	.....	.....	.....	SPWCM
	3:40 p.m.	67	12	.6	10.4	.4	54,600	32	40	48	58	66	85	94	99	100	.....	.....	SPWCM
July 6....	5:45 p.m.	141	5	1.1	7.4	.2	24,200	26	33	41	48	57	72	87	95	100	.....	.....	SPWCM
	5:25 p.m.	143	5	1.1	7.3	.4	24,300	25	33	39	47	55	71	85	94	100	.....	.....	SPWCM
	5:15 p.m.	144	5	1.1	7.6	.7	26,600	24	30	36	43	52	69	82	94	100	.....	.....	SPWCM
	5:10 p.m.	144	8.5	1.8	8.0	.4	23,200	27	33	40	48	56	73	88	96	99	100	.....	SPWCM
	5:05 p.m.	143	8.5	1.8	8.3	.9	27,700	24	30	37	47	50	66	82	93	99	.....	.....	SPWCM
	4:55 p.m.	143	8.5	1.8	7.3	1.4	31,500	24	29	35	42	50	64	79	90	97	99	.....	SPWCM
	4:30 p.m.	148	11	1.2	8.6	.1	25,800	23	31	39	47	54	70	87	97	100	.....	.....	SPWCM
	4:25 p.m.	148	11	1.2	8.2	.4	26,200	26	32	38	47	54	70	87	97	100	.....	.....	SPWCM
	4:25 p.m.	148	11	1.2	8.7	.8	28,200	25	31	37	45	54	70	86	97	100	.....	.....	SPWCM
July 19...	4:50 p.m.	150	5	1.1	7.8	.1	28,900	28	36	43	51	60	76	90	96	100	.....	.....	SPWCM
	4:50 p.m.	150	5	1.1	7.5	.3	30,000	26	36	43	52	59	74	86	94	99	100	.....	SPWCM
	4:45 p.m.	151	5	1.1	7.2	.7	31,700	23	34	42	48	55	68	82	91	99	100	.....	SPWCM
	4:40 p.m.	151	8.5	2.2	8.7	.4	29,200	17	36	42	50	59	73	87	95	99	100	.....	SPWCM
	4:35 p.m.	152	8.5	2.2	6.6	1.3	36,100	23	29	35	41	48	60	75	87	98	100	.....	SPWCM
	4:30 p.m.	152	8.5	2.2	5.5	1.8	42,100	19	25	30	36	41	53	66	81	94	99	100	SPWCM
	4:20 p.m.	154	11	1.3	6.3	.2	31,400	26	33	38	46	53	69	85	96	100	.....	.....	SPWCM
	4:15 p.m.	155	11	1.3	7.5	.5	30,800	27	34	40	48	56	70	86	96	100	.....	.....	SPWCM
	4:10 p.m.	155	11	1.3	6.7	.9	32,800	25	33	38	45	52	66	82	95	99	100	.....	SPWCM
Aug. 3....	12:38 p.m.	183	6	1.6	7.2	.3	23,900	21	27	33	39	52	63	83	94	99	100	.....	SPWCM
	12:38 p.m.	183	6	1.6	7.4	.7	25,300	21	27	32	37	44	61	81	92	99	100	.....	SPWCM
	12:38 p.m.	183	6	1.6	6.9	1.2	31,600	17	19	26	31	38	49	67	84	98	100	.....	SPWCM

	12:38 p.m.	183	8.5	2.6	9.6	.6	22,100	25	27	37	44	52	69	91	96	100	.....	.....	SPWCM
	12:38 p.m.	183	8.5	2.6	8.8	1.2	23,900	21	28	34	41	48	63	83	93	99	100	.....	SPWCM
	12:38 p.m.	183	8.5	2.6	4.6	2.2	32,800	18	22	28	30	37	56	71	84	94	98	100	SPWCM
	12:38 p.m.	183	12	1.7	6.6	.3	24,600	24	28	36	41	49	64	85	97	100	.....	.....	SPWCM
	12:38 p.m.	183	12	1.7	7.5	.7	26,100	22	28	33	38	47	59	82	97	100	.....	.....	SPWCM
	12:38 p.m.	183	12	1.7	8.2	1.3	30,700	18	24	27	33	40	56	79	96	100	.....	.....	SPWCM
Aug. 14...	11:50 a.m.	159	5.5	1.4	7.1	.2	21,400	20	26	32	38	46	60	79	93	99	100	.....	SPWCM
	11:50 a.m.	159	5.5	1.4	7.9	.5	22,500	20	25	30	37	44	58	78	91	99	100	.....	SPWCM
	11:50 a.m.	159	5.5	1.4	7.4	1.0	24,100	19	24	29	35	41	54	74	89	98	99	100	SPWCM
	11:50 a.m.	159	8.5	2.4	9.1	.5	20,600	20	27	32	39	46	61	82	95	99	100	.....	SPWCM
	11:50 a.m.	159	8.5	2.4	7.9	1.0	23,000	18	23	29	35	42	56	78	93	98	100	.....	SPWCM
	11:50 a.m.	159	8.5	2.4	5.1	2.0	30,500	16	18	23	27	33	44	61	79	93	98	100	SPWCM
	11:50 a.m.	159	11	1.4	8.4	.2	21,800	20	24	30	37	43	57	79	96	100	.....	.....	SPWCM
	11:50 a.m.	159	11	1.4	10.6	.5	16,200	20	24	29	34	40	53	75	94	99	100	.....	SPWCM
	11:50 a.m.	159	11	1.4	8.1	1.0	24,200	18	23	32	33	40	52	76	94	99	100	.....	SPWCM
Sept. 14..	10:45 a.m.	123	5.5	1.1	8.3	.2	18,500	22	29	34	41	49	63	80	94	100	.....	.....	SPWCM
	10:45 a.m.	123	5.5	1.1	7.9	.4	18,800	21	28	33	40	47	60	77	91	99	100	.....	SPWCM
	10:45 a.m.	123	5.5	1.1	8.6	.7	19,900	21	27	32	38	45	57	74	89	99	100	.....	SPWCM
	11:28 a.m.	125	8.5	2.7	9.3	.6	17,800	22	29	36	42	50	62	80	94	99	100	.....	SPWCM
	11:28 a.m.	125	8.5	2.7	10.0	1.3	19,000	21	27	33	40	48	60	77	92	99	100	.....	SPWCM
	11:28 a.m.	125	8.5	2.7	5.7	2.3	27,500	15	19	24	29	34	44	59	76	91	97	100	SPWCM
	12:08 p.m.	121	11	1.1	7.8	.2	19,600	21	27	29	38	46	60	80	96	100	.....	.....	SPWCM
	12:08 p.m.	121	11	1.1	7.3	.4	21,200	20	25	30	36	43	56	76	95	100	.....	.....	SPWCM
	12:08 p.m.	121	11	1.1	8.0	.7	22,300	18	23	26	34	40	52	72	93	99	100	.....	SPWCM
Oct. 2....	1:10 p.m.	62	6	.8	5.7	.1	9,640	22	29	34	41	47	61	81	97	100	.....	.....	SPWCM
	1:10 p.m.	62	6	.8	6.5	.3	11,500	19	24	30	35	41	53	74	94	100	.....	.....	SPWCM
	1:10 p.m.	62	6	.8	6.1	.4	12,500	18	22	27	32	38	49	69	92	100	.....	.....	SPWCM
	1:10 p.m.	62	8	2.0	7.2	.2	9,960	21	26	33	38	45	58	78	94	99	100	.....	SPWCM
	1:10 p.m.	62	8	2.0	6.1	1.0	15,400	14	17	23	27	31	40	58	82	97	100	.....	SPWCM
	1:10 p.m.	62	8	2.0	3.9	1.6	21,100	12	14	17	20	24	30	43	63	87	97	100	SPWCM
	1:10 p.m.	62	11	.7	6.5	.1	9,130	24	29	35	43	50	62	83	97	100	.....	.....	SPWCM
	1:10 p.m.	62	11	.7	6.6	.2	10,200	22	27	32	38	44	57	78	95	99	100	.....	SPWCM
	1:10 p.m.	62	11	.7	6.3	.3	11,000	20	26	30	35	41	52	72	93	100	.....	.....	SPWCM
1952																			
July 1....	1:00 p.m.	164	5	1.5	....	.3	16,600	.....	29	.....	43	.....	72	87	95	99	100	.....	SPWCM
	1:00 p.m.	164	5	1.5	....	.3	17,500	.....	28	.....	41	.....	69	85	96	100	.....	.....	SPWCM
	1:00 p.m.	164	5	1.5	....	.7	17,800	.....	28	.....	43	.....	71	84	94	99	100	.....	SPWCM
	1:00 p.m.	164	5	1.5	....	.7	19,100	.....	26	.....	40	.....	64	81	93	99	100	.....	SPWCM

Table 48.--Particle-size analyses of suspended sediment, point-integrated samples, contracted section, Fivemile Creek near Riverton, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point			Percent finer than indicated size, in millimeters											Methods of analysis
					Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1952																			
July 1....	1:00 p.m.	164	5	1.5	....	1.1	18,600	.....	28	.....	41	.....	64	79	91	99	100	.....	SPWCM
	1:00 p.m.	164	5	1.5	7.7	1.1	19,300	.....	26	.....	38	.....	64	77	90	98	100	.....	SPWCM
	1:00 p.m.	164	8.5	1.7	7.2	.4	16,500	.....	30	.....	44	.....	68	85	96	100	.....	.....	SPWCM
	1:00 p.m.	164	8.5	1.7	7.4	.4	16,900	.....	28	.....	42	.....	71	84	96	99	100	.....	SPWCM
	1:00 p.m.	164	8.5	1.7	7.5	.9	18,400	.....	27	.....	38	.....	63	80	93	99	100	.....	SPWCM
	1:00 p.m.	164	8.5	1.7	7.8	.9	17,000	.....	29	.....	42	.....	69	84	95	99	100	.....	SPWCM
	1:00 p.m.	164	8.5	1.7	7.2	1.3	18,900	.....	25	.....	39	.....	62	79	92	98	100	.....	SPWCM
	1:00 p.m.	164	8.5	1.7	7.7	1.3	19,900	.....	25	.....	37	.....	60	76	91	98	99	100	SPWCM
	1:00 p.m.	164	11	1.5	6.7	.6	20,300	.....	25	.....	36	.....	64	79	95	100	.....	.....	SPWCM
	1:00 p.m.	164	11	1.5	7.2	.6	18,900	.....	27	.....	38	.....	64	81	95	100	.....	.....	SPWCM
	1:00 p.m.	164	11	1.5	7.4	.8	18,600	.....	26	.....	38	.....	62	79	94	99	100	.....	SPWCM
	1:00 p.m.	164	11	1.5	7.9	.8	19,500	.....	24	.....	37	.....	61	78	94	99	100	.....	SPWCM
	1:00 p.m.	164	11	1.5	7.0	1.1	22,500	.....	22	.....	32	.....	52	71	91	99	100	.....	SPWCM
	1:00 p.m.	164	11	1.5	10.9	1.1	15,400	.....	22	.....	33	.....	54	73	92	99	100	.....	SPWCM
Aug. 6....	2:55 p.m.	192	4.5	1.5	7.1	.4	19,500	.....	28	.....	41	.....	64	80	94	100	.....	.....	SPWCM
	2:53 p.m.	192	4.5	1.5	7.5	.4	19,900	.....	28	.....	43	.....	66	80	94	99	100	.....	SPWCM
	2:52 p.m.	192	4.5	1.5	7.6	1.1	24,400	.....	22	.....	33	.....	53	70	89	99	100	.....	SPWCM
	2:50 p.m.	192	4.5	1.5	8.6	1.1	22,900	.....	23	.....	34	.....	55	72	88	99	100	.....	SPWCM
	2:48 p.m.	192	8	2.9	9.2	.5	16,300	.....	32	.....	48	.....	72	87	96	99	100	.....	SPWCM
	2:47 p.m.	192	8	2.9	7.2	.5	17,300	.....	31	.....	46	.....	70	86	96	99	100	.....	SPWCM
	2:45 p.m.	192	8	2.9	9.6	1.5	20,000	.....	26	.....	40	.....	62	78	92	98	100	.....	SPWCM
	2:41 p.m.	192	8	2.9	9.4	1.5	18,900	.....	28	.....	43	.....	65	82	94	99	100	.....	SPWCM
	2:37 p.m.	192	8	2.9	7.1	2.5	25,300	.....	20	.....	35	.....	52	69	85	95	99	100	SPWCM
	2:28 p.m.	192	8	2.9	6.0	2.5	25,400	.....	27	.....	33	.....	50	66	82	94	98	100	SPWCM
	2:14 p.m.	192	11	1.6	10.5	.4	14,000	.....	28	.....	41	.....	65	83	97	100	.....	.....	SPWCM
	2:13 p.m.	192	11	1.6	8.1	.4	20,200	.....	26	.....	39	.....	60	79	96	100	.....	.....	SPWCM

	2:12 p.m.	194	11	1.6	11.9	.8	15,300	.....	25	.....	37	.....	59	78	96	100	.....	.....	SPWCM
	2:11 p.m.	195	11	1.6	7.8	.8	19,300	.....	27	.....	40	.....	64	82	96	100	.....	.....	SPWCM
	2:17 p.m.	192	11	1.6	8.4	1.2	21,800	.....	24	.....	36	.....	56	76	94	99	100	.....	SPWCM
	2:15 p.m.	192	11	1.6	8.5	1.2	22,600	.....	23	.....	35	.....	54	75	93	99	100	.....	SPWCM
	2:09 p.m.	198	14	1.0	6.8	.3	19,700	.....	26	.....	38	.....	60	81	97	100	.....	.....	SPWCM
	2:08 p.m.	198	14	1.0	....	.3	19,700	.....	26	.....	39	.....	61	81	98	100	.....	.....	SPWCM
	2:07 p.m.	198	14	1.0	9.6	.6	14,700	.....	25	.....	38	.....	59	81	97	100	.....	.....	SPWCM
	2:05 p.m.	198	14	1.0	9.7	.6	22,800	.....	24	.....	32	.....	55	76	96	100	.....	.....	SPWCM
1953 July 16...	11:09 a.m.	215	5.5	1.3	8.6	.1	9,390	.....	26	.....	36	.....	56	78	97	100	.....	.....	SPWCM
	11:10 a.m.	215	5.5	1.3	10.5	.3	9,860	.....	25	.....	36	.....	63	80	97	100	.....	.....	SPWCM
	11:11 a.m.	215	5.5	1.3	9.5	.5	10,400	.....	24	.....	35	.....	55	76	95	100	.....	.....	SPWCM
	11:12 a.m.	215	5.5	1.3	9.9	.7	11,000	.....	23	.....	32	.....	51	72	94	100	.....	.....	SPWCM
	11:13 a.m.	215	5.5	1.3	9.8	.9	12,200	.....	18	.....	30	.....	50	68	91	100	.....	.....	SPWCM
	11:14 a.m.	215	5.5	1.3	10.5	1.0	11,900	.....	16	.....	29	.....	49	68	91	99	100	.....	SPWCM
	11:21 a.m.	a 214	7.5	1.4	13.3	.1	7,380	.....	29	.....	46	.....	74	90	99	100	.....	.....	SPWCM
	11:22 a.m.	a 214	7.5	1.4	13.0	.3	7,910	.....	26	.....	41	.....	66	85	97	100	.....	.....	SPWCM
	11:23 a.m.	a 214	7.5	1.4	12.5	.5	8,380	.....	26	.....	42	.....	64	84	97	100	.....	.....	SPWCM
	11:24 a.m.	a 214	7.5	1.4	10.8	.7	9,500	.....	22	.....	36	.....	59	80	96	100	.....	.....	SPWCM
	11:25 a.m.	a 214	7.5	1.4	11.5	.9	10,000	.....	23	.....	36	.....	55	73	95	99	100	.....	SPWCM
	11:26 a.m.	a 214	7.5	1.4	9.1	1.0	10,400	.....	22	.....	31	.....	52	74	93	100	.....	.....	SPWCM
	12:06 p.m.	a 214	11.0	2.7	16.6	.1	6,290	.....	26	.....	44	.....	64	84	96	100	.....	.....	SPWCM
	12:07 p.m.	a 214	11.0	2.7	10.1	.3	9,290	.....	23	.....	38	.....	59	78	93	99	100	.....	SPWCM
	12:09 p.m.	a 214	11.0	2.7	11.6	.5	9,310	.....	26	.....	38	.....	63	79	94	99	100	.....	SPWCM
	12:10 p.m.	a 214	11.0	2.7	11.7	.8	9,120	.....	27	.....	40	.....	65	81	94	99	100	.....	SPWCM
	12:11 p.m.	a 214	11.0	2.7	12.3	1.1	10,700	.....	24	.....	37	.....	56	74	90	98	100	.....	SPWCM
	12:12 p.m.	a 214	11.0	2.7	11.9	1.4	10,800	.....	23	.....	35	.....	55	73	90	98	100	.....	SPWCM
	12:13 p.m.	a 214	11.0	2.7	10.6	1.7	11,300	.....	22	.....	34	.....	53	71	88	97	100	.....	SPWCM
	12:14 p.m.	a 214	11.0	2.7	10.2	2.0	12,300	.....	19	.....	32	.....	49	66	84	96	99	.....	SPWCM
	12:15 p.m.	a 214	11.0	2.7	3.3	2.4	12,300	.....	17	.....	18	.....	51	62	75	84	87	.....	SPWCM
	12:31 p.m.	a 214	13.0	1.4	10.2	.1	10,700	.....	22	.....	34	.....	57	76	93	100	.....	.....	SPWCM
	12:32 p.m.	a 214	13.0	1.4	11.1	.3	12,000	.....	19	.....	32	.....	52	70	90	99	100	.....	SPWCM
	12:33 p.m.	a 214	13.0	1.4	10.4	.5	13,700	.....	16	.....	26	.....	46	63	85	98	100	.....	SPWCM
	12:34 p.m.	a 214	13.0	1.4	10.8	.7	14,200	.....	17	.....	27	.....	46	61	84	98	100	.....	SPWCM
	12:35 p.m.	a 214	13.0	1.4	10.4	.9	13,900	.....	18	.....	28	.....	46	63	84	98	100	.....	SPWCM

a Streamflow measurement.

Table 49.--Particle-size analyses of sediment, Tait-Binckley samples, contracted section, Fivemile Creek near Riverton, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Depth (ft)	Sampling point: Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1951																		
July 6....	5:58 p.m.	143	5	1.0	0.9	26,800	22	28	36	43	50	65	77	88	98	100	......	SPWCM
	5:58 p.m.	143	8	1.7	1.6	31,200	18	24	31	38	45	59	74	86	95	99	......	SPWCM
	5:58 p.m.	143	11	1.1	1.0	32,000	18	24	30	35	43	56	75	91	99	100	......	SPWCM
Aug. 14...	12:20 p.m.	155	5.5	1.4	1.3	28,200	17	22	26	31	37	48	66	85	98	100	......	SPWCM
	12:20 p.m.	155	8.5	2.4	2.3	53,600	9	11	13	16	19	25	37	53	68	77	84	SPWCM
	12:20 p.m.	155	11	1.4	1.3	24,800	17	22	28	33	40	53	74	94	99	100	......	SPWCM
Sept. 14..	1:10 p.m.	120	5.5	1.1	1.0	23,200	20	24	29	35	41	55	68	84	98	100	......	SPWCM
	1:10 p.m.	120	8.5	2.7	2.6	48,200	9	12	14	16	20	25	34	52	75	86	94	SPWCM
	1:10 p.m.	120	11	1.1	1.0	17,300	23	30	37	44	52	65	83	96	100	......	......	SPWCM
1952																		
Aug. 6....	3:40 p.m.	196	4.5	1.5	1.4	40,700	......	15	......	24	......	40	56	78	97	100	......	SPWCM
	3:43 p.m.	196	8	2.9	2.8	22,100	......	26	......	40	......	66	82	94	99	100	......	SPWCM
	3:50 p.m.	196	11	1.6	1.5	33,200	......	17	......	26	......	45	62	83	98	100	......	SPWCM
	3:55 p.m.	196	14	1.0	.9	23,000	......	25	......	37	......	61	79	95	100	......	......	SPWCM
Aug. 13...	5:05 p.m.	148	4	1.4	1.3	18,800	......	23	......	34	......	53	70	88	99	......	......	SPWCM
	5:05 p.m.	148	5	1.4	1.3	19,800	......	21	......	32	......	50	66	85	99	100	......	SPWCM
	5:05 p.m.	148	6	1.6	1.5	24,300	......	18	......	28	......	42	59	83	99	100	......	SPWCM
	5:05 p.m.	148	7	1.8	1.7	30,600	......	15	......	22	......	34	46	69	95	100	......	SPWCM
	5:05 p.m.	148	8	1.9	1.8	21,500	......	20	......	30	......	46	60	78	95	99	......	SPWCM
	5:05 p.m.	148	9	3.0	2.9	23,500	......	18	......	28	......	43	57	76	94	100	......	SPWCM
	5:05 p.m.	148	10	2.0	1.9	18,400	......	23	......	34	......	53	70	88	98	......	......	SPWCM
	5:05 p.m.	148	11	2.0	1.9	24,000	......	18	......	28	......	42	58	82	98	100	......	SPWCM
	5:05 p.m.	148	12	1.6	1.5	20,300	......	21	......	32	......	48	65	89	99	......	......	SPWCM
	5:05 p.m.	148	13	1.6	1.5	25,100	......	18	......	26	......	41	58	86	99	......	......	SPWCM
	5:05 p.m.	148	14	1.4	1.3	19,900	......	21	......	31	......	48	66	91	100	......	......	SPWCM
	5:05 p.m.	148	15	.8	.7	17,000	......	27	......	35	......	54	73	94	100	......	......	SPWCM

Table 50.--Particle-size analyses of sediment samples collected with Bureau of Reclamation point sampler[a], contracted section, Fivemile Creek near Riverton, Wyo.

[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point		Suspended sediment: Percent finer than indicated size, in millimeters							Methods of analysis
					Depth (ft)	Concentration (ppm)	0.004	0.016	0.062	0.125	0.250	0.500	1.000	
1953														
July 16.........	11:16 a.m.	215	5.5	1.3	1.2	17,400	14	22	36	52	78	95	99	SPWCM
	11:31 a.m.	b 214	7.5	1.4	1.3	10,900	23	32	51	70	91	98	99	SPWCM
	12:46 p.m.	b 214	13.0	1.4	1.3	31,600	10	14	23	32	50	77	86	SPWCM

a Bureau of Reclamation point sampler is a 2- by 12-in. cylinder with flap valves.
b Streamflow measurement.

Table 51.--Particle-size analyses of suspended sediment, depth-integrated samples, normal section, Fivemile Creek near Shoshoni, Wyo.

[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)[a]	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters						Methods of analysis
					0.004	0.016	0.062	0.125	0.250	0.500	
1953											
Aug. 12.....	12:00 m.	....	5,330	....	30	43	71	93	99	100	SPWCM
	12:05 p.m.	....	9,400	....	17	25	44	72	97	100	SPWCM
	12:10 p.m.	....	8,070	....	20	29	52	76	96	100	SPWCM
(b)	12:05 p.m.	286	7,600	....	22	32	56	80	97	100	SPWCM
Aug. 27.....	10:12 a.m.	254	5,450	2,550	....	....	32	63	96	100	SPWCM

a Concentration from analyses of size samples.
b Average for several verticals and composite of size distributions determined by particle-size analyses of samples from individual verticals.

Table 52.--Particle-size analyses of stream-bed material, normal section, Fivemile Creek near Shoshoni, Wyo.
[Method of analysis: S, sieve]

Date	Station	Stream-bed material								
		Percent finer than indicated size, in millimeters								
		0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.000
1953										
Aug. 12............	5	8	29	58	60	62	63	65	71	100
	10	1	9	79	92	94	96	97	99	100
	15	1	3	39	81	92	96	98	99	100
	20	....	3	28	74	92	97	98	100	....
	25	1	3	15	58	81	86	89	92	100
	30	1	3	13	55	86	94	97	100	....
	35	....	1	2	6	35	55	66	80	100
	40	1	4	6	8	19	37	54	73	100
	45	....	....	....	....	....	....	1	3	9
Aug. 27............	6	....	....	1	2	13	41	65	86	100
	11	....	....	2	6	25	41	53	75	90
	16	....	3	27	80	93	96	97	100	....
	21	....	2	18	50	67	76	83	90	100
	26	....	1	18	60	80	85	88	91	100
	31	....	2	22	80	95	98	100	....	....
	36	....	2	38	86	94	97	98	99	100
	41	2	6	42	69	78	84	88	91	100
	46	....	3	24	33	47	59	63	66	72
Nov. 30............	4, 8	0	2	16	30	35	38	40	43	57
	12, 16	1	5	26	42	46	47	48	56	65
	20, 24	2	10	41	59	65	69	74	80	94
	28, 32	0	4	29	54	61	66	71	79	89
	36, 40	0	3	26	54	67	74	77	81	94

Table 53.--Particle-size analyses of suspended sediment, depth-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment										Methods of analysis
			Concentration of sample (ppm) a	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters								
					0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1952													
Aug. 26 b	5:10 p.m.	247	14,000	....	16	23	40	56	77	94	98	100	SPWCM
	5:12 p.m.	247	12,000	8,040	17	25	43	67	90	98	100	......	SPWCM
Sept. 3 c	3:00 p.m.	....	10,100	3,660	22	32	53	74	89	96	99	100	SPWCM
(c)	3:05 p.m.	....	11,500	3,750	20	28	49	73	95	100	......	......	SPWCM
(c)	3:10 p.m.	....	15,800	4,010	13	20	35	57	90	100	......	......	SPWCM
(c)	3:15 p.m.	....	13,300	3,670	16	24	42	65	94	99	100	......	SPWCM
(b c)	3:08 p.m.	251	12,700	....	18	26	45	67	92	99	100	......	SPWCM
(d)	1:15 p.m.	....	7,920	3,420	26	39	65	87	98	99	99	100	SPWCM
(d)	1:20 p.m.	....	8,460	3,660	27	30	62	85	98	100	......	......	SPWCM
(d)	1:25 p.m.	....	31,900	4,210	7	12	20	29	53	89	97	100	SPWCM
(d)	1:30 p.m.	....	19,400	4,200	12	18	32	52	90	100	......	......	SPWCM
(b d)	1:23 p.m.	251	16,900	....	18	25	45	63	85	97	99	100	SPWCM
(e)	1:35 p.m.	....	8,570	3,750	25	38	62	84	97	99	100	......	SPWCM
(e)	1:40 p.m.	....	10,000	3,800	22	32	54	74	89	97	99	100	SPWCM
(e)	1:45 p.m.	....	27,100	4,510	8	13	23	34	62	95	99	100	SPWCM
(e)	1:49 p.m.	....	14,500	4,330	16	23	40	60	89	98	99	99	SPWCM
(b e)	1:42 p.m.	251	15,000	....	18	26	45	63	84	97	99	100	SPWCM
(f)	1:54 p.m.	....	19,500	4,070	11	18	30	41	55	88	97	100	SPWCM
(f)	2:00 p.m.	....	13,800	3,660	16	24	41	54	72	95	99	100	SPWCM
(f)	2:06 p.m.	....	12,800	4,010	18	26	43	59	74	81	82	84	SPWCM
(f)	2:11 p.m.	....	12,900	3,750	17	25	44	66	91	99	99	99	SPWCM
(b f)	2:02 p.m.	251	14,800	....	16	23	40	55	73	91	94	96	SPWCM
(g)	2:17 p.m.	....	12,200	3,360	18	26	44	60	74	92	98	100	SPWCM
(g)	2:21 p.m.	....	16,300	4,270	14	20	36	48	67	91	98	100	SPWCM
(g)	2:26 p.m.	....	13,100	4,000	17	24	42	58	79	94	96	98	SPWCM
(g)	2:32 p.m.	....	10,600	4,490	21	31	52	72	92	97	98	98	SPWCM

See footnotes at end of table.

Table 53.--Particle-size analyses of suspended sediment, depth-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment										Methods of analysis
			Concentration of sample (ppm) a	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters								
					0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1952													
Sept. 3 b g......	2:24 p.m.	251	13,000	....	18	25	44	60	78	94	98	99	SPWCM
(h)	2:39 p.m.	....	12,300	3,980	17	26	46	60	74	93	99	100	SPWCM
(h)	2:44 p.m.	....	13,000	3,800	17	24	43	57	78	96	99	100	SPWCM
(h)	2:49 p.m.	....	17,900	3,780	11	18	34	46	71	92	97	100	SPWCM
(h)	2:55 p.m.	....	11,300	3,640	19	28	50	56	86	98	98	99	SPWCM
(b h)	2:47 p.m.	251	13,600	....	16	24	43	55	77	95	98	100	SPWCM
(i)	3:21 p.m.	....	13,100	3,750	19	27	50	65	83	96	99	99	SPWCM
(i)	3:27 p.m.	....	14,600	3,220	14	19	34	50	75	94	98	100	SPWCM
(i)	3:31 p.m.	....	14,000	3,700	15	22	39	58	84	98	100	....	SPWCM
(i)	3:35 p.m.	....	12,600	4,490	17	25	45	66	92	99	100	....	SPWCM
(b i)	3:28 p.m.	247	13,600	....	16	23	42	60	84	97	99	100	SPWCM
Sept. 4 b........	12:00 m.	234	14,000	....	16	24	41	55	75	90	96	98	SPWCM
	3:20 p.m.	....	10,600	3,290	22	33	49	63	74	91	97	98	SPWCM
	3:20 p.m.	....	14,200	3,780	16	24	38	52	68	90	98	100	SPWCM
	3:20 p.m.	....	12,900	3,920	18	27	43	59	76	92	98	100	SPWCM
	3:20 p.m.	....	10,700	4,130	2	32	50	68	85	96	99	100	SPWCM
(b)	3:20 p.m.	224	12,100	....	14	29	45	60	76	92	98	100	SPWCM
Oct. 15..........	2:45 p.m.	....	17,000	2,100	7	10	18	28	37	52	72	88	SPWCM
	2:45 p.m.	....	10,200	2,400	12	17	30	48	72	95	98	100	SPWCM
	2:45 p.m.	....	7,620	2,370	15	22	40	64	88	99	100	....	SPWCM
	2:45 p.m.	....	7,750	2,040	16	22	40	65	90	100	....	....	SPWCM
	2:45 p.m.	....	6,800	2,250	15	24	44	72	95	100	....	....	SPWCM
(b)	2:45 p.m.	j 81.2	9,870	....	12	17	31	50	68	82	90	96	SPWCM
Dec. 8 b.........	1:30 p.m.	j 58.4	1,810	....	16	23	36	53	82	98	100	....	SPWCM
1953													
Feb. 26..........	1:00 p.m.	....	3,570	....	16	20	35	59	91	99	100	....	SPWCM
	1:00 p.m.	....	k 3,700	....	....	....	....	....	....	....	....	....	SPWCM
	1:00 p.m.	....	3,710	....	9	19	34	60	94	100	....	....	SPWCM

	1:00 p.m.	....	4,390	....	9	18	29	54	95	100	....	....	SPWCM
(b)	1:00 p.m.	j 29.6	3,760	....	11	19	32	57	93	100	....	....	SPWCM
	2:52 p.m.	....	2,600	....	20	30	53	75	94	100	....	....	SPWCM
	2:52 p.m.	....	3,390	....	12	22	41	62	87	99	100	....	SPWCM
	2:52 p.m.	....	3,670	....	14	21	38	59	92	100	....	....	SPWCM
	2:52 p.m.	....	4,340	....	15	20	36	60	96	100	....	....	SPWCM
(b)	2:52 p.m.	j 29.6	3,490	....	15	23	41	63	92	100	....	....	SPWCM
Mar. 24..........	12:02 p.m.	....	10,200	....	16	26	51	69	82	93	98	....	SPWCM
	12:02 p.m.	....	14,200	....	12	20	39	56	78	95	98	....	SPWCM
	12:02 p.m.	....	14,200	....	13	20	39	62	90	98	100	....	SPWCM
	12:02 p.m.	....	13,300	....	13	21	42	70	96	99	100	....	SPWCM
	12:02 p.m.	j 27.2	13,600	....	13	21	42	64	87	96	99	....	SPWCM
Apr. 15..........	11:30 a.m.	....	17,000	....	6	10	21	37	74	94	95	....	SPWCM
	11:30 a.m.	....	14,300	....	7	30	26	44	85	98	99	....	SPWCM
	11:30 a.m.	....	9,300	....	12	19	36	60	92	100	....	....	SPWCM
	11:30 a.m.	....	9,750	....	12	18	35	57	90	100	....	....	SPWCM
	11:30 a.m.	....	8,500	....	13	19	39	62	91	99	100	....	SPWCM
	11:30 a.m.	....	7,550	....	14	22	43	66	91	99	100	....	SPWCM
	11:30 a.m.	....	12,800	....	8	14	26	40	60	80	94	....	SPWCM
	11:30 a.m.	....	20,300	....	6	9	18	30	50	76	94	....	SPWCM
(b)	11:30 a.m.	j 32.8	12,400	....	9	16	28	45	75	91	97	....	SPWCM
Apr. 28..........	10:12 a.m.	....	36,100	....	20	32	47	54	67	85	95	....	SPWCM
	10:12 a.m.	....	29,200	....	26	40	58	66	78	93	98	....	SPWCM
	10:12 a.m.	....	26,900	....	31	45	68	77	91	99	100	....	SPWCM
	10:12 a.m.	....	28,700	....	31	44	64	74	90	98	99	....	SPWCM
	10:12 a.m.	....	24,200	....	34	50	72	82	95	100	....	....	SPWCM
	10:12 a.m.	....	23,800	....	35	52	72	82	95	100	....	....	SPWCM
	10:12 a.m.	....	23,700	....	35	51	73	84	96	100	....	....	SPWCM
	10:12 a.m.	....	22,600	....	37	54	76	86	97	100	....	....	SPWCM
(b)	10:12 a.m.	114	26,600	....	30	45	65	74	87	96	99	....	SPWCM
June 24..........	4:58 p.m.	....	14,600	....	25	34	54	84	86	95	98	....	SPWCM
	4:59 p.m.	....	17,100	....	21	29	54	70	85	96	99	....	SPWCM
	5:00 p.m.	....	14,000	....	26	36	55	69	82	94	97	....	SPWCM

See footnotes at end of table.

Table 53.--Particle-size analyses of suspended sediment, depth-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment										Methods of analysis
			Concentration of sample (ppm)a	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters								
					0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1953													
June 24	5:01 p.m.	....	14,300	....	25	35	56	70	83	96	99	....	SPWCM
(b)	5:00 p.m.	j303	15,000	....	24	34	55	73	84	95	98	....	SPWCM
	5:15 p.m.	....	12,200	....	26	39	62	80	94	99	....	....	SPWCM
	5:16 p.m.	....	13,400	....	25	37	57	72	87	97	99	....	SPWCM
	5:18 p.m.	....	15,100	....	22	32	52	69	83	98	100	....	SPWCM
	5:20 p.m.	....	21,200	....	18	23	36	46	55	78	91	....	SPWCM
(b)	5:18 p.m.	300	15,500	....	23	33	52	67	80	93	98	....	SPWCM
June 25	12:27 p.m.	....	14,700	....	20	29	51	69	84	92	99	....	SPWCM
	12:28 p.m.	....	14,100	....	20	30	53	72	88	98	100	....	SPWCM
	12:29 p.m.	....	15,000	....	21	29	51	71	88	97	99	....	SPWCM
	12:30 p.m.	....	14,700	....	21	30	54	75	95	100	....	....	SPWCM
(b)	12:28 p.m.	321	14,600	....	20	30	52	72	89	97	100	....	SPWCM
July 22	10:26 a.m.	....	12,700	....	21	30	50	68	83	96	99	....	SPWCM
	11:18 a.m.	....	12,900	....	20	30	52	69	87	99	100	....	SPWCM
	11:40 a.m.	....	13,400	....	19	29	50	68	90	100	....	....	SPWCM
	12:50 p.m.	....	11,700	....	24	35	61	80	96	100	....	....	SPWCM
(b)	11:38 a.m.	311	12,700	....	21	31	53	71	89	99	100	....	SPWCM
Aug. 12	10:20 a.m.	....	8,090	....	20	29	49	72	86	93	98	....	SPWCM
	10:25 a.m.	....	12,900	....	13	19	34	53	76	92	97	....	SPWCM
	10:30 a.m.	....	12,800	....	13	19	34	56	80	96	99	....	SPWCM
	10:34 a.m.	....	10,500	....	15	22	40	65	91	99	100	....	SPWCM
(b)	10:27 a.m.	293	11,100	....	15	22	39	62	83	95	98	....	SPWCM
	1:30 p.m.	....	9,420	....	16	24	39	56	67	83	96	....	SPWCM
	1:30 p.m.	....	11,500	....	13	20	34	50	72	90	97	....	SPWCM
	1:30 p.m.	....	12,100	....	13	19	33	50	73	88	95	....	SPWCM
	1:30 p.m.	....	10,300	....	15	23	38	61	88	96	97	....	SPWCM
(b)	1:30 p.m.	286	10,800	....	14	22	36	54	75	89	96	....	SPWCM

Aug. 27 m........	10:41 a.m.	254	8,510	2,430	15	23	36	54	83	98	100	....	SPWCM

a Concentration from analyses of size samples.
b Average for several verticals analyzed individually.
c 31 ft upstream from the upstream end of the throat of the flume.
d Upstream end of the throat of the flume.
e 20 ft downstream from the upstream end of the throat of the flume.
f 10 ft upstream from the downstream end of the throat of the flume.
g Sampling bridge at downstream end of the throat of the flume.
h 9 ft downstream from the sampling bridge in the diverging section.
i 21 ft downstream from the downstream end of the wing walls of the flume.
j Streamflow measurement.
k Estimated from comparative samples.
m Average for several verticals.

Table 54.--Particle-size analyses of suspended sediment, point-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment											Methods of analysis
					Sampling point			Percent finer than indicated size, in millimeters								
					Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1952																
Aug. 27......	4:00 p.m.	196	19	2.4	5.9	0.4	9,510	20	28	48	69	85	96	99	......	SPWCM
	4:02 p.m.	196	19	2.4	7.1	.4	9,170	19	29	48	69	85	95	99	......	SPWCM
	3:45 p.m.	199	19	2.4	7.6	1.5	19,000	10	15	26	40	62	87	98	......	SPWCM
	3:50 p.m.	199	19	2.4	6.5	1.5	16,200	12	18	29	43	64	88	98	......	SPWCM
	3:45 p.m.	199	19	2.4	....	2.0	27,400	7	10	19	29	48	77	93	99	SPWCM
	3:45 p.m.	199	19	2.4	.6	2.0	21,200	10	14	23	37	58	82	94	99	SPWCM
	4:24 p.m.	199	22	2.0	6.1	.5	10,100	19	26	45	61	81	93	97	......	SPWCM
	4:27 p.m.	199	22	2.0	5.4	.5	20,400	10	15	27	44	72	94	99	......	SPWCM
	4:15 p.m.	196	22	2.0	....	1.0	15,700	12	18	30	45	74	95	99	......	SPWCM
	4:20 p.m.	196	22	2.0	....	1.0	18,500	11	16	27	42	73	94	99	......	SPWCM
	4:05 p.m.	196	22	2.0	6.0	1.6	16,700	7	11	20	29	49	78	93	......	SPWCM
	4:10 p.m.	196	22	2.0	3.7	1.6	23,600	9	12	21	32	56	83	95	100	SPWCM
	4:43 p.m.	199	25	1.9	6.3	.5	10,100	21	28	47	66	91	99	......	......	SPWCM
	4:45 p.m.	199	25	1.9	3.2	.5	8,680	24	32	52	70	91	98	......	......	SPWCM
	4:37 p.m.	199	25	1.9	9.4	1.0	12,000	16	25	40	62	89	98	99	......	SPWCM
	4:40 p.m.	199	25	1.9	8.4	1.0	11,000	18	25	42	55	75	92	96	99	SPWCM
	4:31 p.m.	199	25	1.9	3.3	1.5	21,200	10	13	25	39	61	81	93	......	SPWCM
	4:34 p.m.	199	25	1.9	3.4	1.5	18,400	11	16	26	42	69	87	94	99	SPWCM

Table 54.--Particle-size analyses of suspended sediment, point-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952																
Aug. 28......	....	231	19	2.6	10.4	0.4	7,640	27	36	62	82	93	98	......	......	SPWCM
	1:35 p.m.	231	19	2.6	7.2	.4	7,980	25	34	60	81	94	98	......	......	SPWCM
	....	231	19	2.6	8.0	1.0	8,770	22	30	53	72	87	97	100	......	SPWCM
	....	231	19	2.6	7.5	1.0	7,970	26	35	57	77	91	99	......	......	SPWCM
	11:25 a.m.	234	19	2.6	....	2.2	20,000	11	16	29	43	60	89	98	......	SPWCM
	1:15 p.m.	231	19	2.6	1.2	2.2	13,500	17	22	38	52	67	88	97	98	SPWCM
	2:45 p.m.	234	22	2.1	....	.4	10,100	20	28	45	62	85	97	99	......	SPWCM
	2:45 p.m.	234	22	2.1	....	.4	7,390	27	37	58	76	92	99	......	......	SPWCM
	....	231	22	2.1	8.7	1.1	14,300	15	21	35	53	82	96	99	......	SPWCM
	2:00 p.m.	231	22	2.1	....	1.1	15,000	14	20	34	50	76	94	99	......	SPWCM
	....	231	22	2.1	8.7	1.7	23,300	9	12	22	34	58	85	96	......	SPWCM
	....	231	22	2.1	6.1	1.7	22,100	9	13	23	37	62	86	94	98	SPWCM
	3:10 p.m.	234	25	1.8	....	.3	7,700	26	40	57	78	96	100	......	......	SPWCM
	3:15 p.m.	234	25	1.8	....	.3	7,520	25	35	57	78	97	......	......	......	SPWCM
	3:10 p.m.	234	25	1.8	....	.6	8,350	22	32	52	74	95	99	......	......	SPWCM
	3:10 p.m.	234	25	1.8	....	.6	8,790	22	31	50	70	94	100	......	......	SPWCM
	2:55 p.m.	234	25	1.8	....	1.4	12,800	16	22	36	55	87	99	100	......	SPWCM
	3:00 p.m.	234	25	1.8	....	1.4	10,100	19	27	45	66	90	99	......	......	SPWCM
	3:35 p.m.	231	19	2.6	....	.6	8,410	22	32	53	70	84	91	92	93	SPWCM
	3:35 p.m.	231	19	2.6	....	2.2	15,600	12	17	29	40	57	84	95	100	SPWCM
	3:35 p.m.	231	22	2.1	2.6	.6	8,720	23	31	52	72	91	98	99	99	SPWCM
	3:30 p.m.	231	22	2.1	....	1.7	23,600	8	12	20	31	58	88	95	98	SPWCM
	3:40 p.m.	231	25	1.8	2.3	.6	8,250	24	35	56	77	94	100	......	......	SPWCM
	3:30 p.m.	231	25	1.8	....	1.4	12,100	17	24	39	58	85	99	100	......	SPWCM
Sept. 4......	10:20 a.m.	244	7.5	2.6	7.3	.3	10,300	22	32	52	72	89	98	100	......	SPWCM
	10:24 a.m.	244	7.5	2.6	7.7	.3	11,000	20	28	48	65	83	97	99	100	SPWCM
	10:15 a.m.	244	7.5	2.6	9.2	1.3	14,000	16	24	39	54	75	95	100	......	SPWCM
	10:18 a.m.	244	7.5	2.6	8.8	1.3	13,500	17	25	40	57	78	96	99	100	SPWCM
	10:10 a.m.	244	7.5	2.6	15.1	2.2	15,000	15	22	35	46	68	93	99	100	SPWCM
	10:12 a.m.	244	7.5	2.6	5.0	2.2	21,600	10	15	27	39	60	89	98	100	SPWCM

	11:04 a.m.	241	9.5	1.8	8.1	.4	10,200	22	30	52	70	86	96	99	100	SPWCM
	11:05 a.m.	241	9.5	1.8	8.9	.4	11,000	20	28	48	65	84	97	99	99	SPWCM
	11:00 a.m.	241	9.5	1.8	9.5	.9	18,400	12	17	30	43	68	92	98	99	SPWCM
	11:02 a.m.	241	9.5	1.8	10.8	.9	16,300	14	20	34	48	71	93	98	100	SPWCM
	10:30 a.m.	244	9.5	1.8	2.9	1.4	26,800	9	13	22	32	56	86	96	100	SPWCM
	10:55 a.m.	241	9.5	1.8	4.8	1.4	26,400	9	13	22	24	39	79	93	99	SPWCM
	11:23 a.m.	241	11.5	1.8	9.7	.4	10,700	21	30	51	68	84	93	95	97	SPWCM
	11:26 a.m.	237	11.5	1.8	7.6	.4	11,800	18	27	45	62	83	97	99	100	SPWCM
	11:16 a.m.	241	11.5	1.8	8.8	.9	16,100	14	21	35	51	78	95	98	100	SPWCM
	11:20 a.m.	241	11.5	1.8	8.5	.9	19,200	12	18	30	46	73	94	98	100	SPWCM
	11:10 a.m.	241	11.5	1.8	4.6	1.4	21,700	11	15	26	38	61	84	93	99	SPWCM
	11:12 a.m.	241	11.5	1.8	4.9	1.4	22,200	11	15	26	38	64	89	96	100	SPWCM
	11:42 a.m.	234	13.5	1.5	10.7	.4	10,400	20	31	51	72	93	100	......	......	SPWCM
	11:45 a.m.	234	13.5	1.5	....	.4	9,850	22	33	54	74	94	100	......	......	SPWCM
	11:37 a.m.	237	13.5	1.5	10.1	.7	11,200	19	29	48	69	91	99	100	......	SPWCM
	11:40 a.m.	237	13.5	1.5	10.3	.7	11,600	19	28	47	66	88	98	100	......	SPWCM
	11:30 a.m.	237	13.5	1.5	8.7	1.1	12,400	18	26	44	64	88	99	100	......	SPWCM
	11:33 a.m.	237	13.5	1.5	12.2	1.1	11,700	19	28	45	64	86	97	98	98	SPWCM
Oct. 15......	1:30 p.m.	a 81.2	6	1.4	6.2	.2	4,730	23	34	57	81	95	99	100	......	SPWCM
	1:30 p.m.	a 81.2	6	1.4	5.8	.2	4,780	21	32	56	80	93	99	100	......	SPWCM
	1:30 p.m.	a 81.2	6	1.4	6.4	.7	5,940	17	26	46	69	84	96	100	......	SPWCM
	1:30 p.m.	a 81.2	6	1.4	5.9	.7	6,350	17	25	44	67	84	94	99	100	SPWCM
	1:30 p.m.	a 81.2	6	1.4	5.3	1.3	9,680	12	17	30	48	62	79	94	100	SPWCM
	1:30 p.m.	a 81.2	6	1.4	5.9	1.3	9,020	12	19	32	50	67	86	96	100	SPWCM
	1:30 p.m.	a 81.2	8	1.2	6.8	.2	4,960	21	32	53	76	91	98	99	100	SPWCM
	1:30 p.m.	a 81.2	8	1.2	6.5	.2	4,800	21	31	56	78	92	98	98	99	SPWCM
	1:30 p.m.	a 81.2	8	1.2	6.0	.4	6,900	15	22	41	64	85	98	100	......	SPWCM
	1:30 p.m.	a 81.2	8	1.2	7.3	.4	6,820	15	22	39	60	83	98	100	......	SPWCM
	1:30 p.m.	a 81.2	8	1.2	6.3	1.1	27,500	4	6	12	21	53	95	100	......	SPWCM
	1:30 p.m.	a 81.2	8	1.2	3.2	1.1	20,100	5	8	15	24	39	70	87	97	SPWCM
	1:30 p.m.	a 81.2	10	1.3	5.2	.2	5,510	18	27	48	70	91	99	100	......	SPWCM
	1:30 p.m.	a 81.2	10	1.3	5.6	.2	4,680	20	31	56	78	94	99	99	100	SPWCM
	1:30 p.m.	a 81.2	10	1.3	6.9	.4	5,700	18	27	48	71	91	98	99	99	SPWCM
	1:30 p.m.	a 81.2	10	1.3	7.0	.4	5,860	16	26	47	70	91	100	......	......	SPWCM
	1:30 p.m.	a 81.2	10	1.3	4.9	1.2	12,900	8	12	23	39	72	98	100	......	SPWCM

See footnotes at end of table.

Table 54.--Particle-size analyses of suspended sediment, point-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment											Methods of analysis
					Sampling point			Percent finer than indicated size, in millimeters								
					Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1952																
Oct. 15......	1:30 p.m.	a 81.2	10	1.3	3.8	1.2	13,000	8	12	23	41	75	98	100	......	SPWCM
	1:30 p.m.	a 81.2	12	1.2	6.7	.2	4,930	20	30	55	79	96	100	......	......	SPWCM
	1:30 p.m.	a 81.2	12	1.2	6.3	.2	4,980	20	30	53	76	94	100	......	......	SPWCM
	1:30 p.m.	a 81.2	12	1.2	6.5	.4	5,920	18	25	47	71	91	99	99	100	SPWCM
	1:30 p.m.	a 81.2	12	1.2	5.6	.4	6,340	16	24	44	67	91	100	......	......	SPWCM
	1:30 p.m.	a 81.2	12	1.2	4.8	1.1	9,280	12	16	32	54	84	99	100	......	SPWCM
	1:30 p.m.	a 81.2	12	1.2	4.7	1.1	9,030	12	18	32	54	85	99	100	......	SPWCM
	1:30 p.m.	a 81.2	14.5	1.0	6.4	.2	5,610	18	26	51	77	97	100	......	......	SPWCM
	1:30 p.m.	a 81.2	14.5	1.0	6.8	.2	5,830	17	26	49	76	96	100	......	......	SPWCM
	1:30 p.m.	a 81.2	14.5	1.0	7.0	.4	6,300	18	25	46	73	96	100	......	......	SPWCM
	1:30 p.m.	a 81.2	14.5	1.0	7.9	.4	6,610	16	24	44	71	96	100	......	......	SPWCM
	1:30 p.m.	a 81.2	14.5	1.0	7.2	.9	7,910	14	20	37	63	93	100	......	......	SPWCM
	1:30 p.m.	a 81.2	14.5	1.0	7.5	.9	8,400	10	19	35	61	92	100	......	......	SPWCM
Dec. 8......	2:50 p.m.	a 58.4	9.5	2.6	b 4.0	.3	2,040	18	27	42	64	90	99	100	......	SPWCM
	2:50 p.m.	a 58.4	9.5	2.6	b 3.3	1.2	2,300	14	22	33	51	82	99	100	......	SPWCM
	2:50 p.m.	a 58.4	9.5	2.6	b 3.2	2.3	3,310	11	15	24	39	73	98	100	......	SPWCM
	2:50 p.m.	a 58.4	11	2.5	b 3.8	.3	1,910	19	25	38	59	87	99	100	......	SPWCM
	2:50 p.m.	a 58.4	11	2.5	b 3.9	1.1	2,360	15	21	31	50	78	93	95	......	SPWCM
	2:50 p.m.	a 58.4	11	2.5	b 1.9	2.2	5,960	7	9	14	24	44	65	84	......	SPWCM
	2:50 p.m.	a 58.4	12	2.5	b 3.6	.3	1,590	24	28	45	68	91	99	100	......	SPWCM
	2:50 p.m.	a 58.4	12	2.5	b 2.2	1.1	1,930	18	24	39	59	94	99	100	......	SPWCM
	2:50 p.m.	a 58.4	12	2.5	b 2.6	2.2	2,130	16	23	34	54	83	95	97	......	SPWCM
	2:50 p.m.	a 58.4	13.5	2.5	b 3.2	.3	1,260	26	34	53	77	96	100	......	......	SPWCM
	2:50 p.m.	a 58.4	13.5	2.5	b 3.7	1.1	1,540	24	28	43	87	92	100	......	......	SPWCM
	2:50 p.m.	a 58.4	13.5	2.5	b 2.2	2.2	1,890	19	24	37	59	88	97	98	......	SPWCM
1953																
Jan. 13......	4:10 p.m.	a 52.9	9	1.9	b 3.0	.2	1,740	24	33	52	69	82	86	86	......	SPWCM
	4:10 p.m.	a 52.9	9	1.9	b 4.4	1.0	2,500	17	25	39	56	83	97	98	......	SPWCM

	4:10 p.m.	a 52.9	9	1.9	b 1.8	1.6	5,470	9	12	20	31	60	97	100	......	SPWCM
	4:10 p.m.	a 52.9	12	1.3	b 5.0	.2	1,730	21	37	55	75	95	100	......	......	SPWCM
	4:10 p.m.	a 52.9	12	1.3	b 4.9	.7	2,210	20	29	43	63	90	100	......	......	SPWCM
	4:10 p.m.	a 52.9	12	1.3	b 5.2	1.0	3,020	14	20	33	51	83	99	99	......	SPWCM
	4:10 p.m.	a 52.9	14	1.3	b 3.8	.2	2,090	18	29	43	63	89	100	......	......	SPWCM
	4:10 p.m.	a 52.9	14	1.3	b 3.5	.7	2,420	16	27	41	60	87	100	......	......	SPWCM
	4:10 p.m.	a 52.9	14	1.3	b 1.6	1.0	2,940	20	22	35	52	82	99	100	......	SPWCM
	4:10 p.m.	a 52.9	16	1.9	b 2.8	.2	1,930	23	31	48	69	93	100	......	......	SPWCM
	4:10 p.m.	a 52.9	16	1.9	b 1.7	1.0	2,300	22	24	41	60	88	100	......	......	SPWCM
	4:10 p.m.	a 52.9	16	1.9	b 1.3	1.6	2,800	16	22	36	52	82	100	......	......	SPWCM
Feb. 26......	1:22 p.m.	a 29.6	5.5	.8	b 3.3	.5	2,860	11	24	40	65	90	98	99	......	SPWCM
	1:22 p.m.	a 29.6	8	.8	b 4.3	.2	3,410	11	21	33	55	87	99	100	......	SPWCM
	1:22 p.m.	a 29.6	8	.8	b 3.2	.5	4,380	8	17	27	46	79	98	100	......	SPWCM
	1:22 p.m.	a 29.6	11	.6	b 4.5	.2	3,350	12	21	33	55	92	100	......	......	SPWCM
	1:22 p.m.	a 29.6	11	.6	b 4.2	.3	4,460	9	17	27	47	89	98	98	......	SPWCM
	1:22 p.m.	a 29.6	14	.7	b 3.5	.2	4,620	8	13	27	51	96	100	......	......	SPWCM
	1:22 p.m.	a 29.6	14	.7	b 3.9	.4	5,170	8	11	23	45	95	100	......	......	SPWCM
Apr. 15......	2:24 p.m.	a 32.8	8	.6	4.1	.1	3,280	32	46	75	93	100	......	......	......	SPWCM
	2:26 p.m.	a 32.8	8	.6	5.2	.1	3,370	30	46	74	92	99	100	......	......	SPWCM
	2:20 p.m.	a 32.8	8	.6	4.5	.4	4,550	22	33	59	84	98	100	......	......	SPWCM
	2:22 p.m.	a 32.8	8	.6	4.7	.4	4,660	21	32	58	82	98	100	......	......	SPWCM
	2:14 p.m.	a 32.8	8	.6	5.3	.55	5,910	17	26	47	68	88	97	98	......	SPWCM
	2:16 p.m.	a 32.8	8	.6	....	.55	6,700	15	24	43	65	88	99	100	......	SPWCM
	2:10 p.m.	a 32.8	10	.4	3.9	.05	4,320	24	37	62	85	98	100	......	......	SPWCM
	2:12 p.m.	a 32.8	10	.4	3.1	.05	3,900	27	40	66	87	98	100	......	......	SPWCM
	2:08 p.m.	a 32.8	10	.4	4.1	.2	5,990	19	29	48	72	94	100	......	......	SPWCM
	2:10 p.m.	a 32.8	10	.4	5.0	.2	4,560	20	28	48	71	95	100	......	......	SPWCM
	2:08 p.m.	a 32.8	10	.4	5.1	.35	7,500	15	21	38	59	87	100	......	......	SPWCM
	2:08 p.m.	a 32.8	10	.4	5.0	.35	6,600	17	24	43	65	90	100	......	......	SPWCM
	2:02 p.m.	a 32.8	12	.5	4.8	.05	3,850	31	43	70	89	98	100	......	......	SPWCM
	2:04 p.m.	a 32.8	12	.5	4.9	.05	3,940	28	44	71	90	99	100	......	......	SPWCM
	2:06 p.m.	a 32.8	12	.5	4.0	.3	6,240	18	28	49	73	94	100	......	......	SPWCM
	2:07 p.m.	a 32.8	12	.5	4.0	.3	6,180	19	28	48	72	93	100	......	......	SPWCM
	1:58 p.m.	a 32.8	12	.5	4.4	.45	6,790	18	27	45	64	84	97	100	......	SPWCM
	2:00 p.m.	a 32.8	12	.5	4.8	.45	5,790	20	29	50	72	92	99	100	......	SPWCM
	1:55 p.m.	a 32.8	14	.4	4.6	.05	4,170	26	40	67	89	98	100	......	......	SPWCM
	1:56 p.m.	a 32.8	14	.4	5.9	.05	3,290	27	38	64	86	98	100	......	......	SPWCM

See footnotes at end of table.

Table 54.--Particle-size analyses of suspended sediment, point-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1953																
Apr. 15......	1:53 p.m.	a 32.8	14	0.4	4.3	0.2	4,400	27	40	65	89	98	100	......	......	SPWCM
	1:54 p.m.	a 32.8	14	.4	4.1	.2	4,220	26	39	67	88	98	100	......	......	SPWCM
	1:50 p.m.	a 32.8	14	.4	4.7	.35	5,150	22	33	57	79	96	100	......	......	SPWCM
	1:52 p.m.	a 32.8	14	.4	....	.35	4,730	23	35	60	82	96	100	......	......	SPWCM
Apr. 28......	12:48 p.m.	109	6.5	1.0	8.2	.1	17,500	42	61	85	93	98	100	......	......	SPWCM
	12:49 p.m.	109	6.5	1.0	7.1	.1	17,900	41	59	85	93	98	100	......	......	SPWCM
	12:46 p.m.	109	6.5	1.0	7.2	.25	18,400	40	58	79	88	96	100	......	......	SPWCM
	12:48 p.m.	109	6.5	1.0	6.8	.25	18,500	41	60	84	91	98	100	......	......	SPWCM
	12:45 p.m.	109	6.5	1.0	9.5	.5	20,200	38	56	78	86	95	99	100	......	SPWCM
	12:46 p.m.	109	6.5	1.0	8.2	.5	20,100	38	57	78	87	94	100	......	......	SPWCM
	12:43 p.m.	109	6.5	1.0	9.8	.85	27,600	29	42	56	65	82	99	100	......	SPWCM
	12:44 p.m.	109	6.5	1.0	9.2	.85	26,000	29	43	60	69	85	99	100	......	SPWCM
	1:02 p.m.	109	9.0	1.2	6.5	.1	19,800	38	57	84	92	98	100	......	......	SPWCM
	1:03 p.m.	109	9.0	1.2	7.0	.1	19,200	39	57	81	91	98	100	......	......	SPWCM
	12:59 p.m.	109	9.0	1.2	6.7	.4	19,900	39	56	81	88	97	100	......	......	SPWCM
	12:59 p.m.	109	9.0	1.2	6.2	.4	20,600	37	54	80	86	95	100	......	......	SPWCM
	12:57 p.m.	109	9.0	1.2	7.0	.7	22,600	35	52	72	80	92	99	100	......	SPWCM
	12:58 p.m.	109	9.0	1.2	7.2	.7	22,800	33	48	68	77	92	99	100	......	SPWCM
	12:52 p.m.	109	9.0	1.2	7.2	1.05	26,100	29	42	60	70	87	99	100	......	SPWCM
	12:56 p.m.	109	9.0	1.2	7.8	1.05	28,100	28	39	61	69	85	99	100	......	SPWCM
	1:10 p.m.	109	11.5	1.1	6.3	.1	19,700	40	59	82	92	99	100	......	......	SPWCM
	1:11 p.m.	109	11.5	1.1	6.7	.1	19,100	40	58	82	91	99	100	......	......	SPWCM
	1:08 p.m.	109	11.5	1.1	7.1	.3	21,800	36	54	76	87	97	100	......	......	SPWCM
	1:09 p.m.	109	11.5	1.1	6.2	.3	21,500	36	53	75	86	97	100	......	......	SPWCM
	1:07 p.m.	109	11.5	1.1	6.6	.6	22,200	36	51	74	85	96	100	......	......	SPWCM

	1:07 p.m.	109	11.5	1.1	7.6	.6	22,600	34	52	73	84	96	100	......	......	SPWCM
	1:05 p.m.	109	11.5	1.1	6.8	.9	24,900	32	46	65	76	92	100	......	......	SPWCM
	1:06 p.m.	109	11.5	1.1	6.6	.9	23,800	33	47	69	79	93	100	......	......	SPWCM
	1:16 p.m.	109	14.0	.9	5.9	.1	20,600	40	57	79	89	98	100	......	......	SPWCM
	1:17 p.m.	109	14.0	.9	6.8	.1	21,000	38	55	77	87	97	99	100	......	SPWCM
	1:14 p.m.	109	14.0	.9	7.4	.4	21,700	36	52	76	87	98	100	......	......	SPWCM
	1:15 p.m.	109	14.0	.9	7.6	.4	21,500	37	54	76	87	98	100	......	......	SPWCM
	1:12 p.m.	109	14.0	.9	7.2	.7	22,200	36	51	72	83	96	100	......	......	SPWCM
	1:13 p.m.	109	14.0	.9	7.8	.7	22,500	35	51	73	83	96	100	......	......	SPWCM
June 24......	2:58 p.m.	318	8	3.2	....	.1	10,800	35	49	79	94	99	100	......	......	SPWCM
	2:59 p.m.	318	8	3.2	12.0	.3	11,000	32	45	76	92	99	100	......	......	SPWCM
	3:00 p.m.	318	8	3.2	12.5	1.0	11,800	28	42	72	90	98	100	......	......	SPWCM
	3:02 p.m.	318	8	3.2	12.2	1.5	13,100	25	40	67	86	96	100	......	......	SPWCM
	....	318	8	3.2	13.4	1.8	12,200	27	41	68	85	95	99	100	......	SPWCM
	3:06 p.m.	318	8	3.2	....	2.5	14,500	23	36	59	74	86	97	100	......	SPWCM
	3:09 p.m.	318	8	3.2	14.2	2.9	16,400	20	31	51	66	80	96	100	......	SPWCM
	3:13 p.m.	314	10	3.1	13.3	.1	10,600	31	48	79	95	99	100	......	......	SPWCM
	3:15 p.m.	314	10	3.1	13.4	.6	13,200	26	39	66	86	97	100	......	......	SPWCM
	3:15 p.m.	314	10	3.1	13.8	1.0	15,400	23	33	58	75	93	100	......	......	SPWCM
	....	314	10	3.1	11.1	1.6	19,500	19	27	45	60	83	97	100	......	SPWCM
	3:20 p.m.	314	10	3.1	6.3	2.0	20,900	18	26	40	54	72	91	98	......	SPWCM
	3:21 p.m.	314	10	3.1	6.6	2.7	26,400	14	21	34	45	62	89	97	......	SPWCM
	....	314	12	3.1	12.4	.1	10,600	33	49	79	92	98	100	......	......	SPWCM
	3:27 p.m.	314	12	3.1	14.3	.8	13,800	26	38	62	79	94	98	99	......	SPWCM
	3:29 p.m.	314	12	3.1	10.8	1.4	20,900	19	26	42	58	79	95	99	......	SPWCM
	3:33 p.m.	314	12	3.1	4.2	1.9	22,200	18	24	39	50	70	92	98	......	SPWCM
	3:37 p.m.	314	12	3.1	2.1	2.5	23,500	16	23	38	48	61	83	95	......	SPWCM
	3:40 p.m.	314	12	3.1	2.7	2.8	42,200	8	13	21	28	41	69	84	......	SPWCM
	3:45 p.m.	314	14	2.7	....	.1	10,800	32	49	69	87	98	100	......	......	SPWCM
	3:46 p.m.	314	14	2.7	14.5	.8	14,600	24	36	59	78	94	99	......	......	SPWCM
	3:47 p.m.	314	14	2.7	11.3	1.4	19,500	19	27	44	60	82	96	99	......	SPWCM
	3:54 p.m.	314	14	2.7	3.8	2.0	28,600	13	19	31	41	58	84	95	......	SPWCM
	4:00 p.m.	314	14	2.7	1.5	2.4	26,700	14	21	34	46	64	81	89	......	SPWCM
June 25......	11:53 a.m.	321	7	3.0	9.9	.1	9,540	27	43	75	93	99	100	......	......	SPWCM
	11:54 a.m.	321	7	3.0	12.1	.6	10,200	27	40	71	90	97	99	100	......	SPWCM

See footnotes at end of table.

Table 54.--Particle-size analyses of suspended sediment, point-integrated samples, contracted section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1953 June 25......	11:55 a.m.	321	7	3.0	12.4	1.1	10,500	25	39	68	88	96	99	100	......	SPWCM
	11:56 a.m.	321	7	3.0	11.0	1.6	13,600	20	31	59	80	92	97	99	......	SPWCM
	12:00 m.	321	7	3.0	7.8	2.1	13,100	18	26	56	73	84	94	98	......	SPWCM
	12:01 p.m.	321	7	3.0	8.8	2.6	24,600	9	14	30	41	52	67	80	......	SPWCM
	12:05 p.m.	321	7	3.0	5.5	3.0	34,700	7	10	22	29	36	56	81	......	SPWCM
	11:34 a.m.	325	10	2.0	10.3	.1	9,290	28	45	74	94	99	100	......	......	SPWCM
	11:35 a.m.	325	10	2.0	11.7	.4	9,810	25	38	69	89	99	100	......	......	SPWCM
	11:36 a.m.	325	10	2.0	12.1	.8	10,700	26	38	66	88	98	100	......	......	SPWCM
	11:38 a.m.	325	10	2.0	13.0	1.2	11,800	23	35	61	82	94	99	100	......	SPWCM
	11:39 a.m.	325	10	2.0	13.8	1.6	14,700	17	28	52	71	90	100	......	......	SPWCM
	11:40 a.m.	325	10	2.0	8.9	2.0	26,600	10	16	30	43	69	95	100	......	SPWCM
	11:45 a.m.	325	10	2.0	....	2.0	26,400	10	17	30	44	70	97	100	......	SPWCM
	11:24 a.m.	325	13	1.7	10.3	.1	8,010	31	51	83	96	100	......	......	......	SPWCM
	11:25 a.m.	325	13	1.7	10.9	.4	11,300	25	37	65	85	97	......	......	......	SPWCM
	11:26 a.m.	325	13	1.7	10.8	.7	12,800	23	32	58	79	94	100	......	......	SPWCM
	11:27 a.m.	325	13	1.7	11.9	1.0	13,000	21	33	58	80	96	100	......	......	SPWCM
	11:28 a.m.	325	13	1.7	12.2	1.2	13,600	20	30	54	76	94	100	......	......	SPWCM
	11:29 a.m.	325	13	1.7	10.6	1.4	14,500	20	30	52	72	92	100	......	......	SPWCM
	11:10 a.m.	325	16	1.6	9.7	.1	12,000	23	35	62	84	97	100	......	......	SPWCM
	....	325	16	1.6	10.1	.3	13,100	22	32	57	79	96	100	......	......	SPWCM
	11:13 a.m.	325	16	1.6	10.5	.6	12,400	22	33	59	81	97	100	......	......	SPWCM
	11:14 a.m.	325	16	1.6	10.2	.9	14,400	18	30	53	77	95	100	......	......	SPWCM
	11:15 a.m.	325	16	1.6	10.6	1.2	14,300	18	29	52	75	95	100	......	......	SPWCM
	11:16 a.m.	325	16	1.6	9.8	1.3	15,200	17	28	50	72	94	99	100	......	SPWCM
July 22......	10:10 a.m.	a 313	8	2.1	12.3	.1	7,550	13	46	73	91	99	......	......	......	SPWCM
	10:12 a.m.	a 313	8	2.1	....	.3	8,830	27	43	69	90	98	100	......	......	SPWCM
	10:13 a.m.	a 313	8	2.1	....	.5	10,200	22	34	62	83	96	100	......	......	SPWCM

10:14 a.m.	a 313	8	2.1	12.6	.7	9,500	29	39	68	88	97	99	100	......	SPWCM
10:15 a.m.	a 313	8	2.1	12.8	.9	9,420	25	41	67	87	98	100	......	......	SPWCM
10:16 a.m.	a 313	8	2.1	13.3	1.1	10,800	22	35	60	80	95	99	100	......	SPWCM
10:16 a.m.	a 313	8	2.1	13.7	1.3	10,400	23	36	52	74	92	99	100	......	SPWCM
10:17 a.m.	a 313	8	2.1	14.1	1.5	12,500	19	30	49	68	88	98	100	......	SPWCM
....	a 313	8	2.1	13.0	1.7	15,500	17	25	42	61	83	97	100	......	SPWCM
10:18 a.m.	a 313	8	2.1	11.6	1.9	17,400	15	22	38	54	76	95	99	......	SPWCM
10:19 a.m.	a 313	8	2.1	14.8	2.1	22,300	11	17	29	42	65	93	99	......	SPWCM
11:05 a.m.	a 313	10.5	2.1	10.4	.1	7,850	31	48	77	92	97	99	......	......	SPWCM
11:06 a.m.	a 313	10.5	2.1	12.0	.3	8,530	31	46	76	93	99	100	......	......	SPWCM
11:06 a.m.	a 313	10.5	2.1	12.3	.5	8,920	26	32	70	89	98	100	......	......	SPWCM
11:07 a.m.	a 313	10.5	2.1	13.0	.7	9,560	23	39	68	87	97	100	......	......	SPWCM
11:08 a.m.	a 313	10.5	2.1	13.1	.9	9,420	23	39	69	88	98	100	......	......	SPWCM
11:09 a.m.	a 313	10.5	2.1	13.6	1.1	11,000	21	34	58	78	93	99	100	......	SPWCM
11:10 a.m.	a 313	10.5	2.1	12.6	1.3	11,800	22	32	48	69	86	98	100	......	SPWCM
11:11 a.m.	a 313	10.5	2.1	12.4	1.5	16,800	18	25	43	59	81	98	100	......	SPWCM
11:12 a.m.	a 313	10.5	2.1	11.0	1.7	16,400	16	24	42	58	78	97	100	......	SPWCM
11:14 a.m.	a 313	10.5	2.1	12.5	1.9	21,200	13	19	34	48	74	97	100	......	SPWCM
11:15 a.m.	a 313	10.5	2.1	10.1	2.0	20,700	14	18	33	47	72	96	100	......	SPWCM
11:29 a.m.	a 313	12.5	2.1	11.3	.1	8,170	36	48	78	93	98	100	......	......	SPWCM
11:30 a.m.	a 313	12.5	2.1	11.5	.3	9,250	30	44	71	87	96	99	......	......	SPWCM
11:31 a.m.	a 313	12.5	2.1	11.2	.5	9,910	28	39	66	83	95	100	......	......	SPWCM
....	a 313	12.5	2.1	11.9	.8	11,400	22	33	58	78	95	100	......	......	SPWCM
11:33 a.m.	a 313	12.5	2.1	13.5	1.1	13,600	20	29	51	69	91	100	......	......	SPWCM
11:34 a.m.	a 313	12.5	2.1	12.4	1.4	15,200	17	26	44	64	90	100	......	......	SPWCM
11:35 a.m.	a 313	12.5	2.1	13.7	1.7	12,200	15	23	43	60	87	100	......	......	SPWCM
11:39 a.m.	a 313	12.5	2.1	10.8	2.0	19,100	13	22	37	53	83	99	100	......	SPWCM
12:38 p.m.	303	15.5	1.8	11.2	.1	10,500	26	37	65	86	98	100	......	......	SPWCM
12:40 p.m.	303	15.5	1.8	11.3	.3	10,300	26	37	65	86	98	100	......	......	SPWCM
12:45 p.m.	303	15.5	1.8	12.5	.5	10,700	25	38	64	83	98	100	......	......	SPWCM
12:46 p.m.	303	15.5	1.8	13.0	.7	11,000	25	38	62	92	96	100	......	......	SPWCM
12:47 p.m.	303	15.5	1.8	9.2	.9	10,900	25	42	64	82	96	99	99	......	SPWCM
12:47 p.m.	303	15.5	1.8	10.1	1.1	11,800	22	35	57	76	94	100	......	......	SPWCM
12:47 p.m.	303	15.5	1.8	11.9	1.4	12,300	24	33	57	76	94	100	......	......	SFWCM
12:48 p.m.	303	15.5	1.8	9.5	1.7	14,200	20	31	50	71	93	100	......	......	SPWCM

a Streamflow measurement.
b Measured by current meter.

Table 55.--Particle-size analyses of sediment, Tait-Binckley samples, contracted section, Fivemile Creek near Shoshoni, Wyo.
[Methods of analyeis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Depth (ft)	Suspended sediment: Sampling point: Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952															
Aug. 10 a	3:15 p.m.	340	11	2.2	2.1	39,400	11	16	28	36	42	47	58	77	SPWCM
(a)	3:15 p.m.	340	12	2.1	2.0	33,700	12	18	30	40	47	54	77	93	SPWCM
(a)	3:15 p.m.	340	16	1.8	1.7	34,200	12	18	31	45	63	94	99	......	SPWCM
(a)	3:15 p.m.	340	24	1.3	1.2	60,500	8	11	20	32	62	97	100	......	SPWCM
(a)	3:15 p.m.	340	28	1.3	1.2	32,800	13	19	34	54	86	99	100	......	SPWCM
(b)	4:30 p.m.	336	80	2.4	2.3	30,000	14	21	38	63	95	99	100	......	SPWCM
(b)	4:30 p.m.	336	85	2.3	2.2	30,400	14	21	37	60	91	99	100	......	SPWCM
(c)	12:50 p.m.	336	14	1.6	1.5	42,100	8	13	24	32	36	39	42	54	SPWCM
(c)	12:50 p.m.	336	18	1.5	1.4	84,000	5	9	17	17	28	31	40	55	SPWCM
(c)	12:50 p.m.	336	22	1.6	1.5	25,500	14	21	40	55	66	77	90	96	SPWCM
(c)	12:50 p.m.	336	26	1.6	1.5	45,500	9	14	25	34	42	87	98	99	SPWCM
(c)	12:50 p.m.	336	30	1.5	1.4	63,900	7	11	19	32	62	98	100	......	SPWCM
Aug. 27	5:15 p.m.	199	19	2.4	2.3	14,000	13	20	31	43	61	82	92	98	SPWCM
	5:15 p.m.	199	22	2.0	1.9	25,900	8	11	18	28	51	78	90	96	SPWCM
	5:15 p.m.	199	25	1.9	1.8	13,000	15	21	36	53	81	97	99	......	SPWCM
Aug. 28	4:00 p.m.	231	19	2.6	2.5	21,500	9	13	21	30	46	77	87	91	SPWCM
	4:00 p.m.	231	22	2.1	2.0	28,400	7	10	18	29	55	88	95	99	SPWCM
	3:50 p.m.	231	25	1.8	1.7	12,400	16	22	38	56	81	92	93	94	SPWCM
Sept. 4	1:15 p.m.	231	7.5	2.6	2.5	23,600	9	14	23	32	42	64	77	84	SPWCM
	1:15 p.m.	231	9.5	1.8	1.7	36,100	6	9	16	22	34	68	83	89	SPWCM
	1:15 p.m.	231	11.5	1.8	1.7	31,700	7	10	18	27	44	67	74	82	SPWCM
	1:15 p.m.	231	13.5	1.5	1.4	15,500	14	21	35	52	76	93	96	97	SPWCM
1953															
Apr. 15	2:20 p.m.	d32.8	8	.6	.5	4,530	24	37	59	81	96	99	100	......	SPWCM
	2:20 p.m.	d32.8	10	.4	.3	5,580	18	28	51	76	96	99	100	......	SPWCM
	2:20 p.m.	d32.8	12	.5	.4	5,150	21	33	56	80	96	99	100	......	SPWCM
	2:20 p.m.	d32.8	14	.4	.3	4,520	23	35	61	84	98	99	100	......	SPWCM

Apr. 28	1:22 p.m.	111	6.5	1.0	.9	39,300	20	29	43	53	82	99	100	......	SPWCM
	1:21 p.m.	111	9.0	1.2	1.1	26,500	30	43	63	73	91	99	100	......	SPWCM
	1:20 p.m.	111	11.5	1.1	1.0	24,700	33	48	66	77	95	100	......	......	SPWCM
	1:19 p.m.	111	14.0	.9	.8	23,300	34	50	70	81	96	100	......	......	SPWCM

a 6 ft upstream from the downstream end of the throat of the flume.
b 19 ft downstream from the downstream end of the throat of the flume.
c 44 ft downstream from the downstream end of the throat of the flume.
d Streamflow measurement.

Table 56.--Particle-size analyses of sediment samples collected with Bureau of Reclamation point sampler,[a] contracted section, Fivemile Creek near Shoshoni, Wyo.

[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment										Methods of analysis
					Sampling point		Percent finer than indicated size, in millimeters								
					Depth (ft)	Concentration (ppm)	0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1952															
Sept. 3 b	1:20 p.m.	251	7	3.9	3.8	156,000	1	2	3	6	9	13	26	50	SPWCM
(b)	1:15 p.m.	251	11	3.2	3.1	308,000	......	1	1	3	11	56	82	92	SPWCM
(c)	1:30 p.m.	251	6	3.1	3.0	54,600	4	6	10	15	20	31	47	66	SPWCM
(c)	1:45 p.m.	251	10	3.0	2.9	48,900	4	6	11	17	40	94	100	......	SPWCM
(c)	2:00 p.m.	251	14	3.3	3.2	23,300	8	13	24	40	77	98	99	100	SPWCM
(d)	2:10 p.m.	251	8	2.6	2.5	22,900	10	15	25	35	48	81	94	99	SPWCM
(d)	2:25 p.m.	251	11	2.1	2.0	42,200	3	4	7	13	28	59	82	91	SPWCM
(d)	2:45 p.m.	251	14	2.2	2.1	20,300	12	18	30	47	73	97	99	100	SPWCM
(e)	3:45 p.m.	251	8	2.5	2.4	36,400	7	10	17	23	42	85	97	100	SPWCM
(e)	2:35 p.m.	251	11	2.0	1.9	66,000	3	5	9	13	26	56	75	89	SPWCM
(e)	3:30 p.m.	247	14	1.5	1.4	11,500	20	30	49	71	90	98	99	99	SPWCM
(f)	3:20 p.m.	247	8	.....	.....	10,600	22	32	56	73	84	95	99	100	SPWCM
(f)	3:10 p.m.	251	12	.....	.....	118,000	2	3	5	9	23	52	73	86	SPWCM
(f)	3:00 p.m.	251	15	.....	.....	16,800	13	20	32	52	80	96	99	100	SPWCM

See footnotes at end of table.

Table 56.--Particle-size analyses of sediment samples collected with Bureau of Reclamation point sampler,[a] contracted section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Depth (ft)	Sampling point: Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952															
Sept. 4 e	11:50 a.m.	234	7.5	2.6	2.5	22,900	10	15	26	36	50	72	88	97	SPWCM
(e)	11:50 a.m.	234	9.5	1.8	1.7	22,600	10	15	20	30	48	74	86	92	SPWCM
(e)	11:50 a.m.	234	11.5	1.8	1.7	38,300	6	10	18	27	44	62	73	82	SPWCM
(e)	11:50 a.m.	234	13.5	1.5	1.4	16,300	14	21	35	51	75	89	94	98	SPWCM
Oct. 15	2:00 p.m.	g 81.2	6	1.4	1.3	14,900	8	11	21	32	45	74	94	100	SPWCM
	2:00 p.m.	g 81.2	8	1.2	1.1	13,700	8	12	22	37	59	94	99	100	SPWCM
	2:00 p.m.	g 81.2	10	1.3	1.2	8,410	10	19	35	58	84	99	100	......	SPWCM
	2:00 p.m.	g 81.2	12	1.2	1.1	8,640	13	19	36	62	90	99	100	......	SPWCM
	2:10 p.m.	g 81.2	14.5	1.0	.9	6,300	16	25	46	74	96	100	......	......	SPWCM
Dec. 8	3:05 p.m.	g 58.4	9.5	2.6	2.5	4,210	7	8	16	31	65	94	100	......	SPWCM
	3:05 p.m.	g 58.4	11	2.5	2.4	85,000	......	1	1	2	7	28	52	......	SPWCM
	3:05 p.m.	g 58.4	12	2.5	2.4	3,230	9	13	22	37	68	88	93	......	SPWCM
	3:05 p.m.	g 58.4	13.5	2.5	2.4	3,000	13	15	22	28	59	93	96	......	SPWCM
1953															
Jan. 13	4:25 p.m.	g 52.9	9	1.9	1.8	2,060	20	24	43	60	84	99	100	......	SPWCM
	4:25 p.m.	g 52.9	12	1.3	1.2	2,690	16	22	36	53	81	99	100	......	SPWCM
	4:25 p.m.	g 52.9	14	1.3	1.2	2,110	20	26	42	60	84	99	100	......	SPWCM
	4:25 p.m.	g 52.9	16	1.9	1.8	2,690	17	22	35	53	81	97	97	......	SPWCM
Feb. 26	1:38 p.m.	g 29.6	5.5	.8	.7	2,970	12	18	37	56	87	100	......	......	SPWCM
	1:38 p.m.	g 29.6	8	.8	.7	2,930	11	19	35	56	87	99	100	......	SPWCM
	1:38 p.m.	g 29.6	11	.6	.5	4,520	8	13	25	44	86	100	......	......	SPWCM
	1:38 p.m.	g 29.6	14	.7	.6	4,820	8	13	24	46	93	100	......	......	SPWCM
Mar. 24	11:44 a.m.	g 27.2	5.5	.....	.....	13,900	12	19	39	56	68	73	76	......	SPWCM
	11:44 a.m.	g 27.2	8	.....	.....	36,300	5	8	16	25	40	80	94	......	SPWCM
	11:44 a.m.	g 27.2	11	.....	.....	19,200	9	15	30	52	86	99	100	......	SPWCM
	11:47 a.m.	g 27.2	14	.....	.....	16,900	10	17	35	59	94	100	......	......	SPWCM

Apr. 15	2:34 p.m.	g 32.8	8	.6	.5	....	10	16	30	48	78	97	100	......	SPWCM
	2:32 p.m.	g 32.8	10	.4	.3	....	17	26	46	70	90	99	100	......	SPWCM
	2:30 p.m.	g 32.8	12	.5	.4	....	14	23	44	64	83	97	100	......	SPWCM
	2:28 p.m.	g 32.8	14	.4	.3	....	22	32	57	79	94	99	100	......	SPWCM
Apr. 28	1:28 p.m.	111	6.5	1.0	.9	....	11	16	24	29	42	69	86	......	SPWCM
	1:27 p.m.	111	9.0	1.2	1.1	....	30	44	60	70	90	99	100	......	SPWCM
	1:25 p.m.	111	11.5	1.1	1.0	....	32	46	65	76	94	99	100	......	SPWCM
	1:24 p.m.	111	14.0	.9	.8	....	34	49	68	80	96	100	......	......	SPWCM
June 24	4:01 p.m.	g 307	14	2.7	2.6	48,500	6	9	18	26	42	64	78	......	SPWCM
June 25	10:27 a.m.	321	7	3.0	2.9	34,100	7	11	22	32	51	84	95	......	SPWCM
	10:30 a.m.	321	10	2.0	1.9	26,500	9	15	29	41	63	86	90	......	SPWCM
	10:32 a.m.	321	13	1.7	1.6	17,600	17	25	46	64	87	98	100	......	SPWCM
	10:35 a.m.	321	16	1.6	1.5	16,800	17	26	45	66	89	99	100	......	SPWCM
July 22	1:01 p.m.	303	8	2.1	2.0	20,200	13	19	31	42	59	89	94	......	SPWCM
	12:59 p.m.	303	10.5	2.1	2.0	21,900	13	19	33	46	71	96	99	......	SPWCM
	12:57 p.m.	303	12.5	2.1	2.0	16,300	17	25	40	57	83	98	100	......	SPWCM
	12:55 p.m.	303	15.5	1.8	1.7	13,200	21	32	52	70	92	100	......	......	SPWCM

a Bureau of Reclamation point sampler is a 2- by 12-in. cylinder with flap valves.
b Upstream end of throat of flume.
c 20 ft downstream from the upstream end of the throat of the flume.
d 10 ft upstream from the downstream end of the throat of the flume.
e Sampling bridge and downstream end of the throat of the flume.
f 9 ft downstream from the downstream end of the throat of the flume in the diverging section.
g Streamflow measurement.

Table 57.--Particle-size analyses of stream-bed material at or near the site of the artificial contraction, Fivemile Creek near Shoshoni, Wyo.
[Method of analysis: S, sieve]

Date	Station	Stream-bed material									Remarks
		Percent finer than indicated size, in millimeters									
		0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.000	
1952											
Aug. 10 a..	15	1	2	14	69	95	99	....	....	....	Sec. 0 + 25.
(a)	20	1	4	30	86	98	100	....	....	....	Do.
(a)	25	....	0	1	2	6	24	52	....	....	Do.
(a)	30	2	13	69	96	99	....	....	....	....	Do.
(a)	90	4	33	84	97	99	100	....	....	....	Sec. 0 + 50.
(a)	100	0	5	44	90	98	100	....	....	....	Do.
(a)	105	0	2	21	84	98	100	....	....	....	Do.
(a)	110	0	2	8	60	93	99	100	....	....	Do.
(a)	115	....	0	1	2	7	31	64	....	....	Do.
(a)	11	0	1	3	7	16	48	71	....	....	Sec. 0 + 75.
											Do.
(a)	20	1	7	35	92	99	....	....	....	....	Do.
(a)	24	0	4	30	92	99	100	....	....	....	Do.
(a)	28	0	3	45	95	99	100	....	....	....	Do.
(a)	82	1	6	51	98	100	....	....	....	....	Sec. 1 + 00.
(a)	90	0	2	14	63	92	99	....	....	....	Do.
(a)	95	0	2	14	78	99	....	....	....	....	Do.
(a)	100	0	2	4	10	46	85	....	....	....	Do.
(a)	102	....	....	....	0	5	25	....	....	....	Do.
(a)	104	....	0	1	2	12	47	....	....	....	Do.
(a)	14	....	....	....	0	1	11	40	....	....	Sec. 1 + 25.
(a)	18	0	1	3	6	17	31	42	....	....	Do.
(a)	22	1	1	6	54	97	100	....	....	....	Do.
(a)	26	0	2	18	85	99	100	....	....	....	Do.
(a)	30	1	3	30	94	100	....	....	....	....	Do.

Sept. 3....	10	0	3	28	93	99	100	....	....	....	Sec. 0 + 00.
	10	0	1	18	70	86	92	....	....	....	Sec. 0 + 10.
	12	0	2	26	75	85	91	....	....	....	Sec. 0 + 31.
Oct. 15....	7	0	1	4	20	42	69	88	....	....	Sec. 0 + 61.
	10	0	2	24	86	98	99	99	....	....	Do.
	7	....	0	2	8	17	26	31	....	....	Sec. 0 + 81.
	9	0	1	8	39	67	86	93	....	....	Do.
	11	0	1	5	26	51	73	77	....	....	Do.
	12	0	1	5	20	43	69	88	....	....	Do.
Dec. 8.....	10	....	0	6	35	70	88	95	....	....	Sec. 0 + 76.
	11	0	2	25	85	99	100	....	....	....	Sec. 0 + 76, no bed material at sta. 12 and 14.
1953											
Feb. 26....	10-14	....	....	....	....	....	....	....	....	....	Sec. 0 + 76, no bed material.
Mar. 24....	6	0	2	6	19	36	58	77	....	....	Sec. 0 + 72.
	8	1	5	27	78	93	97	98	....	....	Sec. 0 + 73.
	11	0	6	41	75	90	97	100	....	....	Sec. 0 + 75, no bed material at sta. 14.
Apr. 15....	8	0	1	14	54	79	92	98	....	....	Sec. 0 + 73.
	10	0	4	30	79	93	96	98	....	....	Sec. 0 + 74, no bed material at sta. 12 and 14.
Apr. 28....	6	0	3	11	36	72	88	91	....	....	Sec. 0 + 76, no bed material at sta. 9, 12, and 14.
July 22....	2	2	10	63	90	95	97	98	99	100	Sec. 0 + 31.
	5	1	6	68	93	96	97	99	100	....	Do.
	14	1	3	42	81	90	96	99	100	....	Do.
	18	0	2	18	62	79	88	95	99	100	Do.
Nov. 30....	2, 4	....	0	5	38	70	85	92	95	100	Sec. 0 + 74, 0.6 ft deep at sta. 0; 0 ft deep at sta. 5; no bed material at sta. 6 to 14.

a Collected before the construction of the artificial contraction, which was completed on Aug. 26, 1952.

Note--0 + 00, 31 ft upstream from throat of flume; 0 + 31, upstream end of throat of flume; 0 + 81, downstream end of flume; 0 + 90, downstream diverging section; 1 + 00, end of downstream wing wall; 1 + 25, unconfined stream channel downstream from flume.

Table 58.--Particle-size analyses of suspended sediment, depth-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.
[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; N, in native water; S, sieve; P, pipette; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1948																
Nov. 17......	12:32 p.m.	45	10,400	....	9	12	18	23	30	44	64	88	96	......	......	BW
1949																
Jan. 6........	2:40 p.m.	31	889	307	8	17	30	30	31	34	40	75	100	......	......	BN
Feb. 1........	2:45 p.m.	30	1,270	432	......	24	40	60	68	76	82	95	100	......	......	BN
Do........	2:45 p.m.	30	1,270	365	16	28	41	55	66	72	76	84	100	......	......	BW
Feb. 10......	2:02 p.m.	29	1,800	2,060	......	8	28	44	50	60	67	90	98	......	......	BN
Do........	2:02 p.m.	29	1,800	1,740	10	21	30	42	50	58	72	88	98	......	......	BW
Feb. 17......	3:45 p.m.	29	3,320	1,690	2	5	12	19	26	34	44	74	100	......	......	BW
Apr. 21......	9:52 a.m.	25	10,700	1,510	15	22	29	36	44	56	78	92	98	......	......	BW
May 2........	11:45 a.m.	16	6,940	1,750	......	18	26	38	48	68	86	98	100	......	......	BW
May 9........	11:10 a.m.	78	8,030	2,410	......	12	16	22	30	45	74	91	100	......	......	BW
May 12........	10:22 a.m.	81	13,600	2,040	......	34	44	54	62	72	88	98	100	......	......	BW
May 19........	10:45 a.m.	122	20,100	1,520	16	25	34	44	58	67	82	95	100	......	......	BW
Sept. 2.......	4:30 p.m.	188	12,400	1,140	......	28	37	45	54	66	82	100	......	......	......	BW
Sept. 27......	11:26 a.m.	132	9,660	1,890	......	16	24	29	37	52	71	90	99	......	......	BW
Oct. 3........	4:45 p.m.	72	8,300	1,560	......	16	23	28	35	46	63	97	100	......	......	BW
Oct. 10.......	3:36 p.m.	78	10,100	2,040	......	26	36	43	50	62	82	99	100	......	......	BW
Oct. 19.......	9:30 a.m.	53	6,810	1,350	......	10	14	19	26	33	52	92	98	......	......	BW
Nov. 10.......	3:25 p.m.	55	7,020	2,590	......	16	21	27	34	42	54	87	97	......	......	BW
1950																
Mar. 5........	5:45 p.m.	78	23,800	11,800	......	26	......	42	......	58	79	97	100	......	......	SPWCM
Mar. 17.......	4:30 p.m.	a 55	27,700	14,300	......	26	......	41	......	63	77	93	100	......	......	SPWCM
Mar. 28.......	4:55 p.m.	37	11,600	7,190	24	30	38	48	59	76	91	99	100	......	......	SPWCM
Apr. 5........	12:15 p.m.	44	13,000	3,460	......	32	......	50	......	77	92	99	100	......	......	SPWCM
Apr. 7........	3:45 p.m.	58	14,200	4,080	......	38	......	55	......	74	87	98	100	......	......	SPWCM
Apr. 23.......	3:10 p.m.	40	9,980	8,190	......	1	4	58	74	87	96	100	......	......	......	SPNM
Do........	3:10 p.m.	40	9,980	8,200	31	40	50	62	74	88	96	100	......	......	......	SPWCM
Apr. 29.......	2:30 p.m.	47	14,600	10,800	......	1	3	55	68	79	93	100	......	......	......	SPNM

Do........	2:30 p.m.	47	14,600	4,620	31	43	52	58	66	78	90	100	......	......	......	BWC
May 6.........	4:45 p.m.	100	13,800	4,200	......	33	......	50	......	71	88	98	100	......	......	SPWCM
May 7.........	3:25 p.m.	155	17,300	12,000	......	......	3	39	51	70	87	99	100	......	......	SPNM
Do........	3:25 p.m.	155	17,300	5,210	17	22	30	38	49	69	89	99	100	......	......	SPWCM
May 15........	5:25 p.m.	124	13,100	6,290	......	37	......	52	......	70	85	98	100	......	......	SPWCM
May 20........	12:10 p.m.	114	13,800	2,170	......	20	......	33	......	56	75	92	99	100	......	SPWCM
May 29........	10:35 a.m.	167	22,400	5,750	......	39	......	56	......	77	89	98	100	......	......	SPWCM
June 9........	4:20 p.m.	310	27,000	2,070	12	18	26	36	46	60	70	83	90	......	......	BWC
June 10.......	2:40 p.m.	274	23,800	5,720	25	33	41	50	60	79	88	92	98	......	......	BWC
June 19.......	12:00 p.m.	716	160,000	6,430	24	30	38	50	58	74	88	96	100	......	......	SPWCM
June 29.......	10:15 a.m.	332	35,200	3,920	......	26	......	37	......	63	......	......	......	......	......	SPWCM
July 3........	3:15 p.m.	278	35,400	5,940	22	30	37	46	55	68	82	96	98	......	......	BWC
July 8........	2:30 p.m.	378	36,600	4,200	......	26	......	36	......	62	80	95	100	......	......	SPWCM
July 17.......	12:20 p.m.	328	30,400	6,070	......	28	......	42	......	71	85	97	100	......	......	SPWCM
July 24.......	2:50 p.m.	346	31,000	3,430	......	29	......	42	......	67	85	98	100	......	......	SPWCM
July 25.......	8:15 p.m.	812	66,000	3,100	......	6	24	56	62	78	92	99	100	......	......	BN
Do........	8:15 p.m.	812	66,000	3,070	25	34	45	53	64	79	91	99	100	......	......	BWC
Do........	11:45 p.m.	2,300	172,000	6,730	......	28	......	44	......	72	91	99	100	......	......	SPWCM
July 26.......	2:30 a.m.	1,020	155,000	5,440	......	26	......	40	......	69	90	99	100	......	......	SPWCM
Do........	1:25 p.m.	472	65,600	4,040	......	34	......	49	......	74	......	......	......	......	......	SPWCM
Aug. 2........	11:00 a.m.	314	28,000	3,950	......	33	......	47	......	80	95	100	......	......	......	SPWCM
Aug. 7........	10:00 a.m.	364	26,800	8,880	......	38	......	55	......	80	......	......	......	......	......	SPWCM
Aug. 11.......	1:50 p.m.	355	30,800	4,180	......	28	......	41	......	69	87	98	100	......	......	SPWCM
Aug. 18.......	4:30 p.m.	274	35,200	4,510	......	27	......	38	......	62	83	98	100	......	......	SPWCM
Aug. 23.......	10:25 a.m.	288	31,700	15,500	......	......	1	35	44	60	81	95	100	......	......	SPNM
Do........	10:25 a.m.	288	31,700	13,000	17	24	31	36	44	58	78	96	99	......	......	BWC
Aug. 24.......	5:50 p.m.	242	29,200	11,100	......	27	......	40	......	60	82	97	100	......	......	SPWCM
Aug. 25.......	11:07 a.m.	265	28,000	16,200	......	......	1	36	44	59	79	94	100	......	......	SPNM
Do........	11:07 a.m.	265	28,000	2,140	......	24	28	34	40	52	69	91	98	......	......	BWC
Aug. 29.......	11:30 a.m.	252	37,000	5,080	......	39	......	56	......	74	89	98	100	......	......	SPWCM
Sept. 1.......	9:40 a.m.	229	26,900	16,600	......	1	2	42	49	63	85	97	100	......	......	SPNM
Do........	9:40 a.m.	229	26,900	2,560	26	32	38	41	48	66	87	97	100	......	......	SPWCM
Sept. 12......	3:40 p.m.	310	29,800	3,580	......	27	......	40	......	65	84	96	100	......	......	SPWCM
Sept. 15......	10:55 a.m.	180	23,500	4,200	......	27	......	39	......	63	83	97	100	......	......	SPWCM
Sept. 20......	1:15 p.m.	1,060	74,000	3,560	......	32	......	43	......	71	91	98	100	......	......	SPWCM

See footnotes at end of table.

Table 58.--Particle-size analyses of suspended sediment, depth-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment														Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1950																
Sept. 20......	3:15 p.m.	2,360	174,000	5,120	......	23	......	36	......	62	83	95	99	100	......	SPWCM
Sept. 21......	4:15 p.m.	171	39,000	26,300	......	......	1	49	65	73	89	98	100	......	......	SPNM
Do........	4:15 p.m.	171	39,000	3,750	24	32	48	58	68	72	88	98	100	......	......	SPWCM
Sept. 29......	11:22 a.m.	85	16,600	10,600	1	2	3	39	49	65	87	98	100	......	......	SPNM
Do........	11:22 a.m.	85	16,600	3,220	20	26	32	39	46	62	80	95	99	......	......	BWCM
Oct. 9........	4:30 p.m.	62	12,200	8,100	......	25	......	37	......	66	89	99	100	......	......	SPWCM
Oct. 16.......	4:00 p.m.	55	11,500	6,780	1	2	5	30	38	58	86	99	100	......	......	SPNM
Do........	4:00 p.m.	55	11,500	3,190	23	28	32	38	43	60	80	94	99	......	......	BWCM
Oct. 23.......	11:00 a.m.	52	8,730	6,360	......	25	......	35	......	61	89	99	100	......	......	SPWCM
Oct. 30.......	11:30 a.m.	48	9,290	5,290	......	......	6	29	35	57	85	99	100	......	......	SPNM
Do........	11:30 a.m.	48	9,290	6,560	18	20	26	30	37	64	87	99	100	......	......	SPWCM
Nov. 6........	2:45 p.m.	48	10,800	6,050	......	20	......	29	......	51	80	98	100	......	......	SPWCM
Nov. 13.......	12:00 m.	a 51	7,480	2,960	......	16	......	19	......	38	71	98	100	......	......	SPWCM
Nov. 21.......	1:45 p.m.	90	17,200	5,680	......	1	5	17	21	31	65	96	100	......	......	SPNM
Do........	1:45 p.m.	90	17,200	4,500	12	15	17	20	22	30	50	......	......	......	......	BWCM
Nov. 27.......	10:50 a.m.	50	10,900	4,890	......	19	......	27	......	46	74	98	100	......	......	SPWCM
Dec. 5........	12:30 p.m.	41	6,300	5,280	......	19	......	28	......	44	70	96	100	......	......	SPWCM
Dec. 11.......	10:55 a.m.	51	11,800	8,170	1	1	2	24	32	49	76	96	100	......	......	SPNM
Do........	10:55 a.m.	51	11,800	5,050	......	20	23	28	34	46	68	92	99	......	......	BWCM
Dec. 19.......	12:10 p.m.	51	9,140	4,730	......	17	......	23	......	44	74	98	100	......	......	SPWCM
Dec. 22.......	4:45 p.m.	56	17,300	8,220	......	26	......	41	......	71	92	99	100	......	......	SPWCM
Dec. 26.......	10:10 a.m.	47	10,400	6,290	......	19	......	28	......	54	80	98	100	......	......	SPWCM
1951																
Jan. 2........	2:45 p.m.	33	3,560	4,040	......	21	......	33	......	50	72	95	100	......	......	SPWCM
Jan. 8........	12:20 p.m.	35	3,360	2,640	......	13	......	18	......	30	47	88	100	......	......	SPWCM
Jan. 15.......	12:05 p.m.	39	3,620	3,790	......	18	......	26	......	43	62	92	100	......	......	SPWCM
Jan. 22.......	3:15 p.m.	52	7,870	4,040	1	1	7	28	33	44	......	......	......	......	......	SPNM
Do.......	3:15 p.m.	52	7,870	4,590	18	23	25	36	44	50	66	97	100	......	......	BWCM

Jan. 26.......	5:40 p.m.	44	13,900	5,590	......	29	......	43	......	68	87	99	100	......	......	SPWCM
Feb. 12.......	12:25 p.m.	40	3,470	1,300	......	38	......	45	......	54	73	97	100	......	......	SPWCM
Feb. 19.......	4:55 p.m.	50	6,940	6,300	......	......	4	79	86	92	......	......	......	......	......	SPNM
Do........	4:55 p.m.	50	6,940	8,140	37	48	62	72	79	93	......	......	......	......	......	SPWCM
Feb. 25.......	4:30 p.m.	53	41,400	13,600	......	19	......	33	......	59	88	99	100	......	......	SPWCM
Feb. 27.......	2:10 p.m.	46	35,600	18,100	......	......	1	30	35	54	83	98	100	......	......	SPNM
Do........	2:10 p.m.	46	35,600	5,370	......	20	24	29	36	54	......	......	......	......	......	BWCM
Feb. 28.......	6:00 p.m.	68	18,000	9,280	......	31	......	50	......	80	95	100	......	......	......	SPWCM
Mar. 6........	2:20 p.m.	52	27,200	17,100	......	......	1	27	44	66	89	99	100	......	......	SPNM
Do........	2:20 p.m.	52	27,200	6,460	......	26	31	39	48	66	85	99	100	......	......	BWCM
Mar. 13.......	11:45 a.m.	37	18,600	8,110	......	20	......	30	......	59	86	98	100	......	......	SPWCM
Mar. 20.......	12:50 p.m.	54	27,100	6,260	22	28	35	42	55	76	93	99	100	......	......	SPWCM
Do........	12:50 p.m.	54	27,100	26,300	......	1	2	17	58	71	87	98	100	......	......	BNM
Mar. 27.......	11:00 a.m.	38	18,200	7,210	......	33	......	49	......	76	91	99	100	......	......	SPWCM
Apr. 3........	3:10 p.m.	33	14,500	12,500	......	1	2	50	67	85	96	100	......	......	......	SPNM
Do........	3:10 p.m.	33	14,500	4,220	30	37	46	56	68	84	95	100	......	......	......	BWCM
Apr. 10.......	11:50 a.m.	34	11,600	7,980	......	......	3	44	55	75	93	100	......	......	......	SPNM
Do........	11:50 a.m.	34	11,600	5,500	23	30	36	45	54	71	92	100	......	......	......	BWCM
Apr. 17.......	3:50 p.m.	21	8,180	6,980	......	......	13	59	66	82	......	......	......	......	......	SPNM
Do........	3:50 p.m.	21	8,180	2,780	32	40	50	60	70	84	96	100	......	......	......	BWCM
Apr. 25.......	12:50 p.m.	34	13,700	9,910	......	......	1	58	67	80	95	100	......	......	......	SPNM
Do........	12:50 p.m.	34	13,700	6,560	30	41	50	56	65	77	90	100	......	......	......	BWCM
Apr. 28.......	7:15 a.m.	44	19,800	5,040	......	37	......	52	......	74	91	100	......	......	......	SPWCM
Apr. 29.......	7:25 a.m.	44	27,000	6,960	......	43	......	60	......	78	93	100	......	......	......	SPWCM
Apr. 30.......	5:45 p.m.	62	21,000	6,300	......	22	......	67	......	88	......	......	......	......	......	SPWCM
May 1.........	4:20 p.m.	78	48,400	38,700	......	......	2	66	77	84	94	99	100	......	......	SPNM
Do........	4:20 p.m.	.78	48,400	3,220	27	35	44	55	63	74	86	97	99	......	......	BWCM
May 7.........	12:25 p.m.	155	46,800	38,100	......	......	2	54	68	81	98	100	......	......	......	SPNM
Do........	12:25 p.m.	155	46,800	2,950	28	36	43	55	69	81	94	100	......	......	......	BWCM
May 14........	11:55 a.m.	121	18,400	8,590	......	1	3	45	57	62	87	98	100	......	......	SPNM
Do........	11:55 a.m.	121	18,400	7,540	19	23	29	36	47	71	91	99	100	......	......	SPWCM
May 21........	10:55 a.m.	139	22,800	15,300	......	26	......	37	......	68	......	......	......	......	......	SPWCM
June 14.......	10:45 a.m.	135	10,600	5,260	......	20	......	28	......	49	75	94	99	100	......	SPWCM
June 21.......	4:50 p.m.	175	20,600	8,210	......	33	......	48	......	73	87	98	100	......	......	SPWCM
June 25.......	5:10 p.m.	301	27,000	19,300	......	1	2	48	57	72	86	95	100	......	......	SPNM

See footnotes at end of table.

Table 58.--Particle-size analyses of suspended sediment, depth-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1951																
June 25.......	5:10 p.m.	301	27,000	3,980	24	32	40	47	56	69	82	97	100	......	......	BWCM
July 2........	5:00 p.m.	278	22,700	8,400	......	22	......	41	......	60	......	......	......	......	......	SPWCM
July 5........	11:30 a.m.	292	21,000	7,100	......	26	......	39	......	64	81	92	99	100	......	SPWCM
July 12.......	10:50 a.m.	373	30,500	18,500	......	1	2	......	47	60	72	92	99	100	......	SPNM
Do........	10:50 a.m.	373	30,500	4,200	19	26	32	38	45	59	74	91	98	......	......	BWCM
July 16.......	11:00 a.m.	306	24,300	9,540	......	28	......	42	......	65	82	93	99	100	......	SPWCM
July 19.......	4:10 p.m.	270	25,400	5,900	......	34	......	49	......	74	87	95	99	100	......	SPWCM
July 23.......	1:25 p.m.	420	28,600	5,000	......	26	......	40	......	66	84	96	100	......	......	SPWCM
July 30.......	11:10 a.m.	378	27,400	4,910	......	27	......	42	......	64	83	94	100	......	......	SPWCM
Aug. 2........	11:05 a.m.	373	27,800	4,280	......	23	......	34	......	56	81	94	100	......	......	SPWCM
Aug. 13.......	11:30 a.m.	283	18,700	11,700	......	......	2	39	46	63	84	97	100	......	......	SPNM
Do........	11:30 a.m.	283	18,700	5,880	22	28	34	40	50	67	85	96	100	......	......	SPWCM
Aug. 20.......	11:20 a.m.	278	19,600	6,040	......	23	......	34	......	53	75	92	99	100	......	SPWCM
Aug. 23.......	10:40 a.m.	256	15,600	5,520	......	23	......	34	......	57	79	95	99	100	......	SPWCM
Aug. 30.......	10:55 a.m.	224	16,700	8,100	......	19	......	28	......	50	75	94	98	100	......	SPWCM
Sept. 13......	9:40 a.m.	224	21,000	12,100	......	......	1	22	37	52	75	94	99	100	......	SPNM
Do........	9:40 a.m.	224	21,000	6,000	16	23	27	32	40	53	68	99	100	......	......	BWCM
Sept. 24......	4:45 p.m.	188	11,600	6,850	......	21	......	31	......	54	76	94	99	100	......	SPWCM
Sept. 28......	10:35 a.m.	175	19,700	8,400	......	15	......	24	......	42	63	87	97	99	100	SPWCM
Oct. 1........	12:20 p.m.	153	14,200	11,300	......	19	......	26	......	47	70	90	97	99	......	SPWCM
Oct. 8........	10:50 a.m.	77	10,400	1,390	......	24	......	37	......	61	82	98	100	......	......	SPWCM
Oct. 15.......	10:35 a.m.	67	9,130	9,380	......	19	......	29	......	54	84	99	100	......	......	SPWCM

Oct. 22.......	4:20 p.m.	71	9,850	9,320	......	16	......	25	......	45	72	93	99	100	......	SPWCM
Nov. 5........	11:10 p.m.	37	7,350	6,380	......	15	......	22	......	44	80	98	100	......	......	SPWCM
Nov. 13.......	3:10 p.m.	37	7,590	7,530	......	19	......	30	......	51	81	99	100	......	......	SPWCM
Nov. 26.......	3:35 p.m.	48	5,180	2,480	......	10	......	14	......	25	57	97	100	......	......	SPWCM
Dec. 3........	3:10 p.m.	58	5,970	2,220	......	15	......	21	......	39	82	91	98	99	......	SPWCM
1952																
Jan. 11.......	1:55 p.m.	33	1,410	580	......	37	......	52	......	54	......	......	......	......	......	SPWCM
Feb. 4........	2:55 p.m.	38	3,660	1,510	......	24	......	35	......	51	72	93	99	......	......	SPWCM
Mar. 17.......	1:20 p.m.	55	9,240	6,960	......	27	......	34	......	60	79	97	100	......	......	SPWCM
Mar. 24.......	10:40 a.m.	41	5,160	4,390	......	31	......	47	......	67	79	97	100	......	......	SPWCM
Apr. 1........	3:20 p.m.	65	25,800	21,400	......	0	1	29	46	66	89	99	100	......	......	SPNM
Do........	3:20 p.m.	65	25,800	6,380	......	23	29	36	47	68	......	......	......	......	......	SPWCM
Apr. 21.......	2:45 p.m.	34	9,940	5,710	......	27	......	42	......	68	88	98	100	......	......	SPWCM
May 6.........	10:20 a.m.	139	47,000	8,130	......	40	......	59	......	84	......	......	......	......	......	SPWCM
May 13........	1:15 p.m.	125	9,820	6,440	......	1	5	35	41	58	81	97	100	......	......	SPNM
Do........	1:15 p.m.	125	9,820	6,490	20	25	30	36	43	59	......	......	......	......	......	SPWCM
June 10.......	2:30 p.m.	187	15,800	9,510	......	1	3	36	44	58	79	95	99	100	......	SPNM
Do........	2:30 p.m.	187	15,800	3,110	19	33	32	38	46	57	......	......	......	......	......	SPWCM
June 17.......	1:05 p.m.	286	13,300	4,750	......	28	......	41	......	63	81	94	98	99	......	SPWCM
June 24.......	12:45 p.m.	344	19,800	6,240	......	25	......	38	......	64	82	95	100	......	......	SPWCM
June 26.......	2:40 p.m.	440	23,800	15,600	......	0	......	36	......	63	80	93	99	100	......	SPNM
Do........	2:40 p.m.	440	23,800	7,770	......	23	......	35	......	62	......	......	......	......	......	SPWCM
July 1........	4:00 p.m.	355	16,900	7,420	......	24	......	35	......	56	74	94	100	......	......	SPWCM
July 8........	2:10 p.m.	234	14,500	6,810	......	28	......	43	......	68	82	95	99	100	......	SPWCM
July 15.......	1:00 p.m.	448	19,200	12,000	......	1	......	38	......	63	79	92	98	100	......	SPNM
Do........	1:00 p.m.	448	19,200	6,240	......	26	......	38	......	64	......	......	......	......	......	SPWCM
July 29.......	2:20 p.m.	347	15,600	2,000	......	28	......	39	......	66	81	94	99	......	......	SPWCM
Aug. 4........	2:00 p.m.	444	24,800	8,150	......	27	......	42	......	64	79	91	99	100	......	SPWCM
Aug. 7 b......	3:50 p.m.	389	16,200	....	......	22	......	37	......	64	85	96	100	......	......	SPWCM

a Mean daily discharge.
b Composite of size distributions determined by particle-size analyses of samples from individual verticals.

Table 59.--Particle-size analyses of suspended sediment, depth-integrated samples, gaging-station section as modified by artificial contraction upstream, Fivemile Creek near Shoshoni, Wyo.

[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; and N, in native water]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm) [a]	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952													
Aug. 22 b.......	11:15 a.m.	268	10,800	6,390	1	30	54	77	93	99	100	....	SPNM
(b)	11:15 a.m.	268	10,800	6,280	23	34	56	....	....	....	....	....	SPWCM
Aug. 26 b.......	5:10 p.m.	238	11,600	8,040	17	25	43	67	90	98	100	....	SPWCM
Sept. 3 b c.....	1:00 p.m.	254	12,100	....	17	25	45	67	89	99	100	....	SPWCM
(b c)	3:20 p.m.	251	12,000	....	19	28	47	69	91	100	....	....	SPWCM
Sept. 4 b c.....	12:00 m.	234	10,600	....	22	32	52	71	92	98	100	....	SPWCM
(b)	3:20 p.m.	224	12,700	....	19	28	48	64	86	96	98	100	SPWCM
Sept. 15 b......	2:20 p.m.	231	14,200	9,680	1	25	42	63	86	96	98	99	SPNM
(b)	2:20 p.m.	231	14,200	9,360	18	28	45	....	....	....	....	....	SPWCM
Sept. 29 b......	10:15 a.m.	228	11,000	11,500	20	28	50	75	94	100	....	....	SPWCM
Oct. 15.........	10:15 a.m.	....	6,170	....	17	22	38	66	91	99	100	....	SPWCM
	10:15 a.m.	....	7,580	....	13	18	33	59	94	100	....	....	SPWCM
	10:15 a.m.	....	6,610	....	15	21	37	65	96	100	....	....	SPWCM
	10:15 a.m.	....	6,130	....	16	22	40	70	98	100	....	....	SPWCM
	10:15 a.m.	....	6,450	....	15	21	38	71	99	100	....	....	SPWCM
(b)	10:15 a.m.	d 81.2	6,590	....	15	21	37	66	96	100	....	....	SPWCM
	2:45 p.m.	....	5,470	....	22	31	52	78	94	100	....	....	SPWCM
	2:45 p.m.	....	6,810	....	17	24	44	72	96	100	....	....	SPWCM
	2:45 p.m.	....	6,110	....	18	26	48	74	96	100	....	....	SPWCM
	2:45 p.m.	....	5,830	....	20	29	51	81	98	100	....	....	SPWCM
	2:45 p.m.	....	5,430	....	20	41	54	83	99	100	....	....	SPWCM
(b)	2:45 p.m.	d 81.2	5,930	....	19	30	50	77	97	100	....	....	SPWCM
Dec. 8 b c......	4:05 p.m.	d 58.4	1,960	....	14	20	27	43	78	97	98	....	SPWCM
1953													
Jan. 13.........	11:47 a.m.	....	1,380	....	27	36	54	74	94	99	100	....	SPWCM
	11:47 a.m.	....	2,570	....	14	22	41	56	82	99	100	....	SPWCM
	11:47 a.m.	....	3,400	....	12	17	26	41	72	97	100	....	SPWCM

	11:47 a.m.	....	3,430	....	11	16	24	39	70	97	100	....	SPWCM
	11:47 a.m.	....	1,690	....	20	30	44	64	92	99	100	....	SPWCM
(b)	11:47 a.m.	d 52.9	2,460	....	15	22	34	50	79	98	100	....	SPWCM
Feb. 26........	1:00 p.m.	....	2,560	....	11	26	47	72	95	100	....	....	SPWCM
	1:00 p.m.	....	5,000	....	10	13	27	50	90	99	100	....	SPWCM
	1:00 p.m.	....	5,260	....	10	11	27	50	88	99	100	....	SPWCM
	1:00 p.m.	....	4,570	....	10	14	28	52	88	99	100	....	SPWCM
	1:00 p.m.	....	3,360	....	13	18	36	63	96	100	....	....	SPWCM
(b)	1:00 p.m.	d 29.6	4,250	....	11	15	31	55	91	99	100	....	SPWCM
	2:52 p.m.	....	2,730	....	22	35	47	68	93	99	99	....	SPWCM
	2:52 p.m.	....	5,210	....	13	20	29	48	87	99	99	....	SPWCM
	2:52 p.m.	....	5,450	....	14	20	28	47	86	100	....	....	SPWCM
	2:52 p.m.	....	5,330	....	13	18	29	48	84	99	100	....	SPWCM
	2:52 p.m.	....	4,300	....	16	22	35	59	94	100	....	....	SPWCM
(b)	2:52 p.m.	d 29.6	4,700	....	15	22	32	52	88	99	100	....	SPWCM
Mar. 24........	11:59 a.m.	....	9,570	....	21	28	58	84	98	100	....	....	SPWCM
	11:59 a.m.	....	9,950	....	19	27	57	83	99	100	....	....	SPWCM
	11:59 a.m.	....	9,950	....	18	28	55	83	99	100	....	....	SPWCM
	11:59 a.m.	....	8,480	....	21	32	62	87	99	100	....	....	SPWCM
	11:59 a.m.	....	9,400	....	18	29	57	85	99	100	....	....	SPWCM
(b)	11:59 a.m.	d 27.2	9,550	....	19	29	58	84	99	100	....	....	SPWCM
Apr. 15........	11:26 a.m.	....	6,250	....	18	27	55	79	98	100	....	....	SPWCM
	11:26 a.m.	....	6,710	....	18	26	52	80	98	....	....	....	SPWCM
	11:26 a.m.	....	6,420	....	19	28	54	83	100	....	....	....	SPWCM
	11:26 a.m.	....	5,790	....	21	30	58	85	99	100	....	....	SPWCM
	11:26 a.m.	....	4,500	....	27	37	70	92	100	....	....	....	SPWCM
	11:26 a.m.	....	4,690	....	24	37	68	90	100	....	....	....	SPWCM
	11:26 a.m.	....	4,160	....	29	42	52	84	100	....	....	....	SPWCM
	11:26 a.m.	....	4,780	....	23	37	66	88	99	100	....	....	SPWCM
	11:26 a.m.	....	4,260	....	27	41	73	94	100	....	....	....	SPWCM
	11:26 a.m.	....	4,990	....	24	35	63	89	100	....	....	....	SPWCM
(b)	11:26 a.m.	d 32.8	5,290	....	22	33	60	86	99	100	....	....	SPWCM
Apr. 28........	10:03 a.m.	....	20,200	....	41	60	85	93	98	99	99	....	SPWCM
	10:03 a.m.	....	19,800	....	41	61	84	93	99	100	....	....	SPWCM
	10:03 a.m.	....	25,400	....	32	46	66	74	84	91	96	....	SPWCM
	10:03 a.m.	....	22,500	....	36	56	74	85	96	99	100	....	SPWCM

See footnotes at end of table.

Table 59.--Particle-size analyses of suspended sediment, depth-integrated samples, gaging-station section as modified by artificial contraction upstream, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment										Methods of analysis
			Concentration of sample (ppm) a	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters								
					0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1953													
Apr. 28........	10:03 a.m.	....	22,000	....	37	60	78	88	97	99	99	....	SPWCM
	10:03 a.m.	....	23,400	....	34	56	74	84	96	100	....	....	SPWCM
	10:03 a.m.	....	21,900	....	36	53	77	87	98	100	....	....	SPWCM
	10:03 a.m.	....	22,500	....	36	55	76	87	98	100	....	....	SPWCM
	10:03 a.m.	....	21,600	....	38	55	78	88	98	100	....	....	SPWCM
	10:03 a.m.	....	22,000	....	36	53	76	86	97	100	....	....	SPWCM
(b)	10:03 a.m.	d 121.2	22,700	....	38	54	76	86	96	99	99	....	SPWCM
(b c)	10:03 a.m.	d 121.2	22,700	....	11	59	75	84	94	97	99	....	SPN
June 24........	2:18 p.m.	....	11,400	....	29	47	75	91	98	100	....	....	SPWCM
	2:18 p.m.	....	13,500	....	24	38	65	83	95	99	100	....	SPWCM
	2:18 p.m.	....	17,000	....	21	31	57	66	85	98	100	....	SPWCM
	2:18 p.m.	....	16,200	....	22	36	56	74	90	98	99	....	SPWCM
	2:18 p.m.	....	17,200	....	20	31	53	72	91	99	100	....	SPWCM
(b c)	2:18 p.m.	d 330	15,100	....	23	37	61	77	92	99	100	....	SPWCM
(b)	2:10 p.m.	d 330	14,600	....	0	30	53	72	87	98	100	....	SPN
(b)	2:10 p.m.	d 330	14,600	....	22	32	59	75	88	98	100	....	SPWCM
	5:27 p.m.	....	16,000	....	19	31	51	70	90	100	....	....	SPWCM
	5:28 p.m.	....	13,800	....	23	35	57	75	90	98	100	....	SPWCM
	5:29 p.m.	....	15,200	....	22	34	53	69	86	98	100	....	SPWCM
	5:29 p.m.	....	13,100	....	26	37	60	79	91	97	97	....	SPWCM
	5:30 p.m.	....	10,000	....	34	49	75	92	98	100	....	....	SPWCM
(b c)	5:28 p.m.	300	13,600	....	25	37	59	77	91	99	100	....	SPWCM
June 25........	12:21 p.m.	....	15,000	....	20	29	51	71	91	99	100	....	SPWCM
	12:22 p.m.	....	14,300	....	22	31	53	74	91	99	100	....	SPWCM
	12:23 p.m.	....	10,900	....	26	40	68	88	98	100	....	....	SPWCM
(b c)	12:22 p.m.	321	13,400	....	23	33	57	78	93	99	100	....	SPWCM
July 22........	2:56 p.m.	....	8,680	....	28	44	75	91	99	100	....	....	SPWCM
	2:56 p.m.	....	10,900	....	24	37	63	80	93	100	....	....	SPWCM

	2:57 p.m.	....	12,600	....	19	32	57	72	86	98	100	....	SPWCM
	2:57 p.m.	....	11,100	....	26	37	60	77	93	100	....	....	SPWCM
	2:58 p.m.	....	9,640	....	28	42	69	88	98	100	....	....	SPWCM
(b c)	2:57 p.m.	293	10,600	....	25	38	65	82	94	100	....	....	SPWCM
(b)	3:25 p.m.	289	11,300	....	24	36	58	76	92	99	100	....	SPWCM
Aug. 12.........	11:23 a.m.	....	11,400	....	10	22	38	61	88	100	....	....	SPWCM
	11:27 a.m.	....	10,800	....	15	22	38	58	79	95	99	....	SPWCM
	11:30 a.m.	....	7,470	....	21	47	53	77	92	98	99	....	SPWCM
(b c)	11:26 a.m.	286	9,890	....	15	30	43	65	86	98	99	....	SPWCM
Aug. 27 b.......	10:53 a.m.	251	7,260	2,450	15	21	35	53	83	99	100	....	SPWCM

a Concentration from analyses of size samples subsequent to Sept. 29, 1952.
b Average for several verticals.
c Composite of size distributions determined by particle-size analyses of samples from individual verticals.
d Streamflow measurement.
Note--Data for 1953 include only those collected as part of special studies.

Table 60.--Particle-size analyses of suspended sediment, point-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Sampling point: Depth (ft)	Sampling point: Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952																
July 1 a.....	2:55 p.m.	366	10	2.3	6.2	0.3	13,000	29	46	76	92	99	100	......	......	SPWCM
(a)	2:48 p.m.	366	10	2.3	5.0	1.1	13,700	28	43	73	91	100	......	......	......	SPWCM
(a)	2:40 p.m.	366	10	2.3	4.6	1.9	13,300	28	44	74	90	98	100	......	......	SPWCM
(a)	3:10 p.m.	362	17	2.1	6.1	.3	13,500	29	44	76	91	99	100	......	......	SPWCM
(a)	3:17 p.m.	362	17	2.1	7.1	1.1	17,700	22	34	58	78	96	100	......	......	SPWCM
(a)	3:02 p.m.	366	17	2.1	4.8	1.7	25,300	15	23	41	60	84	98	100	......	SPWCM
(a)	3:30 p.m.	362	26	1.6	6.0	.3	15,800	26	38	67	86	99	100	......	......	SPWCM
(a)	3:27 p.m.	362	26	1.6	6.3	.9	20,100	20	30	53	75	97	100	......	......	SPWCM

See footnotes at end of table.

Table 60.--Particle-size analyses of suspended sediment, point-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952																
July 1 a.....	3:23 p.m.	362	26	1.6	5.3	1.2	24,500	17	26	45	68	98	100	......	......	SPWCM
Aug. 7 a.....	3:33 p.m.	396	4	1.9	6.4	.5	12,000	34	50	81	97	100	......	......	......	SPWCM
(a)	3:35 p.m.	396	4	1.9	6.3	.5	12,000	34	50	81	97	100	......	......	......	SPWCM
(a)	3:28 p.m.	400	4	1.9	5.0	1.0	12,000	33	50	78	96	100	......	......	......	SPWCM
(a)	3:31 p.m.	396	4	1.9	5.1	1.0	12,800	33	48	80	96	100	......	......	......	SPWCM
(a)	3:23 p.m.	396	4	1.9	....	1.5	13,000	33	47	76	95	100	......	......	......	SPWCM
(a)	3:25 p.m.	400	4	1.9	3.6	1.5	9,300	32	47	77	94	99	100	......	......	SPWCM
(a)	3:18 p.m.	392	12	2.5	5.6	.5	15,000	28	41	68	89	99	100	......	......	SPWCM
(a)	3:21 p.m.	396	12	2.5	5.4	.5	14,800	27	41	68	89	99	100	......	......	SPWCM
(a)	3:10 p.m.	392	12	2.5	5.0	1.3	16,600	24	37	63	85	97	100	......	......	SPWCM
(a)	3:15 p.m.	392	12	2.5	5.0	1.3	15,900	26	39	65	87	97	99	100	......	SPWCM
(a)	3:03 p.m.	389	12	2.5	3.3	2.1	18,900	22	32	56	77	91	97	99	100	SPWCM
(a)	3:05 p.m.	389	12	2.5	4.7	2.1	14,400	22	32	55	77	91	97	99	100	SPWCM
(a)	2:59 p.m.	389	19	2.2	7.1	.5	15,700	26	38	65	85	97	100	......	......	SPWCM
(a)	3:00 p.m.	389	19	2.2	6.9	.5	15,000	27	40	68	88	98	100	......	......	SPWCM
(a)	2:57 p.m.	392	19	2.2	6.1	1.1	19,400	22	32	54	75	93	99	100	......	SPWCM
(a)	2:58 p.m.	389	19	2.2	7.0	1.1	18,100	23	34	57	79	94	100	......	......	SPWCM
(a)	2:52 p.m.	392	19	2.2	4.9	1.8	29,300	14	22	38	56	80	98	100	......	SPWCM
(a)	2:55 p.m.	392	19	2.2	4.7	1.8	36,400	12	18	31	47	71	95	99	100	SPWCM
(a)	2:46 p.m.	392	27	1.8	6.4	.5	14,900	28	41	69	88	98	100	......	......	SPWCM
(a)	2:49 p.m.	392	27	1.8	6.1	.5	14,400	29	43	71	90	98	100	......	......	SPWCM
(a)	2:40 p.m.	392	27	1.8	7.8	1.0	13,400	24	36	60	81	94	100	......	......	SPWCM
(a)	2:43 p.m.	392	27	1.8	5.9	1.0	17,300	25	36	60	82	95	100	......	......	SPWCM
(a)	2:32 p.m.	392	27	1.8	4.8	1.4	26,600	16	24	41	59	78	96	100	......	SPWCM
(a)	2:37 p.m.	392	27	1.8	4.4	1.4	27,300	15	23	40	58	78	96	100	......	SPWCM
(a)	2:23 p.m.	396	34	1.5	3.3	.3	12,100	34	50	81	96	100	......	......	......	SPWCM
(a)	2:28 p.m.	392	34	1.5	4.2	.3	12,600	32	48	78	95	100	......	......	......	SPWCM
(a)	2:14 p.m.	400	34	1.5	4.8	.8	15,200	26	39	68	87	96	100	......	......	SPWCM

(a)	2:19 p.m.	396	34	1.5	5.2	.8	14,800	27	41	69	90	98	100	......	......	SPWGM
(a)	2:05 p.m.	400	34	1.5	4.0	1.1	14,800	21	31	55	73	89	99	100	......	SPWGM
(a)	2:10 p.m.	400	34	1.5	2.8	1.1	14,500	19	28	50	68	84	98	100	......	SPWGM
Sept. 4......	2:23 p.m.	231	7	1.4	3.9	.3	7,110	29	45	70	88	98	99	100	......	SPWGM
	2:23 p.m.	231	7	1.4	3.7	.3	7,280	30	44	69	87	96	98	98	98	SPWGM
	2:23 p.m.	231	7	1.4	4.0	.6	7,260	33	44	69	88	98	100	......	......	SPWGM
	2:23 p.m.	231	7	1.4	3.6	.6	7,320	30	43	69	87	98	99	100	......	SPWGM
	2:23 p.m.	231	7	1.4	4.3	1.0	7,560	31	44	69	87	98	100	......	......	SPWGM
	2:23 p.m.	231	7	1.4	3.9	1.0	7,300	32	45	70	88	98	100	......	......	SPWGM
	2:23 p.m.	231	12	1.6	5.8	.3	10,800	21	31	53	74	93	99	100	......	SPWGM
	2:23 p.m.	231	12	1.6	6.0	.3	10,200	22	32	55	76	94	100	......	......	SPWGM
	2:23 p.m.	231	12	1.6	4.9	.8	12,600	17	26	45	64	88	99	100	......	SPWGM
	2:23 p.m.	231	12	1.6	5.1	.8	12,300	17	26	47	65	88	98	100	......	SPWGM
	2:23 p.m.	231	12	1.6	2.2	1.2	14,500	19	24	40	60	80	95	99	100	SPWGM
	2:23 p.m.	231	12	1.6	3.4	1.2	16,100	14	21	35	53	78	96	99	100	SPWGM
	2:23 p.m.	231	17	1.5	6.4	.3	9,180	26	37	61	82	96	99	100	......	SPWGM
	2:23 p.m.	231	17	1.5	6.6	.3	8,200	24	42	67	86	99	100	......	......	SPWGM
	2:23 p.m.	231	17	1.5	6.0	.7	11,800	19	28	48	70	95	100	......	......	SPWGM
	2:23 p.m.	231	17	1.5	6.3	.7	10,900	21	32	53	73	96	100	......	......	SPWGM
	2:23 p.m.	231	17	1.5	5.1	1.1	17,500	13	20	35	55	89	100	......	......	SPWGM
	2:23 p.m.	231	17	1.5	5.5	1.1	16,300	14	22	35	55	89	100	......	......	SPWGM
	2:23 p.m.	231	22	1.4	5.1	.3	9,040	24	35	59	80	97	100	......	......	SPWGM
	2:23 p.m.	231	22	1.4	5.3	.3	9,240	23	35	61	82	97	100	......	......	SPWGM
	2:23 p.m.	231	22	1.4	5.4	.6	10,600	21	30	54	75	96	100	......	......	SPWGM
	2:23 p.m.	231	22	1.4	5.3	.6	10,500	23	31	51	74	95	100	......	......	SPWGM
	2:23 p.m.	231	22	1.4	5.6	1.0	12,900	18	26	44	66	93	100	......	......	SPWGM
	2:23 p.m.	231	22	1.4	5.4	1.0	12,700	18	27	46	67	93	100	......	......	SPWGM
	2:23 p.m.	231	30	1.1	4.4	.3	9,810	23	35	57	77	96	100	......	......	SPWGM
	2:23 p.m.	231	30	1.1	4.1	.3	9,340	24	35	59	78	100	......	......	......	SPWGM
	2:23 p.m.	231	30	1.1	4.4	.5	11,100	19	30	51	71	93	100	......	......	SPWGM
	2:23 p.m.	231	30	1.1	4.5	.5	10,100	22	33	54	74	94	100	......	......	SPWGM
	2:23 p.m.	231	30	1.1	3.3	.7	15,600	14	22	38	55	83	97	100	......	SPWGM
	2:23 p.m.	231	30	1.1	3.2	.7	14,900	16	24	40	58	86	99	100	......	SPWGM
Oct. 15......	10:02 a.m.	b 81.2	7	.8	3.9	.2	5,520	19	20	42	70	93	99	100	......	SPWGM
	10:02 a.m.	b 81.2	7	.8	4.4	.2	6,080	17	23	39	49	88	100	......	......	SPWGM
	10:02 a.m.	b 81.2	7	.8	2.8	.4	7,300	16	20	34	59	88	99	100	......	SPWGM
	10:02 a.m.	b 81.2	7	.8	2.9	.4	7,340	14	19	34	60	89	99	100	......	SPWGM

See footnotes at end of table.

Table 60.--Particle-size analyses of suspended sediment, point-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952																
Oct. 15......	10:02 a.m.	b 81.2	12	0.7	4.9	0.2	4,820	19	30	49	78	99	100	......	......	SPWCM
	10:02 a.m.	b 81.2	12	.7	4.2	.3	13,100	7	12	21	44	90	100	......	......	SPWCM
	10:02 a.m.	b 81.2	12	.7	5.2	.3	10,100	10	15	26	53	92	100	......	......	SPWCM
	10:02 a.m.	b 81.2	17	.8	6.1	.2	4,680	21	31	50	80	99	100	......	......	SPWCM
	10:02 a.m.	b 81.2	17	.8	6.1	.2	5,600	16	38	43	75	99	100	......	......	SPWCM
	10:02 a.m.	b 81.2	17	.8	4.9	.4	11,700	8	13	23	49	93	100	......	......	SPWCM
	10:02 a.m.	b 81.2	17	.8	4.5	.4	13,100	7	11	19	42	84	100	......	......	SPWCM
	10:02 a.m.	b 81.2	22	.6	3.6	.2	8,760	10	16	30	59	96	100	......	......	SPWCM
	10:02 a.m.	b 81.2	22	.6	4.1	.2	8,150	10	16	32	62	97	100	......	......	SPWCM
	10:02 a.m.	b 81.2	30	.6	....	.2	9,660	9	14	28	59	99	100	......	......	SPWCM
	10:02 a.m.	b 81.2	30	.6	4.3	.2	7,670	11	16	33	66	98	100	......	......	SPWCM
Dec. 8 c.....	4:10 p.m.	b 58.4	4	1.6	5.1	.3	884	30	45	53	79	99	100	......	......	SPWCM
(c)	4:10 p.m.	b 58.4	4	1.6	4.6	.8	1,220	27	41	44	69	98	100	......	......	SPWCM
(c)	4:10 p.m.	b 58.4	4	1.6	2.3	1.3	2,660	12	17	21	36	76	99	100	......	SPWCM
(c)	4:10 p.m.	b 58.4	7	1.3	4.6	.3	895	34	44	51	75	94	97	98	......	SPWCM
(c)	4:10 p.m.	b 58.4	7	1.3	4.4	.8	1,060	28	38	43	66	92	97	98	......	SPWCM
(c)	4:10 p.m.	b 58.4	7	1.3	3.2	1.0	5,600	6	8	10	18	40	80	96	......	SPWCM
(c)	4:10 p.m.	b 58.4	10	1.0	4.4	.3	906	32	33	55	76	95	99	100	......	SPWCM
(c)	4:10 p.m.	b 58.4	10	1.0	2.0	.7	4,450	1	8	19	27	52	91	99	......	SPWCM
(c)	4:10 p.m.	b 58.4	13	1.0	3.4	.3	1,130	20	25	40	60	89	100	......	......	SPWCM
(c)	4:10 p.m.	b 58.4	13	1.0	2.4	.7	1,540	16	20	31	48	83	100	......	......	SPWCM
(c)	4:10 p.m.	b 58.4	16	.8	2.3	.3	2,250	15	21	33	62	98	100	......	......	SPWCM
(c)	4:10 p.m.	b 58.4	16	.8	1.8	.5	2,180	12	16	27	52	95	100	......	......	SPWCM
1953																
Jan. 13......	1:20 p.m.	b 52.9	10	.7	1.9	.2	1,460	28	40	58	80	98	100	......	......	SPWCM
	1:20 p.m.	b 52.9	10	.7	1.9	.4	1,710	24	34	51	74	96	100	......	......	SPWCM
	1:20 p.m.	b 52.9	15	1.3	4.0	.2	1,750	24	34	52	74	96	100	......	......	SPWCM
	1:20 p.m.	b 52.9	15	1.3	4.4	.7	2,420	16	25	39	58	89	100	......	......	SPWCM

	1:20 p.m.	b 52.9	15	1.3	3.0	1.0	3,680	11	17	25	41	71	95	100	......	SPWCM
	1:20 p.m.	b 52.9	17	1.2	4.4	.3	2,270	18	25	41	61	89	99	100	......	SPWCM
	1:20 p.m.	b 52.9	17	1.2	4.1	.6	3,360	12	18	29	45	77	98	100	......	SPWCM
	1:20 p.m.	b 52.9	17	1.2	3.2	.9	5,350	9	12	19	31	62	93	100	......	SPWCM
	1:20 p.m.	b 52.9	19	1.3	3.9	.2	2,030	21	27	46	66	93	100	......	......	SPWCM
	1:20 p.m.	b 52.9	19	1.3	3.2	.7	4,940	9	12	21	34	71	98	100	......	SPWCM
	1:20 p.m.	b 52.9	19	1.3	2.3	1.0	6,190	8	10	17	29	63	97	100	......	SPWCM
	1:20 p.m.	b 52.9	23	.9	3.6	.2	1,880	23	32	52	74	96	100	......	......	SPWCM
	1:20 p.m.	b 52.9	23	.9	3.6	.4	2,380	18	26	43	66	93	100	......	......	SPW CM
	1:20 p.m.	b 52.9	23	.9	3.1	.6	2,840	16	22	36	56	88	100	......	......	SPWCM
Feb. 26......	2:10 p.m.	b 29.6	10	.5	2.5	.2	1,840	26	34	57	79	98	100	......	......	SPWCM
	2:10 p.m.	b 29.6	15	.7	3.4	.2	3,060	15	23	39	63	96	100	......	......	SPWCM
	2:10 p.m.	b 29.6	15	.7	3.4	.4	4,620	10	15	27	46	90	100	......	......	SPWCM
	2:10 p.m.	b 29.6	17	.7	3.2	.2	3,480	12	21	35	57	94	100	......	......	SPWCM
	2:10 p.m.	b 29.6	17	.7	3.0	.4	7,090	6	10	19	34	81	99	100	......	SPWCM
	2:10 p.m.	b 29.6	19	.8	3.2	.2	3,050	14	22	40	63	94	100	......	......	SPWCM
	2:10 p.m.	b 29.6	19	.8	2.8	.5	5,470	8	13	24	42	84	99	100	......	SPWCM
	2:10 p.m.	b 29.6	23	.5	2.6	.2	2,770	15	16	43	68	97	100	......	......	SPWCM
Apr. 15......	12:04 p.m.	b 32.8	8	.5	3.3	.05	4,950	22	34	64	88	99	100	......	......	SPWCM
	12:04 p.m.	b 32.8	8	.5	3.0	.05	5,290	20	32	60	84	99	100	......	......	SPWCM
	12:02 p.m.	b 32.8	8	.5	3.3	.2	6,360	18	28	50	73	97	100	......	......	SPWCM
	12:02 p.m.	b 32.8	8	.5	3.6	.2	5,340	24	34	59	83	98	100	......	......	SPWCM
	11:58 a.m.	b 32.8	8	.5	3.2	.3	5,860	20	32	54	76	97	100	......	......	SPWCM
	12:00 m.	b 32.8	8	.5	3.1	.3	6,280	20	30	51	74	97	100	......	......	SPWCM
	12:15 p.m.	b 32.8	12	.5	3.8	.05	4,090	31	45	75	93	100	......	......	......	SPWCM
	12:16 p.m.	b 32.8	12	.5	3.8	.05	4,930	25	38	66	90	100	......	......	......	SPWCM
	....	b 32.8	12	.5	3.6	.2	5,870	19	29	54	81	99	100	......	......	SPW CM
	12:11 p.m.	b 32.8	12	.5	4.0	.2	5,940	18	28	55	82	99	100	......	......	SPWCM
	12:10 p.m.	b 32.8	12	.5	2.2	.3	9,830	11	18	37	66	98	100	......	......	SPWCM
	12:08 p.m.	b 32.8	12	.5	2.7	.3	7,310	15	25	48	75	99	100	......	......	SPWCM
	12:17 p.m.	b 32.8	21	.3	2.3	.1	4,390	26	40	71	91	100	......	......	......	SPWCM
	12:18 p.m.	b 32.8	21	.3	2.1	.1	4,650	27	37	68	89	100	......	......	......	SPWCM
	12:20 p.m.	b 32.8	28	.3	2.2	.1	5,890	23	32	59	86	99	100	......	......	SPWCM
	12:21 p.m.	b 32.8	28	.3	2.5	.1	5,130	24	34	64	90	100	......	......	......	SPWCM
	12:27 p.m.	b 32.8	33	.5	2.9	.05	4,100	28	42	78	96	100	......	......	......	SPWCM
	12:30 p.m.	b 32.8	33	.5	2.7	.05	3,710	29	44	81	96	100	......	......	......	SPWCM.

See footnotes at end of table.

Table 60.--Particle-size analyses of suspended sediment, point-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1953																
Apr. 15......	12:25 p.m.	b 32.8	33	0.5	2.9	0.2	6,470	20	29	58	90	100	......	......	......	SPWCM
	12:26 p.m.	b 32.8	33	.5	3.2	.2	4,170	26	40	78	97	100	......	......	......	SPWCM
	12:23 p.m.	b 32.8	33	.5	2.8	.3	4,220	29	42	63	88	99	100	......	......	SPWCM
	12:24 p.m.	b 32.8	33	.5	2.3	.3	6,950	17	27	54	88	100	......	......	......	SPWCM
Apr. 28......	10:28 a.m.	114	9	1.0	4.2	.1	18,600	43	64	89	97	100	......	......	......	SPWCM
	10:29 a.m.	114	9	1.0	4.7	.1	18,300	43	64	88	96	100	......	......	......	SPWCM
	10:26 a.m.	114	9	1.0	4.1	.25	18,600	45	62	87	95	100	......	......	......	SPWCM
	10:27 a.m.	114	9	1.0	4.1	.25	19,100	42	63	87	95	100	......	......	......	SPWCM
	10:24 a.m.	114	9	1.0	4.0	.5	19,000	41	62	86	94	99	100	......	......	SPWCM
	10:25 a.m.	114	9	1.0	4.0	.5	19,300	42	62	86	95	100	......	......	......	SPWCM
	10:22 a.m.	114	9	1.0	3.5	.8	19,300	40	60	83	92	99	100	......	......	SPWCM
	10:23 a.m.	114	9	1.0	3.5	.8	20,400	39	59	82	92	99	100	......	......	SPWCM
	10:39 a.m.	114	13	.8	5.7	.1	18,700	43	62	88	96	100	......	......	......	SPWCM
	10:40 a.m.	114	13	.8	4.9	.1	18,400	44	64	89	96	100	......	......	......	SPWCM
	10:37 a.m.	114	13	.8	5.5	.4	21,100	38	56	79	88	98	100	......	......	SPWCM
	10:38 a.m.	114	13	.8	5.4	.4	20,800	39	57	80	90	98	100	......	......	SPWCM
	10:35 a.m.	114	13	.8	5.0	.75	41,700	20	30	42	50	67	88	97	......	SPWCM
	10:36 a.m.	114	13	.8	4.4	.75	39,000	18	30	44	52	74	94	99	......	SPWCM
	10:46 a.m.	114	17	.9	6.0	.1	17,900	44	65	89	96	100	......	......	......	SPWCM
	10:48 a.m.	114	17	.9	6.2	.1	18,300	44	65	90	96	100	......	......	......	SPWCM
	10:45 a.m.	114	17	.9	6.0	.5	23,000	35	52	73	84	98	100	......	......	SPWCM
	10:42 a.m.	114	17	.9	4.1	.75	44,400	18	27	39	49	79	99	100	......	SPWCM
	10:43 a.m.	114	17	.9	4.5	.75	38,300	21	31	44	56	87	100	......	......	SPWCM
	10:53 a.m.	114	21	.8	5.7	.1	20,400	40	59	83	93	99	100	......	......	SPWCM
	10:54 a.m.	114	21	.8	6.3	.1	19,800	42	61	86	94	99	100	......	......	SPWCM
	10:51 a.m.	114	21	.8	5.7	.4	22,600	35	52	74	86	98	100	......	......	SPWCM
	10:52 a.m.	114	21	.8	6.0	.4	22,900	35	51	74	85	98	100	......	......	SPWCM
	10:50 a.m.	114	21	.8	4.0	.65	32,600	21	31	45	56	82	99	100	......	SPWCM
	10:49 a.m.	114	21	.8	4.8	.65	32,100	26	37	55	66	90	100	......	......	SPWCM

	10:58 a.m.	114	27	.7	....	.1	19,900	42	61	84	93	99	100	......	......	SPWCM
	10:58 a.m.	114	27	.7	4.8	.1	18,800	43	64	88	96	100	......	......	......	SPWCM
	10:58 a.m.	114	27	.7	5.3	.35	22,200	37	55	77	87	98	100	......	......	SPWCM
	10:57 a.m.	114	27	.7	5.2	.35	21,800	37	54	78	88	98	100	......	......	SPWCM
	10:56 a.m.	114	27	.7	4.0	.5	23,000	35	51	71	82	96	100	......	......	SPWCM
	10:55 a.m.	114	27	.7	4.4	.5	23,100	35	51	74	85	97	100	......	......	SPWCM
June 24......	1:40 p.m.	b 330	7	1.5	5.4	.1	9,660	34	51	80	95	100	......	......	......	SPWCM
	1:42 p.m.	b 330	7	1.5	6.1	.3	10,000	33	49	78	94	99	100	......	......	SPWCM
	1:43 p.m.	b 330	7	1.5	4.8	.8	11,100	30	47	73	90	98	100	......	......	SPWCM
	1:44 p.m.	b 330	7	1.5	4.1	1.2	11,600	29	43	70	88	97	100	......	......	SPWCM
	1:28 p.m.	b 330	13	2.2	7.9	.1	11,100	35	45	72	89	98	100	......	......	SPWCM
	1:30 p.m.	b 330	13	2.2	7.0	.3	11,500	31	44	69	87	97	100	......	......	SPWCM
	1:31 p.m.	b 330	13	2.2	6.7	.7	12,400	24	40	65	84	96	100	......	......	SPWCM
	1:33 p.m.	b 330	13	2.2	5.6	1.1	12,800	26	39	63	82	95	100	......	......	SPWCM
	1:36 p.m.	b 330	13	2.2	6.2	1.6	13,700	26	36	59	78	93	100	......	......	SPWCM
	1:38 p.m.	b 330	13	2.2	4.7	1.9	14,400	23	36	58	76	92	100	......	......	SPWCM
	1:19 p.m.	b 330	18	2.1	7.6	.1	11,400	31	44	70	88	97	100	......	......	SPWCM
	1:20 p.m.	b 330	18	2.1	7.5	.3	12,400	30	40	66	84	96	100	......	......	SPWCM
	1:21 p.m.	b 330	18	2.1	6.8	.7	14,000	27	36	59	78	92	100	......	......	SPWCM
	1:22 p.m.	b 330	18	2.1	7.4	1.1	15,300	26	33	54	72	88	99	100	......	SPWCM
	1:24 p.m.	b 330	18	2.1	6.8	1.5	18,300	21	27	45	62	81	98	100	......	SPWCM
	1:26 p.m.	b 330	18	2.1	5.7	1.75	29,700	14	18	29	42	62	92	100	......	SPWCM
	1:10 p.m.	b 330	24	1.8	6.8	.2	10,900	30	43	72	90	98	100	......	......	SPWCM
	1:11 p.m.	b 330	24	1.8	7.2	.4	11,800	28	41	69	85	97	100	......	......	SPWCM
	1:12 p.m.	b 330	24	1.8	7.2	.8	14,100	22	34	58	76	93	100	......	......	SPWCM
	1:13 p.m.	b 330	24	1.8	6.3	1.2	15,800	22	31	52	70	90	99	100	......	SPWCM
	1:14 p.m.	b 330	24	1.8	5.1	1.5	23,400	16	22	36	50	73	96	100	......	SPWCM
	1:04 p.m.	b 330	31	1.2	6.6	.1	11,600	28	42	69	88	98	100	......	......	SPWCM
	1:05 p.m.	b 330	31	1.2	5.8	.3	13,000	24	38	63	82	96	100	......	......	SPWCM
	1:06 p.m.	b 330	31	1.2	5.9	.6	15,600	22	32	53	74	93	100	......	......	SPWCM
	1:07 p.m.	b 330	31	1.2	4.7	.9	20,000	17	26	42	60	84	99	100	......	SPWCM
July 22......	2:08 p.m.	296	8	2.0	5.3	.2	8,310	34	48	80	94	100	......	......	......	SPWCM
	2:09 p.m.	296	8	2.0	5.7	.4	8,210	28	49	78	94	99	100	......	......	SPWCM
	2:10 p.m.	296	8	2.0	5.9	.8	8,770	30	46	77	93	99	100	......	......	SPWCM
	2:11 p.m.	296	8	2.0	4.6	1.1	9,890	29	40	69	89	98	100	......	......	SPWCM
	2:12 p.m.	296	8	2.0	4.2	1.4	9,440	30	41	70	88	98	100	......	......	SPWCM

See footnotes at end of table.

Table 60.--Particle-size analyses of suspended sediment, point-integrated samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Velocity (ft/sec)	Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1953																
July 22......	2:13 p.m.	296	8	2.0	3.7	1.7	11,200	26	36	61	82	95	100	......	......	SPWCM
	2:14 p.m.	296	8	2.0	4.2	1.8	10,400	28	39	66	85	97	100	......	......	SPWCM
	2:18 p.m.	296	14	2.0	6.8	.2	9,100	33	44	73	89	98	100	......	......	SPWCM
	2:19 p.m.	296	14	2.0	5.2	.4	9,780	30	42	68	85	97	100	......	......	SPWCM
	2:22 p.m.	296	14	2.0	7.3	.6	9,680	29	44	69	86	97	100	......	......	SPWCM
	2:23 p.m.	296	14	2.0	6.8	.9	11,400	23	36	60	78	93	99	......	......	SPWCM
	2:25 p.m.	296	14	2.0	7.0	1.3	11,700	23	......	58	76	92	99	......	......	SPWCM
	....	296	14	2.0	5.6	1.6	12,700	23	34	56	74	91	99	......	......	SPWCM
	2:26 p.m.	296	14	2.0	4.9	1.8	15,400	19	27	46	63	84	98	99	......	SPWCM
	2:29 p.m.	296	18	1.8	7.6	.2	9,390	29	44	73	89	98	100	......	......	SPWCM
	2:30 p.m.	296	18	1.8	7.9	.5	10,700	25	39	64	83	96	100	......	......	SPWCM
	2:31 p.m.	296	18	1.8	5.8	.8	15,100	23	36	60	78	94	100	......	......	SPWCM
	2:32 p.m.	296	18	1.8	6.6	1.1	14,000	21	31	51	67	86	99	......	......	SPWCM
	2:33 p.m.	296	18	1.8	6.5	1.4	16,400	17	27	44	60	82	98	......	......	SPWCM
	....	296	18	1.8	4.8	1.6	21,500	14	20	34	48	72	96	100	......	SPWCM
	2:37 p.m.	296	24	1.6	5.5	.2	9,120	28	44	73	88	98	100	......	......	SPWCM
	2:38 p.m.	296	24	1.6	5.9	.5	12,300	22	33	56	74	93	100	......	......	SPWCM
	2:39 p.m.	296	24	1.6	6.8	.8	11,700	23	36	60	78	95	100	......	......	SPWCM
	2:40 p.m.	296	24	1.6	6.4	1.1	14,800	19	28	48	65	87	99	......	......	SPWCM
	2:41 p.m.	296	24	1.6	4.7	1.4	16,100	17	26	43	58	82	98	100	......	SPWCM
	2:43 p.m.	293	30	1.6	5.7	.2	9,020	27	43	72	89	98	100	......	......	SPWCM
	2:44 p.m.	293	30	1.6	6.6	.5	9,770	28	42	70	88	98	100	......	......	SPWCM
	2:44 p.m.	293	30	1.6	6.1	.8	9,950	29	41	68	87	98	100	......	......	SPWCM
	2:45 p.m.	293	30	1.6	5.6	1.1	10,500	28	38	68	86	97	100	......	......	SPWCM
	2:46 p.m.	293	30	1.6	4.3	1.4	11,800	23	36	57	78	96	100	......	......	SPWCM

a Collected before the construction of the artificial contraction, which was completed on Aug. 26, 1952.
b Streamflow measurement.
c Average of two samples.

Table 61.--Particle-size analyses of suspended sediment, Tait-Binckley samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.
[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Depth (ft)	Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1952															
Aug. 7	3:55 p.m.	389	4	1.9	1.8	13,000	28	45	75	94	100	......	......	......	SPWCM
	4:02 p.m.	381	12	2.5	2.4	18,300	20	32	56	80	96	100	......	......	SPWCM
	4:10 p.m.	377	19	2.2	2.1	43,500	9	15	27	41	64	93	99	100	SPWCM
	4:15 p.m.	377	27	1.8	1.7	35,300	11	17	31	45	63	92	99	100	SPWCM
	4:20 p.m.	373	34	1.4	1.3	18,400	20	32	57	78	93	99	100	......	SPWCM
Aug. 13	1:35 p.m.	318	4	1.4	1.3	13,800	27	42	69	90	99	......	......	......	SPWCM
	1:30 p.m.	318	6	2.1	2.0	16,200	24	37	62	83	94	95	95	95	SPWCM
	1:24 p.m.	318	8	1.8	1.7	23,400	17	25	43	63	85	93	95	......	SPWCM
	1:22 p.m.	318	10	2.3	2.2	16,000	25	36	62	83	96	99	99	......	SPWCM
	1:21 p.m.	318	12	1.8	1.7	23,000	17	26	45	63	81	89	94	99	SPWCM
	1:19 p.m.	321	14	2.1	2.0	28,900	14	21	35	49	62	70	78	89	SPWCM
	1:17 p.m.	321	16	2.0	1.9	39,200	11	16	27	42	68	92	98	99	SPWCM
	1:15 p.m.	321	18	2.0	1.9	61,800	7	11	19	32	63	97	100	......	SPWCM
	1:14 p.m.	321	20	1.8	1.7	47,300	9	13	23	37	65	90	93	93	SPWCM
	1:12 p.m.	321	22	1.8	1.7	35,100	12	17	30	46	71	93	97	97	SPWCM
	1:11 p.m.	321	24	1.6	1.5	58,400	7	10	18	30	58	92	97	99	SPWCM
	1:09 p.m.	321	26	1.6	1.5	49,600	9	13	23	35	56	91	99	100	SPWCM
	1:07 p.m.	321	28	1.5	1.4	24,400	17	25	42	61	80	97	99	......	SPWCM
	1:05 p.m.	321	30	1.6	1.5	52,900	8	12	21	33	59	93	99	......	SPWCM
	1:04 p.m.	321	32	1.4	1.3	23,700	17	24	43	61	80	97	100	......	SPWCM
	1:02 p.m.	321	34	1.3	1.2	19,400	22	30	52	73	89	99	100	......	SPWCM
	1:00 p.m.	321	36	1.1	1.0	15,600	25	37	64	86	96	100	......	......	SPWCM
Sept. 4	3:10 p.m.	228	7	1.4	1.3	9,140	25	37	60	79	94	98	99	100	SPWCM
	3:10 p.m.	228	12	1.6	1.5	16,400	15	22	35	49	70	88	96	100	SPWCM
	3:10 p.m.	228	17	1.5	1.4	23,000	11	16	27	41	71	96	99	99	SPWCM
	3:10 p.m.	228	22	1.4	1.3	17,100	14	21	35	52	85	99	100	......	SPWCM
	3:10 p.m.	228	30	1.1	1.0	18,800	13	20	31	48	77	95	99	100	SPWCM

Table 61.--Particle-size analyses of suspended sediment, Tait-Binckley samples, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment: Sampling point: Depth (ft)	Sampling point: Concentration (ppm)	Percent finer than indicated size, in millimeters: 0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1953															
Apr. 15..............	12:20 p.m.	a 32.8	8	0.5	0.4	5,690	21	32	56	78	96	99	100	......	SPWCM
	12:21 p.m.	a 32.8	12	.5	.4	5,610	21	32	58	81	98	100	......	......	SPWCM
	12:23 p.m.	a 32.8	21	.3	.2	5,430	22	33	60	84	98	99	100	......	SPWCM
	12:24 p.m.	a 32.8	28	.3	.2	5,300	21	33	62	83	99	100	......	......	SPWCM
	12:24 p.m.	a 32.8	33	.5	.4	7,220	18	26	54	87	99	100	......	......	SPWCM
Apr. 28..............	11:04 a.m.	a 121.21	9	1.0	.9	19,200	41	61	83	92	98	99	100	......	SPWCM
	11:03 a.m.	a 121.21	13	.8	.7	21,200	38	57	76	85	96	99	100	......	SPWCM
	11:02 a.m.	a 121.21	17	.9	.8	32,800	25	38	39	51	83	96	99	100	SPWCM
	11:01 a.m.	a 121.21	21	.8	.7	27,000	31	45	64	75	93	98	100	......	SPWCM
	11:00 a.m.	a 121.21	27	.7	.6	23,600	34	51	72	83	97	99	100	......	SPWCM
June 24..............	1:50 p.m.	a 330	7	1.5	1.4	12,800	25	38	65	83	96	99	100	......	SPWCM
	1:52 p.m.	a 330	7	1.5	1.4	11,700	28	42	71	89	98	100	......	......	SPWCM
	1:54 p.m.	a 330	13	2.2	2.1	15,600	21	32	55	73	90	97	99	100	SPWCM
	1:55 p.m.	a 330	13	2.2	2.1	14,600	24	34	58	77	91	97	99	100	SPWCM
	1:58 p.m.	a 330	18	2.1	2.0	25,100	13	20	36	49	70	83	94	100	SPWCM
	1:59 p.m.	a 330	18	2.1	2.0	30,000	11	17	30	43	66	84	96	100	SPWCM
	2:02 p.m.	a 330	24	1.8	1.7	79,400	4	7	12	20	43	70	91	99	SPWCM
	2:03 p.m.	a 330	24	1.8	1.7	28,600	13	19	32	46	66	82	92	99	SPWCM
	2:05 p.m.	a 330	31	1.2	1.1	24,600	14	22	38	54	79	92	98	100	SPWCM
	2:06 p.m.	a 330	31	1.2	1.1	24,500	14	21	37	55	81	93	99	100	SPWCM

a Streamflow measurement.

Table 62.--Particle-size analyses of sediment samples collected with Bureau of Reclamation point sampler,[a] gaging-station section, Fivemile Creek near Shoshoni, Wyo.

[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment										Methods of analysis
					Sampling point		Percent finer than indicated size, in millimeters								
					Depth (ft)	Concentration (ppm)	0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1952															
Oct. 15..............	10:15 a.m.	b 81.2	7	0.8	0.7	27,900	4	5	10	20	44	88	98	99	SPWCM
	10:15 a.m.	b 81.2	12	.7	.6	21,100	5	7	14	28	61	92	98	100	SPWCM
	10:15 a.m.	b 81.2	17	.8	.7	21,200	5	7	14	30	64	80	85	91	SPWCM
	10:15 a.m.	b 81.2	22	.6	.5	20,300	5	8	15	34	79	96	98	100	SPWCM
	10:15 a.m.	b 81.2	30	.6	.5	22,100	5	7	14	29	71	97	100	......	SPWCM
Dec. 8..............	4:45 p.m.	b 58.4	4	1.6	1.5	92,500	......	......	1	2	31	98	100	......	SPWCM
	4:45 p.m.	b 58.4	7	1.3	1.2	52,900	......	......	1	2	8	48	80	......	SPWCM
	4:45 p.m.	b 58.4	10	1.0	.9	25,700	......	1	2	4	14	59	81	......	SPWCM
	4:45 p.m.	b 58.4	13	1.0	.9	53,500	......	......	1	2	8	50	78	......	SPWCM
	4:45 p.m.	b 58.4	16	.8	.7	107,000	......	......	1	5	51	94	98	......	SPWCM
1953															
Jan. 13..............	1:45 p.m.	b 52.9	10	.7	.6	2,160	19	28	47	72	97	100	......	......	SPWCM
	1:45 p.m.	b 52.9	15	1.3	1.2	5,040	9	14	24	43	76	99	100	......	SPWCM
	1:45 p.m.	b 52.9	17	1.2	1.1	23,400	2	3	5	10	27	69	92	......	SPWCM
	1:45 p.m.	b 52.9	19	1.3	1.2	62,400	1	2	3	6	23	74	94	......	SPWCM
	1:45 p.m.	b 52.9	23	.9	.8	6,340	7	10	17	29	62	88	92	......	SPWCM
Feb. 26..............	2:40 p.m.	b 29.6	10	.5	.4	6,530	8	12	26	50	88	99	100	......	SPWCM
	2:40 p.m.	b 29.6	15	.7	.6	8,540	6	9	16	32	80	99	100	......	SPWCM
	2:40 p.m.	b 29.6	17	.7	.6	23,800	2	4	8	14	45	77	90	......	SPWCM
	2:45 p.m.	b 29.6	19	.8	.7	10,600	6	9	14	26	64	92	96	......	SPWCM
	2:45 p.m.	b 29.6	23	.5	.4	5,790	10	15	23	41	84	98	99	......	SPWCM
Mar. 24..............	11:15 a.m.	b 27.2	8	.5	.4	....	4	6	14	33	63	94	99	......	SPWCM
	11:15 a.m.	b 27.2	12	.45	.35	....	7	11	24	48	85	96	98	......	SPWCM
	11:15 a.m.	b 27.2	17	.3	.2	....	8	12	27	55	90	99	100	......	SPWCM
	11:15 a.m.	b 27.2	24	.4	.3	....	6	9	21	42	72	87	92	......	SPWCM
	11:20 a.m.	b 27.2	28	.4	.3	....	6	10	22	46	76	88	92	......	SPWCM

See footnotes at end of table.

Table 62.--Particle-size analyses of sediment samples collected with Bureau of Reclamation point sampler,[a] gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Sampling station	Total depth (ft)	Suspended sediment										Methods of analysis
					Sampling point		Percent finer than indicated size, in millimeters								
					Depth (ft)	Concentration (ppm)	0.004	0.016	0.062	0.125	0.250	0.500	1.000	2.000	
1953															
Apr. 15	12:26 p.m.	b 32.8	8	0.5	0.4	....	3	4	9	15	42	89	99	......	SPWCM
	12:28 p.m.	b 32.8	12	.5	.4	....	1	2	4	10	45	80	93	......	SPWCM
	12:29 p.m.	b 32.8	21	.3	.2	....	2	3	6	14	46	90	96	......	SPWCM
	12:30 p.m.	b 32.8	28	.3	.2	....	13	19	35	55	78	90	97	......	SPWCM
	12:31 p.m.	b 32.8	33	.5	.4	....	3	4	8	18	51	86	98	......	SPWCM
Apr. 28	11:10 a.m.	b 121.21	9	1.0	.9	....	40	60	82	91	98	100	......	......	SPWCM
	11:11 a.m.	b 121.21	13	.8	.7	....	34	49	68	79	92	99	100	......	SPWCM
	11:13 a.m.	b 121.21	17	.9	.8	....	11	17	25	32	55	85	91	......	SPWCM
	11:14 a.m.	b 121.21	21	.8	.7	....	20	31	43	53	78	98	100	......	SPWCM
	11:15 a.m.	....	27	.7	.6	....	23	34	46	56	80	95	98	......	SPWCM
July 22	2:53 p.m.	293	8	2.0	1.9	9,950	26	40	66	83	96	100	......	......	SPWCM
	2:56 p.m.	293	14	2.0	1.9	18,000	16	23	39	54	72	88	92	......	SPWCM
	3:00 p.m.	293	18	1.8	1.7	33,000	8	13	22	31	48	72	79	......	SPWCM
	3:03 p.m.	293	24	1.6	1.5	31,500	9	14	24	38	66	93	98	......	SPWCM
	3:08 p.m.	293	30	1.6	1.5	11,700	23	36	58	78	95	100	......	......	SPWCM

a Bureau of Reclamation point sampler is a 2- by 12-in. cylinder with flap valves.
b Streamflow measurement.

Table 63.--Particle-size analyses of stream-bed material, gaging-station section, Fivemile Creek near Shoshoni, Wyo.
[Method of analysis: S, sieve]

Date	Station	Stream-bed material									Remarks
		Percent finer than indicated size, in millimeters									
		0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.000	
1952											
Aug. 13...	12	0	3	11	20	32	61	81	......	......	
	16	2	9	33	76	94	98	100	......	......	
	20	2	7	27	64	84	92	97	......	......	
	24	1	6	29	75	91	96	98	......	......	
	28	2	5	18	59	82	93	97	......	......	
	30	2	6	22	70	94	99	......	......	......	
Sept. 9...	7	0	2	4	6	7	9	......	......	......	
	12	1	7	31	73	91	97	......	......	......	
	17	1	9	43	94	97	97	......	......	......	
	22	0	1	7	27	52	67	......	......	......	
	30	1	3	14	31	38	42	......	......	......	
Oct. 15...	7	0	3	18	59	79	86	89	92	......	
	12	0	1	17	71	95	99	100	......	......	
	17	0	2	19	58	77	88	93	95	......	
	22	0	1	15	41	57	76	90	98	......	
	30	1	8	51	88	94	96	96	98	......	
Dec. 8....	4	0	1	18	72	88	94	97	100	......	
	7	......	0	7	45	71	86	93	99	100	
	10	......	0	8	38	67	86	94	99	100	
	13	......	0	14	70	88	92	95	99	100	
	16	0	2	37	90	97	98	100	......	......	

Table 63.--Particle-size analyses of stream-bed material, gaging-station section, Fivemile Creek near Shoshoni, Wyo.--Continued

Date	Station	Stream-bed material: Percent finer than indicated size, in millimeters									Remarks
		0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	16.000	
1953											
Feb. 26...	17	2	10	56	75	82	84	88	90	100	No deposited material at sta. 10, 15, 19, and 23.
Mar. 24...	8	1	8	29	61	73	79	86	97	100	
	12	1	5	40	77	86	91	95	100	......	
	17	1	8	43	83	92	96	98	100	......	
	24	1	9	51	88	96	97	99	99	100	
	28	1	10	54	89	94	97	98	100	......	
Apr. 15...	8	0	2	23	66	84	93	97	99	100	
	12	3	3	37	65	80	88	95	99	100	
	21	0	2	22	57	75	89	96	99	100	
	28	1	7	47	84	94	98	99	100	......	
	33	2	10	57	86	96	98	100	......	......	
Apr. 28...	13	1	5	41	93	99	100	......	......	......	No deposited material at sta. 9.
	17	1	7	36	81	96	100	......	......	......	
	21	1	7	41	78	92	98	100	......	......	
	27	0	4	26	55	72	85	92	96	......	
June 24...	24	1	5	24	66	87	95	98	99	100	No deposited material except behind large boulders and in crevices at sta. 7, 13, 18, and 31.
July 22...	18	1	4	16	51	81	93	98	100	......	Deposited material from behind rock.
	24	1	5	23	62	86	94	97	99	100	Do.

Table 64.--Particle-size analyses of suspended sediment, depth-integrated samples, sediment stations on tributaries to Fivemile Creek

[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; and B, bottom-withdrawal tube]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
Powerline wasteway near Pavillion																
1950																
June 9	12:30 p.m.	13	4,520	2,740	......	58	......	81	......	97	......	......	......	......	......	SPWCM
June 28	3:15 p.m.	6.2	2,850	1,730	......	64	......	88	......	95	......	......	......	......	......	SPWCM
Pavillion drain near Pavillion																
1949																
Sept. 24	9:31 a.m.	8	552	493	......	27	36	43	49	52	56	83	98	......	......	BW
Oct. 1	3:40 p.m.	a 3.8	1,500	927	......	26	40	52	65	74	80	97	100	......	......	BW
1950																
Mar. 27	12:15 p.m.	a 1.0	1,650	1,370	40	53	66	80	87	92	94	98	100	......	......	BW
May 7	6:50 p.m.	1.2	1,370	900	......	56	......	74	......	90	......	......	......	......	......	SPWCM
May 17	7:35 a.m.	16.2	11,100	7,360	......	50	......	72	......	88	94	99	100	......	......	SPWCM
May 29	6:00 p.m.	6.8	9,460	6,290	......	47	......	65	......	88	98	100	......	......	......	SPWCM
June 1	8:00 p.m.	3.8	9,250	5,340	......	44	......	61	......	85	97	100	......	......	......	SPWCM
June 3	6:30 p.m.	13.5	9,850	5,700	......	46	......	64	......	85	96	99	100	......	......	SPWCM
June 11	7:45 p.m.	16.5	8,660	5,360	......	37	......	51	......	70	86	97	100	......	......	SPWCM
June 28	8:05 a.m.	13.2	7,000	3,400	......	42	......	57	......	76	......	......	......	......	......	SPWCM
July 6	6:45 p.m.	26.4	8,670	4,240	......	37	......	51	......	68	80	93	100	......	......	SPWCM
July 15	8:30 a.m.	22.0	5,800	2,400	......	30	......	39	......	54	74	95	100	......	......	SPWCM
July 21	8:00 p.m.	17.8	6,450	2,590	......	30	......	39	......	51	69	92	100	......	......	SPWCM
July 25	6:25 p.m.	67.2	13,400	8,410	......	38	......	54	......	76	86	95	99	100	......	SPWCM
Aug. 15	8:20 p.m.	42.2	7,960	3,780	......	36	......	50	......	68	83	97	99	100	......	SPWCM
Aug. 18	1:50 p.m.	36.5	8,740	3,900	......	35	......	48	......	66	83	94	99	100	......	SPWCM
Sept. 1	6:35 a.m.	21.6	5,420	1,840	......	25	......	33	......	46	61	84	98	......	......	SPWCM
Ocean drain near Pavillion																
1949																
Mar. 25	1:30 p.m.	21	2,440	1,290	12	20	28	38	55	61	77	90	99	......	......	BW
Sept. 1	4:00 p.m.	62	2,870	1,850	......	16	22	30	38	52	73	92	100	......	......	BW

See footnotes at end of table.

Table 64.--Particle-size analyses of suspended sediment, depth-integrated samples, sediment stations on tributaries to Fivemile Creek--Continued

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
Ocean drain near Pavillion--Continued																
1949																
Sept. 19......	2:25 p.m.	55	1,510	557	......	......	22	24	28	34	48	78	93	......	......	BW
Sept. 23......	2:40 p.m.	46	1,070	754	......	15	21	24	28	34	45	77	90	......	......	BW
Sept. 30......	9:25 a.m.	45	878	719	......	22	26	30	36	44	55	84	94	......	......	BW
Oct. 4........	2:31 p.m.	28	839	590	......	26	40	55	69	77	82	100	......	......	......	BW
1950																
Mar. 7........	11:20 a.m.	16	3,350	1,570	......	35	......	48	......	70	87	97	100	......	......	SPWCM
Mar. 29.......	4:00 p.m.	19	3,500	1,960	......	36	......	48	......	72	88	96	100	......	......	SPWCM
May 16........	7:00 p.m.	a 39	4,060	3,310	30	33	41	57	62	69	74	79	82	......	......	BWC
June 7........	8:10 p.m.	43	2,160	1,120	......	37	......	48	......	65	81	95	100	......	......	SPWCM
June 12.......	7:45 p.m.	48	2,820	1,290	......	29	......	39	......	61	82	91	95	......	95	SPWCM
June 19.......	5:00 p.m.	45	2,880	1,320	......	27	......	43	......	62	79	93	99	100	......	SPWCM
July 5........	6:20 a.m.	62	3,360	1,910	......	36	......	48	......	68	87	96	100	......	......	SPWCM
July 11.......	6:40 a.m.	59	3,160	1,180	......	31	......	34	......	51	77	97	100	......	......	SPWCM
July 25.......	6:45 p.m.	114	9,900	7,030	......	44	......	70	......	86	......	......	......	......	......	SPWCM
Dudley wasteway near Pavillion																
1950																
July 25.......	6:55 p.m.	14	4,370	3,900	......	72	......	94	......	98	......	......	......	......	......	SPWCM
Kellett drain near Pavillion																
1950																
Mar. 17.......	2:35 p.m.	a 0.4	1,370	1,070	41	53	60	78	88	94	98	100	......	......	......	BW
June 9........	2:45 p.m.	1.1	1,870	1,140	51	65	86	96	99	100	......	......	......	......	......	BWC
July 25.......	7:40 p.m.	20	23,800	7,810	......	39	......	60	......	85	......	......	......	......	......	SPWCM
Aug. 22.......	12:35 p.m.	3.1	10,200	2,810	......	20	......	31	......	42	58	87	99	100	......	SPWCM
Dewey drain near Pavillion																
1950																
July 25.......	6:45 p.m.	1.8	1,700	1,120	......	66	......	96	......	98	......	......	......	......	......	SPWCM

Fivemile 76 drain near Riverton																
1950																
Mar. 7.......	11:10 a.m.	a 0.2	2,360	....	......	14	19	24	34	58	81	98	100	......	......	BW
Sand Gulch drain and wasteway near Riverton																
1950																
July 25......	8:00 p.m.	b 30	12,400	6,520	......	34	......	54	......	69	81	94	100	......	......	SPWCM
Lost Wells Butte drain near Riverton																
1950																
May 8........	4:00 p.m.	4.2	1,850	....	49	52	57	68	80	92	96	98	99	......	......	BWCM
July 25......	4:50 p.m.	103	57,000	8,670	......	34	......	70	......	97	......	......	......	......	......	SPWCM
Coleman drain near Shoshoni																
1950																
May 23.......	5:25 p.m.	5.8	6,880	3,500	......	56	......	81	......	83	86	92	99	100	......	SPWCM
June 9.......	6:35 p.m.	3.8	4,240	2,940	......	51	......	74	......	91	97	99	100	......	......	SPWCM
June 17......	9:00 a.m.	20	3,300	5,120	......	47	......	68	......	96	100	......	......	......	......	SPWCM
June 28......	6:20 a.m.	19	2,300	1,400	......	39	......	56	......	84	......	......	......	......	......	SPWCM
July 5.......	8:30 a.m.	24	1,660	921	......	42	......	57	......	85	......	......	......	......	......	SPWCM
Sand Gulch near Shoshoni																
1949																
Sept. 1......	2:55 p.m.	33	367	248	......	......	22	32	48	74	84	96	100	......	......	BW
1950																
Mar. 1.......	1:10 p.m.	a 7.4	1,690	1,200	30	37	46	59	72	84	90	96	98	......	......	BW
May 6........	7:15 a.m.	33	12,700	6,510	18	27	37	49	66	79	90	97	100	......	......	SPWCM
Eagle drain near Shoshoni																
1949																
Aug. 25......	1:00 p.m.	18	1,610	1,310	10	15	18	37	42	60	73	96	99	......	......	BW
Sept. 1......	1:50 p.m.	15	1,160	799	......	20	27	36	47	66	84	98	......	......	......	BW
Sept. 14.....	3:00 p.m.	9.0	630	506	......	19	26	32	38	54	74	94	99	......	......	BW
1950																
Aug. 17......	3:20 p.m.	14	5,430	4,400	......	39	......	66	......	94	......	......	......	......	......	SPWCM

a Mean daily discharge.
b Estimated.

Table 65.--Particle-size analyses of suspended sediment, depth-integrated samples, Poison Creek near Shoshoni, Wyo.
[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment											Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters									
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	
1949														
June 2...........	8:50 a.m.	41	28,200	2,070	28	32	58	69	87	92	94	98	100	BW
1950														
Mar. 15..........	1:55 p.m.	a .3	10,100	6,000	......	41	......	85	......	99	......	......	......	SPWCM
Apr. 28..........	1:40 p.m.	a 8.9	16,000	11,600	45	61	77	88	95	96	97	99	100	SPWCM
May 8............	12:00 m.	a 7.0	10,900	7,920	34	48	67	82	92	96	98	100	......	SPWCM
July 2...........	2:05 a.m.	37.2	101,000	8,300	......	44	......	78	......	91	......	......	......	SPWCM
Do............	2:55 a.m.	56.8	90,800	5,990	......	50	......	84	......	93	......	......	......	SPWCM
Do............	10:05 a.m.	a 5.3	16,400	6,540	......	84	......	99	......	100	......	......	......	SPWCM
Sept. 21.........	10:30 a.m.	1.6	27,200	4,860	......	82	......	99	......	99	......	......	......	SPWCM
Sept. 29.........	12:25 p.m.	b 3.0	23,000	8,190	......	72	......	97	......	98	......	......	......	SPWCM
Oct. 24..........	3:40 p.m.	c .3	6,960	5,760	......	79	......	98	......	99	......	......	......	SPWCM
1951														
Apr. 24..........	1:20 p.m.	c 4.1	29,800	11,700	......	48	......	80	......	94	......	......	......	SPWCM
May 16...........	11:50 a.m.	c 6	12,000	12,500	33	49	65	81	92	97	......	......	......	SPWCM
1952														
Apr. 16..........	5:00 p.m.	....	7,800	4,980	......	67	......	91	......	95	......	......	......	SPWCM

a Mean daily discharge.
b Estimated.
c Streamflow measurement.

Table 66.--Particle-size analyses of suspended sediment, depth-integrated samples, Badwater Creek at Bonneville, Wyo.
/Methods of analysis: B, bottom-withdrawl tube; N, in native water; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; and M, mechanically dispersed/

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1948																
Mar. 25.....	3:10 p.m.	340	17,200	6,500	......	3	15	44	46	56	71	95	100	......	......	BN
Mar. 26.....	2:50 p.m.	335	16,500	5,420	......	4	16	32	37	52	67	95	99	......	......	BN
Apr. 17.....	3:45 p.m.	102	8,470	6,680	......	3	7	45	74	86	94	97	99	......	......	BN
Apr. 22.....	11:10 a.m.	61	5,520	9,500	......	2	4	47	75	87	95	98	99	......	......	BN
1949																
May 6.......	11:53 a.m.	42	22,500	1,660	......	49	63	71	77	83	87	95	100	......	......	BW
May 12......	12:30 p.m.	25	7,610	1,880	35	41	54	68	80	93	97	99	100	......	......	BW
June 2......	12:05 p.m.	350	99,800	1,350	......	29	38	47	56	68	83	92	98	......	......	BW
July 11.....	8:00 a.m.	210	172,000	9,300	15	24	38	53	76	87	94	99	100	......	......	BW
July 16.....	8:00 a.m.	1.3	8,930	1,600	53	75	86	92	95	98	98	99	100	......	......	BW
Nov. 19.....	4:00 p.m.	a 1.0	17,000	2,790	40	60	82	98	100	......	......	......	......	......	......	BW
1950																
Feb. 27.....	11:40 a.m.	11	7,520	2,670	15	24	36	50	68	84	96	100	......	......	......	BW
Mar. 1......	4:20 p.m.	27	35,000	8,570	......	19	......	38	......	87	96	100	......	......	......	SPWCM
Mar. 9......	3:00 p.m.	22	5,820	4,470	......	33	......	57	......	94	99	100	......	......	......	SPWCM
Mar. 28.....	4:20 p.m.	a 14	7,280	4,060	......	38	......	58	......	84	96	99	100	......	......	SPWCM
Apr. 4......	10:05 a.m.	a 23	13,500	7,760	25	32	38	47	63	80	95	100	......	......	......	SPWCM
May 3.......	11:15 a.m.	24	6,540	2,840	......	25	......	35	......	71	87	96	......	97	97	SPWCM
May 13......	12:50 p.m.	32	3,760	2,850	......	53	......	75	......	95	98	100	......	......	......	SPWCM
May 23......	10:15 a.m.	17	3,720	2,250	......	35	......	47	......	90	99	100	......	......	......	SPWCM
June 18.....	8:00 a.m.	a 10	10,900	6,430	......	68	......	84	......	95	......	......	......	......	......	SPWCM
Sept. 10....	1:30 p.m.	a 50	105,000	5,230	......	61	......	95	......	98	......	......	......	......	......	SPWCM
Sept. 20....	7:15 p.m.	b 157	90,200	5,930	......	49	......	75	......	88	......	......	......	......	......	SPWCM
Sept. 29....	8:10 p.m.	26	52,400	10,700	......	60	......	89	......	96	98	99	100	......	......	SPWCM
Oct. 3......	5:25 p.m.	c 2.0	52,800	18,000	......	75	......	97	......	100	......	......	......	......	......	SPWCM
Nov. 7......	8:00 a.m.	c .2	9,520	3,430	......	83	......	99	......	100	......	......	......	......	......	SPWCM

See footnotes at end of table.

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Table 66.--Particle-size analyses of suspended sediment, depth-integrated samples, Badwater Creek at Bonneville, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1951																
Feb. 26.....	4:15 p.m.	45	11,000	8,310	1	1	4	33	65	79	......	......	......	......	......	SPNM
Do........	4:15 p.m.	45	11,000	6,440	21	27	35	49	60	82	......	......	......	......	......	SPWCM
Mar. 5......	3:30 p.m.	49	3,840	4,130	......	22	......	35	......	54	66	88	99	100	......	SPWCM
Mar. 9......	2:15 p.m.	27	11,000	7,960	25	32	47	63	81	93	98	100	......	......	......	BWCM
Mar. 19.....	3:25 p.m.	21	22,600	18,800	......	......	1	20	60	79	91	98	100	......	......	SPNM
Do........	3:25 p.m.	21	22,600	6,070	20	32	32	44	60	81	92	98	100	......	......	SPWCM
Mar. 23.....	3:20 p.m.	14	8,380	13,700	......	33	......	57	......	86	......	......	......	......	......	SPWCM
Mar. 26.....	4:10 p.m.	b 11	19,400	37,700	......	20	......	43	......	84	94	99	100	......	......	SPWCM
Mar. 28.....	3:00 p.m.	72	14,700	12,300	1	1	3	41	78	90	97	100	......	......	......	SPNM
Do........	3:00 p.m.	72	14,700	4,020	32	44	53	69	80	90	......	......	......	......	......	SPWCM
Apr. 2......	3:50 p.m.	17	9,200	17,900	......	34	......	57	......	91	......	......	......	......	......	SPWCM
Apr. 6......	3:55 p.m.	10	5,520	12,000	......	45	......	69	......	89	......	......	......	......	......	SPWCM
Apr. 9......	2:10 p.m.	8.4	4,580	8,030	......	43	......	65	......	86	......	......	......	......	......	SPWCM
Apr. 24.....	1:40 p.m.	13	6,830	4,100	......	47	......	60	......	87	......	......	......	......	......	SPWCM
Apr. 29.....	1:00 p.m.	40	17,400	4,660	......	36	......	54	......	79	......	......	......	......	......	SPWCM
Apr. 30.....	7:00 a.m.	45	23,000	6,610	......	36	......	55	......	83	......	......	......	......	......	SPWCM
May 1.......	12:20 p.m.	b 48	11,200	9,250	......	1	10	51	65	82	92	100	......	......	......	SPNM
Do........	12:20 p.m.	b 48	11,200	9,030	26	34	41	51	64	81	90	98	100	......	......	SPWCM
May 4.......	1:20 p.m.	9.9	3,560	7,110	......	47	......	69	......	92	......	......	......	......	......	SPWCM
1952																
Mar. 24.....	12:00 m.	16	7,850	9,600	......	29	......	55	......	87	......	......	......	......	......	SPWCM
Mar. 25.....	6:25 p.m.	36	14,300	18,900	......	36	......	69	......	90	97	100	......	......	......	SPWCM
Mar. 26.....	3:45 a.m.	22	2,230	3,020	......	64	......	77	......	84	......	......	......	......	......	SPWCM
Do........	5:15 p.m.	28	11,600	16,500	......	43	......	75	......	92	......	......	......	......	......	SPWCM
Apr. 7......	10:00 a.m.	34	10,800	7,830	......	40	......	60	......	84	......	......	......	......	......	SPWCM
May 16......	2:00 p.m.	6.5	8,480	8,000	......	1	2	65	84	92	......	......	......	......	......	SPNM
Do........	2:00 p.m.	6.5	8,480	7,980	......	60	......	79	......	92	......	......	......	......	......	SPWCM
June 27.....	2:30 p.m.	32	44,600	5,590	......	66	74	82	84	95	......	......	......	......	......	SPWCM

a Estimated.
b Streamflow measurement.

Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; and M, mechanically dispersed

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	Methods of analysis
1949															
Mar. 30....	1:00 p.m.	13	12,400	7,220	......	14	21	30	42	58	75	90	96	......	BW
Apr. 15....	12:30 p.m.	14	7,800	4,240	......	24	32	43	55	68	86	96	100	......	BW
Apr. 25....	3:25 p.m.	11	4,900	1,150	......	29	38	48	57	70	88	96	100	......	BW
May 19.....	8:40 p.m.	156	168,000	2,110	......	20	29	41	55	71	89	98	100	......	BW
Sept. 3....	3:00 p.m.	26	34,000	1,560	28	48	66	83	93	98	100	......	......	......	BW
Sept. 13...	1:35 p.m.	4.6	1,260	765	15	22	36	50	61	69	80	85	92	......	BW
Oct. 3.....	10:30 a.m.	6.2	568	418	21	38	50	64	72	79	86	92	95	......	BW
Oct. 12....	2:00 p.m.	5.0	1,260	1,030	19	26	36	46	55	66	83	93	98	......	BW
Oct. 26....	3:00 p.m.	5.0	2,510	1,770	20	28	38	48	58	70	85	94	96	......	BW
1950															
Feb. 27...	3:45 p.m.	a 20	4,440	1,530	30	36	47	55	64	74	85	98	100	......	BW
Mar. 20...	2:25 p.m.	a 13	9,980	5,580	......	49	......	54	......	84	......	......	......	......	SPWCM
Mar. 31...	1:20 p.m.	9.2	21,400	13,500	......	28	......	45	......	83	97	100	......	......	SPWCM
Apr. 5....	2:10 p.m.	8.6	27,800	8,490	16	22	28	37	58	85	98	100	......	......	SPWCM
Apr. 14...	2:10 p.m.	12	9,050	6,200	......	36	......	56	......	87	98	100	......	......	SPWCM
May 9.....	2:30 p.m.	9.2	4,040	2,250	......	35	......	47	......	78	97	100	......	......	SPWCM
May 26....	3:30 p.m.	4.2	5,560	1,710	......	24	......	30	......	47	59	73	82	92	SPWCM
June 7....	3:00 p.m.	1.4	5,020	846	......	15	......	24	......	52	......	......	......	......	SPWCM
June 19...	6:50 p.m.	141	164,000	5,820	......	31	......	49	......	82	......	......	......	......	SPWCM
June 20...	1:15 p.m.	8.6	22,400	9,530	......	58	......	89	......	98	......	......	......	......	SPWCM
June 27...	11:05 a.m.	5.0	19,300	6,840	......	71	......	96	......	100	......	......	......	......	SPWCM
July 2....	4:55 p.m.	62	106,000	5,310	......	30	......	50	......	93	......	......	......	......	SPWCM
July 6....	2:10 p.m.	13	25,000	8,840	......	69	......	92	......	98	......	......	......	......	SPWCM
July 25...	10:00 a.m.	34	54,400	5,230	......	58	......	82	......	96	......	......	......	......	SPWCM
Do......	4:15 p.m.	13	27,800	5,290	......	72	......	94	......	99	......	......	......	......	SPWCM
Sept. 10..	3:10 p.m.	10	13,100	4,250	60	73	86	93	95	97	99	100	......	......	BWCM
Sept. 17..	12:40 p.m.	5.0	3,530	2,470	......	85	......	99	......	99	......	......	......	......	SPWCM
Sept. 20..	4:25 p.m.	64	23,800	9,500	37	48	57	65	74	81	92	99	100	......	BWCM
Nov. 30...	3:05 p.m.	b 7	1,060	1,550	......	25	......	33	......	49	62	92	100	......	SPWCM

See footnotes at end of table.

Table 67.--Particle-size analyses of suspended sediment, depth-integrated samples, Muddy Creek near Pavillion, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	Methods of analysis
1951															
Mar. 21...	1:10 p.m.	a 30	16,400	10,400	......	35	......	63	......	90	......	......	......	......	SPWCM
Mar. 27...	2:40 p.m.	b 3	23,900	11,800	......	22	......	34	......	62	84	98	100	......	SPWCM
Mar. 30...	11:40 a.m.	b 5	8,950	5,870	......	35	......	55	......	81	......	......	......	......	SPWCM
Apr. 4....	2:20 p.m.	13	18,300	6,350	......	38	......	54	......	87	......	......	......	......	SPWCM
Apr. 12...	4:20 p.m.	4.2	14,400	2,380	......	51	......	71	......	93	......	......	......	......	SPWCM
May 21....	2:40 p.m.	48	120,000	8,810	......	38	......	59	......	83	94	99	100	......	SPWCM
June 14...	10:00 a.m.	6.8	29,400	5,520	......	74	......	91	......	96	......	......	......	......	SPWCM
1952															
Apr. 7....	3:30 p.m.	a 55	33,200	3,900	......	24	......	38	......	59	72	93	99	......	SPWCM
Apr. 25...	9:55 a.m.	84	73,700	5,760	......	32	......	49	......	81	......	......	......	......	SPWCM
Aug. 29...	7:30 p.m.	3.8	1,330	1,850	......	78	......	92	......	93	......	......	......	......	SPWCM

a Streamflow measurement.
b Mean daily discharge.

Table 68.--Particle-size analyses of suspended sediment, depth-integrated samples, Muddy Creek near Shoshoni, Wyo.
[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; M, mechanically dispersed; and N, in native water]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1949																
Mar. 26.....	1:15 p.m.	16	18,400	4,520	......	36	48	58	70	84	95	100	......	......	......	BW
Mar. 30.....	3:50 p.m.	11	18,200	5,820	......	34	44	58	70	80	90	98	......	......	......	BW
May 2.......	2:20 p.m.	2.3	6,650	1,740	......	42	56	68	80	90	98	100	......	......	......	BW
June 6......	5:30 p.m.	53	90,900	2,410	19	39	54	70	83	91	95	98	......	......	......	BW

June 9......	2:28 p.m.	28	76,200	1,950	34	53	70	84	92	96	98	99	100	......	......	BW
June 12.....	5:40 a.m.	91	233,000	3,750	18	28	36	50	63	80	91	96	98	......	......	BW
Oct. 10.....	9:56 a.m.	5.6	3,120	968	45	70	88	94	95	95	96	97	98	......	......	BW
Oct. 24.....	4:10 p.m.	20	11,200	2,100	25	40	58	73	83	90	95	97	98	......	......	BW
1950																
Feb. 28.....	2:50 p.m.	a 5.2	19,600	3,640	11	16	21	29	43	65	85	95	98	......	......	BW
Mar. 14.....	2:00 p.m.	a 8.0	4,240	2,040	......	31	......	49	......	73	92	100	......	......	......	SPWCM
Mar. 31.....	2:05 p.m.	17	26,200	15,400	......	50	......	74	......	87	94	99	100	......	......	SPWCM
Apr. 3......	10:45 a.m.	a 14	28,800	2,350	38	46	56	66	73	80	90	100	......	......	......	BWC
Apr. 11.....	4:40 p.m.	b 10	18,600	1,720	36	41	53	58	73	83	90	97	100	......	......	BWC
Apr. 26.....	4:00 p.m.	6.6	14,400	4,630	......	36	......	56	......	82	95	99	100	......	......	SPWCM
May 9.......	12:30 p.m.	4.3	6,060	3,400	......	54	......	78	......	93	98	100	......	......	......	SPWCM
May 17......	3:50 p.m.	14	19,200	4,390	28	33	39	50	72	90	97	99	100	......	......	SPWCM
May 29......	4:40 p.m.	6.0	11,000	5,140	......	33	......	50	......	86	93	99	100	......	......	SPWCM
June 5......	3:15 p.m.	7.0	13,800	7,310	......	37	......	59	......	90	97	100	......	......	......	SPWCM
June 20.....	9:30 a.m.	63	176,000	7,540	29	39	49	62	75	90	96	99	100	......	......	SPWCM
June 25.....	6:25 p.m.	24	16,800	5,930	......	30	......	43	......	86	......	......	......	......	......	SPWCM
June 28.....	10:15 a.m.	16	20,000	7,160	......	68	......	87	......	94	......	......	......	......	......	SPWCM
July 3......	11:45 a.m.	28	41,800	25,000	......	48	......	75	......	93	98	99	100	......	......	SPWCM
July 5......	3:15 p.m.	146	153,000	12,500	......	36	......	58	......	84	94	99	100	......	......	SPWCM
July 6......	2:50 p.m.	94	38,300	6,080	......	37	......	58	......	93	......	......	......	......	......	SPWCM
July 19.....	2:45 p.m.	4.3	2,420	1,370	......	66	......	96	......	98	......	......	......	......	......	SPWCM
July 25.....	11:00 p.m.	112	82,000	4,090	31	41	49	58	68	80	94	100	......	......	......	BWC
July 26.....	3:15 p.m.	b 144	105,000	9,270	......	35	......	52	......	82	94	99	100	......	......	SPWCM
July 27.....	12:30 p.m.	70	47,900	8,040	......	44	......	64	......	84	......	......	......	......	......	SPWCM
Aug. 4......	2:45 p.m.	b 51	16,000	9,770	......	30	......	45	......	78	94	99	100	......	......	SPWCM
Aug. 13.....	8:55 a.m.	38	55,000	5,190	......	50	......	75	......	89	......	......	......	......	......	SPWCM
Sept. 10....	1:25 p.m.	105	146,000	3,150	32	44	50	63	74	84	92	98	100	......	......	SPWCM
Sept. 11....	2:40 p.m.	21	15,600	5,710	......	62	......	81	......	93	97	100	......	......	......	SPWCM
Sept. 22....	10:15 a.m.	a 25	14,400	2,660	48	58	65	73	79	87	94	98	100	......	......	BWCM
Sept. 24....	10:40 a.m.	14	17,000	6,120	......	74	......	89	......	96	......	......	......	......	......	SPWCM
Oct. 23.....	4:25 p.m.	5.0	3,660	2,290	31	38	47	55	65	81	93	100	......	......	......	BWCM
Nov. 7......	11:50 a.m.	3.5	2,560	1,420	51	63	75	85	89	92	95	98	100	......	......	BWCM
Nov. 30.....	1:07 p.m.	a 7.0	796	2,770	......	38	......	55	......	81	95	100	......	......	......	SPWCM

See footnotes at end of table.

Table 68.--Particle-size analyses of suspended sediment, depth-integrated samples, Muddy Creek near Shoshoni, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1951																
Feb. 12	4:35 p.m.	c 18	1,700	1,160	58	71	84	92	93	94	96	100	......	......	......	BWCM
Mar. 16	1:15 p.m.	a 9.0	8,240	4,670	......	34	......	46	......	75	94	100	......	......	......	SPWCM
Mar. 20	2:30 p.m.	c 15	11,700	6,210	......	38	......	64	......	72	95	100	......	......	......	SPWCM
Mar. 22	2:55 p.m.	c 6	19,000	9,370	......	33	......	48	......	70	87	98	100	......	......	SPWCM
Mar. 23	4:40 p.m.	c 20	10,200	7,990	......	51	......	77	......	98	......	......	......	......	......	SPWCM
Mar. 27	2:05 p.m.	7.0	24,000	15,000	......	36	......	50	......	80	97	100	......	......	......	SPWCM
Mar. 30	1:15 p.m.	22	21,000	8,380	......	46	......	63	......	86	97	100	......	......	......	SPWCM
Apr. 3	12:55 p.m.	5.0	25,800	8,000	......	43	......	62	......	80	......	......	......	......	......	SPWCM
Apr. 6	12:25 p.m.	7.8	22,400	7,450	......	42	......	60	......	81	......	......	......	......	......	SPWCM
Apr. 23	1:05 p.m.	4.5	15,800	5,350	......	51	......	77	......	89	......	......	......	......	......	SPWCM
Apr. 25	3:05 p.m.	8.5	15,600	9,150	......	51	......	77	......	92	......	......	......	......	......	SPWCM
May 1	1:40 p.m.	24	38,300	35,900	......	......	1	66	83	90	99	100	......	......	......	SPNM
Do	1:40 p.m.	24	38,300	6,400	37	50	56	70	78	89	......	......	......	......	......	SPWCM
May 21	12:35 p.m.	77	23,600	17,100	......	......	2	41	54	75	95	99	100	......	......	SPNM
Do	12:35 p.m.	77	23,600	8,660	23	29	36	44	54	76	95	100	......	......	......	SPWCM
June 14	12:42 p.m.	29	6,580	4,760	......	......	11	37	56	78	......	......	......	......	......	SPNM
Do	12:42 p.m.	29	6,580	2,390	29	29	36	47	60	80	98	100	......	......	......	SPWCM
June 28	12:40 p.m.	49	7,420	6,120	......	28	......	42	......	74	95	100	......	......	......	SPWCM
July 5	2:12 p.m.	65	16,700	5,780	......	24	......	36	......	60	80	95	100	......	......	SPWCM
July 12	12:47 p.m.	63	18,700	11,400	......	......	2	38	41	54	77	96	100	......	......	SPNM
Do	12:47 p.m.	63	18,700	5,970	20	25	31	36	41	57	80	96	99	100	......	SPWCM
Do	12:47 p.m.	63	18,700	4,930	20	28	35	35	37	54	71	96	100	......	......	BWCM
July 20	10:47 a.m.	20	6,900	4,710	......	23	......	32	......	55	75	93	100	......	......	SPWCM
July 22	2:15 p.m.	203	77,300	8,910	......	36	......	54	......	81	94	99	100	......	......	SPWCM
July 23	3:10 p.m.	115	34,200	14,200	......	32	......	49	......	80	94	99	100	......	......	SPWCM
July 30	1:05 p.m.	115	21,800	8,160	......	31	......	46	......	72	90	98	100	......	......	SPWCM
Aug. 6	1:05 p.m.	69	8,930	8,150	......	30	......	42	......	72	95	100	......	......	......	SPWCM
Aug. 9	1:10 p.m.	73	12,100	7,710	......	1	14	28	36	56	80	96	100	......	......	SPNM
Do	1:10 p.m.	73	12,100	3,920	18	24	27	33	40	59	82	96	100	......	......	SPWCM
Aug. 16	1:15 p.m.	47	7,640	6,160	......	21	......	30	......	57	83	97	100	......	......	SPWCM
Aug. 27	2:45 p.m.	36	5,280	3,720	......	27	......	38	......	66	87	98	100	......	......	SPWCM

Sept. 6.....	11:30 a.m.	35	4,070	3,830	......	20	......	27	......	47	77	96	100	......	......	SPWCM
Sept. 7.....	2:05 a.m.	274	64,200	8,070	......	31	......	45	......	75	91	99	100	......	......	SPWCM
Sept. 13....	10:37 a.m.	49	7,790	7,400	......	26	......	36	......	61	86	98	100	......	......	SPWCM
Oct. 1......	3:55 p.m.	47	6,810	4,620	......	17	......	25	......	49	74	96	......	......	......	SPWCM
Nov. 5......	1:00 p.m.	4.7	2,300	1,620	......	27	......	38	......	64	88	99	......	......	......	SPWCM
1952																
Mar. 17.....	3:35 p.m.	11	3,590	5,000	14	19	22	28	35	52	......	......	......	......	......	BWCM
Mar. 26.....	11:00 a.m.	17	6,650	9,080	17	24	28	39	51	68	78	98	100	......	......	BWCM
Apr. 8......	12:45 p.m.	30	27,000	7,880	......	48	......	66	......	81	......	......	......	......	......	SPWCM
Apr. 17.....	3:45 p.m.	45	61,200	5,270	......	51	......	71	......	85	......	......	......	......	......	SPWCM
Apr. 28.....	6:15 p.m.	141	93,600	7,940	......	34	......	49	......	81	......	......	......	......	......	SPWCM
May 6.......	11:30 a.m.	15	9,620	6,440	......	0	4	50	58	73	88	98	100	......	......	SPNM
Do........	11:30 a.m.	15	9,620	3,900	29	41	46	53	60	71	......	......	......	......	......	SPWCM
May 22......	4:50 p.m.	189	84,500	7,090	......	23	......	33	......	61	80	95	100	......	......	SPWCM
June 18.....	9:35 a.m.	47	12,400	3,750	......	26	......	35	......	66	92	99	100	......	......	SPWCM
June 23.....	4:45 p.m.	57	13,600	7,130	......	17	......	25	......	54	79	95	100	......	......	SPWCM
July 7......	2:35 p.m.	80	14,200	6,460	......	15	......	21	......	34	65	91	99	100	......	SPWCM
July 14.....	11:20 a.m.	49	9,800	6,100	......	17	......	24	......	43	68	91	99	100	......	SPWCM
July 17.....	10:00 a.m.	96	12,600	8,130	......	17	......	24	......	46	70	93	99	100	......	SPWCM
July 22.....	11:30 a.m.	119	14,400	7,360	......	12	......	17	......	33	54	85	98	99	100	SPWCM
Aug. 4......	4:20 p.m.	149	34,400	4,760	......	4	......	40	......	72	90	98	100	......	......	SPNM
Do........	4:20 p.m.	149	34,400	4,380	......	29	......	43	......	70	......	......	......	......	......	SPWCM
Sept. 5.....	11:40 a.m.	66	10,200	4,260	......	1	......	19	......	34	57	89	99	100	......	SPNM
Do........	11:40 a.m.	66	10,200	4,210	......	18	......	25	......	39	......	......	......	......	......	SPWCM
1953																
Aug. 12.....	4:00 p.m.	....	d 2,490	....	......	27	......	39	......	70	91	99	100	......	......	SPWCM
Do........	4:00 p.m.	....	d 3,100	....	......	23	......	32	......	61	83	98	100	......	......	SPWCM
Do........	4:00 p.m.	....	d 5,040	....	......	15	......	21	......	41	68	92	100	......	......	SPWCM
Do. e.....	4:00 p.m.	b 20.3	d 3,540	....	......	22	......	31	......	57	81	96	100	......	......	SPWCM
Do........	4:20 p.m.	b 20.3	3,130	....	......	23	......	33	......	62	84	99	100	......	......	SPWCM

a Mean daily discharge.
b Streamflow measurement.
c Estimated.
d Concentration from analyses of size samples.
e Composite of size distributions determined by particle-size analyses of samples from individual verticals.
Note--Data for 1953 include only those collected as part of special studies.

Table 69.--Particle-size analyses of suspended sediment, depth-integrated samples, Dry Cottonwood Creek near Bonneville, Wyo.
[Methods of analysis: B, bottom-withdrawal tube; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; M, mechanically dispersed; and N, in native water]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	Methods of analysis
1949														
June 2	7:30 p.m.	64	26,400	1,120	46	75	81	88	91	94	96	98	99	BW
1951														
Sept. 7	12:55 a.m.	230	46,700	8,030	......	61	......	82	......	92	......	......	......	SPWCM
1952														
May 22	5:50 p.m.	195	29,800	25,400	......	1	60	67	74	82	92	98	100	SPNM
Do	5:50 p.m.	195	29,800	6,590	40	52	58	66	72	81	......	......	......	SPWCM
June 23	11:00 a.m.	8.9	2,220	4,650	......	56	......	92	......	100	......	......	......	SPWCM
June 27	10:50 a.m.	57	15,500	9,150	......	59	......	78	......	86	......	......	......	SPWCM

Table 70.--Particle-size analyses of suspended sediment, depth-integrated samples, Bighorn River at Thermopolis, Wyo.
[Methods of analysis: B, bottom-withdrawl tube; N, in native water; W, in distilled water; S, sieve; P, pipette; C, chemically dispersed; and M, mechanically dispersed]

Date	Time	Water discharge (cfs)	Suspended sediment: Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	Methods of analysis
1946																
June 20	9:20 a.m.	5,240	6,370	18,700	30	40	50	59	68	79	89	95	98	......	......	BN
Sept. 6	11:30 a.m.	1,060	1,730	3,310	......	3	19	41	58	79	93	98	99	......	......	BN
1947																
June 13	9:16 a.m.	9,050	4,480	13,300	25	30	37	46	56	66	74	87	92	......	......	BN
June 21	4:10 p.m.	12,800	2,630	2,990	9	15	32	54	61	69	77	87	92	......	......	BN
Oct. 4	1:21 p.m.	......	....	3,090	......	37	41	......	......	93	96	99	100	......	......	BN

1948																
Mar. 18......	1:30 p.m.	1,420	1,380	....	......	......	......	......	......	72	80	89	99	......	......	B
Mar. 26......	4:49 p.m.	1,740	5,690	....	......	4	6	......	......	86	90	94	98	......	......	BW
Do........	4:49 p.m.	1,740	5,690	....	......	61	74	82	86	90	94	98	100	......	......	BW
Mar. 29......	3:44 p.m.	1,460	3,770	5,460	......	7	13	......	87	89	91	96	99	......	......	BN
May 17.......	3:30 p.m.	713	663	1,860	......	8	29	64	72	82	86	92	94	......	......	BN
May 21.......	3:43 p.m.	4,800	5,990	6,000	......	9	17	27	40	61	78	96	99	......	......	BN
May 31.......	10:57 a.m.	7,060	3,830	5,150	......	16	24	32	40	54	71	99	100	......	......	BN
June 15......	10:50 a.m.	5,550	1,900	6,250	......	9	17	24	32	47	66	93	99	......	......	BN
Aug. 9.......	3:05 p.m.	1,100	2,860	3,180	......	7	18	......	......	98	99	100	......	......	......	BN
Do........	3:05 p.m.	1,100	2,860	3,270	......	58	71	85	88	96	98	100	......	......	......	BW
Aug. 16......	4:18 p.m.	713	2,130	2,720	......	4	10	......	......	......	......	98	99	......	......	BN
Do........	4:18 p.m.	713	2,130	2,870	......	62	73	88	94	98	98	99	99	......	......	BW
Aug. 23......	12:38 p.m.	699	1,430	1,610	......	14	42	......	98	99	100	......	......	......	......	BN
Do........	12:38 p.m.	699	1,430	1,640	......	58	74	92	98	100	......	......	......	......	......	BW
Sept. 24.....	10:08 a.m.	1,160	2,270	3,710	......	6	24	......	70	85	94	100	......	......	......	BN
Do........	10:08 a.m.	1,160	2,270	3,150	......	30	42	55	68	85	96	100	......	......	......	BW
Oct. 14......	10:50 a.m.	810	697	1,150	......	20	40	54	70	88	97	97	98	......	......	BN
Do........	10:50 a.m.	810	697	1,140	......	32	42	53	68	85	92	98	100	......	......	BW
1949																
Feb. 11......	3:30 p.m.	665	848	676	......	3	6	12	25	56	82	91	92	......	......	BN
Do........	3:30 p.m.	665	848	620	1	3	4	10	22	56	84	94	98	......	......	BW
Apr. 1.......	....	830	1,550	1,300	......	22	37	64	80	89	94	97	100	......	......	BW
June 8.......	3:37 p.m.	4,050	4,440	1,250	15	23	30	38	48	61	77	90	97	......	......	BW
June 13......	....	7,750	4,720	2,000	......	18	25	33	44	56	73	86	93	......	......	BW
July 13......	10:21 a.m.	2,950	3,430	1,230	17	28	37	50	67	78	89	96	99	......	......	BW
July 15......	7:15 a.m.	3,000	12,300	4,420	26	43	59	74	89	93	95	97	98	......	......	BW
Aug. 2.......	11:06 a.m.	780	1,620	1,490	36	66	82	94	98	99	100	......	......	......	......	BW
Aug. 15......	10:57 a.m.	800	1,860	5,100	33	56	79	90	98	98	99	99	100	......	......	BW
Aug. 22......	3:05 p.m.	804	1,800	1,360	34	51	67	85	97	99	99	100	......	......	......	BW
Aug. 31......	10:00 a.m.	948	1,710	2,770	32	44	60	74	88	95	97	99	100	......	......	BW
Sept. 1......	7:15 a.m.	935	1,580	1,190	27	47	61	77	86	94	96	98	99	......	......	BW
Sept. 7......	3:11 p.m.	1,350	2,320	1,730	24	32	44	58	70	84	92	97	100	......	......	BW
Sept. 10.....	7:15 a.m.	1,380	2,010	1,410	14	22	31	43	60	83	92	98	100	......	......	BW
Sept. 15.....	2:55 p.m.	1,360	1,470	844	1	10	28	38	53	77	88	94	98	......	......	BN
Do........	2:55 p.m.	1,360	1,470	894	15	22	31	42	55	78	87	94	98	......	......	BW
Sept. 20.....	7:15 a.m.	1,200	1,080	860	21	29	40	50	59	80	81	89	91	......	......	BW

Table 70.--Particle-size analyses of suspended sediment, depth-integrated samples, Bighorn River at Thermopolis, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1949																
Sept. 22	10:04 a.m.	1,120	918	1,350	20	29	40	50	63	78	92	98	99	......	......	BW
Sept. 30	5:15 p.m.	957	700	497	30	39	55	66	76	86	95	98	99	......	......	BW
Oct. 6	10:50 a.m.	1,460	1,260	520	......	11	15	22	34	55	84	93	96	......	......	BN
Do	10:50 a.m.	1,460	1,260	999	3	7	11	18	32	54	89	96	98	......	......	BW
Oct. 12	10:20 a.m.	1,500	1,180	1,530	......	10	14	20	34	54	74	92	98	......	......	BW
Oct. 27	10:20 a.m.	1,420	894	1,500	22	24	30	35	42	57	79	98	99	......	......	BW
Nov. 4	10:25 a.m.	1,330	686	503	......	6	12	14	18	36	58	79	......	......	......	BN
Do	10:25 a.m.	1,330	686	480	......	4	8	14	22	36	60	82	98	......	......	BW
Nov. 10	2:35 p.m.	1,270	653	1,840	......	18	22	26	33	46	68	88	97	......	......	BW
Nov. 18	9:50 a.m.	1,100	486	974	......	10	12	16	20	30	52	88	98	......	......	BN
Do	9:50 a.m.	1,100	486	900	......	8	11	14	19	31	50	78	95	......	......	BW
Nov. 25	3:00 p.m.	1,040	656	2,230	12	17	24	27	35	52	70	100	......	......	......	BW
Dec. 2	3:05 p.m.	930	422	1,210	......	14	19	24	32	46	65	92	98	......	......	BW
Dec. 7	12:50 p.m.	792	209	647	......	17	22	26	38	55	69	88	94	......	......	BW
1950																
Jan. 16	3:40 p.m.	676	278	874	......	......	5	7	11	20	43	......	......	......	......	BW
Mar. 8	10:00 a.m.	935	792	966	......	18	22	24	27	32	56	92	100	......	......	BN
Do	10:00 a.m.	935	792	945	10	16	21	24	27	37	60	94	100	......	......	BW
Mar. 17	10:15 a.m.	940	664	1,230	......	40	......	51	......	63	77	98	......	......	......	SPWCM
Mar. 22	3:05 p.m.	835	875	1,980	......	50	......	76	......	86	91	99	......	......	......	SPWCM
Mar. 30	3:00 p.m.	708	559	1,390	......	49	......	75	......	90	95	100	......	......	......	SPWCM
Apr. 5	10:15 a.m.	850	1,170	3,340	......	49	......	74	......	88	94	99	100	......	......	SPWCM
Apr. 13	3:10 p.m.	820	1,170	3,390	......	60	......	79	......	90	95	99	100	......	......	SPWCM
Apr. 21	12:15 p.m.	1,060	1,130	2,230	28	35	45	56	64	72	88	99	100	......	......	SPWCM
May 1	12:35 p.m.	955	765	1,650	......	43	......	57	......	71	80	99	100	......	......	SPWCM
May 8	1:10 p.m.	1,000	2,080	4,820	......	62	......	74	......	86	90	99	100	......	......	SPWCM
May 12	4:35 p.m.	1,000	1,350	3,390	......	59	......	76	......	88	94	99	100	......	......	SPWCM
May 17	11:40 a.m.	1,840	2,920	1,910	2	8	27	36	49	72	89	97	100	......	......	SPN
Do	11:40 a.m.	1,840	2,920	2,080	23	26	32	42	53	72	......	......	......	......	......	SPWCM
May 26	11:10 a.m.	3,610	2,520	2,790	......	21	......	34	......	51	73	96	99	100	......	SPWCM

June 6........	2:05 p.m.	5,230	3,200	5,010	......	20	......	31	......	61	80	93	100	......	......	SPWCM
June 16.......	10:50 a.m.	7,310	1,970	3,760	......	32	......	48	......	72	81	92	100	......	......	SPWCM
June 21.......	3:40 p.m.	8,470	1,830	3,600	......	35	......	53	......	74	81	88	98	100	......	SPWCM
July 1........	8:50 a.m.	6,770	2,460	5,360	......	25	......	38	......	76	94	97	99	100	......	SPWCM
July 6........	12:10 p.m.	8,770	2,130	1,920	12	29	48	61	80	91	......	......	......	......	......	SPN
Do........	12:10 p.m.	8,770	2,130	1,980	52	......	53	66	76	90	......	......	......	......	......	SPWCM
July 20.......	10:55 a.m.	3,150	2,290	5,150	......	37	......	55	......	81	......	......	......	......	......	SPWCM
July 27.......	3:20 p.m.	2,970	7,250	6,590	......	1	16	66	......	93	......	......	......	......	......	SPN
Do........	3:20 p.m.	2,970	7,250	5,520	34	42	53	66	89	93	......	......	......	......	......	SPWCM
Aug. 1........	10:25 a.m.	2,750	4,160	3,340	4	5	36	50	61	80	......	......	......	......	......	SPN
Do........	10:25 a.m.	2,750	4,160	1,970	21	36	44	53	64	80	95	98	99	99	100	SPWCM
Aug. 9........	10:15 a.m.	1,420	3,460	9,510	......	54	......	77	......	94	......	......	......	......	......	SPWCM
Aug. 17.......	9:55 a.m.	1,400	3,870	1,120	......	54	......	79	......	95	......	......	......	......	......	SPWCM
Sept. 1.......	10:15 a.m.	a 1,000	2,620	2,890	3	6	32	75	84	97	......	......	......	......	......	SPN
Do........	10:15 a.m.	a 1,000	2,620	2,820	40	49	64	75	84	97	......	......	......	......	......	SPWCM
Sept. 13......	11:20 a.m.	2,190	6,080	4,620	......	2	15	43	57	80	97	99	100	......	......	SPN
Do........	11:20 a.m.	2,190	6,080	3,580	22	29	36	42	54	80	......	......	......	......	......	SPWCM
Sept. 21......	7:15 a.m.	4,180	36,900	7,180	......	45	......	67	......	86	......	......	......	......	......	SPWCM
Do........	2:45 p.m.	4,190	17,000	5,090	......	40	......	58	......	81	95	100	......	......	......	SPWCM
Sept. 27......	10:00 a.m.	1,930	2,390	1,230	5	8	14	19	28	52	82	99	100	......	......	SPN
Do........	10:00 a.m.	1,930	2,390	1,260	15	18	......	19	31	56	84	99	100	......	......	SPWCM
Oct. 4........	2:45 p.m.	2,000	2,380	2,770	......	19	......	25	......	51	78	99	100	......	......	SPWCM
Oct. 13.......	10:35 a.m.	1,860	1,700	2,490	......	14	......	19	......	46	81	99	100	......	......	SPWCM
Oct. 20.......	10:35 a.m.	1,590	1,130	1,500	......	15	......	19	......	44	78	99	100	......	......	SPWCM
1951																
Mar. 13.......	9:50 a.m.	920	532	964	......	45	......	50	......	61	......	......	......	......	......	SPWCM
Mar. 20.......	2:25 p.m.	900	605	1,530	......	50	......	60	......	68	......	......	......	......	......	SPWCM
Apr. 3........	12:00 m.	956	1,200	2,610	......	41	......	58	......	76	90	100	......	......	......	SPWCM
Apr. 12.......	12:25 p.m.	1,120	1,130	2,240	......	32	......	45	......	69	88	99	100	......	......	SPWCM
Apr. 13.......	2:25 p.m.	1,000	1,030	2,470	......	33	......	49	......	70	89	100	......	......	......	SPWCM
Apr. 19.......	10:30 a.m.	1,140	1,130	2,020	......	29	......	38	......	70	92	100	......	......	......	SPWCM
Apr. 27.......	12:45 p.m.	1,070	1,070	2,110	......	31	......	41	......	64	86	99	100	......	......	SPWCM
May 3.........	11:00 a.m.	1,220	2,320	5,230	......	42	......	57	......	84	94	100	......	......	......	SPWCM
May 10........	2:35 p.m.	1,720	3,030	4,270	3	4	35	46	54	68	91	100	......	......	......	SPNM
Do........	2:35 p.m.	1,720	3,030	2,000	30	35	39	48	55	69	91	100	......	......	......	SPWCM

a Mean daily discharge.

Table 70.--Particle-size analyses of suspended sediment, depth-integrated samples, Bighorn River at Thermopolis, Wyo.--Continued

Date	Time	Water discharge (cfs)	Suspended sediment													Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters											
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	2.000	
1951																
May 18........	3:30 p.m.	2,640	4,100	9,000	......	38	......	50	......	68	87	99	100	......	......	SPWCM
May 28........	10:30 a.m.	7,790	2,900	1,860	10	10	15	21	29	56	70	91	100	......	......	SPNM
Do........	10:30 a.m.	7,790	2,900	1,300	14	14	17	26	32	47	64	89	100	......	......	SPWCM
May 31........	11:45 a.m.	11,100	1,890	2,280	......	14	......	23	......	38	51	78	99	100	......	SPWCM
June 7........	11:45 a.m.	4,810	2,590	1,690	12	15	25	28	36	58	84	93	100	......	......	SPNM
Do........	11:45 a.m.	4,810	2,590	2,700	18	21	25	31	38	58	84	94	100	......	......	SPWCM
June 13.......	2:15 p.m.	4,500	2,180	2,830	......	14	......	23	......	53	88	96	100	......	......	SPWCM
June 18.......	10:55 a.m.	10,100	1,560	2,170	......	20	......	34	......	54	76	94	100	......	......	SPWCM
June 19.......	2:20 p.m.	11,600	1,160	2,100	......	23	......	36	......	54	71	88	99	100	......	SPWCM
June 27.......	11:05 a.m.	5,280	2,070	4,470	......	28	......	44	......	72	93	99	100	......	......	SPWCM
July 3........	3:55 p.m.	4,360	2,090	2,050	19	25	29	37	44	65	93	99	100	......	......	SPWCM
July 12.......	2:40 p.m.	5,480	2,110	1,790	19	23	27	34	42	62	......	......	......	......	......	SPWCM
July 22.......	3:30 p.m.	7,770	10,200	6,300	......	47	......	66	......	81	......	......	......	......	......	SPWCM
July 25.......	10:05 a.m.	4,760	3,170	6,640	......	32	......	48	......	74	90	99	100	......	......	SPWCM
July 30.......	10:45 a.m.	4,140	3,080	7,130	......	36	......	52	......	77	93	100	......	......	......	SPWCM
July 31.......	4:55 p.m.	4,480	2,830	4,910	......	31	......	45	......	70	88	99	100	......	......	SPWCM
Aug. 7........	2:50 p.m.	4,500	2,330	4,340	......	4	......	38	......	63	86	99	100	......	......	SPWCM
Aug. 13.......	12:25 p.m.	1,900	1,700	4,310	......	49	......	69	......	88	......	......	......	......	......	SPWCM
Aug. 23.......	2:30 p.m.	1,340	1,600	3,980	......	51	......	77	......	92	......	......	......	......	......	SPWCM
Aug. 30.......	2:05 p.m.	1,200	1,130	2,980	......	52	......	75	......	91	......	......	......	......	......	SPWCM
Do........	6:00 p.m.	1,220	1,090	2,800	......	70	......	74	......	91	......	......	......	......	......	SPWCM
Aug. 31.......	10:10 a.m.	1,320	1,240	3,710	......	49	......	72	......	91	......	......	......	......	......	SPWCM
Sept. 4.......	12:35 p.m.	1,490	1,820	4,490	......	47	......	68	......	86	......	......	......	......	......	SPWCM
Sept. 8.......	1:45 p.m.	1,450	5,660	8,560	43	58	72	83	91	96	......	......	......	......	......	SPWCM
Sept. 13......	2:45 p.m.	1,220	1,930	4,880	......	56	......	81	......	95	......	......	......	......	......	SPWCM
Sept. 26......	11:25 a.m.	1,040	590	1,620	42	54	65	75	82	88	93	98	100	......	......	BWCM
Oct. 1........	6:25 p.m.	950	584	1,370	55	65	76	86	90	93	98	100	......	......	......	BWCM

1952																
Apr. 7........	1:15 p.m.	295	973	1,380	36	53	80	91	97	98	98	99	100	......	......	BWCM
May 22........	5:15 p.m.	965	1,880	2,730	23	37	52	75	94	95	96	99	100	......	......	BWCM
June 11........	6:40 p.m.	3,660	3,100	2,130	......	1	5	14	25	58	89	99	100	......	......	SPNM
Do........	6:40 p.m.	3,660	3,100	2,440	9	10	12	14	24	53	......	......	......	......	......	SPWCM

Table 71.--Particle-size analyses of suspended sediment, depth-integrated samples, unscheduled sampling points

[Methods of analysis: S, sieve; P, pipette; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; and B, bottom-withdrawal tube]

Date (1953)	Time	Water discharge (cfs)	Suspended sediment												Methods of analysis
			Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters										
					0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	
Wind River near Dubois															
June 14...	9:30 a.m.	1,410	1,170	6,060	......	28	......	48	......	72	80	90	97	99	SPWCM
Horse Creek at Dubois															
June 15...	1:00 p.m.	a 454	632	2,160	......	2	12	19	30	45	56	70	78	81	BWCM
North Fork Wind River near Duncan															
June 15...	3:10 p.m.	a 1,240	709	3,330	10	15	20	30	40	56	71	92	......	......	BWCM
East Fork Wind River near Duncan															
June 15...	4:50 p.m.	a 692	1,330	4,390	6	9	11	16	22	32	51	81	91	......	BWCM
Wind River near Burris															
June 14...	3:00 p.m.	7,090	1,670	6,020	......	14	......	25	......	50	64	78	91	97	SPWCM
Crow Creek near Crowheart															
June 16...	3:00 p.m.	a 203	2,390	3,190	......	11	......	21	......	44	64	88	99	......	SPWCM
Wind River near Crowheart															
June 14...	1:30 p.m.	10,600	1,600	9,520	......	29	......	52	......	74	86	96	100	......	SPWCM
Dry Creek near Morton															
June 15...	11:00 a.m.	a 32	1,620	2,210	......	76	......	86	......	93	......	......	......	......	SPWCM
Little Popo Agie River at Hudson															
June 14...	9:55 a.m.	609	1,290	5,180	......	22	......	37	......	77	91	98	99	100	SPWCM
Little Wind River near Arapahoe															
June 14...	11:40 a.m.	2,040	647	4,870	11	14	16	20	24	30	35	42	54	......	BWCM

a Streamflow measurement.

Table 72.--Particle-size analyses of stream-bed material collected at several sediment stations
[Method of analysis: S, sieve]

Date	Station	Stream-bed material								Remarks
		Percent finer than indicated size, in millimeters								
		0.062	0.125	0.250	0.500	1.000	2.000	4.000	8.000	
Beaver Creek near Arapahoe										
1948										
Sept. 6	......	3	13	59	90	97	100	......	......	
	......	18	35	72	91	98	100	......	......	
	......	4	16	62	91	99	100	......	......	
	......	6	16	62	92	99	100	......	......	
	......	3	12	60	91	99	100	......	......	
Popo Agie River near Riverton										
1953										
Aug. 13	25	......	1	7	24	56	83	94	100	
	35	1	1	4	22	70	96	100	......	
	45	......	1	10	48	79	95	100	......	
	55	......	......	0	33	97	100	......	......	No bed material at stations 65 and 75.
Badwater Creek at Bonneville										
1953										
Aug. 11	12	3	11	44	79	93	98	100	......	
	22	1	6	30	64	79	89	95	98	
	32	4	18	68	94	98	99	100	......	
	42	8	16	52	83	90	93	95	100	
	52	7	17	48	77	87	92	97	100	
	60	2	11	60	85	94	98	100	......	

Aug. 16............	6.2	2	6	44	80	89	94	97	100
	8	......	1	9	34	62	79	87	90
	10	2	7	45	69	75	82	91	100
	14	1	3	15	41	66	84	94	100
	16	1	2	18	80	98	99	100	......
Muddy Creek near Shoshoni									
1953									
Aug. 12............	2	2	9	47	71	78	84	91	96
	4	1	5	38	53	65	76	84	94
	6	2	7	43	85	94	97	98	99
	8	3	10	62	98	100	......	......	......
	10	2	11	78	98	100	......	......	......
	12	2	9	55	88	94	96	98	98
Bighorn River at Thermopolis									
1953									
Aug. 11............	15	12	26	88	99	100	......	......	......
	110	4	12	58	91	99	100	......	......
	175	16	30	48	51	55	62	75	82

Note--Other particle-size analyses of samples, which were collected primarily for the determination of specific weight and which do not necessarily represent the average particle size of the stream-bed material in the reach, are tabulated in an unpublished report entitled, "Sedimentation and chemical quality of water in the Bighorn River drainage basin, Wyoming and Montana."

Table 86.--Chemical analyses, Wind River near Dubois, Wyo.

Records available.--April 1947 to December 1950.
Extremes.--Dissolved solids: Maximum, 163 ppm Apr. 1-30, 1947; minimum, 90 ppm June 29, 1950.
Total hardness: Maximum, 124 ppm Mar. 4, 1948; minimum, 46 ppm June 29, 1950.
Daily specific conductance: Maximum, 385 micromhos Apr. 19, 1947; minimum, 111 micromhos June 29, 1950.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1947																						
Apr. 1-30	85	12	0.00	30	11	4.5	0.8	132	0	18	2.0	0.3	0.4	....	163	0.22	37	120	12	7	261	8.2
May 1-4	238	16	.00	26	7.9	6.6	1.2	118	0	14	1.0	.1	.3	....	146	.20	94	97	0	13	228	7.7
May 5-31	584	24	.00	17	3.7	18	.8	72	0	35	1.0	.2	.5	0.05	105	.14	166	58	0	40	139	7.2
June 1-30	600	26	.01	16	4.7	8.0	2.0	72	0	17	1.0	.2	.5	.06	98	.13	159	58	0	22	140	7.2
July 1-Aug. 1	414	28	.05	15	8.5	5.2		80	0	14	.6	.2	.5	.00	94	.13	105	72	6	12	133	7.9
Aug. 2-11	290	29	.02	17	8.5	4.3		80	0	18	.5	.2	.5	.00	107	.15	84	77	11	10	144	7.7
Aug. 12-31	172	30	.10	19	9.0	4.8		89	0	19	.6	.1	.5	.04	106	.14	49	84	11	10	147	7.8
Sept. 1-30	113	28	.01	20	10	4.2		90	0	23	.9	.2	.5	.00	114	.16	35	81	7	9	171	7.8
Oct. 1-31	95	28	.05	21	11	6.0		96	0	29	.9	.1	.3	.00	123	.17	31	98	19	12	179	8.0
Nov. 1-30	79	23	.05	22	4.5	16	8.4	112	0	20	.0	.0	.1	.09	134	.18	29	73	0	29	194	8.0
Dec. 1-31	82	25	.00	23	5.3	13	4.8	118	0	16	.6	.0	.0	.09	150	.20	33	79	0	25	201	8.1
1948																						
Jan. 1-4	76	27	.00	26	5.5	13	7.2	117	5	10	3.3	.0	.2	....	146	.20	30	87	0	23	207	8.2
Feb. 5	64	29	.05	25	6.3	13		111	0	12	9.0	.1	.0	.00	141	.19	24	88	0	24	207	7.5
Mar. 1-31	60	23	.05	24	7.0	16	8.0	127	0	16	2.2	.0	.2	.11	150	.20	24	89	0	26	210	8.1
Mar. 4 [a]	60	30	.02	30	6.0	4.2		116	0	13	.0	.0	.0	.01	131	.18	21	124	29	8	212	8.0
Weighted average [b]	226	26	0.02	18	6.4	10		c 84	......	22	0.9	0.2	0.5	....	109	0.15	67	72	3	23	154	...
Weighted average [d]	202	26	....	18	6.4	11		c 85	......	21	1.1	.....	.....	....	111	0.15	61	72	2	25	156	...
1949																						
Oct. 24	e 68	26	0.02	25	5.4	13		115	0	15	1.2	0.1	0.8	....	154	0.21	.....	85	0	25	211	7.4
Nov. 10	e 83	28	.06	25	1.5	15		107	0	10	1.5	.1	.4	0.20	138	.19	.....	69	0	32	188	8.0
Nov. 29	e 41	22	.02	27	5.0	14		121	0	17	1.6	.1	.2	....	152	.21	.....	88	0	26	223	7.8
1950																						
Apr. 13	e 137	17	.24	28	4.4	11		114	0	13	2.6	.2	.4	....	142	.19	.....	88	0	21	204	7.2
May 17	e 320	26	.04	24	5.3	12		112	0	10	2.0	.4	1.2	....	160	.22	.....	82	0	24	206	7.8

June 29.............	e 778	3.7	.04	14	2.6	9.4	66	0	10	.5	.1	.7	.10	90	.12	....	46	0	31	111	7.5
July 30.............	e 300	27	.04	23	3.4	1.2	83	0	3.0	1.0	.3	.5	....	106	.14	....	72	4	3	144	7.5
Sept. 8.............	e 132	31	.02	19	4.0	9.7	91	0	9.0	.5	.2	.2	....	130	.18	....	64	0	25	162	7.5
Oct. 9.............	e 166	31	.04	23	3.5	13	106	0	11	1.0	.2	.5	.30	138	.19	....	72	0	29	190	7.8
Nov. 6.............	e 111	24	.04	27	3.8	12	109	0	15	1.5	.2	.5	....	158	.21	....	83	0	23	215	7.5
Dec. 4.............	e 104	24	.04	29	2.8	10	114	0	11	.5	.2	.6	....	158	.21	....	84	0	21	214	7.5

a Not included in weighted average.
b Represents 95 percent of runoff for year April 1947 to March 1948.
c Includes carbonate as bicarbonate.
d Includes estimates for missing chemical data for year April 1947 to March 1948.
e Discharge at time of sampling.

Table 87.--Chemical analyses, Wind River at Dubois, Wyo.

Records available.--April 1948 to September 1949.
Extremes.--Dissolved solids: Maximum, 296 ppm Jan. 1-31, 1949; minimum, 117 ppm June 1-30, 1948.
Total hardness: Maximum, 216 ppm Jan. 1-31, 1949; minimum, 66 ppm May 1-31, June 1-30, 1948.
Daily specific conductance: Maximum, 527 micromhos June 2, 1949; minimum, 127 micromhos May 29, 1948.

[Analytical results in parts per million except as indicated]

Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1948																					
Apr. 5-30.....	27	0.02	48	10	15	4.0	188	4	35	6.3	0.2	0.5	0.08	244	0.33	66	164	3	16	358	8.3
May 1-31......	19	.02	21	3.4	10	2.0	94	0	7.2	1.2	.3	1.0	.00	122	.17	145	66	0	24	165	7.8
June 1-30.....	23	.05	20	3.8	7.2	2.0	88	0	9.6	1.5	.2	.4	.01	117	.16	224	66	0	19	154	7.9
July 1-31.....	24	.05	36	8.4	10	6.0	130	6	21	4.5	.3	.3	.....	190	.26	123	124	8	16	262	8.2
Aug. 1-31.....	33	.02	49	11	19	3.6	201	0	37	6.4	.4	.3	.02	247	.34	79	168	3	19	381	8.2
Sept. 1-30....	30	.02	53	12	18	2.0	209	0	40	6.7	.4	.3	.01	253	.34	61	182	11	18	399	8.2
Oct. 1-31.....	24	.02	49	13	21	3.2	196	6	42	5.0	.4	.1	.08	258	.35	58	176	5	20	380	8.2
Nov. 1-30.....	25	.02	58	14	20	8.8	231	0	48	6.0	.4	.2	.02	278	.38	54	202	13	17	419	8.0
Dec. 1-31.....	27	.05	60	14	11	3.2	225	0	47	7.5	.3	.2	.04	280	.38	51	207	23	10	397	8.1

Table 87.--Chemical analyses, Wind River at Dubois, Wyo.--Continued

Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1949																					
Jan. 1-31.....	27	0.05	62	15	12	2.4	228	0	47	8.0	0.4	0.2	0.04	296	0.40	46	216	21	11	460	8.1
Feb. 1-28.....	24	.02	52	17	14	3.2	200	11	46	7.0	.4	.6	.20	280	.38	39	200	18	13	446	8.4
Mar. 1-21.....	28	.02	41	15	17	1.6	172	8	44	6.0	.4	.2	.50	248	.34	35	164	10	18	396	8.2
Mar. 22-26....	26	.04	42	17	13	1.6	182	0	46	7.0	.4	1.0	.20	250	.34	32	175	26	14	412	8.0
Mar. 27-31....	24	.01	59	13	14	6.4	223	0	43	6.0	.4	1.2	....	280	.38	35	201	18	13	410	7.9
Apr. 1-28.....	24	.01	45	13	14	.4	180	0	32	8.0	.3	.8	....	233	.32	69	166	18	15	359	7.8
Apr. 29-May 1.	24	.04	39	7.2	9.6	2.4	146	0	24	3.6	.4	.5	....	178	.24	99	127	7	14	281	7.8
May 2-31......	19	.02	28	4.3	7.5	2.0	98	0	18	2.4	.4	.5	.11	131	.18	155	88	8	15	194	7.5
June 1-30.....	25	.02	38	12	25	2.4	154	5	63	4.0	.1	.8	.20	264	.36	381	145	11	27	384	8.2
July 1-31.....	26	.02	38	14	9.0	6.0	168	0	32	4.0	.4	.6	.10	226	.31	146	153	15	11	345	7.7
Aug. 1-31.....	26	.02	49	12	12	4.4	203	0	30	5.0	.4	.8	.20	248	.34	79	172	6	13	397	8.0
Sept. 1-17....	31	.02	48	12	11	4.4	199	0	30	5.0	.2	.8	.10	246	.33	65	170	7	12	389	8.0

Table 88.--Chemical analyses, Wind River at Riverton, Wyo.

Records available.--March 1947 to December 1950.
Extremes.--Dissolved solids: Maximum, 384 ppm Mar. 21, 1950; minimum, 106 ppm July 1-31, 1947.
Total hardness: Maximum, 216 ppm Mar. 31-Apr. 10, 1947; minimum, 69 ppm June 1-30, 1948.
Daily specific conductance: Maximum, 822 micromhos May 13, 1948; minimum, 152 micromhos July 10, 1947.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1947																						
Mar. 31-Apr. 10......	363	11	0.00	57	18	29	2.8	192	0	105	11	0.2	0.6	0.06	327	0.44	320	216	59	22	533	8.1
Apr. 11-21...........	410	18	.00	54	17	29	3.2	184	0	103	9.0	.3	.5	.07	327	.44	362	205	54	23	538	8.1

Apr. 22-29	517	19	.00	54	17	39	3.2	186	0	119	11	.2	.8	.05	358	.49	500	205	52	29	571	8.0
Apr. 30-May 31	2,590	19	.00	33	9.0	9.4		114	0	36	5.0	.2	1.5	.03	174	.24	1,220	119	26	15	274	8.0
June 1-11	2,390	19	.00	26	9.4	4.8		94	0	25	7.0	.2	.4	.....	141	.19	910	104	27	11	220	8.1
June 12-13	3,560	24	.00	51	6.6	1.7		122	0	53	1.5	.1	.8	.....	222	.30	2,130	154	54	2	340	8.3
June 14-30	5,390	9.0	.00	22	8.3	4.6		86	0	24	2.0	.1	.6	.05	130	.18	1,890	89	18	10	209	7.9
July 1-31	3,630	4.0	.00	23	7.2	.1		78	0	19	2.0	.1	.5	.....	106	.14	1,040	87	23	1	173	8.1
Aug. 1-9	1,610	15	.01	20	5.5	9.1	1.2	78	0	27	2.0	.2	1.0	.02	126	.17	548	72	8	21	245	7.8
Aug. 10, 12-14	2,020	17	.01	22	4.8	12		80	0	28	2.5	.3	1.5	.....	126	.17	687	75	9	27	245	7.7
Aug. 11	2,450	19	.05	41	5.0	9.2		94	0	58	3.0	.1	1.2	.....	166	.23	1,100	123	46	14	224	8.0
Aug. 15-20	995	16	.01	28	6.1	14	1.2	102	0	38	3.5	.2	2.0	.09	160	.22	430	95	11	24	284	7.7
Aug. 21-26	490	18	.01	32	8.3	19		110	0	54	5.0	.2	2.0	.06	190	.26	251	114	24	27	294	7.6
Aug. 27-Sept. 8	363	14	.01	34	8.1	25		122	0	60	5.7	.2	1.8	.00	220	.30	216	116	16	31	324	8.1
Sept. 9-29	443	14	.01	38	13	21		136	0	70	6.3	.2	1.5	.01	238	.32	285	148	36	24	330	7.8
Sept. 30	1,390	21	.01	37	10	13		130	0	44	4.4	.3	2.5	.....	202	.27	758	133	26	17	302	8.1
Weighted average a.	2,065	12	0.00	27	8.3	6.6		96	......	31	3.5	0.1	0.9	.....	146	0.20	822	102	24	13	235	...
Weighted average b.	1,262	13	....	31	9.3	9.7		109	......	40	4.2	.....	1.0	.....	171	0.23	583	116	27	15	270	...
1947																						
Oct. 1-8	942	18	0.01	44	10	20		146	0	61	6.6	0.2	1.5	.....	242	0.33	615	151	31	22	340	8.0
Oct. 9-31	659	18	.01	53	12	19		157	0	80	6.4	.2	.5	0.05	274	.37	487	182	53	18	352	7.9
Oct. 10 c	360	20	.05	65	9.0	26		170	0	98	8.0	.2	1.6	.....	312	.42	303	199	60	22	486	8.1
Nov. 1-30	570	22	.03	46	14	26	4.4	167	0	94	7.5	.2	1.6	.07	258	.35	397	172	35	24	419	8.2
Dec. 1-30	374	24	.05	50	13	22	5.2	165	5	74	8.5	.2	1.9	.06	278	.38	281	178	34	23	442	8.3
1948																						
Mar. 17-29	441	20	.03	48	13	22	3.6	160	0	84	7.5	.4	1.2	.04	266	.36	317	173	42	21	435	8.2
Apr. 2-30	562	20	.03	46	12	23	3.6	146	4	75	7.5	.1	1.4	.10	258	.35	391	164	38	23	388	8.4
May 1-31	1,330	21	.03	32	5.8	8.7	3.2	113	0	28	2.5	.2	2.6	.02	154	.21	553	104	11	15	235	8.0
June 1-30	4,430	20	.04	20	4.6	7.8	2.8	91	0	14	2.0	.2	1.6	.07	118	.16	1,410	69	0	19	197	8.2
July 1-31	1,650	17	.05	23	5.6	10	2.4	79	0	30	2.5	.0	.6	.02	110	.15	490	80	15	21	198	7.8
Aug. 1-31	280	18	.02	34	7.0	30	1.2	126	0	70	5.4	.3	1.1	.05	231	.31	175	114	11	36	370	7.9
Sept. 1-30	668	19	.02	33	7.0	26	4.0	126	0	60	6.5	.3	.8	.01	216	.29	390	111	8	33	340	7.9
Weighted average d.	983	20	0.04	29	6.9	13	3.1	e 110	......	37	3.7	0.2	1.4	0.05	162	0.22	501	101	11	21	259	...
Weighted average f.	917	20	....	32	7.8	17		e 117	......	43	4.2	.....	1.4	.....	177	0.24	438	112	16	25	282	...
1948																						
Oct. 1-31	566	17	0.02	42	12	37	0.4	166	0	86	8.0	0.3	0.9	0.07	262	0.36	400	154	18	34	475	8.1
Nov. 1-30	427	18	.03	57	15	37	4.0	195	0	102	8.0	.2	.4	.17	346	.47	399	204	44	28	502	8.2
Dec. 1-23	465	19	.02	51	15	28	1.2	179	0	92	8.0	.3	2.1	.06	309	.42	388	189	42	24	472	7.9

See footnotes at end of table.

Table 88.--Chemical analyses, Wind River at Riverton, Wyo.--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1949																						
Feb. 24-Mar. 2	418	16	0.02	49	14	37	1.6	147	7	102	9.0	0.3	2.2	.....	298	0.41	336	180	49	31	460	8.2
Mar. 3-25	550	18	.02	50	14	33	3.2	159	0	106	7.5	.2	2.1	0.04	306	.42	454	183	53	28	461	8.0
Mar. 26-Apr. 30	619	19	.02	46	13	27	1.2	155	0	83	7.0	.2	1.3	.03	276	.38	461	169	42	26	424	8.2
May 1-10	614	19	.03	40	8.0	25	2.4	132	0	68	5.8	.3	.7	.19	229	.31	380	133	25	29	362	7.5
May 11-17	1,600	19	.03	34	4.4	11	2.4	108	0	36	2.4	.2	1.1	.20	164	.22	708	103	14	18	257	7.3
May 18	2,830	20	.02	47	4.3	26		176	0	39	3.6	.....	2.5	.....	224	.30	1,710	135	0	30	287	7.6
May 19-27	1,620	21	.03	33	5.0	12	2.8	107	0	40	2.4	.2	.5	.16	172	.23	752	103	15	20	259	7.6
May 28-31	2,600	20	.03	27	3.3	10	1.2	84	0	27	3.4	.3	.7	.....	143	.19	1,000	81	12	21	209	7.2
June 1-7	1,320	22	.10	26	6.4	13	4.0	89	4	38	1.0	.1	.6	.08	180	.24	642	92	12	23	246	8.3
June 8-11	2,560	22	.06	25	5.3	8.1	2.4	91	0	28	1.0	.1	.6	.....	160	.22	1,110	85	10	17	211	7.4
June 12-14	3,940	21	.10	29	4.7	4.9	1.6	102	0	18	1.0	.1	1.2	.....	154	.21	1,640	92	8	10	220	8.1
June 15-27	2,410	20	.10	24	5.2	7.3	.8	85	0	23	1.0	.1	.4	.11	144	.20	937	82	12	16	196	8.2
June 28-29	1,570	19	.02	24	5.4	13	2.0	92	0	31	3.0	.2	.6	.15	162	.22	687	82	7	25	220	7.9
June 30-July 19	1,590	17	.04	24	5.3	9.0	3.2	83	0	33	3.0	.2	.6	.30	136	.18	584	82	14	18	207	7.3
July 20-31	477	14	.04	29	5.9	20	.8	101	0	53	4.0	.2	1.1	.30	180	.24	232	97	14	31	275	8.0
Aug. 1	208	13	.06	38	8.9	26		120	0	79	5.0	.2	1.5	.....	242	.33	136	132	34	30	375	7.2
Aug. 2-20	290	15	.05	35	9.6	28	1.2	118	0	79	6.0	.2	1.1	.20	240	.33	188	127	30	32	370	7.3
Aug. 21-26	346	18	.02	35	8.7	32	2.0	116	0	88	9.5	.1	.7	.60	260	.35	243	124	29	36	385	8.0
Aug. 27-Sept. 30	705	13	.02	37	9.2	24	.8	120	0	72	7.0	.1	.9	.17	226	.31	430	131	33	28	352	7.6
Weighted average g.	858	18	0.04	35	8.2	19	1.9	e 120	......	56	4.5	0.2	0.8	0.15	208	0.28	482	121	23	25	315	...
Weighted average h.	775	18	....	37	8.8	21		e 125	......	59	4.9	.....	0.8	.....	217	0.30	454	129	26	26	329	...
1949																						
Nov. 4	i 776	14	0.04	40	10	25		136	0	69	7.2	0.2	1.1	.....	248	0.34	....	141	29	28	377	7.7
Nov. 29	i 652	13	.02	45	10	30		149	0	81	8.4	.2	.5	.....	264	.36	....	154	32	30	417	7.9
1950																						
Feb. 10	490	14	.08	49	11	36		156	0	95	12	.2	2.5	.....	308	.42	....	168	40	32	466	7.0
Mar. 21	i 342	24	.02	42	13	57		182	0	113	10	.3	1.8	.....	384	.52	....	159	10	44	514	8.0
Apr. 29	i 409	18	.02	53	12	37		176	0	99	10	.2	.4	.....	322	.44	....	182	38	31	498	7.7
June 10	i 1,760	17	.10	33	5.3	8.3		104	0	31	2.5	.2	1.0	0.10	158	.21	....	105	20	15	236	7.5
Sept. 16	i 1,560	19	.02	35	8.1	32		133	0	69	5.5	.2	.9	.....	246	.33	....	121	12	36	364	7.8

Oct. 10.............	i 1,240	21	.04	39	8.4	27	145	0	59	5.0	1.0	.8	.....	234	.32	....	132	13	31	351	7.7
Dec. 11.............	i 644	19	.04	49	11	29	166	0	79	7.0	.2	.7	.....	286	.39	....	167	31	27	460	7.7

a Represents 83 percent of runoff for water year October 1946 to September 1947.
b Includes estimates for missing chemical data for water year October 1946 to September 1947.
c Not included in weighted average.
d Represents 89 percent of runoff for water year October 1947 to September 1948.
e Includes carbonate as bicarbonate.
f Includes estimates for missing chemical data for water year October 1947 to September 1948.
g Represents 92 percent of runoff for water year October 1948 to September 1949.
h Includes estimates for missing chemical data for water year October 1948 to September 1949.
i Discharge at time of sampling.

Table 89.--Chemical analyses, Fivemile Creek above Wyoming Canal near Pavillion, Wyo.

Records available.--September 1949 to November 1951.
Extremes.--Daily specific conductance: Maximum, 5,820 micromhos Nov. 20, 1950; minimum, 2,370 micromhos June 19, 1950.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Sum	Dissolved solids: Tons per acre-foot	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1949																					
Sept. 5.............	1.5	14	0.02	497	145	627		166	0	2,850	65	1.0	1.5	0.97	4,280	5.82	1,840	1,700	43	4,670	7.8
1950																					
Feb. 20.............	5	22	.02	426	185	430		200	0	2,400	65	1.4	1.9	....	3,630	4.94	1,820	1,660	34	4,040	7.6
June 19.............	a 135	17	.04	310	62	266		208	0	1,350	18	.7	5.1	.20	2,130	2.90	1,030	859	36	2,370	7.1
Sept. 18-22.........	57	......	....	....	....	308	....	206	0	1,890	32	.....	.....	....	.....	....	....	....	31	3,340	7.6
Sept. 25-29.........	1.3	......	....	....	....	600	....	198	0	2,880	66	.....	.....	....	.....	....	....	....	40	4,900	7.5
1950																					
Oct. 1-31...........	1.22	......	....	....	....	615	....	200	0	2,890	67	.....	.....	....	.....	....	....	....	41	4,920	7.6
Nov. 1-15...........	.55	......	....	....	....	615	....	201	0	2,840	67	.....	.....	....	.....	....	....	....	42	4,900	7.5
Nov. 16-30..........	1.33	......	....	....	....	780	....	249	0	3,160	77	.....	.....	....	.....	....	....	....	47	5,460	7.7

See footnotes at end of table.

Table 89.--Chemical analyses, Fivemile Creek above Wyoming Canal near Pavillion, Wyo.--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids		Hardness as $CaCO_3$		Percent sodium	Specific conductance (micromhos at 25°C)	pH
															Sum	Tons per acre-foot	Calcium, magnesium	Noncarbonate			
1950																					
Dec. 1-30	1.23	...	...	...	...	740	...	237	0	2,970	71	...	...	...	...	...	...	...	48	5,170	7.7
1951																					
Feb. 7-10	2.08	...	...	...	...	768	...	242	0	3,450	92	...	...	...	...	...	...	...	43	5,750	8.1
Feb. 11-28	1.83	...	...	...	...	574	...	232	0	3,080	74	...	...	...	...	...	...	...	36	4,940	7.8
Mar. 1-Apr. 3	1.67	...	...	...	...	490	...	175	0	2,500	57	...	...	...	...	...	...	...	38	4,130	7.6
Apr. 4-22	.77	...	...	...	...	660	...	210	0	3,000	68	...	...	...	...	...	...	...	42	5,010	7.7
Apr. 23-26	1.68	...	...	...	...	568	...	207	0	2,830	65	...	...	...	...	...	...	...	39	4,700	7.8
Apr. 27-May 3	3.01	...	...	...	...	628	...	203	0	2,990	70	...	...	...	...	...	...	...	40	4,980	7.8
May 4-10	1.57	...	...	...	...	600	...	196	0	2,890	69	...	...	...	...	...	...	...	40	4,860	7.7
May 11-22	4.60	...	...	...	...	572	...	216	0	2,720	57	...	...	...	...	...	...	...	40	4,550	7.6
May 23-26	1.05	...	...	...	...	564	...	194	0	2,800	64	...	...	...	...	...	...	...	39	4,630	7.9
May 27-June 13	1.68	...	...	...	...	504	...	174	0	2,510	57	...	...	...	...	...	...	...	39	4,350	7.6
June 14-25	.71	...	...	...	...	590	...	179	0	2,780	64	...	...	...	...	...	...	...	41	4,720	7.3
July 11-30	.59	...	...	...	...	476	...	241	0	2,590	59	...	...	...	...	...	...	...	35	4,410	7.3
Sept. 7	.4	...	...	...	...	544	...	183	0	2,540	56	...	...	...	...	...	...	...	41	4,420	7.3
Weighted average [b]	...	...	...	...	...	597	...	208	...	2,820	65	...	...	...	...	...	...	...	41	4,750	...
Weighted average [c]	1.18	...	...	...	...	554	...	208	...	2,680	60	...	...	...	...	...	...	...	40	4,540	...
1951																					
Oct. 5-19	1.88	...	...	...	...	492	...	190	0	2,510	57	...	...	...	...	...	...	...	38	4,250	7.5
Nov. 4-8	1.24	...	...	...	...	558	...	197	0	2,630	64	...	...	...	...	...	...	...	41	4,550	7.7

a Discharge at time of sampling.
b Represents 85 percent of runoff for water year October 1950 to September 1951.
c Includes estimates for missing chemical data for water year October 1950 to September 1951.

Table 90.--Chemical analyses, Ocean drain at Ocean Lake Outlet near Pavillion, Wyo.

Records available.--September 1947 to August 1951.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Sum	Dissolved solids: Tons per acre-foot	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1947																					
Sept. 23	......	0.0	....	140	48	521		148	0	1,360	100	0.7	0.3	.....	2,240	3.05	547	426	67	3,080	8.2
1948																					
Sept. 3	27	7.2	0.02	102	46	507		60	4	1,300	96	.7	.0	0.10	2,090	2.84	444	388	71	2,920	8.5
Oct. 14	22	11	.08	101	45	519	3.2	67	0	1,310	93	.7	1.2	.15	2,120	2.88	437	382	72	2,910	7.4
1949																					
Sept. 16	33	4.2	.01	109	41	518	4.8	88	0	1,350	83	.7	1.6	.23	2,160	2.94	441	369	72	2,910	7.1
1950																					
Mar. 31	a 12	22	.02	149	50	557		172	0	1,450	95	1.0	2.6	.05	2,410	3.28	578	437	68	3,130	7.5
June 29	a 17	24	.04	110	46	549		104	0	1,390	87	.8	.8	.20	2,260	3.07	464	379	72	2,970	7.1
1951																					
Jan. 8	26	5.0	.04	118	49	568		106	0	1,460	88	.8	.3	.00	2,340	3.18	498	409	71	3,200	7.3
Jan. 24	23	2.9	.10	124	46	575		110	0	1,470	90	1.0	.2	.....	2,360	3.21	500	405	71	3,250	7.7
Apr. 3	13	3.4	.02	117	46	545		109	0	1,400	84	1.0	.9	.....	2,250	3.06	483	394	71	2,990	6.9
Aug. 17	40	9.6	.02	97	46	556		55	0	1,420	81	.8	.5	.....	2,240	3.05	431	386	74	2,970	7.2

a Discharge at time of sampling.

Table 91.--Chemical analyses, Fivemile Creek near Riverton, Wyo.

Records available.--September 1950 to November 1951.
Extremes.--Daily specific conductance: Maximum, 4,720 micromhos Apr. 27, 1951; minimum, 1,090 micromhos June 28, 1951.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Sodium (Na)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1950								
Sept. 18-24......	146	346	277	1,720	38	36	3,290	7.6
Sept. 25-29......	46.2	484	172	1,480	68	59	3,180	7.6
1950								
Oct. 1-31........	29.8	574	172	1,670	80	63	3,530	7.6
Nov. 1-30........	38.4	556	167	1,570	80	64	3,260	7.7
Dec. 1-31........	34.5	574	170	1,590	83	65	3,390	7.6
1951								
Jan. 1-31........	26.9	600	154	1,650	92	66	3,560	7.5
Jan. 30 [a]........	20.0	668	196	1,790	92	67	3,760	7.5
Feb. 1-9.........	26.8	596	165	1,650	91	65	3,490	8.0
Feb. 10-28.......	25.9	594	165	1,770	85	62	3,550	7.6
Mar. 1-Apr. 4....	27.3	604	170	1,780	83	62	3,580	7.6
Apr. 5-22........	16.4	646	176	1,800	86	66	3,710	7.7
Apr. 23-27.......	16.8	734	210	2,240	94	61	4,380	7.5
Apr. 28-May 4....	47.6	396	189	1,520	50	48	2,970	7.6
May 5-11.........	62.9	272	153	1,140	32	44	2,310	7.5
May 12-23........	58.3	252	147	940	33	48	1,970	8.1
May 24-27........	59.0	208	136	725	26	50	1,620	7.8
May 28-June 14...	66.4	217	157	760	26	49	1,730	7.7
June 15-29.......	119	133	148	455	16	47	1,210	7.5
June 30-July 30..	173	155	132	555	19	47	1,320	7.5
July 31-Aug. 29..	156	221	113	703	31	55	1,640	7.5
Aug. 30-Sept. 20.	128	250	132	760	35	57	1,770	7.7
Sept. 21-30......	86.9	282	145	850	41	58	1,960	7.8
Weighted average [b]....	67.0	300	142	933	41	57	2,070	...
1951								
Oct. 5-31........	37.9	552	148	1,630	76	62	3,370	7.7
Nov. 2-30........	8.17	672	195	1,850	82	66	3,810	7.8

a Not included in weighted average.
b Represents 100 percent of runoff for water year October 1950 to September 1951.

Table 92.--Chemical analyses, Fivemile Creek near Shoshoni, Wyo.

Records available.--October 1948 to November 1951.
Extremes.--Dissolved solids: Maximum, 3,500 ppm Dec. 12-31, 1949; minimum, 1,140 ppm July 1-24, 1950.
Total hardness: Maximum, 1,030 ppm Sept. 15-24, 1950; minimum, 431 ppm July 1-24, 1950.
Daily specific conductance: Maximum, 4,860 micromhos Feb. 2, 1951; minimum, 1,270 micromhos July 22, 1951

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1948																							
Oct. 19	45	10	0.01	222	53	592	7.2	237	0	1,640	78	0.7	13	0.28	....	2,730	3.71	.....	772	578	62	3,450	7.7
1949																							
Sept. 1	206	10	.04	131	53	256		168	0	865	39	.5	9.2	....	....	1,450	1.97	.....	545	407	51	1,950	7.4
Sept. 13-30	146	21	.04	136	35	315	4.4	186	0	950	44	.6	9.3	.30	....	2,730	3.71	.....	484	331	58	2,270	7.8
Sept. 16	156	9.2	.01	139	30	344	2.4	176	0	992	44	.7	10	.40	....	1,660	2.26	.....	471	327	61	2,220	7.5
1949																							
Oct. 1-31	64	15	0.01	210	54	568	4.7	240	0	1,670	73	0.9	18	0.30	....	2,730	3.71	472	746	549	62	3,360	7.7
Nov. 1-30	49	......	....	....	....	....	....	......	......	.....	.....	.....	.....	....	3,010	.....	4.09	398	....	....	....	3,560	...
Dec. 1-11	36	......	....	....	....	....	....	......	......	.....	.....	.....	.....	....	3,150	.....	4.28	306	....	....	....	3,650	...
Dec. 12-31	26	......	....	....	....	....	....	......	......	.....	.....	.....	.....	....	3,500	.....	4.76	246	....	....	....	4,060	...
1950																							
Jan. 1-31	19	19	.01	282	70	693	5.0	310	0	2,050	90	1.0	29	.48	....	3,390	4.61	174	992	738	60	4,060	7.7
Feb. 1-28	34	......	....	....	....	....	....	......	......	.....	.....	.....	.....	....	3,330	.....	4.53	306	....	....	....	3,650	...
Mar. 1-31	40	13	.01	255	62	598	5.8	240	0	1,870	80	.9	25	.30	....	3,030	4.12	327	892	695	59	3,600	7.6
Apr. 1-30	45	11	.01	236	61	667	5.2	218	0	1,850	91	1.2	15	.30	....	3,040	4.13	369	840	661	63	3,740	7.9
May 1-5	51	33	.10	234	60	642	6.4	238	0	1,830	87	.9	15	.53	....	3,030	4.12	417	830	635	62	3,760	7.7
May 6-16	116	19	.04	188	37	392	5.8	217	0	1,160	56	.7	11	.10	....	1,980	2.69	620	620	442	58	2,620	7.7
May 17-31	136	18	.04	150	29	269	4.4	203	0	820	38	.7	9.6	.20	....	1,440	1.96	529	492	326	54	1,970	7.6
June 1-30	253	19	.04	150	22	196	4.3	192	0	675	26	.7	9.4	.20	....	1,200	1.63	820	467	310	47	1,620	7.6
July 1-24	298	18	.04	142	19	188	4.1	172	0	650	23	.6	6.6	.20	....	1,140	1.55	917	431	290	48	1,560	7.7
July 25-26	546	15	.04	216	32	228	5.4	186	0	920	26	.8	7.4	.30	....	1,540	2.09	2,270	670	517	42	1,980	7.6
July 27-Aug. 25	295	17	.04	151	22	212	4.1	168	0	725	26	.7	9.5	.30	....	1,250	1.70	996	467	329	49	1,690	7.6
Aug. 26-Sept. 14	234	17	.04	152	25	247	4.3	176	0	815	33	.7	10	.30	....	1,390	1.89	878	482	338	52	1,880	7.7
Sept. 15-24	213	16	.04	322	55	362	6.2	195	0	1,530	42	1.0	5.9	.30	....	2,440	3.32	1,400	1,030	870	43	3,000	7.7

Table 92.--Chemical analyses, Fivemile Creek near Shoshoni, Wyo.--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
1950																							
Sept. 25-30	80	13	0.04	237	48	536	5.1	225	0	1,610	68	1.0	15	0.30	....	2,640	3.59	570	788	603	59	3,360	7.8
Weighted average [a]	121	......	....	....	....	....	....	......	......	.....	.....	.....	.....	.....		1,710	2.33	559	....	....	....	2,190	...
Weighted average [b]	121	......	....	179	32	309	4.6	191	......	1,000	40	.....	11	.....		1,710	2.33	559	578	421	54	2,190	...
1950																							
Oct. 1-31	55.3	......	....	....	....	600	....	243	0	1,730	73	.....	.....	.....	....	.....	.....	....	....	....	62	3,670	7.7
Nov. 1-30	58.1	......	....	....	....	612	....	241	0	1,800	81	.....	.....	.....	....	.....	.....	....	....	....	61	3,790	7.6
Dec. 1-31	47.6	......	....	....	....	576	....	221	0	1,690	79	.....	.....	.....	....	.....	.....	....	....	....	61	3,600	7.7
1951																							
Jan. 1-31	35.9	......	....	....	....	630	....	230	0	1,750	83	.....	.....	.....	....	.....	.....	....	....	....	64	3,740	7.7
Feb. 1-10	30.9	......	....	....	....	736	....	257	0	2,160	99	.....	.....	.....	....	.....	.....	....	....	....	62	4,300	7.7
Feb. 11-28	43.9	......	....	....	....	630	....	224	0	1,920	82	.....	.....	.....	....	.....	.....	....	....	....	60	3,820	8.2
Mar. 1-Apr. 3	41.5	......	....	....	....	636	....	229	0	1,880	80	.....	.....	.....	....	.....	.....	....	....	....	61	3,850	7.6
Apr. 4-23	28.9	......	....	....	....	668	....	242	0	2,010	86	.....	.....	.....	....	.....	.....	....	....	....	60	4,050	7.5
Apr. 24-28	35.4	......	....	....	....	674	....	240	0	2,060	86	.....	.....	.....	....	.....	.....	....	....	....	60	4,100	7.7
Apr. 29-May 5	112	......	....	....	....	362	....	194	0	1,230	47	.....	.....	.....	....	.....	.....	....	....	....	52	2,630	7.7
May 6-12	121	......	....	....	....	276	....	165	0	1,030	36	.....	.....	.....	....	.....	.....	....	....	....	48	2,210	8.1
May 13-24	110	......	....	....	....	261	....	181	8	875	34	.....	.....	.....	....	.....	.....	....	....	....	51	1,980	8.4
May 25-28	122	......	....	....	....	245	....	185	0	790	30	.....	.....	.....	....	.....	.....	....	....	....	52	1,810	7.6
May 29-June 15	149	......	....	....	....	212	....	167	0	655	25	.....	.....	.....	....	.....	.....	....	....	....	54	1,580	7.7
June 16-30	228	......	....	....	....	170	....	172	0	550	20	.....	.....	.....	....	.....	.....	....	....	....	50	1,360	7.5
July 1-31	294	......	....	....	....	182	....	156	0	600	22	.....	.....	.....	....	.....	.....	....	....	....	50	1,430	7.7
Aug. 1-30	276	......	....	....	....	225	....	147	0	675	27	.....	.....	.....	....	.....	.....	....	....	....	57	1,620	7.4
Aug. 31-Sept. 21	248	......	....	....	....	241	....	165	0	745	31	.....	.....	.....	....	.....	.....	....	....	....	55	1,760	7.8
Sept. 22-30	180	......	....	....	....	298	....	185	0	870	38	.....	.....	.....	....	.....	.....	....	....	....	58	2,020	7.6
Weighted average [c]	119	......	....	....	....	305	....	d178	......	932	38	.....	.....	.....	....	.....	.....	....	....	....	57	2,090	...

1951																							
Oct. 5-31.......	67.6	......	....	....	....	560	....	191	0	1,610	72	.....	.....	.....	....	.....	.....	....	....	....	63	3,370	7.7
Nov. 2-30.......	36.1	......	....	....	....	624	....	265	0	1,770	70	.....	.....	.....	....	.....	.....	....	....	....	63	3,720	7.9

a Represents 100 percent of runoff for water year October 1949 to September 1950.
b Includes estimates for missing chemical data for water year October 1949 to September 1950.
c Represents 100 percent of runoff for water year October 1950 to September 1951.
d Includes carbonate as bicarbonate.

Table 93.--Chemical analyses, Muddy Creek near Pavillion, Wyo.

Records available.--September 1949 to April 1951.
Extremes.--Dissolved solids: Maximum, 1,780 ppm Dec. 8, 1949; minimum, 1,130 ppm Mar. 20, 1950.
Total hardness: Maximum, 1,040 ppm Dec. 8, 1949; minimum, 684 ppm Mar. 20, 1950.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids		Hardness as $CaCO_3$		Percent sodium	Specific conductance (micromhos at 25°C)	pH
															Sum	Tons per acre-foot	Calcium, magnesium	Noncarbonate			
1949																					
Sept. 5...	a 1.8	14	0.02	212	91	185		258	0	1,020	19	0.9	2.3	0.30	1,670	2.27	903	691	31	2,060	7.4
Dec. 8....	.4	20	.04	211	126	172		350	0	1,050	24	1.2	1.7	.....	1,780	2.42	1,040	753	26	2,150	7.7
1950																					
Mar. 20...	13	22	.02	154	73	98		256	0	635	14	1.0	3.9	.15	1,130	1.54	684	474	24	1,460	7.6
May 26....	a 4.6	16	.10	182	100	151		260	0	910	20	1.0	1.8	.20	1,510	2.05	865	652	27	1,990	7.7
Sept. 18..	a 6.2	14	.06	174	72	115		242	0	728	14	.9	2.2	.30	1,240	1.69	731	523	25	1,600	7.8
Oct. 13...	a 6.8	17	.10	159	76	121		244	0	725	12	.8	.6	.24	1,230	1.67	710	510	27	1,590	7.9
1951																					
Mar. 30...	5.0	14	.10	160	85	146		194	0	845	16	.8	2.8	.12	1,370	1.86	749	590	30	1,750	8.3
Apr. 18...	a 5.0	14	.04	186	93	167		278	0	920	14	.8	2.3	.18	1,530	2.08	847	619	30	1,920	8.2

a Discharge at time of sampling.

Table 94.--Chemical analyses, Muddy Creek near Shoshoni, Wyo.

Records available.--September 1949 to August 1951.
Extremes.--Dissolved solids: Maximum, 4,230 ppm Sept. 4, 1949; minimum, 310 ppm July 16, 1951.
Total hardness: Maximum, 2,220 ppm Sept. 4, 1949.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Percent sodium	Specific conductance (micromhos at 25°C)	pH
															Residue on evaporation at 180°C	Sum	Tons per acre-foot	Calcium, magnesium	Noncarbonate			
1949																						
Sept. 4	0.9	26	0.02	448	267	493		482	0	2,690	61	1.8	1.4	0.54	....	4,230	5.75	2,220	1,830	33	4,670	7.1
Dec. 8	.3	20	.04	318	195	400		372	0	2,000	52	1.4	.7	.....	....	3,170	4.31	1,600	1,300	35	3,430	7.6
1950																						
Feb. 28	5.2	32	.04	190	82	148		218	0	890	16	1.0	3.7	.30	....	1,470	2.00	811	632	28	1,720	7.9
May 25	a 3.7	17	.02	242	141	254		244	0	1,420	38	1.4	2.7	.30	....	2,240	3.05	1,180	980	32	2,780	7.7
Aug. 23	a 20	16	.02	93	30	71		178	0	333	11	.5	1.5	.10	658	.....	.89	356	210	30	916	7.9
Sept. 18	a 15	18	.02	106	38	82		184	0	413	12	.5	2.0	.10	794	.....	1.08	422	271	30	1,070	8.0
Oct. 13	a 5.0	16	.04	207	96	177		246	0	1,020	20	1.0	1.2	.30	....	1,660	2.26	910	708	30	2,070	7.7
1951																						
Apr. 18	a 3.5	14	.04	257	130	250		268	0	1,400	25	1.2	3.8	.23	....	2,210	3.01	1,180	960	32	2,610	8.1
June 3	a 80	......	....	....	....	45	....	140	0	235	5.0	.....	.....	.....	478	.....	.65	....	....	27	697	8.0
July 16	a 41	......	....	....	....	26	....	142	0	118	4.0	.....	.....	.....	310	.....	.42	....	....	23	475	8.2
Aug. 20	a 45	......	....	....	....	27	....	134	0	122	5.0	.....	.....	.....	312	.....	.42	....	....	24	467	8.1

a Discharge at time of sampling.

Table 95.--Chemical analyses, Bighorn River at Thermopolis, Wyo.

Records available.--April 1947 to September 1952.
Extremes.--Dissolved solids: Maximum, 728 ppm Aug. 1-31, 1948; minimum, 166 ppm June 26, 1950.
Total hardness: Maximum, 346 ppm Apr. 1-10, 11-20, 1947; minimum, 92 ppm June 26, 1950.
Daily specific conductance: Maximum, 1,270 micromhos Apr. 26, 1947; minimum, 245 micromhos June 11, 1948.

[Analytical results in parts per million except as indicated]

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH	Phenolic material (phenol)
1947																							
Apr. 1-10	879	9.0	0.06	86	32	96	14	208	2	355	19	0.5	2.5	0.06	726	0.99	1,720	346	172	36	1,020	8.3	....
Apr. 11-20	942	9.0	.06	86	32	96	8.8	216	0	347	18	.4	2.0	.06	709	.96	1,800	346	169	37	1,000	8.1	....
Apr. 21-30	1,370	10	.06	82	32	95	15	208	0	349	17	.4	2.8	.06	710	.97	2,630	336	165	37	1,000	8.3	....
May 1-10	4,640	14	.08	52	16	30	7.2	158	0	126	6.0	.3	.8	.17	335	.46	4,200	196	66	24	496	8.2	....
May 11-20	5,810	11	.06	35	11	19	8.8	117	0	79	3.9	.2	2.0	.17	234	.32	3,670	133	37	23	350	8.3	....
May 21-30	4,490	9.0	.05	34	11	10	14	106	0	74	4.0	.2	.5	.17	222	.30	2,690	130	43	13	333	8.1	....
June 1-9	4,370	21	.05	33	10	22	8.0	114	0	75	4.0	.2	.4	.10	234	.32	2,760	123	30	26	341	8.1	....
June 10-12	6,420	17	.10	34	9.2	15	8.8	110	0	66	5.0	.2	1.1	.....	214	.29	3,710	123	33	20	306	7.6	....
June 13-14	8,430	20	.10	44	18	56	15	144	0	188	7.0	.2	.8	.....	422	.57	9,610	184	66	38	612	7.7	....
June 15-16	8,190	20	.08	42	16	26	6.4	144	0	110	2.0	.2	1.5	.....	298	.41	6,590	171	53	24	427	7.9	....
June 17-21	10,500	16	.06	34	12	15	5.2	118	0	66	2.0	.3	.5	.....	226	.31	6,410	134	37	19	340	7.9	....
June 22-24	15,800	18	.02	49	13	32 (Na + K)		126	4	120	6.7	.4	1.2	.....	306	.42	13,200	176	67	30	462	8.3	....
June 25-27	11,400	16	.02	39	12	16	.8	118	0	71	4.8	.3	.0	.07	213	.29	6,560	147	50	19	329	8.2	....
June 28-July 6	8,720	21	.02	40	13	21	1.6	120	4	92	5.3	.2	.3	.....	261	.35	6,140	153	49	23	405	8.3	....
July 7-15	7,790	16	.02	31	7.9	14	3.2	100	0	53	3.8	.2	.0	.09	176	.24	3,700	107	25	21	273	8.1	....
July 16-21	5,360	18	.02	38	9.8	19	3.6	110	0	78	5.0	.2	.0	.....	220	.30	3,180	135	45	23	338	8.2	....
July 22-23	6,240	24	.02	45	10	27	3.2	83	0	124	5.7	.4	.4	.....	266	.36	4,480	153	85	27	391	8.0	....
July 24	5,970	24	.04	63	9.0	60 (Na + K)		150	0	181	6.0	.4	3.9	.....	394	.54	6,350	194	71	40	546	8.1	....
July 25-Aug. 1	3,880	17	.08	42	10	27	3.6	99	4	107	5.8	.2	.0	.11	242	.33	2,540	146	59	28	370	8.3	....
Aug. 2	2,980	18	.04	70	11	68 (Na + K)		160	0	212	10	.4	.5	.....	504	.69	4,060	220	89	40	642	7.9	....
Aug. 3-10	2,990	18	.02	48	12	46	3.2	112	4	151	8.7	.3	.1	.15	337	.46	2,720	169	71	37	505	8.3	....
Aug. 11-15	3,660	15	.02	50	12	45	3.2	113	4	149	7.5	.3	.2	.02	336	.46	3,320	174	75	35	502	8.4	....
Aug. 16-21	2,060	16	.08	52	15	54	3.2	120	3	194	12	.3	.2	.....	416	.57	2,310	191	87	38	624	8.3	....
Aug. 22-Sept. 30	1,100	10	.20	72	22	91	3.6	158	7	302	15	.3	1.6	.14	604	.82	1,790	270	129	42	856	8.3	....
Weighted average [a]	4,068	16	0.05	44	13	31	5.7	b 127	......	118	6.2	0.3	0.7	.....	299	0.41	3,280	163	59	28	443	...	....
Weighted average [c]	2,464	16	....	49	15	39	5.4	b 138	......	143	7.7	.....	.....	.....	349	0.47	2,320	184	71	31	506	...	....

See footnotes at end of table.

Table 95.--Chemical analyses, Bighorn River at Thermopolis, Wyo.--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH	Phenolic material (phenol)
1947																							
Oct. 1-9........	1,620	14	0.06	54	18	54	6.8	143	5	188	9.0	0.4	1.5	0.07	418	0.57	1,830	209	84	35	600	8.3	....
Oct. 10-Nov. 5...	1,210	15	.02	66	25	71	6.8	164	7	246	14	.3	1.2	.05	526	.72	1,720	267	121	36	710	8.4	....
Nov. 6-30........	1,070	12	.03	72	25	63	2.8	187	0	243	13	.3	1.6	.08	522	.71	1,510	282	129	32	759	8.0	....
Dec. 1-31........	756	16	....	82	30	89	2.4	216	0	296	17	.4	2.2	.17	660	.90	1,350	328	151	37	898	8.2	....
1948																							
Jan. 1-31........	818	18	.00	76	26	79	2.8	199	0	254	16	.4	1.9	.07	591	.80	1,310	296	133	36	809	8.2	....
Feb. 1-29........	989	18	.00	75	24	73	2.0	178	8	252	16	.4	2.3	.11	576	.78	1,540	286	128	35	780	8.3	....
Mar. 1-31........	1,170	17	.00	77	26	82	2.4	176	6	282	15	.4	2.5	.15	624	.85	1,970	299	145	37	829	8.4	....
Apr. 1-30........	1,210	15	.00	70	26	67	3.2	173	6	238	14	.4	1.3	.10	569	.77	1,860	282	130	34	771	8.3	....
May 1-31.........	2,670	26	.08	52	13	38	3.6	145	5	117	5.0	.3	1.8	.02	358	.49	2,580	183	56	31	497	8.2	....
June 1-30........	5,640	24	.02	41	6.8	26	1.6	124	0	85	3.0	.1	1.3	.06	260	.35	3,960	130	28	30	354	8.1	....
June 24 d........	5,360	16	.00	52	12	59		124	0	186	7.0	.2	2.6	.06	415	.56	6,010	179	77	42	632	7.7	....
July 1-31........	2,130	25	.02	39	10	44	5.2	127	0	132	7.0	.3	1.4	.07	350	.48	2,010	138	34	40	455	8.0	....
Aug. 1-31........	800	24	.04	77	22	120	11	188	0	341	18	.5	2.9	.00	728	.99	1,570	283	129	47	918	8.1	....
Sept. 1-30.......	1,020	19	.03	63	18	98	6.0	163	5	278	18	.4	1.8	.00	582	.79	1,600	231	89	47	754	8.2	....
Weighted average e.....	1,633	21	0.03	57	16	55	3.6	b 151	......	179	9.5	0.3	1.7	0.07	437	0.59	1,920	208	79	36	590	...	....
1948																							
Oct. 1-31........	866	18	0.04	63	25	101	6.0	184	8	267	17	0.4	1.5	0.00	640	0.87	1,500	260	96	45	828	8.3	....
Nov. 1-30........	734	19	.03	77	30	92	14	201	12	296	17	.4	1.9	.00	670	.91	1,330	315	131	38	858	8.4	....
Dec. 1-31........	649	18	.01	81	24	77	3.6	220	0	251	16	.4	2.2	.15	616	.84	1,080	300	120	35	877	8.0	....
1949																							
Jan. 1-31........	595	17	.01	78	22	71	2.0	190	8	250	16	.4	2.7	.18	572	.78	919	285	116	35	819	8.4	....
Feb. 1-9.........	644	23	.04	48	24	67	9.6	149	0	234	13	.4	2.9	.20	510	.69	887	219	97	39	764	8.0	....
Feb. 10-28.......	744	17	.02	68	24	70	5.6	168	12	248	14	.4	3.1	.20	550	.75	1,100	268	111	36	820	8.4	....
Mar. 1-22........	1,010	18	.06	71	27	89	5.6	188	0	312	16	.4	3.8	.25	666	.91	1,820	288	134	40	960	8.1	....
Mar. 23-30.......	1,090	21	.02	71	26	87	4.8	164	12	304	16	.4	3.4	.25	656	.89	1,930	284	130	39	943	8.2	....

Mar. 31-Apr. 27..	1,080	21	.02	73	28	76	4.0	168	16	282	14	.4	3.0	.20	628	.85	1,830	297	133	25	912	8.3	....
Apr. 28..........	1,980	23	.04	55	16	39	1.6	182	0	130	7.4	.2	2.9	.....	392	.53	2,100	203	54	29	586	7.4	....
Apr. 29-30.......	2,430	21	.04	48	15	39	2.4	144	8	119	7.0	.4	1.5	.15	334	.45	2,190	182	51	32	511	8.3	....
May 1-31.........	3,340	20	.02	43	11	39	6.0	138	0	114	8.0	.3	2.2	.20	312	.42	2,810	153	40	35	453	8.2	....
June 1-11........	4,010	15	.04	39	9.6	29	4.8	113	0	104	4.8	.3	2.0	.10	272	.37	2,940	137	44	31	407	7.9	....
June 12-20.......	6,630	17	.04	32	7.3	22	2.4	100	0	72	3.4	.2	1.7	.10	216	.29	3,870	110	28	30	322	7.6	....
June 21..........	8,130	18	.06	46	9.5	21		138	0	76	3.6	.2	2.0	.....	252	.34	5,530	154	41	23	326	7.4	....
June 22-30.......	4,650	16	.06	32	6.5	29	1.6	96	0	88	4.4	.2	1.6	.10	242	.33	3,040	107	28	37	346	7.3	....
July 1-31........	2,340	17	.03	50	13	50	4.0	137	0	162	10	.2	2.0	.10	392	.53	2,480	179	67	37	585	7.2	....
Aug. 1-31........	839	16	.02	78	22	107	5.2	177	0	338	18	.5	3.2	.10	694	.94	1,570	285	140	44	1,000	7.9	....
Sept. 1-30.......	1,190	11	.04	64	19	77	1.2	168	0	245	14	.2	2.3	.13	516	.70	1,660	238	100	41	807	7.9	....
Weighted average f.....	1,552	17	0.03	53	16	55	4.5	b 152	......	179	10	0.3	2.2	0.13	426	0.58	1,780	199	74	37	616	...	....
1949																							
Oct. 20..........	1,700	14	0.06	60	20	59		174	0	189	14	0.2	2.1	.....	462	0.63	.....	232	89	36	674	7.3	....
Nov. 4...........	g 1,330	11	.04	64	19	88		177	0	249	15	.5	2.1	.....	552	.75	.....	238	93	45	772	7.7	....
Nov. 6...........	1,240	12	.04	63	23	72		178	0	229	16	.2	2.0	.....	532	.72	.....	252	106	39	762	7.4	....
Dec. 2...........	g 930	13	.02	66	20	81		192	0	230	15	.6	3.2	0.20	552	.75	.....	247	90	42	813	7.7	....
1950																							
Jan. 16..........	g 676	16	.02	74	25	79		216	0	249	14	.2	4.2	.....	576	.78	.....	288	111	38	833	7.6	....
Feb. 13..........	g 776	20	.02	67	23	70		192	0	225	13	.2	3.8	.20	540	.73	.....	262	105	37	767	7.8	....
Mar. 17..........	g 930	22	.02	72	26	79		200	0	260	14	.4	3.8	.....	608	.83	.....	287	123	38	843	7.6	....
Apr. 13..........	g 830	22	.04	84	23	114		212	0	330	21	.4	4.2	.20	706	.96	.....	304	130	45	1,040	7.8	....
May 17...........	g 1,840	18	.02	68	19	68		204	0	199	13	.4	3.0	.....	548	.75	.....	248	81	38	742	7.5	....
June 26..........	g 9,100	13	.04	28	5.4	17		88	0	50	2.5	.2	.8	.10	166	.23	.....	92	20	28	255	7.5	....
July 1...........	g 6,820	16	.06	32	5.9	24		90	0	73	3.8	.2	1.1	.....	204	.28	.....	105	31	33	307	7.2	....
Aug. 1...........	g 2,730	16	.02	51	10	49		120	0	160	7.5	.3	1.3	.25	362	.49	.....	170	72	39	550	7.6	....
Sept. 1..........	1,000	13	.08	109	4.6	112		181	0	343	18	.5	3.2	.....	694	.94	.....	291	143	46	956	7.6	....
1950																							
Oct. 4 d.........	2,000	......	....	71	14	67	....	172	0	208	12	.....	2.6	0.20	494	0.67	2,670	234	93	39	646	...	....
Oct. 9 d.........	1,810	13	0.02	56	20	58		162	0	187	14	0.2	1.7	.....	458	.62	2,240	222	89	36	668	7.7	0.001
Nov. 2 d.........	1,370	10	.02	61	22	61		176	0	202	12	.4	1.2	.....	478	.65	1,770	241	97	35	697	7.9	.000
Dec. 13 d........	1,070	12	.04	68	22	75		184	0	241	14	.4	2.3	.....	534	.73	1,540	262	111	38	806	7.7	.000
1951																							
Jan. 1-27........	788	......	....	76	25	79	....	210	0	251	16	....	2.0	.06	636	.86	1,350	294	122	37	904	...	....
Jan. 8 d.........	766	13	.04	75	24	81		197	0	263	15	.4	2.2	.....	584	.79	1,210	284	122	38	870	7.7	.000
Jan. 28..........	722	......	....	71	21	65	....	210	0	223	15	....	2.8	.53	554	.75	1,080	264	92	33	786	8.0	....
Jan. 29-Feb. 28..	913	......	....	71	20	65	....	190	0	211	14	....	2.4	.03	550	.75	1,360	262	106	35	783	...	....

See footnotes at end of table.

Table 95.--Chemical analyses, Bighorn River at Thermopolis, Wyo.--Continued

Date of collection	Mean discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Tons per acre-foot	Dissolved solids: Tons per day	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH	Phenolic material (phenol)
1951																							
Feb. 6 d........	1,270	12	0.04	64	20	67		182	0	208	13	0.4	2.1	.....	488	0.66	1,670	241	92	38	731	7.8	0.000
Mar. 1-31........	1,017	......	....	69	23	71	....	180	0	250	14	.....	3.0	0.08	555	.75	1,520	266	118	36	804	8.0	....
Mar. 1 d........	932	11	.06	71	20	71		187	0	230	14	.4	2.7	.....	528	.72	1,330	260	107	37	784	7.4	.001
Apr. 1-30........	1,169	......	....	66	23	70	....	182	0	241	12	.....	2.9	.10	541	.74	1,710	260	111	36	786	7.8	....
Apr. 3 d........	980	10	.01	83	21	79		197	0	267	16	.4	3.8	.....	634	.86	1,680	295	133	37	893	7.6	.000
May 1-19........	2,047	......	....	58	17	57	....	160	0	197	10	.....	2.9	.12	455	.62	2,520	216	85	35	664	7.2	....
May 7 d........	2,220	11	.02	70	22	69		176	0	239	12	.3	2.6	.....	528	.72	3,170	263	119	36	787	7.8	.000
May 20-24........	4,742	......	....	46	13	39	....	131	0	134	5.5	.....	4.0	.06	342	.47	4,380	167	60	33	502	7.3	....
May 25-29........	7,530	......	....	31	7.9	17	....	103	0	56	3.0	.....	1.9	.16	201	.27	4,090	110	26	25	300	7.3	....
May 30...........	10,100	......	....	42	7.5	17	....	144	0	48	4.0	.....	2.1	.02	222	.30	6,050	136	18	21	332	7.8	....
May 31...........	10,900	......	....	38	8.0	19	....	134	0	53	4.0	.....	1.9	.06	222	.30	6,530	128	18	24	331	7.9	....
June 1-2.........	9,645	......	....	31	6.7	18	....	106	0	54	3.0	.....	1.9	.15	206	.28	5,370	105	18	26	288	7.8	....
June 3-17........	5,470	......	....	38	8.8	25	....	122	0	83	4.5	.....	2.2	.07	252	.34	3,720	131	31	28	374	8.1	....
June 7 d........	4,790	13	.04	42	10	33		132	0	98	5.0	.2	1.9	.....	272	.37	3,520	147	39	33	416	7.8	.000
June 18-21.......	10,360	......	....	32	6.3	15	....	111	0	49	2.5	.....	1.9	.07	192	.26	5,370	106	15	22	282	8.0	....
June 22-24.......	7,083	......	....	32	5.8	19	....	102	0	58	3.0	.....	1.8	.09	201	.27	3,840	104	20	28	293	7.9	....
June 25-July 21..	4,905	......	....	33	8.1	27	....	97	0	90	4.5	.....	1.5	.06	242	.33	3,210	116	36	32	358	7.7	....
July 10 d........	5,100	11	.04	39	7.2	28		116	0	81	4.7	.4	1.0	.....	229	.31	3,150	127	32	32	359	7.7	.000
July 22-23.......	6,635	......	....	41	8.6	36	....	117	0	114	5.0	.....	2.5	.06	296	.40	5,300	138	42	35	438	7.9	....
July 24-31.......	4,266	......	....	40	9.2	34	....	106	0	117	5.5	.....	2.0	.09	287	.39	3,310	138	51	34	433	7.8	....
July 30 d........	4,170	12	.04	50	10	40		132	0	128	7.0	.6	1.6	.....	329	.45	3,700	168	60	34	498	7.6	.000
Aug. 1-14........	3,439	......	....	44	10	41	....	120	0	135	7.5	.....	1.6	.05	326	.44	3,030	153	55	37	492	7.5	....
Aug. 15-31.......	1,384	......	....	62	18	81	....	158	0	247	14	.....	2.1	.11	544	.74	2,030	229	99	43	791	8.0	....
Sept. 1-30.......	1,230	......	....	74	22	90	....	180	0	296	15	.....	2.2	.08	644	.88	2,140	274	126	42	918	7.8	....
Sept. 4 d.......	1,470	11	.02	68	19	88		172	0	264	14	.4	2.2	.....	570	.78	2,260	248	107	43	828	7.4	.000
Weighted average h.....	2,530	......	....	46	12	41	....	132	......	136	7.3	.....	2.1	0.08	346	0.47	2,360	165	57	34	506	...	....
Weighted average i.....	2,200	......	....	49	11	44	....	138	......	146	8.1	.....	2.1	.....	368	0.50	2,190	180	67	34	536	...	....

1951																							
Oct. 1-31	649	...	...	...	...	60	...	...	...	...	...	...	...	...	554	0.75	971	285	...	...	791	...	...
Nov. 1-30	446	...	...	...	...	43	...	...	...	...	...	...	...	...	404	.55	486	210	...	...	596	...	...
Nov. 5 d	290	6.4	0.02	55	18		44	153	0	150	17	0.2	0.5	...	372	.51	291	211	86	31	581	7.7	0.000
Dec. 1-31	515	...	...	...	...	58	...	...	...	...	...	...	...	...	476	.65	662	248	...	...	708	...	...
Dec. 5 d	512	...	...	59	19		55	167	0	182	13	...	...	...	432	.59	597	225	88	35	657	7.4	.000
1952																							
Jan. 1-31	446	...	...	...	...	59	...	...	...	...	...	...	...	...	501	.68	603	262	...	...	735	...	...
Jan. 8 d	480	...	...	66	22		61	189	0	205	13	...	...	...	494	.67	640	254	99	34	730	7.6	.000
Jan. 31 d	388	...	...	69	23		59	198	0	203	15	...	...	0.09	...	...	...	267	105	32	761	7.6	.001
Feb. 1-29	276	...	...	...	...	58	...	...	...	...	...	...	...	...	518	.70	386	282	...	...	765	...	...
Mar. 1-31	270	...	...	...	...	61	...	...	...	...	...	...	...	...	548	.75	399	291	...	...	804	7.9	...
Mar. 4 d	275	...	...	77	24		62	210	0	219	18	...	...	...	...	...	...	290	118	32	805	7.7	.001
Apr. 1-30	437	...	...	...	...	69	...	...	...	...	...	...	...	...	574	.78	677	290	...	...	837	8.1	...
Apr. 2 d	285	...	...	81	27		74	214	0	261	20	...	...	...	...	...	...	314	139	34	898	7.6	.002
May 1-31	849	...	...	...	...	65	...	...	...	...	...	...	...	...	500	.68	1,150	267	...	...	728	...	...
May 13 d	880	...	...	62	22		65	174	0	217	13	...	...	...	...	...	...	245	102	37	739	7.5	.001
June 1-30	1,225	...	...	...	...	45	...	...	...	...	...	...	...	...	373	.51	1,230	185	...	...	561	...	...
June 10 d	1,490	...	...	53	17		54	150	0	174	11	...	...	...	...	...	...	202	79	37	616	7.5	...
June 11 d	3,390	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	.002
July 1-31	1,436	...	...	...	...	41	...	...	...	...	...	...	...	...	327	.44	1,270	164	...	...	505	...	...
July 2 d	1,130	...	...	45	13		49	126	0	133	8.5	...	...	...	...	...	...	167	64	34	502	7.3	.000
Aug. 1-31	1,253	...	...	...	...	44	...	...	...	...	...	...	...	.04	352	.48	1,190	176	...	...	538	...	...
Aug. 5 d	1,340	...	...	48	13		44	131	0	143	8.0	...	...	...	342	.47	1,240	172	65	36	525	7.4	.001
Sept. 1-30	1,141	...	...	...	...	47	...	...	...	...	...	...	...	.05	388	.53	1,200	195	...	...	583	...	...
Sept. 2 d	1,020	...	...	49	14		47	137	0	149	9.5	...	...	...	...	...	...	179	67	36	546	7.4	.000
Sept. 30 d	1,030	...	...	51	16		54	146	0	169	9.5	...	...	...	...	...	...	192	72	38	594	7.8	...
Weighted average j	747	...	...	...	...	51	...	...	...	...	...	...	...	...	423	0.58	853	217	...	...	630	...	...

a Represents 83 percent of runoff for water year October 1946 to September 1947.
b Includes carbonate as bicarbonate.
c Includes estimates for missing chemical data for water year October 1946 to September 1947.
d Not included in weighted average.
e Represents 100 percent of runoff for water year October 1947 to September 1948.
f Represents 100 percent of runoff for water year October 1948 to September 1949.
g Discharge at time of sampling.
h Represents 86 percent of runoff for water year October 1950 to September 1951.
i Includes estimates for missing chemical data for water year October 1950 to September 1951.
j Represents 100 percent of runoff for water year October 1951 to September 1952.

Table 96.--Chemical analyses, unscheduled sampling points in Wind River Basin
[Analytical results in parts per million except as indicated]

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Dissolved solids: Tons per acre-foot	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
Wind River near Dubois																						
1953																						
June 14	1,410	20	....	.....	.....	1.8		74	0	2.0	2.0	0.1	.....	.....	....	.....	.....	62	1	6	143	6.9
Sept. 9	93	40	....	.....	.....	10		96	8	10	.0	.....	.....	.....	....	.....	.....	80	0	22	192	8.6
Wind River below Dubois																						
1951																						
Apr. 9	316	21	0.04	42	11	18		178	0	36	3.0	0.2	1.6	0.00	232	.....	0.32	150	4	21	374	8.4
Apr. 19	a 440	22	.10	38	10	14		164	0	27	2.0	.2	1.6	.00	202	.....	.27	136	2	19	324	8.1
July 17	2,180	25	.10	15	3.0	6.4		72	0	3.0	1.0	.....	.7	.02	96	.....	.13	50	0	22	130	7.9
North Fork Wind River near Dubois																						
1951																						
Apr. 9	150	24	0.04	22	5.9	13		114	0	10	1.0	0.2	1.2	0.00	140	.....	0.19	80	0	26	199	8.2
Apr. 20	229	36	.10	20	6.1	12		108	0	8.0	1.0	.2	1.2	.10	148	.....	.20	75	0	25	186	8.4
July 18	1,150	20	.10	13	3.8	3.9		64	0	1.0	1.0	.2	1.4	.01	80	.....	.11	48	0	15	115	8.0
1953																						
June 14	3,070	20	....	.....	.....	3.5		96	0	2.0	.2	.1	.....	.....	....	.....	.....	74	0	9	164	7.4
Sept. 9	100	28	....	.....	.....	9.9		128	0	15	2.0	.....	.....	.....	....	.....	.....	102	0	17	231	8.0
Wind River near Burris																						
1953																						
June 14	7,090	15	....	.....	.....	2.8		87	0	7.0	1.0	0.5	.....	.....	....	.....	.....	76	5	7	170	7.4
Sept. 8	417	18	....	.....	.....	14		144	0	43	2.0	.....	.....	.....	....	.....	.....	136	18	18	325	8.0
Dry Creek at Burris																						
1953																						
June 16	253	3.5	....	.....	.....	0.3		19	0	3.0	0.5	0.1	.....	.....	....	.....	.....	19	3	3	47.2	6.5
Sept. 8	1.5	10	....	.....	.....	15		156	0	99	3.0	.....	.....	.....	....	.....	.....	202	74	14	442	8.0
Willow Creek near Crowheart																						
1953																						
June 16	88	8.9	....	.....	.....	4.4		55	0	18	0.5	0.1	.....	.....	....	.....	.....	55	10	15	125	7.0
Sept. 8	8.04	9.6	....	.....	.....	22		136	0	250	4.0	.....	.....	.....	....	.....	.....	330	218	12	690	8.1

Bull Lake Creek near Lenore																						
1953 Aug. 18	....	2.1	....	8.5	2.4	3.0		26	0	13	1.5	0.1	0.2	.....	48	.....	0.07	31	10	17	81.9	6.2
Wind River near Crowheart																						
1953 June 14	10,600	15	....	.....	.....	6.7		109	0	20	0.5	0.1	.....	.....	146	.....	0.20	97	8	13	230	7.2
July 13	2,370	14	....	.....	.....	6.4		73	0	21	1.5	.0	.....	.....	106	.....	.14	70	10	17	175	6.9
Aug. 28	965	7.3	....	.....	.....	14		97	0	38	6.0	.....	.....	.....	130	.....	.18	97	17	24	246	7.7
Sept. 8	794	6.1	....	.....	.....	15		106	0	42	3.0	.....	.....	.....	148	.....	.20	102	15	24	262	8.2
Sept. 21	893	6.3	....	.....	.....	15		102	0	42	3.0	.....	.....	.....	150	.....	.20	98	14	25	255	8.2
Wind River above Diversion Dam (NE¼ sec. 23, T. 3 N., R. 2 W.)																						
1948 Oct. 14	....	15	0.02	44	13	19	1.6	167	0	62	8.0	0.3	1.1	0.18	262	.....	0.36	164	27	20	397	7.7
Wyoming Canal near Lenore																						
1948 Sept. 4	....	15	0.05	24	7.0	9.9		84	0	30	7.0	0.1	0.0	0.04	131	.....	0.18	89	20	20	212	7.6
1949 Sept. 16	....	9.6	.01	30	7.6	9.7	3.2	100	0	38	3.6	.1	.7	.18	158	.....	.21	107	25	16	248	7.6
1953 Aug. 18	....	9.2	....	25	7.4	11		92	0	34	3.5	.1	.5	.....	146	.....	.20	93	18	21	235	7.5
Wyoming Canal at Fivemile Creek wasteway																						
1953 Aug. 18	....	......	....	.....	.....	.....	....	......	......	....	.....	.....	.....	.....	....	.....	.....	....	....	....	238	...
Wyoming Canal at Muddy Creek wasteway																						
1953 Aug. 18	....	......	....	.....	.....	.....	....	......	......	....	.....	.....	.....	.....	....	.....	.....	....	....	....	248	...
Wyoming Canal in Dry Cottonwood Creek basin (SE¼ sec. 20, T. 4 N., R. 4 E.)																						
1953 Aug. 18	....	......	....	.....	.....	36		98	0	100	8.0	.....	.....	.....	258	.....	0.35	118	38	40	395	8.0
Pilot Butte Reservoir																						
1949 Sept. 16	....	12	0.01	34	7.9	14	4.0	114	0	52	4.0	0.2	1.3	0.19	188	.....	0.26	118	25	20	294	7.1

a Mean discharge.

Table 96.--Chemical analyses, unscheduled sampling points in Wind River Basin--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids			Hardness as $CaCO_3$		Percent sodium	Specific conductance (micromhos at 25°C)	pH
															Residue on evaporation at 180°C	Sum	Tons per acre-foot	Calcium, magnesium	Noncarbonate			
Pilot Canal near Morton																						
1949 Sept. 16	....	9.6	0.02	29	7.9	19	2.4	104	0	56	4.0	0.1	0.9	0.09	192	.....	0.26	105	20	28	288	7.6
1953 Aug. 18	....	11	....	.....	.....	9.4		94	0	33	2.0	.....	.....	.....	150	.....	.20	94	17	18	234	7.5
Pilot Canal (Sec. 23, T. 2 N., R. 2 E.)																						
1948 Sept. 4	....	22	0.05	28	8.5	12		95	0	44	4.5	0.2	0.0	0.00	166	.....	0.23	105	27	20	271	7.7
Wind River at Le Clair Diversion Dam																						
1948 Oct. 15	....	23	0.04	45	14	21	1.2	150	0	77	7.0	0.3	0.2	0.01	264	.....	0.36	170	47	21	411	8.0
North Popo Agie River near Lander																						
1953 June 14	1,230	5.3	....	.....	.....	2.3		36	0	16	1.0	0.1	.....	.....	....	.....	.....	43	13	10	108	6.3
Sept. 8	14.8	13	....	.....	.....	15		192	0	59	2.0	.....	.....	.....	....	.....	.....	190	33	14	409	8.0
Little Popo Agie River above Red Canyon Creek (Sec. 8, T. 31 N., R. 99 W.)																						
1953 Aug. 18	....	5.5	....	.....	.....	0.2		70	0	1.0	0.0	.....	.....	.....	....	.....	.....	58	1	1	117	7.7
Red Canyon Creek (Sec. 21, T. 31 N., R. 99 W.)																						
1953 Aug. 18	....	24	....	.....	.....	12		296	0	275	4.0	.....	.....	.....	....	.....	.....	508	265	5	909	7.8
Little Popo Agie River at Hudson																						
1953 June 14	609	12	....	.....	.....	11		102	0	55	1.0	0.1	.....	.....	....	.....	.....	119	35	17	291	7.3
Sept. 8	22	7.1	....	.....	.....	107		222	0	558	11	.....	.....	.....	....	.....	.....	546	364	30	1,360	7.6
South Fork Little Wind River (SW¼ sec. 6, T. 1 S., R. 1 W.)																						
1945 May 19	....	4.5	0.08	5.6	1.7	1.5	1.0	22	0	3.3	0.9	0.2	0.6	0.04	37	.....	0.04	21	3	13	50	7.9

North Fork Little Wind River (Sec. 27, T. 1 N., R. 2 W.)																						
1945 May 19.....	....	5.4	0.06	7.6	2.9	2.3	1.0	33	0	6.0	2.1	0.2	1.9	0.00	49	.....	0.06	31	4	13	72	7.9
Hot Springs near Fort Washakie																						
1945 May 18.....	....	......	....	162	41	49		290	0	362	41	2.6	0.1	.....	....	801	1.09	573	336	16	1,180	...
Aug. 18.....	....	34	....	.....	.....	49		280	0	358	43	.....	.....	.....	....	.....	.....	556	326	16	1,170	7.3
Little Wind River near Arapahoe																						
1953 June 14.....	2,040	7.5	....	.....	.....	9.2		64	0	41	2.5	0.1	.....	.....	....	.....	.....	79	27	20	211	6.7
Sept. 10....	5	11	....	.....	.....	129		210	0	545	25	.....	.....	.....	....	.....	.....	494	322	36	1,360	8.0
Beaver Creek near Arapahoe																						
1951 Apr. 2......	a 23	21	0.04	89	22	77		196	0	264	29	0.6	1.6	0.07	622	.....	0.85	313	152	35	902	8.2
Apr. 27.....	33	19	.04	75	20	60		176	0	211	23	.6	1.5	.03	524	.....	.71	269	125	32	758	8.4
1953 June 16.....	16	17	....	.....	.....	63		187	0	210	24	.5	.....	.....	....	.....	.....	269	116	34	750	7.5
Popo Agie River near Riverton																						
1951 Apr. 27.....	340	12	0.04	75	40	95		180	0	368	16	0.4	3.6	0.06	760	.....	1.03	352	204	37	1,040	8.3
1953 June 16.....	4,590	6.6	....	.....	.....	9.0		67	0	41	1.5	.0	.....	.....	....	.....	.....	80	25	20	212	7.0
Sept. 8.....	115	11	....	.....	.....	119		228	0	473	19	.....	.....	.....	....	.....	.....	448	261	37	1,260	7.6
Drain ditch in Riverton Le Clair project (SW¼ sec. 24, T. 1 N., R. 4 E.)																						
1948 Oct. 21.....	....	33	0.02	77	16	171	1.6	343	16	279	16	1.6	7.2	0.29	774	.....	1.05	258	0	59	1,200	8.5
Muskrat Creek near Shoshoni																						
1951 Mar. 30.....	0.3	12	0.04	162	28	227		140	0	820	31	0.4	0.9	0.09	1,410	1,350	1.84	519	404	49	1,840	8.0
Pavillion drain near Pavillion																						
1953 Aug. 19.....	30	......	....	.....	.....	61		140	0	213	9.0	.....	.....	.....	474	.....	0.64	216	101	38	682	7.7

a Mean discharge.

Table 96.--Chemical analyses, unscheduled sampling points in Wind River Basin--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Dissolved solids: Tons per acre-foot	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
Drain into Ocean Lake (SW¼SE¼ sec. 7, T. 2 N., R. 3 E.)																						
1953 Aug. 19.....	18	16	....	.....	.....	53		152	0	100	5.0	.....	.....	.....	318	.....	0.43	120	0	49	490	7.8
Drain into Ocean Lake (Sunnyside drain, NE¼SE¼ sec. 9, T. 2 N., R. 2 E.)																						
1953 Aug. 19.....	11	24	....	.....	.....	95		202	0	298	11	.....	.....	.....	654	.....	0.89	284	118	42	909	7.8
Drain into Ocean Lake (Pilot drain, SW¼SE¼ sec. 33, T. 3 N., R. 2 E.)																						
1948 Sept. 4.....	....	18	0.02	126	29	183		198	0	600	29	0.5	1.9	0.15	1,150	.....	1.56	434	272	48	1,520	7.8
1953 Aug. 19.....	30	19	....	.....	.....	213		238	0	688	23	.....	.....	.....	1,340	.....	1.82	480	285	49	1,690	7.9
Drain into Ocean Lake (Sand Butte Lateral, sec. 34, T. 3 N., R. 2 E.)																						
1947 Sept. 23....	....	4	....	247	61	402		278	0	1,370	56	0.8	6.0	.....	2,390	2,280	3.10	867	639	50	2,930	8.3
Drain into Ocean Lake (SW¼NE¼ sec. 27, T. 3 N., R. 2 E.)																						
1953 Aug. 19.....	30	23	....	.....	.....	188		214	0	475	20	.....	.....	.....	956	.....	1.30	290	115	58	1,320	7.7
Drain into Ocean Lake (SE¼SE¼ sec. 22, T. 3 N., R. 2 E.)																						
1953 Aug. 19.....	7	10	....	.....	.....	11		98	0	35	2.0	.....	.....	.....	154	.....	0.21	96	16	20	242	8.0
Drain into Ocean Lake (NE¼NW¼ sec. 25, T. 3 N., R. 2 E.)																						
1948 Sept. 4.....	....	17	0.02	284	62	199		205	0	1,140	26	1.4	0.4	0.20	2,050	1,830	2.49	964	796	31	2,350	7.8
1953 Aug. 19.....	....	14	....	.....	.....	191		196	0	600	16	.....	.....	.....	1,130	.....	1.54	392	231	51	1,500	7.5

Ocean Lake (Center)																						
1947 Sept. 23	....	0.0	....	143	49	532		152	0	1,390	100	0.6	0.3	0.16	2,320	2,290	3.11	558	433	67	3,110	8.2
1948 June 16	....	4.2	0.03	127	44	556		115	0	1,410	101	.8	.1	.18	2,410	2,300	3.13	498	404	71	3,010	7.7
Ocean Lake at Ocean Lake Rock																						
1948 Sept. 3	....	7.6	0.00	108	47	499		64	5	1,300	94	0.8	0.0	0.07	2,220	2,090	2.84	463	402	70	2,890	8.6
Ocean Lake (Southwest corner)																						
1948 Sept. 2	....	6.1	0.03	107	43	495		65	0	1,280	94	0.8	0.0	0.09	2,230	2,060	2.80	444	391	71	2,920	8.1
Ocean Lake (Quarter of a mile west of outlet)																						
1948 Sept. 3	....	6.7	0.06	106	44	491		62	4	1,260	101	0.7	0.0	0.09	2,250	2,040	2.77	445	388	71	2,920	8.6
Ocean Lake (Deepest part)																						
1948 Sept. 4	....	7.1	0.00	106	45	491		57	6	1,260	103	0.8	0.0	0.21	2,270	2,050	2.79	450	393	70	2,970	8.7
Ocean Lake																						
1950 Aug. 20	....	11	0.02	102	44	551		68	0	1,400	84	0.8	0.1	0.20	2,240	2,230	3.03	436	380	73	2,990	7.4
Ocean drain at Ocean Lake Outlet near Pavillion																						
1953 Aug. 19	15	5.5	....	.....	.....	505		132	0	1,310	74	.....	.....	.....	2,220	.....	3.02	478	370	70	2,880	7.3
Ocean drain near Pavillion																						
1948 Oct. 14	....	17	0.16	118	42	513	4.8	108	0	1,310	86	0.8	1.4	0.18	2,210	2,150	2.92	467	378	70	2,890	7.8
1953 Aug. 19	....	7.6	....	.....	.....	275		136	0	715	41	.....	.....	.....	1,270	.....	1.73	317	205	65	1,740	7.4
Sand Gulch drain and wasteway near Riverton																						
1953 Aug. 19	....	......	....	.....	.....	112		138	0	340	8.0	.....	.....	.....	658	.....	0.89	236	123	51	912	7.9
Coleman drain near Shoshoni																						
1953 Aug. 10	....	......	....	.....	.....	307		262	0	890	20	.....	.....	.....	1,650	.....	2.24	502	287	57	2,110	7.9
Eagle drain near Shoshoni																						
1953 Aug. 19	....	......	....	.....	.....	238		186	0	625	31	.....	.....	.....	1,170	.....	1.59	330	177	61	1,590	7.9

Table 96.--Chemical analyses, unscheduled sampling points in Wind River Basin--Continued

Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Dissolved solids: Residue on evaporation at 180°C	Dissolved solids: Sum	Dissolved solids: Tons per acre-foot	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Specific conductance (micromhos at 25°C)	pH
Lateral P-34.9 near Shoshoni																						
1953 Aug. 19	....	14	....	.....	.....	22		96	0	65	5.0	.....	.....	.....	204	.....	0.28	106	27	31	307	7.7
Fivemile Creek near Shoshoni																						
1953 June 16	202	13	....	.....	.....	161		186	0	465	21	0.5	.....	.....	....	.....	.....	318	165	52	1,270	7.3
Sept. 8	268	9.6	....	.....	.....	202		164	4	568	25	.....	.....	.....	....	.....	.....	328	187	57	1,440	8.4
Poison Creek near Shoshoni																						
1951 Mar. 30	0.3	14	0.04	207	85	790		288	0	2,180	49	1.0	7.6	0.16	3,540	3,480	4.73	866	630	66	4,320	8.2
Apr. 27	1.0	15	.04	233	107	1,040		306	0	2,830	63	1.2	4.9	.23	4,510	4,450	6.05	1,020	769	69	5,350	8.2
Badwater Creek at Lybyer Ranch near Lost Cabin																						
1953 June 16	12	19	....	.....	.....	25		155	0	83	1.5	0.2	.....	.....	....	.....	.....	161	34	25	386	7.3
Badwater Creek at Bonneville																						
1951 Apr. 2	18	15	0.04	116	47	149		232	0	570	14	0.4	3.7	0.00	1,120	1,030	1.40	483	293	40	1,440	8.0
Muddy Creek near Shoshoni																						
1953 June 16	15	14	....	.....	.....	103		162	0	500	20	0.7	.....	.....	....	.....	.....	460	327	33	1,230	7.3
Sept. 8	33	14	....	.....	.....	136		168	0	490	26	.....	.....	.....	....	.....	.....	388	250	43	1,200	7.9
Dry Cottonwood Creek near Bonneville																						
1951 July 17	3.7	.....	....	.....	.....	36	....	126	0	58	4.0	.....	.....	.....	222	.....	0.30	....	......	46	333	8.1
Sept. 19	15	.....	....	.....	.....	101	....	184	0	168	10	.....	.....	.....	436	.....	.59	....	......	65	679	8.3
Boysen Reservoir at U. S. Highway 26 bridge near Shoshoni																						
1953 Aug. 19	....	9.5	....	59	17	70		169	0	205	11	0.3	1.2	.....	466	.....	0.63	218	79	41	690	7.4
Boysen Reservoir near dam																						
1953 June 16	....	3.4	....	65	20	77	3.6	170	0	253	14	0.3	1.1	0.12	532	.....	0.72	245	106	40	804	7.1
Aug. 19	....	4.4	....	57	14	58		143	0	185	11	.2	.9	.....	424	.....	.58	200	83	39	636	7.3
Sept. 9	....	4.1	....	.....	.....	66		148	0	198	8.0	.3	.7	.....	412	.....	.56	196	75	42	648	7.8

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