Quality of Surface Waters for Irrigation Western States 1959

Prepared under the direction of S. K. LOVE, *Chief, Quality of Water Branch*

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PREFACE

This report was prepared by the Geological Survey in cooperation with other State and Federal Agencies by personnel of the Water Resources Division under the direction of L. B. Leopold, chief hydraulic engineer, and S. K. Love, chief, Quality of Water Branch.

The data were collected and computed under supervision of district supervisors, Quality of Water Branch as follows:

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QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES, 1959

INTRODUCTION

The records of chemical analyses, other physical measurements, and discharge given in this report comprise the ninth annual compilation of data for 67 irrigation network stations in operation west of the Mississippi River.

Geological Survey Water Supply Papers 1264 and 1362, the annual compilations for water years 1951 and 1952, respectively, describe briefly the development of this series of reports. In summary, there is an expressed need for comprehensive continuing information about the chemical quality of surface waters used for irrigation and the changes resulting from the drainage of irrigated lands.

In recognition of this problem the Subcommittee on Hydrology, Interagency Committee on Water Resources (formerly the Federal Interagency River Basin Committee) on February 6, 1950, approved a list of 106 network stations on streams in Western United States at which water samples were to be collected and analyzed with particular reference to the use of these streams waters for irrigation. These stations, with pertinent information about periods of operation, are shown in the following table. Of the 106 stations selected, 39 were already being operated by the Geological Survey and 7 by the International Boundary and Water Commission. From the remaining stations on the list, 30 were selected for activation by the U. S. Geological Survey during the fiscal year 1951. In addition, 3 stations previously operated in connection with other programs and scheduled to be discontinued were to be included in the list to be operated by the Geological Survey (the subcommittee amended the list on October 2, 1952, to include the three additional stations, bringing the recommended number of irrigation network stations to a total of 109).

It was contemplated that the network stations would be located at streamflow gaging stations and that the program of collecting and analyzing the samples and reporting the findings would be the

Irrigation-Quality Network Stations in Western United States

[Selected by Subcommittee on Hydrology, Interagency Committee on Water Resources, 1950]

Irrigation network no.	Geological Survey station ident. no.	Stream and location	Date established	Date discontinued
1	5-1240	Souris River near Westhope, N. Dak.	June 1954	.....
2	6-3300	Missouri River near Williston, N. Dak	12- 5-50	.....
3	-4400	Missouri River at Pierre, S. Dak.	10- 3-50	9-30-58
4	-8070	Missouri River at Nebraska City, Nebr.	1- 4-51	.....
5	-2145	Yellowstone River at Billings, Mont	12-15-50	9-30-58
6	-3295	Yellowstone River near Sidney, Mont.	1- 3-51	.....
7	-2595	Bighorn River at Thermopolis, Wyo.	1- 1-51	1-21-54
	-2590	Wind River below Boysen Dam, Wyo	11-24-53	9-30-54
8	-2947	Bighorn River at Bighorn, Mont	10- 2-50	.....
9	-3085	Tongue River at Miles City, Mont.	1- 4-51	.....
10	-3265	Powder River near Locate, Mont	1- 4-51	.....
11	-3580	Grand River near Wakpala, S. Dak.	1-17-51	11-20-53
12	-3610	Moreau River at Promise, S. Dak	.....	.....
13	-4395	Cheyenne River near Eagle Butte, S. Dak.	1-17-51	11-20-53
14	-4520	White River near Oacoma, S. Dak	.....	.....
15	-4760	James River upstream from diversion, at Huron, S. Dak.	Aug. 1956	.....
16	-6420	North Platte River below Alcova Dam, Wyo	.....	.....
17	-6560	North Platte River below Guernsey Reservoir, Wyo .	12- 7-50	9-30-58
18	-7660	Platte River at Brady, Nebr.	2-28-51	.....
18a	-7657	Supply Canal (Tri-County Diversion) near Maxwell, Nebr.	3- 1-51	.....
19	-7640	South Platte River at Julesburg, Colo	10- 1-45	.....
20	.....	Republican River above Medicine Creek at Cambridge, Nebr.	12-22-50	9-30-58
21	-8535	Republican River near Hardy, Nebr	Aug. 1956	Sept. 1957
22	-8655	Smoky Hill River near Langley, Kans	.....	.....
23	-8680	Saline River near Wilson (or Russell), Kans	.....	10- 3-52
	-8695	Saline River near Tescott, Kans	4- 3-50	9-30-53
24	7-1305	Arkansas River below John Martin Reservoir, Colo.	1-10-51	.....
25	-1465	Arkansas River at Arkansas City, Kans	10- 8-51	.....
26	-1525	Arkansas River at Ralston, Okla.	1- 1-50	.....
27	-2505	Arkansas River at Van Buren, Ark.	10- 1-45	.....
28	-1640	Cimarron River at Mannford, Okla	10- 1-49	9-30-52
	-1610	Cimarron River at Perkins, Okla	10- 1-52	.....
29	.....	Canadian River near Tascosa, Tex.	6- 2-48	9-30-53
30	-2450	Canadian River near Whitefield, Okla	9- 1-46	.....
31	-3316	Red River at Denison Dam, near Denison, Tex.	5- 1-44	.....
32	-3280	Washita River near Tabler, Okla	9-10-46	10- 3-52
33	8- 305	Sabine River near Ruliff, Tex	10- 1-47	.....
34	- 410	Neches River at Evadale, Tex	10- 1-47	.....
35	- 665	Trinity River at Romayor, Tex	9- 1-45	.....

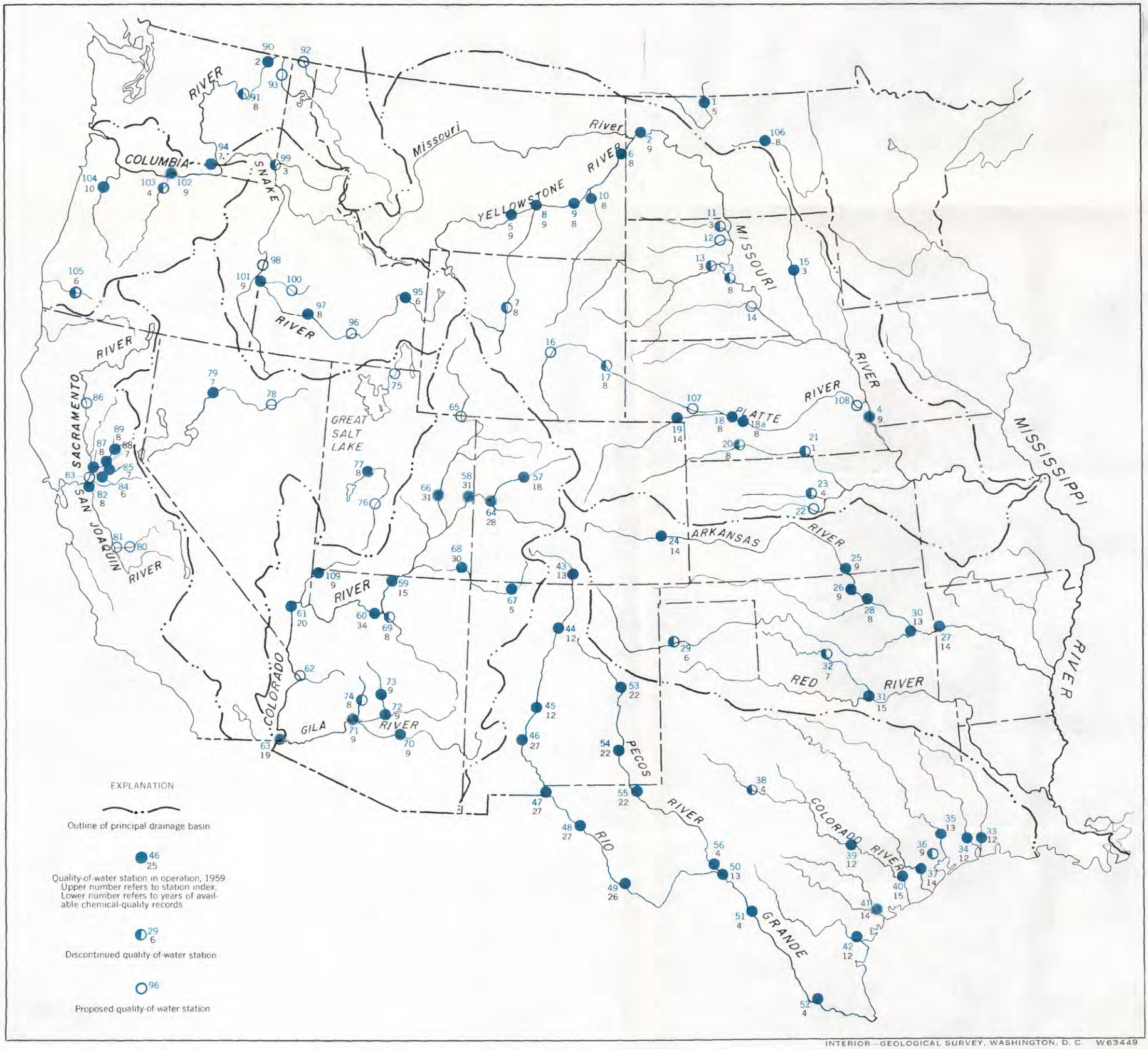
Irrigation-Quality Network Stations in Western United States--Continued

Irrigation network no.	Geological Survey station ident. no.	Stream and location	Date established	Date discontinued
36	.....	San Jacinto River near Huffman, Tex.....	9- 1-45	4- 5-54
37	-1140	Brazos River at Richmond, Tex	9- 1-45	.....
38	.....	Colorado River at Robert Lee, Tex	10- 1-47	9-30-51
39	-1580	Colorado River at Austin, Tex.....	10- 1-47	.....
40	-1620	Colorado River at Wharton, Tex.....	4-11-44	.....
41	-1765	Guadalupe River at Victoria, Tex.....	9- 1-45	.....
42	-2110	Nueces River near Mathis, Tex.....	10- 1-47	.....
43	-2492	Rio Grande above Culebra Creek, near Lobatos, Colo.	10-11-46	.....
44	-3130	Rio Grande at Otowi Bridge, near San Ildefonso, N. Mex.	10-23-47	.....
45	-3585	Rio Grande at San Marcial, N. Mex.....	7- 1-48	Oct. 1954
	-3583	Rio Grande conveyance channel at San Marcial, N. Mex.	Oct. 1954	.....
	-3584	Rio Grande floodway at San Marcial, N. Mex....	Oct. 1954	.....
46	-3610	Rio Grande below Elephant Butte Dam, N. Mex..	1933	.....
47	.....	Rio Grande near El Paso, Tex[a].....	1930	.....
48	.....	Rio Grande below Old Fort Quitman, Tex [a].....	1930	.....
49	.....	Rio Grande at Upper Presidio, Tex [a]	1935	.....
50	.....	Rio Grande at Langtry, Tex[a].....	1945	.....
51	.....	Rio Grande at Eagle Pass, Tex [a]	1938	1-30-55
	.....	Rio Grande at Laredo, Tex[a]	7- 1-55	.....
52	.....	Rio Grande at Roma, Tex[a].....	1944	1-31-55
	.....	Rio Grande at Chapeno, Tex [a].....	July 1955	9-30-56
	.....	Rio Grande at Falcon Dam-U. S. tailrace [a].....	July 1955	.....
53	3845	Pecos River below Alamogordo Dam, N. Mex...	6-26-37	.....
54	-3965	Pecos River near Artesia, N. Mex	7- 1-37	.....
55	-4101	Pecos River below Red Bluff Dam, near Orla, Tex.	7- 1-37	.....
56	.....	Pecos River near Comstock, Tex [a]	1935	Dec. 1954
	.....	Pecos River near Shumla, Tex [a]	1- 1-55	.....
57	9- 725	Colorado River near Glenwood Springs, Colo....	Oct. 1941	.....
58	-1805	Colorado River near Cisco, Utah	Oct. 1928	.....
59	-3800	Colorado River at Lees Ferry, Ariz	10- 1-47	.....
60	-4025	Colorado River near Grand Canyon, Ariz.....	Oct. 1925	.....
61	-4215	Colorado River below Hoover Dam, Ariz-Nev ...	Oct. 1939	.....
62	-4280	Colorado River below Parker Dam, Ariz-Calif..	.....	.....
63	-5255	Colorado River (Yuma Main Canal) below Colorado River Siphon, at Yuma, Ariz.	Oct. 1942	.....
64	-1525	Gunnison River near Grand Junction, Colo.....	Oct. 1931	.....
65	-2255	Green River near Linwood, Utah.....	.....	.....
66	-3150	Green River at Green River, Utah	Oct. 1928	.....
67	-3565	San Juan River near Blanco, N. Mex.....	10- 1-45	12-31-54
	-3555	San Juan River near Archuleta, N. Mex	12-31-54	.....
68	-3795	San Juan River near Bluff, Utah	Oct. 1929	.....
69	-4012	Little Colorado River at Cameron, Ariz.....	1-17-51	9-30-58
70	-4740	Gila River at Kelvin, Ariz	12- 1-50	.....
71	-5195	Gila River below Gillespie Dam, Ariz.....	12- 1-50	.....

Irrigation-Quality Network Stations in Western United States--Continued

Irrigation network no.	Geological Survey station ident. no.	Stream or location	Date established	Date discontinued
72	9-5020	Salt River at Stewart Mountain Dam, Ariz	12- 9-50	
73	-5100	Verde River below Bartlett Dam, Ariz	12- 9-50	
74	-5136	Agua Fria River below Lake Pleasant Dam, Ariz.	12- 1-50	9-30-58
75	10-1180	Bear River near Collinston, Utah		
76	-1915	Sevier River near Marysville, Utah		
77	-2240	Sevier River near Lynndyl, Utah	3-22-51	
78	-3225	Humboldt River at Palisade, Nev		
79	-3350	Humboldt River near Rye Patch, Nev [b]	12-10-51	
80	11-2510	San Joaquin River below Friant Dam, Calif		
81	-2540	San Joaquin River near Mendota, Calif		
82	-3035	San Joaquin River near Vernalis, Calif	3- 1-51	
83		San Joaquin River at Antioch, Calif		
84	-3105	Calaveras River (Stockton diverting canal) at Stockton, Calif.	3- 1-51	10- 3-52
	-2535	San Joaquin River near Biola, Calif [b]	1952	
85	-3255	Mokelumne River at Woodbridge, Calif [b]	3- 1-51	
86	-3780	Sacramento River near Red Bluff, Calif		
87	-3910	Sacramento River at Knights Landing, Calif.	2-26-51	
88	-4250	Feather River at Nicolaus, Calif [b]	2-26-51	
89	-4465	American River at Fair Oaks, Calif [b]	5- 1-51	
90	12-3995	Columbia River at international boundary	11-15-51	9-30-57
	-3995	Columbia River at Northport, Wash	10- 1-57	
91	-4365	Columbia River at Grand Coulee Dam, Wash	11-25-50	9-30-58
92	-3220	Kootenai River at Porthill, Idaho		
93	-3985	Pend Oreille River near Netaline Falls, Wash.		
94	-5105	Yakima River at Kiona, Wash	12-30-52	
95	13- 375	Snake River near Heise, Idaho	1- 8-53	
96	- 815	Snake River near Minidoka, Idaho		
97	-1545	Snake River at King Hill, Idaho	3-27-51	
98	-2690	Snake River at Weiser, Idaho		
99	-3435	Snake River near Clarkston, Wash	11-14-51	Feb. 1956
		Snake River at Central Ferry, near Pomeroy, Wash.	9-28-55	9-30-58
100		Boise River near Arrowrock, Idaho		
101	-2125	Boise River at Notus, Idaho	11-21-50	
102	14-1057	Columbia River near The Dalles, Idaho [c]	12- 1-50	
103	-3010	Deschutes River at Moody, near Biggs, Oreg	Dec. 1952	2-15-54
104	-1910	Willamette River at Salem, Oreg	2- 1-51	
105	-3615	Rogue River at Grants Pass, Oreg	1- 5-53	9-30-58
106	5- 560	Sheyenne River near Warwick, N. Dak	1- 8-51	
107	6-6875	North Platte River at Lewellen, Nebr [d]		
108	-8055	Platte River near Louisville, Nebr [d]		
109	9-4150	Virgin River at Littlefield, Ariz [d]	July 1949	

a Operated by International Boundary and Water Commission.
b Operation suspended October 1958 to September 1959.
c Formerly published as Columbia River at Maryhill Ferry near Rufus, Oreg.
d Stations added by Subcommittee, October 2, 1952



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QUALITY-OF-WATER STATIONS IN WESTERN STATES RECOMMENDED FOR IRRIGATION STUDY

responsibility of the Geological Survey. The scope of the chemical analyses would provide for the calculation of the salt burden of stream and in general would conform with the current Geological Survey standards for the comprehensive investigation of the chemical quality of surface waters.

The following criteria were recommended in the selection of the key network stations.

1. All recommended stations should be located on streams west of the main stem of the Mississippi River.
2. All proposed stations should relate primarily to irrigation although multiple-purpose needs which include irrigation may be considered.
3. All stations should be located at or near streamflow gaging stations. The most nearly up-to-date list of gaging stations currently operated by the U. S. Geological Survey (which comprises all but a small percentage of all gaging stations) will be found in the most recently published Geological Survey water-supply papers for the areas involved.
4. Consideration should be given to the location of irrigation development areas that are now affecting or are likely to affect the chemical quality of the river water.
5. Only those stations should be proposed that are likely to reflect important changes in chemical quality over a period of years. Stations operated for relatively short periods (5 years or less), as would be required for intensive studies of specific projects, should not in general be included.

Plate 1 is a plot of the recommended list of 109 network stations on streams in Western United States. The 67 stations in operation in 1959 are identified by a solid circle. The period of record, in years, is also shown at each of these stations. In a few instances the period of record differs from that obtained from the date established by the Subcommittee, as earlier records were included also. Proposed stations are identified by an open circle.

To facilitate identification, each Geological Survey gaging station and sampling station has been assigned a station number. The station numbers were assigned according to Geological Survey practice in reporting records of streamflow: Stations on tributary streams are listed between stations on the main stem in the order in which those tributaries enter the main stem. However, in this report the numbers will not all appear in increasing numerical order because all the main stem stations on a river are reported before listing the stations on the tributaries.

The complete number for each station has eight digits, but the station number as shown in this report just to the left of the station name consists of only the digits essential for identification. For example, for a station with the complete number 04-0100.00, this station number shown in this report is 4-100.

At the end of the 1958 water year, nine stations were discontinued; Missouri River at Pierre, S. Dak., Yellowstone River at Billings, Mont., North Platte River below Guernsey Reservoir, Wyo., Republican River above Medicine Creek, at Cambridge, Nebr., Little Colorado River at Cameron, Ariz., Agua Fria River below Lake Pleasant Dam, Ariz., Columbia River at Grand Coulee Dam, Wash., Snake River at Central Ferry, near Pomeroy, Wash., and Rogue River at Grants Pass, Oreg. Operations were suspended at seven stations. Humboldt River at Rye Patch, Nev., and the six stations in California. The station at Rye Patch, Nev., is expected to resume operation in the 1960 water year.

Two of the six stations in California resumed operations December 1958; San Joaquin River near Vernalis, and Sacramento River at Knights Landing. Although the data at these two stations represented less than 70 percent of the discharge for the 1959 water year, these data are published in order to give a more representative account of conditions of the quality of water for irrigation in the western states.

ACKNOWLEDGMENTS

Agencies that have each contributed to some part of the data published herein include: The Agriculture Research Service, and the Soil Conservation Service, U.S. Department of Agriculture; the Bureau of Reclamation, U.S. Department of the Interior; the Corps of Engineers, U.S. Department of the Army; the State engineers for each of the 17 Western States and for Louisiana and Arkansas, the State Board of Health, the El Paso, Tex., Department of Water and Sewage; the Ministry of Hydraulic Resources of Mexico.

During 1958-59, the United States Section of the International Boundary and Water Commission operated the stream gaging stations for the following Rio Grande stations included in this report: El Paso, Fort Quitman, Upper Presidio, Langtry, Falcon Dam U.S. tailrace and it operated the station Pecos River near Shumla, also. The Mexican Section operated the stream gaging station on

the main stem at Laredo. Each section operated the gaging stations on the tributary streams, floodways, and diversions within its own country.

Descriptive headings and discharge data for the seven stations operated by the International Boundary and Water Commission, were obtained from Water Bulletins 28 and 29 prepared jointly by the United States and Mexican Sections of the International Boundary and Water Commission. These publications contain stream discharge and related data for 1958 and 1959. Analyses for seven Rio Grande main stem stations and for the Pecos River near Shumla, Tex., were obtained from the U. S. Salinity Laboratory, Riverside, Calif.

Additional contributions of data have been made by individuals, corporations and other State and Federal agencies, and their cooperation is acknowledged with appreciation.

COLLECTION OF SAMPLES

In accordance with the recommendation of the Subcommittee, where practicable, one sample was collected each day throughout the water year. In general, each sample was taken in an 8- or 12- ounce glass bottle provided with a pressure-type or positive-seal closure to prevent escape of dissolved gases. Each sample was integrated in the vertical section of a stream usually at about midpoint of flow by lowering the open sample bottle to the bottom and returning it to the surface during the filling process.

At most stations the samples were collected by local residents hired for the purpose. The local sample collector recorded on each bottle the name of the stream, location, gage height (if practicable), water temperature, time of day, date, and collector's name or initials. Samples were shipped to the laboratory or picked up by technical personnel on a predetermined schedule. Visits were made periodically by technical personnel to check on sampling procedures.

EXAMINATION OF SAMPLES

Upon receipt of samples in the laboratory, they were recorded and stored away from direct sunlight until opened for analysis. Specific conductance was determined with a conductance bridge on each sample as soon as opened. These data provided a basis for compositing a series of daily samples, for complete analysis. In general, a minimum of three composites a month consisting of

equal volumes of approximately 10 daily samples, were prepared for chemical analysis. Individual samples that showed differences in conductance of more than 30 percent of the mean for the period were not included in the composite, but were grouped separately for additional conposite samples—or analysis of the individual sample was made. For those stations where acceptable discharge values were reported with the samples or could be obtained promptly from rating tables, samples were prepared by mixing volumes of individual samples in proportion to water discharge.

The following series of 15 determinations (schedule 1) were made on all composite samples for all new network stations during the first year of operation: Silica, iron, calcium, magnesium, sodium, potassium, bicarbonate, carbonate, sulfate, chloride, fluoride, nitrate, boron, dissolved solids, and specific conductance. The following values were calculated from the analytical data: Dissolved solids in tons per acre-foot, dissolved solids in total tons, total hardness, noncarbonate hardness, and percent sodium.

It was further recommended by the Subcommittee that during the second and third years the following series of 11 determinations (schedule 2) would be made on all composite samples: Calcium, magnesium, sodium, bicarbonate, carbonate, sulfate, chloride, nitrate, boron, dissolved solids, and specific conductance. Hardness, noncarbonate hardness, percent sodium, total tons and tons per-acre-foot would be calculated as in schedule 1.

In the fourth and succeeding years (unless significant changes become apparent) it was recommended that the following determinations (schedule 3) would be made on all composite samples as long as the program is in effect: Calcium and magnesium (either separately, or together by the recently developed ethylenediamine tetraacetic acid titration test for hardness), sodium dissolved solids, and specific conductance. In addition, four complete analyses (schedule 1) would be made each year, one analysis to be made on a composite sample during each quarter. Certain additional determinations above these minimum requirements were to be made if deemed necessary to define widely varying characteristics of the stream water.

All laboratory determinations were to be made in accordance with standard procedures used by the Geological Survey. These procedures are based on methods found in authoritative publications on water analysis.

REPORTING OF DATA

In order to release the data in the form most widely used in the evaluation of irrigation waters, the results of analyses in this compilation are given in equivalents per million, rather than the conventional unit part per million. Some agencies that actively participate in irrigation water-quality investigations prefer to express results in milligrams per liter (mg/1) and milliequivalents per liter (meq/1). However, for all practical purposes where concentrations of dissolved solids are less than about 7,000 parts per million, no correction for density of the water is necessary and the units reported in each method are considered to be synonymous.

If results are desired in parts per million they can be calculated by multiplying the reported values in equivalents per million by the chemical combining weights of the individual constituents. Pertinent physical data and water discharge are also included in the tables.

EXPLANATION OF TABLES

The tables of analyses beginning on page 22 include a brief descriptive heading summarizing the more pertinent features at each station as follows:

Location of Station is given generally as the distance in land or river miles from a town or other political or geographic feature. In Survey practice the term "at" generally implies that the station is within a mile radius of the named town whereas "near" implies that it is beyond a mile radius.

Drainage area above the gaging station was obtained from the most recent published records of the annual reports of the Geological Survey on Surface Water of the United States, and from International Boundary and Water Commission.

Records available are given for all periods during which samples, other than infrequent, were collected for chemical analyses. It does not include the periods for which discharge records are available.

Extremes for the current year and for the period of record are reported for specific conductance and percent sodium because of their widespread application in the evaluation of analyses of water used for irrigation. The results for specific conductance are

based on the measurement made at the laboratory upon receipt of the sample from the field. Data for percent sodium were obtained from composite-samples analysis.

Remarks include sources of data, additional explanation concerning the records, and offices where the records of chemical quality may be obtained.

Discharge of records were obtained from the responsible Geological Survey Surface Water Branch offices except for the seven stations operated by the International Boundary and Water Commission. Discharge data are shown in acre-feet, calculated from the mean daily discharge in cubic feet per second by multiplying by the factor 1.983.

Analytical values are reported in equivalents per million for cations and anions. The equivalent is the weight with reference to some standard (such as the combining weight—either of oxygen, 8, or of hydrogen, 1.008) of that quantity of an element, radical, or compound to complete a definite chemical reaction. An equivalent of an element or ion is exactly equal in combining power to one equivalent of another element or ion. As previously discussed, for concentrations of dissolved solids that are normally encountered in water for irrigation, an equivalent per million is equal to a milliequivalent per liter. Silica, which is considered to be present in the colloidal state, and boron, are reported in parts per million. Percent sodium is calculated as follows:

$\frac{Na \times 100}{Na+K+Ca+Mg}$, where all constituents are reported in equivalents per million.

At the recommendation of the Subcommittee, sodium-adsorption-ratio (SAR) is published for all network stations beginning October 1952. The term is defined and described under "Sodium hazard" on page 20.

DISCUSSION OF RESULTS

Discharge data and dissolved-solids loads for stations operated in 1959 are summarized in the following table.

HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS

Red River of the North basin.— Runoff in the Red River of the North basin in North Dakota was considerably lower in 1959 than in 1958. Precipitation was below normal during the year. Although snow

Summary of water discharge, and tonnages of dissolved solids

Station	Runoff (acre-feet)	Dissolved solids (tons per acre-foot)
Red River of the North basin		
Sheyenne River near Warwick, N. Dak	8,480	0.58
Souris River near Westhope, N. Dak	6,190	----------
Missouri River main stem		
Missouri River near Williston, N. Dak	13,620,000	.55
Missouri River at Nebraska City, Nebr	20,260,000	.59
Yellowstone River basin		
Yellowstone River near Sidney, Mont	7,768,000	.58
Bighorn River at Bighorn, Mont	2,090,000	1.03
Tongue River at Miles City, Mont	276,000	.67
Powder River near Locate, Mont	330,000	1.21
James River basin		
James River upstream from diversion, at Huron, S. Dak	----------	----------
Platte River basin		
Platte River at Brady, Nebr	195,200	.64
Supply Canal (Tri-County Diversion) near Maxwell, Nebr	989,700	.80
South Platte River at Julesburg, Colo	249,200	1.86
Arkansas River basin		
Arkansas River below John Martin Reservoir, Colo	297,600	2.16
Arkansas River at Arkansas City, Kans	1,222,000	1.32
Arkansas River at Ralston, Okla	2,854,000	1.10
Cimarron River at Perkins, Okla	503,100	4.42
Canadian River near Whitefield, Okla	3,024,000	.57
Arkansas River at Van Buren, Ark	15,743,300	.61
Red River basin		
Red River at Denison Dam, near Denison, Tex	1,664,000	1.50
Sabine River basin		
Sabine River near Ruliff, Tex	4,867,000	.15
Neches River basin		
Neches River at Evadale, Tex	3,737,000	.12
Trinity River at Romayor, Tex	3,554,000	.34
Brazos River basin		
Brazos River at Richmond, Tex	3,222,000	.44
Colorado River basin		
Colorado River at Austin, Tex	1,181,000	.34
Colorado River at Wharton, Tex	1,717,000	.31
Guadalupe River basin		
Guadalupe River at Victoria, Tex	1,144,000	.41
Nueces River basin		
Nueces River near Mathis, Tex	600,300	.37
Rio Grande basin		
Rio Grande above Culebra Creek, near Lobatos, Colo	77,610	.37
Rio Grande at Otowi Bridge, near San Ildefonso, N. Mex	509,800	.33
Rio Grande conveyance channel at San Marical, N. Mex	162,700	1.02
Rio Grande floodway at San Marcial, N. Mex	179,100	.58
Rio Grande below Elephant Butte Dam, N. Mex	699,700	.56
Rio Grande near El Paso, Tex	393,600	1.11
Rio Grande below Fort Quitman, Tex	----------	----------
Rio Grande at Upper Presido, Tex	----------	----------
Rio Grande at Langtry, Tex	2,391,000	.68

Summary of water discharge, and tonnages of dissolved solids

Station	Runoff (acre-feet)	Dissolved solids (tons per acre-foot)
Rio Grande basin--Continued		
Rio Grande at Laredo, Tex	4,386,000	0.65
Rio Grande at Falcon Dam - U. S. tailrace	5,871,000	.54
Pecos River below Alamogordo Dam, N. Mex	125,400	1.65
Pecos River near Artesia, N. Mex	125,900	3.78
Pecos River below Red Bluff Dam, near Orla, Tex	61,100	6.99
Pecos River near Shumla, Tex	220,900	2.29
Colorado River main stem		
Colorado River near Glenwood Springs, Colo	1,296,000	.43
Colorado River near Cisco, Utah	3,110,000	1.13
Colorado River at Lees Ferry, Ariz	6,742,000	.98
Colorado River near Grand Canyon, Ariz	6,935,000	1.06
Colorado River below Hoover Dam, Ariz.-Nev	9,757,000	.85
Diversions and return flows at and below Imperial Dam		
Yuma Main Canal below Colorado River siphon, at Yuma, Ariz	340,200	1.01
Gunnison River basin		
Gunnison River near Grand Junction, Colo	951,000	1.22
Green River basin		
Green River at Green River, Utah	2,755,000	.63
San Juan River basin		
San Juan River near Archuleta, N. Mex	374,500	.28
San Juan River near Bluff, Utah	618,100	.86
Virgin River basin		
Virgin River at Littlefield, Ariz	92,860	2.86
Gila River basin		
Gila River at Kelvin, Ariz	187,300	1.14
Gila River below Gillespie Dam, Ariz	18,690	5.58
Salt River below Stewart Mountain Dam, Ariz	451,400	.84
Verde River below Bartlett Dam, Ariz	246,900	.47
Sevier Lake basin		
Sevier River near Lynndyl, Utah	126,800	1.94
San Joaquin River basin		
San Joaquin River near Vernalis, Calif	1,244,000	.48
Sacramento River basin		
Sacramento River at Knights Landing, Calif	.....	.....
Columbia River main stem		
Columbia River at Northport, Wash	84,729,000	.12
Yakima River basin		
Yakima River at Kiona, Wash	3,117,900	.17
Snake River main stem		
Snake River near Heise, Idaho	4,446,000	.30
Snake River at King Hill, Idaho	6,265,900	.45
Boise River basin		
Boise River at Notus, Idaho	395,070	.52
Columbia River main stem		
Columbia River near The Dalles, Idaho	153,222,000	.13
Willamette River basin		
Willamette River at Salem, Oreg	17,380,000	.07

cover was substantial during the winter months, runoff was minimal because the snow melted gradually and was absorbed into the soil.

Runoff for Sheyenne River at Warwick was 50 percent lower than in the previous year, and the dissolved-solids content of the water decreased by 15 percent.

Runoff for Souris River near Westhope was 70 percent lower than in the previous year, and the dissolved-solids content of the water increased by 19 percent. The percent sodium was 49—the highest of the 5 years of record.

MISSOURI RIVER BASIN

Missouri River main stem. —The Missouri River is regulated by the following dams: Canyon Ferry and Fort Peck, upstream from Williston, N. Dak.; Garrison, Oahe, Fort Randall, and Gavins Point (Lewis and Clark Lake), between Williston, N. Dak., and Nebraska City, Nebr.

Total amount of water in storage in the main-stem reservoirs on September 30, 1959, was about 25,900,000 acre-feet, an increase of about 2,760,000 acre-feet over the previous year. Currently, water from all reservoirs is used for power generation, flood control, pollution control, municipal supply, navigation, and recreation. Also, water from Canyon Ferry Reservoir is used for irrigation; eventually, water from other reservoirs will be used for irrigation.

Upstream from Fort Peck Reservoir, Mont., runoff was about 15 percent above the annual average, and precipitation was slightly above the long-term mean. At Williston, N. Dak., runoff increased by 10 percent over the previous year and the dissolved-solids content decreased. Streams in North and South Dakota contributed little runoff to the main-stem flow because of drought conditions that prevailed during the year. At Nebraska City, Nebr., runoff was about the same as that in the 1958 water year, and the dissolved-solids content increased slightly.

The discharge-weighted average of dissolved solids for the 1959 water year was about the same as that for previous years. Average dissolved-solids content at Williston was 405 ppm compared with 415 ppm and at Nebraska City was 433 ppm compared with 432 ppm for the 9-year period 1951-59.

Yellowstone River basin. —Runoff from the Yellowstone River basin in Montana was slightly more in 1959 than in 1958, but it was considerably less than in 1957 and less than the long-term average. Runoff for Yellowstone River at Billings and Tongue River at

Miles City was above the average. The weighted average of dissolved-solids content increased over those for 1957 and 1958 for the Bighorn and Tongue Rivers but decreased for the Powder River and for Yellowstone River near Sidney. Despite the decrease at the Sidney station, the weighted average of dissolved-solids content for 1959 was slightly above the 9-year average. The sodium-adsorption-ratio was about average for all sampling stations.

The concentrations of dissolved solids at Sidney was equal to the 9-year average, although it was considerably less than that for 1957 and slightly less than that for 1958. The Bighorn River contributed 48 percent of the concentration at Sidney compared with 54 percent in 1958 and 52 percent in 1957. The Tongue and Powder Rivers contributed 4 and 9 percent, respectively; in 1958 these streams contributed 3 and 10 percent. Yellowstone River at Billings was discontinued September 30, 1958; however, 8 years of past record indicate that the average annual contribution of dissolved-solids content from the Yellowstone River upstream from Billings was about 29 percent of that at Sidney.

No significant changes in impoundment or diversions were made during the year. About 5,000 acres of new land was brought under irrigation in the Bighorn River basin during 1959. There were no variations in methodology from that proposed for irrigation network stations.

James River basin. — Severe drought conditions existed in the James River basin in South Dakota during the year. Almost no flow was recorded during the entire water year at the gaging station at Huron; runoff for 1959 was 367 acre-feet compared with the 20-year average of 151,300 acre-feet. Samples for chemical analyses were collected upstream from the gage and the diversion.

Platte River basin. — Precipitation in the North Platte River basin was greater during 1959 than during 1958. Runoff at the gaging station below Guernsey Reservoir was less than in 1958 and about 30 percent below the long-term average. The sampling station below Guernsey Reservoir was discontinued September 30, 1958; therefore, no data on chemical quality are available for 1959.

Streamflow in the South Platte River was near normal most of the year. Runoff at Julesburg, Colo., was near average for the period 1951-59, although it was 62 percent less in 1959 than in 1958. The dissolved-solids content increased, but the percentage composition remained about the same as the previous year. The average dissolved-solids content was 1,370 ppm compared with the 9-year discharge-weighted average of 1,210 ppm.

Downstream from the confluence of the North Platte and South Platte Rivers, the degree of concentration depends on the proportional amount of flow entering from these rivers. Water from the

North Platte River is less concentrated than water from the South Platte River. Both runoff and dissolved-solids concentration decreased from the previous year at the stations Platte River at Brady, Nebr., and Supply Canal near Maxwell, Nebr.

LOWER MISSISSIPPI RIVER BASIN

Arkansas River basin . —Runoff in the Arkansas River basin above John Martin Reservoir was much lower than for the preceding two year period. The lower runoff is reflected in the quality of water released from the reservoir by an increase in salinity at Arkansas River below John Martin Dam, Colo.

Streamflow at four irrigation network stations was less during the 1959 water year than during the 1958 water year. The annual discharges in the Arkansas River stations at Arkansas City, Kans., and Ralston, Okla., were approximately 50 percent less than the 1958 values. The decrease in discharge at Arkansas City amounted to slightly more than 1 million acre-feet, and at the Ralston station the decrease was about 2 million acre-feet. The Cimarron River at Perkins showed a drop in streamflow of some 184,000 acre-feet, or about 17 percent less than in 1958. The annual discharge of the Canadian River at Whitefield during 1959 was about 33 percent less than 1958, a decrease of some 1,000,000 acre-feet.

The reduced streamflow in the Arkansas River resulted in an increase in the dissolved-solids content in the water at both irrigation stations. The weighted average dissolved-solids content at Arkansas City increased from 707 ppm in 1958 to 967 ppm in 1959. At the Ralston station, the dissolved-solids content increased from 741 ppm in 1958 to 812 ppm in 1959.

In contrast, the lower discharges recorded at the Cimarron and Canadian River stations during the 1959 water year resulted in decreased weighted average dissolved-solids concentrations. At Perkins the dissolved-solids content in the Cimarron River dropped from 3,530 ppm in 1958 to 3,250 ppm in 1959. This decrease in dissolved-solids content was the result of lower runoff from the basin draining the "Salt Plains" of Oklahoma.

The weighted average dissolved-solids content in the Canadian River at the Whitefield station was 416 ppm in 1959 as compared to 512 ppm in 1958. This decrease in dissolved solids was a result of a decrease in the proportionate amount of water contributed to the Canadian River by the North Canadian and Little Rivers during 1959. These two tributaries in the lower part of the Canadian River basin contribute the major portion of the annual dissolved-solids load to the Canadian River.

Red River basin. —Runoff of the Red River at Denison Dam near Denison, Tex., during the 1959 water year was only 44 percent of the long-time average, and the weighted average of dissolved-solids content, 1.50 tons per acre-foot, was the highest since 1944.

WESTERN GULF OF MEXICO BASINS

From the Sabine to the Nueces River, in the Western Gulf of Mexico basins, the 1959 weighted average dissolved-solids content of all stations increased slightly over 1957 and 1958 levels. Runoff was considerably less than for 1957 and 1958, and was below the long-term averages except at Victoria where the flow of

Colorado River basin. —Runoff in the Colorado River basin shows a decrease from the previous year, and a more or less corresponding increase in salinity.

Rio Grande basin. —Runoff in the Rio Grande basin in New Mexico was less than that of the preceding two years. This was reflected by a generally higher dissolved-solids content in the surface water. However, the effect of the lower runoff was not so conspicuous in in the Rio Grande at Otowi Bridge, near San Ildefonso due to the low flow and delivery of the saline-type water from the San Luis Valley. The effect of the lower flow upon the quality of water of the two stations on the Rio Grande near San Marcial was also slight because two major tributaries (Rio Puerco and Rio Salado) which ordinarily contribute water of poor quality to these stations had a low storm runoff.

Runoff at the station, Pecos River below Red Bluff Dam, near Orla, Tex., was only 34 percent of the 22-year average but was 15 percent greater than in 1958. Weighted average dissolved-solids concentration decreased from 8.02 tons per acre-foot in 1958 to 6.99 in 1959. Storage in Red Bluff Reservoir decreased during the year to 60,000 acre-feet, only about 20 percent of capacity.

COLORADO RIVER BASIN

Colorado River main stem. — Runoff continued to decrease in the upper Colorado River basin for the second consecutive year. Flow was less than that of the previous year throughout the basin and approximately 50 percent of long term average for the station at Cisco.

The percentage composition for the weighted average analysis remained relatively unchanged for the stations at Glenwood Springs, Colo., and Cisco, Utah, although the dissolved-solids

content increased by 21 percent and 50 percent respectively. Dissolved-solids content has nearly doubled at the Cisco station since the 1957 water year. Total loads for both stations were considerably lower than those of the preceding year.

Little or no variation was observed in the quality of the water at the station below Hoover Dam. Both the discharge and total dissolved solids load passing the station were 20 percent less than that reported the preceding year.

Gunnison River basin. —Total dissolved-solids load for the Gunnison River basin decreased by 32 percent as compared to the 1958 water year. A decrease of 60 percent in runoff was reflected by a 69 percent increase in dissolved-solids content. Weighted average dissolved-solids content has increased by slightly more than 100 percent since 1957. The total load for the Gunnison River was approximately 30 percent of that recorded at Cisco.

Green River basin. —An increase of 8 percent in weighted average dissolved-solids and tons per acre-foot was noted at the Green River, Utah station, probably as the result of a continued decrease in runoff in the Green River basin. Percent sodium and SAR increased slightly as compared with the preceding year.

San Juan River basin. —The runoff for the San Juan River at Bluff, Utah for the 1959 water year was 75 percent less than that of the previous year. Total loads decreased by 58 percent. The decrease in runoff was reflected by an increase of 72 percent in the weighted average of dissolved-solids content. The weighted average analysis indicated that the percentage composition of the water remained relatively unchanged. Sodium content continued to be high during periods of low flow.

Virgin River basin. —Runoff for the Virgin River at Littlefield, Ariz., decreased by 68 percent as compared to the previous years flow. A decrease of 48 percent in total load was observed for this station although the dissolved-solids content increased 65 percent. There was little or no change in the percentage composition of the water.

Gila River basin. —The annual runoff in the Gila River at Kelvin, Ariz., was much greater than that of the preceding year, but the water quality of the runoff was relatively the same since this river was not affected by upstream storage and storm runoff.

THE GREAT BASIN

Sevier River basin. —The chemical characteristics of the water and the percent sodium remained relatively unchanged for the Sevier River at Lynndyl, Utah. The weighted average of dissolved solids increased by 10 percent because of a 15 percent of runoff.

Humboldt River basin. —The station for the Humboldt River near Rye Patch, Nev., was not in operation for the period Oct. 1, 1958 to Sept. 30, 1959. Station operations are to be resumed at the beginning of the 1960 water year.

PACIFIC SLOPE BASINS IN CALIFORNIA

Since only two of the six stations in California were in operation for part of the 1959 water year, the chemical data are incomplete. As a consequence, these data must be regarded as pertaining only to that part of the basin where the station is located and not having basin-wide application.

San Joaquin River basin. —Runoff of the San Joaquin River near Vernalis was approximately 20 percent less than the previous year and 35 percent less than the long-term average for the station. Although samples were not collected during the first two months of the water year which was 31 percent of the runoff, weighted averages were based on the flow for the entire water year.

Chemical quality of the outflow declined rather markedly—the weighted dissolved-solids load increased from 0.21 to 0.48 tons per acre-foot and average specific conductance increased. Because of impoundment of water and extensive irrigation in the San Joaquin Valley, the San Joaquin River channel at times carries mainly irrigation-return water of poor quality.

Sacramento River basin. —Runoff of the Sacramento River at Knights Landing was approximately 60 percent less than the previous year and slightly greater than the 1957 water year. Samples were not collected during the first two months of the water year and weighted averages were not determined for this station.

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

Columbia River main stem. —The discharge at Northport, Wash., increased 29 percent as compared with last years flow. Water quality remained relatively unchanged for the 1959 water year.

The total dissolved-solids content increased only 4 percent over the previous year.

Yakima River basin. —Based on the previous year, there was a 46 percent increase in discharge and a 24 percent decrease in dissolved-solids content and in tons per acre-foot.

SNAKE RIVER BASIN

Snake River main stem. —The record for the Snake River at Heise, Idaho was similar to that of the preceding year. Little or no change was observed in the chemical quality of the water at this station. Total loads increased by less than 2 percent as the result of a very slight increase in runoff.

Although the discharge at the King Hill station decreased from the 1958 water year, the tons per acre-foot of dissolved-solids remained essentially the same.

Boise River basin. —A marked decrease in discharge over the previous year caused a 200 percent increase in dissolved-solids content.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

Columbia River main stem. —An increase in discharge decreased the dissolved-solids content but the tons per acre-foot remained very nearly the same as last year.

Willamette River basin. —The discharge increased slightly over the 1958 water year. Values for tons per acre-foot of dissolved solids remained the same as those for last year.

CRITERIA OF WATER QUALITY

Many different classifications of water for irrigation appear in the literature; however, most of the development in this field has been made in the last 30 years. Scofield and Headley (1921) were among the first important contributors to water-quality criteria; they pointed out the hazards from the use of high-sodium water. A brief historical resume of these early developments is given in Water-Supply Paper 1264, the first of this series of reports.

Although the above classifications have relied principally on specific conductance as the criterion for total salt concentrations,

investigators generally place emphasis on the composition of the water, as indicated by the analysis of dissolved constituents in equivalents per million. For example, Eaton (1950) discusses precipitation of calcium and magnesium carbonate and its effects on the sodium percentage in the soil solution. Eaton's suggestion of "residual sodium carbonate" in irrigation waters as related to the base exchange of the soil has assumed added importance in soil permeability studies.

Thorne and Thorne (1951) in developing a system for classifying Utah waters for irrigation used a diagram similar to that of Wilcox (1948) and designated categories by a series of numbers and letters: 1A.....5E. The numbers 1 to 5 denote increasing concentrations of dissolved solids, and the letters A to E increasing sodium percentages in the water with increasing probabilities for developing alkali soil conditions. Class 1A water, in which specific conductance ranges from 0 to 750 micromhos and the percent sodium from 0 to an approximate maximum of 70, can be used safely on most soils. Class 5E waters, those having specific conductance greater than 5,000 micromhos and percent sodium of about 90 and above, are generally unsatisfactory for irrigation.

The United States Salinity Laboratory Staff (1954) recently released a classification that incorporates many of the desirable features of the early classifications together with more recent developments. Empirical equations are used in developing a diagram for the classification of irrigation waters. Although the classification embodies both research and field observations, it is tentative and should be used for general guidance only.

A. Salinity hazard

Waters are divided into four classes: low salinity, medium salinity, high salinity, and very high salinity, the dividing points between classes being 250, 750, and 2,250 micromhos per centimeter. They range from water that can be used for irrigation of most crops on most soils to that which is not suitable for irrigation under ordinary conditions.

B. Sodium hazard

The Salinity Laboratory introduced the term "Sodium-adsorption-ratio (SAR)," a ratio for irrigation waters and soil extracts used to express the relative activity of sodium ions in exchange reactions with the soil. This ratio is expressed by the

equation:

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

where the concentrations of the ions are expressed in milliequivalents per liter (or equivalents per million for most irrigation waters). It has more significance than percent sodium for use as an index of the sodium or alkali hazard of the water because it relates more directly to the adsorption of sodium by the soil.

Waters are divided into four classes with respect to sodium or alkali hazard: low, medium, high, and very high, depending upon the SAR value and the specific conductance. At a conductance of 100 micromhos per centimeter the dividing points are at SAR values of 10, 18, and 26, but at 5,000 micromhos the corresponding dividing points are at SAR values of approximately 2.5, 6.5, and 11. Waters range in respect to sodium hazard from those which can be used for irrigation on almost all soils to those which are generally unsatisfactory for irrigation.

C. Boron hazard

In assessing water quality on the basis of boron only, the classification uses the limits proposed by Scofield (1936). This grouping involves the ranges for sensitive, semitolerant, and tolerant crops, with respect to boron, for each of five classes.

D. Bicarbonate ion hazard

The effect of bicarbonate ion concentration on water quality is expressed in terms of "residual sodium carbonate" (RSC) which is defined by the equation:

$$RSC = (HCO_3^- + CO_3^{--}) - (Ca^{++} + Mg^{++})$$

Then in appraising quality of irrigation water with the above classifications, the Salinity Laboratory Staff recommends that first consideration be given to salinity and alkali hazards, then to independent characteristics, boron or toxic elements, any one of which may change the quality rating. Factors such as drainage and management practices, largely determine the effectiveness of irrigation activity.

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RED RIVER OF THE NORTH BASIN

5-560. SHEYENNE RIVER NEAR WARWICK, N. DAK.

LOCATION.--At gaging station at highway bridge, 3.3 miles south of Warwick, Benson County.
DRAINAGE AREA.--2,100 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1959.
Water temperatures: January 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,350 micromhos Mar. 14; minimum daily, 429 micromhos Aug. 4.
Percent sodium: Maximum, 39 June 28 to July 7; minimum, 10 Aug. 15-31.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 1,940 micromhos Feb. 1, 1955; minimum daily, 240 micromhos Apr. 4, 1955.
Percent sodium: Maximum, 66 July 8-18, 1955; minimum, 10 Aug. 15-31, 1959.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for water year October 1958 to September 1959 given in WSP 1628.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-19, 1958 ..	134	--	4.22		0.96	--	4.08	--	--	--	--	--	294	0.40	54	19	0.7	479	7.4
Oct. 20-Nov. 15 ..	121	--	4.40		1.96	--	4.77	--	--	--	--	--	365	.50	61	31	1.3	597	7.4
Nov. 16-Dec. 31 ..	528	16	3.09	2.81	3.39	0.19	6.83	2.12	0.54	0.02	0.15	0.19	540	.73	385	36	2.0	851	7.7
Jan. 1-19, 1959 ..	135	--	6.06		2.31	--	6.42	--	--	--	--	--	479	.65	88	28	1.3	752	7.7
Jan. 20-Feb. 27 ..	196	--	5.28		1.17	--	5.18	--	--	--	--	--	370	.50	98	18	.7	590	7.6
Feb. 28-Mar. 8 ..	59	--	5.54		1.31	--	5.61	--	--	--	--	--	392	.53	31	19	.8	616	7.9
Mar. 9-15	84	--	9.04		3.35	--	9.69	--	--	--	--	--	698	.95	80	27	1.6	1,060	8.0
Mar. 16-19	179	35	5.49	4.43	3.13	.23	10.15	2.35	.59	.03	.03	.16	728	.99	177	24	1.4	1,090	8.1
Mar. 20	244	--	11.44		3.57	--	11.96	--	--	--	--	--	853	1.16	283	24	1.5	1,270	8.2
Mar. 21-26	1,420	--	4.10		2.52	--	4.33	--	--	--	--	--	423	.58	824	38	1.8	649	7.2
Mar. 27-Apr. 5 ..	1,800	--	3.08		1.83	--	3.25	--	--	--	--	--	309	.42	756	37	1.5	482	7.3
Apr. 6-17.....	873	--	3.32		2.04	--	3.61	--	--	--	--	--	329	.45	393	38	1.6	519	7.7
Apr. 18-May 6 ...	613	--	4.52		2.61	--	4.98	--	--	--	--	--	423	.58	356	37	1.7	672	7.9
May 7-June 7.....	1,540	11	2.99	2.47	3.09	.17	6.00	2.21	.45	.01	.02	.16	495	.67	1,030	35	1.9	805	7.7
June 8-27.....	211	--	5.38		2.96	--	5.98	--	--	--	--	--	485	.66	139	35	1.8	765	8.0

RED RIVER OF THE NORTH BASIN--Continued

5-560. SHEYENNE RIVER NEAR WARWICK, N. DAK.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
June 28-July 7, 1959	150	--	5.30		3.39	--	6.00	--	--	--	--	--	502	0.68	102	39	2.1	795	8.0
July 8-22	59	--	4.58		2.00	--	4.95	--	--	--	--	--	380	.52	31	30	1.3	616	7.9
July 23-Aug. 14	62	--	4.18		.78	--	4.13	--	--	--	--	--	291	.40	25	16	.5	461	7.8
Aug. 15-31	22	30	2.50	1.80	.48	0.06	4.08	0.69	0.07	0.01	0.00	0.05	275	.37	8	10	.3	438	7.4
Sept. 1-30	48	--	4.18		.57	--	3.97	--	--	--	--	--	276	.38	18	12	.4	440	7.3
Total or weighted average [a]	8,480	--	4.70		2.44	--	5.06	--	--	--	--	--	428	0.58	4,940	34	1.6	673	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

5-1240. SOURIS RIVER NEAR WESTHOPE, N. DAK.

LOCATION.--At gaging station, 1,200 feet upstream from second crossing of international boundary, 1 mile downstream from Fish and Wildlife Service dam 357, 7 miles northeast of Westhope, Bottineau County, and 11 miles downstream from Boundary Creek.
DRAINAGE AREA.--17,600 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: June 1954 to September 1959.
Water temperatures: October 1954 to September 1955, October 1956 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 3,910 micromhos Mar. 22; minimum daily, 1,100 micromhos June 1.
Percent sodium: Maximum, 57 Sept. 25-30; minimum, 42 Mar. 17-31.
EXTREMES, 1954-59.--Specific conductance: Maximum daily (1956-59), 3,910 micromhos Mar. 22, 1959; minimum daily (1954-55, 1956-59), 232 micromhos Apr. 18, 1957.
Percent sodium: Maximum, 57 Sept. 25-30, 1959; minimum, 29 Mar. 26 to Apr. 12, 1957.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for water year October 1958 to September 1959 given in WSP 1628.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958 ..	906	--	6.88		6.44	--	7.42	--	--	--	--	--	--	--	--	48	3.5	1,220	7.2
Nov. 1-19	53	20	2.89	4.39	6.39	0.38	7.65	5.14	1.10	0.03	0.35	0.23	897	1.22	65	45	3.3	1,280	7.5
Mar. 17-31, 1959	53	33	8.43	12.57	15.92	.82	20.65	13.97	2.96	.04	.24	.45	2,310	3.14	166	42	4.9	2,970	7.8
Apr. 1-12	11	--	11.08		8.27	--	10.64	--	--	--	--	--	--	--	--	43	3.5	1,680	7.7
Apr. 13-30.....	6.0	--	8.48		7.00	--	8.59	--	--	--	--	--	--	--	--	45	3.4	1,410	7.6
May 1-31	46	--	7.10		7.13	--	6.93	--	--	--	--	--	--	--	--	50	3.8	1,320	7.7
June 1-10.....	855	5.3	2.59	4.09	5.26	.38	5.77	5.93	.99	.02	.04	.20	770	1.05	898	43	2.9	1,130	8.1
June 11-30.....	625	--	7.68		6.00	--	6.26	--	--	--	--	--	--	---	--	44	3.1	1,260	7.6
July 1-31	1,480	--	7.08		6.53	--	5.92	--	--	--	--	--	--	--	--	48	3.5	1,260	7.8
Aug. 1-31.....	1,180	--	6.12		7.13	--	4.95	--	--	--	--	--	--	--	--	54	4.1	1,280	7.3
Sept. 1-24	827	8.6	2.30	2.94	6.87	.41	4.61	6.75	.27	.03	.21	.22	835	1.14	943	55	4.3	1,190	7.2
Sept. 25-30	151	--	4.98		6.48	--	4.65	--	--	--	--	--	--	--	--	57	4.1	1,130	7.5
Total or weighted average [a]	6,190	--	6.70		6.54	--	5.92	--	--	--	--	--	--	--	--	49	3.6	1,240	--

a Represents 99.6 percent of runoff for water year October 1958 to September 1959.

708-297 O-63--3

PART 6. MISSOURI RIVER BASIN

MISSOURI RIVER MAIN STEM

6-3300. MISSOURI RIVER NEAR WILLISTON, N. DAK.

LOCATION.--At gaging station at Lewis and Clark Highway bridge, 5 miles southwest of Williston, Williams County and 25 miles downstream from Yellowstone River.
DRAINAGE AREA.--164,500 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1959.
Water temperatures: May 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 917 micromhos Dec. 21; minimum daily, 303 micromhos June 22.
Percent sodium: Maximum, 38 Mar. 20-22; minimum, 25 June 21-26.
EXTREMES, 1950-59.--Specific conductance: Maximum daily, 957 micromhos Jan. 10, 12, 1958; minimum daily, 303 micromhos June 22, 1959.
Percent sodium: Maximum, 43 Apr. 25-30, 1957; minimum, 24 May 27 to June 2, 1956.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for water year October 1958 to September 1959 given in WSP 1629.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	884,400	--	5.08		2.91	--	3.36	--	--	--	--	--	506	0.69	610,200	36	1.8	767	7.3
Nov. 1-25	732,300	11	3.14	2.18	2.83	0.09	3.44	4.62	0.28	0.03	0.02	0.17	509	.69	505,300	34	1.7	778	7.3
Dec. 19-Jan. 22, 1959	866,600	--	5.80		2.91	--	3.77	--	--	--	--	--	547	.74	641,300	33	1.7	822	7.4
Jan. 23-Mar. 7	1,014,000	--	5.54		2.78	--	3.59	--	--	--	--	--	518	.70	709,800	33	1.7	776	7.6
Mar. 8-13	247,700	--	4.10		2.26	--	2.69	--	--	--	--	--	406	.55	136,200	36	1.6	622	7.5
Mar. 14-19	388,800	--	3.28		1.96	--	2.43	--	--	--	--	--	345	.47	182,700	37	1.5	535	7.3
Mar. 20-22	293,600	9.2	1.85	1.13	1.91	.14	2.33	2.37	.17	.02	.03	.11	325	.44	129,200	38	1.6	505	7.4
Mar. 23	218,200	--	4.08		1.87	--	3.20	--	--	--	--	--	374	.51	111,300	31	1.3	580	7.7
Mar. 24-26	327,900	--	3.52		1.83	--	2.62	--	--	--	--	--	345	.47	154,100	34	1.4	534	7.6
Mar. 27-31	313,000	--	3.76		1.91	--	2.79	--	--	--	--	--	364	.50	156,500	34	1.4	564	7.5
Apr. 1-30	1,049,000	--	4.96		2.83	--	3.25	--	--	--	--	--	497	.68	713,300	36	1.8	747	7.6
May 1-21	724,000	--	4.70		2.57	--	3.23	--	--	--	--	--	457	.62	448,900	35	1.7	699	7.7
May 22-31	381,200	11	2.50	1.44	1.83	.08	2.85	2.85	.21	.13	.02	.12	364	.50	190,600	31	1.3	563	7.6

June 1-8, 1959 ...	302,900	--	4.04	2.09	--	2.90	--	--	--	--	--	380	0.52	157,500	34	1.5	596	7.7
June 9.....	59,110	--	4.36	2.09	--	3.08	--	--	--	--	--	390	.53	31,330	32	1.4	609	8.0
June 10.....	78,350	--	3.92	1.65	--	3.11	--	--	--	--	--	342	.47	36,820	30	1.2	542	8.0
June 11-12.....	172,400	--	3.24	1.22	--	2.57	--	--	--	--	--	274	.37	63,790	27	1.0	437	7.6
June 13-16	322,500	--	2.72	1.00	--	2.21	--	--	--	--	--	228	.31	99,980	27	.9	370	7.9
June 17-20.....	450,600	--	2.50	.91	--	2.11	--	--	--	--	--	211	.29	130,700	27	.8	341	7.9
June 21-26.....	650,200	--	1.60 | 0.70	.78	0.05	1.93	1.12	0.06	0.01	0.01	0.06	199	.27	175,600	25	.7	314	7.3
June 27-July 1 ...	534,500	--	3.20	1.35	--	2.52	--	---	--	--	--	283	.38	203,100	38	1.1	449	7.6
July 2-5	333,000	--	3.16	1.26	--	2.36	--	--	--	--	--	274	.37	123,200	29	1.0	436	7.6
July 6-11.....	422,500	--	3.64	1.78	--	2.56	--	--	--	--	--	340	.46	194,400	33	1.3	529	7.5
July 12-21	471,300	--	3.16	1.48	--	2.39	--	--	--	--	--	290	.39	183,800	32	1.2	463	7.5
July 22-31	346,500	--	3.28	1.65	--	2.52	--	--	--	--	--	320	.44	152,500	33	1.3	508	7.6
Aug. 1-31	798,900	--	4.20	2.26	--	3.06	--	--	--	--	--	402	.55	439,400	35	1.6	624	7.6
Sept. 1-21	490,900	8.8	2.84 | 1.92	2.57	.11	3.26	4.04	.27	.04	.00	.14	453	.62	304,400	35	1.7	696	7.4
Sept. 22-30	287,200	--	4.96	2.96	--	3.29	--	--	--	--	--	502	.68	195,300	37	1.9	752	7.3
Total or weighted average [a]	13,160,000	--	4.22	2.18	--	2.95	--	--	--	--	--	401	0.55	7,181,000	34	1.5	616	--
Total or weighted average [b]	13,620,000	--	4.26	2.18	--	2.98	--	--	--	--	--	406	0.55	7,520,000	34	1.5	623	--

a Represents 97 percent of runoff for water year October 1958 to September 1959.
b Includes estimated data for missing period. Represents 100 percent of runoff for water year October 1958 to September 1959.

MISSOURI RIVER MAIN STEM

6-8070. MISSOURI RIVER AT NEBRASKA CITY, NEBR.

LOCATION.--At gaging station at Waubonsie Highway Bridge at Nebraska City, Otoe County.
DRAINAGE AREA.--414,400 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1959.
Water temperatures: May 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 860 micromhos Dec. 13; minimum daily, 435 micromhos Aug. 4.
Percent sodium: Maximum, 39 Oct. 1-31; minimum, 24 June 4-5.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 936 micromhos Jan. 6, 1953; minimum daily, 361 micromhos Mar. 29, 1951.
Percent sodium: Maximum, 48 May 29, 1956; minimum, 18 Mar. 27-29, 1951.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for water year October 1958 to September 1959 given in WSP 1630.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958 ..	1,985,000	--	4.68		2.96	--	3.20	--	--	--	--	--	493	0.67	1,330,000	39	1.9	747	6.9
Nov. 1-30	1,049,000	--	4.70		2.78	--	3.39	--	--	--	--	--	478	.65	681,900	37	1.8	734	7.3
Dec. 1-31	740,600	20	3.24	1.70	2.78	0.15	3.67	3.37	0.82	0.03	0.04	0.15	488	.66	488,800	35	1.8	754	7.3
Jan. 1-11, 1959 ..	235,000	--	5.08		2.74	--	3.65	--	--	--	--	--	504	.69	162,200	35	1.7	768	7.3
Jan. 12.....	33,720	--	4.16		1.78	--	3.02	--	--	--	--	--	382	.52	17,530	30	1.2	580	7.6
Jan. 13-19	237,800	--	4.96		2.74	--	3.52	--	--	--	--	--	493	.67	159,300	36	1.7	754	7.3
Jan. 20.....	32,530	--	3.64		2.00	--	2.75	--	--	--	--	--	361	.49	15,940	35	1.5	564	7.5
Jan. 21-Feb. 27..	1,193,000	--	4.42		2.48	--	3.13	--	--	--	--	--	442	.60	715,800	36	1.7	679	7.3
Feb. 28	41,650	--	3.94		1.96	--	3.02	--	--	--	--	--	386	.52	21,660	33	1.4	594	7.4
Mar. 1-31	1,418,000	21	2.64	1.28	1.91	.15	2.95	2.44	.59	.02	.07	.09	378	.51	723,200	32	1.4	588	7.3
Apr. 1-30	1,966,000	--	4.22		2.09	--	3.16	--	--	--	--	--	413	.56	1,101,000	33	1.4	625	7.6
May 1-5	410,000	--	4.44		2.31	--	3.31	--	--	--	--	--	429	.58	237,800	34	1.6	666	7.6
May 6-7	245,000	14	2.69	1.19	1.70	.18	3.05	2.14	.39	.02	.08	.11	352	.48	117,600	30	1.2	546	7.9
May 8-22	1,181,000	--	4.28		2.04	--	3.33	--	--	--	--	--	404	.55	649,600	32	1.4	626	7.6
May 23-29	599,400	--	4.20		1.83	--	3.26	--	--	--	--	--	376	.51	305,700	30	1.3	592	7.9

May 30-June 3, 1959 ...	671,200	--	4.20	1.48	--	3.31	--	--	--	--	--	348	0.47	315,500	26	1.0	559	7.8
June 4-5.....	149,200	--	3.86	1.22	--	3.05	--	--	--	--	--	316	.43	64,160	24	.9	506	8.0
June 6-28.....	1,529,000	--	4.42	2.09	--	3.26	--	--	--	--	--	409	.56	856,200	32	1.4	641	7.9
June 29-July 5 ..	584,100	--	4.06	1.74	--	a3.10	--	--	--	--	--	371	.50	292,100	30	1.2	576	8.3
July 6-31	1,640,000	--	4.42	2.52	--	3.18	--	--	--	--	--	433	.59	967,600	36	1.7	675	7.7
Aug. 1-7.....	682,100	--	3.58	1.87	--	2.79	--	--	--	--	--	349	.47	320,600	34	1.4	547	7.4
Aug. 8-31	1,617,000	--	4.50	2.70	--	3.29	--	--	--	--	--	466	.63	1,019,000	38	1.8	712	7.6
Sept. 1-30	2,019,000	10	3.14 | 1.68	2.87	0.22	3.28	4.14	0.51	0.03	0.01	0.15	490	.67	1,353,000	36	1.9	743	7.2
Total or weighted average [b]	20,260,000	--	4.42	2.35	--	3.23	--	--	--	--	--	433	0.59	11,920,000	35	1.6	667	--

a Includes 0.07 equivalents per million carbonate (CO_3).
b Represents 100 percent of runoff for water year October 1958 to September 1959.

6-3295. YELLOWSTONE RIVER NEAR SIDNEY, MONT.

LOCATION.--At bridge on State Highway 23, 2 miles south of Sidney, Richland County, 4½ miles downstream from gaging station, 2 miles downstream from Fox Creek, and 30 miles upstream from mouth.
DRAINAGE AREA.--69,450 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1959.
Water temperatures: January 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,100 micromhos Dec. 18, 19; minimum daily, 265 micromhos June 22.
Percent sodium: Maximum, 42 Sept. 1-19; minimum, 21 June 14-26.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 2,780 micromhos Jan. 14, 1951; minimum daily, 257 micromhos June 15, 1956.
Percent sodium: Maximum, 48 May 1-30, 1953; minimum, 21 June 14-26, 1959.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analyses composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo. Records of discharge for gaging station near Sidney for water year October 1958 to September 1959 given in WSP 1629. No appreciable inflow between gaging station and sampling station.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-15, 1958 ..	189,200	11	3.39	2.37	3.87	0.10	3.43	6.02	0.34	0.03	0.02	0.19	620	0.84	158,900	40	2.3	904	7.5
Oct. 16-31.....	263,900	--	5.50		3.65	--	3.43	--	--	--	--	--	599	.81	213,800	40	2.2	876	7.2
Nov. 1-30	441,500	--	6.20		3.74	--	3.74	--	--	--	--	--	641	.87	384,100	38	2.1	926	7.3
Dec. 1-31	379,900	--	6.88		4.18	--	4.26	--	--	--	--	--	712	.97	368,500	38	2.3	1,020	7.6
Jan. 1-31, 1959 ..	315,600	--	7.16		3.92	--	4.36	--	--	--	--	--	712	.97	306,100	35	2.1	1,010	7.7
Feb. 1-Mar. 3 ...	270,000	--	6.76		3.57	--	4.06	--	--	--	--	--	678	.92	248,400	35	1.9	965	7.7
Mar. 4-31	1,126,000	9.9	2.50	1.38	2.22	.13	2.59	3.35	.21	.02	.02	.31	398	.54	608,000	35	1.6	606	7.3
Apr. 1-30	441,000	--	6.30		4.05	--	3.57	--	--	--	--	--	677	.92	405,700	39	2.3	973	7.3
May 1-18	330,300	--	4.76		2.83	--	3.08	--	--	--	--	--	486	.66	218,000	37	1.8	727	7.5
May 19-31	308,500	--	3.64		1.74	--	2.59	--	--	--	--	--	347	.47	145,000	32	1.3	532	7.4
June 1-13.....	513,900	--	3.44		1.31	--	2.74	--	--	--	--	--	302	.41	210,700	28	1.0	469	7.5
June 14-26.....	1,162,000	12	1.80	.60	.65	.05	2.10	.94	.03	.01	.00	.06	186	.25	290,500	21	.6	302	7.4
June 27-July 11...	973,500	--	3.22		1.17	--	2.47	--	--	--	--	--	275	.37	360,200	27	.9	438	7.5

July 12-22, 1959 .	319,100	--	2.60	1.26	--	2.03	--	--	--	--	--	244	0.33	105,300	33	1.1	390	7.5
July 23-31	163,300	--	2.94	1.61	--	2.25	--	--	--	--	--	294	.40	65,320	35	1.3	461	7.7
Aug. 1-9	112,700	--	3.38	2.04	--	2.43	--	--	--	--	--	350	.48	54,100	38	1.6	541	7.1
Aug. 10-31	178,100	10	2.54 | 1.74	2.96	0.10	2.90	4.27	0.26	0.03	0.01	0.18	475	.65	115,800	40	2.0	709	7.5
Sept. 1-19	130,900	--	5.02	3.65	--	3.21	--	--	--	--	--	553	.75	98,180	42	2.3	832	7.3
Sept. 20-23	44,070	--	5.52	3.83	--	3.41	--	--	--	--	--	599	.81	35,700	41	2.3	881	7.5
Sept. 24-30	104,200	--	5.58	3.83	--	3.52	--	--	--	--	--	614	.84	87,530	41	2.3	892	7.4
Total or weighted average [a]	7,768,000	--	4.30	2.31	--	2.90	--	--	--	--	--	425	0.58	4,480,000	35	1.6	636	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

YELLOWSTONE RIVER BASIN--Continued

6-2947. BIGHORN RIVER AT BIGHORN, MONT.

LOCATION.--At gaging station at bridge on U.S. Highway 10, three-quarters of a mile upstream from mouth, 1 mile southwest of Bighorn, Treasure County, and 4 miles east of Custer.
RECORDS AVAILABLE.--Chemical analyses: February 1950 to September 1959.
Water temperatures: April 1949 to September 1951, August 1952 to September 1959.
Sediment records: July 1947 to September 1954, October 1955 to September 1958 (discontinued).
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,370 micromhos Apr. 2, 30; minimum daily, 550 micromhos June 13.
Percent sodium: Maximum, 44 Aug. 1-15, Sept. 10-17; minimum, 29 June 11-20.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 1,640 micromhos Nov. 18, 1955; minimum daily, 384 micromhos June 20, 1951.
Percent sodium: Maximum, 49 May 23-28, 1952; minimum, 27 June 20-21, 1955.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analyses composited by discharge. Records of specific conductance of daily samples available in district office in Worland, Wyo. Records of discharge for water year October 1958 to September 1959 given in WSP 1629.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-17, 1958 ..	122,200	--	6.66		4.44	--	3.46	--	--	--	--	--	727	0.99	121,000	40	2.4	1,030	7.4
Oct. 18-31.....	118,100	13	4.09	2.39	4.26	0.09	3.43	7.04	0.37	0.02	0.02	0.14	697	.95	112,200	39	2.4	991	7.2
Nov. 1-30.....	232,500	--	7.04		4.65	--	3.74	--	--	--	--	--	767	1.04	241,800	40	2.5	1,060	7.2
Dec. 1-31.....	226,700	--	7.68		4.83	--	4.13	--	--	--	--	--	816	1.11	251,600	39	2.5	1,130	7.5
Jan. 1-24, 1959 ..	137,200	--	7.84		4.92	--	3.80	--	--	--	--	--	841	1.14	156,400	39	2.5	1,160	7.8
Jan. 25-Feb. 25..	145,600	10	5.09	3.03	4.83	.10	4.10	8.56	8.48	.03	.02	.16	864	1.18	171,800	37	2.4	1,200	7.7
Feb. 26-Mar. 19 .	119,600	--	6.28		3.70	--	3.08	--	--	--	--	--	675	.92	110,000	37	2.1	943	7.5
Mar. 20-Apr. 30 .	214,800	--	8.64		6.18	--	4.13	--	--	--	--	--	977	1.33	285,700	42	3.0	1,340	7.5
May 1-18	93,440	--	7.30		5.13	--	3.77	--	--	--	--	--	805	1.09	101,800	41	2.7	1,130	7.5
May 19-31	68,450	12	3.79	2.09	3.26	.08	3.26	5.54	.25	.02	.02	.13	588	.80	54,760	35	1.9	851	7.7

June 1-10, 1959 ..	79,680	--	5.52	2.78	--	3.39	--	--	--	--	---	523	0.71	56,570	33	1.7	768	7.7
June 11-20.....	115,200	9.7	2.94 | 1.28	1.74	0.05	2.79	3.14	0.12	0.02	0.01	0.08	377	.51	58,750	29	1.2	581	7.5
June 21-30.....	83,980	--	5.70	2.74	--	3.08	--	--	--	--	--	550	.75	62,980	32	1.6	793	7.7
July 1-12	102,000	--	6.28	3.70	--	3.46	--	--	--	--	--	652	.89	90,780	37	2.1	945	7.7
July 13-31	43,300	--	7.32	5.57	--	3.33	--	--	--	--	--	842	1.15	49,790	43	2.9	1,160	7.6
Aug. 1-15	35,330	--	7.32	5.66	--	3.20	--	---	--	--	--	874	1.19	42,040	44	3.0	1,200	7.2
Aug. 16-31.....	49,840	--	7.54	5.52	--	3.61	--	--	--	--	--	883	1.20	59,810	42	2.9	1,230	7.2
Sept. 1-9	24,220	--	7.40	5.61	--	3.05	--	--	--	--	--	875	1.19	28,820	43	2.9	1,210	7.4
Sept. 10-17	21,460	--	7.68	6.05	--	3.38	--	--	--	--	--	914	1.24	26,610	44	3.1	1,260	7.3
Sept. 18-30	64,400	12	5.04 | 2.96	5.26	.11	3.82	9.39	.48	.03	.03	.17	897	1.22	78,570	39	2.6	1,230	7.6
Total or weighted average [a]	2,090,000	--	7.04	4.48	--	3.62	--	--	--	--	--	757	1.03	2,162,000	38	2.4	1,060	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

6-3085. TONGUE RIVER AT MILES CITY, MONT.

LOCATION.--At gaging station, 4 miles south of Miles City, Custer County, and 8 miles upstream from mouth.
DRAINAGE AREA.--5,420 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1959.
Water temperatures: April 1949 to September 1959.
Sediment records: June 1946 to September 1951.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,320 micromhos July 20; minimum daily, 409 micromhos Mar. 14.
Percent sodium: Maximum, 58 Oct. 22-23; minimum, 22 June 13-22.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 2,400 micromhos Sept. 11, 1958; minimum daily, 288 micromhos June 21, 1953.
Percent sodium: Maximum, 69 May 4, 1955; minimum, 17 June 7-16, June 30 to July 12, 1957.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analyses composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo. Records of discharge for water year October 1958 to September 1959 given in WSP 1629.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-21, 1958 ..	6,270	--	6.36		2.83	--	4.47	--	--	--	--	--	551	0.75	4,700	31	1.6	835	7.4
Oct. 22-23.....	3,490	--	2.08		2.87	--	2.88	--	--	--	--	--	314	.43	1,500	58	2.8	493	7.6
Oct. 24-31.....	3,500	--	5.96		2.44	--	4.10	--	--	--	--	--	506	.69	2,410	29	1.4	769	7.4
Nov. 1-30.....	15,240	--	7.32		2.65	--	4.88	--	--	--	--	--	611	.83	12,650	27	1.4	891	7.2
Dec. 1-31	14,910	9.0	3.94	4.78	2.91	0.13	5.64	5.95	0.13	0.02	0.01	0.13	691	.94	14,020	25	1.4	1,010	7.7
Jan. 1-31, 1959..	12,130	--	8.80		2.96	--	5.74	--	--	--	--	--	692	.94	11,400	25	1.4	1,020	7.9
Feb. 1-28.....	10,620	--	8.48		2.52	--	5.74	--	--	--	--	--	649	.88	9,340	23	1.2	959	7.7
Mar. 1-16	34,160	7.0	1.65	1.27	1.48	.15	2.52	1.94	.01	.01	.03	.08	280	.38	12,980	33	1.2	440	7.2
Mar. 17-28.....	53,190	--	5.80		2.44	--	4.15	--	--	--	--	--	502	.68	36,170	30	1.4	765	7.7
Mar. 29-Apr. 30 .	35,750	--	6.52		2.57	--	4.28	--	--	--	--	--	555	.75	26,810	28	1.4	834	7.6
May 1-31.....	27,660	5.9	3.09	3.31	2.13	.14	4.15	4.37	.08	.02	.01	.13	516	.70	19,360	25	1.2	779	7.7

June 1-12, 1959 ..	9,990	--	5.06	1.70	--	3.74	--	--	--	--	--	406	0.55	5,490	25	1.1	632	7.9
June 13-22	10,800	10	2.10 | 1.74	1.09	0.07	3.08	1.89	0.00	0.01	0.00	0.07	290	.39	4,210	22	.8	475	7.6
June 23-July 14 ..	8,720	--	4.68	2.09	--	3.80	--	--	--	--	--	406	.55	4,800	31	1.4	640	7.9
July 15-21	1,130	--	6.68	5.57	--	5.75	--	--	--	--	--	750	1.02	1,150	45	3.0	1,110	8.0
July 22-31	4,040	--	4.88	2.00	--	3.49	--	--	--	--	--	408	.55	2,220	29	1.3	640	7.8
Aug. 1-31.....	13,560	--	4.90	1.70	--	3.62	--	--	--	--	--	393	.53	7,190	26	1.1	623	7.1
Sept. 1-13	5,730	--	5.22	1.87	--	3.69	--	--	--	--	--	432	.59	3,380	26	1.2	666	7.4
Sept. 14-23	3,820	--	5.76	2.13	--	3.74	--	--	--	--	--	474	.64	2,440	27	1.3	716	7.4
Sept. 24-30	1,950	9.4	2.89 | 3.19	2.52	.14	4.03	4.56	.13	.02	.00	.15	519	.71	1,380	29	1.4	786	7.6
Total or weighted average [a].....	276,700	--	5.84	2.26	--	4.10	--	--	--	--	--	490	0.67	183,600	28	1.3	742	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

6-3265. POWDER RIVER NEAR LOCATE, MONT.

LOCATION.--At gaging station at bridge on U.S. Highway 12, at present site of Locate (5 miles west of former site of Locate), Custer County, 3 miles upstream from Locate Creek, and 25 miles east of Miles City.
DRAINAGE AREA.--12,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1949 to September 1959.
Water temperatures: February 1951 to September 1959.
Sediment records: March 1950 to September 1953.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,700 micromhos Oct. 8; minimum daily, 555 micromhos Mar. 17.
Percent sodium: Maximum, 68 Sept. 25-30; minimum, 28 June 25 to July 12.
EXTREMES, 1951-58.--Specific conductance: Maximum daily, 9,270 micromhos Dec. 16, 1955; minimum daily, 407 micromhos Feb. 14, 1952.
Percent sodium: Maximum, 83 Oct. 22-24, 1953; minimum 17 Aug. 11-13, 1955.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo. Records of discharge for water year October 1958 to September 1959 given in WSP 1629.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-20, 1958 ..	703	--	15.44		13.79	--	4.26	--	--	--	--	--	2,060	2.80	1,970	47	5.0	2,530	7.5
Oct. 21-24.....	2,120	--	3.36		6.70	--	3.64	--	--	--	--	--	700	.95	2,010	67	5.2	1,030	7.3
Oct. 25-27.....	615	--	11.28		8.96	--	3.64	--	--	--	--	--	1,390	1.82	1,120	44	3.8	1,750	7.5
Oct. 28-31.....	591	--	14.32		10.18	--	3.88	--	--	--	--	--	1,670	2.27	1,340	42	3.8	2,050	7.4
Nov. 1-30	4,990	9.4	9.73	6.99	10.66	0.20	4.67	22.28	1.64	0.02	0.06	0.22	1,910	2.60	12,970	39	3.7	2,320	7.4
Dec. 1-31	8,940	--	16.60		9.44	--	5.54	--	--	--	--	--	1,750	2.38	21,280	36	3.3	2,120	7.6
Jan. 1-26, 1959..	5,380	--	18.04		10.09	--	6.16	--	--	--	--	--	1,870	2.54	13,670	36	3.4	2,290	7.8
Jan. 27-Feb. 15..	5,260	13	8.53	6.05	7.40	.14	5.38	14.66	1.52	.02	.05	.16	1,490	2.03	10,680	33	2.7	1,870	7.8
Feb. 16-Mar. 10.	6,300	--	12.76		6.83	--	4.69	--	--	--	--	--	1,310	1.78	11,210	35	2.7	1,690	7.7
Mar. 11-31	161,300	--	4.52		2.96	--	2.56	--	--	--	--	--	490	.67	108,100	40	2.0	735	7.4
Apr. 1-30	29,450	--	12.36		8.00	--	4.13	--	--	--	--	--	1,390	1.89	55,660	39	3.2	1,780	7.5
May 1-7	6,480	--	12.58		8.09	--	4.10	--	--	--	--	--	1,400	1.90	12,310	39	3.2	1,770	7.5
May 8-21	18,610	--	9.78		6.18	--	3.70	--	--	--	--	--	1,060	1.44	26,800	39	2.8	1,420	7.3
May 22-June 5 ...	22,240	--	8.36		4.61	--	3.77	--	--	--	--	--	836	1.14	25,350	36	2.2	1,150	7.3

June 6-11, 1959 ..	6,700	--	11.16	7.48	--	4.16	--	--	--	--	--	1,270	1.73	11,590	40	3.2	1,670	7.5
June 12-24.....	12,640	13	4.94 | 2.62	4.31	0.14	3.41	7.64	0.65	0.03	0.04	0.13	773	1.05	13,270	36	2.2	1,090	7.5
June 25-July 12 ..	32,980	--	14.28	5.66	--	3.69	--	--	--	--	--	1,360	1 85	61,010	28	2.1	1,650	7.6
July 13-21	2,890	--	11.48	7.66	--	3.47	--	--	--	--	--	1,300	1.77	5,120	40	3.2	1,670	7.8
July 22-31	904	--	13.76	11.53	--	3.90	--	--	--	--	--	1,730	2.34	2,120	46	4.4	2,140	8.0
Aug. 1-13	345	--	14.32	12.83	--	3.97	--	--	--	--	--	1,890	2.57	887	47	4.8	2,360	7.6
Aug. 14-23	28	13	9.03 | 5.67	14.27	.28	4.18	23.94	1.47	.03	.00	.26	2,040	1.37	38.4	49	5.3	2,490	7.7
Aug. 24	87	--	15.44	14.44	--	4.77	--	--	--	--	--	2,080	2.83	246	48	5.2	2,570	7.6
Aug. 25-Sept. 14	84	--	15.02	14.44	--	4.44	--	--	--	--	--	2,060	2.80	235	49	5.3	2,560	7.6
Sept. 15-24	60	--	14.52	15.14	--	4.54	--	--	--	--	--	2,090	2.84	170	51	5.6	2,600	7.6
Sept. 25-30	569	--	5.50	11.48	--	4.51	--	--	--	--	--	1,210	1.65	939	68	6.9	1,690	7.3
Total or weighted average [a]	330,300	--	8.36	4.92	--	3.34	--	--	--	--	--	890	1.21	400,100	37	2.4	1,190	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

JAMES RIVER BASIN

6-4760. JAMES RIVER UPSTREAM FROM DIVERSION, AT HURON, S. DAK.

LOCATION.--Just upstream from Chicago and North Western Railway bridge, 135 feet upstream from gaging station, 150 feet upstream from city dam at Huron, Beadle County, and 300 feet upstream from bridge on U.S. Highway 14.
DRAINAGE AREA.--16,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August 1956 to September 1959.
Water temperatures: August 1956 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,640 micromhos Mar. 1; minimum daily, 1,050 micromhos Oct. 1.
Percent sodium: Maximum, 62 Sept. 22-30; minimum, 40 Mar. 24 to Apr. 11.
EXTREMES, 1956-59.--Specific conductance: Maximum daily, 2,640 micromhos Mar. 1, 1959; minimum daily, 483 micromhos Mar. 30, 1957.
Percent sodium: Maximum, 62 Sept. 22-30, 1959; minimum, 30 Mar. 29 to Apr. 4, 1957.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for gaging station at Huron, downstream from the diversion, for water year October 1958 to September 1959 given in WSP 1629.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet) [a]	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958 ..	--	--	5.98		5.57	--	5.29	--	--	--	--	--	--	--		48	3.2	1,130	7.4
Nov. 1-30.....	--	--	6.44		5.92	--	5.46	--	--	--	--	--	--	--		48	3.3	1,210	7.5
Dec. 1-31.....	--	19	3.49	4.05	8.13	0.38	5.67	7.08	3.10	0.03	0.13	0.57	999	1.36		51	4.2	1,500	7.0
Jan. 1-15, 1959 ..	--	--	9.58		9.40	--	6.51	--	--	--	--	--	--	--		50	4.3	1,790	7.0
Jan. 16-31.....	--	--	11.84		11.18	--	7.64	--	--	--	--	--	--	--		49	4.6	2,090	7.0
Feb. 1-28.....	--	33	6.84	8.64	12.57	.54	9.64	14.34	4.26	.03	.08	.77	1,900	2.58		44	4.5	2,450	7.2
Mar. 1-14	--	--	15.80		12.01	--	10.51	--	--	--	--	--	--	--		43	4.3	2,430	7.8
Mar. 15-23	186	--	15.08		10.53	--	10.54	--	--	--	--	--	--	--		41	3.8	2,240	7.8
Mar. 24-Apr. 11 .	181	--	8.80		5.79	--	5.72	--	--	--	--	--	--	--		40	2.8	1,360	7.6
Apr. 12-May 31 ..	--	--	8.16		5.92	--	5.15	--	--	--	--	--	--	--		42	2.9	1,320	8.1
June 1-30.....	--	--	7.32		5.66	--	4.33	--	--	--	--	--	--	--		44	3.0	1,280	7.7
July 1-28	--	13	2.89	3.39	6.31	.51	3.80	7.45	1.92	.02	.11	.51	848	1.15		48	3.6	1,250	7.7
July 29-Aug. 25 ..	--	--	6.20		8.22	--	3.29	--	--	--	--	--	--	--		57	4.7	1,450	7.6
Aug. 26-Sept. 8 ..	--	--	6.38		10.01	--	3.47	--	--	--	--	--	--	--		61	5.6	1,690	7.1
Sept. 9-21	--	13	2.84	4.00	10.83	.59	3.80	11.60	3.16	.03	.16	.88	1,230	1.67		59	5.9	1,780	7.2
Sept. 22-30	--	--	6.58		10.70	--	4.02	--	--	--	--	--	--	--		62	5.9	1,710	7.1

a No flow at gaging station downstream from the diversion, except during Mar. 15-28, Mar. 31 to Apr. 3, Apr. 5, 7-8, 11.

6-7660. PLATTE RIVER AT BRADY, NEBR.

LOCATION.--At gaging stations at highway bridges, half a mile and 2½ miles respectively, south of Brady, Lincoln County, and 18 miles downstream from confluence of North Platte and South Platte and Rivers.
DRAINAGE AREA.--56,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: November 1950 to September 1959.
Water temperatures: March 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,250 micromhos June 17 (chan. 1); minimum daily, 397 micromhos Feb. 20 (chan. 1).
Percent sodium: Maximum, 42 July 17 to Aug. 19; minimum, 30 Jan. 1 to Mar. 31.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 1,250 micromhos June 17, 1959 (chan. 1); minimum daily, 305 micromhos Jan. 13, 1956, Jan. 10, 1957 (chan. 1).
Percent sodium: Maximum, 46 Aug. 1-22, 1955; minimum, 22 Nov. 26, 1952.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis from each of two major channels composited by discharge. Composite periods normally identical to those of Supply Canal (Tri-County Diversion) near Maxwell, Nebr. Records of specific conductance of daily samples, taken at each of the two major channels, available in district office at Lincoln, Nebr. Records of discharge for water year October 1958 to September 1959 given in WSP 1630.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958 ..	10,550	--	4.50		2.52	--	3.67	--	--	--	--	--	475	0.65	6,860	36	1.7	691	7.5
Nov. 1-16	5,070	--	4.66		2.35	--	3.67	--	--	--	--	--	468	.64	3,240	34	1.5	685	7.2
Nov. 17-Dec. 5 ..	6,950	--	4.50		2.18	--	3.61	--	--	--	--	--	459	.62	4,310	33	1.5	659	7.1
Dec. 6-31	11,470	41	3.19	1.27	2.09	0.22	3.61	2.69	0.45	0.03	0.04	0.11	443	.60	6,880	31	1.4	647	7.3
Jan. 1-31, 1959 ..	13,570	--	4.28		1.87	--	3.54	--	--	--	--	--	410	.56	7,600	30	1.3	609	7.6
Feb. 1-28	12,040	--	4.30		1.87	--	3.38	--	--	--	--	--	417	.57	6,860	30	1.3	612	7.3
Mar. 1-31	16,860	38	3.19	1.21	1.96	.24	3.57	2.64	.42	.03	.03	.11	437	.59	9,950	30	1.3	638	7.4
Apr. 1-30	15,240	--	4.84		2.35	--	3.57	--	--	--	--	--	489	.67	10,210	33	1.5	709	7.7
May 1-31	13,950	--	5.18		2.52	--	3.62	--	--	--	--	--	520	.71	9,900	33	1.6	753	7.6
June 1-8	2,820	--	5.40		2.74	--	3.59	--	--	--	--	--	542	.74	2,090	34	1.7	781	7.9
June 9-21.....	4,630	28	4.69	2.33	4.05	.31	3.43	6.85	.87	.03	.02	.16	742	1.01	4,660	36	2.2	1,050	7.8

PLATTE RIVER BASIN--Continued

6-7660. PLATTE RIVER AT BRADY, NEBR.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
June 22-July 2, 1959	7,080	--	5.44		3.31	--	3.54	--	--	--	--	--	587	0.80	5,660	38	2.0	853	7.8
July 3-13	3,610	--	5.24		3.05	--	3.61	--	--	--	--	--	565	.77	2,780	37	1.9	823	7.8
July 14-16	3,000	--	4.30		2.96	--	3.67	--	--	--	--	--	482	.66	1,980	41	2.0	718	7.9
July 17-31	26,390	--	3.98		2.87	--	3.82	--	--	--	--	--	456	.62	16,360	42	2.0	686	7.9
Aug. 1-8	17,990	27	2.59	1.21	2.96	.28	3.84	2.81	0.48	0.03	0.00	0.14	443	.60	10,790	42	2.1	676	7.9
Aug. 9-19	13,270	--	3.84		2.83	--	3.80	--	--	--	--	--	442	.60	7,960	42	2.0	660	7.8
Aug. 20-31	3,270	--	4.08		2.57	--	3.67	--	--	--	--	--	454	.62	2,030	39	1.8	662	7.8
Sept. 1-30	7,450	--	4.20		2.44	--	3.52	--	--	--	--	--	443	.60	4,470	37	1.7	656	7.1
Total or weighted average [a]	195,200	--	4.46		2.52	--	3.64	--	--	--	--	--	469	0.64	124,600	36	1.7	690	.--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

6-7657. SUPPLY CANAL (TRI-COUNTY DIVERSION) NEAR MAXWELL, NEBR.

LOCATION.--At gaging station at Parshall Flume in sec. 28, T. 13 N., R. 29 W., near Maxwell, Lincoln County.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1959.
Water temperatures: March 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,410 micromhos June 17; minimum daily, 596 micromhos Mar. 26.
Percent sodium: Maximum, 46 Aug. 9-19; minimum, 35 Mar. 1-31.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 1,440 micromhos Mar. 1, 1958; minimum daily, 403 micromhos Jan. 9, 1957.
Percent sodium: Maximum, 48 Aug. 1 to Sept. 15, 1955; minimum, 32 Feb. 25 to Mar. 22, May 19-28, 1957.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis composited by discharge. Composite periods normally identical to those of Platte River at Brady, Nebr. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for water year October 1958 to September 1959 given in reports of State Engineer.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	65,740	--	4.44		2.91	--	3.62	--	--	--	--	--	490	0.67	44,050	40	2.0	729	7.3
Nov. 1-16	29,280	--	4.44		2.70	--	3.54	--	--	--	--	--	483	.66	19,320	38	1.8	711	7.3
Nov. 17-Dec. 5	42,390	--	4.94		3.00	--	3.64	--	--	--	--	--	528	.72	30,520	38	1.9	780	7.1
Dec. 6-31	55,930	29	3.84	1.68	3.35	0.26	3.82	4.60	0.68	0.03	0.02	0.17	592	.81	45,300	37	2.0	865	7.2
Jan. 1-31, 1959	62,510	--	6.12		3.52	--	3.90	--	--	--	--	--	635	.86	53,760	37	2.0	930	7.6
Feb. 1-28	65,100	--	6.18		3.57	--	3.90	--	--	--	--	--	653	.89	57,940	37	2.0	942	7.3
Mar. 1-31	75,750	32	3.79	1.61	3.05	.24	3.49	4.54	.65	.03	.03	.13	572	.78	59,090	35	1.9	827	7.3
Apr. 1-30	88,840	--	6.42		3.78	--	3.39	--	--	--	--	--	693	.94	83,510	37	2.1	991	7.6
May 1-31	81,480	--	6.80		4.09	--	3.23	--	--	--	--	--	730	.99	80,670	38	2.2	1,030	7.6
June 1-8	20,050	--	7.52		4.61	--	3.29	--	--	--	--	--	806	1.10	22,060	38	2.4	1,130	7.7
June 9-21	40,500	15	5.34	3.42	5.44	.31	3.28	9.68	1.16	.04	.01	.20	938	1.28	51,840	37	2.6	1,280	7.5
June 22-July 2	41,570	--	5.88		3.78	--	3.51	--	--	--	--	--	645	.88	36,580	39	2.2	934	7.7
July 3-13	31,160	--	5.62		3.74	--	3.57	--	--	--	--	--	622	.85	26,490	40	2.2	908	7.7
July 14-16	12,160	--	4.78		3.52	--	3.64	--	--	--	--	--	548	.75	9,120	42	2.3	824	7.9
July 17-31	61,130	--	4.20		3.31	--	3.65	--	--	--	--	--	496	.67	40,960	44	2.3	757	7.8

6-7657. SUPPLY CANAL (TRI-COUNTY DIVERSION) NEAR MAXWELL, NEBR.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Aug. 1-8, 1959..	33,920	18	2.54	1.42	3.26	0.28	3.67	3.35	0.54	0.03	0.01	0.14	471	0.64	21,710	43	2.3	729	7.7
Aug. 9-19.....	45,660	--	3.86		3.31	--	3.67	--	--	--	--	--	466	.63	28,770	46	2.4	711	7.7
Aug. 20-31	45,000	--	3.92		3.13	--	3.67	--	--	--	--	--	463	.63	28,350	44	2.2	700	7.7
Sept. 1-30	91,480	--	3.80		3.05	--	3.51	--	--	--	--	--	453	.62	56,720	45	2.2	684	7.3
Total or weighted average [a]....	989,700	--	5.38		3.48	--	3.57	--	--	--	--	--	591	0.80	796,800	39	2.1	862	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

6-7640. SOUTH PLATTE RIVER AT JULESBURG, COLO.

LOCATION.--At gaging station at bridge on State Highway 51, 0.9 mile southeast of Julesburg, Sedgwick County, 3 miles upstream from Colorado-Nebraska State line, and 8 miles downstream from Lodgepole Creek.
DRAINAGE AREA.--22,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1959.
Water temperatures: October 1945 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,980 micromhos Jan. 6-7; minimum daily, 1,250 May 27-30.
Percent sodium: Maximum, 39 Aug. 1-31; minimum, 33 May 27-30.
EXTREMES, 1945-59.--Specific conductance: Maximum daily, 2,350 micromhos Apr. 13, 1955; minimum daily, 617 micromhos Aug. 19, 1953.
Percent sodium: Maximum, 82 Mar. 1-12, 1947; minimum, 29 Aug. 6-10, 1951, Aug. 19, 1953, Sept. 14-17, 1956.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for water year October 1958 to September 1959 given in WSP 1630.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958 ..	12,430	--	13.48		7.40	--	4.77	--	--	--	--	--	1,440	1.96	24,360	35	2.8	1,830	7.4
Nov. 1-30.....	18,910	--	14.52		7.83	--	5.31	--	--	--	--	--	1,520	2.07	39,140	35	2.9	1,930	7.2
Dec. 1-31	20,120	31	10.48	4.40	7.57	0.41	5.57	15.30	1.80	0.04	0.05	0.28	1,520	2.07	41,650	34	2.8	1,930	7.4
Jan. 1-31, 1959 ..	17,210	--	14.32		7.57	--	5.11	--	--	--	--	--	1,490	2.03	34,940	35	2.8	1,900	7.3
Feb. 1-28.....	17,220	--	14.14		7.66	--	5.92	--	--	--	--	--	1,470	2.00	34,440	35	2.9	1,870	7.4
Mar. 1-31	26,860	27	8.93	4.77	7.61	.33	4.80	15.12	1.69	.04	.05	.28	1,440	1.96	52,650	35	2.9	1,820	7.4
Apr. 1-19	38,800	--	13.68		7.31	--	4.92	--	--	--	--	--	1,430	1.94	75,270	35	2.8	1,820	7.7
Apr. 20-May 2 ..	26,740	--	12.20		6.48	--	4.46	--	--	--	--	--	1,270	1.73	46,260	35	2.6	1,640	7.6
May 3-24	31,170	--	12.50		6.83	--	4.51	--	--	--	--	--	1,330	1.81	56,420	35	2.7	1,720	7.9
May 25-26	3,090	--	9.88		5.39	--	3.93	--	--	--	--	--	1,020	1.39	4,300	35	2.4	1,360	8.1
May 27-30	13,730	18	5.89	3.27	4.70	.24	3.70	9.31	.99	.04	.09	.19	912	1.24	17,030	33	2.2	1,250	7.7
May 31-June 1...	6,170	--	10.44		5.52	--	4.00	--	--	--	--	--	1,050	1.43	8,820	35	2.4	1,400	8.2
June 2-30.....	12,360	--	12.40		7.22	--	4.26	--	--	--	--	--	1,320	1.80	22,250	37	2.9	1,700	7.6

PLATTE RIVER BASIN--Continued

6-7640. SOUTH PLATTE RIVER AT JULESBURG, COLO.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
July 1-31, 1959..	1,840	--	12.34		7.66	--	3.85	--	--	--	--	--	1,350	1.84	3,390	38	3.1	1,740	7.7
Aug. 1-31.....	1,260	--	12.08		7.74	--	3.52	--	--	--	--	--	1,330	1.81	2,280	39	3.1	1,720	7.7
Sept. 1-21	732	--	12.40		7.40	--	3.70	--	--	--	--	--	1,360	1.85	1,350	37	3.0	1,740	7.5
Sept. 22-30	557	31	9.43	4.33	7.66	0.46	4.33	15.22	1.97	0.04	0.04	0.22	1,450	1.97	1,100	35	2.9	1,860	7.9
Total or weighted average [a]	249,200	--	13.12		7.09	--	4.74	--	--	--	--	--	1,370	1.86	465,700	35	2.8	1,760	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.

ARKANSAS RIVER BASIN

7-1305. ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR COLO.

LOCATION.--At gaging station, 1 mile upstream from Caddoa Creek, 1¾ miles downstream from John Martin Dam, Bent County, and 3 miles southeast of Hasty.
DRAINAGE AREA.--18,917 square miles, of which 785 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: August 1942 to August 1943, October 1945 to July 1949 (intermittent and weekly samples); January 1951 to September 1959 (daily samples).
Water temperatures: January 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 4,540 micromhos Jan. 22; minimum daily, 1,420 micromhos Sept. 26.
Percent sodium: Maximum, 41 Jan. 21-23, Sept. 20-24, Sept. 29-30; minimum, 31 Oct. 1-31.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 5,180 micromhos Apr. 21, 1955; minimum daily, 818 micromhos Aug. 17, 20, 1957.
Percent sodium: Maximum, 42 Feb. 1-10, 1954; July 13, 1956; minimum, 23 July 1-10, 1955.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1631.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	31,950	15	7.39	5.01	5.61	0.18	2.85	13.66	0.87	0.04	0.02	0.13	1,200	1.63	52,080	31	2.3	1,500	7.7
Nov. 1-20	434	--	14.37	9.63	15.31	--	5.29	--	--	--	--	--	2,720	3.70	1,610	39	4.4	3,060	7.7
Nov. 21-30	138	--	16.72	11.28	18.10	--	5.16	--	--	--	--	--	3,230	4.39	606	39	4.8	3,530	7.5
Dec. 1-31	415	--	17.22	13.98	18.31	--	5.93	--	--	--	--	--	3,290	4.47	1,860	37	4.6	3,620	7.6
Jan. 1-8, 1959	92	25	17.96	12.84	18.92	.20	6.26	39.35	3.30	.05	.12	.55	3,410	4.64	427	38	4.8	3,730	7.5
Jan. 9-20, 24-31	380	--	15.07	12.13	15.53	--	6.34	--	--	--	--	--	2,900	3.94	1,500	36	4.2	3,230	7.7
Jan. 21-23	58	--	21.46	12.34	23.79	--	4.46	--	--	--	--	--	4,010	5.45	316	41	5.8	4,250	7.7
Feb. 1-28	414	--	16.57	12.23	17.01	--	6.47	--	--	--	--	--	3,130	4.26	1,760	37	4.5	3,370	7.7
Mar. 1-20	257	--	16.97	13.23	18.18	--	6.54	--	--	--	--	--	3,320	4.52	1,160	38	4.7	3,620	7.7
Mar. 21-31	147	--	15.47	12.93	17.14	--	6.36	--	--	--	--	--	3,130	4.26	626	38	4.5	3,420	7.7
Apr. 1-9, 14-30	31,700	10	8.88	5.22	6.87	.18	2.51	17.03	1.33	.05	.02	.21	1,480	2.01	63,720	32	2.6	1,790	7.8
Apr. 10-13	748	--	13.22	9.18	13.75	--	3.80	--	--	--	--	--	2,570	3.50	2,620	38	4.1	2,860	7.8

7-1305. ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, COLO.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
May 1-31, 1959 .	43,550	--	9.23	5.47	7.26	--	2.47	--	--	--	--	--	1,560	2.12	92,330	33	2.7	1,840	7.8
June 1-30.....	42,370	--	9.23	5.47	7.57	--	2.44	--	--	--	--	--	1,600	2.18	92,370	34	2.8	1,880	7.8
July 1-31	60,110	11	9.98	5.32	8.00	0.20	2.51	19.32	1.35	0.05	0.02	0.20	1,620	2.20	132,200	34	2.9	1,960	7.9
Aug. 1-31.....	56,830	--	9.73	6.19	8.53	--	2.75	--	--	--	--	--	1,730	2.35	133,600	35	3.0	2,070	7.8
Sept. 1-14	26,420	--	10.58	6.54	9.57	--	2.52	--	--	--	--	--	1,700	2.31	61,030	36	3.3	2,240	7.6
Sept. 15-19	151	--	16.47	11.13	18.01	--	4.06	--	--	--	--	--	3,210	4.37	660	39	4.8	3,560	7.6
Sept. 20-24	276	--	18.96	12.24	21.32	--	3.41	--	--	--	--	--	3,740	5.09	1,400	41	5.4	4,030	7.4
Sept. 25-26	865	--	7.39	3.01	5.66	--	3.08	--	--	--	---	--	1,080	1.47	1,270	35	2.5	1,420	7.8
Sept. 27-28	135	--	10.98	7.42	12.35	--	2.13	--	--	--	--	--	2,170	2.95	398	40	4.1	2,510	7.9
Sept. 29-30	165	--	13.97	9.23	16.27	--	2.29	--	--	--	--	--	2,780	3.78	624	41	4.8	3,160	7.7
Total or weighted average	297,600	--	9.43	5.67	7.79	--	2.61	--	--	--	--	--	1,590	2.16	642,800	34	2.8	1,930	--

7-1465. ARKANSAS RIVER AT ARKANSAS CITY, KANS.

LOCATION.--At gaging station at bridge on U.S. Highway 166, half a mile west of Arkansas City, Cowley County, 5.4 miles upstream from Walnut River.
DRAINAGE AREA.--43,713 square miles, of which 7,607 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1951 to September 1959.
Water temperatures: October 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 3,270 micromhos Jan. 4; minimum daily, 388 micromhos July 18.
Percent sodium: Maximum, 71 Sept. 11-24; minimum, 45 July 24, Sept. 25-30.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 5,770 micromhos Jan. 16, 1957; minimum daily, 259 micromhos Oct. 4, 1955.
Percent sodium: Maximum, 79 Apr. 28, 1955; minimum, 36 May 27-29, 1955.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1958 to September 1959 given in WSP 1631.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-10, 1958	43,820	21	5.19	1.91	9.14	0.17	3.97	0.00	3.44	8.69	0.03	0.10	0.37	964	1.31	57,500	56	4.9	1,610	8.2
Oct. 11-13.....	12,950	--	3.99	1.49	7.91		3.08	.00	2.77	7.39	--	.15	--	808	1.10	14,250	59	4.8	1,370	8.1
Oct. 14-31	52,150	--	5.44	1.96	10.87		3.97	.00	3.75	10.43	--	.12	--	1,110	1.51	78,790	59	5.7	1,880	8.1
Nov. 1-17	37,790	--	5.14	2.36	11.74		4.36	.00	2.91	11.84	--	.13	--	1,120	1.52	57,610	61	6.1	2,160	8.1
Nov. 18-21	12,380	--	4.44	2.16	8.66		3.38	.20	3.33	8.23	--	.12	--	939	1.28	15,820	57	4.8	1,550	8.4
Nov. 22-30	20,950	--	5.59	2.31	11.95		3.97	.40	4.00	11.34	--	.14	--	1,220	1.66	34,780	60	6.0	1,980	8.4
Dec. 1-10	22,690	--	6.24	2.76	13.66		4.10	.40	5.31	12.69	--	.16	--	1,420	1.93	43,860	60	6.4	2,260	8.4
Dec. 11-16	9,680	--	7.68	4.62	16.83		4.75	.27	7.00	16.92	--	.19	--	1,800	2.45	23,710	58	6.8	2,800	8.3
Dec. 17-20	10,040	--	6.59	2.91	14.24		4.29	.47	6.06	12.69	--	.23	--	1,460	1.99	19,950	60	6.5	2,270	8.4
Dec. 21-31	30,350	25	6.54	2.06	13.53	.15	4.06	.27	6.79	11.62	.02	.14	.43	1,380	1.88	57,010	59	6.3	2,240	8.4
Jan. 1-12, 1959	22,830	--	6.29	3.71	17.28		4.98	.00	7.33	14.95	--	.02	--	1,660	2.26	51,590	63	7.8	2,570	8.1
Jan. 13-20	22,570	--	5.59	2.61	11.76		4.10	.00	5.39	10.29	--	.18	--	1,210	1.65	37,180	59	5.8	2,010	7.8
Jan. 21-24	8,230	--	6.54	4.06	17.56		4.26	.40	7.37	16.07	--	.06	--	1,720	2.34	19,260	62	7.7	2,590	8.4
Jan. 25-31.....	18,090	--	6.39	2.21	14.09		4.13	.27	5.85	12.41	--	.03	--	1,380	1.88	33,980	62	6.9	2,230	8.3
Feb. 1-4	7,240	--	7.19	3.41	17.48		3.80	.67	6.89	16.64	--	.08	--	1,750	2.38	17,250	62	7.6	2,740	8.5
Feb. 5-10	17,430	--	5.79	3.41	14.83		4.33	.00	6.66	12.97	--	.07	--	1,450	1.97	34,410	62	6.9	2,210	8.2
Feb. 11-20	34,690	20	6.39	2.21	11.66	.21	4.00	.00	4.35	12.55	.03	.02	.00	1,320	1.80	62,330	57	5.6	2,210	7.8
Feb. 21-28	23,940	18	6.09	3.31	12.09	.20	4.13	.00	4.23	12.83	.03	.12	.00	1,330	1.81	43,340	56	5.6	2,360	8.0

7-1465. ARKANSAS RIVER AT ARKANSAS CITY, KANS.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Mar.1-10, 1959	27,7500	18	6.94	3.26	13.92	0.17	4.26	0.00	8.91	10.43	0.03	0.13	0.25	1,540	2.09	58,170	57	6.2	2,350	7.4
Mar.11-20	30,510	20	4.99	2.81	14.01	.17	3.77	.00	4.56	13.82	.00	.01	.11	1,450	1.97	60,210	64	7.1	2,240	7.8
Mar. 21-26 ...	15,430	--	7.09	3.11	14.79		3.74	.53	8.74	11.84	--	.14	--	1,550	2.11	32,560	59	6.5	2,380	8.5
Mar. 27-31 ...	27,870	--	4.14	2.06	7.73		2.95	.00	4.50	6.43	--	.05	--	860	1.17	32,620	55	4.4	1,390	8.1
Apr. 1.....	3,990	--	4.24	1.66	9.87		2.98	.00	4.46	8.32	--	.01	--	976	1.33	5,300	63	5.7	1,580	7.4
Apr. 2-8	19,640	--	5.74	2.66	13.14		3.87	.00	6.79	10.77	--	.11	--	1,360	1.85	36,350	61	6.4	2,100	8.2
Apr. 9.....	3,350	--	6.49	3.01	16.82		3.93	.00	7.72	14.66	--	.01	--	1,680	2.28	7,670	64	7.7	2,590	7.8
Apr. 10	2,920	--	5.89	2.71	11.69		3.67	.13	6.89	9.53	--	.07	--	1,280	1.74	5,080	58	5.6	1,960	8.3
Apr. 11-20 ..	24,580	20	4.89	2.79	13.05	.17	3.34	.00	4.52	13.54	.00	.01	.10	1,440	1.96	48,170	62	6.7	2,160	7.7
Apr. 21-30 ..	25,150	--	5.74	3.86	12.22		3.67	.13	6.52	11.42	--	.08	--	1,340	1.82	45,880	56	5.6	2,130	8.3
May 1-5	10,670	--	4.79	3.21	15.22		3.15	.00	6.64	13.40	--	.03	--	1,440	1.96	20,920	66	7.6	2,240	8.2
May 6	5,360	--	3.49	2.11	6.68		2.39	.27	3.75	5.87	--	.00	--	744	1.01	5,420	54	4.0	1,230	8.4
May 7-11	60,500	--	2.50	1.18	4.44		2.52	.00	1.71	3.89	--	.00	--	480	.65	39,530	55	3.3	835	7.6
May 12-17 ...	78,600	--	2.45	1.07	3.87		2.46	.00	1.37	3.52	--	.04	--	438	.60	46,870	52	2.9	787	7.9
May 18-27 ..	44,550	--	3.79	1.71	9.63		3.05	.00	3.27	8.74	--	.07	--	896	1.22	54,340	64	5.8	1,540	7.9
May 28-31 ...	19,220	--	3.64	1.66	7.96		3.05	.13	2.98	7.05	--	.05	--	795	1.08	20,800	60	4.9	1,350	8.3
June 1-2.....	8,130	--	3.84	1.56	8.24		3.15	.00	3.29	7.19	--	.01	--	829	1.13	9,180	60	5.0	1,370	7.8
June 3-10....	24,440	--	4.09	2.01	11.06		2.88	.00	4.64	9.59	--	.05	--	1,050	1.43	34,930	64	6.3	1,750	8.0
June 11-20...	22,290	--	4.49	2.71	13.48		2.88	.00	6.14	11.62	--	.04	--	1,240	1.69	37,620	65	7.1	2,070	8.0
June 21-22...	4,020	--	4.74	2.86	14.88		2.92	.00	6.06	13.48	--	.02	--	1,370	1.86	7,500	66	8.1	2,250	8.1
June 23.....	3,530	--	3.84	2.06	9.63		2.75	.13	4.25	8.32	--	.08	--	975	1.33	4,690	62	5.6	1,570	8.3
June 24-26 ..	12,480	--	2.64	1.56	5.41		2.49	.00	2.46	4.65	--	.01	--	597	.81	10,140	56	3.7	971	6.9
June 27-30...	8,810	--	3.89	2.11	10.77		2.92	.00	4.25	9.59	--	.01	--	1,060	1.44	12,710	64	6.2	1,700	7.1

July 1, 1959...	2,360	--	4.54	1.86	13.31	2.62	0.00	4.62	12.41	--	0.06	--	1,160	1.58	3,730	68	7.4	1,950	8.2
July 2	2,960	--	3.49	1.23	7.65	2.46	.00	3.08	6.77	--	.06	--	726	.99	2,920	62	5.0	1,190	8.2
July 3-4	4,680	--	4.49	1.59	11.32	2.59	.00	4.37	10.43	--	.01	--	1,040	1.41	6,630	65	6.5	1,740	7.0
July 5-14	25,940	--	4.14	1.26	4.61	3.02	.00	3.21	3.72	--	.06	--	800	1.09	28,250	46	2.8	1,340	8.2
July 15-20	84,910	--	1.75	.89	2.31	1.70	.00	1.06	2.12	--	.07	--	294	.40	33,980	47	2.0	526	7.6
July 21-23	22,470	--	2.25	.99	3.79	2.20	.00	1.44	3.33	--	.06	--	419	.57	12,820	54	3.0	723	8.0
July 24	15,750	--	1.45	.71	1.76	1.74	.00	.75	1.35	--	.08	--	229	.31	4,910	45	1.7	392	7.9
July 25-27	16,360	--	2.64	1.04	4.87	2.49	.00	1.77	4.23	--	.06	--	507	.69	11,290	57	3.6	871	8.1
July 28-31	14,140	--	3.29	1.51	7.16	2.98	.00	2.27	6.63	--	.08	--	712	.97	13,710	60	4.6	1,230	8.1
Aug. 1-10.....	19,780	12	4.94	2.02	12.57 | 0.15	3.61	.00	3.93	12.13	0.03	.06	0.05	1,200	1.63	32,300	64	6.7	1,980	8.2
Aug. 11-15 ...	6,040	--	5.49	2.51	15.57	3.54	.00	4.73	15.23	--	.07	--	1,420	1.93	11,680	66	7.8	2,330	8.1
Aug. 16-20 ...	25,940	--	2.79	1.09	4.51	2.10	.00	1.85	4.37	--	.07	--	504	.69	17,800	54	3.2	867	8.0
Aug. 21-31 ...	15,190	11	4.89	1.99	12.35 | .08	2.88	.00	3.96	12.41	.01	.07	.06	1,170	1.59	24,190	64	6.6	2,070	7.9
Sept. 1-10....	9,680	14	5.04	2.08	12.70 | .08	3.21	.27	3.62	12.97	.01	.06	.20	1,340	1.82	17,660	64	6.7	2,150	8.4
Sept. 11-24 ...	13,020	7.8	5.09	1.91	17.40 | .08	4.03	.00	2.66	17.48	.02	.14	.00	1,450	1.97	25,690	71	9.3	2,520	7.9
Sept. 25-30 ...	51,050	--	2.10	.62	2.24	2.40	.00	.77	1.95	--	.04	--	305	.41	21,200	45	1.9	507	7.9
Total or weighted average [a]	1,222,000	--	4.34	1.97	9.32	[b] 3.28	--	3.77	8.57	--	0.01	--	967	1.32	1,608,000	60	5.3	1,560	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.
b Includes equivalent of individual carbonate values shown above.

ARKANSAS RIVER BASIN--Continued

7-1525. ARKANSAS RIVER AT RALSTON, OKLA.

LOCATION.--At gaging station at bridge on State Highway 18 at Ralston, Pawnee County, 2 miles downstream from Salt Creek, and 2 miles upstream from Grayhorse Creek.
DRAINAGE AREA.--54,465 square miles, of which 7,615 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: January 1950 to September 1959.
Water temperatures: January 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 3,070 micromhos Feb. 16; minimum daily, 268 micromhos July 17.
Percent sodium: Maximum, 75 Sept. 29-30; minimum, 39 July 15-20.
EXTREMES, 1950-59.--Specific conductance: Maximum daily, 7,510 micromhos Sept. 14, 1955; minimum daily, 251 micromhos Oct. 5, 1955.
Percent sodium: Maximum, 87 May 1-2, 1957; minimum, 30 Apr. 23-29, 1958.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1958 to September 1959 given in WSP 1631.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-11, 1956	67,440	17	5.29	1.71	10.22	0.18	3.47	0.00	3.29	10.15	0.02	0.06	0.14	1,020	1.39	93,640	59	5.5	1,720	7.7
Oct. 12-31 ...	83,780	--	4.89	1.91	10.06		3.34	.00	3.16	10.29	--	.07	--	1,020	1.39	116,300	60	5.5	1,740	8.0
Nov. 1-20	59,640	--	5.44	2.26	11.77		3.61	.00	2.27	13.54	--	.05	--	1,130	1.54	91,740	60	6.0	2,010	7.4
Nov. 21-22 ...	10,870	--	4.79	3.01	7.58		3.05	.33	3.16	8.74	--	.10	--	993	1.35	14,690	49	3.8	1,560	8.4
Nov. 23-30....	27,610	--	5.44	2.36	11.44		3.61	.40	3.64	11.51	--	.08	--	1,180	1.60	44,350	59	5.8	1,940	8.4
Dec. 1-10	29,590	--	6.09	2.51	14.27		4.00	.40	4.25	14.10	--	.12	--	1,390	1.89	55,990	62	6.9	2,280	8.3
Dec. 11-31 ...	64,660	--	6.79	3.11	14.78		4.29	.33	5.14	14.80	--	.12	--	1,520	2.07	133,800	60	6.6	2,450	8.3
Jan. 1-15, 1959	37,510	21	7.78	2.82	17.40	.16	4.72	.00	6.70	16.36	.02	.10	.45	1,670	2.27	85,270	62	7.6	2,760	8.0
Jan. 16-21....	21,580	--	5.59	3.01	14.44		4.26	.00	5.18	13.54	--	.06	--	1,430	1.94	42,010	63	7.0	2,180	8.1
Jan. 22-31....	33,240	--	4.94	4.46	18.29		4.33	.40	5.98	16.92	--	.06	--	1,640	2.23	74,210	66	8.5	2,610	8.3
Feb. 1-10	28,540	12	7.09	2.41	17.40	.16	4.33	.00	5.79	16.36	.02	.09	.30	1,590	2.16	61,780	64	8.0	2,660	8.0
Feb. 11-15 ...	20,370	--	5.79	3.21	15.66		3.47	.93	6.10	14.10	--	.06	--	1,490	2.03	41,320	64	7.4	2,200	8.4
Feb. 16-28 ...	54,490	17	6.64	3.16	17.01	.10	4.00	.00	6.93	15.23	.03	.11	.32	1,640	2.23	121,600	63	7.7	2,640	8.0
Mar. 1-29 ...	111,800	14	6.49	3.41	16.57	.15	4.00	.00	7.16	15.51	.03	.10	.11	1,620	2.20	246,500	62	7.4	2,570	7.9
Mar. 30-31 ...	14,820	--	4.69	2.01	12.80		3.31	.00	4.62	11.56	--	.01	--	1,210	1.65	24,400	66	7.0	2,000	8.2

Apr. 1-9, 1959	50,180	--	5.49	2.31	16.80	3.21	0.00	5.37	15.93	--	0.09	--	1,510	2.05	103,100	68	8.5	2,500	8.2
Apr. 10	9,960	--	5.69	1.61	12.69	3.25	.00	4.83	11.90	--	.01	--	1,250	1.70	16,940	63	6.6	2,020	7.3
Apr. 11-13 ...	36,650	--	4.69	1.91	9.06	3.21	.00	3.56	8.88	--	.01	--	980	1.33	48,900	58	5.0	1,580	7.7
Apr. 14-20 ...	46,990	--	5.29	2.41	14.40	3.18	.07	5.10	13.68	--	.07	--	1,390	1.89	88,910	65	7.3	2,220	8.3
Apr. 21-30 ...	60,500	15	3.99	1.37	14.05 | 0.16	2.16	.27	2.56	14.38	0.02	.06	0.05	1,160	1.58	95,530	72	8.6	2,100	8.5
May 1-8	37,610	--	4.79	2.81	15.61	2.95	.00	5.43	14.80	--	.03	--	1,400	1.90	71,670	67	8.0	2,350	8.2
May 9-19	203,600	--	2.64	1.16	5.59	2.36	.00	1.62	5.36	--	.05	--	572	.78	158,600	60	4.1	1,000	8.2
May 20-23	78,110	--	2.89	1.61	4.99	2.36	.13	1.83	5.08	--	.09	--	605	.82	64,330	53	3.3	964	8.4
May 24-28	52,340	--	3.84	1.76	9.80	2.69	.20	3.08	9.36	--	.07	--	946	1.29	67,410	64	5.9	1,550	8.4
May 29-31	60,100	--	3.14	1.96	7.58	2.39	.13	2.52	7.56	--	.08	--	790	1.07	64,630	60	4.7	1,300	8.4
June 1-10.....	85,210	--	4.49	1.51	12.31	2.95	.00	3.48	11.84	--	.04	--	1,110	1.50	127,600	67	7.1	1,900	7.8
June 11-20....	40,360	--	5.09	2.01	14.26	3.02	.27	4.79	13.25	--	.03	--	1,280	1.74	70,330	67	7.6	2,160	8.4
June 21-25....	16,520	--	4.69	2.31	15.52	2.52	.13	4.89	14.95	--	.03	--	1,360	1.85	30,590	69	8.3	2,300	8.3
June 26-30....	36,240	--	3.89	1.51	8.35	2.62	.13	2.77	8.18	--	.05	--	845	1.15	41,680	61	5.1	1,440	8.3
July 1-2	7,460	--	4.54	1.86	15.42	2.92	.00	3.81	15.09	--	.00	--	1,310	1.78	13,300	71	8.6	2,200	7.9
July 3-11	49,050	--	4.09	1.11	9.70	2.66	.00	2.87	9.31	--	.06	--	880	1.20	58,760	65	6.0	1,490	8.2
July 12-14	24,300	--	2.94	.94	5.92	2.23	.00	1.69	5.87	--	.01	--	584	.79	19,320	60	4.3	995	8.0
July 15-20	425,500	--	1.85	.31	1.40	1.80	.00	.48	1.24	--	.04	--	200	.27	115,800	39	1.3	355	7.8
July 21-27	271,600	--	2.05	.83	1.90	2.13	.00	.77	1.83	--	.05	--	281	.38	103,900	40	1.6	497	7.7
July 28-31	49,450	--	3.04	1.28	4.89	2.82	.00	1.54	4.79	--	.06	--	544	.74	36,620	53	3.3	940	8.1
Aug. 1-15.....	75,390	14	3.29	1.51	9.44 | .10	2.46	.07	2.19	9.87	.02	.05	.00	858	1.17	88,050	66	6.1	1,550	8.3
Aug. 16-17....	14,740	--	3.39	1.11	5.53	2.43	.00	2.06	5.41	--	.13	--	580	.79	11,640	55	3.7	992	8.2
Aug. 18.....	16,680	--	3.64	1.28	7.85	2.29	.00	2.14	8.23	--	.11	--	766	1.04	17,390	61	5.0	1,310	8.1
Aug. 19-20....	46,060	--	2.20	.64	2.47	1.97	.00	1.02	2.25	--	.06	--	314	.43	19,690	47	2.1	510	8.1
Aug. 21-22 ...	15,910	--	2.64	.76	4.14	2.16	.00	1.44	3.89	--	.05	--	447	.61	9,680	55	3.2	747	8.2

ARKANSAS RIVER BASIN--Continued

7-1525. ARKANSAS RIVER AT RALSTON, OKLA.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Aug. 23-31, 1959.....	40,260	--	3.99	1.45	9.49		2.82	0.00	2.91	9.16	--	0.04	--	880	1.20	48,230	64	5.8	1,460	8.2
Sept. 1-10...	34,200	6.8	3.89	1.47	11.83	0.04	2.49	.00	2.37	12.13	0.03	.05	0.00	1,140	1.55	53,060	69	7.1	1,750	8.0
Sept. 11-19..	20,140	--	4.09	2.23	14.16		2.43	.00	3.35	14.66	--	.04	--	1,210	1.65	33,170	69	8.0	2,110	7.7
Sept. 20-21..	13,690	--	2.50	1.02	4.98		1.84	.00	1.39	5.22	--	.05	--	506	.69	9,430	59	3.8	890	7.8
Sept. 22-24..	11,520	--	2.64	2.26	9.28		2.00	.00	2.31	9.81	--	.06	--	874	1.19	13,710	65	5.9	1,500	7.8
Sept. 25.....	26,580	--	2.79	1.11	3.93		1.87	.00	.44	5.50	--	.02	--	486	.66	17,580	50	2.8	820	7.5
Sept. 26-27..	125,000	--	1.45	.71	2.20		1.57	.00	.56	2.17	--	.06	--	264	.36	44,910	50	2.1	466	7.6
Sept. 28.....	51,170	--	2.00	1.20	6.80		1.70	.00	1.17	7.11	--	.02	--	625	.85	43,540	68	5.4	1,070	7.5
Sept. 29-30..	54,940	--	3.19	2.01	15.91		1.87	.00	2.71	16.50	--	.03	--	1,330	1.81	99,470	75	9.9	2,300	7.4
Total or weighted average [a]	2,854,000	--	3.64	1.56	8.23		2.70	--	b2.60	8.07	--	0.06	--	812	1.10	3,155,000	61	5.1	1,360	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.
b Includes equivalent of individual carbonate values shown above.

7-1610. CIMARRON RIVER AT PERKINS, OKLA.

LOCATION.--At gaging station on State Highway 40, 1 mile south of Perkins, Payne County, 1½ miles upstream from Dugout Creek, and 4 miles downstream from Wildhorse Creek.
DRAINAGE AREA.--17,852 square miles, of which 4,926 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1952 to September 1959.
Water temperatures: October 1952 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 22,800 micromhos Feb. 14; minimum daily, 910 micromhos July 27.
Percent sodium: Maximum, 92 Feb. 14; minimum, 63 Aug. 8.
EXTREMES, 1952-59.--Specific conductance: Maximum daily, 32,400 micromhos Mar. 18, 1957; minimum daily, 438 micromhos Oct. 5, 1955.
Percent sodium: Maximum, 94 Feb. 18-20, 1955, Apr. 1-2, 1957; minimum, 53 May 21, June 24, 1957, June 26, 1958.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1958 to September 1959 given in WSP 1631.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-20, 1958	8,210	23	9.68	4.62	63.51	0.25	3.80	0.00	8.08	67.12	0.02	0.00	0.64	4,770	6.49	53,330	81	24	8,010	7.6
Oct. 21-31....	2,760	--	9.48	5.32	64.89		4.20	.00	8.37	67.12	--	--	--	4,880	6.64	18,370	81	24	8,330	8.1
Nov. 1-19	5,080	--	9.58	4.82	61.77		4.52	.00	8.20	63.45	--	--	--	4,520	6.15	31,230	81	23	7,610	8.1
Nov. 20-22 ...	1,660	--	7.58	4.32	57.19		4.20	.00	7.08	57.81	--	--	--	4,130	5.62	9,330	83	23	6,980	8.1
Nov. 23-28 ...	2,700	--	11.18	5.02	83.38		4.59	.00	10.39	84.60	--	--	--	5,980	8.13	21,970	84	29	9,820	8.1
Nov. 29-30 ...	809	--	12.33	5.31	120.05		4.87	.00	10.43	122.39	--	--	--	8,220	11.18	9,060	87	40	13,500	8.1
Dec. 1-16	5,410	--	11.53	5.31	100.65		5.20	.00	9.64	102.65	--	--	--	7,000	9.52	51,520	86	35	11,700	8.1
Dec. 17-20 ...	1,700	--	9.68	5.32	77.65		5.34	.00	8.35	78.96	--	--	--	5,450	7.41	12,630	84	28	9,170	8.1
Dec. 21-25 ...	2,070	--	10.18	5.62	85.81		5.05	.00	9.14	87.42	--	--	--	6,050	8.23	17,070	84	31	10,100	8.2
Dec. 26	452	--	10.33	5.91	100.78		4.77	.00	9.60	120.65	--	--	--	6,980	9.49	4.300	86	35	11,700	8.2
Dec. 27-29 ...	1,410	--	11.93	6.85	159.80		4.56	.00	11.31	162.71	--	--	--	10,500	14.28	20,160	89	52	17,200	8.1
Dec. 30-31....	857	--	9.38	4.30	89.75		4.82	.00	8.37	90.24	--	--	--	6,120	8.32	7,140	87	34	10,400	8.1
Jan. 1-6, 1959	2,060	--	10.38	6.02	95.95		5.61	.00	9.45	97.29	--	--	--	6,770	9.21	19,010	85	34	11,200	8.2
Jan. 7-10	1,470	--	8.98	7.02	79.72		4.95	.33	8.66	81.78	--	--	--	5,770	7.85	11,530	83	28	9,680	8.4
Jan. 11-14....	1,780	--	9.28	6.32	87.29		4.62	.33	9.10	88.83	--	--	--	6,270	8.53	15,190	85	31	10,400	8.3

ARKANSAS RIVER BASIN--Continued

7-1610. CIMARRON RIVER AT PERKINS, OKLA.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Jan. 15-20, 1959	2,640	--	8.83	7.91	119.60		3.79	0.27	9.89	122.39	--	--	--	8,160	11.10	29,280	88	41	13,500	8.3
Jan. 21-22	734	--	11.08	8.36	180.43		3.31	.00	13.26	183.30	--	--	--	12,100	16.46	12,090	90	58	19,500	8.1
Jan. 23	397	--	6.74	7.40	122.10		2.21	.00	10.51	123.52	--	--	--	9,130	12.42	4,930	90	46	14,900	8.1
Jan. 24-31	4,440	--	7.88	5.92	83.61		4.52	.00	8.29	84.60	--	--	--	5,720	7.78	34,560	86	32	9,850	8.2
Feb. 1-8	2,990	--	9.18	5.98	100.21		4.64	.00	9.49	101.24	--	--	--	6,910	9.40	28,080	87	36	11,600	7.6
Feb. 9	651	--	9.03	7.29	146.76		2.67	.00	11.80	148.61	--	--	--	9,740	13.25	8,630	90	51	15,800	7.9
Feb. 10	714	--	8.08	5.50	114.97		3.57	.00	9.64	115.34	--	--	--	7,820	10.64	7,600	89	44	13,000	7.8
Feb. 11-12	1,280	--	7.78	5.60	96.17		3.74	.00	8.54	97.29	--	--	--	6,550	8.91	11,390	88	37	11,000	8.1
Feb. 13	853	--	7.93	6.97	154.16		2.05	.00	10.22	156.79	--	--	--	10,200	13.87	11,840	91	56	16,700	8.1
Feb. 14	853	--	11.08	8.32	215.58		3.21	.00	12.66	219.11	--	--	--	14,300	19.45	16,600	92	69	22,800	8.1
Feb. 15-16	1,500	--	8.13	6.41	137.92		4.25	.00	9.18	139.03	--	--	--	9,080	12.35	18,510	90	51	15,100	8.2
Feb. 17-18	1,290	--	7.68	5.90	100.13		3.87	.33	8.27	101.24	--	--	--	6,870	9.34	12,020	88	38	11,600	8.3
Feb. 19-21	1,710	--	9.53	7.21	136.24		4.31	.00	9.64	139.03	--	--	--	9,260	12.59	21,500	89	47	15,300	8.2
Feb. 22-28	3,540	--	8.18	6.98	107.44	0.22	3.98	.00	9.85	109.70	0.02	--	0.00	7,450	10.13	35,950	87	39	12,800	8.1
Mar. 1-20	9,670	--	8.93	5.99	101.79	--	3.26	.40	10.43	103.78	.04	0.00	.03	6,890	9.37	90,730	87	37	11,500	8.6
Mar. 21-26	3,000	--	8.43	5.23	88.69		3.52	.40	9.04	89.39	--	--	--	6,300	8.57	25,750	87	34	10,300	8.5
Mar. 27	734	--	11.03	6.09	136.22		4.28	.00	12.85	136.21	--	--	--	9,350	12.72	9,340	89	47	14,700	8.0
Mar. 28	666	--	10.43	5.61	110.93		3.92	.33	11.89	110.83	--	--	--	7,730	10.51	7,010	87	39	12,300	8.4
Mar. 29-30	3,920	--	11.43	5.59	141.62		3.69	.40	12.99	141.56	--	--	--	9,670	13.15	51,540	89	49	15,500	8.4
Mar. 31	1,340	--	9.18	3.52	59.09		3.08	.00	12.87	55.84	--	--	--	4,400	5.98	8,050	82	23	7,150	8.2
Apr. 1-2	1,980	--	10.18	3.82	63.22		2.79	.00	11.83	62.60	--	--	--	4,590	6.24	12,390	82	24	7,600	7.7
Apr. 3-10	6,070	--	11.23	5.39	117.10		3.75	.20	11.89	117.88	--	--	--	8,390	11.41	69,360	88	41	13,100	8.4

Apr. 11-14, 1959.	6,420	--	7.48	3.42	66.03	2.23	0.33	9.51	64.86	--	--	--	4,600	6.26	40,230	86	28	7,630	8.5
Apr. 15-18	3,520	--	11.03	4.89	128.47	3.00	.20	11.47	129.72	--	--	--	8,690	11.82	41,670	89	46	14,100	8.4
Apr. 19-26	10,080	--	9.08	4.12	84.13	3.44	.00	9.85	84.04	--	--	--	5,820	7.92	79,860	86	33	9,730	7.9
Apr. 27-28	1,400	--	10.23	5.07	144.20	3.70	.27	11.10	144.38	--	--	--	9,940	13.52	18,950	90	52	15,700	8.4
Apr. 29-30	1,190	--	8.53	4.43	93.25	3.85	.27	9.31	92.78	--	--	--	6,870	9.34	11,130	88	37	10,700	8.4
May 1-8	4,830	--	9.73	4.59	103.27	4.02	.00	9.79	103.78	--	--	--	6,910	9.40	45,410	88	39	11,600	8.2
May 9-10	11,110	--	5.39	2.11	34.01	2.59	.00	5.64	33.28	--	--	--	2,530	3.44	38,250	82	18	4,360	8.1
May 11	7,660	--	4.89	1.71	35.37	2.43	.13	4.16	35.25	--	--	--	2,680	3.64	27,930	84	19	4,380	8.4
May 12-14	10,930	--	6.64	2.56	49.81	2.39	.00	7.27	49.35	--	--	--	3,520	4.79	52,370	84	23	6,070	8.2
May 15	2,020	--	9.98	3.22	72.42	2.23	.20	9.87	73.32	--	--	--	5,190	7.06	14,290	85	28	8,610	8.4
May 16-20	5,920	--	9.33	3.03	91.26	3.23	.00	9.02	91.37	--	--	--	6,170	8.39	49,710	88	37	10,400	8.0
May 21-24	4,250	--	8.98	3.82	82.23	3.38	.07	9.24	82.34	--	--	--	5,700	7.75	33,010	87	33	9,530	8.3
May 25	1,580	--	4.94	2.26	41.56	2.49	.20	5.18	40.89	--	--	--	2,890	3.93	6,230	85	22	5,040	8.5
May 26-27	4,940	--	6.49	3.01	62.22	2.75	.00	6.37	62.60	--	--	--	4,250	5.78	28,580	87	29	7,300	8.0
May 28-29	17,380	--	3.94	1.16	24.65	2.33	.07	3.64	23.69	--	0.02	--	1,750	2.38	41,390	83	15	3,170	8.3
May 30	3,830	--	5.94	2.06	42.75	2.23	.13	7.50	40.89	--	--	--	3,060	4.16	15,950	84	21	5,240	8.4
May 31	2,080	--	5.94	1.86	24.32	1.90	.13	7.99	22.00	--	.10	--	1,940	2.64	5,500	76	12	3,290	8.4
June 1	1,500	--	7.68	2.22	25.61	2.29	.00	8.64	24.53	--	.05	--	2,140	2.91	4,370	72	12	3,440	8.2
June 2-3	2,040	--	9.38	2.72	38.27	2.85	.00	9.45	38.07	--	--	--	3,140	4.27	8,730	76	16	5,020	7.5
June 4-5	1,610	--	11.78	1.92	60.03	3.34	.00	9.76	60.63	--	--	--	4,400	5.98	9,620	81	23	7,150	8.2
June 6-10	2,760	--	10.78	4.02	80.63	3.44	.20	10.01	81.78	--	--	--	5,720	7.78	21,510	84	30	9,280	8.4
June 11-16	2,730	--	10.33	5.21	90.86	3.36	.00	10.24	92.78	--	--	--	6,450	8.77	23,930	85	33	10,600	8.2
June 17-20	1,080	--	8.18	3.82	56.71	3.15	.00	9.16	56.40	--	--	--	4,180	5.68	6,120	83	23	6,860	8.1

ARKANSAS RIVER BASIN--Continued

7-1610. CIMARRON RIVER AT PERKINS, OKLA.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
June 21-26, 1959	1,940	--	11.13	6.19	99.31		3.62	0.00	10.64	102.37	--	--	--	7,200	9.79	19,030	85	34	11,400	8.1
June 27-30	2,820	--	7.98	3.82	53.54		2.72	.00	9.60	53.02	--	--	--	4,030	5.48	15,480	82	22	6,570	8.2
July 1-4	2,300	--	8.38	3.42	67.32		2.85	.20	7.83	68.24	--	--	--	4,820	6.56	15,080	85	28	8,040	8.4
July 5-10	2,110	--	10.23	4.31	88.20		3.23	.20	10.76	88.55	--	--	--	6,260	8.51	17,980	86	33	10,200	8.4
July 11-12	2,350	--	12.52	5.00	99.63		2.70	.00	13.49	100.96	--	--	--	7,080	9.63	22,610	85	34	11,600	7.5
July 13-20	5,920	--	5.49	2.01	34.38		2.16	.00	5.60	34.12	--	--	--	2,570	3.50	20,710	82	18	4,370	7.7
July 21-25	3,020	--	6.69	2.81	50.93		2.88	.13	5.25	52.17	--	--	--	3,690	5.02	15,190	84	23	6,240	8.3
July 26	341	--	7.09	3.11	56.19		3.02	.27	6.14	56.96	--	--	--	3,980	5.41	1,850	85	25	6,790	8.4
July 27-28	6,310	--	1.90	.74	7.12		1.70	.00	.83	7.19	--	--	--	572	.78	4,910	73	6.2	1,080	8.2
July 29-31	3,340	--	5.69	2.51	47.88		2.52	.00	5.62	47.94	--	--	--	3,420	4.65	15,570	85	24	5,760	8.2
Aug. 1-4	1,400	--	6.29	3.51	40.25		3.25	.00	5.91	40.89	--	--	--	3,030	4.12	5,780	80	18	5,160	8.0
Aug. 5-6	605	--	15.47	7.33	182.58		3.33	.00	15.93	186.12	--	--	--	12,400	16.86	10,210	89	54	19,900	7.9
Aug. 7	831	--	7.09	3.29	89.39		2.72	.00	6.81	90.24	--	--	--	5,850	7.96	6,620	90	39	11,500	7.8
Aug. 8	873	--	5.39	2.61	13.38		2.46	.00	4.52	14.38	--	--	--	1,250	1.70	1,480	63	6.7	1,950	7.8
Aug. 9-10	952	--	6.24	3.36	57.08		2.46	.00	5.56	58.66	--	--	--	4,030	5.48	5,220	86	26	7,000	7.8
Aug. 11-20	2,560	--	10.88	5.68	100.98		3.74	.00	9.74	104.06	--	--	--	7,000	9.52	24,420	86	35	11,600	8.0
Aug. 21-28	3,030	--	13.12	5.78	146.22		2.87	.00	13.64	148.61	--	--	--	10,000	13.60	41,280	89	48	16,200	7.9
Aug. 29	538	--	2.35	2.75	14.28		1.90	.00	1.39	16.07	--	0.02	--	1,150	1.56	841	74	8.9	2,180	7.7
Aug. 30	361	--	8.48	5.70	89.12		2.79	.00	9.14	91.37	--	--	--	6,370	8.66	3,130	86	33	10,500	7.8
Aug. 31	1,120	--	2.25	1.75	13.36		2.46	.00	1.77	13.11	--	--	--	1,030	1.40	1,570	77	9.4	1,860	7.7

Sept. 1-2, 1959	922	--	2.79	2.01	18.18	1.93	0.00	2.23	18.75	--	0.07	--	1,420	1.93	1,780	79	12	2,540	7.8
Sept. 3	1,210	--	5.84	3.96	47.41	2.95	.00	4.91	49.35	--	--	--	3,460	4.71	5,690	83	21	5,920	7.9
Sept. 4	1,430	--	10.88	5.88	95.88	3.31	.00	10.91	98.42	--	--	--	6,810	9.26	13,260	85	33	11,200	7.8
Sept. 5-6	1,110	--	2.15	2.55	11.63	1.80	.00	1.50	12.97	--	.06	--	996	1.35	1,510	71	7.6	1,810	7.7
Sept. 7-8	960	--	6.19	3.61	52.80	2.92	.00	5.54	54.14	--	--	--	3,730	5.07	4,870	84	24	6,410	8.0
Sept. 9-10	1,150	--	11,98	4.80	95.69	2.72	.00	13.87	95.88	--	--	--	6,850	9.32	10,760	85	33	11,100	7.8
Sept. 11	635	--	5.14	2.16	22.48	2.20	.00	5.00	22.56	--	.02	--	1,830	2.49	1,580	75	12	3,090	7.3
Sept. 12	413	--	11.68	4.92	67.32	2.72	.00	10.70	70.50	--	--	--	5,050	6.87	2,840	80	23	8,250	7.7
Sept. 13-20 ...	2,310	--	10.98	4.98	94.68	3.64	.00	9.99	97.01	--	--	--	6,750	9.18	21,270	86	33	11,000	7.9
Sept. 21-23 ...	524	--	10.98	6.98	92.24	3.80	.00	9.39	97.01	--	--	--	6,710	9.13	4,780	84	31	11,000	8.0
Sept. 24	18,530	--	1.65	1.25	6.48	1.64	.00	.67	7.05	--	.02	--	591	.80	14,900	69	5.4	1,090	7.6
Sept. 25	86,280	--	3.14	1.16	22.43	2.29	.00	2.08	22.28	--	.08	--	1,600	2.18	187,900	84	15	2,820	7.8
Sept. 26-27 ...	112,500	--	3.49	1.19	13.37	1.93	.00	3.10	12.97	--	.05	--	1,100	1.50	168,400	74	8.7	2,020	7.8
Sept. 28-30 ...	32,110	--	4.24	2.26	24.83	1.80	.00	3.81	25.66	--	.06	--	1,880	2.56	82,180	79	14	3,300	7.7
Total or weighted average a ..	503,100	--	5.74	2.63	45.42	2.66	--	b5.45	45.68	--	--	--	3,250	4.42	2,225,000	84	22	5,490	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.
b Includes equivalent of individual carbonate values shown above.

708-297 O-63-5

ARKANSAS RIVER BASIN--Continued

7-2505. ARKANSAS RIVER AT VAN BUREN, ARK.

LOCATION.--At gaging station at bridge on U.S. Highways 64 and 71, at Van Buren, Crawford County, 1.3 miles downstream from Lee Creek, 8.6 miles downstream from Poteau River.
DRAINAGE AREA.--150,483 square miles, of which 22,241 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1959.
Water temperatures: October 1945 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,200 micromhos Jan. 15; minimum daily, 255 micromhos Apr. 19.
Percent sodium: Maximum, 68 Feb. 3-5; minimum, 18 July 22.
EXTREMES, 1945-59.--Specific conductance: Maximum daily, 8,980 micromhos Apr. 1, 1954; minimum daily, 132 micromhos May 11, 1948.
Percent sodium: Maximum, 80 Oct. 21-24, 1946, Aug. 3-4, 1956; minimum, 18 July 22, 1959.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Little Rock, Ark. Records of discharge for water year October 1958 to September 1959 given in WSP 1631.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride ($F)_2$	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-4, 1958 ..	126,700	5.6	2.25	0.81	2.96	0.13	2.07	1.00	2.90	0.03	0.05	--	403	0.55	69,680	48	2.4	617	8.0
Oct. 5-7, 10	68,650	5.7	2.89	1.15	5.05	.15	2.54	1.58	5.02	.03	.07	0.05	614	.84	57,670	55	3.6	945	7.9
Oct. 8-9.....	32,370	--	3.94	1.56	8.66	.18	3.11	2.04	8.88	--	.05	--	896	1.22	39,490	60	5.2	1,450	8.0
Oct. 11-20.....	160,300	5.4	3.49	1.56	6.83	.16	2.82	2.06	7.28	.03	.05	.20	772	1.05	168,300	57	4.3	1,210	7.7
Oct. 21.....	11,960	--	3.09	1.07	4.96	.15	2.54	1.48	5.08	--	.02	--	523	.71	8,490	54	3.4	926	8.1
Oct. 22-28.....	78,250	5.4	3.59	1.40	7.22	.17	2.92	1.75	7.47	.02	.05	.05	788	1.07	83,730	58	4.6	1,240	8.2
Oct. 29-31.....	30,000	--	3.64	1.81	8.53	.18	3.08	1.83	9.08	--	.01	.05	896	1.22	36,600	60	5.2	1,460	8.2
Nov. 1-10.....	87,110	5.2	3.89	1.48	8.22	.16	2.98	2.02	8.60	.02	.05	.01	874	1.19	103,700	60	5.0	1,420	8.1
Nov. 11-14.....	38,880	3.5	3.99	1.56	9.05	.16	3.02	2.12	9.36	.02	.05	.15	927	1.26	48,990	61	5.4	1,530	8.1
Nov. 15	33,720	--	2.74	1.23	5.44	.14	2.38	1.62	5.50	--	.02	--	546	.74	24,950	57	3.9	991	8.1
Nov. 16-18	113,300	--	1.30	.62	1.74	.11	1.33	.65	1.78	--	.02	.02	257	.35	39,660	46	1.8	420	7.5
Nov. 19-20	52,170	--	2.10	1.15	4.78	.13	1.79	1.15	5.13	--	.02	.05	510	.69	36,000	59	3.7	861	7.7
Nov. 21-23	77,550	--	1.65	.99	3.39	.12	1.57	.96	3.61	--	.01	.04	384	.52	40,330	55	3.0	661	8.2
Nov. 24-30	165,400	4.5	2.89	1.07	4.61	.12	2.26	1.37	5.02	.02	.07	.06	562	.76	125,700	53	3.3	928	8.2
Dec. 1-6.....	103,100	4.6	2.89	1.07	4.57	.11	2.33	1.35	4.85	.02	.07	.01	546	.74	76,290	53	3.2	890	7.9
Dec. 7-17.....	123,400	4.1	3.59	1.32	7.66	.13	2.92	1.71	7.95	.02	.07	.12	807	1.10	135,700	60	4.9	1,310	8.0
Dec. 18-19	26,440	--	3.19	1.48	6.83	.14	2.80	1.79	6.99	--	.03	--	718	.98	25,910	59	4.5	1,200	7.5
Dec. 20-22	35,500	--	2.89	1.15	5.09	.12	2.51	1.33	5.36	--	.01	.04	560	.76	26,980	55	3.6	966	8.1

Dec. 23-24, 27-29, 1958.....	49,490	4.5	3.64	1.48	7.74	0.13	2.88	1.83	8.18	0.02	0.06	0.07	831	1.13	55,920	60	4.8	1,360	8.2
Dec. 25-26,30-31	46,530	3.8	4.69	1.64	11.27	.15	3.31	2.71	11.84	.01	.07	.04	1,130	1.54	71,660	63	6.3	1,820	8.2
Jan. 1-12, 1959.	134,300	3.6	3.54	1.23	8.18	.11	2.79	2.06	8.18	.01	.07	.05	831	1.13	151,800	63	5.3	1,380	8.1
Jan. 13-16.....	40,520	4.2	4.44	1.73	11.79	.15	3.08	2.69	12.41	.01	.08	.06	1,160	1.58	64,020	65	6.7	1,870	8.2
Jan. 17-20.....	37,070	3.8	3.94	1.40	8.13	.12	2.82	2.10	8.60	.01	.05	.05	863	1.17	43,370	60	5.0	1,440	8.2
Jan. 21-23, 28-29	64,500	3.1	4.14	1.89	10.79	.14	2.72	2.79	11.22	.01	.08	.07	1,080	1.47	94,820	64	6.2	1,720	7.9
Jan. 24-26, 30-31	71,680	2.8	2.74	1.40	6.92	.10	2.20	1.87	7.11	.01	.06	.09	716	.97	69,530	62	4.8	1,180	8.2
Jan. 27.....	8,490	--	3.69	1.73	9.35	.15	a2.95	2.29	9.45	--	..06	.05	960	1.31	11,120	63	5.7	1,520	8.4
Feb. 1, 7-8, 10.	53,470	2.8	3.09	1.48	7.22	.12	2.49	1.92	7.39	.01	.06	.02	762	1.04	55,610	61	4.8	1,240	7.8
Feb. 2, 6.....	27,650	--	3.44	1.48	9.44	.14	2.62	2.39	9.25	--	..06	.16	925	1.26	34,840	66	6.0	1,490	7.4
Feb. 3-5	42,660	2.7	3.94	1.81	12.70	.15	2.88	2.87	13.03	.02	.07	.11	1,180	1.60	68,260	68	7.5	1,940	8.0
Feb. 9, 11, 16-17, 19-20.....	123,700	3.2	2.99	1.32	6.13	.11	2.20	1.69	6.54	.02	.07	.15	698	.95	117,500	58	4.2	1,130	8.2
Feb. 12.....	14,060	--	4.29	2.06	12.40	.15	a3.25	2.96	12.35	--	.08	.26	1,270	1.73	24,320	66	6.9	1,930	8.3
Feb. 13, 18.....	47,210	--	3.39	1.48	8.61	.14	2.46	2.37	8.60	--	.08	.22	878	1.19	56,180	63	5.5	1,410	7.4
Feb. 14-15	53,950	--	2.79	1.07	4.61	.11	2.20	1.37	4.85	--	.08	.17	588	.80	43,160	54	3.3	896	7.3
Feb. 21-22, 28..	74,180	--	2.69	.99	5.35	.10	2.10	1.69	5.30	--	.07	.14	599	.81	60,090	59	3.9	977	7.6
Feb. 23-27.....	114,000	5.5	2.84	1.15	6.83	.14	2.16	1.89	6.99	.02	.09	.04	716	.97	110,600	62	4.8	1,140	7.9
Mar. 1-2.....	37,430	--	3.14	1.32	6.87	.13	2.33	2.42	6.77	--	.09	.17	750	1.02	38,180	60	4.6	1,180	7.7
Mar. 3-4.....	39,310	--	3.74	1.64	10.31	.14	2.62	3.04	10.10	--	.08	.17	1,050	1.43	56,210	65	6.3	1,660	7.8
Mar. 5.....	63,470	--	2.20	.90	5.00	.09	1.70	1.58	4.85	--	.07	.15	554	.75	47,600	61	4.0	887	8.0
Mar. 6-10.....	441,900	6.2	1.65	.64	2.26	.09	1.39	.83	2.40	.02	.07	.01	301	.41	181,200	49	2.1	520	7.5
Mar. 11-12	142,400	--	1.40	.51	1.74	.08	1.08	.92	1.69	--	.08	.11	252	.34	48,420	47	1.8	427	7.5
Mar. 13-14	116,600	--	1.65	.62	2.26	.09	1.34	1.08	2.23	--	.04	.12	310	.42	48,970	49	2.1	486	7.3

a Includes 0.20 equivalent per million of carbonate (CO_3).

ARKANSAS RIVER BASIN--Continued

7-2505. ARKANSAS RIVER AT VAN BUREN, ARK.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Mar. 15-20, 1959	233,900	6.7	2.30	0.90	3.87	0.10	1.82	1.46	3.72	0.02	0.06	0.01	454	0.62	145,000	54	3.1	736	7.8
Mar. 21, 29-31...	210,800	--	1.60	.80	2.78	.09	1.25	1.17	2.90	--	.04	.03	346	.47	99,080	53	2.5	539	7.4
Mar. 22-28	569,900	5.5	1.30	.52	1.70	.08	1.13	.71	1.75	.02	.05	.01	239	.33	188,100	47	1.8	402	6.8
Apr. 1-3.....	148,400	--	1.80	.82	3.65	.10	1.31	1.29	3.81	--	.07	.93	448	.61	90,520	57	3.2	686	7.4
Apr. 4	51,170	--	1.30	.61	2.22	.10	1.02	.90	2.26	--	.13	.04	250	.34	17,400	52	2.3	463	7.5
Apr. 5-6	92,030	--	1.90	.82	5.31	.10	1.34	1.52	5.30	--	.06	.09	543	.74	68,100	65	4.6	880	7.4
Apr. 7-8	65,060	--	2.69	1.15	9.27	.13	1.77	2.06	9.08	--	.07	.13	850	1.16	75,470	70	6.7	1,380	7.5
Apr. 9-13	142,200	5.0	2.45	.90	4.65	.12	1.84	1.52	4.79	.02	.12	.01	535	.73	103,800	57	3.6	863	7.8
Apr. 14-18	180,700	8.7	3.39	1.23	7.00	.15	2.49	1.92	7.19	.03	.12	.02	773	1.05	189,700	59	4.6	1,220	7.8
Apr. 19.....	54,350	--	.90	.25	1.17	.05	.85	.35	1.13	--	.05	.00	166	.23	12,500	49	1.5	255	7.1
Apr. 20-24, 27..	416,500	4.7	2.05	.73	3.87	.10	1.70	1.17	3.81	.01	.05	.00	427	.58	241,600	57	3.3	727	7.3
Apr. 25-26, 28-30	172,800	6.6	2.64	1.07	6.48	.13	2.00	1.62	6.54	.02	.07	.04	666	.91	157,200	63	4.8	1,090	7.6
May 1-3	70,020	--	2.89	.99	5.74	.13	2.23	1.71	5.70	--	.05	.01	608	.83	58,120	59	4.1	1,050	7.1
May 4-5	27,130	--	3.24	1.32	6.87	.15	2.49	2.00	7.05	--	.06	.01	744	1.01	27,400	59	4.5	1,270	7.2
May 6-7	32,070	--	4.54	1.15	10.66	.18	2.75	2.85	10.86	--	.05	.01	1,050	1.43	45,860	64	6.3	1,780	7.2
May 8-9	43,490	--	3.39	1.32	8.70	.18	2.49	2.08	9.16	--	.11	.01	902	1.23	53,490	64	5.7	1,510	7.0
May 10	88,860	--	1.90	.82	4.00	.10	1.57	.96	4.37	--	.04	.00	450	.61	54,200	59	3.4	763	7.4
May 11-15	998,300	5.9	2.00	.56	2.09	.09	1.79	.69	2.28	.02	.03	.02	308	.42	419,300	44	1.8	498	7.3
May 16-17, 20 ..	251,100	--	2.40	.69	3.92	.12	1.90	1.15	3.95	--	.06	.01	446	.61	153,200	55	3.2	775	7.0
May 18-19	142,400	--	2.59	.99	6.39	.15	2.10	1.50	6.49	--	.10	.01	652	.89	126,700	63	4.8	1,110	7.2
May 21-31, June 1	1,156,000	7.2	2.35	.79	3.48	.12	2.00	1.12	3.52	.03	.06	.02	436	.59	682,000	52	2.8	698	7.8
June 2.....	108,500	--	2.50	.99	5.52	.14	2.07	1.39	5.50	--	.09	.01	592	.81	87,880	60	4.2	930	7.6
June 3-8.....	413,800	7.7	2.20	.76	4.26	.12	1.80	1.25	4.09	.03	.06	.01	464	.63	260,700	58	3.5	766	7.8
June 9-10.....	81,320	--	2.84	1.23	5.92	.15	2.16	1.56	6.26	--	.07	.03	650	.88	71,560	58	4.1	1,100	7.5
June 11-16.....	192,400	4.7	2.50	.90	4.13	.14	2.07	1.37	4.09	.03	.05	.02	484	.66	127,000	54	3.2	796	7.8

June 17-23, 1959 .	109,900	4.6	3.14	1.32	6.79	0.17	2.49	1.96	6.91	0.02	0.06	0.04	726	0.99	108,800	59	4.5	1,180	8.0
June 24-28.....	84,930	4.7	3.14	1.56	8.05	.18	2.33	2.08	8.18	.03	.06	.03	819	1.11	94,270	62	5.3	1,340	7.9
June 29-30	73,790	--	2.84	.75	4.65	.14	2.07	.98	5.30	--	.05	--	532	.72	53,130	55	3.5	915	7.3
July 1-3, ...	91,640	--	3.09	1.23	6.87	.17	2.23	1.71	7.33	--	.07	.03	740	1.01	92,560	60	4.7	1,250	7.1
July 4-13	229,700	6.3	2.64	1.07	4.31	.14	2.20	1.35	4.46	.02	.05	.04	517	.70	160,800	53	3.2	871	7.8
July 14-15	497,900	--	3.54	1.48	6.87	.15	2.39	1.71	7.90	--	.08	.04	764	1.04	517,800	57	4.3	1,320	6.8
July 16	36,890	--	2.50	1.48	4.74	.14	2.43	1.37	5.08	--	.07	.02	564	.77	28,410	53	3.4	939	7.6
July 17-18	200,700	--	2.25	.72	2.48	.11	1.97	.92	2.68	--	.06	.03	352	.48	96,340	45	2.0	606	7.3
July 19-21, 23-31	3,039,000	5.2	1.55	.46	.91	.10	1.54	.46	.96	.02	.05	.00	194	.26	790,100	30	.9	333	7.6
July 22	232,100	--	3.89	.99	1.13	.11	.03	.56	5.13	--	.05	--	518	.70	162,500	18	.7	673	4.9
Aug. 1-6	520,700	7.5	1.90	.61	1.30	.10	1.87	.58	1.41	.01	.04	.22	250	.34	177,000	33	1.2	388	7.1
Aug. 7-9	168,000	--	2.25	.62	2.04	.12	2.20	.79	2.06	--	.05	.04	338	.46	77,280	41	1.7	506	7.3
Aug. 10-21	351,400	6.6	2.40	1.07	2.83	.12	2.20	1.08	2.96	.02	.05	.00	418	.57	200,300	44	2.1	658	7.1
Aug. 22-24	125,600	--	3.59	.82	4.35	.16	2.95	1.42	4.51	--	.09	.03	613	.83	104,200	49	2.9	914	6.9
Aug. 25-28	73,190	6.9	2.54	1.07	2.91	.11	2.26	1.10	3.10	.02	.06	.05	426	.58	42,450	44	2.2	678	7.3
Aug. 29-30	39,270	--	3.14	.99	4.70	.14	2.79	1.48	4.74	--	.05	.02	609	.83	32,590	52	3.3	929	6.8
Aug. 31, Sept. 1-8	159,270	6.6	3.74	1.48	6.70	.19	2.72	1.96	7.33	.01	.07	.20	808	1.10	175,200	55	4.2	1,320	7.3
Sept. 9-10	36,580	--	4.04	1.23	9.61	.25	2.87	1.83	10.49	--	.12	.03	1,070	1.46	53,410	64	5.9	1,640	6.8
Sept. 11-12	36,580	--	3.44	.82	6.18	.18	2.95	1.48	6.34	--	.05	.03	713	.97	35,480	58	4.2	1,130	6.8
Sept. 13-18	81,120	5.4	2.74	1.23	4.09	.16	2.39	1.31	4.37	.01	.04	.10	537	.73	59,220	50	2.9	887	7.2
Sept. 19-23	47,270	3.5	2.69	1.32	5.31	.19	2.43	1.64	5.13	.02	.05	.05	603	.82	38,760	56	3.8	979	7.3
Sept. 24	8,730	--	3.24	1.40	6.92	.17	2.52	1.81	7.19	--	.04	.03	668	.91	7,940	59	4.6	1,250	6.8
Sept. 25	16,960	--	2.94	.74	4.05	.13	2.46	1.37	4.00	--	.07	.03	452	.61	10,350	52	3.0	821	6.9
Sept. 26-27	224,300	--	3.34	.90	4.96	.14	2.79	1.37	5.22	--	.04	.03	621	.84	188,400	53	3.4	974	6.9
Sept. 28-29	373,300	--	3.09	.80	7.05	.17	2.62	1.50	6.91	--	.08	.03	747	1.02	380,800	64	5.1	1,210	6.9
Sept. 30	156,100	--	2.40	.44	2.87	.13	2.16	1.00	2.82	--	.09	.03	343	.47	73,370	49	2.4	628	6.9
Weighted average	15,743,300	--	2.30	0.82	3.61	0.12	1.90	1.10	3.81	--	0.06	--	447	0.61	9,603,410	53	2.9	728	--

ARKANSAS RIVER BASIN--Continued

7-2450. CANADIAN RIVER NEAR WHITEFIELD, OKLA.

LOCATION.--At gaging station on State Highway 2, three-quarters of a mile north of Whitefield, Haskell County, and 5½ miles upstream from Snake Creek.
DRAINAGE AREA.--47,576 square miles, of which 9,700 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: September 1944 to February 1945, September 1946 to September 1959.
Water temperatures: September 1944 to February 1945, September 1946 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 3,030 micromhos Oct. 17; minimum daily, 162 micromhos Mar. 5.
Percent sodium: Maximum, 70 Sept. 11-20; minimum, 21 Mar. 5.
EXTREMES, 1944-45, 1946-59.--Specific conductance: Maximum daily, 22,900 micromhos Nov. 11, 1956; minimum daily, 71.7 micromhos Jan. 2, 1948.
Percent sodium: Maximum, 80 Nov. 6-14, Dec. 21-23, 1947; minimum, 21 Mar. 5, 1959.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1958 to September 1959 given in WSP 1631.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-4, 1958	8,950	--	3.79	1.81	6.77		2.79	0.00	1.33	8.18	--	0.07	--	753	1.02	9,170	55	4.0	1,310	7.9
Oct. 5-10	9,000	--	4.29	2.43	9.49		2.95	.00	1.23	11.98	--	.05	--	1,010	1.37	12,370	59	5.2	1,740	7.9
Oct. 11-13 ...	6,570	--	4.59	2.85	10.77		3.02	.00	1.21	13.96	--	.02	--	1,190	1.62	10,640	59	5.6	1,940	7.9
Oct. 14-31 ...	16,380	--	5.69	3.11	15.04		2.69	.00	.83	20.30	--	.02	--	1,430	1.94	31,890	63	7.2	2,580	7.8
Nov. 1-10....	5,400	--	5.84	3.56	15.94		3.51	.00	.65	21.15	--	.03	--	1,560	2.12	11,460	63	7.4	2,680	8.2
Nov. 11-14...	2,030	--	5.29	3.91	14.88		3.31	.13	.87	19.74	--	.03	--	1,620	2.20	4,470	62	6.9	2,560	8.4
Nov. 15.....	881	--	3.34	2.66	9.02		2.52	.00	.65	11.84	--	.01	--	987	1.34	1,180	60	5.2	1,590	7.9
Nov. 16-18...	7,440	--	3.99	3.81	10.16		2.56	.00	.71	14.66	--	.03	--	1,180	1.60	11,960	57	5.1	1,890	8.1
Nov. 19.....	3,510	--	2.69	1.51	6.16		2.43	.00	.87	7.05	--	.01	--	628	.85	3,000	59	4.3	1,090	8.1
Nov. 20.....	2,720	--	3.19	2.21	8.95		2.36	.00	.69	11.28	--	.02	--	921	1.25	3,410	62	5.4	1,510	7.8
Nov. 21-22...	3,890	--	3.89	2.51	10.51		2.39	.00	.67	13.82	--	.03	--	1,020	1.39	5,400	62	5.9	1,820	8.2
Nov. 23-30...	9,570	--	5.49	3.71	15.58		2.98	.13	.77	20.87	--	.03	--	1,530	2.08	19,930	63	7.3	2,660	8.3
Dec. 1-10....	12,600	--	5.79	3.01	13.84		3.47	.20	.87	18.05	--	.05	--	1,390	1.89	23,840	61	6.6	2,380	8.3
Dec. 11-31...	16,560	--	6.19	3.61	14.13		4.03	.20	1.02	18.61	--	.07	--	1,460	1.99	32,900	59	6.4	2,500	8.3
Jan. 1-10, 1959	8,310	--	5.94	3.46	14.32		4.00	.33	1.00	18.33	--	.06	--	1,480	2.01	16,750	60	6.6	2,490	8.4
Jan. 11-20 ...	8,940	7.4	6.29	3.31	15.53	0.19	4.36	.00	1.10	19.18	0.01	.03	0.38	1,620	2.20	19,710	61	7.1	2,560	8.2
Jan. 21-31 ...	11,200	13	5.59	3.21	14.09	.17	3.97	.00	1.62	16.36	.02	.03	.25	1,450	1.97	22,120	61	6.7	2,350	7.7

Feb. 1-15, 1959	15,840	12	5.09	3.11	13.40	0.18	3.54	0.00	1.77	16.07	0.02	0.02	0.30	1,300	1.77	28,040	62	6.6	2,250	7.9
Feb. 16-20 ...	8,920	--	4.64	3.36	11.86		3.11	.20	2.56	13.96	--	.03	--	1,240	1.69	15,060	60	5.9	2,100	8.3
Feb. 21-28 ...	8,160	13	4.94	3.46	13.83	.18	3.34	.00	1.96	16.36	.02	.02	.32	1,350	1.84	15,000	62	6.7	2,310	7.5
Mar. 1-4.....	3,940	--	5.04	3.16	14.16		3.15	.27	1.64	17.20	--	.10	--	1,390	1.89	7,460	63	7.0	2,340	8.4
Mar. 5.....	13,880	--	.95	.25	.32		1.18	.00	.10	.23	--	.01	--	104	.14	1,970	21	.4	162	7.9
Mar. 6-10....	81,820	--	1.55	.65	2.32		1.38	.00	.35	2.32	--	.03	--	314	.43	34,970	51	2.2	494	7.9
Mar. 11-14...	20,230	--	2.00	.88	4.18		1.44	.00	.50	5.08	--	.04	--	440	.60	12,120	59	3.5	759	8.0
Mar. 15-20...	12,960	--	3.19	1.61	8.19		1.97	.00	.83	10.15	--	.04	--	829	1.13	14,630	63	5.3	1,380	8.1
Mar. 21.....	43,240	--	1.10	.18	.43		1.18	.00	.03	.48	--	.02	--	122	.17	7,180	25	.5	181	7.9
Mar. 22-23...	50,280	--	1.35	.41	1.55		1.31	.00	.29	1.69	--	.02	--	211	.29	14,440	47	1.7	355	7.4
Mar. 24-26...	34,750	--	1.90	.78	3.87		1.31	.00	.46	4.74	--	.04	--	458	.62	21,670	59	3.3	735	7.9
Mar. 27-28...	26,560	--	1.20	.44	1.50		1.21	.00	.31	1.61	--	.01	--	225	.31	8,130	48	1.7	338	7.3
Mar. 29-31...	15,710	--	2.05	.95	4.71		1.44	.00	.46	5.78	--	.03	--	513	.70	10,970	61	3.8	823	7.9
Apr. 1.....	6,960	--	2.15	.97	5.13		1.51	.00	.54	6.20	--	.00	--	486	.66	4,610	62	4.1	835	8.0
Apr. 2-4	24,710	--	1.45	.59	2.54		1.25	.00	.48	2.85	--	.00	--	293	.40	9,860	55	2.5	489	7.8
Apr. 5-10	17,140	--	2.35	1.33	5.49		1.90	.00	.62	6.63	--	.02	--	559	.76	13,040	60	4.0	955	7.9
Apr. 11-17 ...	14,220	--	3.04	1.76	7.64		2.20	.13	.79	9.31	--	.01	--	783	1.06	15,150	61	4.9	1,310	8.4
Apr. 18	7,810	--	1.85	1.03	3.87		1.61	.07	.58	4.46	--	.03	--	433	.59	4,610	57	3.2	716	8.3
Apr. 19	16,660	--	1.10	.58	1.88		1.25	.00	.42	1.86	--	.03	--	230	.31	5,220	53	2.1	377	8.2
Apr. 20	27,770	--	2.50	.94	4.23		1.77	.07	.65	5.64	--	.04	--	458	.62	17,310	58	3.6	854	8.3
Apr. 21-30 ...	63,710	13	2.30	.50	4.65	0.17	1.48	.00	.33	5.64	.03	.05	.00	516	.70	44,750	61	3.9	901	8.1

ARKANSAS RIVER BASIN--Continued

7-2450. CANADIAN RIVER NEAR WHITEFIELD, OKLA.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
May 1-7,1959	13,740	--	2.89	1.99	6.46		2.66	0.00	0.90	7.76	--	0.02	--	700	0.95	13,090	57	4.1	1,190	8.2
May 8	3,410	--	2.94	2.46	8.98		2.20	.00	.87	11.28	--	.03	--	931	1.27	4,320	62	5.5	1,560	8.1
May 9-10 ...	127,900	--	1.45	.75	2.40		.95	.00	.69	2,96	--	.00	--	296	.40	51,550	52	2.3	503	7.6
May 11-15 ..	391,500	--	1.65	.59	1.88		1.70	.00	.56	1.83	--	.03	--	242	.33	129,000	46	1.8	404	7.5
May 16-20 ..	59,960	--	2.10	1.18	3.28		2.03	.00	.98	3.52	--	.03	--	407	.55	33,220	50	2.6	689	7.9
May 21-25 ..	32,150	--	2.64	2.06	4.51		2.29	.13	1.25	5.50	--	.04	--	559	.76	24,470	49	2.9	959	8.3
May 26-28 ..	52,320	--	1.90	1.40	2.94		1.80	.00	.77	3.67	--	.00	--	381	.52	27,140	47	2.3	654	8.1
May 29-30 ..	54,450	--	2.69	1.81	4.46		2.46	.00	1.42	5.08	--	.00	--	544	.74	40,320	50	3.0	932	8.0
May 31	14,480	--	1.80	1.10	2.71		1.80	.07	.75	2.93	--	.06	--	353	.48	6,960	48	2.3	588	8.3
June 1-6	80,530	--	1.70	1.14	2.34		1.80	.00	.81	2.54	--	.03	--	296	.40	32,450	45	2.0	522	8.2
June 7-14 ...	81,380	--	2.00	1.32	3.79		1.84	.00	.73	4.51	--	.03	--	435	.59	48,190	53	2.9	742	8.2
June 15-18 ..	14,690	--	2.30	1.50	4.87		1.90	.00	.81	5.92	--	.04	--	535	.73	10,700	56	3.5	935	8.1
June 19-20 ..	3,750	--	3.14	1.98	6.53		2.49	.00	.98	8.18	--	.00	--	719	.98	3,670	56	4.1	1,230	8.1
June 21-27 ..	37,040	--	3.54	2.76	8.07		2.56	.00	1.35	10.43	--	.03	--	920	1.25	46,390	56	4.5	1,550	8.2
June 28-30 ..	62,400	--	2.15	1.09	3.39		1.77	.00	.31	4.51	--	.04	--	440	.60	37,370	51	2.7	729	8.2
July 1-10....	87,070	--	2.25	1.15	3.88		1.90	.00	.60	4.74	--	.04	--	468	.64	55,470	53	3.0	791	8.2
July 11-16 ..	39,170	--	3.29	1.59	6.51		2.10	.07	1.27	7.90	--	.05	--	751	1.02	40,050	57	4.2	1,250	8.3
July 17-21 ..	72,670	--	1.70	.70	2.95		1.38	.00	.33	3.61	--	.03	--	349	.47	34,530	55	2.7	598	8.2
July 22.....	30,550	--	1.10	.62	.52		1.48	.00	.09	.62	--	.05	--	115	.16	4,780	23	.6	217	7.8
July 23	31,540	--	1.90	1.22	2.93		1.80	.00	.27	3.92	--	.06	--	365	.50	15,670	48	2.3	660	8.0
July 24-31 ..	492,900	--	1.10	.74	1.26		1.38	.00	.27	1.41	--	.04	--	201	.27	134,900	41	1.3	332	7.8

Aug. 1-10, 1959	146,700	8.8	0.95	0.49	3.22 | 0.02	1.05	0.00	0.22	3.27	0.02	0.02	0.00	309	0.42	61,710	69	3.8	455	7.7
Aug. 11-20	29,580	--	2.69	1.87	5.29	2.36	.00	.83	6.63	--	.03	--	610	.83	24,560	54	3.5	1,050	8.1
Aug. 21-31	25,970	13	4.44	2.36	9.74 | .13	2.88	.00	2.48	11.28	.03	.07	.26	1,080	1.47	38,170	58	5.3	1,680	8.2
Sept. 1-7	66,570	--	3.34	2.66	8.08	2.66	.00	2.50	8.80	--	.12	--	872	1.19	79,010	57	4.7	1,470	7.9
Sept. 8-10	14,840	--	1.95	1.85	3.94	2.07	.00	.87	4.74	--	.06	--	481	.65	9,710	51	2.9	838	7.7
Sept. 11-20	18,920	11	1.80	.84	6.26 | .06	1.44	.00	.50	7.05	.02	.02	.00	640	.87	16,490	70	5.4	1,050	8.0
Sept. 21-25	19,430	--	2.74	2.16	6.17	2.85	.00	.79	7.39	--	.04	--	696	.95	18,400	56	3.9	1,190	8.0
Sept. 26-30	269,400	--	1.85	.99	2.39	2.07	.00	.67	2.43	--	.06	--	334	.45	122,500	46	2.0	553	7.7
Total or weighted average a	3,024,000	--	1.95	1.07	3.59	b1.77	--	0.65	4.15	--	0.04	--	416	0.57	1,713,000	54	2.9	693	--

a Represents 100 percent of runoff for water year October 1958 to September 1959.
b Includes equivalent of individual carbonate values shown above.

RED RIVER BASIN

7-3316. RED RIVER AT DENISON DAM, NEAR DENISON, TEX.

LOCATION.--Immediately below Denison Dam, 1.7 miles upstream from Sand Creek, 3 miles upstream from gaging station near Colbert, Bryan County, and 4 miles northwest of Denison, Grayson County, Okla.
DRAINAGE AREA.--39,719 square miles above dam, 39,777 square miles above gaging station, of which 5,936 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: May 1944 to September 1959.
Water temperatures: October 1945 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,980 micromhos May 7; minimum daily, 1,720 micromhos Oct. 2.
Percent sodium: Maximum, 66 Dec. 1-31; minimum, 57 Nov. 1-30, Apr. 1-30.
EXTREMES, 1944-59.--Specific conductance: Maximum daily, 3,520 micromhos Aug. 14, 1944; minimum daily, 656 micromhos Oct. 16, 1945.
Percent sodium: Maximum, 66 Dec. 1-31, 1958; minimum, 31 Nov. 1-10, 1945.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for gaging station near Colbert, Okla. for water year October 1958 to September 1959 given in WSP 1631. No appreciable inflow between dam and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	112,100	8.8	4.94	1.97	10.19		2.26	4.54	10.29	--	0.01		1,020	1.39	155,800	60	5.5	1,770	8.2
Nov. 1-30	113,800	9.8	5.04	2.55	9.91		2.23	4.68	10.58	--	.01		1,040	1.41	160,500	57	5.1	1,830	7.9
Dec. 1-31	91,210	9.0	2.05	3.95	11.75		2.23	4.79	10.72	--	.01		1,050	1.43	130,400	66	6.8	1,840	8.0
Jan. 1-31, 1959	139,400	10	5.19	2.30	10.35	0.14	2.28	4.96	10.77	0.02	.01		1,070	1.46	203,500	58	5.3	1,870	8.0
Feb. 1-28	42,890	9.0	5.19	2.38	10.64		2.29	5.06	10.86	--	.00		1,080	1.47	63,050	58	5.5	1,870	8.2
Mar. 1-31	149,500	9.2	5.39	2.14	10.53		2.21	5.06	10.77	.01	.01		1,080	1.47	219,800	58	5.4	1,880	8.0
Apr. 1-30	134,700	8.8	5.39	2.14	10.35	.14	2.28	4.96	10.66	.03	.01		1,070	1.46	196,700	57	5.3	1,850	7.8
May 1-31	43,780	8.2	5.39	2.22	10.51		2.29	5.10	10.72	--	.01		1,080	1.47	64,360	58	5.4	1,870	7.5
June 1-30	126,000	8.4	5.24	2.06	10.92		2.33	5.10	10.77	.02	.00		1,090	1.48	186,500	60	5.7	1,860	7.8
July 1-31	243,000	10	5.49	2.14	11.46		2.26	5.39	11.42	.01	.01		1,140	1.55	376,600	60	5.9	1,930	7.0
Aug. 1-31	284,200	10	5.59	2.22	11.29		2.15	5.39	11.51	.02	.03		1,140	1.55	440,500	59	5.7	1,900	7.4
Sept. 1-30	182,900	9.2	5.39	2.14	11.43		2.03	5.54	11.34	.02	.03		1,140	1.55	283,500	60	5.9	1,940	7.6
Weighted average	1,664,000	9.4	5.19	2.30	10.96		2.21	5.12	11.00	--	0.01		1,100	1.50	2,496,000	59	5.7	1,880	--

SABINE RIVER BASIN

8-305. SABINE RIVER NEAR RULIFF, TEX.

LOCATION.--At gaging station at bridge on State Highway 235, 2.4 miles north of Ruliff, Newton County, 4.2 miles upstream from Kansas City Southern Railway Co. bridge, 4.5 miles downstream from Cypress Creek and at mile 40.
DRAINAGE AREA.--9,440 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1946, October 1947 to September 1959.
Water temperatures: October 1947 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 430 micromhos Sept. 18; minimum daily, 75 micromhos Feb. 3.
Percent sodium: Maximum, 75 Aug. 4-10; minimum, 29 Jan. 31.
EXTREMES, 1945-46, 1947-59.--Specific conductance: Maximum daily, 774 micromhos Dec. 26, 1948; minimum daily, 33 micromhos May 22, 1953.
Percent sodium: Maximum, 86 Dec. 26-27, 1948; minimum, 14 Sept. 18-22, 27, 1958.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-11, 1958	534,100	9.8	0.26	0.12	0.60		0.30	**0.16**	0.51	--	0.01		66	0.09	48,070	61	1.4	114	6.8
Oct. 12-16.....	51,530	15	.40	.16	.80		.41	.25	.68	--	.02		92	.13	6,700	59	1.5	156	6.9
Oct. 17-31.....	95,780	17	.47	.25	1.29		.56	.27	1.18	--	.00		132	.18	17,240	64	2.2	229	7.0
Nov. 1-10	52,220	16	.60	.27	1.90		.56	.29	1.92	--	.00		a182	.25	13,060	69	2.9	324	6.6
Nov. 11-20	48,830	17	.50	.23	1.59		.57	.23	1.52	--	.00		a154	.21	10,250	69	2.6	267	6.7
Nov. 21-30	81,240	16	.50	.25	1.62		.41	.27	1.69	--	.00		151	.21	17,060	68	2.6	278	6.7
Dec. 1-10.....	66,880	16	.47	.30	1.73		.46	.31	1.72	--	.01		a176	.24	16,050	69	2.8	288	6.9
Dec. 11-20	56,610	18	.55	.33	1.79		.46	.40	1.80	--	.01		172	.23	13,020	67	2.7	345	7.0
Dec. 21-31.....	61,750	18	.46	.26	1.67		.43	.37	1.58	--	.01		a170	.23	14,200	70	2.8	275	6.9
Jan. 1-10, 1959	48,400	20	.50	.30	1.74	0.06	.49	.35	1.69	0.01	.01		a183	.25	12,100	67	2.8	303	7.6
Jan. 11-20.....	49,230	18	.50	.30	1.80		.44	.35	1.80	--	.01		a182	.25	12,310	69	2.6	307	7.0
Jan. 21-30.....	58,140	17	.50	.30	1.96		.39	.40	1.97	--	.00		177	.24	13,950	71	3.1	328	6.4
Jan. 31.....	19,300	5.8	.37	.09	.19		.10	.12	.42	--	.01		43	.06	1,160	29	.4	76	6.7

a Residue at 180°C.

SABINE RIVER BASIN--Continued

8-305. SABINE RIVER NEAR RULIFF, TEX.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Feb. 1-6, 1959..	229,500	7.0	0.15	0.09	0.51		0.10	0.19	0.45	--	0.01		52	0.07	16,060	68	1.5	91	6.2
Feb. 7-13	242,200	10	.25	.16	.80		.20	.31	.68	--	.02		81	.11	26,640	66	1.8	138	6.3
Feb. 14-22	233,300	12	.32	.22	1.08		.21	.40	.99	--	.02		107	.15	35,000	67	2.1	185	6.4
Feb. 23-28	227,300	9.4	.24	.17	.74		.16	.29	.68	--	.02		77	.10	22,730	64	1.6	135	6.4
Mar. 1-13	297,600	13	.42	.29	1.12		.34	.46	1.02	--	.01		120	.16	47,620	61	1.9	211	6.6
Mar. 14-20	110,600	14	.50	.35	1.56		.33	.56	1.52	--	.00		156	.21	23,230	65	2.4	284	6.9
Mar. 21-31.....	168,700	13	.49	.30	1.24		.36	.50	1.16	--	.01		132	.18	30,370	61	2.0	235	6.9
Apr. 1-7.....	72,630	15	.50	.28	1.22	0.06	.46	.46	1.13	0.01	.02		136	.18	13,070	59	2.0	243	6.5
Apr. 8-11, 13...	72,040	10	.32	.16	.66		.23	.25	.65	--	.01		76	.10	7,200	58	1.3	134	6.1
Apr. 12, 14-20..	176,400	11	.37	.25	1.12		.30	.40	1.02	--	.02		113	.15	26,460	64	2.0	202	6.3
Apr. 21-30.....	356,800	9.8	.32	.18	.67		.23	.31	.62	--	.01		78	.11	39,250	57	1.3	141	6.1
May 1-10	234,000	11	.55	.30	1.01		.49	.40	.96	--	.01		117	.16	37,440	54	1.5	204	6.8
May 11-20	249,900	9.4	.42	.25	.83		.33	.29	.87	--	.01		96	.13	32,490	55	1.4	182	6.0
May 21-31	173,700	12	.47	.29	1.25		.43	.35	1.21	--	.02		128	.17	29,530	62	2.0	236	7.0
June 1-9.....	100,300	13	.37	.23	.96		.36	.25	.93	--	.02		102	.14	14,040	62	1.8	185	6.6
June 10.....	8,450	--	--	--	--		.46	--	1.69	--	--		--	--	--	--	--	278	6.8
June 11-22	122,200	14	.40	.25	1.13		.46	.29	1.02	--	.01		116	.16	19,550	63	2.0	202	6.8
June 23-30	39,810	14	.45	.30	1.35		.62	.29	1.18	--	.01		133	.18	7,170	64	2.2	239	6.4
July 1-10.....	45,740	13	.47	.24	1.46		.59	.27	1.30	--	.01		137	.19	8,690	67	2.4	238	6.1
July 11-23.....	48,040	12	.37	.21	1.35		.52	.19	1.21	--	.01		122	.17	8,170	70	2.5	217	6.1
July 24-28.....	73,820	6.4	.17	.09	.56		.20	.13	.48	--	.01		54	.07	5,170	68	1.6	91	5.8
July 29-31, Aug. 1-3	104,800	12	.35	.20	1.55		.43	.27	1.38	--	.02		134	.18	18,860	74	3.0	237	6.6

Aug. 4-10, 1959.	59,800	13	0.49	0.27	2.28	0.41	0.35	2.26	--	0.02		188	0.26	15,550	75	3.7	353	6.4
Aug. 11-21	64,460	14	.46	.23	1.31	.51	.29	1.18	--	.02		126	.17	10,960	66	2.2	226	6.5
Aug. 22-31	49,750	15	.37	.20	.87	.56	.16	.70	--	.02		96	.13	6,470	60	1.6	156	6.5
Sept. 1-8, 10-15.	43,020	18	.60	.33	1.53	.95	.20	1.30	--	.01		a166	.23	9,890	62	2.2	262	7.3
Sept. 9, 16-24 ..	25,210	15	.70	.40	2.39	.92	.25	2.31	--	.01		212	.29	7,310	68	3.2	377	7.0
Sept. 25-30	13,130	18	.50	.29	1.79	.75	.18	1.64	--	.01		163	.22	2,890	69	2.8	281	7.0
Weighted average	4,867,000	12	0.36	0.22	1.04	0.34	0.31	0.99	--	0.01		109	0.15	730,000	63	1.9	192	--

a Residue at 180°C.

NECHES RIVER BASIN

8-410. NECHES RIVER AT EVADALE, TEX.

LOCATION.--At gaging station at bridge on U.S. Highway 96, 200 feet upstream from Gulf, Colorado and Santa Fe Railway Co. bridge at Evadale, Jasper County, 600 feet downstream from Mill Creek, and 15 miles upstream from Village Creek.
DRAINAGE AREA.--7,923 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1959.
Water temperatures: October 1947 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 295 micromhos Jan. 4; minimum daily, 61 micromhos Oct. 4.
Percent sodium: Maximum, 63 Jan. 21-29; minimum, 40 Oct. 1-10.
EXTREMES, 1947-59.--Specific conductance: Maximum daily, 422 micromhos Jan. 25, 1957; minimum daily, 44 micromhos Sept. 22, 1958.
Percent sodium: Maximum, 76 Jan. 21-31, 1957; minimum, 14 June 4-18, 1950.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-10, 1958..	352,700	10	0.24	0.12	0.29	0.07	0.26	0.19	0.25	0.00	0.01		52	0.07	24,690	40	0.7	76	6.9
Oct. 11-20	142,800	13	.35	.20	0.52		.36	.25	.45	.00	.01		74	.10	14,280	49	1.0	123	7.0
Oct. 21-31.....	35,230	14	.42	.23	.74		.46	.31	.62	.00	.00		94	.13	4,580	53	1.3	159	7.1
Nov. 1-10	31,680	18	.49	.24	.88		.48	.35	.76	.01	.01		110	.15	4,750	55	1.5	181	7.1
Nov. 11-20	28,520	18	.50	.23	.95		.54	.33	.79	.01	.01		114	.16	4,560	57	1.6	191	7.0
Nov. 21-30	55,300	18	.47	.22	1.09		.56	.35	.85	.01	.01		120	.16	8,850	61	1.9	195	7.2
Dec. 1-10	37,960	16	.44	.29	1.04		.59	.37	.79	.01	.01		117	.16	6,070	59	1.7	196	7.2
Dec. 11-20	24,340	18	.44	.30	1.08		.66	.35	.79	.01	.01		121	.16	3,890	59	1.8	201	7.1
Dec. 21-31.....	43,020	16	.42	.30	1.08		.56	.37	.85	.01	.01		119	.16	6,880	60	1.8	201	7.0
Jan. 1-10, 1959..	30,330	20	.45	.31	1.09	.07	.52	.42	.99	.01	.01		132	.18	5,460	57	1.8	221	7.6
Jan. 11-20	38,580	19	.45	.30	1.21		.52	.44	.99	.01	.00		a140	.19	7,330	62	2.0	218	6.8
Jan. 21-29	28,700	18	.45	.30	1.27		.52	.46	1.02	.01	.01		a139	.19	5,450	63	2.1	222	7.1
Jan. 30-31, Feb. 1-5.....	70,490	8.4	.27	.15	.50		.26	.25	.39	.01	.01		63	.09	6,340	54	1.1	111	6.8

a Residue on evaporation at 180°C.

Feb. 6-20, 1959.	213,800	12	0.35	0.23	0.81	0.31	0.44	0.62	0.01	0.01		94	0.13	27,790	58	1.5	159	6.8
Feb. 21-28	156,100	11	.28	.21	.64	.23	.37	.51	.01	.01		78	.11	17,170	57	1.3	134	6.6
Mar. 1-5, 7-10 .	137,900	12	.36	.21	.81	.21	.54	.62	.00	.01		96	.13	17,930	59	1.5	162	6.5
Mar. 6	11,230	14	.65	.31	1.42	.26	.67	1.41	.01	.03		156	.21	2,360	60	2.0	273	7.1
Mar. 11-20	105,100	13	.44	.26	.92	.25	.54	.82	.00	.01		108	.15	15,760	57	1.6	192	6.4
Mar. 21-31	81,660	14	.50	.32	1.05	.34	.62	.90	.00	.01		124	.17	13,880	56	1.6	218	6.5
Apr. 1-11.....	72,890	14	.50	.35	1.00 | 0.07	.43	.58	.90	.01	.01		128	.17	12,390	52	1.5	221	7.1
Apr. 12-22	279,000	11	.42	.23	.77	.33	.44	.62	.01	.02		94	.13	36,270	54	1.4	164	7.1
Apr. 23-30.....	388,800	9.4	.25	.15	.37 | .07	.26	.27	.28	.01	.01		59	.08	31,100	44	.8	92	6.6
May 1-4	86,280	11	.40	.24	.57	.30	.37	.51	.01	.02		81	.11	9,490	47	1.0	144	6.2
May 5-20	273,100	12	.50	.31	.96	.36	.48	.90	.01	.02		115	.16	43,700	54	1.5	206	6.0
May 21-31	262,500	9.4	.37	.25	.75	.36	.25	.73	.01	.02		87	.12	31,500	55	1.3	162	6.4
June 1-10.....	123,300	14	.45	.26	.60	.49	.23	.56	.01	.02		87	.12	14,800	46	1.0	155	6.4
June 11-20	139,000	14	.40	.28	.52	.49	.23	.45	.01	.02		80	.11	15,290	43	.9	137	6.3
June 21-30.....	57,680	14	.45	.30	.61	.59	.23	.51	.01	.02		89	.12	6,920	45	1.0	147	6.4
July 1-12	46,410	17	.50	.30	1.13	.69	.27	.93	.02	.02		125	.17	7,890	59	1.8	205	7.3
July 13-24	35,500	18	.50	.30	1.07	.72	.27	.85	.02	.01		123	.17	6,040	57	1.7	199	6.7
July 25-31	110,800	12	.39	.20	.74	.43	.29	.59	.01	.01		88	.12	13,300	56	1.4	147	6.5
Aug. 1-10	96,040	13	.30	.16	.58	.36	.29	.37	.01	.01		73	.10	9,600	56	1.2	116	6.3
Aug. 11-20	46,510	15	.35	.21	.63	.41	.37	.39	.01	.01		84	.11	5,120	53	1.2	128	6.0
Aug. 21-31	33,720	17	.39	.26	.77	.49	.35	.56	.01	.01		99	.13	4,380	54	1.4	159	6.2
Sept. 1-10	28,770	16	.47	.30	1.18	.52	.37	1.04	.01	.01		128	.17	4,890	61	1.9	224	6.3
Sept. 11-20	21,370	20	.47	.30	.98	.59	.35	.79	.01	.01		120	.16	3,420	56	1.6	195	6.5
Sept. 21-30	10,620	20	.50	.35	.96	.72	.31	.76	.01	.01		121	.16	1,700	53	1.5	197	6.6
Weighted average	3,737,000	12	0.37	0.23	0.74	0.36	0.35	0.59	0.01	0.01		89	0.12	448,400	55	1.3	151	--

TRINITY RIVER BASIN

8-665. TRINITY RIVER AT ROMAYOR, TEX.

LOCATION.--At gaging station at bridge on State Highway 105, 1,9 miles south of Romayor, Liberty County, 2.0 miles downstream from Gulf, Colorado and Santa Fe Railway Co. bridge, and 4.1 miles downstream from Big Creek.
DRAINAGE AREA.--17,192 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to November 1949, February 1950 to September 1951, April 1953 to September 1959. Water temperatures: February 1950 to September 1951, April 1953 to January 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,520 micromhos Sept. 15; minimum daily, 194 micromhos Apr. 13. Percent sodium: Maximum, 67 Sept. 7-8, 10-16; minimum, 29 May 21-31.
EXTREMES, 1945-50, 1953-59.--Specific conductance: Maximum daily, 3,800 micromhos Oct. 30, 1956; minimum daily, 103 micromhos Nov. 9, 1946. Percent sodium: Maximum, 86 Nov. 7, 1953; minimum, 23 June 11-20, 1946.
REMARKS.--Values reported for dissolved solids are residues at 180°C unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-10, 1958	95,460	15	2.20	0.33	1.60		2.03	0.83	1.21	--	0.06		264	0.36	34,370	39	1.4	434	8.0
Oct. 11-20	33,540	16	2.79	.43	3.19		2.52	1.04	2.76	--	.09		397	.54	18,110	50	2.5	681	7.9
Oct. 21-31	30,980	14	2.94	.44	3.66		2.70	1.29	2.93	--	.12		434	.59	18,280	52	2.8	742	7.8
Nov. 1-10	19,070	14	2.64	.41	3.27		2.43	1.04	2.74	--	.11		392	.53	10,110	52	2.6	675	7.7
Nov. 11-20	14,970	15	2.89	.45	3.25		2.56	1.21	2.76	--	.06		407	.55	8,230	49	2.5	691	7.8
Nov. 21-30	21,270	11	2.74	.52	5.03		2.38	1.31	4.54	--	.06		506	.69	14,680	61	3.9	891	7.8
Dec. 1-14	36,690	16	2.54	.57	5.89		2.34	1.52	5.02	--	.12		555	.75	27,520	65	4.7	964	7.5
Dec. 15-31	29,010	16	2.74	.56	5.01		2.39	1.52	4.26	--	.14		506	.69	20,020	60	3.9	883	7.8
Jan. 1-15, 1959	31,920	16	2.64	.60	5.44	0.16	2.29	1.56	4.99	0.02	.14		555	.75	23,940	62	4.3	958	7.5
Jan. 16-31	26,160	13	2.79	.66	6.24		2.46	1.85	5.22	--	.16		595	.81	21,190	64	4.8	1,040	7.8
Feb. 1-6	29,380	15	1.80	.28	2.81		1.46	.85	2.48	--	.10		a 299	.41	12,050	57	2.8	534	8.0
Feb. 7-15, 19-20	97,090	17	2.30	.54	5.00		1.88	1.46	4.37	--	.13		511	.69	66,990	64	4.2	851	7.9
Feb. 16-18	102,900	12	1.20	.19	1.47		.98	.65	1.16	--	.07		a 178	.24	24,700	51	1.8	313	7.7
Feb. 21-28	145,900	14	1.95	.32	1.53		1.80	.92	.99	--	.09		a 230	.31	45,230	40	1.4	395	7.8
Mar. 1-8	37,800	16	2.30	.45	2.53		2.00	1.17	2.03	--	.08		344	.47	17,770	48	2.2	555	7.7
Mar. 9-20	79,830	14	2.45	.53	3.94		2.11	1.46	3.21	--	.14		438	.60	47,900	57	3.2	735	7.7
Mar. 21-31	36,500	13	2.54	.47	2.71		2.25	1.21	2.17	--	.09		366	.50	18,250	47	2.2	593	7.8

Apr. 1-9, 1959 ..	32,390	16	2.94	0.66	4.39	0.13	2.41	1.52	3.95	0.02	0.08	516	0.70	22,670	54	3.3	856	7.8
Apr. 10-11.....	41,770	20	1.45	.34	1.87		1.34	.77	1.49	--	.06	a 230	.31	12,950	51	2.0	393	7.8
Apr. 12-22	523,400	12	1.10	.23	.82		1.05	.42	.65	--	.03	a 132	.18	94,210	38	1.0	235	7.3
Apr. 23-30	219,100	14	1.90	.31	1.14		1.80	.73	.76	--	.06	a 202	.27	59,160	34	1.1	355	7.6
May 1-7, 13-15 ..	147,600	14	2.40	.42	2.12		2.10	1.00	1.80	--	.04	a 294	.40	59,040	43	1.8	521	7.6
May 8-12, 16-20..	336,800	9.8	1.60	.25	.80		1.57	.42	.62	--	.04	a 154	.21	70,730	30	.8	284	7.5
May 21-31	463,500	11	1.70	.28	.82		1.54	.56	.68	--	.02	a 166	.23	106,600	29	.8	296	7.4
June 1-10.....	100,800	22	2.15	.42	1.90		1.93	.96	1.52	--	.06	286	.39	39,310	43	1.7	461	7.2
June 11-17, 29-30	191,000	16	2.10	.31	1.14		2.05	.73	.70	--	.07	230	.31	59,210	32	1.0	359	7.2
June 18-28	76,480	21	2.40	.41	2.26		2.34	.85	1.83	--	.05	308	.42	32,120	45	1.9	512	7.4
July 1-9	244,100	22	2.10	.31	1.12		2.10	.73	.68	--	.02	226	.31	75,670	32	1.0	350	7.8
July 10-25	47,670	19	2.89	.48	2.85		2.72	.96	2.48	--	.06	372	.51	24,310	46	2.2	626	6.8
July 26-31	114,900	13	1.40	.25	2.27		1.36	.73	1.78	--	.05	a 238	.32	36,770	58	2.5	414	7.3
Aug. 1-5, 9-16 ..	56,770	17	2.00	.35	2.42		1.90	.83	2.00	--	.04	308	.42	23,840	51	2.2	501	7.3
Aug. 6-8, 17-20, 22	22,420	17	2.50	.46	3.10		2.29	.94	2.79	--	.04	382	.52	11,660	51	2.5	639	7.5
Aug. 21, 23-25...	7,520	20	2.84	.49	4.87		2.80	.96	4.43	--	.01	a 483	.66	4,960	59	3.8	832	7.9
Aug. 26-31	18,390	13	2.15	.37	3.19		2.18	1.10	2.43	--	.00	357	.49	9,010	56	2.8	579	7.8
Sept. 1-6, 9	13,040	19	2.54	.51	4.04		2.66	1.19	3.21	--	.03	435	.59	7,690	57	3.3	741	7.6
Sept. 7-8, 10-16 .	13,420	11	3.09	.65	7.45		3.06	1.56	6.54	--	.03	666	.91	12,210	67	5.4	1,180	7.6
Sept. 17-30	14,340	13	2.99	.61	6.81		3.36	1.31	5.72	--	.02	614	.84	12,050	65	5.1	1,100	7.6
Weighted average	3,554,000	14	1.90	0.34	1.83		1.75	0.77	1.44	--	0.05	249	0.34	1,208,000	45	1.7	425	--

a Calculated from determined constituents.

BRAZOS RIVER BASIN

8-1140. BRAZOS RIVER AT RICHMOND, TEX.

LOCATION.--At gaging station at bridge on U.S. Highway 59 in Richmond, Fort Bend County, and 925 feet downstream from Texas and New Orleans Railroad Co. bridge.
DRAINAGE AREA.--44,020 square miles, approximately, of which 9,240 square miles are probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1959.
Water temperatures: November 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,230 micromhos Dec. 25, Apr. 4; minimum daily, 235 micromhos Oct. 1, Apr. 20.
Percent sodium: Maximum, 52 Mar. 1-10; minimum, 24 Apr. 11-22.
EXTREMES, 1945-59.--Specific conductance: Maximum daily, 2,540 micromhos Sept. 4, 1951; minimum daily, 187 micromhos Aug. 31, 1947.
Percent sodium: Maximum, 76 Dec. 3-4, 1945; minimum, 18 Aug. 27-31, 1947.
REMARKS.--Values reported for dissolved solids are residues at 180°C unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million								Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-9, 1958..	133,900	16	1.65	0.35	1.17	0.10	1.66	0.52	1.13	--	0.02		a 201	0.27	36,150	36	1.2	342	7.8
Oct. 10-14, 21-25	51,430	14	2.54	.69	2.09	.13	2.38	.98	2.06	--	.03		330	.45	23,140	38	1.6	556	7.4
Oct. 15-20, 26-31	66,620	13	3.64	1.15	4.26	.13	2.62	2.00	4.51	--	.01		563	.77	51,300	46	2.7	934	7.6
Nov. 1-10	46,910	14	2.94	.82	2.65	.12	2.59	1.37	2.54	--	.03		402	.55	25,800	41	1.9	671	8.0
Nov. 11-20.....	43,260	10	3.19	1.07	3.18	.12	2.75	1.77	3.10	--	.02		464	.63	27,250	42	2.2	782	8.0
Nov. 21-30	40,030	10	3.09	.90	3.13	.14	2.59	1.50	3.21	--	.01		454	.62	24,820	43	2.2	754	7.9
Dec. 1-10	37,090	9.0	3.99	1.32	4.61	.13	3.03	2.21	4.94	--	.01		615	.84	31,160	46	2.8	1,050	7.7
Dec. 11-20	33,560	10	3.89	1.23	4.13	.13	3.13	2.08	4.23	--	.02		578	.79	26,510	44	2.6	982	7.7
Dec. 21-31	33,680	7.0	4.34	1.32	5.09	.13	3.21	2.44	5.41	--	.02		679	.92	30,990	47	3.0	1,160	7.6
Jan. 1-10, 1959.	32,430	11	4.04	1.32	4.26	.12	3.52	2.06	4.20	0.02	.02		605	.82	26,590	44	2.6	988	8.1
Jan. 11-20.....	28,500	8.8	3.84	1.32	4.52	.12	3.20	2.23	4.46	--	.02		623	.85	24,220	46	2.8	1,000	8.0
Jan. 21-31.....	25,840	7.6	4.04	1.48	4.65	.15	3.51	2.31	4.68	--	.00		636	.86	22,220	45	2.8	1,050	8.0
Feb. 1-10	44,350	5.8	3.44	1.15	4.52	.12	2.59	2.21	4.34	--	.02		546	.74	32,820	49	3.0	941	8.1
Feb. 11-20, 28..	168,500	12	2.50	.67	2.31	.12	2.08	1.27	2.31	--	.03		350	.48	80,880	41	1.8	594	8.0
Feb. 21-27	109,600	12	1.85	.39	1.26	.13	1.62	.87	1.13	--	.05		a 221	.30	32,880	35	1.2	379	7.8

Mar. 1-10, 1959.	64,170	14	3.14	0.82	4.52	0.15	2.15	1.58	4.79	--	0.04		a 509	0.69	44,280	52	3.2	919	7.9
Mar. 11-20.....	41,400	12	3.59	1.07	4.44	.14	2.59	2.06	4.46	--	.04		a 542	.74	30,640	48	2.9	965	8.0
Mar. 21-31.....	28,320	9.0	3.94	1.32	4.70	.13	2.98	2.25	4.74	--	.01		641	.87	24,640	47	2.9	1,030	7.9
Apr. 1-7.....	18,320	9.2	4.19	1.56	5.39	.13	3.08	2.60	5.58	0.02	.01		718	.98	17,950	48	3.2	1,160	8.1
Apr. 8-10	37,790	12	3.09	.90	3.00	.13	2.33	1.54	3.27	--	.04		a 422	.57	21,540	42	2.1	752	8.2
Apr. 11-22	641,500	11	1.75	.38	.70	.10	1.77	.48	.62	--	.03		a 171	.23	147,500	24	.7	298	7.6
Apr. 23-30	167,000	13	1.80	.43	1.26	.12	1.59	.73	1.33	--	.03		a 220	.30	50,100	35	1.2	395	7.2
May 1-11	70,650	12	2.40	.69	2.31	.12	2.11	1.17	2.20	--	.02		a 324	.44	31,090	42	1.9	585	7.3
May 12-18	149,700	9.4	2.25	.53	1.87	.11	1.93	.92	1.89	--	.03		a 279	.38	56,890	39	1.6	514	7.4
May 19-31	305,000	11	1.85	.39	1.04	.10	1.82	.60	.93	--	.04		a 200	.27	82,350	31	1.0	359	7.9
June 1-7, 13-16 .	135,500	17	1.80	.36	1.04	.10	1.80	.67	.76	--	.05		217	.30	40,650	32	1.0	341	7.5
June 8-12, 17-20	110,500	16	2.50	.59	1.91	.11	2.13	1.04	1.83	--	.03		322	.44	48,620	37	1.5	532	7.2
June 21-28.....	43,320	15	3.14	.90	2.91	.12	2.72	1.42	2.79	--	.02		436	.59	25,560	41	2.1	716	7.4
June 29-30, July 1-10.....	176,000	15	2.25	.58	1.52	.11	2.08	.79	1.47	--	.05		276	.38	66,880	34	1.3	468	7.3
July 11-16	41,300	15	2.30	.72	2.35	.15	2.11	.94	2.37	--	.03		336	.46	19,000	43	1.9	566	7.3
July 17-31	78,640	14	3.59	1.23	4.57	.13	2.66	2.06	4.68	--	.02		574	.78	61,340	48	2.9	963	7.3
Aug. 1-3, 6-10..	60,400	14	3.29	.99	3.96	.14	2.54	1.69	4.26	--	.01		497	.68	41,070	47	2.7	859	7.6
Aug. 4-5	19,460	24	2.40	.63	1.78	.10	2.41	.79	1.75	--	.02		a 298	.41	7,980	36	1.4	497	7.9
Aug. 11-20	28,380	15	3.89	1.15	5.09	.14	2.97	1.94	5.53	--	.01		628	.85	24,120	50	3.2	1,080	7.4
Aug. 21-31	30,960	14	3.49	1.15	3.96	.13	3.10	1.67	4.12	--	.00		524	.71	21,980	45	2.6	896	7.3
Sept. 1-10.....	33,380	15	3.29	1.23	4.78	.12	2.87	1.85	4.57	--	.01		a 549	.75	25,040	51	3.2	939	7.6
Sept. 11-20	25,990	13	3.09	1.07	3.39	.11	2.84	1.42	3.44	--	.01		450	.61	15,850	44	2.3	775	7.2
Sept. 21-30.....	18,490	14	3.44	1.32	3.87	.12	3.41	1.60	3.58	--	.01		500	.68	12,570	44	2.5	850	7.3
Weighted average	3,222,000	12	2.45	0.66	2.13	0.12	2.13	1.06	2.09	--	0.03		323	0.44	1,418,000	40	1.7	553	--

a Calculated from determined constituents.

8-1580. COLORADO RIVER AT AUSTIN, TEX.

LOCATION.--At raw-water intake at Austin City Water Plant, just downstream from bridge on U.S. Highway 290 in Austin, Travis County, half a mile downstream from Barton Creek, and 4.5 miles upstream from gaging station at Montopolis bridge on U.S. Highway 183.
DRAINAGE AREA.--38,400 square miles, approximately, above gaging station, of which 11,900 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1959.
Water temperatures: October 1947 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 573 micromhos Jan. 2; minimum daily, 268 micromhos July 14.
Percent sodium: Maximum, 29 June 1-30; minimum, 17 Apr. 1-30.
EXTREMES, 1947-59.--Specific conductance: Maximum daily, 591 micromhos July 1, 1948; minimum daily, 243 micromhos Dec. 2, 1953.
Percent sodium: Maximum, 46 Nov. 1-30, 1951; minimum, 15 Nov. 1-30, 1953, Jan. 1-31, 1954.
REMARKS.--Values reported for dissolved solids are residues at 180°C, unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632. No appreciable inflow between sampling point and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	90,810	10	2.20	1.07	0.83		2.93	0.40	0.73	0.01	0.03		a 221	0.30	27,240	20	0.6	387	8.2
Nov. 1-30	53,910	10	2.35	1.15	.84		3.11	.46	.68	.02	.07		236	.32	17,250	19	.6	419	8.2
Dec. 1-31	27,570	14	2.00	1.32	.94		2.88	.46	.82	.02	.08		239	.33	9,100	22	.7	413	8.2
Jan. 1-31, 1959	58,590	11	2.30	1.23	0.96	0.08	3.08	.52	.90	.02	.11		274	.37	21,680	21	.7	451	8.1
Feb. 1-28	54,740	9.4	2.30	1.32	.99		3.11	.54	.90	.02	.03		a 248	.34	18,610	21	.7	437	8.2
Mar. 1-31	49,210	9.8	2.10	1.23	1.07		2.77	.54	1.02	.01	.06		252	.34	16,730	24	.8	431	8.1
Apr. 1-30	101,800	9.0	2.30	1.32	.78	.09	2.98	.52	.87	.02	.06		255	.35	35,630	17	.6	434	8.1
May 1-31	144,000	8.6	2.20	1.23	.99		2.90	.52	.96	.01	.03		250	.34	48,960	22	.8	429	8.1
June 1-30	105,800	7.4	2.20	1.23	1.37		2.88	.56	1.30	.02	.04		272	.37	39,150	29	1.0	474	7.8
July 1-31	137,800	9.2	2.10	1.23	.77		2.66	.50	.90	.01	.03		245	.33	45,470	19	.6	417	7.0
Aug. 1-4, 6-31	198,800	9.4	2.10	1.32	.93		2.88	.50	.93	.02	.02		245	.39	65,600	21	.7	414	7.8
Aug. 5	6,800	--	--	--	--		2.97	--	1.64	--	--		287	.39	2,650	--	--	501	7.9
Sept. 1-30	150,900	11	2.00	1.32	1.17		2.90	.50	1.07	.01	.01		250	.34	51,310	26	.9	432	7.9
Weighted average	1,181,000	9.6	2.15	1.23	1.00		2.90	0.50	0.96	0.01	0.04		249	0.34	401,500	23	0.8	428	--

a Calculated from determined constituents.

8-1620. COLORADO RIVER AT WHARTON, TEX.

LOCATION.--At gaging station at bridge on U.S. Highway 59 in Wharton, Wharton County, 1,000 feet downstream from Texas & New Orleans Railroad Co. bridge, and 12 miles upstream from Jones Creek.
DRAINAGE AREA.--41,380 square miles, approximately, of which 11,900 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: April 1944 to September 1959.
Water temperatures: October 1945 to September 1948, March 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 604 micromhos Sept. 10; minimum daily, 190 micromhos Apr. 11.
Percent sodium: Maximum, 23 Sept. 1-30; minimum, 14 Apr. 10-11, 14, 19-20.
EXTREMES, 1944-59.--Specific conductance: Maximum daily, 765 micromhos Feb. 5, 1957; minimum daily, 146 micromhos Sept. 27, 1957.
Percent sodium: Maximum, 43 Nov. 1-30, 1951; minimum, 7 Jan. 19-24, 1945.
REMARKS.--Values reported for dissolved solids are residues at 180°C unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1956 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958 ..	136,700	10	2.30	0.82	0.78	0.11	2.75	0.58	0.70	--	0.03		249	0.34	46,480	20	0.6	395	8.0
Nov. 1-30	137,500	10	2.50	.90	.78	.08	2.88	.67	.73	--	.06		253	.34	46,750	18	.6	431	7.9
Dec. 1-31	53,890	6.4	2.89	1.32	1.09	.08	3.57	.75	1.04	--	.05		302	.41	22,090	20	.8	522	8.0
Jan. 1-31, 1959 ..	65,480	5.8	2.59	1.23	1.13	.09	3.13	.75	1.02	0.02	.04		287	.39	25,540	22	.8	490	7.6
Feb. 1-28	139,000	9.6	2.45	.90	.87	.10	2.72	.71	.79	--	.05		250	.34	47,260	20	.7	417	8.1
Mar. 1-31	73,730	10	2.50	1.23	1.09	.09	3.18	.77	.99	--	.03		298	.41	30,230	22	.8	487	8.2
Apr. 1-9, 23-30..	65,890	9.6	2.50	1.07	1.04	.10	2.98	.75	.99	--	.04		270	.37	24,380	22	.8	462	7.8
Apr. 10-11, 14, 19-20	167,600	12	1.50	.25	.30	.08	1.61	.23	.23	--	.04		a125	.17	28,490	14	.3	217	7.6
Apr. 12-13, 15-18 21-22.....	191,800	12	1.90	.38	.48	.09	1.88	.52	.39	--	.05		a168	.23	44,110	17	.4	292	7.5
May 1-23, 26-31..	151,800	11	2.40	1.07	.87	.08	2.88	.58	.87	--	.05		254	.35	53,130	20	.7	439	7.4
May 24-25	34,990	11	1.30	.34	.34	.07	1.52	.16	.31	--	.03		118	.16	5,600	17	.4	204	7.8
June 1-30	109,300	11	1.90	1.07	.87	.08	2.49	.54	.85	--	.02		226	.31	33,880	22	.7	390	7.6
July 1-31	77,500	11	1.95	1.23	.91	.10	2.56	.58	.99	.01	.03		242	.33	25,580	22	.7	410	7.0
Aug. 1-31	159,700	11	2.20	1.23	.91	.09	2.87	.54	1.07	--	.04		255	.35	55,890	21	.7	432	7.8
Sept. 1-30	152,500	13	2.10	1.23	1.04	.09	2.87	.58	1.07	--	.02		254	.35	53,380	23	.8	446	7.8
Weighted average	1,717,000	11	2.15	0.90	0.78	0.09	2.61	0.56	0.76	--	0.04		231	0.31	53,230	20	0.6	393	--

a Calculated from determined constituents.

GUADALUPE RIVER BASIN

8-1765. GUADALUPE RIVER AT VICTORIA, TEX.

LOCATION.--At gaging station at bridge on U.S. Highway 59 in Victoria, Victoria County, 1,300 feet upstream from Texas and New Orleans Railroad Co. bridge, and 10 miles upstream from Coleto Creek.
DRAINAGE AREA.--5,161 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1946, October 1948 to September 1959.
Water temperatures: November 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 801 micromhos Jan. 23; minimum daily, 298 micromhos Apr. 16.
Percent sodium: Maximum, 26 Feb. 11-20; minimum, 16 Oct. 29-31, Nov. 1-10, Nov. 11-20.
EXTREMES, 1945-46, 1948-59.--Specific conductance: Maximum daily, 1,950 micromhos Jan. 11-17, 1946; minimum daily, 184 micromhos Oct. 24, 1956.
Percent sodium: Maximum, 67 July 23-24, 1950; minimum, 13 May 7-10, 1958.
REMARKS.--Values reported for dissolved solids are residues at 180°C unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-10, 1958 ..	42,230	15	2.50	0.82	0.70	0.09	3.02	0.42	0.68		0.06		a 232	0.32	13,510	17	0.5	406	7.9
Oct. 11-20.....	32,030	18	3.19	1.23	1.00	.07	3.80	.56	.93		.10		322	.44	14,090	18	.7	530	7.7
Oct. 21-28.....	22,790	17	3.49	1.32	1.00	.06	4.18	.56	.90		.13		332	.45	10,260	17	.6	560	7.8
Oct. 29-31, Nov. 1-10	80,230	14	2.84	.99	.74	.07	3.28	.52	.68		.09		274	.37	29,690	16	.5	446	7.9
Nov. 11-20	37,370	17	3.19	1.23	.87	.06	3.90	.52	.76		.12		303	.41	15,320	16	.6	523	8.1
Nov. 21-30	31,870	15	3.49	1.40	1.09	.06	4.26	.58	.99		.12		338	.46	14,660	18	.7	574	7.9
Dec. 1-10	29,570	15	3.49	1.48	1.13	.06	4.33	.60	1.02		.12		344	.47	13,900	18	.7	586	7.9
Dec. 11-20	27,630	14	2.84	1.48	1.09	.05	3.74	.62	1.04	0.02	.12		315	.43	11,880	20	.7	535	8.1
Dec. 21-31	31,970	14	3.64	1.40	1.13	.06	4.49	.58	1.04		.11		356	.48	15,350	18	.7	592	8.1
Jan. 1-10, 1959	27,030	15	3.64	1.32	1.26	.06	4.54	.60	1.16		.11		366	.50	13,520	20	.8	609	8.1
Jan. 11-20.....	24,810	13	2.74	1.48	1.22	.04	3.69	.56	1.18		.12		304	.41	10,170	22	.8	550	8.2
Jan. 21-31.....	26,300	12	3.34	1.48	1.35	.05	4.25	.67	1.30		.12		a 342	.47	12,360	22	.9	616	7.9

Feb. 1-10, 1959..	32,710	15	2.89	1.23	1.26	0.07	3.65	0.60	1.18		0.08		310	0.42	13,740	23	0.9	537	8.1
Feb. 11-20	49,790	15	2.69	.99	1.30	.08	3.10	.65	1.18		.07		294	.40	19,920	26	1.0	506	8.1
Feb. 21-28	26,760	14	3.19	1.07	1.13	.08	3.59	.75	.96		.09		312	.42	11,240	21	.8	524	8.0
Mar. 1-10	30,210	15	3.59	1.32	1.44	.07	4.21	.81	1.35		.10		376	.51	15,410	22	.9	617	8.1
Mar. 11-20	24,690	15	3.54	1.40	1.44	.06	4.29	.73	1.41		.10		372	.51	12,590	22	.9	633	8.2
Mar. 21-31	25,130	14	3.19	1.48	1.30	.06	4.08	.66	1.18		.08		338	.46	11,560	22	.8	576	8.1
Apr. 1-8	18,330	12	2.79	1.48	1.22	.06	3.70	.69	1.18		.08		318	.43	7,880	22	.8	539	8.1
Apr. 9-20	134,100	13	2.30	.66	.87	.09	2.51	.52	.79		.05		235	.32	42,910	22	.7	389	7.7
Apr. 21-30	44,190	15	2.84	.90	.96	.10	3.18	.62	.93		.05		285	.39	17,230	20	.7	466	8.0
May 1-10	34,810	15	3.39	1.23	1.26	.08	3.87	.71	1.21		.09		348	.47	16,360	21	.8	582	7.3
May 11-20	29,020	15	3.49	1.23	1.30	.06	3.97	.75	1.18		.10		352	.48	13,930	21	.8	588	7.3
May 21-22, 27-31	17,300	14	3.19	1.23	1.26	.07	3.82	.65	1.16		.07		332	.45	7,780	22	.8	559	7.4
May 23-26	21,880	9.6	2.30	.75	.83	.08	2.69	.40	.76		.04		a 216	.29	6,350	21	.7	393	7.6
June 1-9.....	20,650	17	3.29	1.48	1.35	.06	4.03	.69	1.30		.07		360	.49	10,120	22	.9	584	7.4
June 10-20.....	21,060	16	3.09	1.15	1.30	.07	3.77	.69	1.13		.06		320	.44	9,270	23	.9	541	8.0
June 21-30.....	25,680	16	2.89	1.23	1.30	.06	3.74	.62	1.10		.05		310	.42	10,790	24	.9	530	7.9
July 1-10	36,200	18	2.69	.82	.78	.07	3.25	.46	.62		.08		256	.35	12,670	18	.6	429	7.5
July 11-20	19,640	18	2.89	1.07	.83	.07	3.64	.44	.70		.06		280	.38	7,460	17	.6	462	7.7
July 21-31	23,460	18	3.29	1.15	1.09	.07	4.03	.56	.96		.07		322	.44	10,320	19	.7	537	7.7
Aug. 1-4.....	6,620	20	2.99	1.40	1.17	.07	3.82	.58	1.24		.06		318	.43	2,850	21	.8	531	7.4
Aug. 5-16, 26-28.	24,550	19	2.74	1.23	1.04	.07	3.52	.56	1.04		.04		a 288	.39	9,570	20	.7	480	7.5
Aug. 17-25, 29-31	19,600	18	--	1.40	1.22	.07	--	.60	1.24		.04		--	--	--	--	--	525	--
Sept. 1-10	16,010	20	2.99	1.48	1.17	.06	3.87	.62	1.10		.05		320	.44	7,040	21	.8	540	7.2
Sept. 11-20	14,180	20	3.04	1.40	1.17	.06	3.95	.60	1.07		.04		316	.43	6,100	21	.8	531	7.9
Sept. 21-30	13,800	18	2.94	1.40	1.17	.06	3.88	.62	1.07		.05		a 311	.42	5,800	21	.8	523	7.4
Weighted average	1,144,000	15	2.99	1.15	1.09	0.07	3.59	0.58	0.99		0.08		303	0.41	469,000	21	0.8	511	--

a Calculated from determined constituents.

8-2110. NUECES RIVER NEAR MATHIS, TEX.

LOCATION (revised).--At intake tower at Wesley Seale Dam, 0.6 mile upstream from gaging station at bridge on State Highway 359, and 4 miles southwest of Mathis, San Patricio County.
DRAINAGE AREA.--16,660 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1959.
Water temperatures: October 1947 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 699 micromhos July 21; minimum daily, 370 micromhos Nov. 15.
Percent sodium: Maximum, 43 July 1-31; minimum, 25 Nov. 1-30.
EXTREMES, 1947-59.--Specific conductance: Maximum daily, 1,040 micromhos July 1, 1948; minimum daily, 233 micromhos July 30, 1949.
Percent sodium: Maximum, 63 May 1-20, 1953; minimum, 22 June 1-30, 1957.
REMARKS.--Values reported for dissolved solids are residues at 180°C unless otherwise noted. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1958 to September 1959 given in WSP. 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	256,300	20	2.64	0.44	1.13	0.21	3.10	0.46	0.76	0.01	0.02		280	0.38	97,390	26	0.9	430	8.1
Nov. 1-30	200,700	16	2.30	.41	.96	.16	2.75	.44	.68	--	.03		237	.32	64,220	25	.8	386	7.7
Dec. 1-31	19,980	15	2.40	.45	1.13	.16	2.82	.50	.76	.01	.04		254	.35	6,990	27	.9	410	8.0
Jan. 1-31, 1959	24,240	17	2.54	.49	1.35	.16	2.98	.58	.96	--	.03		276	.38	9,210	30	1.1	450	8.0
Feb. 1-28	8,590	14	2.69	.52	1.30	.16	3.11	.58	.99	.01	.02		285	.39	3,350	28	1.0	465	8.2
Mar. 1-31	6,810	14	2.69	.58	1.48	.17	3.18	.62	1.10	--	.03		296	.40	2,720	30	1.2	485	8.0
Apr. 1-30	5,210	12	2.79	.67	1.52	.16	3.25	.73	1.18	.01	.02		309	.42	2,190	30	1.2	512	8.0
May 1-31	5,860	11	2.79	.68	1.87	.16	3.20	.77	1.44	--	.01		318	.43	2,520	34	1.4	544	8.0
June 1-30	6,760	9.8	2.69	.66	2.31	.17	3.18	.81	1.86	--	.02		342	.47	3,180	40	1.8	581	7.9
July 1-31	51,960	15	2.59	.72	2.61	.20	3.10	.85	2.09	.01	.02		a353	.48	24,940	43	2.0	599	7.0
Aug. 1-31	8,130	16	2.64	.74	2.61	.22	3.10	.87	2.17	--	.03		362	.49	3,980	42	2.0	602	7.8
Sept. 1-30	5,860	15	2.69	.76	2.52	.23	3.18	.87	2.06	--	.02		358	.49	2,870	41	1.9	615	7.4
Weighted average	600,300	17	2.50	0.47	1.26	0.19	2.97	0.52	0.93	--	0.03		274	0.37	222,100	29	1.0	439	--

a Calculated from determined constituents.

8-2492. RIO GRANDE ABOVE CULEBRA CREEK NEAR LOBATOS, COLO.

LOCATION.--One-half mile southeast of La Sauces, 7 miles upstream from Culebra Creek, and 15 miles upstream from gaging station near Lobatos, Conejos County.
DRAINAGE AREA.--7,700 square miles, approximately, above gaging station (includes 2,940 square miles in closed basin in northern part of San Luis Valley, Colo.).
RECORDS AVAILABLE.--Chemical analyses: October 1946 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,110 micromhos Sept. 21; minimum daily, 232 micromhos Feb. 18.
Percent sodium: Maximum, 68 Sept. 21; minimum, 27 Jan. 12-31.
EXTREMES, 1946-59.--Specific conductance: Maximum daily, 1,110 micromhos Sept. 21, 1959; minimum daily, 122 micromhos June 1, 1949.
Percent sodium: Maximum, 72 May 11-14, 1957; minimum, 16 Dec. 1, 3-10, 1946.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for gaging station near Lobatos for water year October 1958 to September 1959 given in WSP 1632. Culebra Creek which enters the Rio Grande between the sampling point and the gaging station is usually dry at its mouth. Inflow from this and other sources between sampling point and gaging station occurs only after heavy local rainfall. Flow affected by ice Nov. 17 to Feb. 26, Mar. 8.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-3, 1958	157	--	1.30	1.22	2.44	--	1.20	0.90	--	--	--	--	--	374	0.51	80	49	2.2	452	9.1
Oct. 4-5, 9-11	313	68	2.69	1.05	2.57	0.19	3.29	--	262	0.45	0.04	0.01	0.18	446	.61	191	40	1.9	597	8.2
Oct. 6-8, 12	268	--	1.60	.98	2.26	--	2.13	.30	--	--	--	--	--	382	.52	139	47	2.0	465	8.5
Oct. 13-17	424	--	2.50	1.24	2.70	--	2.56	.70	--	--	--	--	--	498	.68	288	42	2.0	603	8.7
Oct. 18-25	962	--	2.45	.85	2.09	--	3.10	--	--	--	--	--	--	396	.54	519	39	1.6	523	8.0
Oct. 26-Nov. 3	1,460	--	2.10	.82	1.61	--	3.03	--	--	--	--	--	--	332	.45	657	36	1.3	432	7.6
Nov. 4-19	2,400	--	2.30	1.00	2.22	--	2.56	.37	--	--	--	--	--	422	.57	1,370	40	1.7	526	8.5
Nov. 20-22	652	--	2.10	.86	1.65	--	2.26	.87	--	--	--	--	--	357	.49	319	36	1.4	426	8.9
Nov. 23-Dec. 15	10,920	--	1.70	.72	1.04	--	2.31	--	--	--	--	--	--	272	.37	4,040	30	.9	330	8.2
Dec. 16-20	1,970	--	2.00	.76	1.30	--	1.93	.67	--	--	--	--	--	322	.44	867	32	1.1	378	8.8
Dec. 21-31	3,990	--	1.70	.54	.96	--	2.11	.10	--	--	--	--	--	266	.36	1,440	30	.9	322	8.3
Jan. 1-11, 1959	3,750	54	1.70	.64	1.09	.14	2.46	--	.87	.17	.02	.03	.10	258	.35	1,310	31	1.0	338	8.2
Jan. 12-31	8,160	--	1.50	.66	.78	--	2.05	--	--	--	--	--	--	202	.27	2,200	27	.8	281	7.4
Feb. 1-4, 7	2,070	--	1.60	.60	.96	--	2.38	--	--	--	--	--	--	216	.29	600	30	.9	297	6.9
Feb. 5-6, 8-9	1,700	--	1.70	.78	1.26	--	2.16	.83	--	--	--	--	--	293	.40	680	34	1.1	344	8.8

RIO GRANDE BASIN--Continued

8-2492. RIO GRANDE ABOVE CULEBRA CREEK NEAR LOBATOS, COLO.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Feb. 10-13, 1959	1,690	--	1.60	0.76	1.09	--	2.20	0.43	--	--	--	--	--	258	0.35	592	32	1.0	302	8.6
Feb. 14-28	7,930	--	1.40	.52	.87	--	1.82	.13	--	--	--	--	--	199	.27	2,140	31	.9	273	8.3
Mar. 1-6	3,810	--	1.70	.76	.96	--	2.13	--	--	--	--	--	--	223	.30	1,140	28	.9	324	7.9
Mar. 7-16	4,710	--	1.90	.80	1.17	--	2.28	--	--	--	--	--	--	280	.38	1,790	30	1.0	368	7.6
Mar. 17-31	4,880	--	2.20	.96	1.52	--	2.29		--	--	--	--	--	334	.45	2,200	32	1.2	433	8.4
Apr. 1-9	2,270	52	2.40	.84	1.91	0.16	2.82	.23	1.83	0.39	0.03	0.01	0.12	368	.50	1,140	36	1.5	485	--
Apr. 10-12	922	--	1.90	.80	1.39	--	2.41	.27	--	--	--	--	--	278	.38	350	34	1.2	382	8.4
Apr. 13-19	1,880	--	2.59	1.01	2.00	--	2.88	--	--	--	--	--	--	382	.52	978	36	1.5	535	8.1
Apr. 20-23	769	--	1.90	.64	1.44	--	2.75	--	--	--	--	--	--	263	.36	277	36	1.3	386	7.6
Apr. 24-25	248	--	2.30	.94	1.65	--	2.82	--	--	--	--	--	--	332	.45	112	34	1.3	464	7.4
Apr. 26-30	654	--	1.70	.80	1.30	--	2.57	--	--	--	--	--	--	265	.36	235	34	1.2	359	7.4
May 1-7	914	--	1.35	.45	1.26	--	2.20	--	--	--	--	--	--	194	.26	238	41	1.3	303	8.1
May 8-14, 18, 20-23	1,370	--	1.85	.55	1.65	--	2.90	--	--	--	--	--	--	254	.35	480	41	1.5	399	8.0
May 15-17, 19	613	--	1.55	.53	1.30	--	2.67	--	--	--	--	--	--	214	.29	178	38	1.3	331	7.7
May 24-31	863	--	1.80	.52	1.61	--	3.03	--	--	--	--	--	--	250	.34	293	41	1.5	380	7.7
June 1-10	720	--	1.80	.56	1.57	--	3.10	--	--	--	--	--	--	242	.33	238	40	1.4	383	7.6
June 11-26	1,060	--	1.85	.53	1.39	--	3.21	--	--	--	--	--	--	244	.33	350	37	1.3	368	7.9
June 27-30	184	--	2.00	.66	1.83	--	3.47	--	--	--	--	--	--	284	.39	72	41	1.6	428	8.2
July 1-15	355	44	1.80	.72	2.09	.16	3.38	--	1.06	.31	.05	.00	.22	313	.43	153	44	1.9	444	7.8
July 16-20	214	--	2.84	1.20	3.26	--	3.31	--	--	--	--	--	--	476	.65	139	45	2.3	689	8.2
July 21-Aug. 1	189	--	2.10	.96	2.52	--	3.26	--	--	--	--	--	--	354	.48	91	45	2.0	536	7.7

Aug. 2-3, 1959	35	--	2.20	1.06	4.44	--	4.23	0.23	--	--	--	--	--	493	0.67	23	58	3.5	710	8.5
Aug. 4-5, 29-30.	140	--	2.35	1.09	3.09	--	3.44	--	--	--	--	--	--	415	.56	78	47	2.4	599	8.2
Aug. 6	38	--	1.90	1.06	6.09	--	4.08	--	--	--	--	--	--	593	.81	31	67	5.0	882	8.0
Aug. 7-9, 13, 15-18, 20-26 ..	748	--	2.30	.98	2.74	--	3.29	--	--	--	--	--	--	381	.52	389	46	2.1	560	8.0
Aug. 10-12, 14, 27-28	335	--	1.60	.72	1.78	--	2.88	--	--	--	--	--	--	270	.37	124	43	1.7	393	7.7
Aug. 19	28	--	3.79	1.65	4.39	--	3.31	--	--	--	--	--	--	639	.87	24	45	2.7	902	8.2
Aug. 31-Sept. 3.	109	--	1.10	1.06	2.65	--	1.67	--	--	--	--	--	--	314	.43	47	55	2.6	472	7.7
Sept. 4-6	65	--	2.50	.92	2.70	--	3.34	--	--	--	--	--	--	414	.56	36	44	2.1	565	7.0
Sept. 7-20, 22-23	441	--	1.90	.88	2.44	--	2.92	--	--	--	--	--	--	347	.47	207	47	2.1	494	7.5
Sept. 21.....	19	--	2.50	1.30	7.96	--	3.03	.43	--	--	--	--	--	805	1.09	21	68	5.8	1,110	8.6
Sept. 24-30.....	208	--	2.59	1.23	2.96	--	2.97	--	--	--	--	--	--	434	.59	123	44	2.1	637	7.9
Total or weighted average	77,610	--	1.80	0.73	1.26	--	a2.46	--	--	--	--	--	--	275	0.37	28,720	33	1.1	364	--

a Includes carbonate values.

8-3130. RIO GRANDE AT OTOWI BRIDGE, NEAR SAN ILDEFONSO, N. MEX.

LOCATION.--At gaging station on downstream side of pier of former railway bridge, 400 feet downstream from bridge on State Highway 4, 1¾ miles southwest of San Ildefonso Pueblo, 2½ miles downstream from Pojoaque River, and 7 miles west of Pojoaque, Santa Fe County.
DRAINAGE AREA.--14,300 square miles, approximately (includes 2,940 square miles in closed basin in San Luis Valley, Colo.).
RECORDS AVAILABLE.--Chemical analyses: October 1946 to September 1959.
Water temperatures: October 1948 to September 1959.
Sediment records: October 1947 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 657 micromhos Aug. 8; minimum daily, 253 micromhos May 19.
Percent sodium: Maximum, 39 July 16-17; minimum, 18 May 17-20.
EXTREMES, 1946-59.--Specific conductance: Maximum daily, 1,230 micromhos Aug. 26, 1951; minimum daily, 165 micromhos June 13, 1952.
Percent sodium: Maximum, 43 Sept. 13-30, 1958; minimum, 12 Apr. 26-30, Aug. 1-7, 1958.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-30, 1958	23,050	26	2.20	0.76	1.22	0.09	2.80	1.21	0.28		0.01		263	0.36	8,300	29	1.0	410	7.8
Oct. 31-Nov. 2	2,510	26	2.54	.78	1.35	.09	2.80	1.75	.28		.02		300	.41	1,030	28	1.0	456	7.8
Nov. 3-30	95,440	20	1.80	.55	.57	.07	1.93	.90	.12		.02		184	.25	23,860	19	.5	289	7.8
Dec. 1-18	57,190	22	1.90	.61	.65	.07	1.97	1.10	.15		.01		203	.28	16,010	20	.6	313	7.7
Dec. 19-31	19,730	26	2.10	.66	1.00	.09	2.39	1.31	.21		.01		246	.33	6,510	26	.9	375	7.8
Jan. 1-31, 1959	36,860	45	2.35	.81	1.26	--	2.79	1.52	.25		.01		298	.41	15,110	29	1.0	403	7.9
Feb. 1-28	36,420	40	2.25	.81	1.17	--	2.61	1.37	.24		.01		275	.37	13,480	28	.9	393	7.9
Mar. 1-31	37,250	34	2.30	.80	1.30	--	2.57	1.67	.27		.01		287	.39	14,520	30	1.0	419	7.9
Apr. 1-13	16,410	29	2.50	.90	1.44	--	2.74	1.85	.28		.01		304	.41	6,730	30	1.1	454	7.9
Apr. 14-30	23,430	27	2.25	.81	1.09	--	2.54	1.44	.25		.01		262	.36	8,430	26	.9	389	7.7
May 1-16	32,140	26	2.15	.49	.78	--	2.39	.90	.18		.02		216	.29	9,320	23	.7	326	7.7
May 17-20	10,730	24	2.00	.40	.52	--	2.16	.65	.11		.03		183	.25	2,680	18	.5	279	7.7

May 21-27, 1959 .	11,060	25	2.45	0.43	0.91	--	2.72	0.90	0.24		0.02		235	0.32	3,540	24	0.8	353	7.5
May 28-June 14 ..	20,500	24	1.85	.52	.83	--	2.25	.83	.21		.01		202	.27	5,540	26	.8	308	7.3
June 15-30	10,870	29	2.30	.56	1.09	--	2.77	.98	.23		.01		246	.33	3,590	28	.9	366	7.7
July 1-9	8,920	24	2.05	.39	.70	--	2.29	.73	.18		.01		197	.27	2,410	22	.6	295	7.5
July 10-15, 18-25.	9,610	31	2.20	.44	.96	--	2.62	.81	.24		.01		230	.31	2,980	27	.8	345	7.4
July 16-17	920	30	2.59	.65	2.09	--	4.25	.75	.42		.00		316	.43	396	39	1.6	494	7.7
July 26-31	6,260	30	2.50	.48	.96	--	2.90	.90	.23		.01		247	.34	2,130	24	.8	380	7.7
Aug. 1-5.....	1,910	35	2.74	.52	1.30	--	3.16	1.19	.21		.01		286	.39	745	29	1.0	439	7.7
Aug. 6-18	19,650	32	3.89	.71	1.87	--	4.18	2.04	.19		.02		392	.53	10,410	29	1.2	595	7.5
Aug. 19-31	11,600	31	3.09	.51	1.39	--	3.10	1.67	.21		.03		313	.43	4,990	28	1.0	475	7.6
Sept. 1-15	5,620	29	2.30	.48	1.26	--	2.84	.98	.25		.01		252	.34	1,910	31	1.1	389	7.6
Sept. 16-22	7,860	26	2.74	.52	1.09	--	2.75	1.46	.16		.01		272	.37	2,910	25	.9	415	7.7
Sept. 23-30	3,760	35	2.20	.62	1.22	--	2.70	1.21	.20		.01		261	.35	1,320	30	1.0	390	7.9
Total or weighted average	509,800	28	2.20	0.64	0.96	--	2.47	1.21	0.20		0.01		242	0.33	168,200	25	0.8	365	--

8-3583. RIO GRANDE CONVEYANCE CHANNEL AT SAN MARCIAL, N. MEX.

LOCATION (revised).--At gaging station, 1,800 feet west of San Marcial gage on railway bridge, about 18½ miles southwest of San Antonio, and about 1 mile south of site of former village of San Marcial, Socorro County.
RECORDS AVAILABLE.--Chemical analyses: March 1954 to September 1959.
Water temperatures: March 1954 to September 1959.
Sediment records: March 1954 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,450 micromhos Aug. 9; minimum daily, 718 micromhos May 21.
Percent sodium: Maximum, 64 Sept. 6-30; minimum, 32 Aug. 16-17, 22-23, 26.
EXTREMES, 1954-59.--Specific conductance: Maximum, 2,860 micromhos Oct. 25, 1956; minimum, 527 micromhos June 24, July 2, 1957.
Percent sodium: Maximum, 66 Oct. 1-20, Nov. 1-21, 1956; minimum, 32 Aug. 16-17, 22-23, 26, 1959.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 furnished by Santa Fe district office of Surface Water Branch; records of composite discharge for Rio Grande Conveyance Channel at San Marcial and Rio Grande Floodway at San Marcial given under Rio Grande at San Marcial in WSP 1632. Chemical analyses for Rio Grande Floodway given on page 88.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	11,060	--	4.44	1.64	5.52	--	3.90	--	--	--	--	--	739	1.01	11,170	48	3.2	1,100	7.9
Nov. 1-30	14,410	--	4.19	1.49	5.09	--	3.70	--	--	--	--	--	690	.94	13,550	47	3.0	1,040	7.9
Dec. 1-31	18,510	--	4.09	1.27	4.65	--	3.65	--	--	--	--	--	658	.89	16,470	46	2.8	975	8.0
Jan. 1-31, 1959	16,730	--	3.94	1.18	4.78	--	3.54	--	--	--	--	--	650	.88	14,720	48	3.0	977	7.9
Feb. 1-28	15,820	--	3.94	1.30	4.83	--	3.59	--	--	--	--	--	657	.89	14,080	48	3.0	989	7.9
Mar. 1-31	20,430	--	3.99	1.33	4.57	--	3.56	--	--	--	--	--	633	.86	17,570	46	2.8	953	8.0
Apr. 1-30	14,410	62	3.89	1.33	5.35	0.16	3.67	4.41	2.59	0.04	0.01	0.25	714	.97	13,980	50	3.3	1,030	8.1
May 1-19	8,380	--	3.79	1.45	5.39	--	3.57	--	--	--	--	--	721	.98	8,210	51	3.3	1,040	8.0
May 20-24	4,890	--	4.19	.89	3.00	--	3.90	--	--	--	--	--	530	.72	3,520	37	1.9	777	7.4
May 25-26	2,190	--	6.54	1.86	5.57	--	4.08	--	--	--	--	--	922	1.25	2,740	40	2.7	1,280	7.2
May 27-June 4	6,520	--	4.24	1.20	4.22	--	3.72	--	--	--	--	--	654	.89	5,800	44	2.6	919	8.2
June 5-July 23	7,830	54	4.44	1.52	6.87	.21	4.02	5.20	3.92	.03	.01	.28	860	1.17	9,160	53	4.0	1,260	8.1
July 24-Aug. 6	878	--	5.04	1.72	10.14	--	4.46	--	--	--	--	--	1,110	1.51	1,330	60	5.5	1,670	7.9

Aug. 7, 9, 11, 1959	3,900	--	10.68	3.32	10.44	--	5.18	--	--	--	--	--	1,620	2.20	8,580	43	3.9	2,130	7.7
Aug. 8, 10, 12-15, 18-21, 24-25, 27-31	10,860	--	7.48	1.96	6.09	--	4.70	--	--	--	--	--	1,010	1.37	14,880	39	2.8	1,400	7.4
Aug. 16-17, 22-23, 26	3,660	--	11.38	3.72	7.22	--	5.34	--	--	--	--	--	1,440	1.96	7,170	32	2.6	1,830	7.3
Sept. 1-5	853	--	4.74	1.46	6.31	--	a3.85	--	--	--	--	--	834	1.13	964	50	3.6	1,210	8.4
Sept. 6-30	1,310	--	4.09	1.87	10.79	--	3.39	--	--	--	--	--	1,090	1.48	1,940	64	6.2	1,690	8.0
Total or weighted average	162,700	--	4.64	1.48	5.31	--	3.82	--	--	--	--	--	751	1.02	166,000	46	3.0	1,090	--

a Includes 0.33 equivalent per million of carbonate (CO_3).

8-3584. RIO GRANDE FLOODWAY AT SAN MARCIAL, N. MEX.

LOCATION.--At gaging station at Atchison, Topeka, & Santa Fe Railway Co. bridge, 1.1 miles downstream from former site of San Marcial, Socorro County, and 18½ miles southwest of San Antonio.
DRAINAGE AREA.--27,700 square miles, approximately (includes 2,940 square miles in closed basin in San Luis Valley, Colo.).
RECORDS AVAILABLE.--Chemical analyses: July 1946 to September 1959.
Water temperatures: January 1949 to September 1959.
Sediment records: July 1946 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum, daily, 2,540 micromhos Aug. 9; minimum daily, 457 micromhos Dec. 9.
Percent sodium: Maximum, 62 Feb. 4-5; minimum, 27 Aug. 17-24.
EXTREMES, 1946-59.--Specific conductance: Maximum daily, 2,730 micromhos Apr. 8, 1953; minimum daily, 311 micromhos June 14, 1952.
Percent sodium: Maximum, 65 May 1-10, 1951; minimum, 22 Nov. 21-22, 28-30, 1947, June 21-30, 1949.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of chemical analyses and sediment loads for years prior to 1946 have been published in Water Bulletins of International Boundary and Water Commission. Records of discharge for water year October 1958 to September 1959 furnished by Santa Fe district office of Surface Water Branch; records of composite discharge for Rio Grande conveyance channel at San Marcial and Rio Grande floodway at San Marcial given under Rio Grande at San Marcial in WSP 1632. Chemical analyses for Rio Grande conveyance channel given on page 86 . No flow Oct. 20, 22-28, Mar. 21-23, Mar. 26 to May 23, May 28 to Aug. 6, Aug. 31, Sept. 3-30.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-7, 1958 ..	452	44	3.54	0.98	3.09	0.17	3.64	3.21	0.99	0.04	0.03	0.15	514	0.70	316	40	2.1	746	8.1
Oct. 8-19, 21, 29-31	2,080	--	4.39	1.25	4.09	--	4.38	--	--	--	--	--	624	.85	1,770	42	2.4	921	7.7
Nov. 1-5	829	--	4.29	1.11	3.35	--	4.21	--	--	--	--	--	574	.78	647	38	2.0	844	7.8
Nov. 6-30	60,580	--	3.09	.71	1.61	--	3.25	--	--	--	--	--	350	.48	29,080	30	1.2	524	7.7
Dec. 1-31	63,770	--	2.99	.67	1.65	--	2.97	--	--	--	--	--	347	.47	29,970	31	1.2	519	7.9
Jan. 1-Feb. 3, 1959	22,810	34	3.29	.83	2.31	.12	3.31	2.46	.79	.03	.04	.12	422	.57	13,000	35	1.6	627	7.9
Feb. 4-5	1,260	--	4.14	1.10	8.70	--	a3.49	--	--	--	--	--	900	1.22	1,540	62	5.4	1,380	8.3
Feb. 6-8	1,490	--	3.39	1.01	5.96	--	b3.39	--	--	--	--	--	687	.93	1,390	58	4.0	1,040	8.3
Feb. 9-28	12,630	--	3.19	.83	2.87	--	3.23	--	--	--	--	--	450	.61	7,700	42	2.0	678	7.7
Mar. 1-7	3,520	--	2.84	.90	3.22	--	c3.45	--	--	--	--	--	511	.69	2,430	46	2.4	665	8.8

Mar. 8-11, 14-20, 24-25	2,380	--	3.19	1.09	3.92	--	a3.87	--	--	--	--	--	574	0.78	1,860	48	2.7	795	8.3
Mar. 12-13	379	--	2.79	1.05	5.13	--	d3.19	--	--	--	--	--	651	.89	337	57	3.7	873	8.7
May 24-27	1,110	--	10.58	2.78	8.79	--	3.47	--	--	--	--	--	1,540	2.09	2,320	40	3.4	1,900	8.2
Aug. 7-9	908	--	13.72	4.38	10.53	--	7.51	--	--	--	--	--	1,900	2.58	2,340	37	3.5	2,360	7.9
Aug. 10-12	305	--	8.73	2.59	8.53	--	4.85	--	--	--	--	--	1,330	1.81	552	43	3.6	1,720	8.0
Aug. 13-16	355	--	5.59	1.37	5.05	--	4.39	--	--	--	--	--	782	1.06	376	42	2.7	1,100	8.2
Aug. 17-24	1,680	--	11.88	3.12	5.61	--	5.97	--	--	--	--	--	1,380	1.88	3,160	27	2.0	1,730	7.7
Aug. 25-26	351	--	6.59	1.81	5.48	--	5.15	--	--	--	--	--	917	1.25	439	39	2.7	1,250	7.8
Aug. 27-28	1,630	--	11.98	3.62	9.09	--	3.18	--	--	--	--	--	1,720	2.34	3,810	37	3.3	2,080	8.2
Aug. 29-30, Sept. 1-2	575	--	9.73	1.97	5.74	--	4.70	--	--	--	--	--	1,200	1.63	937	33	2.4	1,550	7.6
Total or weighted average	179,100	--	3.44	0.82	2.22	--	3.25	--	--	--	--	--	427	0.58	103,900	34	1.5	621	--

a Includes 0.10 equivalent per million of carbonate (CO_3).
b Includes 0.13 equivalent per million of carbonate (CO_3).
c Includes 0.63 equivalent per million of carbonate (CO_3).
d Includes 0.60 equivalent per million of carbonate (CO_3).

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8-3610. RIO GRANDE BELOW ELEPHANT BUTTE DAM, N. MEX.

LOCATION.--At gaging station, 1.0 mile downstream from dam, 1½ miles upstream from Cuchillo Negro River, and in Pedre Armendaris Grant.
DRAINAGE AREA.--28,900 square miles, approximately (includes 2,940 square miles in closed basin in San Luis Valley, Colo.).
RECORDS AVAILABLE.--Chemical analyses: 1933 to 1959.
REMARKS.--Chemical analyses by the U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1958	20	31,200	--	3.25	0.93	2.70	--	2.60	3.40	1.00	--	(a)	0.11	461	0.63	19,600	39	1.9	680	7.9
November ..	25	33,300	--	2.84	.93	2.20	--	2.25	2.82	.95	--	(a)	.09	394	.54	17,980	37	1.6	581	8.0
December ..	20	36,500	--	2.84	.89	2.17	--	2.55	2.68	.84	--	(a)	.08	391	.53	19,340	37	1.6	578	8.0
January 1959	20	47,600	16	2.89	.88	2.17	0.12	2.51	2.66	.85	0.03	(a)	.13	404	.55	26,180	36	1.6	593	8.0
February ...	20	62,200	--	2.88	.87	2.17	--	2.50	2.67	.85	--	(a)	.06	389	.53	32,970	37	1.6	589	8.0
March.....	25	77,400	--	2.86	.95	2.20	--	2.53	2.68	.80	--	(a)	.08	394	.54	41,800	37	1.6	591	8.0
April.....	20	55,000	--	2.93	.93	2.24	--	2.63	2.66	.85	--	(a)	.08	407	.55	30,250	37	1.6	603	8.0
May.....	25	40,800	--	2.99	.93	2.30	--	2.60	2.78	.88	--	(a)	.08	428	.58	23,660	37	1.6	622	8.1
June	20	72,000	--	3.06	1.04	2.40	--	2.71	2.84	1.00	--	0.01	.06	421	.57	41,040	37	1.7	634	8.0
July	20	127,000	22	3.11	1.03	2.50	.08	2.81	2.91	.95	.02	.01	.05	412	.56	71,120	37	1.7	652	7.8
August	25	76,800	--	3.17	1.03	2.52	--	2.85	2.93	.98	--	.01	.05	432	.59	45,310	38	1.7	671	7.8
September ..	20	39,900	--	3.16	1.07	2.72	--	2.90	3.07	1.10	--	.01	.06	435	.59	23,540	39	1.9	683	7.8
Total or weighted average ..	--	699,700	--	3.01	0.97	2.36	--	2.66	2.83	0.92	--	--	0.07	413	0.56	39,280	37	1.7	626	--

a Less than 0.01 equivalent per million.

RIO GRANDE NEAR EL PASO, TEX.

LOCATION.--At gaging station, 5 miles northwest of El Paso, Tex., 6 miles northwest of Juarez, Chihuahua, and 1.9 river miles above the American Dam.
DRAINAGE AREA.--29,267 square miles (from International Boundary and Water Commission Water Bulletin Number 28).
RECORDS AVAILABLE.--Chemical analyses: 1933 to 1959.
REMARKS.--Chemical analyses by the U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge, electrical conductivity of individual water samples, and these same chemical analyses, for water year October 1958 to September 1959 given in International Boundary and Water Commission Water Bulletin Numbers 28 and 29. Records for previous years given in earlier Bulletins.

Chemical analyses, water year October 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1958	31	19,400	--	5.59	1.73	8.50	--	3.68	7.59	4.95	--	(b)	0.21	1,040	1.41	27,350	54	4.4	1,580	7.8
November ..	21	6,560	--	6.70	2.50	13.12	--	a4.47	10.79	7.55	--	(b)	.28	1,460	1.99	13,050	59	6.1	2,160	8.3
December ..	31	5,040	--	7.20	2.62	15.10	--	4.70	12.12	8.55	--	(b)	.37	1,610	2.20	11,090	61	6.8	2,390	8.0
January 1959	31	4,010	22	7.08	2.66	17.23	0.36	4.83	12.37	10.05	0.05	(b)	.32	1,750	2.38	9,540	63	7.8	2,600	7.9
February ...	17	3,340	--	6.86	2.58	15.58	--	4.90	11.68	8.85	--	0.01	.34	1,640	2.22	7,410	62	7.2	2,430	8.0
March.....	26	50,700	--	3.91	1.23	4.12	--	3.17	4.00	2.20	--	.01	.15	612	.83	42,080	44	2.6	926	7.9
April.....	30	38,700	--	4.66	1.55	6.20	--	3.60	5.43	3.60	--	.01	.14	807	1.10	42,570	50	3.5	1,240	8.1
May.....	31	44,700	--	4.58	1.54	6.56	--	3.45	5.40	3.88	--	(b)	.14	823	1.12	50,060	52	3.8	1,260	8.0
June	30	60,900	--	4.42	1.46	5.72	--	3.50	4.93	3.30	--	(b)	.14	736	1.00	60,900	50	3.4	1,150	7.8
July.....	31	62,200	19	4.46	1.42	5.83	.22	3.30	5.24	3.28	.04	.00	.17	773	1.05	65,310	49	3.4	1,180	8.0
August	31	66,400	--	4.52	1.50	5.66	--	3.51	5.10	3.15	--	.01	.11	769	1.05	69,720	48	3.3	1,150	8.1
September ..	28	33,700	--	5.03	1.64	7.08	--	3.93	6.23	3.88	--	.01	.17	888	1.21	40,780	51	3.9	1,340	8.2
Total or weighted average··	--	393,600	--	4.65	2.97	6.36	--	3.53	5.55	3.61	--	--	0.16	816	1.11	51,890	50	3.6	1,240	--

a Includes 0.24 equivalent per million of carbonate (CO_3).
b Less than 0.01 equivalents per million.

RIO GRANDE BASIN--Continued

RIO GRANDE BELOW OLD FORT QUITMAN, TEX.

LOCATION.--At gaging station at the rectified channel of the Rio Grande, 1.5 miles below Old Fort Quitman, and 81.1 river miles below the American Dam at El Paso, Tex.
DRAINAGE AREA.--32,035 square miles (United States and Mexico; from International Boundary and Water Commission Water Bulletin Number 28).
RECORDS AVAILABLE.--Chemical analyses: 1933 to 1959.
REMARKS.--Chemical analyses by the U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity, Laboratory, Riverside, Calif. Records of discharge, electrical conductivity of individual water samples, and these same chemical analyses for water year October 1958 to September 1959 given in International Boundary and Water Commission Water Commission Water Bulletin Numbers 28 and 29. Records for previous years are given in earlier Bulletins.

Chemical analyses, November 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
November 1958	4	1,290	--	8.90	3.50	19.22	--	a4.58	12.76	14.72	--	0.03	0.48	2,030	2.76	3,560	61	7.7	3,070	8.0
December	5	301	--	12.28	5.06	27.10	--	4.80	15.48	24.80	--	.05	.50	2,843	3.87	1,160	61	9.2	4,280	7.8
January 1959	4	32.1	14	32.08	13.92	61.48	0.45	4.75	24.97	77.95	0.04	.02	.48	7,013	9.54	306	57	13	9,970	7.8
February	4	11.7	--	34.64	15.48	64.96	--	4.20	25.46	85.50	--	.02	.54	7,550	10.3	121	56	13	10,600	7.9
July	1	1,250	12	8.25	.71	.29	.17	2.30	7.08	.13	.04	.01	.03	657	.89	1,110	3.1	.1	840	7.8
August	2	6,120	--	3.97	1.30	6.26	--	a3.41	4.66	3.70	--	.02	.20	755	1.03	6,300	54	3.8	1,150	8.0
September	3	245	--	21.14	11.23	70.76	--	a4.14	35.76	63.72	--	.02	.89	6,622	9.01	2,210	69	18	9,310	8.0

a Partly estimated.

RIO GRANDE AT UPPER PRESIDIO, TEX.

LOCATION.--At gaging station, 7.8 river miles above junction of the Rio Conchos, about 10 miles northwest of the towns of Presidio, Texas, and Ojinago, Chihuahua, and 285.7 river miles below the American Dam at El Paso, Tex.
DRAINAGE AREA.--34,988 square miles (United States and Mexico; from International Boundary and Water Commission Water Bulletin Number 28).
RECORDS AVAILABLE.--Chemical analyses: 1935 to 1959.
REMARKS.--Chemical analyses by the U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge, electrical conductivity of individual water samples, and these same chemical analyses for water year October 1958 to September 1959 given in International Boundary and Water Commission Water Bulletin Numbers 28 and 29. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1958	16	13,900	--	4.80		4.12	--	2.35	--	2.70	--	--	--	571	0.78	10,840	46	2.7	918	--
November...	9	a609	--	14.68		18.03	--	3.52	--	17.70	--	--	--	2,097	2.85	1,740	55	6.7	3,200	--
December...	4	363	--	46.49		49.94	--	3.80	--	59.55	--	--	--	6,491	8.83	321	52	10	8,680	--
June 1959...	3	1,220	--	3.47		2.56	--	2.80	--	.65	--	--	--	386	.52	634	42	1.9	595	--
July	5	1,580	14	4.40	0.47	2.52	0.15	2.47	4.72	.32	0.04	0.05	0.06	528	.72	1,140	33	1.6	713	8.0
August.....	7	3,190	--	3.91		2.98	--	2.65	--	1.22	--	--	--	454	.62	1,980	43	2.1	689	--
September...	3	410	--	4.60		4.15	--	2.60	--	2.40	--	--	--	570	.78	320	47	2.7	886	--

a Partly estimated.

RIO GRANDE BASIN--Continued

RIO GRANDE AT LANGTRY, TEX.

LOCATION.--At gaging station at Langtry, Tex., 24.1 river miles above the confluence with the Pecos River, and 614.1 river miles below the American Dam at El Paso, Tex.
DRAINAGE AREA.--84,795 square miles (United States and Mexico; from International Boundary and Water Commission Water Bulletin Number 28).
RECORDS AVAILABLE.--Chemical analyses: 1944 to 1959.
REMARKS.--Chemical analyses by U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge, electrical conductivity of individual water samples, and these same chemical analyses, for water year October 1958 to September 1959 given in International Boundary and Water Commission Water Bulletin Numbers 28 and 29.

Chemical analyses, water year October 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1958	5	1,335,000	--	3.39	0.54	1.63	--	2.50	2.57	0.48	--	0.07	0.11	363	0.49	654,200	29	1.2	561	7.8
November...	4	184,000	--	5.26	1.10	3.86	--	3.00	5.62	1.72	--	.03	.16	681	.93	171,100	38	2.2	1,000	8.1
December...	5	83,700	--	6.05	1.83	5.99	--	3.05	8.29	2.85	--	.07	.30	943	1.28	107,100	43	3.0	1,320	7.8
January 1959	4	66,100	22	5.87	1.84	5.85	0.16	3.18	7.86	2.68	0.07	.07	.29	915	1.24	81,960	43	3.0	1,300	7.9
February ...	4	44,100	--	5.93	2.00	5.94	--	3.10	7.95	2.92	--	.06	.20	916	1.25	55,120	43	3.0	1,320	8.0
March.....	3	39,500	--	5.39	2.10	6.03	--	2.83	7.75	3.00	--	.03	.32	914	1.24	48,900	45	3.1	1,310	7.9
April.....	5	33,700	--	4.86	2.08	5.54	--	2.63	7.09	2.85	--	.02	.24	831	1.13	38,080	44	3.0	1,230	8.0
May.....	3	68,200	--	3.79	.89	4.37	--	2.90	4.94	1.25	--	.02	.14	602	.82	55,920	48	2.9	886	8.0
June	4	67,300	--	4.46	1.09	3.27	--	2.70	4.95	1.40	--	.03	.15	585	.80	53,840	37	2.0	869	8.0
July	6	145,000	18	4.68	.83	3.12	.14	3.00	4.62	1.10	.05	.02	.13	570	.78	113,100	36	1.9	834	7.9
August	4	133,000	--	4.86	.99	3.85	--	2.95	5.21	1.50	--	.02	.20	661	.90	119,700	40	2.3	945	7.9
September ..	4	191,000	--	3.87	.71	2.32	--	2.93	3.20	.92	--	.05	.16	450	.61	116,600	34	1.5	669	8.0
Total or weighted average	--	2,391,000	--	4.04	0.82	2.67	--	2.70	3.86	1.02	--	0.06	0.14	498	0.68	412,800	34	1.7	742	--

RIO GRANDE AT LAREDO, TEX.

LOCATION.--At gaging station, 0.9 mile downstream from the highway bridge between Laredo, Tex., and Nuevo Laredo, Tamaulipas, Mex., and 890.8 river miles below the American Dam at El Paso, Tex.
DRAINAGE AREA.--135,976 square miles in United States and Mexico (from International Boundary and Water Commission Bulletin No. 28).
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1959.
REMARKS.--Chemical analyses by the U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge, electrical conductivity of individual water samples, and these same chemical analyses, for water year October 1958 to September 1959 given in International Boundary and Water Commission Water Bulletin Numbers 28 and 29. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1958	31	1,822,000	--	4.05		1.68	--	2.50	--	0.75	--	--	--	379	0.52	947,400	29	1.2	570	--
November...	30	488,900	--	5.00		2.55	--	2.75	--	1.60	--	--	--	497	.68	332,500	34	1.6	755	--
December ..	31	266,400	--	5.65		3.53	--	2.95	--	2.45	--	--	--	593	.81	215,000	38	2.1	908	--
January 1959	31	219,200	12	4.24	1.63	3.79	0.09	3.00	3.83	2.80	0.04	0.11	0.13	619	.84	184,100	39	2.2	958	7.8
February ...	28	174,800	--	5.51		3.92	--	2.60	--	3.15	--	--	--	601	.82	143,000	42	2.4	948	--
March.....	31	151,600	--	5.69		5.02	--	2.64	--	2.92	--	--	--	662	.90	136,400	47	3.0	1,020	--
April.....	30	129,700	--	5.65		4.20	--	2.65	--	3.48	--	--	--	629	.86	111,500	43	2.5	995	--
May.....	31	176,200	--	5.39		3.96	--	2.70	--	3.10	--	--	--	609	.83	146,200	42	2.4	959	--
June	30	224,600	--	4.70		2.99	--	2.55	--	2.40	--	--	--	473	.64	143,700	39	2.0	777	--
July	31	273,000	22	3.59	.97	2.92	.12	2.50	3.08	1.95	.04	.08	.11	496	.67	182,900	38	1.9	758	7.9
August.....	31	177,300	--	4.74		3.54	--	2.50	--	2.48	--	--	--	546	.74	133,200	43	2.3	837	--
September ..	30	282,700	--	4.30		2.34	--	2.65	--	1.22	--	--	--	429	.58	164,000	35	1.6	660	--
Total or weighted average..	--	4,386,000	--	4.60		2.63	--	2.61	--	1.66	--	--	--	475	0.65	507,100	34	1.7	698	--

RIO GRANDE BASIN--Continued

RIO GRANDE AT FALCON DAM - U.S. TAILRACE

LOCATION.--U.S. Tailrace at Falcon Dam.
DRAINAGE AREA.--164,482 square miles (from International Boundary and Water Commission Water Bulletin Number 28).
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1959.
REMARKS.--Chemical analyses by U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge, electrical conductivity of individual water samples, and these same chemical analyses, for water year October 1958 to September 1959 are available in International Boundary and Water Commission Water Bulletin Numbers 28 and 29. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1958.	12	1,997,000	--	2.90	0.77	2.14	--	2.23	2.14	1.46	--	0.03	0.15	367	0.50	998,500	37	1.6	591	7.8
November...	12	1,128,000	--	2.98	.73	1.73	--	2.25	2.05	1.10	--	.04	.10	347	.47	530,200	32	1.3	551	8.0
December...	6	465,000	--	3.13	.79	1.74	--	2.44	2.19	1.02	--	.07	.11	360	.49	227,800	31	1.2	561	7.9
January 1959.	12	213,000	6.0	3.43	.75	1.74	0.10	2.61	2.18	1.10	0.04	.08	.07	375	.51	108,600	29	1.2	589	7.8
February....	10	335,000	--	3.31	.99	1.83	--	2.65	2.26	1.15	--	.08	.13	388	.53	177,600	30	1.2	610	8.0
March	12	347,000	--	3.61	.77	1.91	--	2.70	2.20	1.30	--	.07	.14	421	.57	197,800	30	1.3	636	7.8
April	12	185,000	--	3.71	1.05	2.20	--	2.75	2.68	1.50	--	.06	.18	411	.56	103,600	32	1.4	688	8.0
May	12	325,000	--	3.63	1.14	2.49	--	2.63	2.98	1.70	--	.06	.11	483	.66	214,500	34	1.6	727	7.8
June.....	10	253,000	--	3.57	1.18	2.69	--	2.50	3.12	1.92	--	.05	.09	468	.64	161,900	36	1.8	750	7.9
July	13	229,000	13	3.43	1.30	3.00	.10	2.27	3.33	2.23	.03	.02	.13	504	.69	158,000	38	2.0	782	7.8
August.....	9	120,000	--	3.30	1.32	3.14	--	2.05	3.57	2.30	--	.01	.15	510	.69	82,800	40	2.1	784	7.9
September	14	274,000	--	3.24	1.32	3.21	--	2.07	3.43	2.32	--	.02	.14	494	.67	183,600	41	2.1	788	7.9
Total or weighted average	--	5,871,000	--	3.16	0.88	2.13	--	2.36	2.38	1.44	--	0.04	0.13	394	0.54	523,850	34	1.5	623	--

8-3845. PECOS RIVER BELOW ALAMOGORDO DAM, N. MEX.

LOCATION.--At gaging station, 1,200 feet downstream from Alamogordo Dam, 1½ miles downstream from Alamogordo Creek, and 4½ miles northeast of Guadalupe, De Baca County.
DRAINAGE AREA.--4,390 square miles, approximately (contributing area).
RECORDS AVAILABLE.--Chemical analyses: June 1937 to September 1959.
Water temperatures: June to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,620 micromhos Aug. 14-18; minimum daily, 987 micromhos Oct. 3.
Percent sodium: Maximum, 13 Oct. 1 to Dec. 31, Feb. 1-28, May 1-31, July 1-31; minimum, 11 Apr. 1-30, Aug. 30 to Sept. 30.
EXTREMES, 1937-59.--Specific conductance: Maximum daily, 3,200 micromhos Jan. 14, 1948; minimum daily, 513 micromhos July 22, 1937.
Percent sodium: Maximum, 19 July 1, 3-10, 1947; minimum, 1 Feb. 21-28, 1950.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million								Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	4,800	14	8.28	1.73	1.73		2.03	8.45	1.02		0.01		738	1.00	4,800	13	0.7	1,040	7.7
Nov. 1-30	3,660	15	9.58	1.97	1.70		2.13	9.95	1.16		.01		854	1.16	4,250	13	.7	1,170	7.7
Dec. 1-31	4,100	12	10.23	2.22	1.82		2.16	10.83	1.27		.01		916	1.25	5,120	13	.7	1,250	7.8
Jan. 1-31, 1959	3,460	14	11.48	2.28	1.92		2.20	12.12	1.35		.01		1,010	1.37	4,740	12	.7	1,320	7.7
Feb. 1-28	4,350	15	12.38	2.26	2.12		2.25	13.03	1.47		.01		1,080	1.47	6,390	13	.8	1,400	7.7
Mar. 1-31	5,040	13	14.07	1.49	2.13		2.25	13.89	1.55		.00		1,150	1.56	7,860	12	.8	1,470	7.7
Apr. 1-30	5,860	14	13.52	2.76	2.10		2.23	14.49	1.66		.00		1,190	1.62	9,490	11	.7	1,520	7.6
May 1-31	18,450	15	14.27	2.93	2.62		2.23	15.80	1.78		.01		1,290	1.75	32,290	13	.9	1,560	7.7
June 1-30	9,170	14	14.37	2.93	2.44		2.18	15.78	1.78		.00		1,280	1.74	15,960	12	.8	1,560	7.6
July 1-31	35,070	14	14.27	2.93	2.48		1.95	15.97	1.75		.01		1,280	1.74	61,020	13	.8	1,560	7.5
Aug. 1-29	25,310	15	14.62	3.08	2.40		1.92	16.39	1.78		.01		1,310	1.78	45,050	12	.8	1,590	7.3
Aug. 30-Sept. 30	6,080	14	12.77	2.63	1.97		1.88	13.99	1.49		.01		1,130	1.54	9,360	11	.7	1,400	7.4
Total or weighted average	125,400	14	13.57	2.71	2.31		2.05	14.93	1.66		0.01		1,210	1.65	206,900	12	0.8	1,500	--

8-3965. PECOS RIVER NEAR ARTESIA, N. MEX.

LOCATION.--At gaging station at bridge on State Highway 83, 4.3 miles east of Artesia, Eddy County, 7.0 miles north of mouth of Rio Penasco, and 17 miles north of McMillan Dam.
DRAINAGE AREA.--15,300 square miles, approximately (contributing area).
RECORDS AVAILABLE.--Chemical analyses: July 1937 to September 1959.
Water temperatures: April 1949 to September 1959.
Sediment records: January 1949 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 22,600 micromhos June 23; minimum daily, 1,410 micromhos May 16.
Percent sodium: Maximum, 68 June 22-23; minimum, 22 May 28 to June 3, July 19-30.
EXTREMES, 1937-59.--Specific conductance: Maximum daily, 22,600 micromhos June 23, 1959; minimum daily, 727 micromhos July 8, 1958.
Percent sodium: Maximum, 71 May 16, 1950; minimum, 12 Mar. 25-31, 1951.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1632.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl) [4]	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-5, 1958..	3,290	45	12.92	4.98	11.18		a1.86	16.66	10.49		0.07		1,850	2.52	8,290	38	3.7	2,570	8.3
Oct. 6-22.....	6,790	59	18.56	8.64	19.50		2.47	24.98	19.18		.07		2,940	4.00	27,160	42	5.3	4,020	7.8
Oct. 23-Nov. 30.	11,330	43	21.46	10.94	27.83		2.54	29.56	28.06		.07		3,740	5.09	57,670	46	6.9	5,180	7.9
Dec. 1-12	3,290	36	22.55	11.65	29.95		2.80	30.81	30.46		.08		3,970	5.40	17,770	47	7.2	5,530	7.9
Dec. 13-17	2,060	31	17.86	7.34	17.73		2.69	23.11	17.06		.07		2,690	3.66	7,540	41	5.0	3,700	7.6
Dec. 18-31	3,370	49	22.46	11.74	34.52		2.03	31.65	34.97		.07		4,260	5.79	19,510	50	8.3	5,990	8.1
Jan. 1-31, 1959.	6,080	42	23.95	13.65	37.58		2.29	34.77	38.07		.05		4,640	6.31	38,360	50	8.7	6,470	7.9
Feb. 1-8	1,640	44	25.95	14.45	42.44		2.66	37.27	42.86		.05		5,110	6.95	11,400	51	9.4	7,100	7.8
Feb. 9-28	4,940	30	22.06	11.14	28.08		2.52	30.81	27.92		.03		3,800	5.17	25,540	46	6.9	5,240	7.7
Mar. 1-14	2,690	27	23.85	13.15	33.01		2.41	33.73	33.84		.03		4,320	5.88	15,820	47	7.7	6,020	7.8
Mar. 15-19, 31..	676	43	26.95	14.05	43.05		2.43	38.93	43.43		.06		5,240	7.13	4,820	51	9.4	7,240	7.8
Mar. 20-27, 29-30	452	29	31.19	18.61	60.59		2.69	46.22	61.48		--		6,750	9.18	4,150	55	12	9,340	7.6
Mar. 28	71	34	36.98	23.22	105.19		2.46	53.51	109.42		--		10,000	13.6	966	64	19	14,100	8.1
Apr. 1-26	1,910	30	29.94	19.46	56.69		2.70	44.97	58.37		.05		6,480	8.81	16,830	53	11	8,940	7.8
Apr. 27-May 1 ..	563	33	28.44	16.96	42.70		2.28	42.06	43.71		.05		5,430	7.38	4,150	48	9.0	7,380	7.9
May 2-4	395	26	28.94	18.66	50.41		2.56	43.51	51.89		.05		6,000	8.16	3,220	51	10	8,320	7.6

a Includes 0.07 equivalent per million of carbonate (CO_3).

May 5-9, 1959 ..	793	26	26.70	14.70	38.28	2.46	37.68	39.48	0.06	4,910	6.68	5,300	48	8.4	6,780	7.8
May 10-15	2,050	30	21.21	10.79	23.59	2.90	28.11	24.53	.05	3,440	4.68	9.590	42	5.9	4,770	7.7
May 16-17	1,150	21	8.68	4.92	8.23	3.36	9.68	8.74	.05	1,320	1.80	2,070	38	3.2	2,070	7.4
May 18-23	5,280	26	19.46	6.14	8.98	2.62	23.73	8.18	.05	2,210	3.01	15,890	26	2.5	2,840	7.8
May 24-27	1,160	27	20.96	10.04	16.48	2.49	27.90	17.06	.03	2,970	4.04	4,690	35	4.2	3,990	7.7
May 28-June 3 ..	6,520	23	20.56	5.44	7.36	2.47	23.94	6.91	.04	2,140	2.91	18,970	22	2.0	2,680	7.7
June 4-6	682	24	21.71	8.29	15.63	2.38	26.86	16.36	.03	2,860	3.89	2,650	34	4.0	3,850	7.5
June 7-10	482	29	22.21	10.39	23.82	2.34	28.94	25.10	.04	3,500	4.76	2,290	42	5.9	4,860	7.9
June 11-14	218	28	28.44	14.96	45.46	2.29	39.14	47.38	.05	5,460	7.43	1,620	51	9.8	7,620	7.5
June 15-21, 24-26	217	27	33.68	18.94	63.94	2.54	48.09	65.71	--	7,120	9.68	2,100	55	12	9,840	7.7
June 22-23.....	105	24	47.45	39.75	188.36 --	2.80	67.87	201.35	--	16,300	22.2	2,330	68	29	22,600	7.9
June 27-30.....	869	23	20.96	6.64	11.63	2.38	26.23	10.58	.04	2,500	3.40	2,950	30	3.1	3,250	7.7
July 1-4	912	21	21.56	6.84	16.73	2.23	26.65	16.22	.03	2,840	3.86	3,520	37	4.4	3,840	7.9
July 5-6	200	21	22.85	8.35	24.81	1.95	29.36	24.68	.02	3,500	4.76	952	44	6.3	4,880	7.7
July 7-8, 10-18 .	14,380	19	19.21	4.19	6.97	2.20	22.07	6.06	.04	1,960	2.67	38,390	23	2.0	2,510	7.8
July 9	851	16	10.73	2.57	6.10	2.15	11.70	5.50	.05	1,230	1.67	1,420	31	2.4	1,780	7.5
July 19-30	11,050	19	16.72	4.08	5.89	2.03	19.26	5.36	.04	1,720	2.34	25,860	22	1.8	2,250	7.9
July 31-Aug. 10 .	9,860	21	18.36	4.04	7.44	2.07	21.24	6.49	.04	1,920	2.61	25,730	25	2.2	2,460	7.8
Aug. 11-29	18,570	17	15.37	3.33	5.89	2.08	17.53	4.94	.04	1,580	2.15	39,930	24	1.9	2,110	7.7
Aug. 30-31	311	16	15.87	5.33	15.14	2.07	19.13	15.09	.05	2,270	3.09	961	42	4.6	3,280	7.8

RIO GRANDE BASIN--Continued

8-3965. PECOS RIVER NEAR ARTESIA, N. MEX.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Sept. 1-2, 1959 .	210	18	17.56	6.84	21.00		2.41	21.65	21.29		0.05		2,810	3.82	802	46	6.0	4,080	7.5
Sept. 3-4	97	18	19.06	8.54	29.54		1.88	24.78	30.46		.02		3,510	4.77	463	52	8.0	5,180	7.3
Sept. 5-8, 11-12	173	21	27.44	13.76	53.46		1.98	37.68	54.99		.01		5,790	7.87	1,360	56	12	8,320	7.4
Sept. 9	26	21	36.78	19.82	104.91		2.43	46.84	112.24		--		9,710	13.2	343	65	20	14,300	7.1
Sept. 10, 13-15..	69	23	33.83	18.37	76.60		2.23	47.89	78.68		--		7,840	10.7	738	59	15	11,200	7.6
Sept. 16-21	61	42	40.17	24.23	117.30		2.51	54.55	124.60		--		11,000	15.0	915	65	21	15,800	7.5
Sept. 22-30	67	22	39.72	25.08	106.16		2.57	60.38	108.01		--		10,400	14.1	945	62	19	14,400	7.6
Total or weighted average	125,900	29	19.56	7.48	17.27		2.31	24.98	16.98		0.05		2,780	3.78	475,900	39	4.7	3,760	--

a Includes 0.07 equivalent per million of carbonate (CO_3).

8-4101. PECOS RIVER BELOW RED BLUFF DAM, NEAR ORLA, TEX.

LOCATION.--Just below dam, 3 miles upstream from Salt (Screwbean) Draw, 5 miles northwest of Orla, Reeves County, and 14 miles upstream from gaging station near Orla.
DRAINAGE AREA.--20,720 square miles, approximately (contributing area).
RECORDS AVAILABLE.--Chemical analyses: July 1937 to September 1959.
Water temperatures: March 1953 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 10,600 micromhos Oct. 3; minimum daily, 5,660 micromhos Nov. 28.
Percent sodium: Maximum, 70 Oct. 1-31; minimum, 53 Jan. 1-31.
EXTREMES, 1937-59.--Specific conductance: Maximum daily, 24,200 micromhos Sept. 28, 30, 1953; minimum daily, 1,610 micromhos June 2, 1948.
Percent sodium: Maximum, 78 Oct. 4-8, 1954; minimum, 9 Aug. 17-19, 1944.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for gaging station near Orla for water year October 1958 to September 1959 given in WSP 1632. Mean discharge values reported below have been adjusted to exclude inflow from Salt (Screwbean) Draw which enters Pecos River between sampling point and gaging station.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	199	18	19.96	11.10	72.40		2.87	27.27	73.32		--		6,220	8.46	1,680	70	18	9,670	7.2
Nov. 1-22	175	21	19.86	10.28	56.12		2.93	26.65	56.68		--		5,210	7.09	1,240	65	14	8,000	6.8
Nov. 23-30	54	15	20.86	9.54	38.82		2.34	27.90	38.92		0.06		4,240	5.77	312	56	10	6,280	7.2
Dec. 1-31	244	15	22.36	9.87	39.68		2.69	30.81	38.35		.06		4,420	6.01	1,470	55	9.9	6,350	8.1
Jan. 1-31, 1959	229	14	22.70	11.60	39.85	0.61	2.72	31.02	40.33		.04		4,550	6.19	1,420	53	9.6	6,520	8.1
Feb. 1-28	233	14	22.70	11.35	47.79		2.44	33.10	46.25		.05		5,010	6.81	1,590	58	12	6,990	8.0
Mar. 1-31	4,990	12	22.21	10.77	43.58		2.34	31.02	43.15		.05		4,680	6.36	31,740	57	11	6,740	8.1
Apr. 1-30	11,880	11	22.36	10.44	43.94	.77	2.28	30.61	45.68		.03		4,790	6.51	77,340	57	11	6,890	7.6
May 1-31	253	14	23.45	12.91	56.90		2.49	33.52	57.25		--		5,670	7.71	1,950	61	13	8,310	7.3
June 1-30	9,780	14	22.36	10.86	48.86		2.31	31.23	48.50		.04		5,010	6.81	66,600	60	12	7,190	7.2
July 1-31	10,590	14	22.46	9.70	48.96		2.21	31.23	47.66		.02		4,970	6.76	71,590	60	12	7,040	7.1
Aug. 1-31	16,040	17	24.05	12.58	52.00		2.13	33.73	52.73		.04		5,410	7.36	118,100	59	12	7,470	7.5
Sept. 1-30	6,440	17	25.20	11.92	60.47		2.13	35.39	60.07		--		5.950	8.09	52,100	61	14	8,460	7.7
Weighted average	61,100	14	23.10	11.10	50.02		2.23	32.27	49.63		0.04		5,140	6.99	427,100	59	12	7,280	--

PECOS RIVER NEAR SHUMLA, TEX.

LOCATION.--At gaging station, 13.0 river miles upstream from the Pecos High Bridge, and 18.5 river miles above confluence with Rio Grande, which confluence is 638.2 river miles below the American Dam at El Paso, Tex.
DRAINAGE AREA.--35,308 square miles (from International Boundary and Water Commission Water Bulletin No. 28).
RECORDS AVAILABLE.--Chemical analyses, January 1955 to September 1959. Chemical analyses for the period July through December 1954 are available for a station near the mouth and for the period February 1935 through June 1954 for a station 4.7 river miles upstream at the Pecos High Bridge.
REMARKS.--Chemical analyses are by the U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge, electrical conductivity for individual water samples, and these same chemical analyses, for water year October 1958 to September 1959 are available in International Boundary and Water Commission Bulletin Numbers 28 and 29. Records of previous years given in earlier Bulletins for station near the mouth and for a station 4.7 river miles upstream at the Pecos High Bridge.

Chemical analyses, water year October 1958 to September 1959

Month	Number of samples	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
				Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1958	3	32,800	--	6.68	3.93	12.28	--	2.77	7.38	13.05	--	0.10	0.15	1,450	1.97	64,620	54	5.3	2,290	7.9
November....	5	16,800	--	6.98	4.95	15.66	--	2.95	7.81	17.00	--	.09	.20	1,720	2.34	39,310	57	6.4	2,790	8.1
December ...	5	14,800	--	7.79	5.55	18.08	--	3.08	8.85	19.62	--	.06	.25	2,000	2.72	40,260	58	7.0	3,150	7.9
January 1959.	4	13,200	5.0	8.47	6.17	20.67	0.18	3.07	9.85	22.50	0.04	.06	.23	2,210	3.01	39,730	58	7.6	3,530	7.9
February	4	11,200	--	8.55	6.66	22.18	--	2.90	10.41	24.22	--	.06	.28	2,350	3.20	35,840	59	8.0	3,730	8.0
March.....	5	11,500	--	8.71	6.72	22.48	--	2.85	10.33	24.75	--	.04	.27	2,480	3.38	38,870	59	8.1	3,800	7.9
April.....	4	10,400	--	8.11	6.37	21.82	--	2.55	10.13	23.70	--	.03	.24	2,270	3.08	32,030	60	8.1	3,650	8.0
May.....	4	14,000	--	7.70	6.22	21.75	--	2.25	9.92	23.68	--	.01	.20	2,300	3.13	43,820	61	8.2	3,590	7.9
June.....	5	15,600	--	7.89	6.30	23.31	--	2.33	10.53	24.82	--	.01	.26	2,370	3.22	50,230	62	8.7	3,760	8.0
July.....	4	38,900	14	5.21	3.28	11.41	.15	2.50	5.35	12.12	.04	.02	.13	1,260	1.71	66,520	57	5.5	2,060	7.9
August.....	4	15,900	--	4.93	3.49	11.09	--	2.60	5.27	11.80	--	.05	.09	1,230	1.67	26,550	57	5.4	1,980	8.2
September...	5	25,800	--	4.07	2.10	6.49	--	2.63	3.00	6.98	--	.04	.10	803	1.09	28,120	51	3.7	1,310	8.0
Total or weighted average	--	220,900	--	6.61	4.60	15.37	--	2.68	7.46	16.57	--	0.05	0.18	1,680	2.29	46,240	57	6.3	2,680	--

COLORADO RIVER MAIN STEM

9-725. COLORADO RIVER NEAR GLENWOOD SPRINGS, COLO.

LOCATION.--At Shoshone powerplant, 6 miles upstream from gaging station at Glenwood Springs, Garfield County, which is half a mile upstream from Roaring Fork.
DRAINAGE AREA.--4,560 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1941 to September 1959.
Water temperatures: May 1949 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,180 micromhos Dec. 1; minimum daily, 224 micromhos June 9.
Percent sodium: Maximum, 49 Dec. 16, 22-23, 27, 29-30; minimum, 23 June 1-20.
EXTREMES, 1941-59.--Specific conductance: Maximum daily, 2,260 micromhos Aug. 10, 1947; minimum daily, 153 micromhos May 24, 1948.
Percent sodium: 53 Dec. 11-20, 1954; minimum, 11 May 21-31, 1956.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1633. No appreciable inflow between Shoshone powerplant and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-19, 22-31, 1958	55,520	11	3.24	1.12	3.09	0.07	2.29	2.44	2.82		0.01	0.03	455	0.62	34,420	41	2.1	767	8.1
Oct. 20-21	2,870	12	4.24	1.56	4.87	.09	2.72	3.48	4.37		.01	.06	655	.89	2,550	45	2.9	1,070	8.1
Nov. 1-18, 20-28	50,090	12	3.40	1.22	3.31	.07	2.44	2.64	2.82		.01	.06	488	.66	33,060	41	2.2	810	8.0
Nov. 19	1,260	12	4.56	1.60	4.96	.09	a2.90	3.60	4.51		.01	--	668	.91	1,150	44	2.8	1,100	8.4
Nov. 29-Dec. 1-2	5,650	13	4.28	1.42	5.31	.09	2.82	3.23	4.94		.01	.06	667	.91	5,140	48	3.1	1,120	8.0
Dec. 3-15, 17-21, 24-26, 28, 31	42,710	12	3.08	1.06	3.04	.06	2.31	2.27	2.59		.01	.04	440	.60	25,630	42	2.1	746	8.0
Dec. 16, 22-23, 27, 29-30	8,570	12	3.76	1.30	4.92	.08	2.57	2.91	4.46		.01	.04	599	.81	6,940	49	3.1	1,020	8.1
Jan. 1-31, 1959	62,500	12	2.68	.88	3.04	.05	2.10	1.81	2.68		.01	.04	400	.54	33,750	46	2.3	679	7.8
Feb. 1-28	54,460	12	2.54	.88	2.83	.06	2.00	1.67	2.54		.01	.04	386	.52	28,320	45	2.2	657	7.9
Mar. 1-31	49,310	11	3.06	1.08	3.52	.06	2.26	2.25	3.16		.01	.03	474	.64	31,560	46	2.5	785	8.0
Apr. 1-30	80,580	13	2.72	1.06	2.70	.07	2.15	2.06	2.31		.01	.05	401	.55	44,320	41	2.0	663	7.7

a Includes 0.20 equivalent per million of carbonate (CO_3).

COLORADO RIVER MAIN STEM--Continued

9-725. COLORADO RIVER NEAR GLENWOOD SPRINGS, COLO.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
May 1-2, 7-8, 1959	17,410	13	2.28	0.72	1.65	0.06	1.97	1.37	1.35		0.02	0.05	294	0.40	6,960	35	1.3	486	7.9
May 3-6, 9-31	234,800	12	1.90	.50	.83	.03	1.69	1.00	.65		.02	.02	204	.28	65,740	25	.8	332	8.1
June 1-20	254,900	8.7	1.54	.44	.61	.02	1.39	.79	.45		.01	.02	161	.22	56,080	23	.6	262	8.1
June 21-30	86,760	8.8	2.00	.58	.91	.02	1.61	1.29	.70		.01	.03	245	.33	28,630	26	.8	361	8.2
July 1-15	75,890	7.5	2.58	.88	1.70	.05	1.87	1.85	1.52		.00	.03	321	.44	33,390	33	1.3	528	7.3
July 16-31	50,460	9.1	2.96	1.08	2.39	.05	2.15	2.23	2.17		.00	.03	398	.54	27,250	37	1.7	659	7.4
Aug. 1-26, 28-31	86,740	9.6	3.22	1.12	2.61	.06	2.31	2.35	2.37		.00	.04	432	.59	51,180	37	1.8	708	7.4
Aug. 27	2,660	11	6.08	1.12	2.57	.07	2.29	5.31	2.31		.01	--	b615	.84	2,230	26	1.4	938	7.4
Sept. 1-30	73,040	9.1	3.04	1.08	2.87	.06	2.07	2.33	2.54		.01	.04	410	.56	40,900	41	2.0	715	7.5
Total or weighted average	1,296,000	10	2.45	0.81	1.87	0.05	1.90	1.62	1.64		0.01	0.03	317	0.43	557,300	36	1.5	524	--

b Calculated from determined constituents.

COLORADO RIVER MAIN STEM--Continued

9-1805. COLORADO RIVER NEAR CISCO, UTAH

LOCATION.--At gaging station, 1 mile downstream from Dolores River, 11 miles south of Cisco, Grand County, 97 miles upstream from Green River, and 235 miles upstream from San Juan River.
DRAINAGE AREA.--24,100 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August 1928 to September 1959.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 3,070 micromhos Aug. 3; minimum daily, 439 micromhos June 13.
Percent sodium: Maximum, 54 Aug. 3; minimum, 29 June 1-30.
EXTREMES, 1941-52, 1953-59.--Specific conductance: Maximum daily, 4,820 micromhos Dec. 13, 1957; minimum daily, 291 micromhos May 31, 1958.
Percent sodium: Maximum, 57 Mar. 2, 4, 1955; minimum, 18 June 1-10, 1957.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958 .	155,100	11	8.04	5.72	9.27	0.19	3.67	14.37	5.36		0.18	0.16	1,460	1.99	308,600	50	3.5	2,090	8.1
Nov. 1-30	189,700	15	6.56	4.60	8.09	.16	3.31	11.45	4.85		.15	.10	1,220	1.66	314,900	42	3.4	1,810	8.2
Dec. 1-31	175,800	12	6.08	4.36	8.66	.17	3.47	10.04	5.87		.16	.09	1,200	1.63	286,600	45	3.8	1,830	8.1
Jan. 1-31, 1959 .	167,600	15	6.08	4.08	10.31	.20	3.44	9.60	7.05		.21	.05	1,260	1.71	286,600	50	4.6	1,920	7.8
Feb. 1-28	152,800	12	5.20	3.52	7.92	.16	3.11	8.43	5.08		.18	.01	1,040	1.41	215,400	47	3.8	1,590	7.7
Mar. 1-31	149,600	9.7	5.28	3.92	9.96	.21	3.05	8.87	7.05		.15	.03	1,180	1.60	239,400	51	4.6	1,850	7.5
Apr. 1-30.....	162,800	11	5.40	3.64	7.48	.15	2.93	8.70	4.65		.18	.12	1,020	1.39	226,300	45	3.5	1,530	7.7
May 1-14	159,900	18	4.36	2.16	3.83	.10	2.75	5.45	2.28		.10	.11	656	.89	142,300	37	2.1	1,020	7.7
May 15-31	375,600	20	3.22	1.24	1.91	.07	2.41	2.96	1.13		.07	.06	405	.55	206,600	30	1.3	641	7.9
June 1-30	923,700	11	2.92	1.20	1.74	.05	2.03	2.94	.99		.03	.05	366	.50	461,800	29	1.2	598	7.7
July 1-14	148,200	10	4.56	2.48	3.87	.09	2.47	6.25	2.14		.04	.07	676	.92	136,300	35	2.1	1,040	7.7
July 15	65,950	7.8	7.20	4.72	7.35	.14	2.92	12.83	3.95		.09	.13	1,230	1.67	110,100	38	3.0	1,750	7.8
Aug. 1-2, 4-31..	154,500	14	9.10	4.60	7.83	.18	3.49	14.47	3.81		.10	.15	1,380	1.88	290,500	36	3.0	1,920	7.7
Aug. 3	5,080	12	9.10	5.90	17.88	.38	3.11	15.43	14.52		.11	.16	2,050	2.79	14,170	54	6.5	3,070	7.6
Sept. 1-30	124,200	12	9.60	6.10	8.96	.18	3.38	16.86	4.57		.16	.20	1,570	2.14	265,800	36	3.2	2,140	8.0
Total or weighted average.....	a3,110,000	13	4.99	2.88	5.31	0.12	2.75	7.29	3.24		0.10	0.08	828	1.13	3,514,000	40	2.7	1,250	--

a Includes estimated data for missing periods. Represents 100 percent of runoff for water year October 1958 to September 1959.

708-297 O-63--8

COLORADO RIVER MAIN STEM--Continued

9-3800. COLORADO RIVER AT LEES FERRY, ARIZ.

LOCATION.--At gaging station at head of Marble Gorge at Lees Ferry, Coconino County, just upstream from Paria River, 16 miles downstream from site of Glen Canyon Dam, 28 miles downstream from Utah-Arizona State Line, 61.5 miles upstream from Little Colorado River, and 79 miles downstream from San Juan River.
DRAINAGE AREA.--107,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: January to July 1926, October 1926 to June 1927, October 1928 to September 1930, November 1942 to October 1945, October 1947 to September 1959.
Water temperatures: July 1949 to September 1959.
Sediment records: October 1928 to December 1933, November 1942 to September 1944, October 1947 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,110 micromhos Sept. 28; minimum daily, 453 micromhos June 23.
Percent sodium: Maximum, 44 Mar. 1-31, Apr. 9-18; minimum, 28 June 11-30.
EXTREMES, 1928-30, 1942-45, 1947-59.--Specific conductance (1942-45, 1947-59): Maximum daily, 2,280 micromhos Oct. 15, 1945; minimum daily, 318 micromhos June 9, 1948.
Percent sodium (1942-44, 1947-59): Maximum, 46 Mar. 2, 4, 7, 10, 1944; minimum, 17 June 1-11, 1958.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	310,500	17	6.74	4.06	7.18	0.17	3.28	11.28	3.58	0.03	0.12	0.24	1,200	1.63	506,100	40	3.1	1,640	7.7
Nov. 1-30	357,200	--	6.69	4.21	7.35	--	3.65	--	--	--	--	--	1,210	1.65	589,400	40	3.1	1,650	7.7
Dec. 1-31	366,200	--	6.39	3.91	6.87	--	3.84	--	--	--	--	--	1,120	1.52	556,600	40	3.0	1,570	7.7
Jan. 1-31, 1959	314,600	15	5.99	3.71	7.05	.15	3.70	9.12	4.06	.03	.13	.20	1,090	1.48	465,600	42	3.2	1,560	7.7
Feb. 1-28	315,300	--	5.49	3.61	6.44	--	3.44	--	--	--	--	--	1,000	1.36	428,800	41	3.0	1,450	7.7
Mar. 1-31	343,900	--	5.19	3.51	6.74	--	3.36	--	--	--	--	--	1,010	1.37	471,100	44	3.2	1,450	7.6
Apr. 1-8	99,150	14	5.54	3.36	6.44	.16	3.26	8.85	3.41	.02	.12	.19	1,020	1.39	137,800	42	3.1	1,430	7.7
Apr. 9-18	163,600	--	4.74	2.66	5.79	--	3.08	--	--	--	--	--	861	1.17	191,400	44	3.0	1,240	7.6
Apr. 19-30	156,800	--	4.39	2.51	4.70	--	3.00	--	--	--	--	--	759	1.03	161,500	41	2.5	1,100	7.6
May 1-7	114,200	--	4.89	2.59	5.09	--	3.25	--	--	--	--	--	831	1.13	129,000	40	2.6	1,190	7.5
May 8-12	138,200	--	4.29	2.07	3.78	--	3.16	--	--	--	--	--	663	.90	124,400	37	2.1	962	7.5
May 13-21	333,100	--	3.74	1.66	2.65	--	3.13	--	--	--	--	--	524	.71	236,500	33	1.6	770	7.3
May 22-31	438,800	--	2.94	1.18	1.78	--	2.56	--	--	--	--	--	383	.52	228,200	30	1.2	572	7.7
June 1-10	471,600	--	3.04	1.24	1.96	--	2.38	--	--	--	--	--	406	.55	259,400	31	1.3	609	7.2
June 11-30	1,364,000	--	2.74	1.00	1.44	--	2.38	--	--	--	--	--	330	.45	613,800	28	1.1	506	7.6

July 1-11, 1959 ..	469,600	19	2.94	1.22	1.87	0.08	2.33	2.83	0.85	0.03	0.04	0.10	383	0.52	244,200	31	1.3	583	7.8
July 12-20	185,900	--	3.59	1.89	3.09	--	2.75	--	--	--	--	--	523	.71	132,000	36	1.9	800	7.8
July 21-28	97,540	--	4.49	1.95	3.78	--	2.97	--	--	--	--	--	654	.89	86,810	37	2.1	978	7.8
July 29-Aug. 7 ...	98,710	--	5.39	2.73	4.78	--	3.21	--	--	--	--	--	841	1.14	112,500	37	2.4	1,200	7.8
Aug. 8-18	178,600	--	7.88	3.08	6.31	--	3.80	--	--		--	--	1,130	1.54	275,000	37	2.7	1,560	7.7
Aug. 19-27	124,800	--	7.19	2.93	4.96	--	4.00	--	--	--	--	--	958	1.30	162,200	33	2.2	1,350	7.5
Aug. 28-30	39,920	--	10.63	3.37	6.13	--	4.41	--	--	--	--	--	1,350	1.84	73,450	30	2.3	1,750	7.7
Aug. 31-Sept. 21 .	177,400	--	7.39	3.49	6.35	--	3.59	--	--	--	--	--	1,120	1.52	269,600	37	2.7	1,540	7.8
Sept. 22-30	80,350	--	9.78	5.12	7.79	--	3.49	--	--	--	--	--	1,480	2.01	161,500	34	2.9	1,920	7.7
Total or weighted average	6,742,000	--	4.59	2.38	4.13	--	3.00	--	--	--	--	--	722	0.98	6,607,000	37	2.2	1,030	--

9-4025. COLORADO RIVER NEAR GRAND CANYON, ARIZ.

LOCATION.--At gaging station at Kaibab Bridge, a quarter of a mile upstream from Bright Angel Creek, 11 miles by trail northeast of Grand Canyon, Coconino County, 26 miles downstream from Little Colorado River, and 267 miles upstream from Hoover Dam.
DRAINAGE AREA.--137,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August 1925 to November 1942, September 1943 to September 1959.
Water temperatures: October 1936 to October 1942, September 1943 to September 1959.
Sediment records: October 1925 to November 1942, September 1943 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,320 micromhos Sept. 30; minimum daily, 546 micromhos June 25.
Percent sodium: Maximum, 47 Apr. 1-18; minimum, 27 June 11-30.
EXTREMES, 1937-42, 1943-59.--Specific conductance: Maximum daily, 2,900 micromhos Sept. 6, 1940; minimum daily, 341 micromhos June 15, 1942.
Percent sodium (1941-42, 1943-59): Maximum, 50 Jan. 12-14, 1957; minimum, 16 June 11-20, 1952.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, April to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Apr. 1-18, 1959.	260,000	12	4.94	3.36	7.40	0.18	3.39	7.66	4.65	0.03	0.10	0.17	1,010	1.37	356,200	47	3.6	1,490	7.4
Apr. 19-30	163,100	--	4.34	2.86	5.61	--	3.16	--	--	--	--	--	807	1.10	179,400	44	3.0	1,200	7.6
May 1-9	152,800	--	5.04	2.76	6.18	--	3.54	--	--	--	--	--	888	1.21	184,900	44	3.1	1,330	8.0
May 10-15	171,600	--	4.29	2.11	4.09	--	3.43	--	--	--	--	--	664	.90	154,400	39	2.3	1,010	7.8
May 16-23	349,700	--	4.09	1.67	3.04	--	3.47	--	--	--	--	--	543	.74	258,800	35	1.8	845	7.8
May 24-June 2 ..	406,600	--	3.44	1.24	2.09	--	3.08	--	--	--	--	--	424	.58	235,800	31	1.4	665	7.7
June 3-10	381,000	--	3.79	1.17	2.31	--	3.10	--	--	--	--	--	457	.62	236,200	32	1.5	710	7.6
June 11-30.....	1,354,000	--	3.44	.96	1.65	--	3.02	--	--	--	--	--	368	.50	677,000	27	1.1	587	7.7
July 1-10	438,700	17	3.29	1.11	2.09	.09	2.82	2.56	1.13	.02	.04	.08	414	.56	245,700	32	1.4	642	7.4
July 11-16	154,900	--	3.69	1.51	3.13	--	2.88	--	--	--	--	--	523	.71	110,000	38	1.9	816	7.7
July 17-24	123,700	--	4.04	1.80	4.26	--	3.03	--	--	--	--	--	637	.87	107,600	42	2.5	983	8.0
July 25-31	78,090	--	4.74	2.34	5.26	--	3.36	--	--	--	--	--	771	1.05	81,990	43	2.8	1,190	7.6

Aug. 1-11, 1959.	154,700	--	6.44	2.64	6.26	--	4.13	--	--	--	--	--	997	1.36	210,400	41	2.9	1,430	7.4
Aug. 12-22.....	192,600	--	8.13	2.87	6.96	--	4.56	--	--	--	--	--	1,180	1.60	308,200	39	3.0	1,620	7.3
Aug. 23-26	64,110	--	6.69	2.47	5.87	--	4.34	--	--	--	--	--	982	1.34	85,910	39	2.7	1,390	7.4
Aug. 27-31	76,170	--	8.43	3.05	6.79	--	4.11	--	--	--	--	--	1,220	1.66	126,400	37	2.8	1,650	7.4
Sept. 1-24	214,100	--	7.63	3.65	8.00	--	3.93	--	--	--	--	--	1,270	1.73	370,400	41	3.4	1,760	7.4
Sept. 25-30	56,710	--	9.63	4.65	9.09	--	3.87	--	--	--	--	--	1,570	2.14	121,400	39	3.4	2,070	7.3
Total or weighted average.....	a4,792,000	--	4.39	1.81	3.61	--	3.28	--	--	--	--	--	621	0.84	4,025,000	37	2.1	930	--
Total or weighted average	b6,935,000	--	4.89	2.38	5.05	--	3.39	--	--	--	--	--	779	1.06	7,351,000	41	2.6	1,170	--

a Average for 183 days of flow, which is 69 percent of runoff for water year.
b Includes estimated data for missing periods. Represents 100 percent of runoff for water year.

9-4215. COLORADO RIVER BELOW HOOVER DAM, ARIZ.-NEV.

LOCATION.--At Hoover Dam, state line between Mohave County, Ariz., and Clark County, Nev., about 1 mile upstream from gaging station.
DRAINAGE AREA.--167,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1939 to September 1959.
Water temperatures: October 1941 to September 1959.
EXTREMES, 1939-57.--Specific conductance: Maximum daily, 1,580 micromhos June 20, 1955; minimum daily, 712 micromhos Nov. 25-26, 1952.
Percent sodium: Maximum, 41 during several periods in 1951, 1952 and 1956; minimum, 32 Jan. 21-22, 25-29, 31, June 12-17, 19-20, 1944.
REMARKS.--Values reported for dissolved solids are residues at 180 C. Records of specific conductance of daily samples prior to August 1957 and of semi-monthly samples thereafter available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet) [a]	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons [b]				
Oct. 1, 15, 1958	728,300	10	4.16	1.92	3.52	0.10	2.59	5.29	1.75	0.02	0.05	0.13	611	0.83	604,500	36	2.0	922	8.0
Nov. 3, 18.....	745,800	--	4.16	1.96	3.44	--	2.51	--	--	--	--	--	602	.82	611,600	36	2.0	916	7.6
Dec. 1, 15	873,100	--	4.28	1.84	3.44	--	2.57	--	--	--	--	--	607	.83	724,700	36	2.0	922	7.6
Jan. 2, 16, 1959	794,800	11	4.34	1.86	3.39	.10	2.61	5.43	1.75	.01	.05	.10	624	.85	675,600	35	1.9	933	7.9
Feb. 2, 16.....	647,500	--	4.24	1.92	3.48	--	2.61	--	--	--	--	--	610	.83	537,400	36	2.0	935	7.6
Mar. 3, 16	827,400	11	4.24	2.04	3.65	.10	2.69	5.48	1.89	--	.05	.15	648	.88	728,100	36	2.0	958	7.5
Apr. 1, 15	916,100	11	4.20	2.24	3.96	.10	2.72	5.62	2.17	.02	.05	.10	672	.91	833,700	38	2.2	1,000	7.7
May 1, 15	949,400	--	4.08	2.16	3.65	--	2.61	--	--	--	--	--	631	.86	816,500	37	2.1	970	7.5
June 1, 15.....	759,900	--	4.12	1.96	3.52	--	2.59	--	--	--	--	--	626	.85	645,900	37	2.0	958	7.7
July 3, 13	848,400	11	4.08	2.04	3.44	.11	2.56	5.29	1.83	.03	.05	.11	618	.84	712,700	36	2.0	947	7.6
Aug. 3, 14.....	893,500	--	4.04	2.00	3.44	--	2.52	--	--	--	--	--	608	.83	741,600	36	2.0	933	7.7
Sept. 2, 15	773,200	--	4.08	1.88	3.31	--	2.52	--	--	--	--	--	598	.81	626,300	36	1.9	912	7.7
Total or weighted average	c9,757,000	--	4.19	1.97	3.52	0.10	2.59	5.43	1.89	0.02	0.05	--	622	0.85	8,293,000	36	2.0	944	--

a Represents runoff in acre-feet for entire month.
b Includes estimated data for missing periods. Represents total loads for the month.
c Includes estimated data for missing periods.

DIVERSIONS AND RETURN FLOW AT AND BELOW IMPERIAL DAM

9-5255. YUMA MAIN CANAL BELOW COLORADO RIVER SIPHON, AT YUMA, ARIZ.

LOCATION.--At gaging station on Yuma Main Canal below Colorado River Siphon on Arizona side of river, 3½ miles downstream from siphon-drop powerplant, and a quarter of a mile downstream from upper highway bridge over Colorado River at Yuma.
RECORDS AVAILABLE.--Chemical analyses: September 1926 to September 1928, October 1942 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,140 micromhos on several days in May and June; minimum daily, 1,010 micromhos on several days in December and February.
Percent sodium: Maximum, 43 June 1-30, Sept. 1-30; minimum, 39 Jan. 1-4, 8-31.
EXTREMES, 1943-59.--Specific conductance: Maximum daily, 1,520 micromhos Jan. 16, 1957; minimum, 795 micromhos Jan. 5, 1953.
Percent sodium: Maximum, 46 Nov. 21-30, 1953; minimum, 32 several periods in 1945, 1946, 1948, 1949, and 1957.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1633. No flow Jan. 5-7.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	28,140	22	4.49	1.99	4.57	0.12	2.62	6.04	2.62	0.02	0.03	0.25	739	1.01	28,420	41	2.5	1,070	7.9
Nov. 1-30	22,060	--	4.54	1.94	4.57	--	2.62	--	--	--	--	--	737	1.00	22,060	41	2.5	1,070	7.8
Dec. 1-31	16,600	--	4.49	1.91	4.26	--	2.59	--	--	--	--	--	716	.97	16,100	40	2.4	1,030	7.8
Jan. 1-4, 8-31, 1959	22,270	17	4.59	1.97	4.31	.11	2.67	5.95	2.37	.02	.03	.27	727	.99	22,050	39	2.4	1,040	7.9
Feb. 1-28	25,160	--	4.59	1.97	4.35	--	2.67	--	--	--	--	--	727	.99	24,910	40	2.4	1,050	7.8
Mar. 1-31	27,350	--	4.74	1.96	4.57	--	2.75	--	--	--	--	--	749	1.02	27,900	41	2.5	1,080	8.0
Apr. 1-30	32,090	16	4.69	1.95	4.52	.11	2.74	5.95	2.54	.02	.03	.26	741	1.01	32,410	40	2.5	1,070	7.8
May 1-31	34,730	--	4.69	2.19	4.92	--	2.80	--	--	--	--	--	770	1.05	36,470	42	2.6	1,120	7.9
June 1-30	32,130	--	4.54	2.18	5.00	--	2.70	--	--	--	--	--	757	1.03	33,090	43	2.7	1,130	7.9
July 1-31	37,860	17	4.39	2.13	4.74	.12	2.67	5.95	2.74	.02	.02	.20	730	.99	37,480	42	2.6	1,090	7.9
Aug. 1-31	27,890	--	4.39	2.09	4.65	--	2.70	--	--	--	--	--	766	1.04	29,010	42	2.6	1,100	8.0
Sept. 1-30	33,910	--	4.29	2.11	4.92	--	2.57	--	--	--	--	--	768	1.04	35,270	43	2.8	1,110	8.0
Total or weighted average	340,200	--	4.54	2.06	4.65	--	2.69	--	--	--	--	--	746	1.01	343,600	41	2.6	1,080	--

GUNNISON RIVER BASIN

9-1525. GUNNISON RIVER NEAR GRAND JUNCTION, COLO.

LOCATION.--At road bridge about a half mile downstream from gaging station, 1 mile downstream from point of diversion of Redlands power canal, and 1½ miles upstream from mouth and Grand Junction, Mesa County.
DRAINAGE AREA.--8,020 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1931 to September 1959.
Water temperatures: April 1949 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,380 micromhos July 25; minimum daily, 459 micromhos June 16.
Percent sodium: Maximum 32 Feb. 1-28, Mar. 1-31; minimum, 22 June 1-19.
EXTREMES, 1941-59.--Specific conductance: Maximum daily, 2,730 micromhos Sept. 10, 1956; minimum daily, 280 micromhos May 23, 1948.
Percent sodium (1950-59): Maximum, 35 Sept. 21-30, 1956, Feb. 11-20, 1957; minimum, 10 June 2-5, 10, 1952.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	51,740	20	10.30	7.00	7.48	0.16	3.59	20.82	0.73		0.16	0.26	1,630	2.22	114,900	30	2.5	2,040	8.0
Nov. 1-30	71,330	18	8.16	5.32	5.70	.14	3.98	15.01	.51		.16	.18	1,250	1.70	121,300	30	2.2	1,630	8.1
Dec. 1-31	65,080	16	6.96	4.84	5.18	.13	3.72	13.10	.45		.14	.17	1,100	1.50	97,620	30	2.1	1,480	7.8
Jan. 1-31, 1959	56,840	19	6.84	4.92	5.18	.13	3.74	12.80	.51		.13	.17	1,090	1.48	84,120	30	2.1	1,450	8.0
Feb. 1-28	49,610	15	6.28	4.72	5.13	.15	3.51	12.33	.48		.11	.20	1,040	1.41	69,950	32	2.2	1,410	7.8
Mar. 1-31	51,960	13	5.64	4.24	4.65	.14	3.28	11.03	.45		.08	.19	939	1.28	66,510	32	2.1	1,280	7.8
Apr. 1-13	24,760	17	4.72	3.08	3.35	.11	2.79	8.04	.42		.08	.12	720	.98	24,300	30	1.7	1,010	7.8
Apr. 14-26	18,370	15	6.36	4.24	4.57	.13	3.21	11.66	.54		.07	.17	983	1.34	224,620	30	2.0	1,330	7.8
Apr. 27-30	12,000	16	4.44	2.44	2.61	.09	2.69	6.58	.31		.06	.14	610	.83	9,960	27	1.4	878	7.4
May 1-31	167,300	17	4.04	2.00	2.00	.09	2.56	5.37	.28		.06	.10	521	.71	118,800	25	1.2	770	8.2
June 1-19	193,900	15	3.18	1.26	1.26	.06	2.26	3.35	.16		.04	.08	363	.49	95,010	22	.8	558	8.2
June 20-26	46,770	16	4.20	1.88	1.87	.09	2.62	5.27	.23		.05	.11	513	.70	32,740	23	1.1	759	8.2
June 27, July 1-31	49,120	11	10.76	6.72	7.44	.14	3.31	21.24	.68		.06	.25	1,630	2.22	109,000	30	2.5	2,060	8.1
Aug. 1-31	51,080	13	9.60	5.40	6.09	.15	3.47	17.49	.54		.07	.23	1,380	1.88	96,030	29	2.2	1,760	7.7
Sept. 1-30	41,120	14	11.70	6.70	7.35	.15	3.74	21.65	.59		.09	.30	1,680	2.28	93,750	28	2.4	2,070	7.7
Total or weighted average	951,000	16	6.14	3.70	3.96	0.11	3.06	10.53	0.39		0.09	0.16	896	1.22	1,160,000	28	1.8	1,200	--

9-3150. GREEN RIVER AT GREEN RIVER, UTAH

LOCATION.--At gaging station, 1 mile southeast of the town of Green River, Emery County, 22 miles upstream from San Rafael River, and 117 miles upstream from mouth.
DRAINAGE AREA.--40,600 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August 1928 to September 1959.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,570 micromhos Sept. 17, 18; minimum daily, 326 micromhos June 20.
Percent sodium: Maximum, 45 Nov. 1-30; minimum, 27 June 1-30.
EXTREMES, 1941-59.--Specific conductance: Maximum daily, 2,420 micromhos Sept. 29, 1943; minimum daily, 272 micromhos May 13, 1956.
Percent sodium (1950-59): Maximum, 47 Nov. 21-24, 26, Dec. 1-10, 1954; minimum, 19 Aug. 7, 1957.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	91,080	7.3	3.48	3.04	5.00	0.08	3.56	6.93	1.30		0.02	0.19	741	1.01	91,990	43	2.8	1,100	8.2
Nov. 1-30	102,000	7.9	3.64	3.40	5.83	.08	a3.64	7.97	1.38		.02	.24	816	1.11	113,200	45	3.1	1,190	8.5
Dec. 1-31	114,200	12	4.06	3.52	5.00	.07	4.15	7.29	1.27		.03	.20	800	1.09	124,500	40	2.6	1,140	8.0
Jan. 1-31, 1959	97,090	11	4.72	3.60	5.09	.07	4.79	7.33	1.55		.03	.01	828	1.13	109,700	38	2.5	1,210	8.1
Feb. 1-28	113,500	9.8	3.68	3.04	4.48	.07	3.82	6.50	1.13		.03	.19	700	.95	107,800	40	2.4	1,030	8.0
Mar. 1-31.....	146,300	7.4	3.60	3.00	4.52	.07	3.82	6.37	1.18		.02	.18	691	.94	137,500	40	2.5	1,020	7.9
Apr. 1-30	218,900	12	3.12	2.32	3.65	.08	3.28	4.98	.93		.03	.13	557	.76	166,400	40	2.2	840	7.8
May 1-8.....	99,650	16	2.78	1.72	2.26	.08	3.11	3.08	.56		.04	.08	422	.57	56,800	33	1.5	635	7.7
May 9-31.....	380,700	13	2.16	1.10	1.26	.06	2.49	1.69	.34		.03	.05	280	.38	144,700	28	1.0	431	7.6
June 1-30	762,700	12	2.06	.90	1.13	.05	2.33	1.48	.31		.02	.06	252	.34	259,300	27	.9	397	7.5
July 1-17	264,500	14	2.56	1.28	2.00	.07	2.82	2.50	.56		.02	.09	360	.49	129,600	34	1.4	567	7.9
July 18-31	81,540	11	3.00	1.60	2.48	.08	3.03	3.31	.73		.02	.11	433	.59	48,110	35	1.6	673	7.9

a Includes 0.33 equivalent per million of carbonate (CO_3).

GREEN RIVER BASIN--Continued

9-3150. GREEN RIVER AT GREEN RIVER, UTAH--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Aug. 1-5, 1959..	26,140	12	2.90	1.62	2.70	0.09	3.02	3.58	0.73		0.00	0.11	442	0.60	15,680	37	1.8	692	7.8
Aug. 6	5,690	19	5.76	2.84	4.74	.13	4.23	8.20	1.07		.01	--	b 842	1.15	6,540	35	2.3	1,210	7.6
Aug. 21-25	34,550	15	6.00	3.00	6.61	.14	3.70	10.60	1.38		.03	.27	1,020	.39	48,020	42	3.1	1,400	7.8
Aug. 7-20, 26-31	113,100	12	3.88	1.96	3.52	.11	3.16	5.31	.96		.02	.13	593	.81	91,610	37	2.1	886	7.9
Sept. 1-16, 19-30	95,400	9.1	3.64	2.12	4.31	.11	3.25	5.54	1.24		.03	.16	623	.85	81,090	42	2.5	954	7.6
Sept. 17-18	8,290	13	10.24	2.68	5.35	.14	3.18	14.37	1.07		.01	.32	1,230	1.67	13,840	29	2.1	1,570	7.3
Total or weighted average	2,755,000	12	2.89	1.81	2.74	0.07	3.02	3.81	0.73		0.02	0.11	466	0.63	1,736,000	36	1.8	701	--

b Calculated from determined constituents.

9-3555. SAN JUAN RIVER NEAR ARCHULETA, N. MEX.

LOCATION.--At gaging station, 4½ miles downstream from Los Pinos River and 4½ miles northeast of Archuleta, San Juan County.
DRAINAGE AREA.--3,240 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1954 to September 1959.
Water temperatures: December 1954 to September 1959.
Sediment records: December 1954 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 613 micromhos Jan. 5; minimum daily, 136 micromhos June 10.
Percent sodium: Maximum, 34 Feb. 1-28, Aug. 20-21; minimum, 21 May 14-22, 29-31.
EXTREMES, 1954-59.--Specific conductance: Maximum daily, 659 micromhos Nov. 22, 1956; minimum daily, 101 micromhos July 2, 1957.
Percent sodium: Maximum, 45 Feb. 13-17, 1957; minimum, 13 Apr. 17-23, 1958.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1633. Flow affected by ice Dec. 17 to Feb. 3.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-25, 1958	19,210	13	2.00	0.52	1.22	0.07	2.20	1.42	0.16	0.04	0.01	0.07	236	0.32	6,150	32	1.1	364	7.8
Oct. 26-27, 30-Nov. 20	15,550	--	2.35	.67	1.44	--	2.46	--	--	--	--	--	280	.38	5,910	32	1.2	427	7.9
Oct. 28-29	1,920	--	3.09	1.69	1.61	--	3.02	--	--	--	--	--	389	.53	1,020	25	1.0	574	7.4
Nov. 21-30	5,600	--	2.45	.75	1.52	--	2.54	--	--	--	--	--	300	.41	2,300	32	1.2	457	7.9
Dec. 1-31	13,540	--	2.54	.70	1.61	--	2.56	--	--	--	--	--	306	.42	5,690	33	1.3	464	8.2
Jan. 1-11, 1959	3,570	28	3.04	.88	2.00	.08	2.97	2.73	.24	.04	.01	.07	376	.51	1,820	33	1.4	552	8.1
Jan. 12-31	7,400	--	2.74	.70	1.70	--	2.62	--	--	--	--	--	323	.44	3,260	33	1.3	487	8.2
Feb. 1-28	14,500	--	2.59	.81	1.74	--	2.43	--	--	--	--	--	325	.44	6,380	34	1.3	487	7.9
Mar. 1-20	10,880	--	2.79	.89	1.74	--	2.51	--	--	--	--	--	331	.45	4,900	32	1.3	509	7.8
Mar. 21-31	7,100	--	2.50	.64	1.35	--	2.25	--	--	--	--	--	273	.37	2,630	30	1.1	427	7.7
Apr. 1-4	3,290	--	2.45	.67	1.17	--	2.23	--	--	--	--	--	275	.37	1,220	27	.9	415	7.6
Apr. 5-8, 26-30	15,900	--	1.70	.42	.74	--	1.66	--	--	--	--	--	194	.26	4,130	26	.7	288	7.7
Apr. 9-25	17,760	20	2.05	.53	1.00	.06	1.90	1.60	.12	.02	.01	.02	237	.32	5,680	27	.9	354	7.7
May 1-13, 23-28	42,730	--	1.40	.28	.52	--	1.38	--	--	--	--	--	154	.21	8,970	24	.6	224	7.5
May 14-22, 29-31	44,300	--	1.10	.16	.34	--	1.13	--	--	--	--	--	121	.16	7,090	21	.4	168	7.3

SAN JUAN RIVER BASIN--Continued

9-3555. SAN JUAN RIVER NEAR ARCHULETA, N. MEX.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
June 1-19, 1959 .	63,670	--	1.00	0.24	0.37	--	1.10	--	--	--	--	--	99	0.13	8,280	23	0.5	159	7.1
June 20.....	2,460	--	1.95	.17	1.04	--	2.02	--	--	--	--	--	212	.29	713	33	1.0	310	8.1
June 21-22, 24-30	15,410	--	1.50	.32	.61	--	1.67	--	--	--	--	--	160	.22	3,390	25	.6	241	7.1
June 23.....	2,220	--	2.94	.50	1.44	--	3.41	--	--	--	--	--	287	.39	866	30	1.1	455	7.5
July 1-17.....	10,970	--	1.90	.46	.96	--	2.15	--	--	--	--	--	214	.29	3,180	29	.9	329	7.4
July 18-31.....	6,540	29	2.15	.63	1.35	0.10	2.57	1.48	0.15	0.03	0.01	0.08	278	.38	2,490	32	1.1	400	7.9
Aug. 1-10.....	12,550	--	2.50	.58	1.17	--	2.70	--	--	--	--	--	282	.38	4,770	28	.9	417	7.7
Aug. 11-19, 22-31	19,740	--	1.90	.48	.87	--	2.15	--	--	--	--	--	214	.29	5,720	27	.8	323	7.5
Aug. 20-21.....	2,120	--	2.69	.65	1.70	--	3.08	--	--	--	--	--	308	.42	890	34	1.3	478	7.3
Sept. 1-10.....	5,270	--	1.90	.56	1.13	--	2.20	--	--	--	--	--	230	.31	1,630	31	1.0	354	7.6
Sept. 11-30.....	10,220	--	2.15	.63	1.39	--	2.39	--	--	--	--	--	260	.35	3,580	33	1.2	414	7.7
Total or weighted average	374,500	--	1.80	0.44	0.91	--	1.84	--	--	---	--	--	203	0.28	104,900	29	0.9	306	--

9-3795. SAN JUAN RIVER NEAR BLUFF, UTAH

LOCATION.--At bridge on State Highway 47, 1,800 feet downstream from gaging station, and 20 miles southwest of Bluff, San Juan County.
DRAINAGE AREA.--23,000 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: February to June 1927, October 1929 to September 1959.
Water temperatures: May 1944 to September 1959.
Sediment records: August to September 1928, July 1929 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,790 micromhos Sept. 19; minimum daily, 373 micromhos June 11.
Percent sodium: Maximum, 46 July 12-31; minimum, 26 June 1-21.
EXTREMES, 1929-59.--Specific conductance (1941-59): Maximum daily, 2,790 micromhos Sept. 19, 1959; minimum daily, 208 micromhos June 17, 1952.
Percent sodium: Maximum, 58 Sept. 10, 1954; minimum, 11 May 21, 23-27, 29-31, July 1-10, 1944.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-20, 1958 .	29,540	6.5	4.48	2.32	3.70	0.09	2.56	7.29	0.82		0.09	0.10	694	0.94	27,770	35	2.0	987	8.1
Oct. 21-31.....	17,550	9.1	5.76	2.44	5.26	.12	3.02	9.45	.99		.12	.12	883	1.20	21,060	39	2.6	1,230	8.1
Nov. 1-30	43,130	8.0	5.76	3.08	4.61	.11	2.95	9.60	1.04		.13	.08	905	1.23	53,050	34	2.2	1,230	7.9
Dec. 1-31	36,030	7.3	5.84	3.32	5.05	.11	2.85	10.10	1.10		.14	.10	949	1.29	46,480	35	2.4	1,280	8.0
Jan. 1-31, 1959 .	30,420	8.2	6.48	3.40	5.31	.11	3.28	10.87	1.24		.15	.08	1,020	1.39	42,280	35	2.4	1,370	8.1
Feb. 1-28	31,090	6.8	6.36	3.40	5.18	.11	2.88	10.81	1.07		.11	.12	999	1.36	42,280	34	2.3	1,340	7.7
Mar. 1-31	32,330	5.2	5.88	3.12	4.83	.12	2.67	10.39	.99		.11	.12	933	1.27	41,060	35	2.3	1,230	7.8
Apr. 1-30.....	38,620	8.7	4.52	2.20	3.96	.12	2.31	7.39	.90		.10	.09	691	.94	36,300	37	2.2	985	7.6
May 1-17	47,130	15	3.36	1.10	2.09	.07	2.20	3.91	.45		.08	.04	438	.60	28,280	32	1.4	633	8.0
May 18-31	63,410	13	2.88	.80	1.44	.06	2.00	2.87	.34		.06	.01	338	.46	29,170	28	1.1	507	8.0
June 1-21	124,700	9.4	2.42	.58	1.09	.05	1.69	2.14	.27		.04	.05	264	.36	44,890	26	.9	421	7.8
June 22-30.....	30,760	10	3.16	.88	1.78	.06	1.97	3.56	.42		.06	.05	378	.51	15,690	30	1.3	582	7.9

SAN JUAN RIVER BASIN--Continued

9-3795. SAN JUAN RIVER NEAR BLUFF, UTAH--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
July 1-11, 1959 .	14,410	7.5	3.44	1.20	2.91	0.08	1.90	5.00	0.73		0.04	0.12	498	0.68	9,800	38	1.9	756	7.8
July 12-31	4,000	7.3	5.20	2.20	6.52	.14	2.41	10.10	1.58		.10	.08	931	1.27	5,080	46	3.4	1,330	7.9
Aug. 1, 5, 11-31	45,620	13	5.30	1.34	3.87	.15	3.57	6.45	.73		.04	.13	697	.95	43,300	36	2.1	1,000	7.7
Aug. 2-4, 6-10..	18,460	17	7.30	2.40	7.96	.18	5.29	11.47	1.24		.01	.24	1,170	1.59	29,350	45	3.6	1,610	7.8
Sept. 1-9	5,730	13	4.68	1.64	4.26	.13	2.43	7.31	.96		.18	.11	712	.97	5,560	40	2.4	1,010	8.2
Sept. 10-18	1,780	8.9	6.40	3.28	7.35	.15	.92	14.55	1.64		.27	.16	1,200	1.63	2,900	43	3.3	1,580	7.2
Sept. 19-30	3,350	6.7	10.60	5.40	9.57	.18	2.69	20.82	2.03		.32	.21	1,780	2.42	8,110	37	3.4	2,150	8.0
Total or weighted average	618,100	9.9	4.39	1.81	3.31	0.09	2.51	6.39	0.70		0.08	0.08	633	0.86	531,600	34	1.9	891	--

9-4150. VIRGIN RIVER AT LITTLEFIELD, ARIZ.

LOCATION.--At gaging station, three-eighths of a mile downstream from Beaverdam Wash, three-eighths of a mile upstream from Littlefield, Mohave County, and 36 miles upstream from water line of Lake Mead at elevation 1,221 feet above mean sea level.
DRAINAGE AREA.--5,090 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: July 1949 to September 1959.
Water temperatures: October 1947 to September 1959.
Sediment records: October 1947 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 3,720 micromhos Aug. 9; minimum daily, 1,820 micromhos Feb. 12.
Percent sodium: Maximum, 36 Nov. 1-30; minimum, 26 Aug. 1-31.
EXTREMES, 1949-59.--Specific conductance: Maximum daily, 4,090 micromhos Oct. 5, 1955; minimum daily, 734 micromhos Apr. 28, 1952.
Percent sodium (1953-59): Maximum, 37 Feb. 24-25, 27-28, 1958; minimum, 8 May 12, 1958.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	7,560	25	15.70	8.20	12.27	0.64	3.67	22.69	10.58		0.03	0.90	2,320	3.16	23,890	33	3.5	3,120	7.9
Nov. 1-30	10,770	22	12.80	6.50	11.05	.56	4.49	17.11	9.45		.03	.67	1,930	2.62	28,220	36	3.6	2,710	7.9
Dec. 1-31	9,710	20	13.20	6.90	11.14	.56	5.02	17.38	9.16		.05	.74	1,960	2.67	25,930	35	3.5	2,780	7.7
Jan. 1-31, 1959	10,430	21	12.80	6.70	10.70	.56	4.77	16.66	9.16		.05	.71	1,900	2.58	26,910	35	3.4	2 700	7.7
Feb. 1-28	13,410	18	11.30	6.30	9.22	.49	4.92	14.34	8.32		.05	.66	1,690	2.30	30,840	34	3.1	2,440	7.8
Mar. 1-31	9,160	19	13.30	7.00	10.79	.51	5.18	17.24	9.31		.04	.76	1,960	2.67	24,460	34	3.4	2,750	7.8
Apr. 1-30	4,400	33	14.10	8.90	11.70	.67	a3.00	21.86	10.58		.04	1.1	2,240	3.05	13,420	33	3.5	3,100	8.3
May 1	129	33	17.60	9.80	11.70	.74	5.18	24.36	11.00		.02	1.0	2,520	3.43	442	29	3.2	3,400	8.1
May 2-31	3,960	29	13.70	9.30	11.27	.74	1.23	23.73	10.43		.02	.98	2,250	3.06	12,120	32	3.3	3,050	7.4
June 1-30	3,630	26	16.00	9.50	11.44	.69	4.03	23.53	10.58		.02	1.0	2,380	3.24	11,760	30	3.2	3,240	8.1
July 1-31	3,840	18	17.90	9.20	11.22	.69	5.21	23.94	10.15		.02	.93	2,440	3.32	12,750	29	3.0	3,330	7.9
Aug. 1-31	11,830	19	20.60	7.70	9.92	.64	5.10	24.98	9.16		.02	.78	2,460	3.35	39,630	26	2.6	3,180	7.6
Sept. 1-30	4,030	19	17.00	9.00	10.96	.67	4.98	22.90	9.87		.02	.88	2,350	3.20	12,900	29	3.0	3,150	8.1
Total or weighted average	92,860	21	14.52	7.48	10.74	0.59	4.54	19.47	9.45		0.04	0.79	2,080	2.83	262,800	32	3.2	2,870	--

a Includes 0.13 equivalent per million of carbonate (CO_3).

GILA RIVER BASIN

9-4740. GILA RIVER AT KELVIN, ARIZ.

LOCATION.--Just above mouth of Mineral Creek, 1,200 feet upstream from gaging station at Kelvin, Pinal County, 17 miles downstream from San Pedro River, and 19½ miles upstream from Ashurst-Hayden Dam.
DRAINAGE AREA.--18,011 square miles, (at gaging station) of which 5,125 square miles is below Coolidge Dam.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1959.
Water temperatures: December 1950 to September 1959.
Sediment records: January 1958 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 2,880 micromhos July 16; minimum daily, 599 micromhos Sept. 17.
Percent sodium: Maximum, 60 July 1-13; minimum, 14 Aug. 12, 14.
EXTREMES, 1950-59.--Specific conductance: Maximum daily, 3,860 micromhos July 15, 1955; minimum daily, 407 micromhos Jan. 20, 1952.
Percent sodium: Maximum, 67 July 15, 1955; minimum, 9 July 11-18, Sept. 10-30, 1956.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1633. No appreciable inflow from Mineral Creek between sampling point and gaging station, except during periods of heavy local rains.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-2, 26-31, 1958	1,950	38	5.29	1.67	4.70	0.19	3.44	5.04	3.33	0.06	0.04	0.14	810	1.10	2,140	40	2.5	1,130	7.7
Oct. 3-4, 8-10, 23-25	1,370	--	7.48	1.96	5.57	--	3.74	--	--	--	--	--	1,040	1.41	1,930	37	2.6	1,410	7.7
Oct. 5-6	1,860	--	3.69	.91	3.00	--	3.31	--	--	--	--	--	550	.75	1,400	39	2.0	765	7.9
Oct. 7	381	--	5.39	1.25	3.31	--	3.18	--	--	--	--	--	720	.98	373	33	1.8	958	7.7
Oct. 11-22	1,460	--	9.68	2.76	5.39	--	3.38	--	--	--	--	--	1,280	1.74	2,540	30	2.2	1,680	7.6
Nov. 1-20	4,650	--	5.89	1.43	5.31	--	3.29	--	--	--	--	--	828	1.13	5,250	42	2.8	1,240	7.8
Nov. 21-30	1,480	--	7.29	2.03	6.00	--	3.69	--	--	--	--	--	1,020	1.39	2,060	39	2.8	1,450	7.7
Dec. 1-3	480	--	8.38	2.26	6.18	--	3.06	--	--	--	--	--	1,140	1.55	744	37	2.7	1,590	7.5
Dec. 4-Jan. 1, 1959	13,670	--	5.14	1.62	5.66	--	3.08	--	--	--	--	--	804	1.09	14,900	46	3.1	1,250	7.6
Jan. 2-10	859	--	10.78	4.06	7.40	--	3.92	--	--	--	--	--	1,500	2.04	1,750	33	2.7	1,960	7.6
Jan. 11-28	1,050	31	15.87	3.85	8.44	.38	3.28	20.05	4.96	.07	.02	.25	1,950	2.65	2,780	30	2.7	2,380	7.5
Jan. 29-Feb. 28	10,670	--	5.99	1.89	6.61	--	3.26	--	--	--	--	--	958	1.30	13,870	46	3.3	1,430	7.7

Mar. 1-31, 1959..	25,020	--	4.24	1.64	6.92	--	3.51	--	--	--	--	--	808	1.10	27,520	54	4.0	1,310	7.7
Apr. 1-30.....	22,140	33	4.99	1.77	8.09	0.19	3.46	4.02	7.44	0.06	0.01	0.17	912	1.24	27,450	54	4.4	1,500	7.7
May 1-31	13,870	--	5.44	2.00	8.83	--	3.56	--	--	--	--	--	1,030	1.40	19,420	54	4.6	1,650	7.8
June 1-30.....	20,480	--	4.99	2.05	9.61	--	3.54	--	--	--	--	--	1,030	1.40	28,670	58	5.1	1,700	7.7
July 1-13	9,060	--	4.74	2.54	10.70	--	4.13	--	--	--	--	--	1,110	1.51	13,680	60	5.6	1,820	7.9
July 14-15	99	--	14.72	4.32	13.70	--	2.49	--	--	--	--	--	2,070	2.82	279	42	4.4	2,650	8.0
July 16-18	1,450	--	7.73	2.43	3.22	--	9.77	--	--	--	--	--	766	1.04	1,510	24	1.4	1,160	8.1
July 19-21	633	--	10.23	2.77	4.13	--	8.13	--	--	--	--	--	1,060	1.44	912	24	1.6	1,520	7.6
July 22-23	884	--	6.59	2.17	4.31	--	6.82	--	--	--	--	--	794	1.08	955	33	2.1	1,220	7.9
July 24-26	954	--	12.72	2.78	7.18	--	4.43	--	--	--	--	--	1,560	2.12	2,020	32	2.6	2,040	7.9
July 27-31	11,830	34	5.39	1.49	2.83	.15	6.13	3.06	.62	.05	.05	.18	609	.83	9,820	29	1.5	896	8.0
Aug. 1.....	333	--	6.99	2.21	3.35	--	5.31	--	--	--	--	--	888	1.21	403	27	1.6	1,120	7.8
Aug. 2-3, 6	1,270	--	12.97	2.87	3.04	--	4.49	--	--	--	--	--	1,220	1.66	2,110	16	1.1	1,560	7.7
Aug. 4-5	2,530	--	5.74	1.70	2.31	--	6.92	--	--	--	--	--	658	.89	2,250	24	1.2	868	7.8
Aug. 7.....	1,890	--	4.49	1.41	2.04	--	7.51	--	--	--	--	--	516	.70	1,320	26	1.2	713	7.6
Aug. 8-11.....	1,030	--	7.14	1.98	3.39	--	5.05	--	--	--	--	--	845	1.15	1,180	27	1.6	1,130	7.8
Aug. 12	228	--	13.72	3.28	2.87	--	4.23	--	--	--	--	--	1,430	1.94	442	14	1.0	1,630	7.4
Aug. 13, 15-16...	4,100	--	5.24	1.44	1.96	--	6.23	--	--	--	--	--	549	.75	3,080	23	1.1	779	7.6
Aug. 14	1,360	--	9.73	1.97	1.91	--	5.59	--	--	--	--	--	946	1.29	1,750	14	.8	1,170	7.5
Aug. 17-18.....	4,240	--	4.59	1.17	1.57	--	5.39	--	--	--	--	--	442	.60	2,540	21	.9	672	7.8
Aug. 19-20.....	1,990	--	5.04	1.44	2.04	--	7.16	--	--	--	--	--	529	.72	1,430	24	1.1	765	7.6
Aug. 21-22	377	--	6.99	1.85	4.18	--	4.08	--	--	--	--	--	890	1.21	456	32	2.0	1,200	7.8
Aug. 23-31.....	5,530	--	4.49	1.11	3.57	--	4.77	--	--	--	--	--	602	.82	4,530	39	2.1	887	7.9
Sept. 1-30	16,090	35	2.69	.71	3.13	.15	3.18	1.52	1.86	.06	.05	.13	447	.61	9,810	47	2.4	661	7.9
Total or weighted average.....	187,300	--	5.19	1.73	6.22	--	4.02	--	--	--	--	--	838	1.14	213,500	47	3.3	1,300	--

708-297 O-63-9

GILA RIVER BASIN--Continued

9-5195. GILA RIVER BELOW GILLESPIE DAM, ARIZ.

LOCATION.--About 1 mile below gaging station on Gila Bend Canal which is 200 feet below Gillespie Dam, Maricopa County, and 8 miles downstream from Hassayampa River. Gila Bend Canal diverts from left bank and Enterprise Canal diverts from right bank at Gillespie Dam.
DRAINAGE AREA.--49,620 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1959.
Water temperatures: December 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 9,760 micromhos Dec. 14; minimum daily, 765 micromhos Aug. 22.
Percent sodium: Maximum, 69 July 1-11, 13-14, 21-31; minimum, 52 Aug. 1-3, 9-10, 17-20.
EXTREMES, 1950-59.--Specific conductance: Maximum daily, 10,200 micromhos Oct. 3, 1951; minimum daily, 370 micromhos Aug. 2, 1955.
Percent sodium: Maximum, 77 Nov. 5-7, 1957; minimum, 36 Jan. 23-24, 1952.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Samples from canal are believed to be representative of total flow passing Gillespie Dam including spill and amounts diverted into Gila Bend and Enterprise Canals. Records of separate and combined discharge for the river and canals for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	944	35	18.91	14.15	66.12	0.28	5.29	32.27	62.32	0.15	0.77	3.5	6,300	8.57	8,090	66	16	8,970	7.8
Nov. 1-30	958	--	20.51	14.56	68.73	--	5.80	--	--	--	--	--	6,590	8.96	8,580	66	16	9,370	7.7
Dec. 1-31	1,040	--	21.11	14.15	67.86	--	6.00	--	--	--	--	--	6,650	9.04	9,400	66	16	9,440	7.7
Jan. 1-31, 1959	1,190	42	21.36	14.44	68.73	.31	6.00	32.69	65.14	.14	.90	3.5	6,550	8.91	10,600	66	16	9,290	7.7
Feb. 1-28	1,380	--	20.36	14.44	67.42	--	5.57	--	--	--	--	--	6,410	8.72	12,030	66	16	9,110	7.7
Mar. 1-31	1,210	--	20.71	14.29	68.30	--	5.54	--	--	--	--	--	6,540	8.89	10,760	66	16	9,260	7.7
Apr. 1-30	1,070	41	20.21	13.59	66.99	.31	5.70	31.85	62.89	.14	.79	3.7	6,380	8.68	9,290	66	16	9,040	7.7
May 1-31	839	--	18.96	13.84	67.42	--	4.87	--	--	--	--	--	6,350	8.64	7,250	67	17	9,040	7.8
June 1-30	523	--	18.46	12.74	65.68	--	4.34	--	--	--	--	--	6,030	8.20	4,290	68	17	8,860	7.6
July 1-11, 13-14, 21-31	318	29	16.57	12.23	63.51	.31	3.64	29.36	58.09	.15	.35	3.3	5,840	7.60	2,420	69	17	8,480	7.7
July 12, 15-20	136	--	13.37	8.83	46.54	--	4.03	--	--	--	--	--	4,310	5.86	797	68	14	6,490	7.7
Aug. 1-3, 9-10, 17-20	2,210	--	5.34	1.70	7.48	--	3.87	--	--	--	--	--	940	1.28	2,830	52	4.0	1,440	7.8

Aug. 4, 7, 1959 ..	410	--	10.23	5.67	31.67	--	5.20		--	--	--	--	2,980	4.05	1,660	67	11	4,530	7.8
Aug. 5-6, 14-15, 21, 26.....	2,400	--	3.54	1.06	7.35	--	4.93	--	--	--	--	--	720	.98	2,350	62	4.8	1,180	8.0
Aug. 8, 11-13....	1,170	--	7.88	4.32	23.88	--	3.77	--	--	--	--	--	2,260	3.10	3,630	66	9.7	3,550	8.1
Aug. 16, 22.....	1,690	--	2.50	.62	4.65	--	3.70	--	--	--	--	--	503	.68	1,150	60	3.7	786	7.9
Aug. 23-25	337	--	12.87	8.13	36.98	--	5.08	--	--	--	--	--	3,580	4.87	1,640	64	11	5,360	7.8
Aug. 27-31	151	--	18.56	16.24	65.68	--	6.20	--	--	--	--	--	6,260	8.51	1,290	65	16	9,000	7.8
Sept. 1-30	711	--	19.31	13.99	67.86	--	4.82	--	--	--	--	--	6,290	8.55	6,080	67	17	9,120	7.7
Total or weighted average.....	18,690	--	13.42	8.80	42.76	--	4.92	--	--	--	--	--	4,100	5.58	104,300	66	13	5,920	--

9-5020. SALT RIVER BELOW STEWART MOUNTAIN DAM, ARIZ.

LOCATION.--Just below dam, 3½ miles above gaging station below Stewart Mountain Dam and 6 miles upstream from Verde River, Maricopa County.
DRAINAGE AREA.--6,211 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1959.
Water temperatures: December 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 1,280 micromhos Apr. 6; minimum daily, 964 micromhos June 6.
Percent sodium: Maximum, 71 May 1 to June 5; minimum, 67 Oct. 2 to Dec. 10, June 6-30, July 1-31, Sept. 1-30.
EXTREMES, 1950-59.--Specific conductance: Maximum daily, 2,490 micromhos Aug. 20, 1951; minimum daily, 620 micromhos Mar. 28, 1953.
Percent sodium: Maximum, 76 July 21-31, Aug. 11-26, 1951; minimum, 53 Mar. 21-31, Apr. 11-30, 1953.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1633. No inflow between sampling point and gaging station except during periods of heavy local rains. No flow Dec. 11 to Feb. 8, Feb. 17-25.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1, 1958 ...	730	--	2.15	0.90	6.96	--	2.39	--	--	--	--	--	600	0.82	599	70	5.6	1,040	7.7
Oct. 2-Dec. 10..	3,200	21	2.20	.88	6.44	0.12	2.36	0.85	6.37	0.02	0.01	0.13	599	.81	2,590	67	5.2	1,030	7.5
Feb. 9-16, 26-Mar. 31, 1959 .	81,200	--	2.40	1.02	7.83	--	2.67	--	--	--	--	--	658	.89	72,270	70	6.0	1,190	7.7
Apr. 1-30	42,160	17	2.50	1.06	8.35	.14	2.93	1.04	7.84	.02	.00	.15	697	.95	40,050	69	6.3	1,260	7.7
May 1-15	16,490	--	2.40	.98	8.18	--	2.82	--	--	--	--	--	669	.91	15,010	71	6.3	1,210	7.9
May 16-June 5 ..	39,360	--	2.20	.96	7.83	--	2.82	--	--	--	--	--	642	.87	34,240	71	6.2	1,160	7.7
June 6-30.....	61,350	--	2.20	.92	6.44	--	2.51	--	--	--	--	--	564	.77	47,240	67	5.2	1,010	7.8
July 1-31.....	87,690	21	2.20	.88	6.57	.13	2.59	.83	6.20	.02	.01	.12	580	.79	69,280	67	5.3	1,040	7.7
Aug. 1-31	54,640	--	2.20	1.00	6.66	--	2.61	--	--	--	--	--	590	.80	43,710	68	5.3	1,070	7.8
Sept. 1-30	64,540	--	2.25	1.01	6.74	--	2.67	--	--	--	--	--	603	.82	52,920	67	5.3	1,090	7.7
Total or weighted average.....	451,400	--	2.30	0.99	7.13	--	2.67	--	--	--	--	--	616	0.84	379,200	68	5.6	1,110	--

9-5100. VERDE RIVER BELOW BARTLETT DAM, ARIZ.

LOCATION.--At gaging station, 2¼ miles downstream from Bartlett Dam, Maricopa County, and 3½ miles upstream from Camp Creek.
DRAINAGE AREA.--6,188 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1959.
Water temperatures: December 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 647 micromhos July 26; minimum daily, 427 micromhos Aug. 20.
Percent sodium: Maximum, 30 Aug. 1-7; minimum, 22 Jan. 1-31.
EXTREMES, 1950-59.--Specific conductance: Maximum daily, 958 micromhos Nov. 10, 1956; minimum daily, 234 micromhos Jan. 13, 15, 1952.
Percent sodium: Maximum, 31 July 21-31, 1951, Nov. 1-20, 1953; minimum, 12 Jan. 4-20, 1952.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1958 to September 1959 given in WSP 1633.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	20,420	22	2.15	1.81	1.22	0.09	3.70	1.08	0.51	0.02	0.01	0.14	342	0.47	9,600	23	0.9	488	8.1
Nov. 1-30	9,780	--	2.25	2.06	1.35	--	4.03	--	--	--	--	--	331	.45	4,400	24	.9	539	8.2
Dec. 1-31	14,020	--	2.40	2.14	1.39	--	4.28	--	--	--	--	--	345	.47	6,590	23	.9	559	8.2
Jan. 1-31, 1959	10,560	23	2.45	2.22	1.35	.08	4.36	1.21	.59	.02	.02	.13	353	.48	5,070	22	.9	567	8.2
Feb. 1-28	4,250	--	2.40	2.36	1.48	--	4.43	--	--	--	--	--	353	.48	2,040	24	1.0	571	8.0
Mar. 1-31	25,700	--	2.35	2.29	1.44	--	4.28	--	--	--	--	--	348	.47	12,080	24	.9	558	7.9
Apr. 1-30	26,990	23	2.25	2.37	1.44	.09	4.25	1.19	.62	.02	.01	.15	343	.47	12,690	23	.9	552	8.2
May 1-31	13,850	--	2.30	2.50	1.44	--	4.34	--	--	--	--	--	348	.47	6,510	23	.9	557	8.0
June 1-30	41,100	--	2.20	2.36	1.48	--	4.31	--	--	--	--	--	340	.46	18,910	25	1.0	551	8.1
July 1-7	8,980	--	1.80	2.60	1.65	--	a3.90	--	--	--	--	--	322	.44	3,950	27	1.1	540	8.3
July 8-31	32,060	29	2.00	2.92	1.87	.10	4.41	1.54	.73	.03	.02	.22	384	.52	16,670	27	1.2	622	8.0
Aug. 1-7	3,510	--	2.30	2.54	2.04	--	4.36	--	--	--	--	--	404	.55	1,930	30	1.3	634	8.0
Aug. 8-19	4,870	--	2.20	1.84	1.39	--	3.67	--	--	--	--	--	319	.43	2,090	26	1.0	514	7.8
Aug. 20-27, 31	5,380	--	1.90	1.48	1.13	--	3.18	--	--	--	--	--	268	.36	1,940	25	.9	431	8.0
Aug. 28-30	2,640	--	2.45	2.05	1.52	--	4.43	--	--	--	--	--	338	.46	1,210	25	1.0	554	8.1
Sept. 1-30	22,810	--	1.90	1.90	1.39	--	3.52	--	--	--	--	--	306	.42	9,580	27	1.0	495	8.0
Total or weighted average	246,900	--	2.20	2.30	1.48	--	4.13	--	--	--	--	--	343	0.47	116,000	25	1.0	549	--

a Includes 0.10 equivalent per million of carbonate (CO_3).

PART 10. THE GREAT BASIN

SEVIER LAKE BASIN

10-2240. SEVIER RIVER NEAR LYNNDYL, UTAH

LOCATION.--At bridge on State Highway 125, 1½ miles upstream from gaging station, and 3½ miles southwest of Lynndyl, Millard County.
DRAINAGE AREA.--6,270 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1959.
Water temperatures: March 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 4,040 micromhos Jan. 3; minimum daily, 1,120 micromhos Sept. 16-17.
Percent sodium: Maximum, 58 Sept. 1-13, 19-20; minimum, 38 Sept. 14-18.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 7,040 micromhos Jan. 21, 1955; minimum daily, 855 micromhos Mar. 11, 1955.
Percent sodium: Maximum, 61 Sept. 11-20, 1955; minimum, 34 Apr. 17-20, 1956.
REMARKS.--Values reported for dissolved solids are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1634.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	2,640	14	3.64	6.36	8.61	0.14	4.85	5.54	8.60		0.05	0.22	1,090	1.48	3,910	46	3.9	1,830	8.0
Nov. 1-2	180	14	3.96	6.32	8.70	.12	5.00	5.41	8.46		.02	.19	1,090	1.48	266	46	3.8	1,840	8.0
Nov. 3-30	4,810	19	6.10	9.50	18.01	.16	6.08	11.06	16,78		.01	.43	1,990	2.71	13,040	53	6.4	3,200	8.2
Dec. 1-31	948	19	6.60	9.90	20.27	.17	6.28	11.85	18.33		.03	.45	2,150	2.92	2,770	55	7.1	3,430	8.1
Jan. 1-31, 1959	889	22	7.10	10.50	20.62	.17	6.72	12.60	18.89		.04	.49	2,250	3.06	2,720	54	7.0	3,620	7.9
Feb. 1-19	541	19	7.20	10.30	20.62	.17	6.33	12.49	18.89		.05	.49	2,230	3.03	1,640	54	7.0	3,590	7.9
Feb. 20-28	770	14	4.88	7.68	10.31	.13	5.31	7.45	10.29		.03	.26	1,330	1.81	1,390	45	4.1	2,180	8.1
Mar. 1-31	2,240	16	4.72	7.24	10.83	.15	5.33	7.12	10.58		.01	.29	1,330	1.81	4,050	47	4.4	2,220	8.0
Apr. 1-5	300	18	5.28	8.44	15.09	.18	5.44	9.16	14.24		.01	.37	1,690	2.30	690	52	5.8	2,720	7.9
Apr. 6-30	17,320	23	4.16	6.16	11.48	.15	5.31	7.08	9.87		.08	.34	1,310	1.78	30,830	52	5.1	2,110	8.0
May 1-31	29,730	25	4.40	6.10	12.70	.15	5.20	7.60	10.21		.10	.37	1,370	1.86	55,300	54	5.5	2,240	8.0
June 1-30	25,130	20	4.20	6.30	13.05	.16	5.02	7.75	10.43		.10	.37	1,390	1.89	47,500	55	5.7	2,280	8.0

July 1-31, 1959 .	20,180	20	3.90	7.00	14.44	0.18	4.84	8.37	12.07		0.08	0.42	1,500	2.04	41,170	57	6.2	2,450	8.0
Aug. 1-31.....	16,120	19	3.32	7.20	14.14	.18	4.75	8.27	12.13		.04	.45	1,480	2.01	32,400	57	6.2	2,460	7.9
Sept. 1-13, 19-20	3,490	18	3.52	7.88	16.23	.18	4.79	9.06	13.54		.03	.45	1,630	2.22	7,750	58	6.8	2,690	7.9
Sept. 14-18	605	13	2.52	4.56	4.44	.08	4.52	2.46	4.51		.03	.15	640	.87	526	38	2.4	1,130	7.9
Sept. 21-30	895	13	3.04	6.04	9.22	.12	4.52	5.29	8.46		.01	.23	1,050	1.43	1,280	50	4.3	1,780	8.1
Total or weighted average.....	126,800	21	4.19	6.74	13.31	0.16	5.10	7.93	11.20		.08	0.38	1,430	1.94	246,000	55	5.7	2,350	--

PART 11. PACIFIC SLOPE BASINS IN CALIFORNIA

SAN JOAQUIN RIVER BASIN

11-3035. SAN JOAQUIN RIVER NEAR VERNALIS, CALIF.

LOCATION.--At gaging station at Durham Ferry highway bridge, 3 miles downstream from Stanislaus River, and 3.4 miles northwest of Vernalis, San Joaquin County.
DRAINAGE AREA.---4,010 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1959.
Water temperatures: March 1951 to September 1959.
EXTREMES,1951-58.--Specific conductance: Maximum daily, 1,150 micromhos Nov. 14, 1955; minimum daily, 60 micromhos June 21, 1953.
Percent sodium: Maximum, 56 Jan. 21-31, 1954; minimum, 27 Dec. 24-28, 1955.
REMARKS.--Values reported for dissolved solids are residues at 180 C. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1958 to September 1959 given in WSP 1635.

Chemical analyses, December 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Dec. 1-17, 1958.	118,800	25	0.85	0.67	1.57	0.05	1.05	0.56	1.41	0.01	0.04	0.1	201	0.27	32,080	50	1.8	322	7.1
Dec. 18-Jan. 2, 1959.....	71,780	29	1.30	.98	2.31	.07	1.54	.87	2.26	.01	.04	.1	306	.40	28,710	50	2.2	495	7.1
Jan. 3-9.....	26,380	33	1.70	1.10	3.52	.10	2.13	1.00	3.21	.01	.05	.1	412	.54	14,250	55	3.0	692	7.2
Jan. 10-18	45,500	28	1.35	1.17	2.65	.11	1.82	.62	2.82	.01	.06	.2	328	.44	20,020	50	2.4	539	7.0
Jan. 19-31	62,600	30	1.60	1.22	3.22	.10	2.13	1.17	2.71	.01	.07	.2	397	.51	31,930	52	2.7	644	7.2
Feb. 1-10	39,590	32	1.85	1.45	4.00	.09	2.16	1.58	3.44	.01	.06	.2	457	.61	24,150	54	3.1	759	7.3
Feb. 11-19	56,190	27	1.35	1.15	2.57	.09	1.74	1.02	2.34	.01	.06	.2	331	.43	24,160	50	2.3	534	7.1
Feb. 20-23	41,610	24	1.00	.76	1.70	.09	1.36	.86	1.30	.01	.05	.0	233	.31	12,900	48	1.8	357	6.9
Feb. 24-Mar. 6 .	88,700	27	1.15	.97	2.18	.07	1.61	.98	1.75	.01	.04	.2	289	.37	32,820	50	2.1	453	7.2
Mar. 7-16	48,650	29	1.60	1.24	3.13	.10	1.90	1.46	2.79	.01	.04	.2	383	.52	25,300	52	2.6	641	7.8
Mar. 17-31	33,960	30	2.30	1.98	4.13	.10	2.59	1.18	4.68	.02	.09	.2	530	.72	24,450	49	2.8	902	7.8
Apr. 1-15.....	23,230	35	2.59	1.97	5.09	.12	2.82	2.35	4.82	.01	.06	.2	615	.84	19,510	52	3.4	938	7.9
Apr. 16-29	22,660	35	2.64	1.88	5.48	.16	2.85	2.35	4.91	.01	.05	.2	620	.84	19,030	54	3.7	966	7.2
Apr. 30-May 4 ..	11,110	31	2.00	1.56	3.87	.14	2.64	1.06	3.95	.01	.06	.2	455	.62	6,890	51	2.9	727	8.0

May 5-13, 1959..	15,060	33	2.54	2.02	5.09	0.15	2.93	1.06	5.92	0.01	0.05	0.2	581	0.79	11,900	52	3.4	982	7.5
May 14-18	7,220	32	2.79	2.13	5.13	.15	2.98	1.50	5.50	.01	.08	.2	610	.83	5,990	50	3.3	1,020	7.8
May 19-31	17,660	33	2.50	2.06	4.83	.17	2.88	1.58	4.74	.01	.06	.3	560	.76	13,420	51	3.2	931	8.1
June 1-9	11,370	33	2.50	2.26	5.61	.18	2.95	2.10	5.30	.01	.05	.2	630	.86	9,780	53	3.6	988	7.5
June 10-30	20,340	36	2.89	1.95	5.87	.19	3.05	1.58	6.06	.01	.04	.3	659	.90	18,310	54	3.8	1,110	7.7
July 1-8	6,470	36	2.89	2.51	6.35	.19	3.15	2.08	6.49	.01	.05	.3	709	.96	6,210	53	3.9	1,130	7.5
July 9-20	7,020	36	3.19	2.53	6.74	.22	3.08	1.73	7.47	.01	.07	.3	748	1.02	7,160	53	4.0	1,260	8.1
July 21-31	5,710	30	2.99	2.25	6.87	.20	2.69	1.39	7.76	.01	.08	.3	707	.96	5,480	56	4.3	1,140	8.2
Aug. 1-19	11,670	42	3.24	2.20	6.09	.20	3.18	1.19	7.61	.01	.03	.4	738	1.00	11,670	52	3.7	1,210	7.3
Aug. 20-31	13,070	38	2.84	2.00	5.22	.16	3.18	1.35	5.92	.01	.03	.2	643	.87	11,370	51	3.4	1,050	7.5
Sept. 1-17	18,540	37	2.94	2.16	5.57	.17	3.34	1.52	6.34	.01	.03	.3	675	.92	17,060	51	3.5	1,120	7.3
Sept. 18-30	28,200	32	1.95	1.35	3.35	.18	2.56	.81	3.36	.01	.06	.1	433	.59	16,640	49	2.6	735	7.1
Total or weighted average[a] ...	853,100	30	1.65	1.32	3.22	0.10	2.00	0.12	3.13	0.01	0.05	0.2	396	0.54	460,700	51	2.6	645	--
Total or weighted average[b] ...	1,244,000	27	1.50	1.15	2.78	0.09	1.84	0.98	2.71	0.01	0.05	0.2	351	0.48	597,100	50	2.4	575	--

a Represents 69 percent of runoff for water year October 1958 to September 1959.
b Includes estimated data for missing period. Represents 100 percent of runoff for water year October 1958 to September 1959.

SACRAMENTO RIVER BASIN

11-3910. SACRAMENTO RIVER AT KNIGHTS LANDING, CALIF.

LOCATION.--At Southern Pacific Railroad bridge at Knights Landing, Yolo County, just downstream from gaging station and about 34 miles upstream from Sacramento.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1959.
Water temperatures: March 1951 to September 1959.
EXTREMES, 1951-57.--Specific conductance: Maximum daily, 447 micromhos Sept. 9, 1952; minimum daily, 83.7 micromhos Dec. 9, 1955.
Percent sodium: Maximum, 46 May 12, 19, 21, 23-29, 1953; minimum, 15 Dec. 21-23, 29, 1952.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1958 to September 1959 given in WSP 1635. Considerable inflow during irrigation season of irrigation waste water from drainage canal about 0.3 mile above sampling site. Mixing not complete at sampling site.

Chemical analyses, December 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Dec. 1, 1958-Jan. 4, 1959 ..	534,900	31	0.70	0.70	0.52	0.03	1.41	0.27	0.25	0.01	0.02	0.0	132	0.18	96,280	27	0.6	184	7.1
Jan. 5-10.....	149,600	22	.60	.56	.48	.04	1.34	.04	.27	.01	.02	.0	123	.17	25,430	29	.6	162	7.0
Jan. 11-16.....	306,000	20	.47	.41	.22	.03	.72	.23	.12	.00	.04	.1	79	.11	33,660	19	.3	111	7.3
Jan. 17-31.....	562,300	26	.55	.49	.27	.03	1.03	.12	.14	.00	.02	.1	95	.13	73,100	20	.4	131	7.4
Feb. 1-24	862,800	25	.55	.49	.28	.02	1.02	.16	.16	.00	.01	.0	90	.12	103,500	21	.4	134	7.3
Feb. 25-Mar. 3 .	299,500	24	.70	.62	.31	.03	1.28	.18	.16	.00	.01	.0	108	.15	44,920	19	.4	162	7.6
Mar. 4-11	237,000	24	.80	.64	.37	.03	1.38	.25	.22	.00	.01	.1	116	.16	37,920	20	.4	175	8.0
Mar. 12-23	251,800	26	.80	.75	.48	.03	1.51	.35	.27	.00	.01	.1	132	.18	45,320	23	.5	203	7.7
Mar. 24-31	136,400	26	.80	.68	.37	.03	1.48	.20	.20	.00	.01	.1	115	.16	21,820	20	.4	178	7.6
Apr. 1-5	90,860	30	.80	.68	.48	.02	1.54	.25	.22	.00	.01	.0	132	.18	16,350	24	.6	194	7.3
July 1-18	217,100	32	.70	.72	.74	.02	1.64	.31	.25	.01	.00	.1	145	.20	43,420	34	.9	214	8.0
July 19-Aug. 1 ..	200,600	28	.70	.62	.65	.02	1.49	.27	.20	.01	.00	.0	136	.18	36,110	33	.8	193	7.6
Aug. 2-19.....	318,100	29	.70	.54	.65	.02	1.49	.23	.20	.00	.00	.0	119	.16	50,900	34	.8	188	7.8
Aug. 20-31	183,600	28	.80	.76	.87	.03	1.87	.35	.28	.01	.00	.1	151	.21	38,560	35	1.0	244	7.3
Sept. 1-10.....	149,600	30	1.10	1.00	1.09	.05	2.38	.35	.48	.01	.01	.4	184	.25	37,400	34	1.1	300	7.2
Sept. 11-30	335,400	27	.85	.69	.74	.05	1.56	.40	.37	.01	.01	.0	142	.19	63,730	32	.8	218	7.8

COLUMBIA RIVER MAIN STEM

12-3995. COLUMBIA RIVER AT NORTHPORT, WASH.

LOCATION.--At bridge on State Highway 22 at Northport, Stevens County and 12 miles downstream from gaging station at International Boundary.
DRAINAGE AREA.--59,700 square miles, approximately (upstream from gaging station).
RECORDS AVAILABLE.--Chemical analyses: February 1910 to January 1911, November 1951 to September 1959.
Water temperatures: November 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 188 micromhos Mar. 2; minimum daily, 130 micromhos Aug. 18.
REMARKS.--Samples collected at international boundary, 2.2 miles downstream from gaging station February 1910 to January 1911, November 1951 to June 1958. Values reported for dissolved solids less than 1,000 ppm are residues at 180°C and for more than 1,000 ppm are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1958 to September 1959 given in WSP 1636. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-15, 1958	1,557,000		1.05	0.41	0.07	0.03	1.15	0.29	0.00	0.01	0.01	0.00	85	0.12	186,800	4	0.1	144	7.2
Oct. 16-31	1,893,000		--	--	.07	--	1.18	--	--	--	--	--	83	.11	208,200	--	--	145	7.3
Nov. 1-15	1,644,000		--	--	.08	--	1.25	--	--	--	--	--	90	.12	197,300	--	--	157	7.2
Nov. 16-30	1,393,000		--	--	.09	--	1.26	--	--	--	--	--	90	.12	167,200	--	--	157	7.4
Dec. 1-14	1,313,000		--	--	.09	--	1.34	--	--	--	--	--	96	.13	170,700	--	--	164	7.3
Dec. 15-31	1,523,000		--	--	.10	--	1.38	--	--	--	--	--	100	.14	213,200	--	--	169	7.5
Jan. 1-15, 1959	1,346,000		1.20	.50	.09	.03	1.38	.33	.01	.01	.03	.00	101	.14	188,400	5	.1	173	7.2
Jan. 16-31	1,872,000		--	--	.09	--	1.38	--	--	--	--	--	100	.14	262,100	--	--	173	7.2
Feb. 1-16	1,694,000		--	--	.10	--	1.44	--	--	--	--	--	102	.14	237,200	--	--	176	7.4
Feb. 17-28	1,133,000		--	--	.10	--	1.44	--	--	--	--	--	103	.14	158,600	--	--	178	7.3
Mar. 1-16	1,419,000		--	--	.10	--	1.39	--	--	--	--	--	103	.14	198,700	--	--	179	7.2
Mar. 17-31	1,367,000		--	--	.10	--	1.39	--	--	--	--	--	101	.14	191,400	--	--	176	7.3
Apr. 1-15	1,734,000		1.20	.43	.10	.03	1.38	.33	.04	.01	.02	.00	100	.14	242,800	6	.1	171	7.5
Apr. 16-30	2,919,000		--	--	.10	--	1.34	--	--	--	--	--	94	.13	379,500	--	--	164	7.3

COLUMBIA RIVER MAIN STEM--Continued

12-3995. COLUMBIA RIVER AT NORTHPORT, WASH.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
May 1-15, 1959	4,487,000		--	--	0.09	--	1.23	--	--	--	--	--	93	0.13	583,300	--	--	161	7.3
May 16-31	6,990,000		--	--	.08	--	1.25	--	--	--	--	--	88	.12	838,800	--	--	150	7.2
June 1-15	8,944,000		--	--	.08	--	1.21	--	--	--	--	--	81	.11	983,800	--	--	142	7.1
June 16-30	11,020,000		--	--	.08	--	1.21	--	--	--	--	--	79	.11	1,212,000	--	--	141	7.1
July 1-15	8,665,000		1.00	0.29	.07	0.02	1.15	0.20	0.01	0.01	0.01	0.00	76	.10	866,500	5	0.1	137	7.2
July 16-31	7,556,000		--	--	.19	--	1.10	--	--	--	--	--	86	.12	906,700	--	--	132	7.4
Aug. 1-15	4,590,000		--	--	.05	--	1.11	--	--	--	--	--	74	.10	459,000	--	--	138	7.3
Aug. 16-31	3,242,000		--	--	.06	--	1.08	--	--	--	--	--	74	.10	324,200	--	--	136	7.4
Sept. 1-15	2,832,000		--	--	.06	--	1.10	--	--	--	--	--	74	.10	283,200	--	--	136	7.2
Sept. 16-30	3,599,000		--	--	.06	--	1.13	--	--	--	--	--	76	.10	359,900	--	--	137	7.3
Total or weighted average	84,729,000		--	--	0.09	--	1.21	--	--	--	--	--	85	0.12	10,170,000	--	--	148	--

YAKIMA RIVER BASIN

12-5105. YAKIMA RIVER AT KIONA, WASH.

LOCATION.--At highway bridge just downstream from gaging station at Kiona, Benton County, 3½ miles downstream from intake of Kiona Canal and 25 miles upstream from mouth.
DRAINAGE AREA.--5,600 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1952 to September 1959.
Water temperatures: December 1952 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 390 micromhos Oct. 10; minimum daily, 124 micromhos Dec. 5, 14.
EXTREMES, 1952-59.--Specific conductance: Maximum daily, 390 micromhos Oct. 10, 1958; minimum daily, 101 micromhos May 9-10, 1957.
REMARKS.--Values reported for dissolved solids concentrations less than 1,000 ppm are residues at 180°C and for concentrations more than 1,000 ppm are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1958 to September 1959 given in WSP 1636.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-11, 1958	39,790		1.90	1.07	1.00	0.12	3.16	0.52	0.23	0.02	0.05	0.00	242	0.33	13,130	24	0.8	375	7.8
Oct. 12-31	110,600		--	--	.78	--	2.56	--	--	--	--	--	194	.26	28,760	--	--	307	7.7
Nov. 1-8	42,780		--	--	.87	--	2.69	--	--	--	--	--	204	.28	11,980	--	--	322	7.5
Nov. 9-18	109,600		--	--	.44	--	1.52	--	--	--	--	--	120	.16	17,540	--	--	185	7.5
Nov. 19-23	44,830		--	--	.52	--	1.70	--	--	--	--	--	131	.18	8,070	--	--	206	7.6
Nov. 24-30	82,510		--	--	.40	--	1.38	--	--	--	--	--	107	.15	12,380	--	--	166	7.2
Dec. 1-4	42,250		--	--	.44	--	1.56	--	--	--	--	--	119	.16	6,760	--	--	185	7.4
Dec. 5-8	57,920		--	--	.31	--	1.15	--	--	--	--	--	90	.12	6,950	--	--	139	7.5
Dec. 9-12	45,220		--	--	.40	--	1.39	--	--	--	--	--	106	.14	6,330	--	--	165	7.4
Dec. 13-22	132,700		--	--	.35	--	1.25	--	--	--	--	--	96	.13	17,250	--	--	148	7.5
Dec. 23-31	87,470		--	--	.44	--	1.48	--	--	--	--	--	112	.15	13,120	--	--	175	7.5
Jan. 1-25, 1959	303,800		.85	.35	.42	.06	1.39	.19	.10	.02	.02	.01	111	.15	45,570	25	.5	169	7.2
Jan. 26-31	111,100		--	--	.31	--	1.13	--	--	--	--	--	99	.13	14,440	--	--	138	7.3
Feb. 1-27	329,000		--	--	.41	--	1.29	--	--	--	--	--	103	.14	46,060	--	--	157	7.4
Feb. 28-Mar. 31	294,100		--	--	.44	--	1.54	--	--	--	--	--	121	.16	47,060	--	--	182	7.2
Apr. 1-3	31,500		--	--	.44	--	1.59	--	--	--	--	--	127	.17	5,360	--	--	186	7.7

YAKIMA RIVER BASIN--Continued

12-5105. YAKIMA RIVER AT KIONA, WASH.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Apr. 4-15, 1959.	138,400		0.80	0.46	0.37	0.05	1.34	0.14	0.08	0.01	0.01	0.00	109	0.15	20,760	22	0.5	157	7.6
Apr. 16-23	44,310		--	--	.52	--	1.84	--	--	--	--	--	137	.19	8,420	--	--	214	7.9
Apr. 24-30.....	48,730		--	--	.44	--	1.61	--	--	--	--	--	128	.17	8,280	--	--	195	7.7
May 1-2	24,990		--	--	.39	--	1.34	--	--	--	--	--	108	.15	3,750	--	--	160	7.5
May 3-22	253,400		--	--	.35	--	1.26	--	--	--	--	--	102	.14	35,480	--	--	151	7.0
May 23-27	52,820		--	--	.40	--	1.41	--	--	--	--	--	107	.15	7,920	--	--	169	7.3
May 28-31	28,820		--	--	.48	--	1.67	--	--	--	--	--	131	.18	5,190	--	--	202	7.5
June 1-5.....	34,550		--	--	.57	--	1.88	--	--	--	--	--	143	.19	6,560	--	--	226	7.4
June 6-19.....	181,900		--	--	.37	--	1.28	--	--	--	--	--	99	.13	23,650	--	--	153	7.2
June 20-29.....	107,600		--	--	.40	--	1.34	--	--	--	--	--	99	.13	13,990	--	--	157	7.4
June 30-July 2 ..	15,310		--	--	.61	--	1.90	--	--	--	--	--	181	.25	3,830	--	--	222	7.5
July 3-15	37,880		1.60	.82	.87	.09	2.70	.46	.21	.02	.04	.01	200	.27	10,230	26	.8	324	7.8
July 16-31	40,560		--	--	.96	--	2.82	--	--	--	--	--	234	.32	12,980	--	--	340	7.8
Aug. 1-31.....	92,390		--	--	.87	--	2.80	--	--	--	--	--	206	.28	25,870	--	--	336	7.6
Sept. 1-18	78,920		--	--	.91	--	2.72	--	--	--	--	--	204	.28	22,100	--	--	327	8.2
Sept. 19-29	64,260		--	--	.78	--	2.46	--	--	--	--	--	187	.25	16,060	--	--	296	8.1
Sept. 30	7,894		--	--	.57	--	1.93	--	--	--	--	--	139	.19	1,500	--	--	233	8.0
Total or weighted average.....	3,117,900		--	--	0.48	--	1.61	--	--	--	--	--	125	0.17	530,000	--	--	192	--

SNAKE RIVER MAIN STEM

13-375. SNAKE RIVER NEAR HEISE, IDAHO

LOCATION.--At Eagle Rock canal headgate, 1¼ miles upstream from Heise, Bonneville County, 1 5/8 miles downstream from Anderson canal headgate, 1¾ miles downstream from gaging station, about 3¾ miles east of Ririe, and about 21 miles upstream from Henrys Fork.
DRAINAGE AREA.--5,752 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: January 1953 to September 1959.
Water temperatures: January 1953 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 510 micromhos Jan. 22; minimum daily, 278 micromhos Aug. 3-5.
Percent sodium: Maximum, 15 Dec. 1-31; minimum, 10 July 1-31.
EXTREMES, 1953-59.--Specific conductance: Maximum daily, 791 micromhos Nov. 13, 1956; minimum daily, 240 micromhos June 27, 1954.
Percent sodium: Maximum, 19 Sept. 1-10, 1955; minimum, 7 June 11-20, 1953, May 1-10, June 1-10, 1955.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1958 to September 1959 given in WSP 1637. About 2.5 percent of normal annual streamflow of 5,000,000 acre-feet is diverted by Anderson Canal between sampling point and gaging station. This diversion occurs during May to November except for leakage through the headgate. No other diversion or appreciable inflow between sampling point and gaging station except during periods of local rains.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-31, 1958	193,200	9.8	2.54	1.02	0.61	0.06	2.89	0.98	0.42		0.01	0.09	240	0.33	63,760	14	0.5	407	8.1
Nov. 1-30	167,500	8.5	2.72	1.12	.65	.06	3.05	1.10	.45		.01	.09	256	.35	58,620	14	.5	432	8.2
Dec. 1-31	125,200	7.2	2.96	1.26	.74	.07	3.29	1.25	.51		.01	.07	280	.38	47,580	15	.5	474	8.2
Jan. 1-31, 1959	135,100	7.3	2.92	1.28	.70	.07	3.25	1.27	.48		.01	.06	280	.38	51,340	14	.5	468	8.1
Feb. 1-28	124,000	8.2	3.00	1.20	.70	.06	3.20	1.29	.48		.02	.02	276	.38	47,120	14	.5	474	7.6
Mar. 1-31	132,900	7.7	3.00	1.30	.70	.06	3.25	1.29	.56		.02	.09	283	.38	50,500	14	.5	469	8.0
Apr. 1-30	185,500	10	2.96	1.14	.70	.06	a3.18	1.06	.56		.02	.07	279	.38	70,490	14	.5	457	8.4
May 1-31	547,600	11	3.12	.68	.52	.04	a2.97	.94	.31		.02	.05	240	.33	180,700	12	.4	412	8.3
June 1-30	766,200	9.3	2.56	.92	.44	.04	2.84	.92	.25		.01	.04	228	.31	237,500	11	.3	377	8.2
July 1-31	805,400	7.5	2.12	.72	.33	.04	2.30	.77	.21	0.02	.01	.05	187	.25	201,400	10	.3	313	7.5
Aug. 1-31	701,100	8.3	1.96	.78	.34	.04	2.23	.69	.18		.00	.04	178	.24	168,300	11	.3	303	7.7
Sept. 1-30	562,600	7.6	2.18	.84	.44	.05	2.46	.81	.26		.00	.02	201	.27	151,900	12	.4	339	7.7
Total or weighted average	4,446,000	8.6	2.50	0.91	0.48	0.05	2.69	0.90	0.31		0.01	0.05	220	0.30	1,334,000	12	0.4	371	--

a Includes 0.20 equivalent per million of carbonate (CO_3).

SNAKE RIVER BASIN--Continued

13-1545. SNAKE RIVER AT KING HILL, IDAHO

LOCATION.--At county highway bridge, about 400 yards downstream from gaging station at King Hill, Elmore County and 20 miles downstream from Malad River.
DRAINAGE AREA.--35,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1959.
Water temperatures: March 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 582 micromhos Oct. 18; minimum daily, 491 micromhos June 19.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 594 micromhos Oct. 3, 1952; minimum daily, 394 micromhos May 7, 1952.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C and for more than 1,000 ppm are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1958 to September 1959 given in WSP 1637.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-15, 1958	272,600		2.40	1.88	1.57	0.13	3.74	1.27	0.73	0.03	0.05	0.05	345	0.47	128,100	26	1.1	542	7.9
Oct. 16-31	334,500		--	--	1.52	--	3.82	--	--	--	--	--	348	.47	157,200	--	--	547	8.0
Nov. 1-15	283,600		--	--	1.48	--	3.72	--	--	--	--	--	349	.47	133,300	--	--	539	7.9
Nov. 16-30	287,100		--	--	1.52	--	3.77	--	--	--	--	--	348	.47	134,900	--	--	541	7.9
Dec. 1-15	280,300		--	--	1.52	--	3.70	--	--	--	--	--	334	.45	126,100	--	--	534	7.7
Dec. 16-31	290,100		--	--	1.44	--	3.70	--	--	--	--	--	332	.45	130,500	--	--	532	7.9
Jan. 1-31, 1959	544,400		2.40	1.78	1.39	.12	3.61	1.15	.70	.04	.05	.05	336	.46	250,400	24	1.0	514	8.0
Feb. 1-28	489,100		--	--	1.39	--	3.44	--	--	--	--	--	328	.45	220,100	--	--	521	7.6
Mar. 1-31	541,600		--	--	1.39	--	3.41	--	--	--	--	--	320	.44	238,300	--	--	512	7.8
Apr. 1-15	244,300		2.50	1.50	1.35	.11	3.51	1.06	.62	.04	.05	.04	315	.43	105,000	25	1.0	503	7.9
Apr. 16-30	225,100		--	--	1.35	--	3.38	--	--	--	--	--	316	.43	96,790	--	--	510	7.9
May 1-15	238,200		--	--	1.39	--	3.39	--	--	--	--	--	319	.43	102,400	--	--	508	7.8
May 16-31	244,200		--	--	1.35	--	3.39	--	--	--	--	--	320	.44	107,400	--	--	507	7.8

June 1-15, 1959 .	224,700		--	--	1.39	--	3.43	--	--	--	--	--	315	0.43	96,620	--	--	506	7.8
June 16-30.....	232,000		--	--	1.39	--	3.46	--	--	--	--	--	319	.43	99,760	--	--	509	7.7
July 1-15	224,800		2.25	1.59	1.48	0.13	3.51	1.12	0.70	0.03	0.05	0.05	322	.44	98,910	27	1.1	512	7.4
July 16-31	243,300		--	--	1.44	--	3.54	--	--	--	--	--	346	.47	114,400	--	--	522	7.9
Aug. 1-15.....	242,500		--	--	1.48	--	3.64	--	--	--	--	--	333	.45	109,100	--	--	534	8.1
Aug. 16-31.....	259,300		--	--	1.57	--	3.67	--	--	--	--	--	338	.46	119,300	--	--	541	8.1
Sept. 1-16	281,500		--	--	1.57	--	3.67	--	--	--	--	--	347	.47	132,300	--	--	548	8.2
Sept. 17-30	282,600		--	--	1.52	--	3.70	--	--	--	--	--	342	.47	132,800	--	--	551	8.0
Total or weighted average.....	6,265,900		--	--	1.44	--	3.57	--	--	--	--	--	332	0.45	2,820,000	--	--	525	--

BOISE RIVER BASIN

13-2125. BOISE RIVER AT NOTUS, IDAHO

LOCATION.--At steel highway bridge, 1,100 feet downstream from gaging station, a quarter of a mile southeast of Notus, Canyon County, and 7 miles northwest of Caldwell.
DRAINAGE AREA.--3,820 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: January 1939 to January 1940, November 1950 to September 1959.
Water temperatures: November 1950 to September 1959.
Sediment records: January 1939 to June 1940.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 850 micromhos, Apr. 11; minimum daily, 313 micromhos May 5.
EXTREMES, 1939-40, 1950-59.--Specific conductance: Maximum daily, 1,470 micromhos July 30, Aug. 26, 1939; minimum daily, 82 micromhos Apr. 27, 1952.
Percent sodium: Maximum, 64 Sept. 1-10, 1939; minimum, 25 Apr. 11-20, 1951.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1958 to September 1959 given in WSP 1637.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-15, 1958	20,250		2.10	0.94	2.44	0.11	3.77	1.42	0.39	0.03	0.05	0.06	348	0.47	9,520	44	2.0	532	7.9
Oct. 16-31.....	28,190		--	--	2.87	--	4.70	--	--	--	--	--	428	.58	16,350	--	--	650	7.8
Nov. 1-15.....	26,440		--	--	2.83	--	4.82	--	--	--	--	--	433	.59	15,600	--	--	653	7.7
Nov. 16-30....	23,820		--	--	2.83	--	4.67	--	--	--	--	--	425	.58	13,820	--	--	644	7.7
Dec. 1-15	19,690		--	--	3.22	--	5.31	--	--	--	--	--	464	.63	12,400	--	--	718	7.7
Dec. 16-31....	18,520		--	--	3.22	--	5.15	--	--	--	--	--	461	.63	11,670	--	--	713	7.8
Jan. 1-14, 1959	14,800		3.49	1.36	3.26	.13	5.44	2.00	.62	.03	.06	.04	492	.67	9,920	40	2.1	737	7.8
Jan. 15-31.....	17,600		--	--	3.22	--	4.82	--	--	--	--	--	460	.63	11,090	--	--	696	7.7
Feb. 1-28.....	28,570		--	--	3.18	--	4.80	--	--	--	--	--	454	.62	17,710	--	--	696	7.7
Mar. 1-31.....	26,500		--	--	3.18	--	4.49	--	--	--	--	--	442	.60	15,900	--	--	682	7.8
Apr. 1-5.....	1,810		2.50	.98	3.04	.10	4.06	1.79	.62	.04	.10	.07	404	.55	996	46	2.3	632	8.0
Apr. 6.....	325		--	--	2.13	--	3.11	--	--	--	--	--	298	.41	133	--	--	471	7.7
Apr. 7-9.....	518		--	--	3.31	--	3.95	--	--	--	--	--	426	.58	300	--	--	665	8.1
Apr. 10-15....	1,630		--	--	3.92	--	4.46	--	--	--	--	--	510	.69	1,120	--	--	786	7.9
Apr. 16-22....	5,480		--	--	1.39	--	2.38	--	---	--	--	--	228	.31	1,700	--	--	364	7.6

Apr. 23-28, 1959	3,810		--	--	1.74	--	2.70	--	--	--	--	--	265	0.36	1,370	--	--	417	7.8
Apr. 29-May 10	19,260		--	--	1.39	--	2.43	--	--	--	--	--	230	.31	5,970	--	--	351	7.4
May 11-15.....	2,800		--	--	2.44	--	3.34	--	--	--	--	--	336	.46	1,290	--	--	521	7.6
May 16-26.....	21,480		--	--	1.57	--	2.57	--	--	--	--	--	241	.33	7,090	--	--	371	7.5
May 27-31.....	5,280		--	---	1.91	--	2.93	--	--	--	--	--	288	.39	2,060	--	--	438	7.5
June 1-4	1,560		--	---	2.87	--	3.64	--	--	--	--	--	367	.50	780	--	--	566	8.2
June 5-18	10,190		--	--	2.22	--	3.23	--	--	--	--	--	313	.43	4,380	--	--	491	8.0
June 19-25.....	1,650		--	--	3.65	--	4.25	--	--	--	--	--	441	.60	990	--	--	683	8.0
June 26-30	1,490		--	--	3.22	--	3.26	--	--	--	--	--	312	.42	626	--	--	490	7.9
July 1-12.....	4,030		2.00	0.76	2.61	0.10	3.52	1.48	0.45	0.03	0.07	0.10	348	.47	1,890	48	2.2	534	7.6
July 13-31.....	11,540		--	--	2.57	--	3.51	--	--	--	--	--	363	.49	5,650	--	--	526	7.9
Aug. 1-20.....	16,240		--	--	2.70	--	3.77	--	--	--	--	--	360	.49	7,960	--	--	565	8.1
Aug. 21-24	6,430		--	--	2.04	--	3.21	--	--	--	--	--	296	.40	2,570	--	--	465	8.1
Aug. 25-31	7,680		--	--	2.65	--	3.85	--	--	--	--	--	363	.49	3,760	--	--	566	8.1
Sept. 1-5.....	4,230		--	--	3.00	--	4.00	--	--	--	--	--	378	.51	2,160	--	--	599	8.2
Sept. 6-14	9,900		--	--	2.61	--	a3.61	--	--	--	--	--	345	.47	4,650	--	--	539	8.4
Sept. 15-19....	15,710		--	--	2.26	--	3.39	--	--	--	--	--	312	.42	6,600	--	--	495	8.2
Sept. 20-30....	17,660		--	--	2.96	--	b4.30	--	--	--	--	--	390	.53	9,360	--	--	606	8.4
Total or weighted average....	395,070		--	--	2.70	--	4.15	--	--	--	--	---	386	0.52	205,400	--	--	592	--

a Includes 0.27 equivalent of carbonate (CO_3).
b Includes 0.33 equivalent of carbonate (CO_3).

COLUMBIA RIVER MAIN STEM

14-1057. COLUMBIA RIVER NEAR THE DALLES, OREG.
(Formerly published as Columbia River at Maryhill Ferry near Rufus, Oreg.)

LOCATION.--At The Dalles Dam, 3.2 miles upstream from gaging station, and 2.6 miles northeast of The Dalles, Wasco County.
DRAINAGE AREA.--237,000 square miles, approximately (at gaging station).
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1959.
Water temperatures: December 1950 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 221 micromhos Nov. 15; minimum daily, 110 micromhos June 10.
EXTREMES, 1950-59.--Specific conductance: Maximum daily, 324 micromhos Dec. 7, 1955; minimum daily, 102 micromhos May 27, 1956.
REMARKS.--Samples were collected from Maryhill Ferry for period December 1950 to August 1953 and from left bank of river at Rufus, Oreg. for period September 1953 to September 1958. Values reported for dissolved solids less than 1,000 ppm are residues at 180 C and for more than 1,000 ppm are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1958 to September 1959 given in WSP 1638.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-15, 1958	2,849,000		1.20	0.50	0.48	0.05	1.61	0.62	0.11	0.01	0.01	0.00	128	0.17	484,300	22	0.5	213	7.8
Oct. 16-31	3,255,000		--	--	.44	--	1.56	--	--	--	--	--	123	.17	553,400	--	--	204	7.9
Nov. 1-15	3,162,000		--	--	.44	--	1.57	--	--	--	--	--	125	.17	537,500	--	--	206	7.4
Nov. 16-30	3,380,000		--	--	.44	--	1.43	--	--	--	--	--	120	.16	540,800	--	--	193	7.5
Dec. 1-15	3,862,000		--	--	.41	--	1.41	--	--	--	--	--	115	.16	617,900	--	--	187	7.7
Dec. 16-31	4,056,000		--	--	.33	--	1.26	--	--	--	--	--	107	.15	608,400	--	--	168	7.6
Jan. 1-20, 1959	5,173,000		1.00	.52	.41	.05	1.43	.37	.12	.02	.02	.05	121	.16	827,700	21	.5	185	7.8
Jan. 21-30	3,485,000		--	--	.33	--	1.33	--	--	--	--	--	114	.16	557,600	--	--	170	7.6
Jan. 31-Feb. 13	4,201,000		--	--	.33	--	1.25	--	--	--	--	--	117	.16	672,200	--	--	170	7.7
Feb. 14-27	3,888,000		--	--	.38	--	1.41	--	--	--	--	--	120	.16	622,100	--	--	189	7.8
Feb. 28-Mar. 15	5,004,000		--	--	.37	--	1.41	--	--	--	--	--	130	.18	900,700	--	--	187	7.8
Mar. 16-31	5,105,000		--	--	.33	--	1.36	--	--	--	--	--	116	.16	816,800	--	--	182	7.7

Apr. 1-15, 1959	5,905,000		1.00	0.36	0.32	0.04	1.29	0.31	0.10	0.02	0.01	0.02	112	0.15	885,800	19	0.4	172	7.6
Apr. 16-30	6,551,000		--	--	.25	--	1.23	--	--	--	--	--	103	.14	917,100	--	--	162	7.7
May 1-15	9,285,000		--	--	.17	--	1.10	--	--	--	--	--	88	.12	1,114,000	--	--	139	7.5
May 16-31	12,180,000		--	--	.15	--	1.02	--	--	--	--	--	80	.11	1,340,000	--	--	126	7.6
June 1-15	14,490,000		--	--	.13	--	.98	--	--	--	--	--	72	.10	1,449,000	--	--	118	7.3
June 16-30	15,950,000		--	--	.11	--	.97	--	--	--	--	--	76	.10	1,595,000	--	--	118	7.3
July 1-15	12,160,000		.90	.30	.11	.02	1.10	.20	.02	.01	.00	.02	80	.11	1,338,000	8	.1	131	7.6
July 16-30	9,416,000		--	--	.13	--	1.15	--	--	--	--	--	80	.11	1,036,000	--	--	136	7.7
July 31-Aug. 15	6,405,000		--	--	.16	--	1.23	--	--	--	--	--	84	.11	704,600	--	--	148	7.8
Aug. 16-31.....	4,346,000		--	--	.22	--	1.29	--	--	--	--	--	92	.13	565,000	--	--	162	7.9
Sept. 1-15	3,852,000		--	--	.32	--	1.39	--	--	--	--	--	101	.14	539,300	--	--	178	7.7
Sept. 16-30	5,234,000		--	--	.33	--	1.39	--	--	--	--	--	104	.14	732,800	--	--	180	7.8
Total or weighted average	153,200,000		--	--	0.24	--	1.21	--	--	--	--	--	96	0.13	19,920,000	--	--	153	--

WILLAMETTE RIVER BASIN

14-1910. WILLAMETTE RIVER AT SALEM, OREG.

LOCATION.--At bridge on State Highway 22, 300 feet downstream from gaging station at Salem, Marion County.
DRAINAGE AREA.--7,280 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August to December 1910, August 1911 to August 1912, February 1951 to September 1959.
Water temperatures: February 1951 to September 1959.
EXTREMES, 1958-59.--Specific conductance: Maximum daily, 73 micromhos Sept. 1; minimum daily, 41 micromhos Nov. 20.
EXTREMES, 1951-59.--Specific conductance: Maximum daily, 133 micromhos Nov. 7, 1954; minimum daily, 35 micromhos Jan. 20, 1953.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C and for more than 1,000 ppm are calculated from determined constituents. Records of specific conductance of daily samples available in district office at Portland, Oreg.
Records of discharge for water year October 1958 to September 1959 given in WSP 1638.

Chemical analyses, water year October 1958 to September 1959

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-15, 1958	239,500		0.27	0.14	0.18	0.03	0.51	0.06	0.07	0.02	0.01	0.01	52	0.07	16,760	29	0.4	63	6.8
Oct. 16-31	309,000		--	--	.17	--	.49	--	--	--	--	--	52	.07	21,630	--	--	62	6.8
Nov. 1-6	117,500		--	--	.17	--	.49	--	--	--	--	--	50	.07	8,220	--	--	62	6.9
Nov. 7-30	2,364,000		--	--	.12	--	.36	--	--	--	--	--	45	.06	141,600	--	--	46	6.4
Dec. 1-15	965,400		--	--	.13	--	.36	--	--	--	--	--	44	.06	57,920	---	--	49	6.9
Dec. 16-31	943,900		--	--	.13	--	.39	--	--	--	--	--	49	.07	66,070	--	--	49	6.7
Jan. 1-15, 1959	1,880,000		.25	.07	.12	.03	.36	.05	.04	.02	.01	.00	51	.07	131,600	26	.3	50	6.8
Jan. 16-31	1,962,000		--	--	.13	--	.36	--	--	--	--	--	51	.07	137,300	--	--	51	6.6
Feb. 1-15	1,254,000		--	--	.13	--	.39	--	--	--	--	--	54	.07	67,760	--	--	56	6.6
Feb. 16-28	1,211,000		--	--	.14	--	.43	--	--	--	--	--	54	.07	84,770	--	--	55	6.7
Mar. 1-17	617,300		--	--	.14	--	.43	--	--	--	--	--	52	.07	43,210	--	--	58	6.6
Mar. 16-31	870,500		--	--	.13	--	.39	--	--	--	--	--	47	.06	52,230	--	--	52	6.8
Apr. 1-15	944,300		.25	.09	.13	.02	.39	.04	.06	.01	.01	.02	48	.07	66,100	27	.3	54	6.8
Apr. 16-30	420,100		--	--	.14	.--	.43	--	--	--	--	--	48	.07	29,410	--	--	58	6.8
May 1-15	778,300		--	---	.10	--	.39	--	--	--	--	--	48	.07	54,480	--	--	50	6.6
May 16-31	577,200		--	--	.14	--	.43	--	--	--	--	--	48	.07	40,400	--	--	55	6.6

14-1910. WILLAMETTE RIVER AT SALEM, OREG.--Continued

Chemical analyses, water year October 1958 to September 1959--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
June 1-15, 1959 ..	399,900		--	--	0.13	--	0.43	--	--	--	--	--	46	0.06	23,990	--	--	55	6.7
June 16-30.....	266,800		--	--	.17	--	.49	--	--	--	--	--	63	.09	24,010	--	--	62	6.8
July 1-31.....	378,600		0.30	0.10	.20	0.02	.54	0.05	0.07	0.02	0.01	0.01	58	.08	30,290	32	0.4	66	7.0
Aug. 1-15	163,200		--	--	.20	--	.51	--	--	--	--	--	47	.06	9,790	--	--	67	6.8
Aug. 16-31.....	173,200		--	--	.19	--	.54	--	--	--	--	--	48	.07	12,120	--	--	69	6.9
Sept. 1-10.....	139,100		--	--	.18	--	.49	--	--	--	--	--	54	.07	9,740	--	--	68	6.7
Sept. 11-21	176,400		--	--	.20	--	.46	--	--	--	--	--	56	.08	14,110	--	--	65	6.5
Sept. 22-30	231,400		--	--	.15	--	.36	--	--	--	--	--	47	.06	13,880	--	--	52	6.5
Total or weighted average	17,380,000		--	--	0.13	--	0.39	--	--	--	--	--	50	0.07	1,217,000	--	--	53	--

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