Quality of Surface Waters for Irrigation Western States 1960

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1746

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

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PREFACE

This report was prepared by the U. S. 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 hydrologist, and S. K. Love, chief, Quality of Water Branch. The data were collected under the supervision of the following:

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QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES, 1960

INTRODUCTION

The records of chemical analyses, other physical measurements, and discharge given in this report comprise the tenth annual compilation of data for 73 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 the western conterminous 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).

Irrigation-Quality Network Stations, Western States

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

Irrigation network no.	Geological Survey station ident. no.	Streams and location	Date established	Date discontinued
1	5-1240	Souris (Mouse) 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 Reservoir, 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, 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	.....
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 Labatos, Colo.	10-11-46	.....

Irrigation-Quality Network Stations, Western States

Irrigation network no.	Geological Survey station ident. no.	Streams and location	Date established	Date discontinued
44	8-3130	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	-3640	Rio Grande near El Paso, Tex[a]	1930	.....
48	-3705	Rio Grande at Fort Quitman, Tex[a]	1930	.....
49	-3715	Rio Grande above Presidio, Tex[a]	1935	.....
50	-3775	Rio Grande at Langtry, Tex[a]	1945	.....
51	-4580	Rio Grande at Eagle Pass, Tex[a]	1938	1-30-55
	-4590	Rio Grande at Laredo, Tex[a]	7- 1-55	.....
52	-4625	Rio Grande at Roma, Tex[a]	1944	1-31-55
	-4615	Rio Grande at Chapeno, Tex[a]	July 1955	9-30-56
	-4613	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	-4475	Pecos River near Comstock, Tex[a]	1935	Dec. 1954
	-4474	Pecos River near Shumla, Tex[a]	1- 1-55	.....
57	9- 711	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	-2345	Green River near Greendale, Utah	Oct. 1956	.....
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	.....
72	-5020	Salt River below 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 below Piute Dam, near Marysvale, Utah.	Mar. 1958	.....
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.....	12-10-51	.....
80	11-2510	San Joaquin River below Friant Dam, Calif...	.....	.....

See footnotes at end of table.

Irrigation-Quality Network Stations, Western States

Irrigation network no.	Geological Survey station ident. no.	Streams and location	Date established	Date discontinued
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	11-3105	Calaveras River (Stockton diverting canal) at Stockton, Calif.	3- 1-51	10- 3-52
	-2535	San Joaquin River near Biola, Calif	1952	.....
85	-3255	Mokelumne River at Woodbridge, Calif	3- 1-51	9-30-58
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	2-26-51	.....
89	-4465	American River at Fair Oaks, Calif	5- 1-51	.....
90	12-3995	Columbia River at Northport, Wash	11-15-51	.....
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 Metaline 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, Oreg	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[b]	1- 8-51	.....
107	6-6875	North Platte River at Lewellen, Nebr[b]	.....	.....
108	-8055	Platte River near Louisville, Nebr[b]	.....	.....
109	9-4150	Virgin River at Littlefield, Ariz[b]	July 1949	.....

[a]Operated by International Boundary and Water Commission.
[b]Stations added by Subcommitte, October 1952.

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 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 109 network stations on streams in the Western States. The 73 stations in operation in 1960 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. Discontinued stations are identified by a half 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 nu-

merical 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 8 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 08-0100.00, this station number shown in this report is 8-100.

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. Army; the State engineers for each of the 19 Western States; and the Ministry of Hydraulic Resources of Mexico.

During 1959-60, 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, 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 29 and 30 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 1959 and 1960. Analyses for eight 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 polyethylene bottle provided with a bakelite cap and poly-seal insert 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 composite 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, soidum, 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/l) and milliequivalents per liter (meq/l). 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 28 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, percent sodium, and sodium adsorption ratio, 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 and sodium adsorption ratio were obtained from composite-sample analysis.

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

Discharge records were obtained from the responsible Geological Survey Water Resources district offices except for the seven stations operated by the International Boundary and Water Commission. Discharge data are shown in acre-feet, calculated from the daily mean discharge in cubic feet per second by multiplying by the factor 1.983471.

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Analytical values are reported in equivalents per million (epm) 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 Subcommitte, sodium adsorption ratio (SAR) is published for all network stations beginning October 1952. The term is defined and described under "Sodium" on page 11.

A program for automatically converting and computing the analytical values which are given in this report was established in 1962. Electronic digital computers perform the following calculations: Converting discharge values from cubic feet per second to acre-feet and constituent values from parts per million to equivalents per million; computing tons per acre-foot and total tons of the dissolved solids, percent sodium, sodium adsorption ratio, total discharge in acre-feet, total tons of dissolved solids, and discharge-weighted average of the individual constituents.

CRITERIA OF WATER QUALITY

The quality of an irrigation water is determined by the composition and concentration of the dissolved substances or solutes that are present in the water. The principal solutes are the cations; calcium, magnesium, and sodium, and the anions; bicarbonate, sulfate, and chloride. Boron, fluoride, and nitrate are usually present in low, but significant, concentrations. Small amounts of carbonate are found in many waters, as well as trace amounts of other less important constituents. The concentrations of the several ions show wide variations but, because of solubility limitations, sodium and chloride often predominate in more saline waters.

The analysis of an irrigation water should provide information on the suitability of its use and act as a guide for management practices. The first step in the interpretation of the analysis is the selection of criteria that will yield the type of information desired. The second step is the classification of the criteria in order to evaluate the water quality.

There are four principal hazards related to the chemical character of water for irrigation use. These are: total concentration, sodium, bicarbonate, and boron or other phytotoxic substances. Criteria that measure these hazards have been worked out and are in general use.

Total concentration is probably the more important single criterion for irrigation water quality and may be expressed in terms of parts per million (ppm) of dissolved solids, or as specific conductance (micromhos at 25°C). The latter is preferred. More than half of the irrigation waters in use in the Western States have specific conductance values below 750 micromhos (about 500 ppm dissolved solids). Saline waters with specific conductance values greater than 2,250 micromhos (about 1,500 ppm dissolved solids) make up less than 10 percent of the total number of waters and an even smaller fraction of the total quantity of water being used. There are very few waters with specific conductance values greater than 5,000 micromhos (about 3,200 ppm dissolved solids) that are being used successfully, although they can be used for certain crops under very special conditions. Such waters are important, however, in that they constitute the only available supply in many arid regions.

Sodium is essentially unique among the cations in its effect upon the soil. When present in the soil in exchangeable form, even at low concentrations as compared with the other cations, it causes adverse chemical and physical conditions to develop. Exchangeable sodium tends to make a moist soil impermeable to air and water. This type of soil, upon drying, is hard and difficult to till, and forms dense crusts that interfere with germination and seedling emergence. The most reliable index of the sodium hazard, or the tendence of the irrigation water to form exchangeable sodium in the soil, is the sodium adsorption ratio, SAR (U. S. Salinity Laboratory Staff, 1954). It is a calculated value and is defined as:

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

where concentrations are expressed in equivalents per million.

A nomogram for determining the SAR value of an irrigation water with an exchangeable-sodium percentage (ESP) scale opposite the SAR scale is shown in figure 1 on page 13. The ESP scale is empirical but is based on a regression equation of high statistical significance. After the SAR value of an irrigation water is determined by use of the nomogram, it is possible to estimate from the central scale the ESP value of a soil that is at equilibrium with the irrigation water. Under field conditions, the actual ESP may be slightly higher than the estimated equilibrium value. This is because the total salt concentration of the soil solution is increased by evaporation and plant transpiration which results in a higher SAR and a correspondingly higher ESP.

Bicarbonate is important primarily in its relation to calcium and magnesium. There is a tendency for calcium to react with the bicarbonate and precipitate as calcium carbonate ($CaCO_3$). The corresponding magnesium salt is more soluble so there is less tendency for it to precipitate but it may be lost from a water by an indirect reaction. Magnesium enters the exchange complex of the soil, replacing calcium which reacts with bicarbonate and precipitates as $CaCO_3$. Ordinarily, magnesium will not replace calcium to any great extent but, if calcium is precipitated as it is released, the reaction proceeds toward completion.

As calcium and magnesium are lost from water, the relative proportion of sodium is increased with an attendant increase in the sodium hazard. This hazard can be evaluated in terms of the residual sodium carbonate (RSC) as proposed by Eaton (1950) and defined as

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

in which the concentrations are expressed in equivalents per million (epm). Studies by Wilcox et al. (1954) indicate that waters with more than 2.5 epm of RSC are probably not suitable for irrigation purposes. Water containing 1.25 epm to 2.5 epm are marginal, and those containing less than 1.25 epm of RSC are probably safe. Some marginal waters, with good management practices and proper use of amendments, particularly gypsum, may be made safe for irrigation use. A condition not provided for by the RSC concept has been encountered in recent years. If the concentrations of both calcium and bicarbonate are about equal and high, i.e., in the order of 10 epm or greater, the RSC will be low or possibly zero. Such waters will precipitate some calcium carbonate and should be considered at least marginal.

Phytotoxic substances: Boron. The occurrence of boron in toxic concentrations in certain irrigation waters makes it necessary

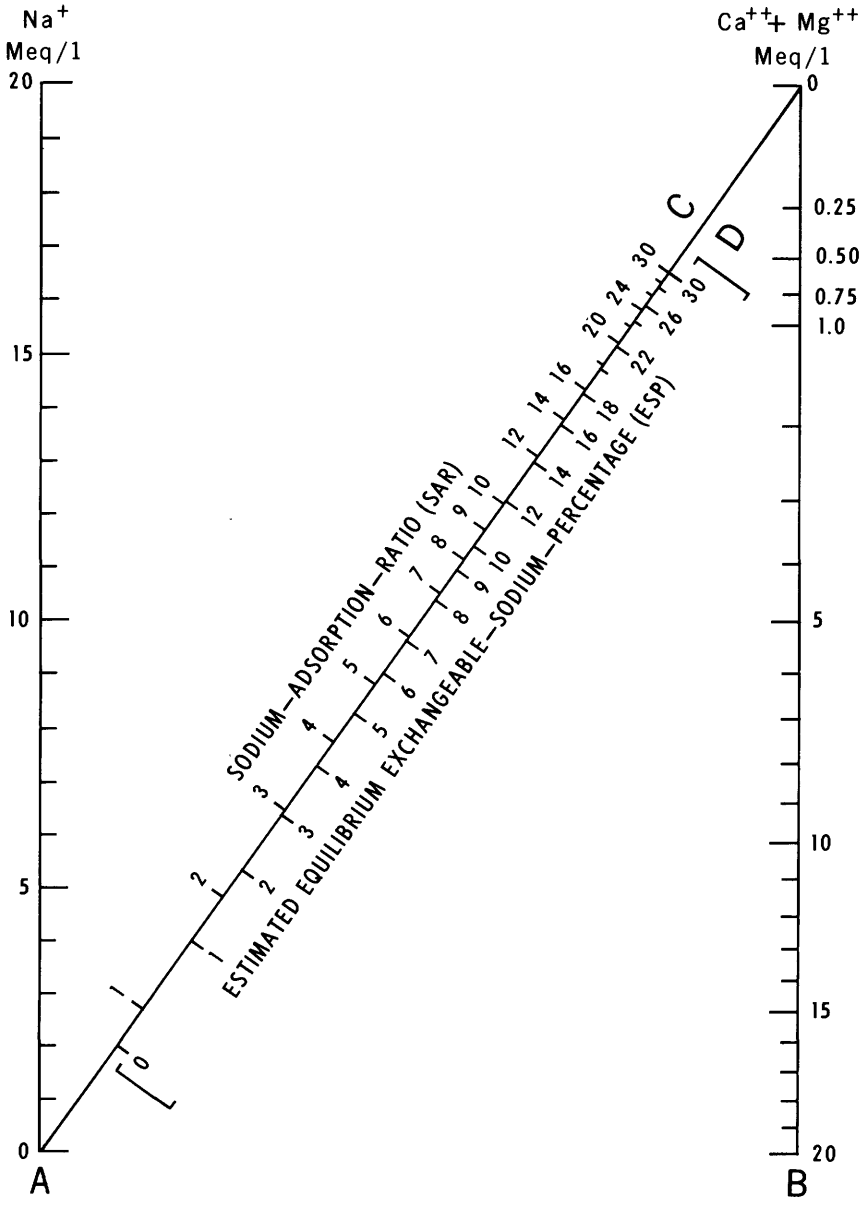

Figure 1.—Nomogram for determining the SAR value of irrigation water and for estimating the corresponding ESP value of a soil that is at equilibrium with the water (U. S. Salinity Laboratory Staff, 1954).

to consider this constituent when assessing the quality of water.

Plant species differ markedly in their tolerance to high concentrations of boron. In areas where boron occurs in excess in the soil or in the irrigation water, boron-tolerant crops may grow satisfactorily, whereas sensitive crops may fail.

Other substances. Very few substances other than boron occur in toxic concentrations in natural waters. However, many substances in industrial wastes that are discharged into surface streams are probably toxic to plants. Wilcox (1959) assembled information on a number of such substances for which the phytotoxic properties are known. If the presence of pollutants is suspected, great care should be exercised in the use of the water for irrigation.

The quality of irrigation water is classified by the amount of critical material determined in a water analysis. A water analysis is classified by plotting, as coordinates, the numerical value for specific conductance and SAR on figure 2, p. 15. The position of the point determines the quality classification of the water. The significance and interpretation of these quality ratings are summarized below.

Salinity Classification:

C1. Low-salinity water can be used for irrigation with most crops on most soils, with little likelihood that a salinity problem will develop. Some leaching is required, but this occurs under normal irrigation practices except in soils of extremely low permeability.

C2. Medium-salinity water can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most instances without special practices for salinity control.

C3. High-salinity water cannot be used on soil with restricted drainage. Even with adequate drainage, special management for salinity control may be required, and plants with good salt tolerance should be selected.

C4. Very high-salinity water is not suitable for irrigation under ordinary conditions but may be used occasionally under very special circumstances. The soil must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching, and very salt-tolerant crops should be selected.

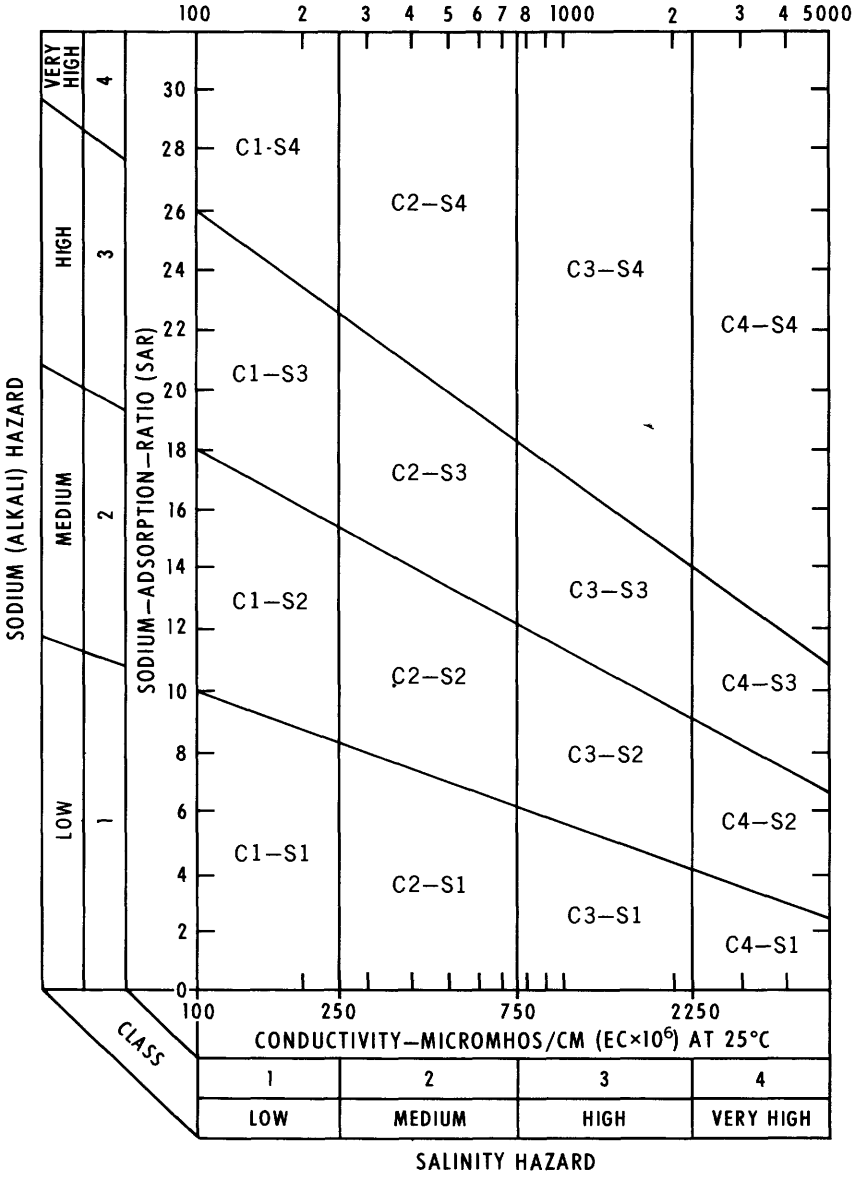

Figure 2.—Diagram for the classification of irrigation waters (U.S. Salinity Laboratory Staff, 1954).

Sodium Classification:

S1. Low-sodium water can be used for irrigation on almost all soils, with little danger of the development of a sodium problem. However, sodium-sensitive crops, such as stone-fruit trees and avocados, may accumulate injurious amounts of sodium in the leaves.

S2. Medium-sodium water may present a moderate sodium problem in fine-textured (clay) soils unless there is gypsum in the soil. This water can be used on coarse-textured (sandy) or organic soils that take water well.

S3. High-sodium water may produce troublesome sodium problems in most soils and will require special management--good drainage, high leaching, and additions of organic matter. If there is plenty of gypsum in the soil, a serious problem may not develop for some time. If gypsum is not present, it or some similar material may have to be added.

S4. Very-high sodium water is generally unsatisfactory for irrigation except at low- or medium-salinity levels where the use of gypsum or some other amendment makes it possible to use such water. (Wilcox and Durum, 1965).

DISCUSSION OF RESULTS

HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS

Red River of the North basin.--Runoff was above median during the 1960 water year in the Red River of the North basin. Runoff at Souris River near Westhope, N. Dak., was the highest since 1956, and the weighted average of specific conductance was the lowest since the station started in 1954; the weighted average of dissolved-solids content for 1960 was 398 ppm (0.54 ton per acre-foot) compared with the weighted average of 452 ppm (0.61 ton per acre-foot) for the period 1955-60. Runoff at Sheyenne River near Warwick, N. Dak., was the highest since 1956, and the weighted average of specific conductance was the lowest since the station started in 1951; the weighted average of dissolved-solids content was 283 ppm (0.38 ton per acre-foot) compared with the 10-year average of 399 ppm (0.54 ton per acre-foot).

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, 1960, was about 30,340,000 acre-feet, an increase of over 4,440,000 acre-feet over the previous year.

At Williston, N. Dak., runoff during 1960 was about 9 percent less than during 1959. The weighted average of dissolved-solids content was 422 ppm (0.57 ton per acre-foot) compared with the weighted average of 415 ppm (0.56 ton per acre-foot) for 1951-60. The total tons of dissolved-solids content was the lowest of the 10-year period of record.

At Nebraska City, Nebr., runoff for 1960 was the highest since 1953 and increased about 18 percent over that of 1959. The weighted average of dissolved solids was 385 ppm (0.52 ton per acre-foot), the lowest since 1951; and the dissolved-solids content in tons was the highest since 1955.

Yellowstone River basin.--Runoff from the Yellowstone River basin in 1960 was about 40 percent less than the long-time average and about 30 percent less than in 1959. During the period of record, runoff was less in only 2 years--1935 and 1940. Runoff from the Bighorn River basin was 60 percent of the long-time average; from the Tongue River basin, 53 percent; and from the Powder River basin, 51 percent. The Bighorn and Powder River basins had runoff about 25 percent less than in 1959, while the Tongue River basin had runoff 51 percent less. The weighted-average of dissolved-solids content was higher than the 10-year median except for the Powder River where the dissolved-solids content was 10 percent lower than the 10-year median. The sodium adsorption ratio for the entire basin was slightly above normal.

The dissolved-solids load at Sidney for 1960 was only 80 percent of the 10-year median load. The loads for the Bighorn, Tongue, and Powder Rivers were, respectively, 83, 69, and 75 percent of the 10-year medians. Yellowstone River near Sidney, Bighorn River at Bighorn, and Tongue River at Miles City had the lowest annual loads in the 10-year period of record. For 2 years, 1951 and 1954, Powder River near Locate had lower annual loads of dissolved solids. In the Yellowstone River basin, the Bighorn

River is the main contributor of dissolved solids; in 1960 the Bighorn River contributed 51 percent, the Tongue River 3 percent, and the Powder River 8 percent of the load passing Sidney, Mont. During the 8 years (1951-58) of sampling at Billings the average annual load was about 29 percent of that at Sidney.

No significant changes in impoundment or diversions were made during the year. There were no variations in methodology from that proposed for irrigation network stations.

James River basin.--During the first part of the 1960 water year, drought conditions continued and no flow was reported at most gaging stations in the lower reaches of the James River. During the last days of March, extremely high runoff from the rapid melting of heavy accumulated snow caused one of the worst floods in the lower James River basin since 1897. Heavy rains during April and May kept runoff well above median. July was extremely hot and dry, and the runoff was low.

At the gaging station at Huron, S. Dak., runoff for 1960 was 221,700 acre-feet compared with the 21-year average of 154,900 acre-feet. Although the samples for chemical analysis were collected upstream from the gage and upstream from the diversion of water to the city of Huron, the weighted average reflects only the quality of the water passing the gage. Comparison of the weighted average of dissolved-solids content for 1960 with the weighted average for 1958 (no average was computed for 1959) indicates that the dissolved-solids content, in parts per million, decreased 62 percent, but the total tons increased 8 percent.

Platte River basin.--Runoff at the gaging station, North Platte River at Wyoming-Nebraska State line, was 7 percent less in 1960 than in 1959 and was 69 percent of the long-time average. No data are available on the chemical quality of the water in the Platte River basin in Wyoming for 1960.

Precipitation and runoff varied considerably in the Platte River basin in Nebraska during the 1960 water year. In western Nebraska, runoff was above median during the fall and winter but below median during the summer. In eastern Nebraska, runoff was above median during the spring as the result of rapid melting of a heavy accumulation of snow. Ice jams and floods were prevalent on the main stem and many of its tributaries.

At South Platte River at Julesburg, Colo., runoff was 19 percent less than that of the previous year, and the dissolved-solids content increased 3 percent; the weighted average of dissolved-solids content for 1960 was 1,410 ppm (1.92 tons per acre-foot)

compared with the 10-year weighted average of 1,220 ppm (1.66 tons per acre-foot). At Platte River at Brady, Nebr., runoff was 26 percent more than that of 1959, and dissolved-solids content decreased 3 percent; the weighted average of dissolved-solids content for 1960 was 457 ppm (0.62 ton per acre-foot) compared with 477 ppm (0.65 ton per acre-foot) for the 10-year average. At Supply Canal (Tri-County Diversion) near Maxwell, Nebr., the runoff was 4 percent less than during the previous year, and dissolved-solids content decreased 7 percent; the weighted average of dissolved-solids content for 1960 was 551 ppm (0.75 ton per acre-foot) compared with the 10-year average of 560 ppm (0.76 ton per acre-foot).

LOWER MISSISSIPPI RIVER BASIN

Arkansas River basin.--The Arkansas River above John Martin Reservoir was less than half that of the 1959 water year. This decrease in runoff was accompanied by an increase in the salinity of the water.

Streamflow in the other four stations in the Arkansas River basin was substantially higher during the 1960 water year than during the 1959 water year. The 1960 annual discharges in the Arkansas River at Arkansas City, Kans., and Ralston, Okla., were about twice the 1959 discharges. The Canadian River near Whitefield, Okla., showed an increase in discharge of approximately the same magnitude during the 1960 water year. The annual discharge in the Cimarron River near Perkins, Okla., was almost four times greater during 1960 than that recorded for 1959. These increases in annual discharges are shown as follows:

Station:	1959 (ac-ft)	1960 (ac-ft)
Arkansas River at Arkansas City, Kans.	1,222,000	2,343,000
Arkansas River at Ralston, Okla	2,854,000	6,412,000
Cimarron River at Perkins, Okla	503,000	1,954,000
Canadian River near Whitefield, Okla.	3,024,000	7,528,000

The increase in discharge at all four stations resulted in lower dissolved-solids content in the streams in 1960. The weighted average dissolved-solids content of the Arkansas River at Arkansas City decreased from 967 ppm (1.32 tons per acre-foot) in 1959 to 671 ppm (0.91 ton per acre-foot) in 1960, or about 30 percent. At the Ralston station, a decrease of some 20 percent in the weighted average dissolved-solids content occurred. The values decreased from 812 ppm (1.10 tons per acre-foot) to 647 ppm (0.88

ton per acre-foot). The greatest change in dissolved-solids content occurred in the Cimarron River at Perkins where the weighted average decreased from 3,250 ppm (4.42 tons per acre-foot) to 2,070 ppm (2.81 tons per acre-foot), or about 37 percent.

Despite an increase in discharge of some 4.5 million acre-feet, the weighted average dissolved-solids content in the Canadian River near Whitefield decreased only 5 percent. Weighted average of dissolved-solids was 416 ppm (0.57 ton per acre-foot) in 1959 and 394 ppm (0.54 ton per acre-foot) in 1960.

Weighted average of percent sodium and sodium adsorption ratios at the four stations were lower than the 1959 averages.

Red River basin.--Water discharge in the Red River at Denison Dam near Denison, Tex., during the 1960 water year was almost equal to the average discharge for the 37 years of record, but was more than twice that for the previous year. However, the weighted-average content of dissolved-solids decreased only slightly from 1,100 to 1,020 ppm (1.50 to 1.38 tons per acre-foot).

WESTERN GULF OF MEXICO BASINS

In the Western Gulf of Mexico basins, from the Sabine to the Nueces River, only minor changes in weighted-average of dissolved-solids content occurred in the 1960 water year, although there were considerable fluctuations in the streamflow. Excessive water discharge occurred in the Brazos and Colorado basins due to floods during the month of October and streamflow for the Guadalupe River at Victoria was above average for the fourth consecutive year. Streamflow in the Sabine, Neches, Trinity, and Nueces Rivers was below the long-time averages.

Rio Grande basin.--In general, runoff in the Rio Grande basin, including the Pecos River basin, was considerably over that of the 1959 water year. The salinity of the water was lower than the previous year but total dissolved-solids loads were greater because of the increased water discharge.

However, in the Pecos River below Alamogordo Reservoir, N. Mex., the discharge was down and the salinity of the water was up from the previous year due to storage in the reservoir. Streamflow in the Pecos River below Red Bluff Dam, near Orla, Tex., continued to decrease and was only 25 percent of the 23-year average. The weighted-average of dissolved-solids content increased from 5,140 ppm (6.99 tons per acre-foot) in 1959 to 7,710 ppm

(10.5 tons per acre-foot) in 1960. Storage in Red Bluff Reservoir increased during the year from 63,150 to 82,000 acre-feet, only 27 percent of capacity.

COLORADO RIVER BASIN

The streamflow in the Colorado River basin, its main stem and tributaries as far upstream as the San Juan River, was much higher than it was in the 1959 water year. However, below reservoirs on a few tributaries, the runoff was less because of water impoundment.

Colorado River main stem.--The dissolved-solids content of the Colorado River near Glenwood Springs, Colo., decreased in 1960. This change may be attributed to an increase of about 15 percent in runoff as compared to the preceding year. The chemical character of the water did not change significantly, although percent sodium and hardness decreased slightly.

The flow of the Colorado River near Cisco, Utah was 32 percent higher than that of the previous year and the dissolved-solids content decreased 24 percent in the 1960 water year. The chemical character of the water did not change significantly, although there was a 3 percent decrease in the percent sodium.

The quality of the water released at Hoover Dam, Ariz.-Nev., remained relatively constant compared with preceding years due to the mixing effect at Lake Mead. However, the average dissolved-solids content in 1960 was about 5 percent higher than that recorded in 1959.

Gunnison River basin.--In 1960, a decrease of 34 percent in the dissolved-solids content of the Gunnison River near Grand Junction, Colo., and an increase of 46 percent in flow were recorded. Although the decrease in dissolved-solids content appears to be due to the increased flow, it may be partly attributed to the fact that the gaging and sampling station was moved to a site 12 miles upstream on January 1, 1960. During the 1959 water year check samples were taken about twice monthly, and results of analysis showed that the dissolved-solids content at the upstream site were 10 to 20 percent lower than at the former sampling station downstream.

Green River basin.--In the 1960 water year the dissolved-solids content of the Green River at Green River, Utah decreased about 8 percent and the flow increased 9 percent over the 1959

water year. There was a slight general increase in the flow of major contributors, such as the Yampa River. However, some of the minor contributors, such as the Price River and White River, had less discharge in 1960 than in 1959. Even though there was some change in the weighted-average concentration of dissolved-solids, the percentage composition of the dissolved-solids content of Green River did not change appreciably.

San Juan River basin.--The dissolved-solids content of the San Juan River near Bluff, Utah decreased about 40 percent in 1960. This change may be attributed to the fact that runoff was 2.7 times greater in 1960 than in the preceding year. The weighted-average computation shows a slight decrease in the percent sodium, but the water continued to be high in calcium and sulfate.

Virgin River basin.--The percentage composition of the dissolved-solids content of the Virgin River at Littlefield, Ariz., remained almost unchanged, although concentrations of sulfate were slightly lower and of bicarbonate slightly higher in 1960. Runoff in 1960 was about 10 percent less than in 1959, but the average dissolved-solids content remained essentially the same.

THE GREAT BASIN

Sevier Lake basin.--Flow past the gaging station, Sevier River near Lynndyl, Utah in 1960 included about 2,300 acre-feet of water discharged into the river from a deep well just downstream from the sampling station and about one mile upstream from the gaging station. Despite this inflow discharge at the gaging station was about 26 percent less than that of the previous year. Runoff shown in this report differs from discharges published for the gaging station by the amount flowing from the deep well. The percentage composition of the dissolved-solids in the water remained unchanged even though there was a decrease of about 4 percent in the dissolved-solids content when compared with the preceding year.

PACIFIC SLOPE BASINS IN CALIFORNIA

San Joaquin River basin.--Drouth conditions in the San Joaquin River basin continued to prevail. Flow during the 1960 water year was less than one-half that of 1959 water year, and only about 30 percent of long term average for the basin. A new minimum daily mean discharge of 150 cubic feet per second was established on Aug. 19 in the San Joaquin River at Vernalis. Outflow from the

basin was more mineralized than outflow during the 1959 water year and the weighted-average concentration of dissolved-solids for the San Joaquin River at Vernalis increased from 351 ppm (0.48 ton per acre-foot) in 1959 to 539 ppm (0.73 ton per acre-foot) in 1960.

Sacramento River basin.--Relatively little change was noted in weighted-average concentrations of dissolved solids in the waters of the Sacramento River basin for the 1960 water year. Flow in the Sacramento River at Sacramento during the 1960 water year was 10 percent less than flow during the 1959 water year and 60 percent of long term average. Flow of the Feather River at Nicolaus was 20 percent more than that of the 1959 water year, while flow in the American River at Fair Oaks was only slightly less than the flow during the 1959 water year due to controlled releases from Folsom Reservoir just upstream from the station.

Release of water from the Shasta Reservoir for salinity control in the Delta area and the large quantities of dilute waters from the Feather River and the American River help to maintain better water quality in the Sacramento River than in the water from the San Joaquin River.

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

Columbia River main stem.--The dissolved-solids concentration in tons per acre-foot for the station at Northport, Wash., remained the same as previous years. The discharge decreased only 6 percent from the 1959 water year.

Yakima River basin.--Water quality remained essentially the same as the 1959 water year. There was a decrease in discharge of less than 1 percent compared with the 1959 water year.

SNAKE RIVER BASIN

Snake River main stem.--Discharge and chemical quality for the Snake River at Heise, Idaho were virtually the same as in water year 1959. Downstream at King Hill the discharge showed a decrease of 3 percent compared to the previous year and the salt removal showed a slight decrease from 332 ppm (0.45 ton per acre-foot) in 1959 to 327 ppm (0.44 ton per acre-foot) in 1960.

Summary of water discharge, and tonnages of dissolved solids--1959-60

Station	Runoff (acre-feet)	Dissolved solids (tons per acre-foot)
Red River of the North basin:		
Sheyenne River near Warwick, N. Dak.	37,220	0.38
Souris (Mouse) River near Westhope, N. Dak.	191,900	.54
Missouri River main stem:		
Missouri River near Williston, N. Dak.	12,432,000	.57
Missouri River at Nebraska City, Nebr.	23,980,000	.52
Yellowstone River basin:		
Yellowstone River near Sidney, Mont.	5,511,000	.64
Bighorn River at Bighorn, Mont	1,614,000	1.13
Tongue River at Miles City, Mont.	136,200	.73
Powder River near Locate, Mont.	218,300	1.36
James River basin:		
James River at Huron, S. Dak.	221,800	.34
Platte River basin:		
Platte River at Brady, Nebr	245,400	.62
Supply Canal (Tri-County diversion) near Maxwell, Nebr	953,700	.75
South Platte River at Julesburg, Colo.	202,600	1.92
Arkansas River basin:		
Arkansas River below John Martin Reservoir, Colo	117,600	2.68
Arkansas River at Arkansas City, Kans.	2,343,000	.91
Arkansas River at Ralston, Okla	6,412,000	.88
Cimarron River at Perkins, Okla.	1,954,000	2.82
Arkansas River at Van Buren, Ark	37,800,000	.56
Canadian River near Whitefield, Okla.	7,528,000	.54
Red River basin:		
Red River at Denison Dam, near Denison, Tex	3,777,000	1.39
Sabine River basin:		
Sabine River near Ruliff, Tex.	4,751,000	.16
Neches River basin:		
Neches River at Evadale, Tex	3,432,000	.15
Trinity River basin:		
Trinity River at Romayor, Tex	4,807,000	.35
Brazos River basin:		
Brazos River at Richmond, Tex	6,440,000	.45
Colorado River basin:		
Colorado River at Austin, Tex.	2,555,000	.34
Colorado River at Wharton, Tex	3,322,000	.31
Guadalupe River basin:		
Guadalupe River at Victoria, Tex	1,281,000	.39
Nueces River basin:		
Nueces River near Mathis, Tex	436,900	.39
Rio Grande basin:		
Rio Grande above Culebra Creek, near Lobatos, Colo.	210,500	.32
Rio Grande at Otowi Bridge, near San Ildefonso, N. Mex.	821,000	.29
Rio Grande conveyance channel at San Marcial, N. Mex.	288,000	.70
Rio Grande floodway at San Marcial, N. Mex.	274,300	.45
Rio Grande below Elephant Butte Dam, N. Mex.	681,820	.66
Rio Grande near El Paso, Tex.	373,800	1.17
Rio Grande below Old Fort Quitman, Tex.	31,423	2.89
Rio Grande at Upper Presidio, Tex	---	---
Rio Grande at Langtry, Tex	1,204,400	.78
Rio Grande at Laredo, Tex.	2,311,960	.72
Rio Grande at Falcon Dam - U. S. tailrace	2,181,400	.74
Pecos River below Alamogordo Dam, N. Mex	113,800	1.94
Pecos River near Artesia, N. Mex.	185,000	3.67
Pecos River below Red Bluff Dam, near Orla, Tex	45,100	10.50
Pecos River near Shumla, Tex	250,450	2.00

Summary of water discharge, and tonnages of dissolved solids--1959-60--Continued

Station	Runoff (acre-feet)	Dissolved solids (tons per acre-foot)
Colorado River main stem:		
Colorado River near Glenwood Springs, Colo.	1,500,000	0.38
Colorado River near Cisco, Utah	4,132,000	.85
Colorado River at Lees Ferry, Ariz	9,182,000	.81
Colorado River near Grand Canyon, Ariz.	9,584,000	.85
Colorado River below Hoover Dam, Ariz.-Nev.	9,250,000	.89
Diversions and return flows at and below Imperial Dam:		
Yuma Main Canal below Colorado River siphon, at Yuma, Ariz.	326,800	1.04
Gunnison River basin:		
Gunnison River near Grand Junction, Colo.	1,390,000	.85
Green River basin:		
Green River at Green River, Utah	3,019,000	.58
San Juan River basin:		
San Juan River near Archuleta, N. Mex	1,090,000	.22
San Juan River near Bluff, Utah	1,690,000	.52
Virgin River basin:		
Virgin River at Littlefield, Ariz.	83,450	2.82
Gila River basin:		
Gila River at Kelvin, Ariz	320,800	.86
Gila River below Gillespie Dam, Ariz.	31,450	4.22
Salt River below Stewart Mountain Dam, Ariz.	367,029	.74
Verde River below Bartlett Dam, Ariz	469,200	.33
Sevier Lake basin:		
Sevier River near Lynndyl, Utah	94,380	1.86
Humboldt River basin:		
Humboldt River near Rye Patch, Nev.	41,530	1.10
San Joaquin River basin:		
San Joaquin River near Biola, Calif.	61,020	.07
San Joaquin River near Vernalis, Calif.	549,900	.73
Sacramento River basin:		
Sacramento River at Knights Landing, Calif	----------	-------
Feather River at Nicolaus, Calif	3,676,000	.10
American River at Fair Oaks, Calif	1,444,000	.06
Columbia River main stem:		
Columbia River at Northport, Wash.	79,665,000	.12
Yakima River basin:		
Yakima River at Kiona, Wash	2,918,540	.16
Snake River main stem:		
Snake River near Heise, Idaho	4,421,910	.30
Snake River at King Hill, Idaho	6,074,800	.44
Boise River basin:		
Boise River at Notus, Idaho	584,460	.39
Columbia River main stem:		
Columbia River near The Dalles, Oreg.	141,800,000	.13
Willamette River basin:		
Willamette River at Salem, Oreg	16,320,000	.07

Boise River basin.--A 48 percent increase in discharge over the previous year was accompanied by a 25 percent decrease in the tons per acre-foot of dissolved-solids content.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

Columbia River main stem.--Although discharge decreased 7 percent, water quality remained very nearly the same as the previous year. Again this year the weighted-average of dissolved-solids content tons per acre-foot remained the same as in the 1959 water year.

Willamette River basin.--Water quality and discharge remained essentially the same as the previous two water years.

Discharge data and dissolved-solids loads for stations operated in 1960 are summarized in the table on p. 24.

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PART 5. HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS

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 1960.
Water temperatures: January 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 949 micromhos May 26; minimum daily, 208 micromhos Apr. 7.
Percent sodium: Maximum, 46 July July 1-27; minimum, 18 Mar. 1-30.
EXTREMES, 1951-60.--Specific conductance: Maximum daily, 1,940 micromhos Feb. 1, 1955; minimum daily, 208 micromhos Apr. 7, 1960.
Percent sodium: Maximum, 66 July 8-18, 1955; minimum, 10 Aug. 15-31, 1959.
REMARKS.--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 1959 to September 1960 given in WSP 1708.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-14, 1959.	67	--	3.84		0.91	--	3.80	0.00	--	--	--	--	--	272	0.37	25	19	0.66	446	7.6
Oct. 15-27.....	178	--	3.72		2.87	--	4.65	.00	--	--	--	--	--	390	.53	94	44	2.11	627	7.6
Oct. 28-Nov. 5..	462	--	4.64		3.65	--	5.51	.00	--	--	--	--	--	497	.68	313	44	2.40	777	8.0
Nov. 6-30.....	446	--	5.00		2.31	--	5.41	.00	--	--	--	--	--	422	.57	256	32	1.46	672	7.8
Dec. 1-31.....	258	21	3.14	2.36	2.04	0.14	5.54	.00	1.69	0.37	0.02	0.02	0.19	433	.59	152	27	1.23	684	7.5
Jan. 1-31, 1960.	172	--	6.00		1.61	--	6.00	.00	--	--	--	--	--	440	.60	103	21	.93	691	7.8
Feb. 1-29.....	104	--	5.82		1.35	--	5.83	.00	--	--	--	--	--	421	.57	59	19	.79	656	7.8
Mar. 1-26.....	108	--	5.24		1.13	--	5.21	.00	--	--	--	--	--	369	.50	54	18	.70	580	7.8
Mar. 27-30.....	582	14	1.50	.90	.57	.17	2.36	.00	.60	.13	.01	.06	.10	200	.27	158	18	.52	311	7.1
Mar. 31-Apr. 1..	1,745	--	2.36		1.22	--	2.36	.00	--	--	--	--	--	242	.33	574	34	1.12	375	7.8
Apr. 2-4.....	4,278	--	1.44		1.17	--	1.88	.00	--	--	--	--	--	179	.24	1,042	45	1.38	278	7.8
Apr. 5-9.....	11,821	10	.85	.58	.74	.15	1.67	.00	.58	.02	.01	.05	.08	150	.20	2,412	32	.88	234	7.1
Apr. 10-17.....	4,776	--	2.04		1.00	--	2.33	.00	--	--	--	--	--	203	.28	1,319	33	.99	313	7.5
Apr. 18-23.....	833	--	3.20		1.74	--	3.51	.00	--	--	--	--	--	316	.43	358	35	1.38	482	7.7
Apr. 24-May 13..	1,075	--	4.08		2.22	--	4.33	.00	--	--	--	--	--	421	.57	616	35	1.55	607	7.6

May 14-19, 1960.	327	--	5.10	2.91	--	5.31	.00	--	--	--	--	--	487	.66	217	36	1.83	741	7.6
May 20-21.....	639	--	5.02	2.44	--	5.11	.00	--	--	--	--	--	457	.62	397	33	1.54	695	7.8
May 22-27.....	2,071	--	5.34	3.87	--	5.85	.00	--	--	--	--	--	583	.79	1,642	42	2.37	863	7.7
May 28-30.....	1,952	--	4.48	2.87	--	4.82	.00	--	--	--	--	--	476	.65	1,263	39	1.92	703	7.9
May 31-June 4...	1,597	--	3.42	1.52	--	3.36	.00	--	--	--	--	--	318	.43	691	31	1.16	482	7.2
June 5-19.....	1,970	--	4.80	2.78	--	4.98	.00	--	--	--	--	--	476	.65	1,275	37	1.80	708	7.7
June 20-30.....	646	--	5.44	3.92	--	6.33	.00	--	--	--	--	--	582	.79	511	42	2.37	861	7.7
July 1-27.....	744	--	5.06	4.35	--	6.61	.00	--	--	--	--	--	582	.79	589	46	2.73	875	7.5
July 28-Aug. 12.	197	--	4.28	3.00	--	5.31	.00	--	--	--	--	--	429	.58	115	41	2.05	669	7.7
Aug. 13-31.....	109	--	3.72	2.09	--	4.18	.00	--	--	--	--	--	334	.45	50	36	1.53	536	7.4
Sept. 1-30.....	60	18	2.15 | 1.48	1.44	.10	3.93	.00	1.08	.12	.01	.05	.10	299	.41	24	28	1.07	484	7.7
Total or weighted average	a37,220	--	2.76	1.61	--	3.07	0.00	--	--	--	--	--	283	0.38	14,310	31	1.31	430	7.4

a Represents 100 percent of runoff for water year.

RED RIVER OF THE NORTH BASIN--Continued

5-1240. SOURIS (MOUSE) 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 1960.
Water temperatures: October 1954 to September 1955, October 1956 to September 1959.
EXTREMES, 1956-60.--Specific conductance: Maximum daily, 2,100 micromhos Mar. 11; minimum daily, 279 micromhos Apr. 16.
Percent sodium: Maximum, 59 Aug. 23-31; minimum, 31 Apr. 8-17, May 1-27.
EXTREMES, 1954-60.--Specific conductance: Maximum daily (1956-60), 3,910 micromhos Mar. 22, 1959; minimum daily (1954-55, 1956-60), 232 micromhos Apr. 18, 1957.
Percent sodium: Maximum, 59 Aug. 23-31, 1960; minimum, 29 Mar. 26 to Apr. 12, 1957.
REMARKS.--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 1959 to September 1960 given in WSP 1708.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-22, 1959.	620	--	5.06		6.31	--	4.64	0.00	6.00	1.18	--	--	0.20	777	1.06	655	55	3.97	1,120	7.2
Oct. 23-29.....	355	--	4.52		5.13	--	4.65	.00	5.10	.90	--	--	.16	682	.93	330	53	3.41	997	7.4
Oct. 30-Nov. 10.	3,261	--	5.40		4.74	--	5.05	.00	4.27	.85	--	--	.19	658	.89	2,918	47	2.89	954	7.5
Nov. 11-30.....	829	--	6.02		5.05	--	5.70	.00	4.81	.90	--	--	.19	717	.98	808	46	2.91	1,050	7.1
Dec. 1-27.....	771	11.0	2.74	4.11	5.57	0.36	6.74	.00	5.00	.96	0.02	0.15	.25	790	1.07	829	44	3.01	1,140	7.2
Dec. 28-Jan. 5, 1960..	293	--	7.80		6.05	--	7.87	.00	4.75	1.04	--	--	.14	862	1.17	343	44	3.06	1,250	7.6
Jan. 6-19.....	553	--	8.82		6.61	--	8.85	.00	5.62	1.18	--	--	.23	966	1.31	726	43	3.15	1,380	7.6
Jan. 20-Feb. 10.	908	--	10.36		7.70	--	10.51	.00	6.41	1.35	--	--	.28	1,120	1.52	1,383	43	3.38	1,570	7.5
Feb. 11-29.....	746	--	11.84		8.40	--	12.24	.00	7.20	1.64	--	--	.34	1,280	1.74	1,299	41	3.45	1,760	7.3
Mar. 1-27.....	1,012	34.0	6.29	8.31	10.09	.59	15.29	.00	8.22	1.89	.04	.02	.39	1,520	2.07	2,092	40	3.74	2,100	7.2
Mar. 28-Apr. 2..	6,117	15.0	5.79	6.58	7.00	.46	13.10	.00	5.58	1.50	.03	.01	.25	1,180	1.60	9,817	35	2.82	1,680	7.1
Apr. 3-7.....	11,306	--	2.54		1.39	--	2.54	.00	1.12	.34	--	--	.08	261	.35	4,013	35	1.24	416	7.3
Apr. 8-17.....	32,291	8.4	1.10	.78	.91	.19	1.77	.00	.85	.24	.01	.10	.05	188	.26	8,256	31	.94	301	6.9
Apr. 18-30.....	49,946	--	2.92		1.52	--	2.92	.00	1.33	.24	--	--	.10	282	.38	19,155	34	1.26	443	7.2
May 1-11.....	33,382	--	3.80		1.87	--	4.02	.00	1.75	.28	--	--	.12	361	.49	16,389	31	1.36	544	7.7

May 12-19, 1960.	12,805	--	4.88	2.31	--	4.92	.00	2.14	.39	--	--	.14	439	.60	7,645	31	1.48	674	7.5
May 20-27.....	2,983	--	5.50	2.61	--	5.52	.00	2.50	.39	--	--	.16	496	.67	2,012	31	1.57	749	7.7
May 28-June 13..	16,657	--	5.80	2.91	--	5.80	.00	2.91	.42	--	--	.15	539	.73	12,210	33	1.71	808	7.6
June 14-24.....	11,782	--	5.92	3.31	--	6.11	.00	3.08	.39	--	--	.18	562	.76	9,005	36	1.92	847	7.7
June 25-July 4..	1,674	--	5.82	3.52	--	6.06	.00	3.14	.48	--	--	.19	577	.78	1,314	38	2.07	861	7.6
July 5-17.....	536	--	4.68	3.83	--	5.08	.00	3.14	.62	--	--	.20	547	.74	399	45	2.50	816	7.6
July 18-31.....	267	--	3.86	4.09	--	4.59	.00	3.04	.56	--	--	.21	527	.72	191	51	2.94	776	7.2
Aug. 1-22.....	358	19.0	1.15 | 2.14	4.22	.31	4.31	.00	2.83	.54	.01	.31	.21	511	.69	249	54	3.29	751	7.1
Aug. 23-31.....	484	--	3.18	4.57	--	4.54	.00	2.66	.56	--	--	.23	519	.71	341	59	3.62	758	7.4
Sept. 1-19.....	1,308	--	3.66	4.96	--	5.28	.00	2.73	.65	--	--	.25	559	.76	994	58	3.67	816	7.5
Sept. 20-30.....	659	--	4.68	5.35	--	6.56	.00	7.04	.65	--	--	.22	637	.87	571	53	3.50	936	7.5
Weighted average	a191,900	--	4.06	2.25	--	4.14	0.00	2.02	0.38	--	--	0.12	398	0.54	103,900	36	1.51	602	7.3

a Represents 100 percent of runoff for water year.

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, and at mile 1,650.2.
DRAINAGE AREA.--164,500 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1960.
Water temperatures: May 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 915 micromhos Nov. 28; minimum daily, 297 micromhos Mar. 19.
Percent sodium: Maximum, 38 May 1-17, Sept. 22-30; minimum, 30 Mar. 19-20, 22-24, June 10-15.
EXTREMES, 1950-60.--Specific conductance: Maximum daily, 957 micromhos Jan. 10, 12, 1958; minimum daily, 297 micromhos Mar. 19, 1960.
Percent sodium: Maximum, 43 Apr. 25-30, 1959; minimum, 24 May 27 to June 2, 1956.
REMARKS.--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 1959 to September 1960 given in WSP 1709.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	1,026,228	--	4.92		2.70	--	3.31	0.00	--	--	--	--	--	486	0.66	678,296	35	1.72	727	7.2
Nov. 1-13.....	411,273	--	4.94		2.52	--	3.29	.00	--	--	--	--	--	468	.64	261,767	34	1.61	703	7.6
Nov. 14-25.....	249,917	--	5.66		2.91	--	3.84	.00	--	--	--	--	--	539	.73	183,199	34	1.73	802	7.4
Nov. 26-30.....	158,678	--	6.08		3.26	--	3.98	.00	--	--	--	--	--	593	.81	127,970	35	1.87	869	7.7
Dec. 1-23.....	713,038	11.0	3.24	2.06	2.96	0.10	3.46	.00	4.48	0.31	0.03	0.01	0.19	511	.69	495,533	35	1.82	768	7.3
Dec. 24-31.....	184,225	--	5.62		2.83	--	3.79	.00	--	--	--	--	--	531	.72	133,040	33	1.69	791	7.6
Jan. 1-14, 1960.	283,517	--	5.60		2.74	--	3.77	.00	--	--	--	--	--	526	.72	202,817	33	1.64	777	7.4
Jan. 15-22.....	218,975	--	5.94		2.91	--	3.90	.00	--	--	--	--	--	555	.75	165,282	33	1.69	819	7.4
Jan. 23-Feb. 1..	246,545	--	5.50		2.61	--	3.70	.00	--	--	--	--	--	508	.69	170,333	32	1.57	766	7.6
Feb. 2-18.....	528,040	--	5.28		2.57	--	3.47	.00	--	--	--	--	--	490	.67	351,886	33	1.58	739	7.6
Feb. 19-Mar. 13.	623,127	--	5.36		2.70	--	3.62	.00	--	--	--	--	--	505	.69	427,964	33	1.65	755	7.5
Mar. 14-18.....	163,835	--	5.86		2.78	--	3.85	.00	--	--	--	--	--	542	.74	120,766	32	1.63	811	7.5
Mar. 19-20.....	76,959	--	2.38		1.04	--	1.77	.00	--	--	--	--	--	214	.29	22,398	30	.96	356	7.2
Mar. 21.....	69,421	--	3.76		1.96	--	2.67	.00	--	--	--	--	--	380	.52	35,877	34	1.43	575	7.4
Mar. 22-24.....	565,289	6.4	2.05	.99	1.35	.12	2.43	.00	1.92	.11	.01	.04	.11	282	.38	216,800	30	1.10	449	7.4

Mar. 25-28, 1960.	626,380	--	3.06	1.35	--	2.44	0.00	--	--	--	--	--	284	.39	241,933	31	1.09	441	7.5
Mar. 29-31.....	286,036	--	3.36	1.57	--	2.69	.00	--	--	--	--	--	320	.44	124,483	32	1.21	498	7.6
Apr. 1-10.....	578,578	--	3.80	2.00	--	2.82	.00	--	--	--	--	--	369	.50	290,354	34	1.45	569	7.5
Apr. 11-18.....	262,129	--	4.62	2.57	--	3.21	.00	--	--	--	--	--	458	.62	175,732	36	1.69	694	8.0
Apr. 19-30.....	338,936	--	4.64	2.52	--	3.21	.00	--	--	--	--	--	459	.62	211,577	35	1.66	696	7.7
May 1-17.....	491,623	--	4.68	2.83	--	3.18	.00	--	--	--	--	--	479	.65	320,263	38	1.85	726	7.5
May 18-31.....	480,397	--	3.76	2.00	--	2.75	.00	--	--	--	--	--	367	.50	239,776	35	1.46	566	7.4
June 1-5.....	153,917	--	4.00	2.31	--	2.82	.00	--	--	--	--	--	400	.54	83,731	37	1.63	610	7.8
June 6-9.....	221,355	--	3.24	1.52	--	2.49	.00	--	--	--	--	--	306	.42	92,721	32	1.20	472	7.5
June 10-15.....	360,833	11.0	1.80 | .82	1.13	.06	2.07	.00	1.67	.10	.02	.01	.08	237	.32	116,304	30	.99	384	7.3
June 16-25.....	642,050	--	3.18	1.52	--	2.26	.00	--	--	--	--	--	311	.42	271,561	32	1.21	475	7.6
June 26-July 9...	558,704	--	3.36	1.65	--	2.44	.00	--	--	--	--	--	319	.43	242,388	33	1.28	497	7.3
July 10-25.....	390,030	--	3.92	2.00	--	2.85	.00	--	--	--	--	--	377	.51	199,976	34	1.43	581	7.0
July 26-Aug. 22..	625,349	--	4.34	2.31	--	3.11	.00	--	--	--	--	--	419	.57	356,349	35	1.57	646	7.1
Aug. 23-Sept. 21.	671,207	8.6	2.79 | 1.89	2.65	.11	3.26	.00	3.83	.26	.04	.01	.16	460	.63	419,907	36	1.73	703	7.8
Sept. 22-30.....	205,825	--	5.12	3.13	--	3.33	.00	--	--	--	--	--	530	.72	148,359	38	1.96	783	7.3
Total or weighted average	a12,432,000	--	4.38	2.27	--	3.06	0.00	--	--	--	--	--	422	0.57	7,130,000	34	1.52	640	7.4

a Represents 100 percent of runoff for water year.

MISSOURI RIVER MAIN STEM--Continued

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 1960.
Water temperatures: May 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 859 micromhos Nov. 27; minimum daily, 327 micromhos Apr. 4.
Percent sodium: Maximum, 37 Oct. 1-31; minimum, 16 Apr. 11-15.
EXTREMES, 1951-60.--Specific conductance: Maximum daily, 936 micromhos Jan. 6, 1953; minimum daily, 327 micromhos Apr. 4, 1960.
Percent sodium: Maximum, 48 May 29, 1956; minimum, 16 Apr. 11-15, 1960.
REMARKS.--Values reported for dissolved solids are residues at 180°C. Daily samples for chemical analysis computed by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr. Records of discharge for water year October 1959 to September 1960 given in WSP 1710.

Chemical analyses, water year October 1959 to September 1960

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. 1-31, 1959.	2,030,000	--	4.64		2.78	--	3.25		--	--	--	--	--	476	0.65	1,320,000	37	1.8	724	7.2
Nov. 1-6.....	395,700	--	4.72		2.70	--	3.31		--	--	--	--	--	469	.64	253,200	36	1.8	718	7.4
Nov. 7-8.....	87,870	--	4.32		2.31	--	3.08		--	--	--	--	--	423	.58	50,960	35	1.6	651	7.5
Nov. 9-16.....	240,600	--	4.64		2.39	--	3.43		--	--	--	--	--	444	.60	144,400	34	1.6	687	7.3
Nov. 17-20.....	60,610	--	5.24		2.70	--	3.88		--	--	--	--	--	490	.67	40,610	34	1.7	756	7.5
Nov. 21-25.....	185,100	--	5.04		2.70	--	3.74		--	--	--	--	--	487	.66	122,200	35	1.7	754	7.3
Nov. 26.....	41,650	--	3.83		1.26	--	3.08		--	--	--	--	--	321	.44	18,330	25	.9	499	7.4
Nov. 27.....	39,670	--	5.88		3.18	--	4.79		--	--	--	--	--	557	.76	30,150	35	1.9	859	7.6
Nov. 28-30.....	92,830	--	4.52		2.26	--	3.47		--	--	--	--	--	430	.58	53,840	33	1.5	660	7.7
Dec. 1-2.....	50,380	--	5.00		2.65	--	3.84		--	--	--	--	--	488	.66	33,250	35	1.7	747	7.6
Dec. 3-31.....	842,600	19	3.14	1.54	2.44	0.15	3.61		3.00	0.71	0.03	0.04	0.10	450	.61	514,000	34	1.6	710	7.3
Jan. 1-4, 1960..	95,210	--	4.72		2.04	--	3.57		--	--	--	--	--	434	.59	56,170	30	1.3	665	7.3
Jan. 5-9.....	60,080	--	5.44		2.57	--	4.23		--	--	--	--	--	506	.69	41,460	32	1.6	767	7.5
Jan. 10-11.....	41,650	--	5.56		2.87	--	4.39		--	--	--	--	--	530	.72	29,990	34	1.7	816	7.6
Jan. 12-15.....	125,800	--	5.18		2.57	--	3.82		--	--	--	--	--	489	.67	84,290	33	1.6	745	7.4

Jan. 16, 1960...	28,760	--	3.76	1.57	--	2.92	--	--	--	--	--	348	.47	13,520	29	1.1	513	7.2
Jan. 17-29.....	306,400	--	5.06	2.57	--	3.72	--	--	--	--	--	488	.66	202,200	34	1.6	741	7.3
Jan. 30-Feb. 5..	207,300	--	4.96	2.61	--	3.69	--	--	--	--	--	485	.66	136,800	34	1.7	740	7.5
Feb. 6-15.....	341,800	--	4.48	2.39	--	3.41	--	--	--	--	--	445	.61	208,500	35	1.6	680	7.6
Feb. 16.....	33,720	--	3.64	1.48	--	2.69	--	--	--	--	--	326	.44	14,840	29	1.1	505	7.4
Feb. 17-22.....	200,100	--	4.46	2.31	--	3.31	--	--	--	--	--	436	.59	118,100	34	1.5	670	7.4
Feb. 23-27.....	143,400	--	4.82	2.52	--	3.74	--	--	--	--	--	478	.65	93,210	34	1.6	717	7.7
Feb. 28.....	27,170	--	4.28	2.18	--	3.28	--	--	--	--	--	418	.57	15,490	34	1.5	630	7.5
Feb. 29-Mar. 28.	904,300	--	4.52	2.39	--	3.39	--	--	--	--	--	439	.60	542,600	35	1.6	668	7.4
Mar. 29.....	124,000	--	3.00	1.31	--	2.69	--	--	--	--	--	280	.38	47,120	30	1.1	449	7.8
Mar. 30.....	206,300	--	2.88	.87	--	2.49	--	--	--	--	--	246	.33	68,080	23	.7	383	7.8
Mar. 31.....	265,800	13	1.85 | .67	.70	0.17	2.16	.96	.17	.02	.04	.06	217	.30	79,740	21	.6	336	6.8
Apr. 1-7.....	2,281,000	11	2.15 | .73	.70	.19	2.31	1.04	.15	.01	.15	.07	229	.31	707,100	19	.6	366	7.1
Apr. 8-10.....	689,900	--	3.08	.61	--	2.49	--	--	--	--	--	240	.33	227,700	17	.5	375	7.5
Apr. 11-15.....	686,700	--	3.34	.65	--	2.64	--	--	--	--	--	259	.35	240,300	16	.5	407	7.5
Apr. 16-21.....	575,600	--	3.74	.83	--	2.90	--	--	--	--	--	294	.40	230,200	18	.6	459	7.6
Apr. 22-30.....	625,800	--	4.08	1.04	--	3.06	--	--	--	--	--	333	.45	281,600	20	.7	515	7.6
May 1-21.....	1,862,000	--	4.46	1.57	--	3.18	--	--	--	--	--	391	.53	986,900	26	1.0	594	7.5
May 22.....	139,800	--	4.16	1.13	--	3.23	--	--	--	--	--	336	.46	64,310	21	.8	515	7.6
May 23-31.....	866,000	--	4.56	1.31	--	3.33	--	--	--	--	--	370	.50	433,000	22	.9	568	7.3
June 1-11, 1960.	728,700	--	5.26	1.78	--	3.59	--	--	--	--	--	451	.61	444,500	25	1.1	677	7.5
June 12-13.....	203,700	--	4.08	1.44	--	2.90	--	--	--	--	--	364	.50	101,900	26	1.0	552	7.2
June 14-20.....	608,900	--	4.38	1.61	--	3.10	--	--	--	--	--	393	.53	322,700	27	1.1	596	7.0
June 21-23.....	449,900	12	2.25 | .83	1.13	0.18	2.41	1.44	0.28	0.02	0.10	0.07	269	.37	166,500	26	.9	426	7.5
June 24-30.....	567,300	--	4.40	1.61	--	3.18	--	--	--	--	--	398	.54	306,300	27	1.1	606	7.0
July 1-31.....	2,161,000	--	4.46	2.09	--	3.08	--	--	--	--	--	417	.57	1,232,000	32	1.4	632	7.0
Aug. 1-25.....	1,770,000	--	4.26	2.26	--	2.84	--	--	--	--	--	422	.57	1,009,000	35	1.5	645	7.2
Aug. 26-Sept. 1.	623,200	--	3.86	1.78	--	2.74	--	--	--	--	--	368	.50	311,600	32	1.3	567	6.8
Sept. 2-30.....	1,961,000	11	7.99 | 1.35	2.31	.15	2.95	3.44	.48	.02	.02	.10	435	.59	1,157,000	34	1.6	665	7.1
Total or weighted average	a23,980,000	--	4.18	1.78	--	3.03	--	--	--	--	--	385	0.52	12,560,000	30	1.2	590	--

YELLOWSTONE RIVER BASIN

6-3295. YELLOWSTONE RIVER NEAR SIDNEY, MONT.

LOCATION.--At bridge on State Highway 23, 2 miles south of Sidney, Richland County, 4.5 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 1960.
Water temperatures: January 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,110 micromhos Mar. 11; minimum daily, 292 micromhos June 12.
Percent sodium: Maximum, 45 Sept. 9-20; minimum, 30 June 6-25.
EXTREMES, 1951-60.--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.--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 gaging station near Sidney for water year October 1959 to September 1960 given in WSP 1709. No appreciable inflow between gaging station and sampling station.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-12, 1959.	183,059	--	5.44		3.39	--	3.44	0.00	--	--	--	--	--	560	0.76	139,417	38	2.06	832	7.6
Oct. 13-31.....	306,613	--	5.38		3.31	--	3.74	.00	--	--	--	--	--	553	.75	230,597	38	2.02	817	7.6
Nov. 1-14.....	193,019	--	5.22		3.00	--	3.46	.00	--	--	--	--	--	523	.71	137,291	37	1.86	776	7.7
Nov. 15-30.....	184,447	--	6.48		3.65	--	4.43	.00	--	--	--	--	--	644	.88	161,546	36	2.03	932	7.8
Dec. 1-10.....	152,926	--	5.72		3.35	--	3.74	.00	--	--	--	--	--	576	.78	119,796	37	1.98	838	7.8
Dec. 11-20.....	127,339	--	6.12		3.35	--	4.05	.00	--	--	--	--	--	598	.81	103,562	35	1.91	873	7.7
Dec. 21-31.....	114,044	14	3.94	2.55	3.44	0.12	4.20	.00	5.73	0.37	0.03	0.01	0.21	629	.86	97,557	34	1.91	918	7.8
Jan. 1-16, 1960.	117,041	--	7.08		3.87	--	4.62	.00	--	--	--	--	--	694	.94	110,468	35	2.06	994	8.0
Jan. 17-31.....	130,701	--	6.86		3.61	--	4.26	.00	--	--	--	--	--	663	.90	117,850	34	1.95	957	7.5
Feb. 1-20.....	253,091	--	5.94		3.18	--	3.77	.00	--	--	--	--	--	572	.78	196,884	35	1.84	845	7.4
Feb. 21-Mar. 13.	183,665	--	6.72		3.61	--	4.06	.00	--	--	--	--	--	660	.90	164,858	35	1.97	951	7.6
Mar. 14-19.....	91,839	--	5.02		2.57	--	3.34	.23	--	--	--	--	--	482	.66	60,202	34	1.62	720	8.4
Mar. 20-25.....	501,418	11	2.69	1.07	1.74	.14	2.84	.00	2.58	.12	.02	.06	.10	354	.48	241,402	31	1.27	544	7.2
Mar. 26-31.....	153,521	--	5.12		2.87	--	3.08	.00	--	--	--	--	--	525	.71	109,614	36	1.79	768	7.2
Apr. 1-30.....	413,792	--	5.60		3.35		3.28	.00	--	--	--	--	--	582	.79	327,524	37	2.00	848	7.4

May 1-15, 1960..	177,352	--	5.18	3.22	--	3.10	.00	5.02	--	--	--	--	539	.73	130,006	38	2.00	791	7.1
May 16-20.....	121,587	--	3.32	1.57	--	2.43	.00	2.39	--	--	--	--	316	.43	52,253	32	1.22	488	7.0
May 21-31.....	148,429	--	3.20	1.74	--	2.23	.00	2.77	--	--	--	--	325	.44	65,606	35	1.38	498	7.1
June 1-5.....	95,048	--	3.48	1.96	--	2.43	.00	2.96	--	--	--	--	354	.48	45,760	36	1.48	541	7.1
June 6-25.....	977,851	--	2.84	1.22	--	2.21	.00	1.79	--	--	--	--	266	.36	353,747	30	1.02	411	7.1
June 26-July 1..	168,159	--	2.70	1.35	--	1.93	.00	2.12	--	--	--	--	267	.36	61,062	33	1.16	415	6.9
July 2-10.....	152,110	--	3.04	1.61	--	2.11	.00	2.48	--	--	--	--	308	.42	63,716	35	1.31	469	6.9
July 11-21.....	111,644	--	3.56	2.26	--	2.64	.00	3.19	--	--	--	--	375	.51	56,938	39	1.70	577	7.0
July 22-31.....	62,460	9.7	2.45 | 1.73	2.91	.09	2.95	.00	4.06	.24	.03	.01	.17	448	.61	38,055	41	2.02	681	7.3
Aug. 1-20.....	116,549	--	4.86	3.74	--	3.13	.00	5.50	--	--	--	--	566	.77	89,715	43	2.40	844	7.1
Aug. 21-31.....	94,953	--	5.20	3.83	--	3.38	.00	5.66	--	--	--	--	613	.83	79,160	42	2.37	887	7.3
Sept. 1-8.....	40,019	--	5.00	3.92	--	3.13	.00	5.81	--	--	--	--	584	.79	31,784	44	2.48	855	7.8
Sept. 9-20.....	58,124	--	5.68	4.70	--	3.41	.00	6.91	--	--	--	--	680	.92	53,753	45	2.79	980	7.8
Sept. 21-30.....	79,934	--	6.44	5.00	--	3.67	.00	7.56	--	--	--	--	741	1.01	80,554	44	2.79	1,060	7.7
Total or weighted average	a5,511,000	--	4.67	2.63	--	3.12	0.00	--	--	--	--	--	470	0.64	3,521,000	32	1.68	670	7.3

a Represents 100 percent of runoff for water year.

YELLOWSTONE RIVER BASIN--Continued

6-2947. BIGHORN RIVER AT BIGHORN, MONT.

LOCATION.--At gaging station at bridge on U.S. Highway 10, 0.8 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 1960.
Water temperatures: April 1949 to September 1951, August 1952 to September 1960.
Sediment records: July 1947 to September 1954, October 1955 to September 1958.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,550 micromhos Sept. 6, 8; minimum daily, 540 micromhos Mar. 11.
Percent sodium: Maximum, 47 July 26 to Aug. 17, Sept. 11-17; minimum, 35 Mar. 9-21.
EXTREMES, 1951-60.--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.--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 1959 to September 1960 given in WSP 1709.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-19, 1959.	112,945	--	7.40		5.00	--	3.70	0.00	--	--	--	--	--	810	1.10	124,420	40	2.60	1,120	7.4
Oct. 20-31.....	72,167	--	7.08		4.70	--	3.72	.00	--	--	--	--	--	769	1.05	75,475	40	2.50	1,080	7.4
Nov. 1-14.....	70,338	--	7.74		4.92	--	4.13	.00	--	--	--	--	--	822	1.12	78,632	39	2.50	1,130	7.8
Nov. 22-30.....	62,961	--	7.80		5.05	--	4.20	.00	--	--	--	--	--	836	1.14	71,585	39	2.56	1,150	7.8
Dec. 1-10.....	60,238	--	7.72		4.79	--	4.21	.00	--	--	--	--	--	804	1.09	65,867	38	2.44	1,120	7.9
Dec. 11-20.....	48,555	12	5.09	2.63	4.61	0.10	4.18	.00	7.99	0.42	0.02	0.02	0.16	794	1.08	52,432	37	2.35	1,160	7.7
Dec. 21-31.....	57,033	--	7.56		4.48	--	4.21	.00	--	--	--	--	--	777	1.06	60,268	37	2.30	1,080	7.6
Mar. 9-21, 1960.	83,002	--	5.58		3.05	--	3.11	.00	--	--	--	--	--	559	.76	63,102	35	1.82	813	7.2
Mar. 22-24.....	36,714	--	6.32		3.61	--	3.74	.00	--	--	--	--	--	649	.88	32,405	36	2.03	922	7.6
Mar. 25-Apr. 2..	59,052	--	7.48		4.48	--	3.74	.00	--	--	--	--	--	793	1.08	63,686	37	2.32	1,100	7.6
Apr. 3-20.....	74,975	--	7.44		5.31	--	4.00	.00	--	--	--	--	--	917	1.25	93,503	39	2.58	1,240	7.8
Apr. 21-May 16..	91,228	--	7.88		5.26	--	3.65	.00	9.20	--	--	--	--	872	1.19	108,169	40	2.65	1,190	7.2
May 17-31.....	45,402	--	6.76		4.48	--	3.11	.00	7.77	--	--	--	--	746	1.01	46,063	40	2.44	1,040	7.0
June 1-11.....	42,415	--	7.08		4.92	--	3.31	.00	8.41	--	--	--	--	789	1.07	45,513	41	2.61	1,080	8.0
June 12-15.....	44,985	17	5.49	2.63	4.96	.18	3.64	.00	9.33	.37	.02	.04	.16	873	1.19	53,410	37	2.46	1,170	8.2

June 16-25, 1960.	64,106	--	6.68	4.13	--	3.34	.00	7.31	--	--	--	--	718	.98	62,598	36	2.26	1,000	7.6
June 26-July 5...	22,433	--	7.48	5.35	--	3.25	.00	9.29	--	--	--	--	852	1.16	25,994	42	2.77	1,170	7.5
July 6-25.....	24,278	--	8.76	7.26	--	3.20	.00	12.62	--	--	--	--	1,110	1.51	36,650	45	3.47	1,460	7.4
July 26-Aug. 17..	45,529	--	8.14	7.09	--	3.26	.00	12.01	--	--	--	--	1,050	1.43	65,015	47	3.51	1,430	7.5
Aug. 18-31.....	46,651	--	8.20	6.48	--	3.72	.00	10.89	--	--	--	--	1,010	1.37	64,080	44	3.20	1,370	7.1
Sept. 1-10.....	19,021	8.9	5.19 3.62	7.44	.13	3.38	.00	12.58	.59	.03	.00	.25	1,110	1.51	28,715	45	3.54	1,490	7.7
Sept. 11-17.....	17,536	--	8.66	7.31	--	3.67	.00	12.05	--	--	--	--	1,070	1.46	25,518	46	3.51	1,440	7.9
Sept. 18-30.....	60,286	--	8.62	6.79	--	4.05	.00	10.81	--	--	--	--	1,010	1.37	82,808	44	3.27	1,360	7.7
Total or weighted average	a1,614,000	--	7.54	5.05	--	3.72	--	--	--	--	--	--	831	1.13	1,427,000	40	2.58	1,150	7.5

a Runoff based on 366 days; runoff for 291 days of actual flow, 1,262,000 acre-feet.

YELLOWSTONE RIVER BASIN--Continued

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 1960.
Water temperatures: April 1949 to September 1960.
Sediment records: June 1946 to September 1951.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,730 micromhos July 22; minimum daily, 361 micromhos Mar. 20.
Percent sodium: Maximum, 56 Sept. 16-30; minimum, 23 Jan. 16-31, Feb. 1-22.
EXTREMES, 1951-60.--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.--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 1959 to September 1960 given in WSP 1709.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-9, 1959..	2,178	--	6.38		2.74	--	4.23	0.00	--	--	--	--	--	560	0.76	1,659	30	1.53	835	7.5
Oct. 10-31.....	4,844	--	7.40		3.31	--	4.85	.00	--	--	--	--	--	642	.87	4,229	31	1.72	944	7.6
Nov. 1-11.....	3,971	--	7.72		2.87	--	4.95	.00	--	--	--	--	--	643	.87	3,472	27	1.46	931	7.6
Nov. 12-22.....	2,989	8.8	4.69	5.10	3.83	0.16	6.56	.00	7.25	0.14	0.02	0.00	0.19	818	1.11	3,325	28	1.73	1,160	8.0
Nov. 23-30.....	2,983	--	7.34		2.70	--	4.85	.00	--	--	--	--	--	607	.83	2,463	27	1.41	889	7.8
Dec. 1-15.....	6,218	--	8.26		2.70	--	5.44	.00	--	--	--	--	--	663	.90	5,607	25	1.33	955	7.8
Dec. 16-31.....	6,696	--	8.86		2.78	--	5.85	.00	--	--	--	--	--	701	.95	6,384	24	1.32	1,000	7.7
Jan. 1-15, 1960.	5,623	--	9.52		3.00	--	6.21	.00	--	--	--	--	--	747	1.02	5,713	24	1.38	1,070	7.6
Jan. 16-31.....	6,188	--	9.80		3.00	--	6.46	.00	--	--	--	--	--	764	1.04	6,430	23	1.36	1,090	7.6
Feb. 1-22.....	8,771	--	8.28		2.52	--	5.54	.00	--	--	--	--	--	638	.87	7,610	23	1.24	943	7.3
Feb. 23-Mar. 18.	8,777	--	7.58		2.57	--	5.08	.00	--	--	--	--	--	615	.84	7,341	25	1.32	896	7.6
Mar. 19-24.....	35,631	10	2.05	.99	1.17	.16	2.92	.00	1.29	.00	.02	.05	.07	266	.36	12,890	27	.95	410	7.1
Mar. 25-Apr. 13.	19,160	--	6.26		2.31	--	4.23	.00	--	--	--	--	--	520	.71	13,550	27	1.30	786	7.5
Apr. 14-28.....	11,246	--	6.34		2.31	--	4.13	.00	--	--	--	--	--	524	.71	8,015	27	1.29	788	7.4
Apr. 29-May 9...	4,429	--	7.16		3.09	--	4.72	.00	--	--	--	--	--	629	.86	3,789	30	1.63	931	7.6

May 10-15, 1960.	476	--	7.46	3.70	--	5.02	.00	6.25	--	--	--	--	684	.93	443	33	1.91	1,000	7.5
May 16-24.....	139	9.5	4.04 | 4.52	6.39	.21	6.65	.00	8.41	.18	.02	.00	.25	930	1.26	176	42	3.09	1,330	7.7
May 25-June 4...	1,115	--	6.64	4.48	--	5.08	.00	6.06	--	--	--	--	687	.93	1,042	40	2.46	1,000	7.3
June 5-16.....	533	--	6.80	5.22	--	5.70	.00	6.33	--	--	--	--	736	1.00	534	43	2.83	1,110	7.4
June 17-26.....	2,003	--	5.10	4.31	--	4.49	.00	4.93	--	--	--	--	589	.80	1,605	46	2.70	877	7.6
June 27-July 13.	337	--	7.88	7.66	--	7.05	.00	8.89	--	--	--	--	987	1.34	453	49	3.86	1,410	7.4
July 14-24.....	140	--	7.84	8.74	--	7.51	.00	9.89	--	--	--	--	1,080	1.47	205	53	4.42	1,520	7.7
July 25-Aug. 12.	1,172	--	6.50	4.22	--	5.21	.00	5.70	--	--	--	--	662	.90	1,055	39	2.34	994	7.1
Aug. 13-31.....	309	--	7.84	7.96	--	7.20	.00	9.31	--	--	--	--	1,010	1.37	424	50	4.02	1,460	7.4
Sept. 1-15.....	161	--	7.86	9.79	--	7.64	.00	10.29	--	--	--	--	1,100	1.50	240	55	4.94	1,550	8.2
Sept. 16-30.....	158	13	3.19 | 4.77	10.27	.20	7.74	.00	10.26	.17	.02	.00	.37	1,130	1.54	242	56	5.14	1,580	8.1
Total or weighted average	a136,200	--	6.38	2.40	--	4.52	--	--	--	--	--	--	534	0.73	98,900	27	1.33	788	7.4

a Represents 100 percent of runoff for water year.

YELLOWSTONE RIVER BASIN--Continued

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.--Chsmical analyses: December 1949 to September 1960.
Water tsmperatures: February 1951 to September 1960.
Sedimsnt records: March 1950 to September 1953.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 3,040 micromhos Nov. 14; minimum daily, 477 micromhos Mar. 19.
Percent sodium: Maximum, 51 July 23-26, 28-31, Aug. 15, Aug. 16-31; minimum, 31 Mar. 23-25.
EXTREMES, 1951-60.--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 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 1959 to September 1960 given in WSP 1709.

Chemical analyses, water year October 1959 to September 1960

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. 1-18, 1959.	1,792	--	13.62		11.70	--	4.29	0.00	--	--	--	--	--	1,750	2.38	4,266	46	4.48	2,170	7.4
Oct. 19-31.....	2,455	--	13.44		9.05	--	4.23	.00	--	--	--	--	--	1,520	2.07	5,074	40	3.49	1,900	7.4
Nov. 1-7.....	1,365	--	15.44		10.66	--	5.06	.00	--	--	--	--	--	1,780	2.42	3,304	41	3.84	2,150	7.9
Nov. 8-18.....	2,225	13	12.48	8.88	16.14	0.25	7.20	.00	28.52	2.12	0.02	0.05	0.24	2,550	3.47	7,718	43	4.94	3,000	8.0
Nov. 19-30.....	2,904	--	12.96		10.27	--	5.49	.00	--	--	--	--	--	1,560	2.12	6,161	44	4.03	1,980	7.9
Dec. 1-10.....	3,769	--	14.68		8.18	--	5.31	.00	--	--	--	--	--	1,520	2.07	7,790	36	3.02	1,890	7.8
Dec. 11-22.....	4,165	--	14.40		8.27	--	5.43	.00	--	--	--	--	--	1,500	2.04	8,497	36	3.08	1,880	7.8
Dec. 23-31.....	2,374	--	15.70		9.16	--	6.00	.00	--	--	--	--	--	1,640	2.23	5,295	37	3.28	2,020	7.8
Jan. 1-18, 1960.	3,963	--	16.48		9.96	--	6.34	.00	--	--	--	--	--	1,750	2.38	9,432	38	3.47	2,160	8.0
Jan. 19-31.....	2,411	--	16.56		9.66	--	6.52	.00	--	--	--	--	--	1,730	2.35	5,672	37	3.36	2,130	8.0
Feb. 1-10.....	3,273	--	14.06		8.35	--	5.38	.00	--	--	--	--	--	1,500	2.04	6,676	37	3.15	1,880	7.4
Feb. 11-29.....	5,917	--	13.50		7.57	--	4.97	.00	--	--	--	--	--	1,420	1.93	11,426	36	2.91	1,780	7.4
Mar. 1-14.....	6,526	--	15.30		8.83	--	5.74	.00	--	--	--	--	--	1,640	2.23	14,555	37	3.19	2,040	7.9
Mar. 15-18.....	7,736	--	6.62		3.18	--	2.67	.00	--	--	--	--	--	660	.90	6,943	32	1.75	925	7.3
Mar. 19.....	7,934	--	3.16		1.65	--	2.25	.00	--	--	--	--	--	322	.44	3,474	34	1.32	487	7.5

Mar. 20-22, 1960	68,251	8.3	3.54 1.23	2.31	.16	3.00	.00	3.81	.17	.02	.06	.07	458	.62	42,512	32	1.49	676	7.4
Mar. 23-25.....	22,867	--	6.54	3.00	--	2.88	.00	--	--	--	--	--	634	.86	19,717	31	1.66	899	7.5
Mar. 26-Apr. 2..	18,613	--	9.30	5.74	--	3.41	.00	--	--	--	--	--	1,030	1.40	26,073	38	2.66	1,360	7.4
Apr. 3-25.....	22,810	--	11.62	7.70	--	4.08	.00	--	--	--	--	--	1,320	1.80	40,948	40	3.19	1,700	7.6
Apr. 26-May 9...	7,831	--	12.10	8.70	--	4.05	.00	--	--	--	--	--	1,420	1.93	15,123	42	3.54	1,820	7.6
May 10-31.....	4,975	--	12.76	11.27	--	4.20	.00	--	--	--	--	--	1,670	2.27	11,298	47	4.46	2,140	7.8
June 1-13.....	1,214	13	7.78 5.18	12.79	.25	4.10	.00	21.03	1.61	.02	.01	.16	1,810	2.46	2,990	49	5.02	2,260	7.9
June 14-23.....	8,549	--	16.60	7.87	--	3.87	.00	19.67	--	--	--	--	1,700	2.31	19,765	32	2.73	1,990	7.3
June 24-July 11.	3,820	--	16.94	12.09	--	4.20	.00	23.32	--	--	--	--	2,000	2.72	10,391	42	4.16	2,430	7.1
July 12-22.....	430	--	16.36	15.05	--	4.36	.00	26.65	--	--	--	--	2,230	3.03	1,304	48	5.26	2,710	7.5
July 23-26, 28-Aug. 15....	169	--	15.18	15.49	--	4.20	.00	26.44	--	--	--	--	2,220	3.02	510	50	5.62	2,740	7.3
Aug. 16-31.....	32	11	9.13 6.50	16.31	.28	4.49	.00	27.07	1.64	.03	.00	.29	2,320	3.16	100	51	5.84	2,790	7.6
Sept.1-20, 28-30	9	--	15.34	14.96	--	4.28	.00	24.78	--	--	--	--	2,080	2.83	26	49	5.40	2,560	8.0
Total or weighted average	a218,300	--	9.28	5.57	--	3.74	0.00	--	--	--	--	--	1,000	1.36	296,700	38	2.60	1,300	--

a Represents 100 percent of runoff.

JAMES RIVER BASIN

6-4760. JAMES RIVER AT HURON, S. DAK.
(Formerly published as James River upstream from diversion, at Huron, S. Dak.)

LOCATION.--Just upstream from Chicago and North Western Railway Co. 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: April 1950 to September 1951, August 1956 to September 1960.
Water temperatures: August 1956 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,460 micromhos Mar. 16-18, 25; minimum daily, 176 micromhos Mar. 30, Apr. 2.
Percent sodium: Maximum, 54 Oct. 1-31; minimum, 24 Mar. 29-31.
EXTREMES, 1956-60.--Specific conductance: Maximum daily, 2,640 micromhos Mar. 1, 1959; minimum daily, 176 micromhos Mar. 30, Apr. 2, 1960.
Percent sodium: Maximum, 62 Sept. 22-30, 1959; minimum, 24 Mar. 29-31, 1960.
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. During some periods, all flow is diverted from the channel near the sampling site and, therefore, does not pass the gaging station. Records of discharge for water year October 1959 to September 1960 given in WSP 1709. No flow October to March, Sept. 20, 27, 30.

Chemical analyses, water year October 1959 to September 1960

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. 1-31,1959 a	--	--	6.88		9.14	--	4.34		9.99	2.68	--	--	0.72	1,100	1.50	--	54	4.9	1,600	7.1
Nov. 1-30 a	--	--	8.02		8.61	--	4.88		10.29	2.59	--	--	.71	1,120	1.52	--	49	4.3	1,610	7.4
Dec. 1-31 a	--	17	4.19	4.77	8.48	0.43	5.13		10.06	2.65	0.02	0.07	.96	1,170	1.59	--	47	4.0	1,670	7.1
Jan. 1-16,1960 a	--	--	9.14		8.70	--	5.03		10.58	2.68	--	--	.66	1,180	1.60	--	47	4.1	1,670	7.1
Jan. 17-24 a	--	--	10.20		9.44	--	5.26		11.47	2.90	--	--	.81	1,290	1.75	--	48	4.2	1,790	7.1
Jan. 25-31 a	--	--	11.10		10.05	--	5.65		12.85	3.21	--	--	.79	1,420	1.93	--	46	4.3	1,950	7.0
Feb. 1-29 a	--	--	11.98		10.79	--	6.08		13.64	3.53	--	--	.82	1,500	2.04	--	46	4.4	2,050	7.2
Mar. 1-27 a	--	--	12.74		12.35	--	6.88		14.32	4.26	--	--	.82	1,680	2.28	--	49	4.9	2,310	7.3
Mar. 28	793	--	13.02		11.31	--	8.16		12.76	4.09	--	--	.55	1,560	2.12	1,660	45	4.4	2,160	7.6
Mar. 29-31	17,750	7.2	1.10	.70	.65	.23	1.41		.92	.23	.00	.12	.15	172	.23	4,060	24	.7	282	7.2
Apr. 1-4	35,350	--	1.26		.87	--	1.12		.83	.31	--	--	.12	161	.22	7,780	39	1.1	263	7.1
Apr. 5-7	34,450	7.0	.85	.51	.61	.17	1.15		.75	.16	.01	.10	.07	147	.20	6,890	28	.7	236	7.0
Apr. 8-14	51,030	--	1.62		.78	--	1.28		1.10	.22	--	--	.13	180	.24	12,250	30	.9	282	6.9
Apr. 15-18	14,940	--	2.32		1.31	--	1.61		1.87	.37	--	--	.17	259	.35	5,230	34	1.2	403	7.2
Apr. 19-20	4,860	--	2.74		1.91	--	1.88		2.56	.56	--	--	.21	333	.45	2,190	38	1.6	510	7.4

Apr. 21-30, 1960	16,100	10	1.75	1.31	2.18	.33	2.15	2.64	.73	.01	.03	.27	375	.51	8,210	39	1.8	560	7.2
May 1-16.....	17,400	--	3.26		2.04	--	2.61	2.33	.73	--	--	.19	369	.50	8,700	36	1.6	565	7.3
May 17-31.....	12,320	--	3.76		2.57	--	3.31	2.37	.93	--	--	.21	436	.60	7,390	39	1.9	652	7.3
June 1-26.....	8,670	--	4.16		2.78	--	3.87	2.42	.96	--	--	.24	452	.61	5,290	38	1.9	701	7.4
June 27-July 13.	3,630	--	5.00		3.26	--	4.57	2.91	1.13	--	--	.30	527	.72	2,610	38	2.1	600	7.3
July 14-31.....	1,990	--	6.00		4.13	--	.5.20	3.60	1.75	--	--	.35	646	.88	1,750	39	2.4	994	7.4
Aug. 1-31.....	2,010	7.1	3.29	2.45	4.26	.46	5.21	3.60	1.69	.02	.00	.35	622	.85	1,710	41	2.5	979	7.4
Sept. 1-30.....	461	--	5.92		4.18	--	5.43	3.60	1.58	--	--	.41	641	.67	401	39	2.4	988	7.4
Total or weighted average	221,600	--	2.24		1.34	--	1.82	1.52	0.45	--	--	0.16	254	0.34	76,160	37	1.3	394	--

a Not included in total or weighted average.

PLATTE RIVER BASIN

6-7660. PLATTE RIVER AT BRADY, NEBR.

LOCATION.--At gaging stations at highway bridges, 0.5 mile and 2.5 miles south of Brady, Lincoln County, and 18 miles downstream from confluence of North and South Platte Rivers.
DRAINAGE AREA.--56,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: November 1950 to September 1960.
Water temperatures: March 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,030 micromhos June 11 (chan. 1); minimum daily, 327 micromhos June 21 (chan. 4).
Percent sodium: Maximum, 43 Aug. 1-12; minimum, 27 June 21.
EXTREMES, 1951-60.--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.--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 1959 to September 1960 given in WSP 1710.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	10,207	--	4.24		2.31	--	3.59	0.00	--	--	--	--	--	437	0.59	6,066	35	1.58	650	7.3
Nov. 1-30.....	13,924	--	4.28		2.22	--	3.61	.00	--	--	--	--	--	444	.60	8,408	34	1.52	655	7.6
Dec. 1-21.....	9,414	34	3.34	1.07	2.26	0.24	3.62	.00	2.94	0.45	0.02	0.04	0.09	454	.62	5,812	33	1.52	664	7.7
Dec. 22-Jan. 1, 1960..	4,429	--	4.38		2.09	--	3.67	.00	--	--	--	--	--	448	.61	2,699	32	1.41	653	7.6
Jan. 2-5.....	2,325	--	4.90		2.57	--	3.93	.00	--	--	--	--	--	508	.69	1,606	34	1.64	723	7.6
Jan. 6-14.....	4,838	--	4.12		1.83	--	3.49	.00	--	--	--	--	--	409	.56	2,691	31	1.27	599	7.5
Jan. 15-24.....	7,260	--	4.60		2.39	--	3.74	.00	--	--	--	--	--	480	.65	4,739	34	1.58	689	7.4
Jan. 25-31.....	5,429	--	4.02		1.87	--	3.44	.00	--	--	--	--	--	406	.55	2,998	32	1.32	593	7.6
Feb. 1-10.....	8,509	--	4.00		1.83	--	3.34	.00	--	--	--	--	--	401	.55	4,641	31	1.29	586	7.4
Feb. 11-29.....	11,683	--	4.42		2.00	--	3.70	.00	--	--	--	--	--	439	.60	6,975	31	1.35	638	7.5
Mar. 1-20.....	15,114	--	4.14		1.91	--	3.43	.00	--	--	--	--	--	420	.57	8,633	32	1.33	612	7.6
Mar. 21-23.....	10,711	22	2.54	1.23	1.65	.23	6.06	.00	2.52	.42	.02	.04	.10	370	.50	5,390	29	1.20	552	7.5
Mar. 24-31.....	13,234	--	4.36		2.04	--	3.46	.00	--	--	--	--	--	431	.59	7,757	32	1.38	633	7.1
Apr. 1-30.....	17,375	--	5.14		2.52	--	3.67	.00	--	--	--	--	--	514	.70	12,146	33	1.57	754	7.8
May 1-31.....	15,987	--	5.30		2.70	--	3.52	.00	--	--	--	--	--	542	.74	11,784	34	1.66	786	7.8

June 1-20, 1960.	7,736	--	5.00	2.44	--	3.41	.00	--	--	--	--	--	506	.69	5,323	33	1.54	735	7.7
June 21.....	988	27	1.90 | 0.76	1.09	.25	2.36	.00	1.42	.19	.02	.03	.10	270	.37	363	27	.94	401	7.7
June 22-30.....	3,909	--	5.12	2.57	--	3.57	.00	--	--	--	--	--	520	.71	2,765	33	1.60	752	7.7
July 1-19.....	5,691	--	4.72	2.18	--	3.43	.00	--	--	--	--	--	483	.66	3,738	32	1.42	697	7.2
July 20-31.....	21,540	--	4.18	3.00	--	3.84	.00	--	--	--	--	--	479	.65	14,032	42	2.08	713	7.1
Aug. 1-12.....	30,038	--	3.90	3.00	--	3.90	.00	--	--	--	--	--	455	.62	18,587	43	2.15	685	7.4
Aug. 13-31.....	18,730	--	3.90	2.78	--	3.74	.00	--	--	--	--	--	446	.61	11,361	42	1.99	671	7.1
Sept. 1-30.....	6,307	30	2.89 | 1.15	2.61	.28	3.67	.00	3.00	.51	.03	.01	.12	451	.61	3,869	38	1.84	669	7.7
Total or weighted average	a245,400	--	4.34	2.41	--	3.74	0.00	--	--	--	--	--	457	0.62	152,400	36	1.64	673	7.4

a Represents 100 percent of runoff.

PLATTE RIVER BASIN--Continued

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 1960.
Water temperatures: March 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,210 micromhos June 2; minimum daily, 555 micromhos Feb. 14.
Percent sodium: Maximum, 45 Aug. 1-31; minimum, 34 Mar. 21-23.
EXTREMES, 1951-60.--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.--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 1959 to September 1960 given in reports of State Engineers.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	72,125	--	3.84		2.70	--	3.46	0.00	--	--	--	--	--	432	0.59	42,375	41	1.95	654	7.3
Nov. 1-30.....	65,931	--	4.32		2.76	--	3.46	.00	--	--	--	--	--	469	.64	42,053	39	1.89	704	7.3
Dec. 1-21.....	43,777	29	3.14	1.23	2.74	0.26	3.51	.00	3.41	0.56	0.02	0.02	0.12	480	.65	28,576	37	1.85	709	7.6
Dec. 22-Jan. 1, 1960..	22,124	--	4.96		2.96	--	3.67	.00	--	--	--	--	--	541	.74	16,278	37	1.86	764	7.4
Jan. 2-5.....	6,196	--	4.76		2.87	--	3.21	.00	--	--	--	--	--	523	.71	4,407	38	1.86	759	7.7
Jan. 6-14.....	19,940	--	5.08		3.13	--	3.52	.00	--	--	--	--	--	562	.76	15,240	38	1.97	614	7.5
Jan. 15-24.....	22,354	--	5.88		3.65	--	3.98	.00	--	--	--	--	--	645	.68	19,609	38	2.13	933	7.5
Jan. 25-31.....	16,411	--	5.66		3.48	--	3.95	.00	--	--	--	--	--	612	.63	15,323	36	2.07	869	7.6
Feb. 1-10.....	23,901	--	4.62		2.57	--	3.56	.00	--	--	--	--	--	469	.67	15,895	36	1.69	716	7.6
Feb. 11-29.....	38,628	--	5.52		3.18	--	3.87	.00	--	--	--	--	--	597	.81	31,363	37	1.91	854	7.6
Mar. 1-20.....	46,612	--	6.06		3.44	--	3.90	.00	--	--	--	--	--	638	.87	40,444	36	1.97	909	7.6
Mar. 21-23.....	10,354	23	4.14	2.22	3.35	.28	3.54	.00	5.73	.79	.03	.05	.16	650	.88	9,153	34	1.68	933	7.6
Mar. 24-31.....	26,943	--	6.06		3.26	--	3.77	.00	--	--	--	--	--	622	.85	22,792	35	1.87	692	7.5
Apr. 1-30.....	83,246	--	5.92		3.26	--	3.59	.00	--	--	--	--	--	618	.84	69,967	36	1.90	890	7.6
May 1-31.....	71,940	--	6.24		3.44	--	3.33	.00	--	--	--	--	--	654	.89	63,987	36	1.95	935	7.7

June 1-20.....	48,793	--	6.82	4.13	--	3.20	.00	--	--	--	--	--	734	1.00	48,708	38	2.24	1,040	7.7
June 21.....	2,142	26	3.49 1.73	3.09	.25	3.05	.00	4.68	.68	.03	.00	.11	558	.76	1,626	36	1.91	806	7.6
June 22-30.....	19,119	--	6.80	4.18	--	3.16	.00	--	--	--	--	--	738	1.00	19,189	38	2.26	1,040	7.7
July 1-19.....	48,502	--	5.42	3.57	--	3.26	.00	--	--	--	--	--	613	.83	40,435	40	2.17	898	7.2
July 20-31.....	47,722	--	4.36	3.46	--	3.44	.00	--	--	--	--	--	523	.71	33,944	44	2.36	797	7.2
Aug. 1-12.....	49,246	--	3.96	3.26	--	3.57	.00	--	--	--	--	--	472	.64	31,612	45	2.32	723	7.1
Aug. 13-31.....	75,372	--	3.94	3.16	--	3.47	.00	--	--	--	--	--	454	.62	46,538	45	2.26	702	7.3
Sept. 1-30.....	90,327	15	2.50 1.32	3.16	.26	3.57	.00	3.27	.56	.02	.02	.16	450	.61	55,260	44	2.30	692	7.5
Total or weighted average	a953,700	--	5.02	3.24	--	3.53	0.00	--	--	--	--	--	551	0.75	714,800	--	2.06	810	7.4

a Represents 100 percent of runoff.

PLATTE RIVER BASIN--Continued

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

LOCATION.--At gaging station at bridge on State Highway 385, 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.--23,138 square miles (revised).
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1960.
Water temperatures: October 1945 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,130 micromhos Jan. 6; minimum daily, 1,290 micromhos Apr. 1, 2.
Percent sodium: Maximum, 37 May 1-20, May 30 to June 16, Aug. 1-31; minimum, 32 Jan. 1-22.
EXTREMES, 1945-60.--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 1959 to September 1960 given in WSP 1710.

Chemical analyses, water year October 1959 to September 1960

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. 1-31, 1959.	9,162	--	14.32		7.61	--	4.62	0.00	--	--	--	--	--	1,520	2.07	18,939	35	2.84	1,910	7.4
Nov. 1-13.....	3,094	--	14.50		7.57	--	4.88	.00	--	--	--	--	--	1,520	2.07	6,396	34	2.81	1,920	7.3
Nov. 14-30.....	8,329	--	15.28		8.09	--	5.41	.00	--	--	--	--	--	1,600	2.18	18,123	35	2.93	2,010	7.3
Dec. 1-31.....	17,278	30	10.53	4.94	8.53	0.46	5.64	.00	16.53	1.92	0.04	0.03	0.28	1,590	2.16	37,362	35	3.07	1,990	7.7
Jan. 1-22, 1960.	10,298	--	15.56		7.35	--	6.13	.00	--	--	--	--	--	1,620	2.20	22,689	32	2.64	2,010	7.1
Jan. 23-Feb. 5..	10,996	--	14.24		7.35	--	5.21	.00	--	--	--	--	--	1,470	2.00	21,984	34	2.76	1,850	7.4
Feb. 6-Mar. 5...	23,468	--	14.92		7.92	--	5.15	.00	--	--	--	--	--	1,560	2.12	49,791	35	2.90	1,950	7.5
Mar. 6-11.....	11,460	--	11.58		5.87	--	4.59	.00	--	--	--	--	--	1,170	1.59	18,236	34	2.44	1,530	7.5
Mar. 12-29.....	29,133	--	13.52		7.26	--	5.00	.00	--	--	--	--	--	1,410	1.92	55,866	35	2.79	1,790	7.7
Mar. 30-Apr. 8..	20,311	19	7.14	3.87	5.92	.25	4.16	.00	11.43	1.38	.05	.12	.21	1,140	1.55	31,490	34	2.52	1,490	7.4
Apr. 9-30.....	18,851	--	13.28		7.35	--	4.77	.00	--	--	--	--	--	1,390	1.89	35,636	36	2.85	1,770	7.9
May 1-20.....	7,656	--	12.68		7.57	--	4.31	.00	--	--	--	--	--	1,360	1.85	14,161	37	3.01	1,750	7.7
May 21-29.....	10,229	--	10.86		6.09	--	4.02	.00	--	--	--	--	--	1,140	1.55	15,859	36	2.61	1,500	7.5
May 30-June 16..	11,603	--	13.20		7.79	--	4.47	.00	--	--	--	--	--	1,450	1.97	22,882	37	3.03	1,820	7.6
June 17-23.....	4,443	22	7.53	4.03	6.39	.33	4.18	.00	12.51	1.47	.04	.05	.24	1,230	1.67	7,432	35	2.66	1,590	7.7
June 24-30.....	1,694	--	13.20		7.44	--	4.43	.00	--	--	--	--	--	1,410	1.92	3,248	36	2.90	1,800	7.1
July 1-31.....	2,576	--	13.34		7.66	--	4.13	.00	--	--	--	--	--	1,430	1.94	5,010	36	2.96	1,810	7.2
Aug. 1-31.....	1,015	--	12.60		7.26	--	3.29	.00	--	--	--	--	--	1,410	1.92	1,945	37	2.89	1,790	7.3
Sept. 1-30.....	958	30	9.13	4.52	7.40	.46	3.95	.00	15.43	1.95	.03	.02	.23	1,440	1.96	1,876	34	2.83	1,820	7.5
Total or weighted average	a202,600	--	13.49		7.28	--	4.86	0.00	--	--	--	--	--	1,410	1.92	388,900	35	2.80	1,790	7.5

a Represents 100 percent of runoff.

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

LOCATION (revised).--At gaging station 1.1 miles upstream from Caddoa Creek, 1.7 miles downstream from John Martin Dam, Bent County, and 2.9 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 1960 (daily samples).
Water temperatures: January 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 4,800 micromhos Feb. 3, 10; minimum daily, 643 micromhos July 6.
Percent sodium: Maximum, 42 Nov. 1-2; minimum, 28 July 14-16, 18-22.
EXTREMES, 1951-60.--Specific conductance: Maximum daily, 5,180 micromhos Apr. 21, 1955; minimum daily, 643 micromhos July 6, 1960.
Percent sodium: Maximum, 42 Feb. 1-10, 1954, July 13, 1956, Nov. 1-2, 1959; minimum, 23 July 1-10, 1955.
RECORDS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1711.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-2, 5-13, 1959.....	3,100	--	10.18	6.42	10.05	--	2.75		--	--	--	--	--	1,870	2.54	7,870	38	3.5	2,240	7.9
Oct. 3-4.....	339	--	14.72	10.68	17.01	--	2.82		--	--	--	--	--	2,980	4.05	1,370	40	4.8	3,380	7.6
Oct. 14-31.....	2,520	10	12.72	8.88	15.01	0.18	2.03		32.06	2.71	0.04	0.03	0.40	2,590	3.52	8,870	41	4.6	2,980	7.5
Nov. 1-2.....	19	--	14.72	11.48	18.88	--	2.88		--	--	--	--	--	3,130	4.26	81	42	5.2	3,550	7.8
Nov. 3-30.....	192	--	20.86	13.54	23.14	--	5.02		--	--	--	--	--	3,970	5.40	1,040	40	5.6	4,260	7.5
Dec. 1-31.....	180	--	20.21	13.59	21.53	--	5.79		--	--	--	--	--	3,880	5.28	950	39	5.2	4,180	7.5
Jan. 1-18, 1960.	101	22	18.71	13.49	20.88	.20	6.64		42.89	3.78	.04	.04	.46	3,660	4.98	503	39	5.2	3,980	7.7
Jan. 19-25.....	39	--	21.86	14.74	23.84	--	6.95		--	--	--	--	--	4,140	5.63	220	39	5.6	4,450	7.4
Jan. 26-31.....	33	--	17.37	13.83	19.58	--	7.06		--	--	--	--	--	3,470	4.72	156	39	5.0	3,810	7.7
Feb. 1-27.....	179	--	21.21	12.79	23.23	--	5.59		--	--	--	--	--	3,960	5.39	965	41	5.6	4,260	7.6
Feb. 28-Mar. 31.	227	--	15.47	12.93	16.53	--	8.38		--	--	--	--	--	3,050	4.15	942	37	4.4	3,430	7.5
Apr. 1-4, 7-30..	8,090	16	13.97	10.23	13.48	.19	5.82		29.56	2.34	.04	.05	.24	2,570	3.50	28,320	36	3.9	2,920	7.6
Apr. 5-6.....	16	--	20.96	12.64	22.45	--	5.31		--	--	--	--	--	3,830	5.21	83	40	5.5	4,170	7.6
May 1-28.....	51,060	--	13.47	8.33	12.05	--	3.41		--	--	--	--	--	2,330	3.17	161,900	36	3.6	2,700	7.8
May 29-June 1...	1,010	--	17.76	11.44	17.49	--	3.54		--	--	--	--	--	3,180	4.32	4,360	37	4.6	3,660	7.5

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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 2-5, 1960..	2,240	--	11.93	6.27	9.70	--	3.74		--	--	--	--	--	1,970	2.68	6,000	35	3.2	2,310	7.6
June 6-8.....	2,560	--	9.28	5.32	8.13	--	3.06		--	--	--	--	--	1,510	2.05	5,250	36	3.0	1,920	7.6
June 9-14.....	4,770	--	7.04	3.86	4.96	--	3.06		--	--	--	--	--	1,060	1.44	6,870	31	2.1	1,410	7.7
June 15.....	720	--	13.77	6.23	11.92	--	3.64		--	--	--	--	--	2,320	3.16	2,280	37	3.8	2,610	7.5
June 16-21.....	4,070	--	9.13	4.87	7.31	--	3.15		--	--	--	--	--	1,510	2.05	8,340	34	2.8	1,820	7.5
June 22-30.....	6,750	--	7.48	4.22	5.79	--	2.98		--	--	--	--	--	1,140	1.55	10,460	33	2.4	1,530	7.6
July 1-2.....	1,800	--	8.03	4.47	6.35	--	2.87		--	--	--	--	--	1,340	1.82	3,280	34	2.5	1,650	7.5
July 3-5.....	3,330	--	6.69	3.51	4.70	--	2.90		--	--	--	--	--	1,020	1.39	4,630	32	2.1	1,330	7.6
July 6.....	2,440	--	3.24	1.24	2.13	--	2.23		--	--	--	--	--	470	.64	1,560	32	1.4	643	7.8
July 7.....	1,030	--	4.59	2.29	3.57	--	1.87		--	--	--	--	--	742	1.01	1,040	34	1.9	983	7.5
July 8-11.....	4,520	--	8.08	4.80	6.39	--	2.36		--	--	--	--	--	1,380	1.88	8,500	33	2.5	1,670	7.6
July 12-13.....	1,190	--	11.68	6.92	9.92	--	3.11		--	--	--	--	--	2,030	2.76	3,280	35	3.3	2,360	7.4
July 14-16.....	4,340	--	9.93	4.27	5.39	--	2.79		--	--	--	--	--	1,390	1.89	8,200	28	2.0	1,680	7.5
July 17.....	823	--	13.17	6.43	8.79	--	3.84		--	--	--	--	--	2,010	2.73	2,250	31	2.8	2,310	7.5
July 18-22.....	4,570	--	7.98	3.62	4.61	--	3.16		--	--	--	--	--	1,120	1.52	6,950	28	1.9	1,430	7.6
July 23-24.....	817	--	10.78	5.54	8.48	--	3.26		--	--	--	--	--	1,730	2.35	1,920	34	3.0	2,070	7.9
July 25-29.....	956	--	13.37	8.23	12.53	--	3.11		--	--	--	--	--	2,410	3.28	3,140	37	3.8	2,760	7.5
July 30-31.....	135	--	14.97	10.23	15.66	--	2.92		--	--	--	--	--	2,860	3.89	525	38	4.4	3,210	7.4
Aug. 1-9.....	327	--	18.36	9.64	19.14	--	2.82		--	--	--	--	--	3,400	4.62	1,510	41	5.1	3,800	7.4
Aug. 10-11.....	416	--	10.88	4.32	9.57	--	2.18		--	--	--	--	--	1,770	2.41	1,000	39	3.5	2,160	7.4
Aug. 12-15.....	321	--	15.77	8.03	14.27	--	2.70		--	--	--	--	--	2,780	3.78	1,210	37	4.1	3,120	7.6
Aug. 16-31.....	327	12	18.76	11.84	20.01	0.23	3.20		43.51	3.69	0.05	0.03	0.49	3,550	4.83	1,580	39	5.1	3,900	7.4
Sept. 1-10.....	221	--	19.36	11.44	21.10	--	3.28		--	--	--	--	--	3,690	5.02	1,110	41	5.4	4,020	7.6
Sept. 11-13.....	946	--	15.17	7.23	9.83	--	3.34		--	--	--	--	--	2,260	3.07	2,900	30	2.9	2,560	7.5
Sept. 14-23.....	585	--	16.57	9.23	14.27	--	3.41		--	--	--	--	--	2,830	3.85	2,250	36	4.0	3,170	7.7
Sept. 24-30.....	262	--	17.56	10.84	18.14	--	3.33		--	--	--	--	--	3,260	4.43	1,160	39	4.8	3,660	7.6
Total or weighted average	117,600	--	11.53	6.91	10.00	--	3.36		--	--	--	--	--	1,970	2.68	315,200	35	3.3	2,320	--

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

LOCATION.--At gaging station at bridge on U.S. Highway 166, 0.5 mile west of Arkansas City, Cowley County, and 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 1960.
Water temperatures: October 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 3,240 micromhos Sept. 24; minimum daily, 227 micromhos Aug. 28.
Percent sodium: Maximum, 71 Dec. 1-10; minimum, 27 Aug. 15.
EXTREMES, 1951-60.--Specific conductance: Maximum daily, 5,770 micromhos Jan. 16, 1957; minimum daily 227 micromhos Aug. 28, 1960.
Percent sodium: Maximum, 79 Apr. 28, 1955; minimum, 27 Aug. 15, 1960.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium. Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1959 to September 1960 given in WSP 1711.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959.	310,215	--	1.60	0.68	1.31		1.64	0.00	0.62	1.27	--	0.07	--	227	0.31	95,770	36	1.22	378	7.7
Oct. 11-13.....	39,689	--	2.50	.99	3.39		2.23	.00	1.39	3.24	--	.06	--	429	.58	23,156	49	2.57	733	7.8
Oct. 14-16.....	60,635	--	1.60	.90	1.78		1.64	.00	.98	1.58	--	.06	--	263	.36	21,688	42	1.59	447	7.6
Oct. 17-20.....	26,539	--	3.94	2.06	5.52		2.92	.00	2.31	6.21	--	.10	--	766	1.04	27,647	48	3.19	1,260	7.9
Oct. 21-31.....	39,055	--	5.74	3.29	10.01		4.03	.00	5.56	9.31	--	.10	--	1,190	1.62	63,206	53	4.71	1,900	8.0
Nov. 1-10.....	34,453	19	4.09	1.81	11.31	0.08	2.69	.00	2.29	12.13	0.02	.18	0.00	1,220	1.66	57,164	65	6.58	1,960	7.9
Nov. 11-20.....	26,202	--	6.89	3.29	13.05		4.46	.00	7.39	11.28	--	.13	--	1,430	1.94	50,957	56	5.79	2,230	7.8
Nov. 21-30.....	25,507	.0	6.29	3.29	10.27	.06	2.03	.00	2.66	14.67	.00	.06	.00	1,330	1.81	46,138	52	4.69	2,250	7.5
Dec. 1-10.....	22,175	8.8	4.79	1.48	15.23	.03	3.61	.00	3.39	14.11	.00	.13	.00	1,310	1.78	39,507	71	8.60	2,340	7.8
Dec. 11-31.....	53,232	9.6	4.59	1.65	14.36	.06	3.47	.00	4.31	12.69	.00	.10	.00	1,330	1.81	96,287	69	8.13	2,200	7.7
Jan. 1-10, 1960.	22,056	18	7.09	3.54	14.14	.28	4.06	.07	8.24	12.27	.03	.19	.31	1,530	2.08	45,895	56	6.13	2,390	8.3
Jan. 11-14.....	9,299	--	6.54	3.95	12.79		3.90	.27	7.75	11.28	--	.10	--	1,470	2.00	18,590	55	5.59	2,280	8.5
Jan. 15-20.....	23,599	--	5.14	2.80	9.05		3.31	.13	5.50	7.84	--	.16	--	1,040	1.41	33,379	53	4.54	1,680	8.3
Jan. 21-31.....	31,244	--	5.54	3.78	9.40		3.84	.13	5.23	9.37	--	.13	--	1,160	1.58	49,290	50	4.35	1,860	8.3
Feb. 1-4.....	17,359	--	5.39	2.80	10.44		3.44	.27	5.43	9.37	--	.13	--	1,150	1.56	27,150	56	5.16	1,870	8.4

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 5, 1960....	7,398	--	4.39	2.55	6.87		2.69	0.27	4.12	6.54	--	0.15	--	886	1.20	8,915	50	3.69	1,430	8.5
Feb. 6-10.....	53,355	--	3.09	1.65	4.74		2.39	.00	2.85	4.09	--	.10	--	584	.79	42,377	50	3.08	997	8.1
Feb. 11-20.....	54,883	--	5.19	3.21	8.48		3.64	.00	5.48	7.62	--	.13	--	1,040	1.41	77,626	50	4.14	1,700	7.9
Feb. 21-29.....	26,134	--	6.69	4.52	11.40		4.47	.00	6.72	11.23	--	.18	--	1,360	1.85	48,338	50	4.81	2,230	7.5
Mar. 1-10.....	31,914	22	6.64	2.96	11.92	0.23	4.52	.00	6.02	11.57	0.02	.23	0.31	1,360	1.85	59,028	55	5.44	2,170	8.2
Mar. 11-12.....	10,810	--	5.59	2.63	9.57		3.64	.27	5.62	8.04	--	.18	--	1,100	1.50	16,172	54	4.72	1,740	8.4
Mar. 13-20.....	88,764	--	3.89	1.89	5.74		2.66	.20	3.75	4.80	--	.16	--	708	.96	85,469	50	3.38	1,160	8.4
Mar. 21-23.....	49,287	--	3.29	1.48	5.26		2.43	.00	3.41	4.09	--	.11	--	626	.85	41,961	52	3.41	1,020	8.0
Mar. 24-31.....	212,311	--	2.30	.74	2.44		1.74	.20	1.64	1.81	--	.10	--	328	.45	94,708	45	1.98	567	8.4
Apr. 1.....	12,833	--	3.09	1.32	4.00		2.23	.00	3.21	2.96	--	.00	--	560	.76	9,774	48	2.70	838	7.8
Apr. 2-4.....	34,233	--	3.94	1.89	5.44		2.59	.00	4.54	4.01	--	.09	--	751	1.02	34,964	48	3.18	1,130	7.2
Apr. 5-10.....	44,664	--	5.34	2.47	8.35		3.51	.00	6.37	6.15	--	.11	--	1,060	1.44	64,387	52	4.23	1,560	8.2
Apr. 11-12.....	11,564	--	6.59	3.04	10.79		3.93	.00	8.31	8.04	--	.10	--	1,320	1.80	20,759	53	4.92	1,940	8.2
Apr. 13.....	5,474	--	3.84	1.73	5.92		2.75	.00	4.29	4.37	--	.12	--	751	1.02	5,591	52	3.55	1,160	8.2
Apr. 14-15.....	12,377	--	6.29	3.13	10.74		3.80	.13	8.20	7.90	--	.10	--	1,300	1.77	21,882	53	4.95	1,920	8.3
Apr. 16-20.....	37,408	--	4.89	2.39	7.48		3.38	.00	5.33	5.98	--	.08	--	974	1.32	49,552	51	3.92	1,470	8.2
Apr. 21-30.....	43,577	--	6.14	2.80	11.44		3.77	.00	7.64	8.89	--	.06	--	1,310	1.78	77,637	56	5.41	1,980	8.1
May 1-5.....	25,547	--	5.04	2.63	9.87		3.38	.33	5.62	8.18	--	.08	--	1,100	1.50	38,218	56	5.04	1,700	8.4
May 6.....	21,421	--	2.50	.99	3.31		2.39	.00	1.75	2.68	--	.00	--	420	.57	12,236	49	2.51	698	8.2
May 7-10.....	69,699	--	1.70	.62	2.39		1.61	.00	1.12	1.92	--	.05	--	297	.40	28,153	51	2.22	501	8.0
May 11-20.....	52,979	--	4.39	2.30	7.92		3.47	.13	4.02	6.91	--	.08	--	937	1.27	67,512	54	4.33	1,500	8.3
May 21-26.....	25,492	--	4.79	2.55	9.18		3.87	.00	4.41	8.18	--	.00	--	1,050	1.43	36,402	56	4.79	1,710	7.8
May 27-29.....	21,362	--	3.44	1.56	6.74		2.88	.00	2.83	6.07	--	.02	--	746	1.01	21,673	57	4.26	1,250	7.5
May 30-31.....	25,468	--	2.30	.99	3.87		2.10	.00	1.69	3.33	--	.02	--	447	.61	15,482	54	3.02	765	8.1
June 1-2.....	12,218	--	3.24	1.07	5.35		2.69	.00	2.33	4.65	--	.00	--	605	.82	10,053	55	3.64	980	7.0
June 3-10.....	30,625	--	4.34	1.65	8.05		3.34	.00	3.54	7.05	--	.06	--	850	1.16	35,402	57	4.65	1,420	8.0
June 11-20.....	82,314	--	2.79	.77	4.48		2.33	.00	1.64	4.01	--	.07	--	505	.69	56,533	56	3.35	847	8.2
June 21-27.....	54,010	--	2.94	1.07	4.61		2.23	.00	2.58	3.72	--	.06	--	527	.72	38,710	53	3.25	881	8.2
June 28-30.....	10,395	--	5.04	2.14	9.00		3.05	.27	5.31	7.48	--	.09	--	986	1.34	13,940	56	4.75	1,590	8.4
July 1-13.....	35,326	--	5.34	2.63	11.01		3.41	.13	5.89	9.53	--	.06	--	1,190	1.62	57,171	58	5.51	1,190	8.4

July 14-15, 1960	7,240	--	2.54	1.23	4.44		2.16	.00	2.17	3.89	--	.01	--	488	.66	4,805	54	3.23	848	7.7
July 16-20.....	13,527	--	3.89	1.97	8.66		2.82	.00	3.91	7.76	--	.06	--	890	1.21	16,373	60	5.05	1,480	7.1
July 21-24.....	12,758	--	3.74	1.73	8.92		2.69	.00	3.29	8.41	--	.03	--	870	1.18	15,095	62	5.39	1,470	8.1
July 25-27.....	8,212	--	1.90	.82	2.78		1.84	.00	1.19	2.48	--	.01	--	336	.46	3,752	51	2.39	569	7.4
July 28-30.....	9,402	--	3.49	1.48	7.92		2.49	.00	3.08	7.33	--	.01	--	798	1.09	10,203	61	5.02	1,330	7.8
July 31.....	5,812	--	1.95	.81	2.70		1.84	.00	1.19	2.40	--	.01	--	321	.44	2,537	49	2.30	577	7.7
Aug. 1-2.....	5,673	--	3.34	1.65	7.74		2.43	.00	3.00	7.28	--	.05	--	790	1.07	6,095	61	4.90	1,290	7.2
Aug. 3-10.....	14,979	--	4.64	2.22	11.22		3.15	.00	4.04	10.95	--	.00	--	1,110	1.51	22,613	62	6.06	1,840	8.1
Aug. 11-14.....	6,323	--	4.29	2.39	10.01		3.11	.00	3.54	10.01	--	.06	--	1,030	1.40	8,858	60	5.48	1,730	8.1
Aug. 15.....	1,069	--	2.84	1.81	1.70		3.64	.00	1.15	1.55	--	.01	--	382	.52	555	27	1.11	623	8.2
Aug. 16-17.....	1,920	--	3.79	2.80	13.66		2.13	.00	4.25	13.88	--	.01	--	1,250	1.70	3,264	67	7.53	2,110	7.6
Aug. 18-20.....	6,123	--	3.54	2.55	8.35		2.85	.00	3.00	8.52	--	.06	--	881	1.20	7,336	58	4.79	1,500	8.1
Aug. 21-23.....	4,356	--	3.99	2.30	10.27		2.82	.00	3.29	10.38	--	.06	--	1,010	1.37	5,983	62	5.79	1,710	8.1
Aug. 24.....	7,597	--	1.95	1.07	4.57		1.64	.00	1.21	4.65	--	.08	--	478	.65	4,938	60	3.72	826	7.7
Aug. 25-31.....	181,190	--	1.35	.65	1.26		1.38	.00	.52	1.33	--	.04	--	213	.29	52,487	39	1.26	343	7.7
Sept. 1-5.....	27,332	--	3.09	.99	5.22		2.36	.00	1.64	5.22	--	.06	--	576	.78	21,411	56	3.65	971	8.0
Sept. 6-9.....	9,060	--	4.64	2.14	9.14		3.38	.00	2.79	9.73	--	.05	--	978	1.33	12,051	57	4.96	1,630	8.1
Sept. 10-12.....	14,340	--	3.04	1.40	4.83		2.46	.00	1.89	4.80	--	.07	--	574	.78	11,195	52	3.24	968	8.0
Sept. 13-20.....	13,027	--	4.54	1.89	10.57		2.95	.00	3.10	10.86	--	.07	--	1,050	1.43	18,603	62	5.89	1,740	8.0
Sept. 21-24.....	4,094	--	4.74	2.22	13.92		2.88	.00	3.87	14.11	--	.07	--	1,280	1.74	7,127	67	7.46	2,140	7.9
Sept. 25-27.....	27,788	--	1.30	.58	1.57		1.44	.00	.50	1.47	--	.04	--	224	.30	8,465	45	1.61	385	7.7
Sept. 28-30.....	16,322	--	2.15	.81	3.96		1.97	.00	1.08	3.81	--	.04	--	435	.59	9,656	57	3.26	726	7.9
Total or weighted average	2,343,000	--	3.39	1.58	5.70	--	2.52	0.00	2.91	5.11	--	0.08	--	671	0.91	2,140,000	53	3.35	1,080	7.8

ARKANSAS RIVER BASIN--Continued

7-1525. ARKANSAS RIVER AT RALSTON, OKLA.

LOCATION.--At gaging station 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 1960.
Water temperatures: January 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,310 micromhos July 15; minimum daily, 263 micromhos Oct. 5.
Percent sodium: Maximum, 68 July 29-30; minimum, 32 Oct. 2-10.
EXTREMES, January 1950 to September 1960.--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.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1959 to September 1960 given in WSP 1711.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959....	25,388	--	3.49	2.80	12.18		2.26	0.00	2.44	13.77	--	0.02	--	1,120	1.52	38,672	66	6.87	1,940	7.7
Oct. 2-10.....	1,522,532	--	1.70	.90	1.26		1.77	.00	.46	1.61	--	.05	--	240	.33	496,955	33	1.11	416	7.7
Oct. 11-13.....	101,574	--	3.39	1.65	4.65		2.75	.00	1.54	5.30	--	.07	--	586	.80	80,950	48	2.93	1,010	7.9
Oct. 14-20.....	305,593	--	2.69	1.07	3.00		2.39	.00	1.17	3.16	--	.06	--	418	.57	173,724	44	2.19	713	7.6
Oct. 21-31.....	148,887	--	5.49	2.22	8.53		4.20	.00	3.21	8.75	--	.08	--	1,000	1.36	202,487	53	4.34	1,640	8.1
Nov. 1-10.....	103,240	17	3.84	1.32	10.44	0.08	2.36	.00	1.92	11.28	0.02	.16	0.04	1,050	1.43	147,426	67	6.50	1,720	7.9
Nov. 11-20.....	78,149	--	6.64	3.13	10.53		4.79	.00	4.58	10.86	--	.08	--	1,210	1.65	128,602	52	4.76	1,980	8.1
Nov. 21-30.....	67,041	--	6.74	3.37	11.09		4.92	.00	5.04	11.14	--	.09	--	1,290	1.75	117,617	52	4.93	2,090	8.2
Dec. 1-17.....	89,659	--	6.69	3.37	12.31		4.79	.00	5.54	11.99	--	.09	--	1,330	1.81	162,175	55	5.49	2,160	8.2
Dec. 18-20.....	33,739	--	4.79	2.39	7.26		3.57	.00	3.37	7.48	--	.07	--	855	1.16	39,232	50	3.84	1,450	8.0
Dec. 21-30.....	70,949	--	6.29	2.88	10.74		4.39	.00	4.89	10.58	--	.08	--	1,200	1.63	115,788	54	5.02	1,970	8.1
Dec. 31.....	10,711	--	4.89	2.71	6.22		3.38	.00	3.33	7.00	--	.12	--	848	1.15	12,352	45	3.19	1,370	8.1
Jan. 1-20, 1960.	162,169	17	5.84	2.39	9.92	.26	3.87	.27	4.46	10.10	.02	.09	.06	1,160	1.58	255,837	54	4.89	1,850	8.4
Jan. 21-23.....	25,289	--	4.99	3.04	8.40		3.44	.27	3.62	8.97	--	.07	--	994	1.35	34,187	51	4.19	1,670	8.4
Jan. 24-31.....	59,964	--	5.84	3.04	10.92		4.23	.20	4.06	11.23	--	.11	--	1,210	1.65	98,677	55	5.18	1,990	8.4

Feb. 1-5, 1960..	46,294	--	5.49	2.80	9.18	3.97	.27	3.83	9.31	--	.09	--	1,070	1.46	67,367	53	4.51	1,760	8.4
Feb. 6-10.....	134,479	--	3.49	1.65	5.39	2.66	.00	2.48	5.22	--	.11	--	643	.87	117,599	51	3.37	1,090	8.2
Feb. 11-13.....	51,828	--	3.89	1.89	6.18	2.62	.00	3.25	8.04	--	.08	--	859	1.17	60,548	59	4.81	1,450	8.2
Feb. 14-29.....	151,442	--	5.89	2.63	10.53	4.06	.00	4.73	10.16	--	.06	--	1,190	1.62	245,094	55	5.10	1,930	8.2
Mar. 1-9.....	57,909	--	6.79	2.80	11.70	4.82	.00	4.79	11.57	--	.13	--	1,320	1.80	103,959	55	5.35	2,130	7.9
Mar. 10.....	11,742	--	4.39	2.39	10.27	2.56	.33	3.79	10.30	--	.11	--	1,080	1.47	17,247	60	5.56	1,790	8.6
Mar. 11-15.....	88,264	--	5.04	2.39	6.79	3.54	.27	3.39	8.89	--	.12	--	981	1.33	117,759	54	4.56	1,650	8.5
Mar. 16-20.....	135,273	--	3.69	1.32	4.83	2.59	.27	2.37	4.51	--	.10	--	622	.85	114,430	49	3.05	1,020	8.6
Mar. 21.....	28,760	--	4.04	1.48	4.39	3.21	.00	2.42	4.23	--	.01	--	a563	.77	22,021	44	2.64	1,010	7.9
Mar. 22-31.....	357,223	--	2.69	1.07	3.09	2.07	.13	1.79	2.71	--	.09	--	422	.57	205,017	45	2.25	701	8.4
Apr. 1-3.....	80,926	--	3.44	1.32	3.70	2.52	.00	2.39	3.44	--	.07	--	570	.78	62,734	44	2.40	888	8.1
Apr. 4-10.....	111,477	--	4.74	2.39	6.39	3.28	.00	4.18	5.92	--	.10	--	862	1.17	130,687	47	3.39	1,330	8.1
Apr. 11-15.....	57,402	--	5.89	2.30	8.79	3.90	.13	5.06	7.84	--	.08	--	1,070	1.46	83,531	52	4.34	1,660	8.3
Apr. 16-20.....	74,936	--	4.89	1.89	6.57	3.47	.00	3.89	5.92	--	.10	--	843	1.15	85,912	49	3.57	1,320	8.1
Apr. 21-30.....	91,517	--	5.84	2.55	9.27	4.03	.00	5.12	6.46	--	.04	--	1,130	1.54	140,644	52	4.52	1,770	8.0
May 1-7.....	84,541	--	5.04	2.39	7.44	3.41	.27	4.27	6.83	--	.06	--	946	1.29	108,768	50	3.86	1,500	8.5
May 8-10.....	113,474	--	1.90	.82	1.96	1.97	.00	.94	1.72	--	.06	--	292	.40	45,063	42	1.68	486	8.2
May 11-14.....	62,678	--	3.34	1.65	4.92	2.49	.27	2.46	4.65	--	.05	--	634	.86	54,043	50	3.11	1,030	8.5
May 15-20.....	60,813	--	4.89	1.89	8.57	3.54	.27	3.44	8.04	--	.08	--	933	1.27	77,165	56	4.65	1,510	8.5
May 21-28.....	63,392	--	4.89	2.55	9.74	3.44	.00	4.08	9.59	--	.04	--	1,060	1.44	91,386	57	5.05	1,740	8.2
May 29-31.....	84,317	--	3.04	1.23	4.52	2.62	.00	1.69	4.51	--	.00	--	540	.73	61,923	51	3.09	901	8.1
June 1-2.....	44,033	--	2.89	1.07	4.83	2.33	.00	1.81	4.65	--	.05	--	554	.75	33,176	55	3.43	904	8.2
June 3-8.....	73,154	--	4.69	2.30	11.18	2.88	.00	4.12	11.14	--	.05	--	1,100	1.50	109,439	62	5.96	1,840	8.2
June 9-20.....	220,594	--	3.49	1.32	7.18	2.43	.00	2.50	7.00	--	.07	--	777	1.06	233,106	60	4.63	1,260	7.9
June 21-30.....	110,063	--	3.69	1.65	7.26	2.46	.13	2.91	7.00	--	.08	--	797	1.08	119,299	58	4.45	1,270	8.3
July 1-3.....	17,869	--	4.89	1.89	9.92	3.44	.00	4.23	9.03	--	.03	--	1,020	1.39	24,768	59	5.39	1,630	8.1
July 4-8.....	106,413	--	2.69	1.07	4.83	2.07	.07	2.08	4.37	--	.04	--	523	.71	75,690	56	3.52	879	8.3
July 9-17.....	107,804	--	4.24	1.97	12.01	2.56	.13	3.77	11.71	--	.04	--	1,120	1.52	164,206	66	6.81	1,850	8.4
July 18-24.....	56,509	--	3.74	1.73	8.57	2.72	.00	3.00	8.32	--	.04	--	875	1.19	67,246	61	5.18	1,440	8.0
July 25-28.....	48,516	--	3.09	1.23	7.05	2.36	.00	2.29	6.63	--	.07	--	707	.96	46,649	62	4.79	1,170	7.8

a Calculated from determined constituents.

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year, October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
July 29-30, 1960	16,050	--	3.84	1.56	11.70		2.52	0.00	2.98	11.57	--	0.02	--	1,050	1.43	25,775	68	7.12	1,760	8.1
July 31.....	9,481	--	3.04	.99	5.74		2.59	.00	1.64	5.50	--	.01	--	606	.82	7,814	59	4.04	1,020	8.2
Aug. 1-5.....	46,099	--	3.29	1.97	6.31		2.43	.00	2.23	6.91	--	.05	--	726	.99	47,491	54	3.89	1,220	8.1
Aug. 6-10.....	25,150	--	4.54	2.55	9.70		3.31	.00	3.19	10.30	--	.02	--	1,020	1.39	34,889	58	5.15	1,720	8.2
Aug. 11-14.....	47,699	--	2.59	.99	3.96		2.16	.00	1.29	4.06	--	.06	--	478	.65	31,008	52	2.96	801	7.9
Aug. 15.....	6,149	--	3.09	2.14	6.44		2.62	.00	1.92	7.05	--	.06	--	715	.97	5,979	55	3.98	1,230	8.0
Aug. 16-20.....	23,167	--	4.24	2.14	11.46		2.92	.00	3.23	11.71	--	.03	--	1,100	1.50	34,658	64	6.43	1,850	8.0
Aug. 21-25.....	36,536	--	4.04	1.73	8.74		3.02	.00	2.66	8.80	--	.05	--	896	1.22	44,521	60	5.15	1,490	8.2
Aug. 26-31.....	373,329	--	1.65	.90	1.96		1.77	.00	.69	2.00	--	.04	--	274	.37	139,117	43	1.73	473	7.7
Sept. 1-2.....	56,727	--	2.15	.57	4.35		1.61	.00	1.23	4.23	--	.01	--	440	.60	33,946	62	3.73	765	7.5
Sept. 3-5.....	40,760	--	2.99	1.23	7.70		2.03	.00	2.23	7.62	--	.01	--	730	.99	40,467	65	5.30	1,250	7.7
Sept. 6-11.....	43,533	--	3.99	1.65	11.31		2.62	.00	3.08	11.14	--	.06	--	1,040	1.41	61,573	67	6.74	1,750	8.0
Sept. 12.....	13,210	--	3.29	1.65	6.66		2.66	.00	2.04	6.77	--	.07	--	715	.97	12,845	57	4.24	1,220	8.1
Sept. 13-14.....	23,683	--	2.40	.90	5.44		2.03	.00	1.58	5.08	--	.01	--	531	.72	17,103	62	4.23	916	7.8
Sept. 15-17.....	19,261	--	3.49	1.32	7.83		2.62	.00	2.29	7.67	--	.04	--	774	1.05	20,275	62	5.05	1,310	8.0
Sept. 18-20.....	13,585	--	4.39	1.81	12.14		2.95	.00	3.23	12.13	--	.01	--	1,100	1.50	20,323	66	6.89	1,880	7.9
Sept. 21-22.....	8,569	--	4.29	2.14	12.27		2.82	.00	3.39	12.41	--	.04	--	1,140	1.55	13,285	66	6.84	1,930	8.1
Sept. 23.....	6,246	--	3.34	1.73	6.22		2.43	.00	2.37	8.46	--	.06	--	812	1.10	6,900	62	5.18	1,410	8.0
Sept. 24-27.....	23,643	--	4.29	2.14	11.31		2.88	.00	3.06	11.71	--	.05	--	1,080	1.47	34,727	64	6.31	1,820	8.0
Sept. 28-30.....	36,833	--	2.45	1.07	3.31		2.16	.00	1.29	3.33	--	.05	--	422	.57	21,139	48	2.49	721	7.9
Total or weighted average	6,412,000	--	3.39	1.56	5.48		2.67	--	2.23	5.47	--	0.06	--	647	0.88	5,647,000	53	3.48	1,070	--

7-1610. CIMARRON RIVER AT PERKINS, OKLA.

LOCATION.--At gaging station at bridge on State Highway 40, 1 mile south of Perkins, Payne County, 1.5 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 1960.
Water temperatures: October 1952 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 12,500 micromhos Jan. 4; minimum daily, 559 micromhos July 6.
Percent sodium: Maximum, 87 Feb. 5; minimum, 54 July 6.
EXTREMES, 1952-60.--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.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1959 to September 1960 given in WSP 1711.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959....	5,673	--	4.84	2.22	34.45		2.10	0.00	4.18	35.26	--	--	--	2,440	3.32	18,824	83	18.34	4,340	7.3
Oct. 2.....	103,934	--	2.20	1.07	8.27		1.70	.00	1.10	8.75	--	0.01	--	721	.98	101,913	72	6.47	1,310	7.4
Oct. 3-10.....	535,220	--	2.50	1.23	8.27		1.84	.00	1.64	8.46	--	.04	--	737	1.00	536,462	69	6.05	1,350	7.6
Oct. 11.....	4,542	--	5.89	2.71	30.06		2.95	.00	4.68	31.03	--	--	--	2,290	3.11	14,146	78	14.49	3,940	7.8
Oct. 12-17.....	25,466	--	7.68	4.44	43.33		4.03	.00	6.27	45.14	--	--	--	3,280	4.46	113,607	78	17.60	5,640	7.4
Oct. 18-20.....	10,830	--	9.98	5.43	63.08		3.80	.00	9.70	64.88	--	--	--	4,760	6.47	70,107	80	22.72	8,030	7.9
Oct. 21-31.....	20,269	--	10.18	5.18	60.47		5.08	.00	8.79	62.06	--	--	--	4,530	6.16	124,874	80	21.82	7,620	7.9
Nov. 1-10.....	14,916	14	8.58	4.85	73.08		3.61	.00	8.06	74.76	0.00	--	0.01	5,160	7.02	104,672	84	28.20	8,890	8.0
Nov. 11-20.....	12,040	--	10.68	6.17	84.39		5.06	.00	10.24	85.76	--	--	--	6,060	8.24	99,226	83	29.08	10,100	8.0
Nov. 21-30.....	10,413	2.0	11.16	4.44	80.91	--	3.67	.00	5.62	87.45	.00	--	.01	5,910	8.04	83,697	84	28.95	9,890	8.0
Dec. 1-10.....	9,283	--	10.78	6.25	79.17		5.41	.00	10.49	80.40	--	--	--	5,760	7.83	72,717	82	27.13	9,580	8.0
Dec. 11-17.....	6,984	--	10.56	6.25	82.65		5.34	.00	10.97	83.22	--	--	--	5,950	8.09	56,513	83	28.49	9,780	8.1
Dec. 18.....	7,874	--	5.34	3.37	36.54		3.28	.27	5.00	36.67	--	--	--	2,690	3.66	28,808	81	17.51	4,570	8.4
Dec. 19.....	15,055	--	3.69	1.89	16.27		2.75	.00	3.25	17.77	--	.09	--	1,390	1.89	28,459	77	10.93	2,480	8.2
Dec. 20.....	6,783	--	2.69	2.22	10.44		2.10	.07	2.64	10.66	--	.06	--	920	1.25	8,487	67	6.53	1,610	8.3
Dec. 21-26.....	16,090	--	7.76	4.36	56.12		3.67	.20	8.10	56.42	--	--	--	4,100	5.58	89,717	82	22.77	6,980	8.3
Dec. 27-31.....	10,007	--	8.98	5.84	64.38		5.02	.00	9.35	64.88	--	--	--	4,630	6.30	63,010	81	23.65	7,750	8.2

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-20, 1960.	36,694	16	9.78	5.02	69.60	0.26	5.11	0.00	9.51	69.96	0.02	--	0.33	5,020	6.83	250,519	82	25.59	8,410	8.0
Jan. 21-31.....	15,622	--	10.88	6.33	77.87		5.38	.00	10.62	78.99	--	--	--	5,850	7.96	124,287	82	26.54	9,540	8.2
Feb. 1-4.....	5,554	--	10.93	6.58	101.79		4.44	.00	12.28	102.68	--	--	--	7,120	9.68	53,778	85	34.40	11,700	8.0
Feb. 5.....	10,711	--	5.59	4.11	62.21		2.59	.20	7.56	61.50	--	--	--	4,360	5.93	63,510	87	28.24	7,380	8.4
Feb. 6-10.....	75,570	--	6.14	2.63	38.32		2.23	.00	6.81	38.08	--	--	--	2,890	3.93	297,021	81	16.30	4,860	8.1
Feb. 11-29.....	59,581	17	11.98	4.85	50.03	.23	4.46	.00	8.74	53.60	.02	--	.23	4,330	5.89	350,863	75	17.25	6,990	8.1
Mar. 1-14.....	49,400	--	11.18	6.83	59.60		5.08	.00	13.45	59.24	--	--	--	4,740	6.45	318,454	77	19.86	7,800	8.0
Mar. 15-16.....	10,294	--	8.88	5.51	84.83		1.57	.00	13.12	84.63	--	--	--	6,220	8.46	87,081	85	31.62	9,940	7.9
Mar. 17-20.....	17,098	--	9.08	6.09	50.46		3.97	.00	12.45	49.37	--	--	--	4,040	5.49	93,941	77	18.32	6,410	8.1
Mar. 21-31.....	30,022	--	12.77	5.43	62.64		4.82	.00	14.16	62.06	--	--	--	5,020	6.83	204,965	77	20.76	7,940	8.0
Apr. 1-2.....	6,764	--	6.99	3.78	27.75		3.18	.33	8.45	26.52	--	0.09	--	2,400	3.26	22,077	72	11.96	3,860	8.5
Apr. 3-5.....	6,885	--	9.68	5.35	40.37		3.80	.20	11.87	39.49	--	--	--	3,520	4.79	32,958	73	14.73	5,550	8.4
Apr. 6-10.....	7,478	--	11.38	6.99	61.77		4.39	.00	13.53	62.06	--	--	--	5,020	6.83	51,052	77	20.38	7,720	8.0
Apr. 11-16.....	8,664	--	9.98	6.42	54.38		3.38	.20	13.62	53.60	--	--	--	4,470	6.08	52,669	77	18.99	6,950	8.3
Apr. 17-19.....	12,811	--	4.89	2.71	23.32		2.43	.20	5.37	22.85	--	.06	--	1,930	2.62	33,627	75	11.96	3,190	8.4
Apr. 20.....	1,736	--	8.98	5.59	50.03		2.95	.20	11.89	49.37	--	--	--	4,030	5.48	9,512	77	18.53	8,420	8.4
Apr. 21-22.....	2,904	--	11.58	6.83	81.78		3.93	.00	14.22	81.81	--	--	--	6,200	8.43	24,485	82	26.96	9,850	8.2
Apr. 23-30.....	10,298	--	8.78	6.42	55.68		3.38	.13	12.37	55.01	--	--	--	4,490	6.11	62,885	79	20.20	7,140	8.3
May 1-2.....	5,700	--	4.29	2.71	18.05		2.66	.00	4.75	17.63	--	.01	--	1,550	2.11	12,017	72	9.65	2,590	8.2
May 3-5.....	4,457	--	8.58	5.43	49.59		3.31	.00	10.95	49.37	--	--	--	3,930	5.34	23,821	78	18.74	6,290	7.9
May 6.....	5,772	--	3.34	1.89	12.14		2.29	.20	2.77	11.99	--	.09	--	1,070	1.46	8,399	70	7.50	1,880	8.5
May 7.....	7,121	--	5.19	3.62	23.62		2.95	.47	5.58	23.27	--	.15	--	1,970	2.68	19,078	73	11.25	3,240	8.5
May 8-10.....	10,455	--	9.18	4.03	50.03		2.36	.20	11.24	49.37	--	--	--	3,960	5.39	56,306	79	19.46	6,240	8.4
May 11-14.....	6,760	--	9.58	4.44	62.21		3.25	.33	10.72	62.06	--	--	--	4,710	6.41	43,300	82	23.49	7,630	8.4
May 15-18.....	4,705	--	7.88	4.52	45.68		3.31	.20	9.29	45.14	--	--	--	3,570	4.86	22,843	79	18.34	5,870	8.4
May 19-20.....	5,355	--	5.69	3.13	34.54		2.62	.20	6.64	33.85	--	--	--	2,590	3.52	18,864	80	16.45	4,250	8.4
May 21-29.....	21,725	--	7.29	4.11	43.02		3.08	.13	8.87	42.32	--	--	--	3,400	4.62	100,456	79	18.02	5,510	8.3
May 30-31.....	74,380	--	3.89	1.40	14.27		2.29	.00	3.16	14.11	--	.01	--	1,220	1.66	123,412	73	8.77	2,120	8.2
June 1-5.....	34,433	--	4.29	1.97	13.09		1.90	.00	4.33	13.12	--	.04	--	1,220	1.66	57,131	68	7.40	2,010	7.5
June 6-9.....	94,096	--	2.89	1.07	8.70		2.03	.00	2.42	8.24	--	.02	--	804	1.09	102,888	69	6.18	1,360	8.1

June 10-13, 1960	66,026	--	6.74	2.47	28.14		2.00	.00	7.12	28.21	--	--		2,370	3.22	212,614	75	13.12	3,810	8.2
June 14-15.....	23,068	--	4.79	1.65	13.31		1.97	.00	5.00	12.75	--	.00		1,250	1.70	39,215	67	7.42	2,050	7.7
June 16-18.....	12,776	--	7.09	2.39	25.93		2.85	.00	7.16	25.39	--	.03		2,160	2.94	37,529	73	11.91	3,460	8.2
June 19-20.....	5,950	--	9.38	4.20	35.89		3.67	.00	9.12	36.67	--	--		3,150	4.28	25,492	73	13.77	5,050	7.8
June 21-30.....	15,947	--	8.78	4.94	44.37		3.28	.07	9.66	45.14	--	--		3,520	4.79	76,342	76	16.94	5,720	8.3
July 1-4.....	5,220	--	6.98	5.18	57.86		3.25	.00	10.99	57.83	--	--		4,360	5.93	30,955	80	21.74	7,050	7.9
July 5.....	19,061	--	2.45	1.48	6.67		2.13	.00	1.60	7.05	--	.00		630	.86	16,332	64	4.91	1,150	8.1
July 6.....	17,256	--	1.20	1.23	2.63		1.46	.00	.85	2.68	--	.00		301	.41	7,064	54	2.56	557	8.1
July 7.....	12,417	--	3.14	1.73	13.44		1.97	.00	3.06	13.32	--	.00		1,100	1.50	18,575	73	8.61	1,890	8.1
July 8-10.....	18,881	--	7.78	3.21	35.02		1.93	.00	8.83	35.26	--	--		2,870	3.90	73,695	76	14.94	4,650	7.3
July 11-14.....	22,278	--	5.59	2.39	21.32		1.97	.00	6.14	21.16	--	.06		1,740	2.37	52,719	73	10.67	2,860	7.6
July 15-16.....	6,764	--	8.28	3.13	46.11		2.69	.00	8.16	46.55	--	--		3,490	4.75	32,103	80	19.31	5,710	7.9
July 17-22.....	12,579	--	5.64	2.80	29.49		2.85	.00	5.41	29.62	--	--		2,290	3.11	39,177	78	14.36	3,840	8.1
July 23.....	6,922	--	3.99	1.97	21.01		2.10	.00	3.77	21.16	--	--		1,670	2.27	15,722	78	12.16	2,930	7.3
July 24.....	21,223	--	2.64	1.40	10.40		2.13	.00	1.96	10.49	--	.01		881	1.20	25,429	71	7.14	1,580	7.5
July 25-27.....	26,319	--	2.10	.90	5.31		1.84	.00	1.46	5.02	--	.00		489	.67	17,503	64	4.33	884	7.7
July 28-31.....	12,861	--	5.29	2.71	21.49		3.11	.00	5.21	21.16	--	.01		1,770	2.41	30,959	73	10.74	2,950	7.9
Aug. 1-2.....	10,889	--	2.00	1.40	5.39		1.97	.00	1.46	5.36	--	.02		542	.74	6,027	61	4.14	914	7.5
Aug. 3-5.....	4,189	11	3.99	2.39	17.70		3.02	.00	3.44	17.63	.02	.00		1,500	2.04	8,546	74	9.91	2,470	7.2
Aug. 6-10.....	3,412	12	6.89	4.77	36.63		4.00	.00	6.20	38.06	.02	--		2,900	3.94	13,455	76	15.17	4,780	8.1
Aug. 11-14.....	9,045	14	8.96	3.04	45.68		2.88	.00	9.81	45.14	.02	--		3,650	4.96	44,698	79	18.63	5,840	8.0
Aug. 15-17.....	4,153	16	11.18	5.59	71.34		2.49	.00	12.16	73.35	.02	--		5,370	7.30	30,333	81	24.64	8,620	7.5
Aug. 18-20.....	2,690	14	8.68	3.70	55.25		3.47	.00	9.06	55.01	.02	--		4,100	5.58	14,997	82	22.20	6,700	8.2
Aug. 21-25.....	17,425	17	9.18	4.44	50.03		2.49	.00	10.12	50.76	.02	--		4,020	5.47	95,265	79	19.17	6,520	7.9
Aug. 26.....	21,421	--	3.04	1.40	11.31		2.16	.00	2.23	11.23	--	.06		969	1.32	28,230	72	7.59	1,660	7.9
Aug. 27-31.....	67,273	11	1.85	.99	5.05		1.77	.00	1.25	4.74	.02	.06		483	.66	57,328	64	4.24	827	7.7
Sept. 1.....	6,407	--	4.09	1.69	14.14		1.97	.00	3.21	14.95	--	.00		1,260	1.71	10,978	70	8.17	2,150	7.5
Sept. 2-4.....	7,813	11	2.64	1.23	9.22		1.93	.00	2.08	9.03	.02	.05		807	1.10	8,575	70	6.62	1,410	7.9
Sept. 5-6.....	2,281	--	4.69	1.97	21.40		3.11	.00	3.83	21.16	--	.01		1,700	2.31	5,274	76	11.72	2,850	7.6
Sept. 7-10.....	3,169	12	6.49	3.13	33.36		4.00	.00	5.64	33.29	.02	--		2,610	3.55	11,321	78	15.22	4,300	6.1

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (reisdue at 180°C)			Per-cent so-dium	So-dium adsorp-tion ratio	Specific conduct-ance (micro-mhos at 25°C)	pH
			Cal-cium (Ca)	Magne-sium (Mg)	So-dium (Na)	Potas-sium (K)	Bicar-bonate (HCO_3)	Car-bonate (CO_3)	Sul-fate (SO_4)	Chlo-ride (Cl)	Fluo-ride (F)	Ni-trate (NO_3)		Parts per mil-lion	Tons per acre-foot	Total tons				
Sept. 11-14.....	5,363	24	7.39	4.44	44.81		3.67	0.00	7.56	45.14	0.02	--		3,430	4.66	25,019	79	18.42	5,550	8.1
Sept. 15.....	1,226	--	8.58	3.45	27.14		2.82	.00	9.45	26.80	--	0.05		2,460	3.35	4,101	69	11.06	3,900	8.1
Sept. 16-20.....	3,521	18	10.38	5.59	63.08		3.54	.00	10.58	64.88	.02	--		4,770	6.49	22,839	80	22.32	7,630	8.1
Sept. 21-23.....	1,970	15	8.88	5.51	57.86		3.74	.00	9.26	59.24	.02	--		4,400	5.98	11,786	80	21.57	7,140	8.2
Sept. 24-28.....	4,889	12	6.79	3.78	39.80		3.93	.00	6.97	39.49	.02	--		3,080	4.19	20,480	79	17.31	5,150	8.2
Sept. 29-30.....	2,400	--	8.98	5.02	59.60		3.11	.00	9.83	60.65	--	--		4,400	5.98	14,362	81	22.52	7,190	7.9
Total or weighted average	1,954,000	--	5.19	2.55	25.87		2.59	--	4.91	26.11	--	--		2,070	2.82	5,533,000	77	13.15	3,460	--

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, and at mile 353.4.
DRAINAGE AREA.--150,483 square miles, of which 22,241 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1960.
Water temperatures: October 1945 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,550 micromhos Feb. 9; minimum daily, 297 micromhos May 23.
Percent sodium: Maximum, 63 Feb. 9; minimum, 33 May 12-14.
EXTREMES, 1945-60.--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 1959 to September 1960 given in WSP 1711.

Chemical analyses, water year October 1959 to September 1960

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, 1959..	1,146,000	6.0	2.20	0.44	2.83	0.10	1.84		0.79	2.76	0.02	0.06	0.00	356	0.48	550,100	51	2.5	614	7.2
Oct. 5-6.....	1,460,000	--	1.80	.39	1.96	.11	1.77		.52	1.92	--	.05	.03	275	.37	540,200	46	1.9	442	7.1
Oct. 7-15.....	4,429,000	5.2	1.55	.44	1.30	.10	1.54		.46	1.35	.01	.04	.30	208	.28	1,240,000	38	1.3	366	7.1
Oct. 16-17.....	589,100	--	2.25	.60	2.70	.13	1.93		.96	2.85	--	.05	.04	380	.52	306,300	48	2.3	603	7.2
Oct. 18-19.....	533,400	--	2.10	.48	1.57	.11	1.90		.75	1.64	--	.05	.04	280	.38	202,700	37	1.4	433	7.3
Oct. 20-22.....	765,600	--	1.75	.57	1.30	.09	1.57		.83	1.30	--	.04	.17	357	.29	222,000	35	1.2	357	7.1
Oct. 23-27.....	853,700	6.0	1.90	.76	1.96	.10	1.77		.87	2.03	.01	.04	.25	296	.40	341,500	42	1.7	499	7.1
Oct. 28-31.....	303,100	5.5	2.79	.90	3.57	.13	2.38		1.19	3.67	.01	.05	.05	761	.64	194,000	48	2.6	761	7.9
Nov. 1-3.....	159,500	--	3.34	1.07	4.87	.15	3.11		1.52	4.85	--	.06	.03	632	.86	137,200	52	3.3	969	7.0
Nov. 4-5.....	299,100	--	2.45	.72	3.13	.13	2.10		1.04	3.33	--	.05	.03	425	.58	173,500	49	2.5	688	7.2
Nov. 6-11.....	926,500	6.8	2.00	.68	2.18	.10	1.87		.77	2.26	.01	.04	.12	316	.43	398,400	44	1.9	523	7.4
Nov. 12-13.....	148,000	--	2.50	.77	2.87	.12	2.16		1.06	3.10	--	.04	.03	449	.61	902,800	46	2.2	665	7.2
Nov. 14-18.....	279,700	5.9	2.74	1.15	4.05	.13	2.39		1.31	4.17	.01	.04	.05	518	.70	195,800	50	2.9	845	7.6
Nov. 19-27.....	340,200	8.5	3.14	1.40	5.22	.15	2.72		1.52	5.50	.02	.07	.05	641	.87	296,000	53	3.5	1,050	7.7
Nov. 28-30.....	83,500	5.5	3.74	1.89	7.18	.18	3.20		1.85	7.61	.02	.08	.20	819	1.11	92,680	55	4.3	1,350	7.7

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--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				
Dec. 1-10, 1960.	292,600	8.0	3.54	1.23	5.26	0.14	2.79		1.64	5.50	0.02	0.10	0.45	651	0.88	257,500	52	3.4	1,070	8.1
Dec. 11-16.....	144,800	6.6	3.39	1.56	6.39	.15	2.84		1.94	6.63	.01	.07	.05	737	1.00	144,800	56	4.0	1,220	7.1
Dec. 17-21.....	663,900	5.8	1.85	.80	2.44	.11	1.61		.79	2.68	.01	.05	.25	347	.47	312,000	47	2.1	564	7.7
Dec. 22-23.....	231,500	--	2.54	.90	4.44	.28	2.18		1.50	4.57	--	.05	.04	567	.77	178,300	54	3.4	874	6.8
Dec. 24-31.....	784,700	5.3	2.15	.74	2.61	.08	1.79		.98	2.59	.01	.04	.40	369	.50	392,400	47	2.2	590	7.5
Jan. 1, 1960....	84,500	--	2.25	.63	2.87	.11	1.77		1.08	3.05	--	.05	.04	a339	.36	38,870	49	2.4	631	7.2
Jan. 2-12.....	654,700	6.2	2.74	1.15	4.83	.13	2.18		1.42	4.94	.01	.05	.30	570	.78	510,700	55	3.5	936	7.5
Jan. 13-17.....	643,200	8.6	1.75	.78	2.48	.09	1.54		.81	2.68	.02	.04	.17	355	.48	308,700	49	2.2	519	7.7
Jan. 18-25.....	697,400	9.1	2.69	.80	3.70	.12	2.03		1.21	3.95	.02	.04	.19	504	.68	474,200	51	2.8	735	7.5
Jan. 26-30.....	235,200	6.8	3.14	1.32	5.05	.14	2.56		1.54	5.36	.02	.04	.04	636	.86	202,300	52	3.4	979	7.4
Jan. 31-Feb. 5..	287,200	10	3.44	1.56	6.26	.16	2.72		1.69	6.77	.02	.08	.21	785	1.07	307,300	55	4.0	1,180	7.4
Feb. 6-8.....	425,300	--	2.35	1.23	3.96	.10	2.03		1.69	3.67	--	.06	.12	504	.68	289,200	52	3.0	763	7.8
Feb. 9.....	156,100	--	3.94	1.81	9.92	.16	3.61		2.12	10.01	--	.10	.07	a907	1.23	192,000	63	5.8	1,550	8.1
Feb. 10-18.....	827,300	11	2.89	1.32	5.66	.15	2.29		1.79	5.78	.02	.10	.25	686	.96	769,400	56	3.9	1,030	7.9
Feb. 19-23.....	338,800	7.1	3.04	1.07	4.87	.14	2.16		1.79	4.94	.02	.07	.14	628	.85	288,000	53	3.4	935	8.0
Feb. 24-29.....	286,600	9.5	4.04	1.32	6.83	.16	2.75		2.27	7.05	.02	.08	.20	853	1.16	332,500	55	4.2	1,250	8.0
Mar. 1-7.....	306,000	6.7	3.19	1.23	5.39	.16	2.13		1.98	5.64	.02	.06	.06	671	.91	278,500	54	3.6	1,050	6.8
Mar. 8-13.....	329,300	9.5	3.89	1.73	6.26	.16	2.88		2.12	6.77	.02	.08	.20	816	1.11	365,500	52	3.7	1,230	8.2
Mar. 14-20.....	886,600	9.9	2.59	1.15	4.31	.11	2.03		1.54	4.37	.02	.07	.04	553	.75	665,000	53	3.2	835	7.9
Mar. 21.....	115,600		2.74	1.40	5.22	.09	2.23		1.79	5.36		.09	.03	a544	.74	85,540	55	3.6	985	8.0
Mar. 22-29.....	812,600	8.6	2.89	1.32	4.31	.12	2.23		1.85	4.37	.02	.09	.06	580	.79	642,000	50	3.0	889	7.6
Mar. 30-31.....	192,000	--	2.79	.90	3.83	.09	2.16		1.92	3.52	--	.08	.08	445	.60	115,200	50	2.8	767	7.8
Apr. 1-5.....	425,700	12	2.94	1.07	3.52	.13	2.16		1.64	3.81	.03	.08	.30	502	.68	289,500	46	2.5	787	7.7
Apr. 6.....	76,560	--	3.24	1.23	3.83	.08	2.65		1.81	3.81	--	.09	.02	a478	.65	49,760	46	2.6	970	8.4
Apr. 7-11.....	304,700	11	3.59	1.15	4.18	.14	2.59		2.17	4.09	.02	.07	.27	644	.88	268,100	46	2.7	903	8.0

Apr. 12-15, 1960	235,200	7.9	3.64	1.40	4.65	.16	2.69	2.37	4.65	.02	.09	.06	676	.92	216,400	47	2.9	982	7.8
Apr. 16-17.....	349,100	--	2.74	1.32	3.52	.09	2.20	1.81	3.72	--	.06	.07	472	.64	223,400	46	2.5	782	7.6
Apr. 18-21.....	508,200	7.9	2.59	.90	2.39	.11	2.00	1.29	2.54	.02	.07	.08	406	.55	279,500	40	1.8	616	7.5
Apr. 22-29.....	465,100	8.5	2.99	1.23	3.39	.13	2.43	1.64	3.52	.02	.06	.08	532	.72	334,900	44	2.3	757	7.8
Apr. 30.....	48,000	--	4.04	1.64	7.48	.10	3.08	2.50	7.61	--	.08	.06	a768	1.04	49,920	56	4.4	1,310	8.2
May 1-3.....	284,200	--	3.44	1.64	5.96	.15	2.46	2.39	6.06	--	.29	.15	751	1.02	289,900	53	3.7	1,140	7.7
May 4-5.....	163,600	--	2.79	1.07	2.74	.10	2.39	1.46	2.88	--	.07	.22	437	.59	96,250	41	2.0	672	7.7
May 6-8.....	946,100	--	1.75	.65	1.74	.11	1.44	.81	1.75	--	.18	.13	260	.35	331,100	41	1.6	448	7.6
May 9-10.....	622,800	--	1.70	.55	1.44	.10	1.48	.71	1.44	--	.18	.05	277	.38	236,700	38	1.4	403	7.4
May 11.....	279,700	--	1.60	.62	1.52	.10	1.48	.65	1.47	--	.16	--	a216	.29	81,110	40	1.4	369	7.3
May 12-14.....	546,200	--	2.00	.68	1.39	.10	1.77	1.00	1.27	--	.14	.11	279	.38	207,600	33	1.2	414	7.6
May 15-18.....	347,300	7.2	1.90	.67	1.91	.10	1.64	.79	1.97	.02	.08	.10	298	.40	138,900	42	1.7	483	7.4
May 19-24.....	2,076,000	6.5	1.50	.47	1.13	.08	1.48	.42	1.18	.02	.07	.08	208	.28	581,300	36	1.1	324	7.4
May 25-29.....	735,900	8.7	1.85	.49	1.26	.08	1.67	.73	1.27	.01	.07	.11	247	.34	250,200	34	1.2	357	7.7
May 30-June 1...	341,200	--	2.45	1.15	3.18	.08	2.13	1.39	3.24	--	.13	.08	444	.60	204,700	46	2.4	689	7.8
June 2.....	186,400	--	1.65	.55	1.44	.08	1.54	.65	1.41	--	.10	.03	a209	.28	52,190	39	1.4	380	7.6
June 3-10.....	883,400	8.2	2.20	.82	2.83	.11	1.90	1.12	2.82	.02	.07	.26	389	.53	468,200	47	2.3	607	7.8
June 11-12.....	218,800	--	2.54	1.23	4.31	.12	2.03	1.71	4.29	--	.12	.10	496	.67	146,600	53	3.1	827	7.8
June 13-18.....	672,800	8.8	3.34	1.07	5.66	.20	2.10	2.25	5.64	.02	.32	.07	682	.93	625,700	55	3.8	1,050	8.0
June 19-21.....	219,200	--	2.50	.99	4.18	.11	2.00	1.75	3.95	--	.06	.06	502	.68	149,100	54	3.2	797	7.6
June 22-23.....	121,400	--	2.25	.90	3.31	.12	1.84	1.54	3.24	--	.05	.10	390	.53	64,340	50	2.6	682	7.7
June 24-25.....	115,400	--	2.74	.82	4.52	.15	2.07	1.62	4.29	--	.08	.14	531	.72	83,090	55	3.4	828	7.6
June 26-27.....	77,360	--	3.09	1.15	4.96	.16	2.33	2.02	4.79	--	.10	.19	644	.88	68,080	53	3.4	945	8.0
June 28.....	28,960	--	3.89	1.48	6.74	.19	3.28	2.44	6.77	--	.07	.06	a718	.98	28,380	55	4.1	1,180	8.2
June 29-July 1..	100,800	--	3.04	1.15	4.78	.16	2.49	1.89	4.79	--	.06	.13	620	.84	84,670	52	3.3	932	7.7

a Calculated from determined constituents.

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--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				
July 2-4, 1960..	69,860	--	3.54	1.32	5.39	0.18	2.56		2.23	5.50	--	0.16	0.12	733	1.00	69,860	52	3.4	1,070	8.0
July 5-8.....	110,900	6.2	3.89	1.56	6.74	.20	2.82		2.52	7.05	0.03	.08	.10	848	1.15	127,500	54	4.1	1,280	8.0
July 9-10.....	109,900	--	2.54	1.07	4.78	.14	1.90		2.04	4.51	--	.10	.15	580	.79	86,820	56	3.6	887	7.9
July 11-14.....	196,000	8.3	2.20	.90	3.83	.16	1.90		1.37	3.81	.03	.07	.06	451	.61	119,600	54	3.1	751	8.0
July 15-21.....	300,900	11	3.29	1.64	8.40	.24	2.72		3.10	7.47	.04	.13	.27	861	1.17	352,100	62	5.4	1,380	8.1
July 22-25.....	471,100	7.9	1.50	.37	1.13	.07	1.48		.46	1.02	.01	.06	.07	203	.28	131,900	37	1.2	337	7.8
July 26.....	240,000	--	3.64	1.48	8.09	.23	3.31		2.79	7.19	--	.18	--	a785	1.07	256,800	60	5.1	1,320	8.2
July 27-31.....	833,900	6.6	1.55	.53	1.65	.10	1.44		.67	1.64	.01	.08	.04	261	.35	291,900	43	1.6	398	7.9
Aug. 1-8.....	421,100	7.5	1.80	.25	2.04	.12	1.44		.73	1.97	.01	.09	.00	281	.38	160,000	48	2.0	450	7.5
Aug. 9-12.....	110,900	9.0	2.84	.99	4.05	.14	2.36		1.33	4.23	.02	.13	.04	531	.72	79,850	50	2.9	823	7.7
Aug. 13-16.....	108,100	4.7	2.74	.90	3.35	.17	1.93		1.27	3.52	.02	.34	.06	461	.63	68,100	47	2.5	748	7.4
Aug. 17-28.....	475,600	7.6	2.69	1.40	5.35	.18	2.26		1.73	5.50	.02	.12	.09	650	.88	418,500	56	3.7	1,010	8.0
Aug. 29-31.....	332,800	--	2.50	.90	3.92	.13	2.13		1.29	3.89	--	.11	.08	502	.68	226,300	53	3.0	777	7.5
Sept. 1.....	113,900	--	2.50	.82	4.18	.16	2.16		1.15	3.95	--	.16	--	a432	.59	67,200	55	3.2	800	8.0
Sept. 2-3.....	165,600	--	1.85	.58	2.00	.12	1.77		.77	1.83	--	.09	.11	305	.41	67,900	44	1.8	473	7.4
Sept. 4-10.....	273,900	7.6	2.50	.54	3.35	.15	1.87		1.21	3.38	.02	.09	.09	437	.59	161,600	51	2.7	709	7.9
Sept. 11-16.....	117,000	6.5	3.09	1.07	5.57	.19	2.39		1.83	5.64	.02	.12	.06	659	.90	105,300	56	3.8	1,020	7.6
Sept. 17-20.....	82,040	--	3.64	.99	6.52	.19	2.59		2.08	6.49	--	.18	.14	753	1.02	83,680	57	4.3	1,150	7.7
Sept. 21-23.....	52,640	--	2.69	.99	4.31	.14	2.33		1.42	4.23	--	.06	.12	541	.74	38,950	53	3.2	848	7.9
Sept. 24-29.....	82,470	6.6	3.19	1.23	5.92	.16	2.62		1.75	5.78	.02	.10	.14	691	.94	77,520	56	4.0	1,080	8.2
Sept. 30.....	15,470	--	4.14	1.32	9.31	.20	2.88		2.42	9.59	--	.07	.09	a868	1.18	18,250	62	5.6	1,500	8.0
Total or weighted average	37,800,000	--	2.30	0.82	3.04	0.12	1.93		1.12	3.10	--	0.08	0.14	417	0.56	21,852,310	46	2.3	650	--

a Calculated from determined constituents.

7-2450. CANADIAN RIVER NEAR WHITEFIELD, OKLA.

LOCATION.--At gaging station on State Highway 2, 0.8 mile north of Whitefield, Haskell County, and 5.5 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 1960.
Water temperatures: September 1944 to February 1945, September 1946 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,310 micromhos Dec. 6; minimum daily, 240 micromhos May 19.
Percent sodium: Maximum, 62 Nov. 21-30; minimum, 29 May 19-20.
EXTREMES, 1944-45, 1946-60.--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.--Records of specific conductance of daily samples available in district office at Oklahoma City, Okla. Records of discharge for water year October 1959 to September 1960 given in WSP 1711.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959.	1,344,595	11	1.05	0.55	1.65	0.01	1.18	0.00	0.35	1.47	0.03	0.13	0.00	223	0.30	407,789	51	1.85	336	7.2
Oct. 11-16.....	198,982	--	1.60	.76	1.57		1.74	.00	.29	1.86	--	.02	--	237	.32	64,136	40	1.44	424	7.7
Oct. 17-18.....	43,954	--	1.85	1.15	2.18		2.00	.00	.48	2.71	--	.02	--	326	.44	19,487	42	1.78	556	7.7
Oct. 19-20.....	30,248	--	2.74	.99	2.78		2.26	.00	.62	3.61	--	.02	--	391	.53	16,085	43	2.04	692	7.8
Oct. 21.....	7,498	--	2.69	1.81	3.87		2.66	.00	.90	4.80	--	.00	--	496	.67	5,058	46	2.58	882	7.5
Oct. 22-24.....	15,174	--	3.74	2.80	5.31		3.34	.00	1.31	7.11	--	.03	--	699	.95	14,425	45	2.93	1,240	8.0
Oct. 25-31.....	24,839	--	4.69	3.54	7.48		4.00	.00	1.44	10.21	--	.03	--	933	1.27	31,518	48	3.69	1,630	8.0
Nov. 1-3.....	10,193	--	4.99	3.13	9.31		4.10	.00	1.50	11.79	--	.02	--	1,060	1.44	14,694	53	4.62	1,830	7.9
Nov. 4-10.....	245,197	--	1.90	.90	2.48		1.77	.00	.42	3.10	--	.02	--	302	.41	100,707	47	2.10	564	7.8
Nov. 11-14.....	44,707	--	2.35	1.97	2.83		2.23	.00	.58	4.32	--	.02	--	410	.56	24,929	40	1.92	765	7.8
Nov. 15-20.....	30,609	--	4.34	3.37	6.39		3.77	.00	.98	9.31	--	.03	--	841	1.14	35,009	45	3.26	1,480	8.0
Nov. 21-30.....	32,370	7.4	5.04	1.40	11.22	.49	2.10	.00	.90	14.95	.01	.04	.00	1,110	1.51	48,866	62	6.26	1,980	8.0
Dec. 1-10.....	23,901	2.0	5.34	2.22	11.31	.74	1.80	.00	2.27	15.23	.00	.04	.51	1,390	1.89	45,182	58	5.82	2,240	8.1
Dec. 11-15.....	12,119	--	5.89	3.78	11.75		4.56	.27	1.33	15.23	--	.05	--	1,300	1.77	21,426	55	5.34	2,200	8.4
Dec. 16.....	11,583	--	4.34	3.13	8.22		3.11	.40	1.02	11.14	--	.04	--	928	1.26	14,619	52	4.25	1,620	8.5
Dec. 17-20.....	239,445	--	1.90	.90	2.61		1.70	.00	.48	3.22	--	.03	--	324	.44	105,509	48	2.21	587	8.0
Dec. 21-24.....	110,281	--	3.39	.61	3.31		2.20	.00	1.54	3.53	--	.04	--	439	.60	65,842	45	2.34	751	8.1
Dec. 25-27.....	65,633	--	2.30	2.71	4.61		2.69	.00	1.73	5.13	--	.04	--	579	.79	51,682	48	2.91	990	8.2

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Dec. 28-31.....	135,511	--	2.00	1.07	2.91		1.84	0.00	0.73	3.41	--	0.02	--	360	0.49	66,346	49	2.35	633	8.0
Jan. 1-9, 1960..	114,444	--	2.89	1.97	4.61		2.52	.07	1.19	5.70	--	.03	--	588	.80	91,519	49	2.96	1,000	8.3
Jan. 10-12.....	67,418	--	2.40	1.73	4.18		1.97	.00	.85	5.42	--	.03	--	530	.72	48,595	50	2.91	898	8.2
Jan. 13-20.....	280,701	--	2.00	1.15	2.91		1.97	.00	.79	3.24	--	.03	--	372	.51	142,012	48	2.32	622	7.7
Jan. 21-31.....	106,364	--	3.74	2.39	5.87		3.34	.00	1.21	7.39	--	.04	--	762	1.04	110,227	49	3.35	1,270	8.1
Feb. 1-4.....	32,053	--	5.04	3.13	8.13		4.13	.00	1.94	10.21	--	.04	--	969	1.32	42,241	50	4.03	1,660	8.2
Feb. 5.....	47,207	--	3.44	1.97	5.52		2.79	.00	1.87	6.21	--	.07	--	673	.92	43,207	50	3.36	1,140	8.2
Feb. 6.....	46,413	--	2.69	1.40	4.61		2.00	.00	.73	5.92	--	.05	--	582	.79	36,737	53	3.22	951	8.1
Feb. 7-10.....	115,993	--	2.59	1.23	3.61		2.20	.00	1.33	3.89	--	.03	--	455	.62	71,777	49	2.61	778	8.1
Feb. 11-29.....	214,395	--	3.34	2.14	4.52		2.29	.00	1.83	5.87	--	.03	--	637	.87	185,735	45	2.73	1,110	8.1
Mar. 1-10.....	85,666	--	3.24	2.47	5.44		2.88	.00	1.31	6.91	--	.03	--	733	1.00	85,399	49	3.22	1,170	8.0
Mar. 11-15.....	75,669	--	3.44	2.22	5.39		2.79	.00	1.56	6.71	--	.04	--	735	1.00	75,639	49	3.21	1,160	7.8
Mar. 16-20.....	75,848	--	3.04	1.97	4.52		2.46	.00	1.60	5.42	--	.03	--	659	.90	67,978	47	2.86	1,020	7.4
Mar. 21-26.....	45,009	--	3.84	2.47	5.87		3.41	.00	1.94	6.77	--	.04	--	819	1.11	50,133	48	3.31	1,260	8.2
Mar. 27-28.....	30,248	--	2.25	1.48	3.22		2.00	.00	1.17	3.72	--	.03	--	479	.65	19,705	46	2.36	761	8.1
Mar. 29-31.....	19,535	--	3.49	2.39	5.35		2.88	.00	1.54	6.83	--	.02	--	757	1.03	20,112	48	3.12	1,190	8.1
Apr. 1-14.....	62,452	9.6	4.14	2.96	9.18	0.12	2.98	.27	2.14	10.49	0.02	.03	0.32	983	1.34	83,490	56	4.87	1,640	8.3
Apr. 15-20.....	141,977	--	2.15	1.23	3.61		1.93	.00	.71	4.32	--	.03	--	452	.61	87,276	52	2.78	752	8.0
Apr. 21-27.....	96,038	--	2.10	1.23	2.91		1.90	.00	.54	3.81	--	.02	--	421	.57	54,987	47	2.26	694	7.9
Apr. 28-30.....	36,696	--	3.54	2.47	6.09		2.95	.20	.90	8.04	--	.01	--	778	1.06	38,828	50	3.51	1,290	8.3
May 1-5.....	152,529	--	2.25	.99	3.13		2.00	.00	.69	3.53	--	.10	--	401	.55	83,183	49	2.46	650	8.0
May 6-18.....	565,210	--	1.70	.82	1.39		1.74	.00	.35	1.83	--	.03	--	260	.35	199,858	36	1.24	409	8.2
May 19-20.....	513,719	--	1.30	.62	.78		1.51	.00	.17	1.02	--	.01	--	184	.25	128,553	29	.80	297	7.8
May 21-26.....	709,646	--	1.30	.66	.87		1.51	.07	.21	1.02	--	.02	--	172	.23	166,000	31	.88	285	8.4
May 27-31.....	78,843	--	2.15	1.07	2.78		2.33	.00	.46	3.19	--	.03	--	380	.52	40,746	46	2.20	605	8.0
June 1-12.....	138,311	--	2.94	2.06	4.48		2.82	.00	.85	5.78	--	.04	--	608	.83	114,367	47	2.83	978	8.1
June 13-14.....	50,777	--	4.94	2.88	8.31		3.28	.00	4.66	8.12	--	.03	--	1,030	1.40	71,128	52	4.20	1,590	8.2
June 15-20.....	107,381	--	3.69	2.71	6.70		2.98	.00	3.04	7.00	--	.08	--	833	1.13	121,650	51	3.74	1,340	8.1
June 21-28.....	38,305	--	3.34	1.89	5.70		2.95	.13	2.17	5.59	--	.05	--	690	.94	35,945	52	3.52	1,090	8.4

June 29-30.....	6,605	--	4.39	2.63	8.70		3.44	.07	1.89	10.30	--	.02	--	1,010	1.37	9,073	55	4.64	1,600	8.3
July 1-22.....	189,513	16	3.69	2.88	8.44	.12	3.38	.00	2.48	8.75	.04	.04	.69	897	1.22	231,190	56	4.66	1,490	8.2
July 23-31.....	392,013	--	1.45	.59	2.09		1.48	.00	.54	2.09	--	.03	--	254	.35	135,417	51	2.07	429	7.8
Aug. 1-4.....	44,549	--	1.70	.90	2.35		1.93	.00	.65	2.37	--	.03	--	292	.40	17,691	47	2.06	516	7.9
Aug. 5-10.....	26,563	--	2.35	1.32	3.61		2.52	.00	.85	3.89	--	.03	--	430	.58	15,534	50	2.67	748	8.2
Aug. 11-13.....	9,580	--	2.00	1.07	2.87		2.23	.00	.73	2.93	--	.02	--	345	.47	4,495	48	2.32	600	8.0
Aug. 14-20.....	44,471	--	3.29	2.06	7.18		3.11	.00	2.75	6.63	--	.05	--	766	1.04	46,329	57	4.39	1,290	8.2
Aug. 21-31.....	97,396	13	2.15	1.32	5.00	.10	2.16	.00	1.64	4.57	.04	.04	.51	502	.68	66,494	58	3.80	882	7.8
Sept. 1-10.....	18,843	--	2.79	1.73	5.26		2.88	.00	1.19	5.64	--	.03	--	580	.79	14,863	54	3.50	1,030	8.2
Sept. 11-30.....	22,969	14	3.54	2.30	7.83	.11	3.11	.13	1.50	9.25	.02	.03	.50	858	1.17	26,802	57	4.58	1,450	8.3
Total or weighted average	7,528,000	--	2.05	1.15	3.01	--	1.93	--	0.79	3.44	--	0.05	--	394	0.54	4,037,000	48	2.38	653	--

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, 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 1960.
Water temperatures: October 1945 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,990 micromhos Oct. 23; minimum daily, 1,490 micromhos Feb. 16-19, May 25.
Percent sodium: Maximum, 59 Nov. 1-30; minimum, 53 Apr. 1-30, June 1-30.
EXTREMES, 1944-60.--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.--Dashes omitted in potassium (K) column indicate sodium (Na) plus potassium (K) are calculated. 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 unless otherwise noted. 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 1959 to September 1960 given in WSP 1711. No appreciable inflow between dam and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1959 to September 1960

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. 1-31, 1959.	983,200	10	5.39	2.38	10.88	0.16	1.90		5.31	11.42	0.02	0.02		1,120	1.52	1,494,000	58	5.5	1,940	7.5
Nov. 1-30.....	154,700	9.6	5.09	2.38	10.55		1.92		5.50	10.58	--	.02		1,080	1.47	227,400	59	5.5	1,830	7.6
Dec. 1-31.....	414,300	8.8	4.94	2.22	9.53		1.87		5.14	9.64	.02	.02		1,000	1.36	563,400	57	5.0	1,720	7.5
Jan. 1-31, 1960.	486,000	9.6	4.69	1.81	9.12		2.00		4.62	8.97	.02	.01		962	1.31	636,700	58	5.1	1,570	7.5
Feb. 1-29.....	429,500	8.8	4.44	1.81	8.63		2.03		4.58	8.18	.02	.07		929	1.26	541,200	58	4.9	1,510	7.4
Mar. 1-31.....	255,100	8.6	4.69	1.81	8.60		2.20		4.39	8.46	.03	.02		971	1.32	336,700	57	4.8	1,560	7.5
Apr. 1-30.....	191,300	7.8	4.79	2.30	8.03		2.38		4.46	8.23	.02	.03		932	1.27	243,000	53	4.3	1,550	7.6
May 1-31.....	166,200	8.6	4.94	2.06	8.12		2.54		4.64	7.90	.02	.02		a900	1.22	202,800	54	4.3	1,530	7.5
June 1-30.....	212,700	11	4.99	2.30	8.17		2.62		4.62	8.18	.02	.02		971	1.32	280,800	53	4.3	1,560	7.4
July 1-31.....	232,700	10	5.29	2.38	9.58		2.51		5.06	9.64	.02	.02		1,030	1.40	325,800	56	4.9	1,740	7.7
Aug. 1-31.....	136,300	11	5.49	2.47	10.56		2.57		5.33	10.58	.02	.02		1,100	1.50	204,400	57	5.3	1,840	7.5
Sept. 1-30.....	114,900	12	5.64	2.30	11.46		2.51		5.54	11.28	.03	.04		1,160	1.58	181,500	59	5.8	1,960	7.5
Total or weighted average	3,777,000	9.5	5.04	2.14	9.66	--	2.11		4.96	9.67	0.02	0.03		1,020	1.39	5,250,000	57	5.1	1,710	--

a Calculated from determined constituents.

PART 8. WESTERN GULF OF MEXICO BASINS

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 1960.
Water temperatures: October 1947 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 457 micromhos May 19, 21; minimum daily, 122 micromhos Dec. 26, 28.
Percent sodium: Maximum, 74 Oct. 11-22, Sept. 5-8; minimum, 53 Dec. 16-31.
EXTREMES, 1945-46, 1947-60.--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.--Dashes omitted in potassium (K) column indicate sodium (Na) plus potassium (K) are calculated. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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, 1959.	18,962	18	0.49	0.26	1.61	0.07	0.67		0.19	1.58	0.01	0.01		a162	0.22	4,178	66	2.64	273	6.9
Oct. 11-22.....	62,527	14	.40	.21	1.74		.52		.25	1.58	--	.02		150	.20	12,755	74	3.14	273	6.5
Oct. 23-31.....	96,200	14	.50	.19	.78		.69		.23	.56	--	.01		97	.13	12,691	53	1.33	162	6.8
Nov. 1-10.....	50,717	15	.60	.33	1.35		.75		.31	1.21	--	.02		144	.20	9,932	59	1.98	255	6.7
Nov. 11-13.....	20,725	10	.35	.26	.74		.39		.23	.73	--	.01		87	.12	2,452	55	1.34	151	6.6
Nov. 14-30.....	87,197	16	.65	.36	1.48		.69		.35	1.41	--	.02		157	.21	18,618	59	2.08	275	6.8
Dec. 1-15.....	48,912	15	.42	.28	1.26		.46		.27	1.24	--	.01		a137	.19	9,113	64	2.13	217	6.4
Dec. 16-31.....	408,119	7	.37	.17	.61		.38		.19	.56	--	.01		72	.10	39,963	53	1.16	126	6.9
Jan. 1-15, 1960.	442,413	11	.44	.30	1.00		.28		.42	.96	--	.07		113	.15	67,990	58	1.65	194	5.9
Jan. 16-31.....	507,134	11	.44	.28	.91		.33		.40	.90	--	.02		106	.14	73,108	56	1.52	188	6.2
Feb. 1-11.....	365,018	11	.45	.23	1.00		.33		.42	.90	.01	.00		108	.15	53,614	60	1.72	186	6.3
Feb. 12-17.....	170,539	12	.44	.28	1.09		.30		.46	1.04	.01	.01		118	.16	27,368	60	1.81	208	6.2
Feb. 18-29.....	418,433	10	.34	.21	.83		.26		.37	.73	.01	.02		91	.12	51,785	60	1.58	153	6.1
Mar. 1-15.....	622,116	9	.42	.27	1.09		.21		.50	1.02	.01	.03		114	.16	96,453	61	1.84	196	6.1
Mar. 16-31.....	430,334	11	.45	.30	1.09		.30		.50	1.02	.01	.02		119	.16	69,645	59	1.77	204	6.4

a Residue at 180°C.

SABINE RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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				
Apr. 1-10, 1960.	156,298	12	0.47	0.35	1.09	0.06	0.38		0.50	1.07	--	0.01		127	0.17	26,996	55	1.69	226	6.5
Apr. 11-21.....	83,258	15	.55	.45	1.57		.49		.52	1.52	--	.02		a176	.24	19,929	61	2.21	293	6.5
Apr. 22-30.....	51,465	16	.60	.47	1.70		.56		.50	1.69	--	.01		a186	.25	13,019	61	2.32	315	6.8
May 1-12.....	109,131	12	.47	.32	1.44		.43		.44	1.33	--	.02		140	.19	20,778	64	2.28	253	6.3
May 13-24.....	67,549	13	.75	.48	2.18		.72		.67	2.00	--	.02		a217	.30	19,935	64	2.78	380	6.3
May 25-31.....	32,031	14	.75	.39	1.44		.85		.44	1.27	--	.02		a172	.23	7,493	56	1.91	286	6.4
June 1-15.....	44,598	15	.65	.36	1.31		.90		.29	1.07	0.02	.02		143	.19	8,673	56	1.84	243	6.8
June 16-24.....	33,221	13	.60	.37	2.44		.70		.40	2.29	.01	.01		a214	.29	9,669	72	3.50	375	6.8
June 25-30.....	56,612	6	.30	.16	1.04		.23		.23	1.02	.01	.02		94	.13	7,237	70	2.19	164	6.2
July 1-3, 8-10..	54,268	10	.40	.24	1.00		.43		.25	.96	--	.02		104	.14	7,676	61	1.77	188	6.4
July 4-7.....	26,118	9	.32	.18	.78		.36		.20	.71	--	.02		82	.11	2,913	61	1.56	133	6.5
July 11-20.....	60,536	11	.46	.28	1.26		.56		.25	1.18	--	.01		124	.17	10,209	63	2.08	216	6.5
July 21-31.....	54,436	10	.60	.37	1.70		.61		.35	1.69	--	.01		a172	.23	12,734	64	2.44	288	6.3
Aug. 1-13.....	38,807	14	.65	.32	2.04		.69		.27	2.03	--	.01		a196	.27	10,344	68	2.94	328	6.3
Aug. 14-20.....	13,940	18	.60	.29	1.48		.82		.23	1.30	--	.01		a160	.22	3,033	63	2.22	249	6.4
Aug. 21-31.....	41,695	12	.46	.25	1.83		.69		.19	1.64	--	.01		155	.21	8,789	72	3.08	272	6.2
Sept. 1-4, 9-11.	28,088	30	.65	.36	1.78		1.48		.16	1.13	--	.01		a190	.26	7,258	64	2.51	292	6.4
Sept. 5-8.....	19,121	11	.55	.35	2.61		.59		.27	2.62	--	.01		211	.29	5,487	74	3.89	402	6.9
Sept. 12-20.....	16,441	13	.39	.28	1.04		.62		.20	.87	--	.01		109	.15	2,437	61	1.81	188	6.4
Sept. 21-30.....	15,035	15	.45	.30	1.22		.67		.23	1.04	--	.01		124	.17	2,535	62	1.98	213	6.4
Total or weighted average	4,751,000	11	0.45	0.27	1.09		0.38		0.40	1.02	--	0.02		117	0.16	760,200	60	1.82	202	--

a Residue at 180°C.

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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, 15 miles upstream from Village Creek, and at mile 55.
DRAINAGE AREA (revised).--7,923 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1960.
Water temperatures: October 1947 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 357 micromhos Dec. 8; minimum daily, 112 micromhos Mar. 5.
Percent sodium: Maximum, 66 Nov. 1-10; minimum, 50 Mar. 1-10.
EXTREMES, 1947-60.--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.--Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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, 1959.	5,435	--	--	--	--		--		--	--	--	--		--	--	--	--	--	204	--
Oct. 11-20.....	10,116	22	0.50	0.29	0.91		0.66		0.25	0.79	0.01	0.01		117	0.16	1,610	54	1.46	185	6.7
Oct. 21-31.....	25,985	18	.49	.28	1.26		.69		.29	1.04	.01	.01		133	.18	4,700	62	2.03	225	6.7
Nov. 1-10.....	33,798	17	.40	.23	1.22		.62		.35	.85	.01	.02		123	.17	5,654	66	2.17	210	6.5
Nov. 11-20.....	68,132	17	.39	.21	1.13		.49		.37	.82	.01	.02		117	.16	10,841	66	2.07	199	6.4
Nov. 21-30.....	50,955	16	.37	.22	1.09		.39		.40	.85	.01	.02		114	.16	7,900	65	1.99	194	6.4
Dec. 1-10.....	37,091	39	.60	.34	1.39		.69		.48	1.13	.01	.02		172	.23	8,676	60	2.03	267	6.9
Dec. 11-20.....	70,215	47	.55	.33	1.31		.66		.44	1.07	.01	.02		172	.23	16,425	60	1.97	241	7.0
Dec. 21-31.....	249,382	53	.50	.23	.87		.66		.37	.54	.01	.02		144	.20	48,839	54	1.44	173	6.9
Jan. 1-10, 1960.	211,835	11	.41	.23	.78		.21		.48	.73	.01	.01		96	.13	27,657	55	1.38	165	6.4
Jan. 11-20.....	222,744	13	.40	.23	.78		.20		.50	.68	.01	.01		96	.13	29,081	55	1.40	158	6.3
Jan. 21-31.....	202,953	11	.45	.27	.87		.23		.58	.79	.01	.00		107	.15	29,534	55	1.45	182	6.4
Feb. 1-10.....	215,008	13	.41	.30	.91		.21		.56	.85	.01	.00		109	.15	31,873	56	1.54	184	6.3
Feb. 11-20.....	176,172	13	.42	.27	1.00		.25		.56	.85	.01	.00		112	.15	26,835	59	1.70	181	6.4
Feb. 21-29.....	243,491	12	.37	.24	.78		.23		.48	.68	.01	.00		95	.13	31,459	56	1.41	164	6.2
Mar. 1-10.....	358,215	9.6	.31	.21	.52		.16		.42	.45	.01	.01		72	.10	35,076	50	1.03	124	6.1
Mar. 11-20.....	259,240	11	.40	.29	.87		.20		.54	.79	.01	.01		103	.14	36,314	56	1.48	172	6.1
Mar. 21-31.....	234,764	11	.45	.32	1.00		.25		.60	.90	.01	.00		115	.16	36,717	57	1.61	198	6.1

NECHES RIVER BASIN--Continued

8-410. NECHES RIVER AT EVADALE, TEX.--Continued

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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				
Apr. 1-10.....	96,317	14	0.50	0.41	1.04	0.06	0.36		0.67	1.02	0.01	0.00		a146	0.20	19,125	52	1.55	221	6.9
Apr. 11-20.....	71,266	12	.55	.44	1.16		.43		.69	1.02	.01	.00		a148	.20	14,344	54	1.71	226	7.0
Apr. 21-30.....	53,217	12	.55	.43	1.26		.49		.62	1.10	.01	.00		a154	.21	11,146	56	1.61	235	6.7
May 1-10.....	110,142	13	.50	.43	1.13		.46		.56	.99	.01	.02		132	.18	19,773	55	1.66	221	6.5
May 11-20.....	62,995	13	.47	.34	.96		.43		.52	.79	.01	.02		116	.16	9,936	54	1.50	190	6.4
May 21-31.....	49,876	13	.47	.34	1.00		.46		.50	.82	.01	.01		118	.16	6,004	55	1.57	198	6.7
June 1-15.....	42,992	13	.60	.39	1.17		.66		.46	1.02	.01	.02		136	.18	7,952	54	1.67	232	6.5
June 16-30.....	55,101	13	.50	.35	1.35		.66		.42	1.07	.02	.02		138	.19	10,341	61	2.08	230	6.4
July 1-15.....	79,200	13	.40	.24	.78		.44		.31	.65	.01	.02		94	.13	10,125	55	1.39	154	6.7
July 16-31.....	52,744	14	.45	.26	.87		.48		.33	.73	.01	.02		104	.14	7,460	55	1.46	163	6.6
Aug. 1-10.....	33,798	16	.45	.26	1.00		.46		.33	.90	.01	.01		114	.16	5,240	59	1.69	181	6.7
Aug. 11-20.....	14,479	18	.55	.30	1.13		.59		.33	1.02	.01	.02		130	.18	2,560	57	1.73	202	6.6
Aug. 21-31.....	6,960	16	.50	.31	.91		.59		.25	.85	.01	.02		112	.15	1,060	53	1.43	175	6.2
Sept. 1-10.....	5,038	19	.50	.31	1.04		.67		.25	.90	.01	.02		122	.17	836	56	1.64	191	6.6
Sept. 11-20.....	12,099	16	.50	.33	1.26		.61		.33	1.13	.01	.01		134	.18	2,205	60	1.96	223	6.4
Sept. 21-30.....	10,552	15	.47	.31	1.26		.62		.31	1.07	.01	.02		a142	.19	2,038	62	2.01	217	6.4
Total or weighted average	3,432,000	16	0.43	0.28	0.91		0.33		0.50	0.76	0.01	0.01		112	0.15	514,800	56	1.54	180	--

a Residue at 180°C.

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 at mile 94.
DRAINAGE AREA.--17,192 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to November 1949, February 1950 to September 1951, April 1953 to September 1960.
Water temperatures: February 1950 to September 1951, April 1953 to January 1959.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,530 micromhos Oct. 7-8; minimum daily, 160 micromhos June 27.
Percent sodium: Maximum, 68 Oct. 1-7; minimum, 28 June 27.
EXTREMES, 1945-50, 1953-60.--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.--Dashes omitted in potassium (K) column indicate sodium (Na) plus potassium (K) are calculated. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-7, 1959..	15,231	14.	2.94	0.60	8.09	0.19	2.97		1.83	7.11		0.05		719	0.98	14,894	68	6.08	1,280	7.3
Oct. 8-9.....	28,479	--	2.62				2.87		--	2.20		--		--	--	--	--	--	701	7.5
Oct. 10-20.....	351,055	18	2.00	.30	1.04		2.07		.48	.78		.03		a199	.27	95,009	31	.98	382	7.2
Oct. 21-31.....	183,033	17	2.30	.39	1.74		2.34		.87	1.16		.05		270	.37	87,210	39	1.50	436	7.3
Nov. 1-5.....	70,929	16	1.40	.25	1.22		1.44		.44	.93		.04		a174	.24	16,785	43	1.34	295	7.9
Nov. 6-10.....	69,461	14	1.70	.35	2.18		1.61		.56	2.00		.04		a250	.34	23,617	52	2.15	445	7.8
Nov. 11-19.....	61,212	17	2.30	.46	2.22		2.16		.96	1.78		.06		317	.43	28,390	45	1.89	510	7.4
Nov. 20-30.....	38,596	16	2.54	.52	2.48		2.31		.92	2.28		.04		352	.48	18,477	45	2.00	572	7.8
Dec. 1-15.....	40,433	16	3.19	.56	4.05		2.80		1.29	3.84		.06		468	.64	25,735	52	2.95	801	7.4
Dec. 16-21.....	229,329	11	1.35	.22	1.61		1.15		.58	1.44		.03		a193	.26	80,194	51	1.82	343	7.2
Dec. 22-31.....	374,678	12	2.10	.32	1.35		1.98		.83	.93		.04		241	.33	122,804	38	1.23	389	7.6
Jan. 1-10, 1960.	337,190	11	2.20	.33	1.22		1.67		.81	1.24		.04		244	.33	111,893	33	1.08	393	6.8
Jan. 11-20.....	446,678	13	2.15	.30	1.04		1.80		.77	.90		.04		228	.31	138,506	30	.94	360	6.8
Jan. 21-31.....	476,509	14	2.10	.35	1.22		1.88		.73	1.02		.03		236	.32	152,940	33	1.10	371	7.3
Feb. 1-10.....	204,498	12	2.40	.44	1.74		2.13		1.00	1.41		.05		290	.39	80,653	38	1.46	469	7.2
Feb. 11-24.....	290,459	11	2.15	.35	1.39		1.88		.83	1.13		.06		a231	.31	91,251	36	1.25	411	7.1
Feb. 25-29.....	208,066	9.0	1.00	.14	.57		.80		.31	.54		.02		a103	.14	29,146	33	.75	198	6.9

a Calculated from determined constituents.

TRINITY RIVER BASIN--Continued

8-665. TRINITY RIVER AT ROMAYOR, TEX.--Continued

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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.....	274,909	9.8	1.80	0.39	1.83		1.59		0.90	1.50		0.05		a240	0.33	89,730	46	1.75	429	7.0
Mar. 11-17.....	79,849	13	2.20	.48	1.91		1.80		1.25	1.50		.04		293	.40	31,818	42	1.66	479	7.2
Mar. 18-31.....	108,186	13	2.89	.65	2.70		2.31		1.80	2.29		.06		395	.54	58,118	43	2.03	651	7.2
Apr. 1-10.....	59,722	14	2.89	.71	3.57	0.13	2.51		1.58	3.13		.08		474	.64	38,499	49	2.66	753	7.5
Apr. 11-22.....	43,843	11	2.79	.67	3.74		2.54		1.33	3.33		.02		448	.61	26,712	52	2.84	742	7.6
Apr. 23-29.....	24,298	9.6	2.89	.69	4.96		2.61		1.52	4.40		.02		541	.74	17,877	58	3.70	889	7.5
Apr. 30.....	19,021	15	2.20	.30	2.57		2.29		.77	1.97		.06		a301	.41	7,787	51	2.30	520	7.4
May 1-3.....	73,369	12	1.25	.21	1.87		1.13		.75	1.41		.03		a204	.28	20,355	56	2.19	352	7.0
May 4-15.....	99,539	16	2.79	.51	3.70		2.38		1.75	2.79		.08		434	.59	58,752	53	2.88	733	7.4
May 16-31.....	74,959	8.0	2.40	.44	2.96		2.28		1.02	2.45		.04		a336	.46	34,253	51	2.48	601	7.3
June 1-14.....	34,905	9.0	2.69	.57	4.26		2.69		1.23	3.61		.01		460	.63	21,837	57	3.34	782	7.2
June 15-24.....	31,517	15	2.74	.56	4.26		2.79		1.12	3.61		.03		469	.64	20,103	56	3.32	780	7.2
June 25-26.....	23,167	--	1.74		--		1.51		--	2.06		--		--	--	--	--	--	417	7.3
June 27.....	54,149	8.6	.95	.16	.44		.97		.29	.25		.03		a94	.13	6,922	28	.58	160	6.9
June 28-30, July 1-3.....	134,122	14	1.05	.25	1.31		1.02		.48	1.07		.03		a161	.22	29,367	50	1.62	284	7.2
July 4.....	8,291	--	2.72		--		2.13		--	8.24		--		--	--	--	--	--	1,250	7.4
July 5-19.....	36,238	18	2.30	.47	2.22		2.25		.87	1.83		.04		318	.43	15,672	45	1.89	514	7.2
July 20-31.....	41,486	14	2.30	.49	3.78		2.33		1.31	2.85		.08		417	.57	23,528	58	3.20	687	7.1
Aug. 1-12.....	13,900	22	2.64	.48	3.83		2.75		.92	3.27		.01		428	.58	8,091	55	3.06	722	7.8
Aug. 13-19, 21-22, 27.....	18,407	20	2.10	.27	2.57		2.13		.54	2.20		.05		320	.44	8,011	52	2.36	519	7.5
Aug. 20, 23-26, 28-31.....	65,978	17	2.40	.41	3.87		2.44		1.19	2.99		.08		422	.57	37,866	58	3.27	707	7.5
Sept. 1-9.....	29,812	18	2.15	.35	2.57		2.07		.85	2.09		.05		318	.43	12,893	51	2.30	530	7.6
Sept. 10-18.....	11,603	14	3.19	.49	4.52		3.11		1.15	3.95		.01		488	.66	7,701	55	3.34	844	7.8
Sept. 19-26.....	11,028	16	1.80	.32	3.39		2.03		.94	2.51		.02		358	.49	5,369	62	3.30	589	7.5
Sept. 27-30.....	10,909	5.4	2.54	.52	5.66		2.98		1.21	4.54		.00		a501	.68	7,433	65	4.57	914	7.6
Total or weighted average	4,807,000	13	2.05	0.36	1.72		1.86		0.83	1.43		0.04		258	0.35	1,644,000	42	1.54	434	7.1

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, 925 feet downstream from Texas and New Orleans Railroad Co. bridge, and at mile 93.
DRAINAGE AREA.--44,020 square miles, approximately, of which 9,240 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1960.
Water temperatures: November 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,220 micromhos Sept. 26; minimum daily, 226 micromhos May 2.
Percent sodium: Maximum, 52 Oct. 1-7; minimum, 19 Oct. 8-11.
EXTREMES, 1945-60.--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.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated ans reported as sodium. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-7, 1959..	72,630	12	3.54	1.23	5.26	0.13	2.64		2.25	5.41	--	0.02		638	0.87	63,190	52	3.4	1,070	7.7
Oct. 8-11.....	384,400	13	1.80	.47	.57	.10	2.02		.42	.42	--	.04		a169	.23	88,410	19	.5	286	7.6
Oct. 12, 18-19, 26-31.....	369,300	12	2.30	.69	1.70	.10	2.16		.90	1.72	--	.07		292	.40	147,700	35	1.4	499	7.3
Oct. 13-17,20-25	628,400	11	2.89	.82	3.22	.12	2.10		1.46	3.50	--	.04		441	.60	377,000	46	2.4	746	7.3
Nov. 1-10.....	277,100	14	2.30	.51	1.30	.10	2.26		.77	1.21	--	.04		262	.36	99,760	31	1.1	440	7.8
Nov. 11-16,18-20	175,900	14	2.50	.67	1.30	.11	2.56		.77	1.24	--	.04		278	.38	66,840	28	1.0	463	7.7
Nov. 17.....	21,620	--	--	--	--		2.62		--	4.74	--	--		--	--	--	--	--	867	8.2
Nov. 21-30.....	124,900	14	2.79	.76	1.39	.10	2.95		.79	1.33	--	.04		304	.41	51,210	28	1.0	505	8.0
Dec. 1-16.....	117,300	15	3.79	1.07	2.35	.08	3.72		1.33	2.26	--	.07		440	.60	70,380	32	1.5	728	7.6
Dec. 17-22.....	281,300	13	2.20	.52	1.17	.10	2.08		.83	1.07	--	.07		257	.35	98,460	29	1.0	413	7.5
Dec. 23-31.....	258,800	11	2.59	.62	1.48	.11	2.41		.92	1.49	--	.06		308	.42	108,700	31	1.2	490	7.0
Jan. 1-10, 1960.	331,800	16	2.84	.67	1.52	.10	2.70		.98	1.49	--	.06		310	.42	139,400	30	1.1	517	7.8
Jan. 11-20.....	366,900	14	2.99	.74	2.09	.09	2.67		1.21	2.06	--	.07		358	.49	179,800	35	1.5	606	7.5
Jan. 21-31.....	316,800	14	2.99	.79	1.87	.09	2.77		1.12	1.80	--	.06		344	.47	148,900	33	1.4	581	7.4
Feb. 1-10.....	307,200	8.8	3.04	.82	1.57	.09	2.88		1.04	1.58	0.02	.07		334	.45	138,200	28	1.1	552	7.7

a Calculated from determined constituents.

BRAZOS RIVER BASIN--Continued

8-1140. BRAZOS RIVER AT RICHMOND, TEX.--Continued

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 11-20, 1960	216,200	10	3.24	0.90	1.91	0.08	2.95		1.21	2.00	0.02	0.07		379	0.52	112,400	31	1.3	620	7.8
Feb. 21-39.....	182,500	12	3.09	.82	1.30	.08	3.08		.87	1.35	.02	.07		322	.44	80,300	24	.9	522	7.6
Mar. 1-10.....	170,700	12	3.24	.90	1.96	.08	2.88		1.29	1.86	.04	.08		375	.51	87,060	32	1.4	609	7.6
Mar. 11-20.....	126,400	11	3.49	1.07	2.22	.09	3.20		1.25	2.17	.02	.13		411	.56	70,780	32	1.5	669	7.8
Mar. 21-31.....	92,150	7.6	3.59	1.32	2.44	.07	3.47		1.46	2.28	.03	.08		439	.60	55,290	33	1.6	719	7.7
Apr. 1-10.....	81,400	10	3.24	1.07	2.35	.09	2.95		1.48	2.31	--	.06		404	.55	44,770	35	1.6	672	8.0
Apr. 11-20.....	52,400	9.4	3.19	1.32	2.70	.08	3.13		1.56	2.59	--	.04		422	.57	29,870	37	1.8	726	7.9
Apr. 21-30.....	79,000	7.2	2.99	1.23	2.70	.09	2.95		1.48	2.57	--	.04		414	.56	44,240	39	1.9	701	7.7
May 1-5.....	237,400	12	1.80	.41	.83	.09	1.70		.62	.70	--	.06		a185	.25	59,350	27	.8	321	7.8
May 6-9.....	71,900	14	2.25	.59	1.78	.10	1.92		1.06	1.66	--	.05		a282	.38	27,320	38	1.5	487	7.1
May 10-31.....	168,300	11	3.09	.99	3.31	.11	2.61		1.54	3.21	--	.02		443	.60	101,000	44	2.3	763	7.3
June 1-10.....	27,460	13	2.94	1.32	3.29		2.87		1.77	2.90	--	.01		466	.63	17,300	44	2.3	769	7.6
June 11-24.....	25,690	15	2.99	1.40	3.90		2.97		1.81	3.50	--	.01		504	.69	17,730	47	2.6	840	7.6
June 25, 28.....	108,000	12	2.12	.74	2.02		2.25		.96	1.64	--	.03		a282	.38	41,040	41	1.7	491	7.6
June 26-27,29-30	255,300	11	1.45	.32	.73		1.64		.33	.51	--	.02		155	.21	53,610	29	.8	245	7.4
July 1-8.....	131,300	14	1.60	.39	1.24		1.90		.56	.73	--	.04		211	.29	38,080	38	1.3	311	7.0
July 9-13.....	25,490	18	2.30	.60	2.23		2.18		.90	2.03	--	.02		a304	.41	10,450	43	1.8	529	7.2
July 14-19.....	42,900	8.8	3.04	.90	3.62		2.52		1.58	3.44	--	.02		a439	.60	25,740	48	2.6	782	7.4
July 20-24,26-31	114,300	13	2.54	.67	2.93		2.13		1.25	2.74	--	.02		a362	.49	56,010	48	2.3	642	7.6
July 25.....	15,170	--	--	--	--		1.75		--	1.16	--	--		--	--	--	--	--	361	7.2
Aug. 1-10.....	33,240	15	3.69	1.07	4.62		2.98		1.89	4.48	.02	.01		570	.78	25,930	49	3.0	930	7.6
Aug. 11-20.....	30,680	16	3.59	1.15	4.16		3.25		1.71	3.92	.02	.00		547	.74	22,700	47	2.7	881	7.2
Aug. 21-31.....	46,910	13	3.04	.99	3.59		2.75		1.54	3.30	.02	.01		469	.64	30,020	47	2.5	758	7.3
Sept. 1-5.....	18,250	17	2.40	.76	2.32		2.46		1.00	2.00	--	.02		335	.46	8,400	42	1.8	555	7 6
Sept. 6-17.....	26,700	17	3.49	1.23	3.93		3.33		1.69	3.58	--	.05		533	.72	19,220	45	2.5	869	7.7
Sept. 18-30.....	24,600	17	4.04	1.48	5.82		3.46		2.29	5.58	--	.01		694	.94	23,120	51	3.5	1,140	7.6
Total or weighted average	6,440,000	12	2.69	0.74	2.09		2.47		1.04	1.89	--	0.05		331	0.45	2,898,000	38	1.6	552	--

a Calculated from determined constituents.

8-1580. COLORADO RIVER AT AUSTIN, TEX.

LOCATION.--At raw-water intake at Austin City Waterplant, just downstream from Lamar Street bridge in Austin, Travis County, 0.5 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, upstream from gaging station, of which 11,900 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1960.
Water temperatures: October 1947 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 486 micromhos Sept. 18; minimum daily, 304 micromhos Oct. 16.
Percent sodium: Maximum, 31 Dec. 1-31; minimum, 23 Oct. 1-7, Mar. 1-31.
EXTREMES, 1947-60.--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.--Dashes omitted in potassium (K) column indicate sodium (Na) plus potassium (K) are calculated. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712. No appreciable inflow between sampling point and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-7, 1959..	169,805	9.8	1.90	1.32	1.00	0.09	2.74		0.50	1.07	0.01	0.02		243	0.33	56,117	23	0.79	428	7.8
Oct. 8-31.....	440,188	12.	1.60	.81	1.00		2.07		.40	.87	.02	.03		199	.27	119,132	29	.91	340	7.6
Nov. 1-30.....	285,560	10.	1.85	1.15	1.17		2.46		.54	1.16		.03		240	.33	93,207	28	.96	411	7.8
Dec. 1-31.....	210,595	11.	2.00	1.15	1.39		2.59		.58	1.35	.01	.02		258	.35	73,894	31	1.11	445	7.7
Jan. 1-31, 1960.	192,825	11.	2.05	1.23	1.26		2.66		.54	1.30		.02		252	.34	66,085	28	.99	444	8.0
Feb. 1-29.....	200,977	9.2	2.15	1.23	1.22		2.75		.56	1.24	.01	.03		261	.35	71,339	26	.94	451	7.9
Mar. 1-31.....	202,417	9.0	2.15	1.40	1.04		2.77		.54	1.24	.02	.04		a248	.34	68,271	23	.78	444	7.7
Apr. 1-30.....	178,929	9.0	2.10	1.32	1.13	.10	2.84		.56	1.16	.02	.03		256	.35	62,296	24	.87	451	7.5
May 1-31.....	166,201	10.	2.15	1.23	1.26		2.85		.54	1.18	.02	.03		260	.35	58,769	27	.97	453	7.6
June 1-30.....	159,412	11.	2.20	1.23	1.22		2.88		.56	1.18	.02	.00		272	.37	58,970	26	.93	455	7.6
July 1-31.....	155,195	9.0	2.25	1.32	1.13		2.88		.54	1.24	.02	.04		265	.36	55,932	24	.85	452	7.5
Aug. 1-31.....	120,885	12.	2.25	1.32	1.35		3.02		.54	1.27	.04	.03		269	.37	44,224	27	1.01	454	7.7
Sept. 1-31.....	72,060	9.4	2.30	1.32	1.44		2.98		.58	1.47	.02	.01		286	.39	28,028	28	1.07	488	7.6
Total or weighted average	2,555,000	10	2.00	1.18	1.17	--	2.63		0.52	1.16	0.02	0.03		246	0.34	856,300	27	0.93	426	7.7

a Calculated from determined constituents.

COLORADO RIVER BASIN--Continued

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 and New Orleans Railroad Co. bridge, 12 miles upstream from Jones Creek, and at mile 67.
DRAINAGE AREA.--41,380 square miles, approximately, of which 11,900 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: April 1944 to September 1960.
Water temperatures: October 1945 to September 1948, March 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 532 micromhos Sept. 18; minimum daily, 181 micromhos June 26.
Percent sodium: Maximum, 30 June 1-25; minimum, 16 May 1-3.
EXTREMES, 1944-60.--Specific conductance: Maximum daily, 765 micromhos Feb. 5, 1957; minimum daily, 146 mocromhos Sept. 27, 1957.
Percent sodium: Maximum, 43 Nov. 1-30, 1951; minimum, 7 Jan. 19-24, 1945.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	599,600	11	1.85	0.90	0.83	0.10	2.29		0.48	0.85	--	0.03		216	0.29	173,900	23	0.7	388	7.4
Nov. 1, 4-30....	301,300	13	2.10	.90	1.00	.10	2.52		.56	1.02	--	.03		240	.33	99,430	24	.8	409	7.4
Nov. 2-3.....	40,150	13	1.40	.51	.61	.09	1.75		.29	.51	--	.03		a152	.21	8,430	23	.6	260	7.5
Dec. 1-16, 20-31	210,100	12	2.25	1.15	1.13	.10	2.75		.62	1.24	--	.03		268	.36	75,640	24	.9	457	7.8
Dec. 17-19.....	44,270	15	1.60	.63	.78	.10	1.84		.46	.79	--	.03		a183	.25	11,070	25	.7	308	7.6
Jan. 1-31, 1960.	246,100	12	2.25	1.07	1.13	.10	2.70		.67	1.21	--	.03		262	.36	88,600	25	.9	463	7.5
Feb. 1-29.....	269,600	7.0	2.30	1.07	1.00	.09	2.75		.56	1.07	0.02	.05		256	.35	94,430	22	.8	440	7.5
Mar. 1-31.....	217,100	9.6	2.40	1.23	1.13	.09	2.98		.65	1.18	--	.03		278	.38	82,500	23	.8	477	7.8
Apr. 1-30.....	253,100	8.6	2.30	1.15	1.13	.10	2.93		.56	1.16	.02	.05		264	.36	91,120	24	.9	455	7.9
May 1-3.....	162,700	14	1.30	.26	.32	.09	1.51		.19	.24	--	.05		a120	.16	26,030	16	.4	194	7.2
May 4-31.....	186,400	13	2.30	.99	1.09	.10	2.85		.58	1.10	--	.02		265	.36	67,820	24	.8	443	7.5
June 1-25.....	107,500	12	2.00	1.23	1.36		2.70		.58	1.27	.02	.02		255	.35	37,620	30	1.1	444	7.4
June 26-28.....	262,600	12	1.30	.25	.41		1.52		.17	.23	.02	.02		a114	.16	42,020	21	.5	190	7.4
June 29-30, July 1.....	58,370	24	1.75	.48	.72		2.02		.54	.34	.02	.03		a182	.25	14,590	24	.7	272	7.9
July 2-31.....	161,300	14	2.30	1.15	1.21		2.92		.60	1.10	.02	.02		a260	.35	56,460	26	.9	442	7.6
Aug. 1-31.....	128,500	13	2.20	1.15	1.29		2.82		.54	1.24	.02	.02		258	.35	44,980	28	1.0	441	7.5
Sept. 1-30.....	71,090	13	2.35	1.40	1.35		3.16		.60	1.30	.02	.02		a279	.38	27,010	26	1.0	491	7.5
Total or weighted average	3,322,000	12	2.05	0.90	1.04		2.51		0.52	0.96	--	0.03		231	0.31	1,030,000	26	0.9	397	--

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, 10 miles upstream from Coleto Creek, and at mile 51.
DRAINAGE AREA.--5,161 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1946, October 1948 to September 1960.
Water temperatures: November 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 748 micromhos Nov. 16; minimum daily, 262 micromhos June 27.
Percent sodium: Maximum, 28 July 5-20; minimum, 15 Oct. 4-16.
EXTREMES, 1945-46, 1948-60.--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.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959..	4,370	20	2.89	1.40	1.13	0.06	3.80		0.56	1.07	--	0.05		312	0.42	1,840	21	0.8	515	7.7
Oct. 4-16.....	107,300	16	2.30	.76	.57	.09	2.70		.40	.51	--	.06		220	.30	32,190	15	.5	354	7.6
Oct. 17-31.....	42,270	18	3.49	1.15	.96	.07	4.08		.54	1.02	--	.10		335	.46	19,440	17	.6	532	7.6
Nov. 1-30.....	77,320	18	3.49	1.40	1.17	.07	4.29		.67	1.16	--	.10		346	.47	36,340	19	.8	577	8.2
Dec. 1-10.....	20,310	17	3.24	1.56	1.09	.05	4.18		.65	1.07	--	.09		a328	.45	9,140	18	.7	577	7.7
Dec. 11-20.....	22,210	14	--	1.48	1.13	.06	--		.65	1.13	--	.08		--	--	--	--	--	597	--
Dec. 21-31.....	25,980	15	3.64	1.48	1.09	.06	4.47		.65	1.07	--	.09		a342	.47	12,210	17	.7	585	7.7
Jan. 1-15, 1960.	43,420	15	3.44	1.32	1.09	.06	4.20		.67	1.02	--	.09		a327	.44	19,100	18	.7	571	7.7
Jan. 16-31.....	44,570	16	3.69	1.40	1.09	.06	4.43		.71	1.07	--	.09		a344	.47	20,950	17	.7	589	7.8
Feb. 1-15.....	47,090	14	3.49	1.40	1.09	.06	4.18		.71	1.02	--	.09		331	.45	21,190	18	.7	566	7.8
Feb. 16-29.....	39,690	10	3.49	1.48	1.04	.05	4.38		.62	1.02	--	.09		330	.45	17,860	17	.7	570	7.9
Mar. 1-10.....	25,690	13	3.49	1.32	1.13	.05	4.21		.65	1.13	--	.09		345	.47	12,070	19	.7	572	7.6
Mar. 11-20.....	23,560	15	3.59	1.56	1.26	.05	4.38		.77	1.30	--	.08		372	.51	12,020	20	.8	614	7.4
Mar. 21-31.....	24,770	9.0	2.99	1.56	1.22	.05	3.92		.69	1.21	--	.07		325	.44	10,900	21	.8	558	7.4
Apr. 1-14.....	33,100	14	3.04	1.56	1.17	.06	3.93		.67	1.10	0.02	.08		323	.44	14,560	20	.8	546	7.8

a Calculated from determined constituents.

GUADALUPE RIVER BASIN--Continued

8-1765. GUADALUPE RIVER AT VICTORIA, TEX.--Continued

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Apr. 15-27, 1960	28,300	15	3.29	1.56	1.13	0.06	4.28		0.62	1.07	0.02	0.08		332	0.45	12,740	19	0.7	563	7.8
Apr. 28-30.....	15,970	13	2.59	.99	.96	.09	3.11		.54	.90	.02	.06		a258	.35	5,590	21	.7	445	7.6
May 1-6.....	82,870	11	2.15	.50	.70	.11	2.31		.56	.56	--	.02		201	.27	22,370	20	.6	344	7.5
May 7-11.....	18,900	18	2.99	.90	1.35	.11	3.25		.77	1.35	--	.05		316	.43	8,130	25	1.0	534	7.4
May 12-31.....	45,280	16	3.64	1.48	1.48	.07	4.43		.73	1.52	--	.07		374	.51	23,090	22	.9	645	7.6
June 1-10.....	16,510	16	2.69	1.64	1.64		3.70		.73	1.47	.02	.05		351	.48	7,920	27	1.1	565	7.5
June 11-25.....	20,350	14	2.59	1.56	1.48		3.54		.67	1.35	.02	.05		316	.43	8,750	26	1.0	531	7.4
June 26-30.....	133,000	13	1.70	.49	.73		2.03		.33	.51	.02	.03		a167	.23	30,590	25	.7	286	7.2
July 1-2.....	64,460	22	2.00	.39	.64		2.21		.44	.34	.02	.02		a182	.25	16,120	21	.6	283	7.6
July 3-4.....	10,370	--	--	--	--		2.67		--	.62	--	--		--	--	--	--	--	360	7.8
July 5-20.....	48,600	21	3.79	1.32	2.01		4.49		.77	1.80	.02	.04		404	.55	26,730	28	1.3	660	7.5
July 21-31.....	38,620	18	3.14	1.15	1.40		3.74		.58	1.30	.02	.05		328	.45	17,380	25	1.0	537	7.2
Aug. 1-10.....	18,860	24	3.09	1.48	1.44		4.10		.62	1.24	--	.05		350	.48	9,050	24	1.0	565	7.6
Aug. 11-18.....	24,180	24	2.94	1.32	1.30		3.88		.54	1.10	--	.04		326	.44	10,640	23	.9	519	7.6
Aug. 19-31.....	67,930	17	2.50	.90	.74		3.11		.40	.56	--	.07		246	.33	22,420	18	.6	388	7.7
Sept. 1-15.....	37,550	19	3.34	1.23	.91		4.00		.48	.90	.02	.08		314	.43	16,150	17	.6	513	7.3
Sept. 16-30.....	27,370	18	3.29	1.40	1.15		4.16		.58	1.02	.02	.06		328	.45	12,320	20	.7	548	7.2
Total or weighted average	1,281,000	16	2.89	1.07	1.09	--	3.52		0.56	0.93	--	0.06		288	0.39	499,600	22	0.8	481	--

a Calculated from determined constituents.

NUECES RIVER BASIN

8-2110. NUECES RIVER NEAR MATHIS, TEX.

LOCATION.--At intake tower at Wesley E. 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 1960.
Water temperatures: October 1947 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 616 micromhos Oct. 2; minimum daily, 334 micromhos Oct. 26.
Percent sodium: Maximum, 42 Aug. 1-31, Sept. 1-30; minimum, 18 Dec. 1-31.
EXTREMES, 1947-60.--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, 18 Dec. 1-31, 1959.
REMARKS.--Dashes omitted in potassium (K) column indicate sodium (Na) plus potassium (K) are calculated. Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-18, 1959.	140,025	23	2.59	0.73	2.31	0.24	3.23		0.79	1.86	0.01	0.03		354	0.48	67,414	39	1.79	592	7.1
Oct. 19-31.....	127,688	23	2.20	.42	.83	.20	2.70		.35	.51	.01	.02		224	.30	38,899	23	.72	350	7.4
Nov. 1-30.....	18,922	27	2.40	.41	.78	.20	2.98		.33	.45	--	.02		232	.32	5,970	21	.66	364	7.8
Dec. 1-31.....	6,579	20	2.45	.44	.70	.20	3.05		.33	.39	--	.02		224	.30	2,004	18	.58	359	8.0
Jan. 1-31, 1960.	5,860	18	2.54	.47	.74	.20	3.18		.35	.39	--	.02		235	.32	1,873	19	.60	378	8.0
Feb. 1-29.....	7,535	12	2.69	.52	.78	.19	3.29		.37	.51	.01	.02		254	.35	2,603	19	.62	402	7.4
Mar. 1-31.....	4,507	15	2.79	.52	.91	.19	3.39		.42	.56	.02	.02		260	.35	1,594	21	.71	419	7.7
Apr. 1-30.....	5,213	17	2.94	.58	1.09	.19	3.52		.46	.87	.02	.01		a275	.37	1,949	23	.82	445	8.1
May 1-31.....	5,276	18	2.89	.58	1.48		3.49		.52	.90	.01	.02		290	.39	2,081	30	1.12	475	7.4
June 1-30.....	13,745	19	2.74	.66	1.74		3.41		.54	1.13	.02	.02		292	.40	5,459	34	1.33	493	7.0
July 1-31.....	18,323	17	2.40	.67	2.00		3.15		.60	1.30	--	.01		312	.42	7,775	39	1.62	490	7.5
Aug. 1-31.....	54,662	18	2.30	.61	2.13		3.02		.60	1.38	.02	.01		300	.41	22,302	42	1.77	484	7.7
Sept. 1-30.....	28,562	15	2.25	.61	2.04		2.98		.62	1.30	--	.01		293	.40	11,381	42	1.71	486	7.8
Total or weighted average	436,900	21	2.41	0.58	1.63	--	3.03		0.56	1.16	0.01	0.02		288	0.39	171,300	35	1.32	469	7.3

a Calculated from determined constituents.

RIO GRANDE BASIN

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, upstream from gaging station (includes 2,940 square miles in closed basin in San Luis Valley, Colo.).
RECORDS AVAILABLE.--Chemical analyses: October 1946 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,080 micromhos July 2; minimum daily, 184 micromhos Apr. 11.
Percent sodium: Maximum, 45 Oct. 4-5, Aug. 27-30; minimum, 26 Apr. 20-21, 23, 25.
EXTREMES, 1946-60.--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.--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 1959 to September 1960 given in WSP 1712. 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. 28 to Mar. 17.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959..	226	--	2.15	0.79	2.18	--	3.13		--	--	--	--	--	368	0.50	113	43	1.8	504	8.2
Oct. 4-5.....	408	--	1.40	.60	1.61	--	2.21		--	--	--	--	--	258	.35	143	45	1.6	370	7.8
Oct. 6-Nov. 1...	5,230	48	2.35	.77	1.96	0.17	2.66		2.12	0.39	0.03	0.02	0.13	358	.49	2,560	37	1.6	502	7.8
Nov. 2.....	155	--	1.80	.60	1.48	--	2.68		--	--	--	--	--	306	.42	65	38	1.4	404	9.0
Nov. 3-8.....	1,090	--	2.30	.86	2.39	--	2.70		--	--	--	--	--	403	.55	600	43	1.9	548	8.5
Nov. 9.....	297	--	1.60	.52	1.26	--	2.00		--	--	--	--	--	246	.33	98	37	1.2	345	9.0
Nov. 10-25.....	9,820	--	1.45	.45	.96	--	1.52		--	--	--	--	--	207	.28	2,750	34	1.0	290	8.2
Nov. 26-Dec. 9..	6,000	--	1.80	.52	1.22	--	2.28		--	--	--	--	--	260	.35	2,100	34	1.1	350	8.2
Dec. 10-29.....	10,230	--	1.60	.44	.91	--	1.95		--	--	--	--	--	211	.29	2,970	31	.9	302	7.7
Dec. 30-Jan. 6, 9,1960	3,500	49	1.80	.54	1.04	.12	2.16		1.06	.19	.02	.02	.08	250	.34	1,190	30	1.0	339	7.7
Jan. 7-8.....	803	--	1.50	.42	.78	--	1.67		--	--	--	--	--	208	.28	225	29	.8	283	7.0
Jan. 10-19,21-31	10,070	--	1.30	.38	.74	--	1.66		--	--	--	--	--	185	.25	2,520	31	.8	249	7.5
Jan. 20.....	397	--	1.50	.56	.87	--	2.00		--	--	--	--	--	224	.30	119	30	.9	308	8.6
Feb. 1-29.....	12,970	--	1.40	.28	.65	--	1.62		--	--	--	--	--	180	.24	3,110	28	.7	243	7.4
Mar. 1-15.....	10,740	--	1.30	.46	.74	--	1.57		--	--	--	--	--	188	.26	2,790	30	.8	260	7.1

Mar. 16-19, 1960	3,790	--	1.80	.60	1.22	--	1.93	--	--	--	--	--	258	.35	1,330	34	1.1	370	7.3
Mar. 20-Apr. 2..	16,300	--	1.45	.51	.96	--	1.84	--	--	--	--	--	214	.29	4,730	33	1.0	302	7.5
Apr. 3-6.....	2,480	--	2.00	.62	1.30	--	2.66	--	--	--	--	--	270	.37	918	33	1.1	394	7.5
Apr. 7-9.....	4,070	--	1.35	.45	.83	--	1.98	--	--	--	--	--	208	.28	1,140	32	.9	271	7.0
Apr. 10-13.....	11,070	--	.95	.33	.52	--	1.25	--	--	--	--	--	142	.19	2,100	29	.6	194	6.6
Apr. 14-19,22,24	16,410	24	1.25	.47	.74	.12	1.61	.73	.19	.02	.01	.08	185	.25	4,100	29	.8	254	7.0
Apr. 20-21,23,25	8,340	--	1.00	.34	.48	--	1.15	--	--	--	--	--	150	.20	1,670	26	.6	201	7.0
Apr. 26-30.....	5,800	--	1.50	.54	.96	--	1.92	--	--	--	--	--	214	.29	1,680	32	1.0	307	7.0
May 1-2.....	1,570	--	1.65	.63	1.04	--	.43	--	--	--	--	--				31	1.0	341	4.8
May 3-10.....	3,840	--	2.00	.68	1.44	--	1.97	--	--	--	--	--	291	.40	1,540	35	1.2	414	7.4
May 11-21.....	7,420	--	1.20	.26	.74	--	1.62	--	--	--	--	--	172	.23	1,710	34	.9	231	7.5
May 22, 29.....	591	--	1.70	.56	1.17	--	2.08	--	--	--	--	--	248	.34	201	34	1.1	348	7.3
May 23,25-27, 30	1,280	--	3.04	.96	2.09	--	2.36	--	--	--	--	--	426	.58	742	34	1.5	598	7.6
May 24, 28.....	460	--	2.25	.71	1.48	--	2.23	--	--	--	--	--	315	.43	198	33	1.2	446	7.5
May 31-June 1...	746	--	1.50	.50	.96	--	2.13	--	--	--	--	--	216	.29	216	32	1.0	303	7.8
June 2-3.....	869	--	1.90	.60	1.26	--	2.39	--	--	--	--	--	266	.36	313	34	1.1	373	8.1
June 4-13, 17...	17,480	--	1.40	.36	1.13	--	2.31	--	--	--	--	--	205	.28	4,890	39	1.2	285	7.7
June 13-16,18-20	19,080	--	1.80	.58	1.48	--	2.03	--	--	--	--	--	278	.38	7,250	38	1.4	391	7.3
June 21-23.....	3,950	--	2.30	.86	2.18	--	2.33	--	--	--	--	--	379	.52	2,050	41	1.7	539	7.7
June 24-30.....	2,390	--	4.39	1.49	4.05	--	3.11	--	--	--	--	--	698	.95	2,270	41	2.4	960	7.2

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			Per-cent so-dium	So-dium adsorp-tion ratio	Specific conduct-ance (micro-mhos at 25°C)	pH
			Cal-cium (Ca)	Magne-sium (Mg)	So-dium (Na)	Potas-sium (K)	Bicar-bonate (HCO_3)	Car-bonate (CO_3)	Sul-fate (SO_4)	Chlo-ride (Cl)	Fluo-ride (F)	Ni-trate (NO_3)		Parts per mil-lion	Tons per acre-foot	Total tons				
July 1-7, 1960..	1,430	27	4.34	1.58	3.92	0.36	3.06		6.16	0.93	0.04	0.03	0.25	676	0.92	1,320	36	2.3	958	7.3
July 8-9.....	617	--	2.84	.98	2.18	--	2.66		--	--	--	--	--	412	.56	346	36	1.6	591	7.9
July 10-27.....	4,120	--	3.59	1.27	3.13	--	3.11		--	--	--	--	--	538	.73	3,010	39	2.0	769	7.3
July 28-31.....	543	--	2.79	1.01	2.44	--	2.60		--	--	--	--	--	414	.56	304	39	1.8	613	7.2
Aug. 1-26.....	2,370	--	2.79	1.01	2.74	--	3.02		--	--	--	--	--	439	.60	1,420	42	2.0	646	7.4
Aug. 27-30.....	121	--	3.19	1.19	3.52	--	3.25		--	--	--	--	--	526	.72	87	45	2.4	760	8.1
Aug. 31-Sept. 8.	256	--	2.99	1.05	3.13	--	3.18		--	--	--	--	--	488	.66	169	44	2.2	704	7.7
Sept. 9-10.....	105	--	2.00	.74	2.18	--	3.05		--	--	--	--	--	321	.44	46	44	1.9	482	8.2
Sept. 11-21.....	496	--	2.50	.96	2.65	--	3.05		--	--	--	--	--	410	.56	278	43	2.0	601	7.7
Sept. 22-23.....	103	--	2.89	.99	2.96	--	3.03		--	--	--	--	--	453	.62	64	43	2.1	668	7.8
Sept. 24-30.....	403	--	2.30	.78	2.18	--	2.80		--	--	--	--	--	351	.46	193	41	1.8	522	7.5
Total or weighted average	210,500	--	1.60	0.52	1.13	--	1.92		--	--	--	--	--	238	0.32	67,360	35	1.1	332	--

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

LOCATION.--At gaging station on pier of former railway bridge, 400 feet downstream from bridge on State Highway 4, 1.8 miles southwest of San Ildefonso Pueblo, 2.5 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 1960.
Water temperatures: October 1948 to September 1960.
Sediment records: October 1947 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 613 micromhos July 28; minimum daily, 204 micromhos May 31.
Percent sodium: Maximum, 32 July 1-19; minimum, 16 Apr. 10-17.
EXTREMES, 1946-60.--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.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712. Flow affected by ice Nov. 28-29, Jan. 3-25.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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)	Sulfates (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-3, 7-31, 1959	27,390	30	2.59	0.71	1.30	0.10	2.90		1.54	0.24	0.04	0.01	0.07	296	0.40	10,960	28	1.0	436	7.8
Oct. 4-6	3,150	26	3.09	.73	1.74	--	2.90		2.48	.21	--	.05	--	353	.48	1,510	31	1.3	536	7.9
Nov. 1-14	17,030	29	2.59	.69	1.39	--	2.84		1.56	.28	--	.02	--	293	.40	6,810	30	1.1	451	7.9
Nov. 15-30	29,260	29	2.10	.70	1.04	--	2.34		1.29	.21	--	.01	--	244	.33	9,660	27	.9	377	7.8
Dec. 1-31	35,840	36	2.20	.66	1.22	--	2.59		1.25	.25	--	.01	--	264	.36	12,900	30	1.0	391	8.2
Jan. 1-31, 1960.	34,860	34	2.10	.60	1.13	.08	2.48		1.10	.23	.04	.01	.08	249	.34	11,850	29	1.0	366	8.5
Feb. 1-29	34,040	31	2.00	.52	1.04	--	2.38		1.00	.24	--	.01	--	229	.31	10,550	29	.9	343	8.5
Mar. 1-8	12,950	36	1.90	.60	.96	--	2.31		.96	.20	--	.03	--	227	.31	4,010	28	.9	335	8.5
Mar. 9-19	28,540	26	2.25	.79	1.22	--	1.98		2.00	.17	--	.04	--	273	.37	10,560	29	1.0	418	8.2
Mar. 20-23	15,010	23	2.64	1.08	1.39	--	1.97		2.87	.19	--	.04	--	327	.44	6,600	27	1.0	494	8.2
Mar. 24-27	17,030	26	2.30	.82	1.00	--	1.87		2.02	.15	--	.04	--	266	.36	6,130	24	.8	401	8.2
Mar. 28-Apr. 9	63,830	21	2.10	.56	.70	--	1.93		1.33	.12	--	.03	--	214	.29	18,510	21	.6	335	7.9
Apr. 10-17	62,010	21	1.80	.42	.42	--	1.90		.62	.09	--	.02	--	163	.22	13,640	16	.4	261	7.5
Apr. 18-30	85,130	19	1.55	.29	.42	--	1.61		.58	.10	--	.01	--	144	.20	17,030	19	.4	229	7.5
May 1-21	95,260	20	1.95	.25	.48	--	2.03		.65	.10	--	.01	--	169	.23	21,910	18	.5	265	7.6

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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 22-26, 1960.	19,020	21	1.40	0.26	0.44	--	1.56		0.52	0.09	--	0.01	--	138	0.19	3,610	21	0.5	211	7.6
May 27-28.....	6,250	22	1.80	.26	.52	--	1.98		.60	.10	--	.01	--	166	.23	1,440	20	.5	253	7.8
May 29-June 5...	33,370	24	1.40	.30	.48	--	1.53		.62	.09	--	.01	--	146	.20	6,670	22	.5	218	8.4
June 6, 8-13....	42,280	23	1.80	.26	.57	--	1.80		.79	.12	--	.01	--	172	.23	9,720	22	.5	261	7.9
June 7.....	5,810	25	2.10	.42	.83	--	1.97		1.23	.17	--	.02	--	216	.29	1,680	25	.7	328	7.7
June 14-21.....	48,090	26	1.85	.43	.91	--	1.74		1.33	.20	--	.01	--	213	.29	13,950	29	.9	323	8.1
June 22-23.....	9,180	26	1.55	.33	.78	--	1.58		1.02	.16	--	.01	--	181	.25	2,300	29	.8	270	8.7
June 24-25.....	1,330	26	2.10	.48	1.00	--	2.23		1.23	.23	--	.01	--	232	.32	1,690	28	.9	357	8.0
June 26-30.....	6,190	28	2.35	.67	1.35	--	2.49		1.73	.28	--	.01	--	283	.38	2,350	31	1.1	431	7.8
July 1-19.....	17,370	28	2.69	.67	1.61	--	2.67		2.06	.34	--	.01	--	319	.43	7,470	32	1.2	486	7.9
July 20-27.....	10,980	26	2.20	.44	.87	--	2.28		1.15	.19	--	.02	--	226	.31	3,400	25	.8	345	7.8
July 28.....	830	24	3.89	.83	1.70	--	2.62		3.56	.28	--	.01	--	412	.56	465	26	1.1	613	8.3
July 29-31.....	2,230	30	2.40	.62	1.35	--	2.66		1.52	.28	--	.01	--	280	.38	847	31	1.1	430	7.9
Aug. 1-8.....	4,870	32	2.30	.76	1.39	--	2.70		1.52	.31	--	.01	--	285	.39	1,900	31	1.1	434	8.0
Aug. 9, 11.....	3,020	23	2.35	.55	1.30	--	2.93		1.08	.31	--	.02	--	259	.35	1,060	31	1.1	409	7.7
Aug. 10, 12-24..	11,240	28	2.00	.64	1.04	--	2.46		1.08	.21	--	.01	--	234	.32	3,600	28	.9	362	7.7
Aug. 25-31.....	7,620	22	1.95	.55	.78	--	2.13		1.06	.13	--	.01	--	206	.28	2,130	24	.7	319	7.7
Sept. 1-6.....	5,870	22	2.25	.41	.83	--	2.31		1.06	.15	--	.00	--	216	.29	1,700	24	.7	342	7.8
Sept. 7-12.....	2,580	30	2.40	.46	1.26	--	2.82		1.06	.27	--	.00	--	258	.35	903	31	1.1	398	7.9
Sept. 13-14.....	1,770	28	2.94	.46	1.30	--	2.82		1.77	.25	--	.01	--	302	.41	726	28	1.0	462	7.6
Sept. 15-30.....	15,780	23	2.50	.46	1.04	--	2.62		1.25	.21	--	.01	--	250	.34	5,370	26	.9	392	7.6
Total or weighted average	821,000	25	2.00	0.48	0.83	--	2.08		1.08	0.16	--	0.02	--	211	0.29	238,100	25	0.7	323	--

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

LOCATION.--At gaging station, 1,800 feet west of San Marcial gage on railway bridge, about 18.5 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 1960.
Water temperatures: March 1954 to September 1960.
Sediment records: March 1954 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,950 micromhos Nov. 2; minimum daily, 476 micromhos May 25.
Percent sodium: Maximum, 66 Oct. 1-9; minimum, 35 Nov. 21-23, May 24-25.
EXTREMES, 1954-60.--Specific conductance: Maximum daily, 2,860 micromhos Oct. 25, 1956; minimum daily, 476 micromhos May 25, 1960.
Percent sodium: Maximum, 66 Oct. 1-20, Nov. 1-21, 1956, Oct. 1-9, 1959; minimum, 32 Aug. 16-17, 22-23, 26, 1959.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 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 1712. Chemical analyses for Rio Grande floodway given on page 91.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-9, 1959..	396	57	3.29	2.14	11.18	0.28	2.85	0.00	6.79	7.02	0.04	0.00	0.36	1,070	1.46	577	66	6.78	1,650	8.2
Oct. 10-13.....	478	--	4.14	1.07	5.05	--	3.54	.00	--	--	--	--	--	664	.90	431	49	3.13	978	8.2
Oct. 14-23.....	1,333	--	3.74	2.14	4.87	--	3.93	.00	--	--	--	--	--	672	.91	1,218	45	2.84	1,000	8.1
Oct. 24-30.....	728	--	4.99	1.97	6.87	--	4.39	.20	--	--	--	--	--	915	1.24	905	50	3.68	1,290	8.3
Oct. 31.....	303	--	4.99	1.48	3.61	--	4.34	.00	--	--	--	--	--	610	.83	252	36	2.01	910	7.6
Nov. 1-2.....	2,317	--	7.98	2.39	6.61	--	4.98	.00	--	--	--	--	--	1,060	1.44	3,340	39	2.90	1,500	8.0
Nov. 3-5.....	2,630	--	5.24	1.32	4.70	--	3.93	.00	--	--	--	--	--	731	.99	2,615	42	2.59	1,050	7.9
Nov. 6-12.....	5,568	--	4.19	.99	3.35	--	3.69	.00	--	--	--	--	--	567	.77	4,293	39	2.08	817	8.1
Nov. 13-17.....	4,374	--	3.89	.90	2.78	--	3.64	.00	--	--	--	--	--	496	.67	2,950	37	1.80	728	7.9
Nov. 18-20.....	3,695	--	4.59	.99	5.31	--	4.16	.00	--	--	--	--	--	744	1.01	3,739	49	3.18	1,060	7.7
Nov. 21-23.....	5,605	--	3.09	.69	2.04	--	2.79	.00	--	--	--	--	--	390	.53	2,973	35	1.49	568	8.0
Nov. 24-Dec. 31.	46,655	--	3.49	.82	2.57	--	3.34	.00	--	--	--	--	--	464	.63	29,441	37	1.75	664	8.2
Jan. 1-6, 1960..	6,855	33	3.29	.82	2.65	.12	2.92	.20	2.71	1.02	.04	.02	.13	465	.63	4,335	39	1.85	657	8.4
Jan. 7-10.....	3,174	--	3.74	.99	3.26	--	3.16	.33	--	--	--	--	--	533	.72	2,300	41	2.12	767	8.6
Jan. 11-31.....	27,616	--	3.39	.65	2.61	--	3.13	.00	--	--	--	--	--	442	.60	16,600	39	1.84	647	8.2
Feb. 1-5.....	6,992	--	3.24	.76	2.52	--	2.80	.33	--	--	--	--	--	438	.60	4,165	39	1.78	626	8.6
Feb. 6-10.....	1,785	--	4.04	1.23	4.96	--	3.28	.27	--	--	--	--	--	665	.90	1,614	48	3.05	1,000	8.4
Feb. 11-29.....	23,931	--	3.29	.73	2.44	--	3.16	.00	--	--	--	--	--	426	.58	13,864	38	1.72	625	8.0

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-8, 1960..	8,854	--	3.64	0.72	2.57	--	3.72	0.00	--	--	--	--	--	459	0.62	5,527	37	1.74	674	7.7
Mar. 9-10.....	4,860	--	7.58	2.39	9.40	--	4.00	.00	--	--	--	--	--	1,310	1.78	8,658	49	4.21	1,740	7.5
Mar. 11-12.....	2,975	--	5.39	1.40	5.83	--	4.06	.00	--	--	--	--	--	828	1.13	3,350	46	3.16	1,160	7.4
Mar. 13-16.....	6,188	--	4.34	1.07	3.87	--	3.52	.00	--	--	--	--	--	609	.83	5,126	42	2.35	887	7.6
Mar. 17-29.....	21,092	--	3.49	.90	2.61	--	3.11	.00	--	--	--	--	--	466	.63	13,367	37	1.76	679	7.6
Mar. 30-Apr. 11.	19,004	31	3.09	.77	2.26	0.13	2.79	.00	2.56	0.85	0.03	0.04	0.16	408	.55	10,545	36	1.63	602	8.1
Apr. 12-30.....	15,376	--	3.79	.99	3.96	--	3.26	.00	--	--	--	--	--	569	.77	11,898	45	2.56	853	8.0
May 1-23.....	18,567	--	3.69	.99	3.83	--	3.28	.00	--	--	--	--	--	548	.75	13,838	45	2.50	829	8.0
May 24-25.....	3,665	--	2.69	.61	1.78	--	2.69	.00	--	--	--	--	--	332	.45	1,655	35	1.39	504	8.0
May 26.....	1,133	--	3.14	.74	2.52	--	2.98	.00	--	--	--	--	--	408	.55	628	39	1.81	627	8.0
May 27-31.....	3,917	--	3.69	.99	3.70	--	3.38	.00	--	--	--	--	--	536	.73	2,856	44	2.42	808	8.2
June 1-2.....	2,059	--	2.99	.77	2.57	--	2.92	.00	--	--	--	--	--	412	.56	1,154	41	1.87	618	8.1
June 3-30.....	23,937	--	3.54	.78	3.61	--	3.21	.00	--	--	--	--	--	512	.70	16,667	46	2.46	769	8.1
July 1-21.....	8,414	28	3.94	.99	4.61	.16	3.51	.00	4.04	2.09	.02	.01	.23	609	.83	6,969	48	2.94	927	8.0
July 22-31.....	1,359	--	4.24	1.23	6.61	--	3.67	.20	--	--	--	--	--	787	1.07	1,454	55	4.00	1,190	8.4
Aug. 1-10.....	738	--	4.54	1.15	7.18	--	4.06	.00	--	--	--	--	--	835	1.14	838	56	4.25	1,280	7.8
Aug. 11-13.....	156	--	3.69	.99	5.22	--	3.80	.00	--	--	--	--	--	642	.87	137	53	3.41	971	7.6
Aug. 14-25.....	486	--	3.79	1.40	8.18	--	3.31	.13	--	--	--	--	--	865	1.18	571	61	5.08	1,340	8.3
Aug. 26-29.....	123	--	3.09	1.07	5.44	--	3.25	.13	--	--	--	--	--	624	.85	104	57	3.77	947	8.3
Aug. 30-Sept. 12	333	--	4.09	1.48	8.35	--	3.80	.00	--	--	--	--	--	897	1.22	407	60	5.00	1,390	7.7
Sept. 13-25.....	250	--	3.59	1.07	5.48	--	3.87	.00	--	--	--	--	--	659	.90	224	54	3.59	995	8.1
Sept. 26-28.....	56	--	4.04	1.48	9.31	--	3.93	.00	--	--	--	--	--	949	1.29	72	63	5.60	1,490	7.7
Sept. 29-30.....	37	--	3.54	1.15	5.57	--	3.84	.00	--	--	--	--	--	665	.90	33	54	3.63	1,010	7.8
Total or weighted average	288,000	--	3.69	0.90	3.22	--	3.29	0.00	--	--	--	--	--	515	0.70	201,600	41	2.11	753	--

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

LOCATION.--At gaging station at Atchison, Topeka, and Santa Fe Railway Co. bridge, 1.1 miles downstream from former site of San Marcial, Socorro County, and 18.5 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 1960.
Water temperatures: January 1949 to September 1960.
Sediment records: July 1946 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,050 micromhos Mar. 10; minimum, 350 micromhos Apr. 24.
Percent sodium: Maximum, 51 Mar. 11-12; minimum, 28 Apr. 6-21.
EXTREMES, 1946-60.--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.--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 1959 to September 1960 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 1712. Chemical analyses for Rio Grande conveyance channel given on page 69. No flow Oct. 1-31, Nov. 5-18, Nov. 22 to Jan. 14, Jan. 18 to Feb. 5, Feb. 13 to Mar. 9, July 2 to Sept. 10, Sept. 13-20, 23-30.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Nov. 1-4, 19-21, 1959...	1,985	--	3.99	0.75	2.26		3.64	0.00	--	--	--	--	--	449	0.61	1,212	32	1.47	669	7.8
Jan. 15-17, 1960	32	--	3.24	.68	2.65		2.62	.33	--	--	--	--	--	428	.58	18	40	1.89	639	8.7
Feb. 6-12.....	2,499	28	3.24	.70	2.52	0.13	3.03	.07	2.52	0.79	0.04	0.05	0.13	434	.59	1,475	38	1.80	628	8.3
Mar. 10.....	526	--	9.36	2.63	11.40		3.87	.00	--	--	--	--	--	1,600	2.18	1,144	49	4.65	2,050	7.9
Mar. 11-12.....	4,161	--	5.44	1.40	6.96		2.95	.00	--	--	--	--	--	937	1.27	5,303	50	3.76	1,290	7.9
Mar. 13-15.....	4,159	--	3.99	1.07	4.22		2.88	.00	--	--	--	--	--	618	.84	3,496	45	2.65	890	7.8
Mar. 16-25.....	6,407	--	3.29	.73	2.48		2.79	.00	--	--	--	--	--	430	.56	3,747	38	1.75	641	7.8
Mar. 26-31.....	11,472	--	2.84	.72	2.04		2.34	.00	--	--	--	--	--	384	.52	5,991	36	1.53	556	7.8
Apr. 1-5.....	11,574	--	2.94	.72	1.61		2.85	.00	--	--	--	--	--	362	.49	5,698	30	1.19	524	7.7
Apr. 6-21.....	68,739	27	2.59	.57	1.31	.12	2.57	.00	1.54	.39	.03	.06	.14	303	.41	28,326	28	1.04	445	7.9
Apr. 22-27.....	28,205	--	2.15	.49	1.13		2.23	.00	--	--	--	--	--	258	.35	9,897	30	.98	379	7.9
Apr. 26-May 8...	32,136	--	2.50	.60	1.31		2.61	.00	--	--	--	--	--	292	.40	12,763	30	1.05	436	7.9
May 9-18.....	18,883	--	2.79	.49	1.44		2.82	.00	--	--	--	--	--	312	.42	8,012	30	1.12	466	7.6
May 19-26.....	16,502	--	2.30	.46	1.31		2.39	.00	--	--	--	--	--	278	.38	6,239	32	1.11	406	8.0
May 27-June 10..	15,977	--	2.50	.46	1.57		2.49	.00	--	--	--	--	--	307	.42	6,671	35	1.29	452	8.1
June 11-12.....	11,722	--	3.29	.82	1.91		2.72	.00	--	--	--	--	--	399	.54	6,361	32	1.33	591	7.9
June 13-July 1..	39,118	--	2.50	.52	1.48		2.38	.00	--	--	--	--	--	310	.42	16,492	33	1.20	449	8.0
Sept.11-12,21-22	212	--	7.83	2.55	5.26		6.85	.00	--	--	--	--	--	972	1.32	280	34	2.31	1,410	7.5
Total or weighted average	274,300	--	2.69	0.59	1.61	--	2.56	--	--	--	--	--	--	330	0.45	123,400	33	1.22	483	--

RIO GRANDE BASIN--Continued

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

LOCATION.--At gaging station, 1.0 mile downstream from dam, 1.5 miles upstream from Cuchillo Negro River, and in Pedro 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 1960.
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 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959	20	15,910	--	3.10	1.16	3.12	--	2.75		3.55	1.15	--	0.01	0.12	483	0.66	10,500	42	2.1	727	7.8
November....	25	623	--	3.30	1.22	3.46	--	2.93		3.94	1.28	--	.01	.16	518	.70	436	43	2.3	794	8.0
December....	20	547	--	3.39	1.28	3.68	--	3.07		4.11	1.30	--	.01	.13	547	.74	404	44	2.4	817	8.0
January 1960	25	36,000	18	3.36	1.30	3.22	0.15	2.80		3.87	1.25	0.04	.01	.13	513	.70	25,200	40	2.1	773	7.9
February....	20	39,600	--	3.36	1.32	3.25	--	2.75		3.89	1.25	--	.01	.11	515	.70	27,620	41	2.1	780	7.9
March.....	20	103,800	--	3.39	1.24	3.22	--	2.75		3.86	1.30	--	.01	.11	512	.70	72,660	41	2.1	776	8.1
April.....	20	102,700	--	3.41	1.34	3.14	--	2.93		3.88	1.25	--	.01	.11	499	.68	69,840	40	2.0	765	8.2
May.....	25	107,200	--	3.30	1.16	3.08	--	2.80		3.73	1.12	--	.01	.11	499	.68	72,900	41	2.1	752	8.0
June.....	20	106,100	--	3.16	1.14	2.92	--	2.73		3.50	1.10	--	.01	.11	473	.64	67,900	40	2.0	722	8.1
July.....	25	82,110	18	2.96	1.07	2.65	.11	2.67		3.20	.85	.03	.01	.10	448	.61	50,090	39	1.9	671	7.8
August.....	20	61,440	--	2.88	1.01	2.65	--	2.67		3.03	.95	--	.01	.11	412	.56	34,410	41	1.9	650	7.8
September...	20	25,790	--	2.61	1.18	3.07	--	2.75		3.20	1.00	--	.01	.18	449	.61	15,730	45	2.2	679	7.8
Total or weighted average	--	681,820	--	3.21	1.19	3.01	--	2.77		3.60	1.13	--	0.01	0.11	482	0.66	447,690	41	2.0	733	--

8-3640. 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 1960.
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 1959 to September 1960 given in International Boundary and Water Commission Water Bulletin Numbers 29 and 30. Records for previous years given in earlier Bulletins.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959	31	8,470	--	6.55	2.62	14.62	--	4.45		11.40	8.20	--	0.01	0.40	1,576	2.14	18,100	61	6.7	2,320	7.9
November....	30	6,120	--	6.41	2.68	15.12	--	a4.55		11.56	8.35	--	.01	.37	1,554	2.11	12,900	62	7.1	2,350	8.3
December....	29	6,570	--	7.14	2.55	15.03	--	4.90		11.76	6.52	--	.01	.25	1,631	2.22	14,600	61	6.8	2,400	8.0
January 1960	27	5,720	33	6.85	2.61	15.10	0.36	5.07		11.40	8.60	0.04	.01	.28	1,640	2.23	12,800	61	8.9	2,380	8.1
February....	28	3,820	--	6.89	2.66	16.04	--	5.13		11.92	6.85	--	.01	.37	1,709	2.32	8,860	63	7.3	2,470	8.2
March.....	31	50,700	--	3.89	1.54	5.05	--	2.97		4.93	2.80	--	.01	.16	667	.91	46,100	46	3.1	1,080	8.2
April.....	30	38,700	--	4.97	1.68	6.46	--	3.75		6.09	3.40	--	.01	.21	845	1.15	44,500	49	3.5	1,280	7.9
May.....	31	41,600	--	4.93	1.74	6.42	--	3.80		6.13	3.35	--	.01	.11	852	1.16	48,300	49	3.5	1,270	7.9
June.....	30	52,800	--	4.58	1.56	5.66	--	3.50		5.72	2.92	--	.01	.22	770	1.05	55,400	48	3.2	1,170	7.9
July.....	28	60,900	24	4.46	1.60	5.61	.20	3.30		5.49	2.95	.04	.01	.19	769	1.05	63,900	47	3.2	1,150	8.0
August.....	31	61,800	--	4.42	1.56	5.66	--	3.50		5.48	2.90	--	.01	.11	753	1.02	63,000	49	3.3	1,140	8.0
September...	30	36,600	--	5.17	1.76	7.49	--	4.05		6.65	4.10	--	.01	.15	945	1.29	47,200	52	4.0	1,420	7.9
Total or weighted average	--	373,800	--	4.76	1.71	6.69	--	3.57		6.19	3.57	--	0.01	0.18	856	1.17	435,660	50	3.7	1,295	--

a Includes 0.32 equivalent per million carbonate (CO_3).

RIO GRANDE BASIN--Continued

8-3705. 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 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 1960.
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 1959 to September 1960 given in International Boundary and Water Commission Water Bulletin Numbers 29 and 30. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959	5	a1,010	--	6.04	2.17	12.68	--	3.25	0.00	8.51	9.30	--	0.02	0.40	1,346	1.69	1,710	61	6.3	2,080	7.8
November....	4	a1,270	--	11.33	5.13	30.37	--	4.11	.42	18.17	24.50	--	.01	.49	2,994	4.07	5,170	65	11	4,480	8.4
December....	5	1,480	--	13.84	6.02	33.22	--	5.10	.00	18.80	30.05	--	.01	.52	3,398	4.62	6,840	63	11	5,040	7.9
January 1960	4	345	20	16.84	7.42	40.80	0.33	4.63	.00	20.67	40.12	0.05	.01	.52	4,210	5.73	1,980	62	12	6,140	8.2
February....	4	83	--	30.97	14.76	71.81	--	4.83	.00	30.14	82.30	--	.01	.77	7,484	10.20	846	61	15	10,600	7.9
March.....	5	68	--	35.68	16.41	92.85	--	4.10	.00	36.35	106.50	--	.02	1.04	9,642	13.10	888	63	18	13,300	7.9
April.....	4	236	--	22.70	11.43	63.68	--	4.20	.00	29.84	64.00	--	.01	.85	6,152	8.37	1,980	65	15	8,980	7.8
May.....	5	205	--	18.89	8.76	38.70	--	4.15	.00	17.40	45.00	--	.01	.49	4,410	6.00	1,230	58	10	6,290	7.8
June.....	7	476	--	8.39	3.41	18.20	--	4.70	.00	9.40	16.20	--	.04	.38	1,892	2.57	1,220	61	7.5	2,970	8.0
July.....	8	18,900	22	7.14	2.51	12.70	.14	4.10	.00	8.14	10.25	.05	.01	.33	1,446	1.97	37,200	56	5.8	2,200	8.0
August.....	7	2,940	--	14.88	6.65	34.68	--	4.50	.00	18.28	33.62	--	.01	.55	3,554	4.83	14,200	62	11	5,410	8.1
September...	4	4,410	--	12.12	4.91	27.68	--	4.85	.00	16.45	23.50	--	.02	.45	2,899	3.94	17,400	62	9.5	4,300	7.9
Total or weighted average	--	31,423	--	9.46	3.74	19.81	--	4.28	--	11.67	17.22	--	0.01	0.40	2,124	2.89	90,664	58	7.5	3,196	--

a Estimated.

RIO GRANDE BASIN--Continued

8-3715. RIO GRANDE AT UPPER PRESIDIO, TEX.

LOCATION.--At gaging station, 7.8 river miles above the junction of the Rio Conchos, about 10 miles northwest of the towns of Presidio, Tex., and Ojinaga, 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 1960.
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 1959 to September 1960 given in International Boundary and Water Commission Water Bulletin Numbers 29 and 30. Records for previous years given in earlier Bulletins. No flow Oct. 18, 1959 to July 8, 1960.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959.	2	729		3.43		2.02	--	2.45			0.95				343	0.47	343	37	1.5	542	
July 1960....	9	8,540	18	5.59	1.42	7.90	0.18	2.95		6.34	5.75	0.02	0.03	0.18	984	1.34	11,400	52	4.2	1,500	7.9
August.....	10	9,080		7.01		8.36	--	2.77			6.75				1,012	1.38	12,500	54	4.5	1,570	
September....	3	1,950		5.15		4.23	--	2.55			2.60				617	.84	1,640	45	2.6	956	

RIO GRANDE BASIN--Continued

8-3775. 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 1960.
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 1959 to September 1960 given in International Boundary and Water Commission Water Bulletin Numbers 29 and 30.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959.	4	87,600	--	4.28	1.36	4.22	--	2.73		5.29	1.90	--	0.04	0.21	660	0.90	78,800	43	2.5	963	7.7
November.....	4	50,800	--	2.86	1.74	5.85	--	1.10		6.84	2.50	--	.02	.27	880	.92	56,400	56	3.9	1,060	8.1
December.....	4	49,300	--	4.87	1.72	5.50	--	3.09		6.86	2.30	--	.03	.23	808	1.10	54,200	45	3.0	1,170	7.9
January 1960.	3	67,500	22	4.05	1.50	4.92	0.14	2.85		8.03	1.80	0.08	.03	.25	727	.99	66,800	46	3.0	1,040	8.2
February.....	4	95,300	--	3.43	1.20	3.75	--	2.40		4.71	1.45	--	.01	.09	589	.80	76,200	45	2.5	838	8.2
March.....	3	77,600	--	3.89	1.42	3.64	--	3.05		4.43	1.50	--	.04	.19	583	.79	61,300	41	2.2	881	8.1
April.....	3	39,800	--	4.16	1.61	4.60	--	2.90		5.49	2.00	--	.02	.19	682	.93	37,000	44	2.7	1,030	7.8
May.....	3	29,900	--	3.91	1.74	4.82	--	2.70		5.83	2.15	--	.01	.25	688	.94	28,100	46	2.9	1,040	7.7
June.....	2	44,600	--	4.62	1.70	5.23	--	2.80		6.75	2.30	--	.02	.28	765	1.04	46,400	45	2.9	1,140	8.1
July.....	4	226,000	22	4.24	.83	2.43	.14	2.90		3.82	.80	.04	.05	.18	511	.69	156,000	32	1.5	729	7.9
August.....	6	248,000	--	4.08	.68	2.97	--	2.95		3.75	1.15	--	.02	.21	527	.72	179,000	38	1.9	759	7.8
September....	7	188,000	--	3.73	.69	2.46	--	3.17		2.96	.85	--	.06	.08	451	.61	115,000	36	1.7	676	8.0
Total or weighted average	--	1,204,400	--	4.00	1.08	3.50	--	2.83		4.48	1.37	--	0.03	0.18	577	0.78	955,200	40	2.2	845	--

8-4590. 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 (United States and Mexico; from International Boundary and Water Commission Bulletin Number 28).
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1960.
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 of individual water samples, and these same chemical analyses, for water year October 1959 to September 1960 given in International Boundary and Water Commission Water Bulletin Numbers 29 and 30. Records for previous years given in earlier Bulletins.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959	31	389,000	--	4.14		2.08	--	2.55		--	1.65	--	--	--	387	0.53	206,000	33	1.5	614	--
November	30	178,300	--	5.27		3.62	--	2.87		--	2.70	--	--	--	559	.76	136,000	41	2.2	894	--
December	31	151,500	--	5.59		4.06	--	2.97		--	3.00	--	--	--	623	.85	129,000	42	2.4	964	--
January 1960	31	160,100	24	4.09	1.76	4.52	0.11	2.90		4.07	3.45	0.04	0.08	0.18	692	.94	150,000	43	2.6	1,060	8.1
February	29	173,100	--	5.57		4.33	--	2.80		--	3.12	--	--	--	649	.88	152,000	44	2.6	992	--
March	31	153,400	--	5.35		4.10	--	2.80		--	3.15	--	--	--	574	.78	120,000	43	2.5	962	--
April	30	99,310	--	5.64		4.82	--	2.65		--	4.00	--	--	--	663	.90	89,400	46	2.9	1,070	--
May	31	91,530	--	5.11		3.97	--	2.55		--	3.30	--	--	--	572	.78	71,400	44	2.5	939	--
June	30	62,020	--	5.19		4.43	--	2.47		--	3.40	--	--	--	608	.83	51,500	46	2.7	987	--
July	31	286,400	20	3.73	0.99	3.01	.12	2.61		3.24	1.85	.05	.07	.13	511	.69	198,000	38	2.0	780	7.8
August	31	274,800	--	4.91		2.95	--	2.70		--	1.65	--	--	--	523	.71	195,000	38	1.9	790	--
September	30	292,500	--	4.20		2.18	--	2.60		--	1.15	--	--	--	409	.56	164,000	34	1.5	641	--
Total or weighted avsrage	--	2,311,960	--	4.93		3.29	--	2.70		--	2.33	--	--	--	528	0.72	1,662,300	39	2.0	828	--

RIO GRANDE BASIN--Continued

8-4613. 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 1960.
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 of individual water samples, and these same chemical analyses, for water year October 1959 to September 1960 given in International Boundary and Water Commission Bulletin Numbers 29 and 30. Records for previous years given in earlier Bulletins.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959	9	97,300	--	3.22	1.42	3.20	--	2.07		3.50	2.32	--	0.02	0.16	503	0.68	66,200	41	2.1	796	7.7
November....	6	42,400	--	3.14	1.62	3.28	--	1.85		3.92	2.30	--	.01	.09	504	.69	29,300	41	2.1	814	8.0
December....	8	133,000	--	3.23	1.38	3.14	--	2.20		3.43	2.28	--	.01	.15	526	.72	95,800	41	2.1	795	7.6
January 1960	11	355,000	18	3.22	1.24	3.30	0.15	2.15		3.43	2.40	0.03	.01	.16	521	.71	252,000	42	2.2	817	8.0
February....	7	244,000	--	3.41	1.28	3.23	--	2.15		3.55	2.30	--	.01	.15	528	.72	176,000	41	2.1	805	8.0
March.....	6	66,500	--	3.59	1.36	3.28	--	2.37		3.55	2.42	--	.01	.17	514	.70	46,600	40	2.1	838	8.0
April.....	10	138,000	--	3.56	1.41	3.44	--	2.40		3.62	2.50	--	.01	.15	534	.73	101,000	41	2.2	861	7.9
May.....	14	244,000	--	3.61	1.54	3.63	--	2.47		3.75	2.60	--	.01	.19	549	.75	183,000	41	2.3	887	7.8
June.....	12	551,000	--	3.45	1.54	3.76	--	2.27		3.92	2.70	--	.01	.15	559	.76	419,000	43	2.4	899	7.8
July.....	10	192,000	12	3.36	1.70	3.98	.12	2.17		4.01	2.90	.04	.01	.22	596	.81	156,000	43	2.5	918	7.8
August.....	9	80,600	--	3.35	1.55	4.15	--	2.15		4.10	2.95	--	.01	.19	582	.79	63,700	46	2.7	928	7.8
September...	4	37,600	--	3.26	1.54	4.02	--	2.05		4.07	2.85	--	.03	.19	570	.78	29,300	46	2.6	905	7.9
Total or weighted average	--	2,181,400	--	3.39	1.48	3.54	--	2.23		3.72	2.55	--	0.01	0.16	544	0.74	1,617,900	42	2.3	860	--

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

LOCATION.--At gaging station, 1,200 feet downstream from Alamogordo Dam, 1.5 miles downstream from Alamogordo Creek, and 4.5 miles northeast of Guadalupe, De Baca County.
DRAINAGE AREA.--4,390 square miles, approximately (contributing area).
RECORDS AVAILABLE.--Chemical analyses: June 1937 to September 1960.
Water temperatures: June 1959 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,940 micromhos on several days during April; minimum daily, 1,400 micromhos July 29-30.
Percent sodium: Maximum, 15 Dec. 1-31; minimum, 11 Mar. 1 to June 30.
EXTREMES, 1937-60.--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.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million									Boron (B) ppm	Dissolved solids (calculated)			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. 1-31, 1959.	4,860	16	13.87	2.43	2.27		1.92		15.03	1.61		0.01		1,210	1.65	8,020	12	0.8	1,520	7.3
Nov. 1-30.....	1,700	16	14.87	2.93	2.70		2.08		16.61	1.80		.01		1,340	1.82	3,090	13	.9	1,640	7.3
Dec. 1-31.....	360	17	15.47	3.13	3.22		1.85		17.99	1.97		.01		1,430	1.94	698	15	1.1	1,720	7.3
Jan. 1-31, 1960.	277	15	16.47	3.03	3.12		2.03		18.49	2.09		.01		1,480	2.01	557	14	1.0	1,790	7.4
Feb. 1-29.....	255	17	16.47	3.53	3.36		1.98		19.24	2.14		.00		1,530	2.08	530	14	1.1	1,620	7.5
Mar. 1-31.....	28,440	22	17.71	3.09	2.53		2.10		19.05	2.17		.01		1,530	2.08	59,160	11	.8	1,880	7.6
Apr. 1-30.....	6,300	20	18.06	3.34	2.74		2.13		19.74	2.26		.01		1,580	2.15	13,540	11	.8	1,920	7.6
May 1-31.....	38,770	15	17.71	2.89	2.55		2.07		18.93	2.14		.01		1,510	2.05	79,480	11	.8	1,870	7.6
June 1-30.....	12,350	15	15.97	4.03	2.27		2.03		17.26	1.97		.01		1,400	1.90	23,460	11	.7	1,730	7.4
July 1-31.....	4,510	12	13.07	2.53	2.19		1.87		14.28	1.64		.00		1,160	1.58	7,130	12	.8	1,490	7.6
Aug. 1-31.....	10,160	16	12.67	2.43	2.14		1.85		13.91	1.47		.01		1,130	1.54	15,650	12	.8	1,450	7.3
Sept. 1-30.....	5,810	16	13.47	2.37	2.34		1.92		14.70	1.55		.01		1,190	1.62	9,410	13	.8	1,510	7.4
Total or weighted average	113,800	17	16.47	3.04	2.48		2.03		17.76	2.00		0.01		1,430	1.94	220,800	11	0.8	1,770	--

RIO GRANDE BASIN--Continued

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 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 1960.
Water temperatures: April 1949 to September 1960.
Sediment records: January 1949 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 20,600 micromhos Oct. 2; minimum daily, 1,090 micromhos July 7.
Percent sodium: Maximum, 66 Oct. 2-5; minimum, 17 May 18-31.
EXTREMES, 1937-60.--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.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of epecific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1712.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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, 1959....	12	33	40.67	24.93	117.24		2.93		58.09	121.82		--		11,000	15.0	180	64	20	15,800	7.8
Oct. 2-5.....	115	29	43.06	24.93	a141.38		2.87		60.79	148.33		--		12,800	17.4	2,000	66	24	18,000	7.5
Oct. 6-11.....	335	26	32.83	20.57	71.23		2.64		47.26	74.73		--		7,570	10.3	3,450	57	14	10,600	7.7
Oct. 12-22.....	642	22	27.35	14.65	44.19		2.21		37.68	46.25		0.05		5,290	7.19	4,620	51	9.6	7,530	7.8
Oct. 23-31.....	466	22	29.94	18.06	58.41		2.46		42.47	61.48		--		6,480	8.81	4,110	55	12	9,120	7.7
Nov. 1-4.....	341	21	28.44	16.36	50.42		2.62		39.56	53.02		.02		5,810	7.90	2,690	53	11	8,130	7.4
Nov. 5-6.....	337	21	26.20	12.60	32.87		2.41		36.23	32.99		.04		4,440	6.04	2,040	46	7.5	6,070	7.9
Nov. 7-10.....	498	22	23.45	10.15	26.07		2.46		31.23	25.94		.04		3,710	5.05	2,510	44	6.4	5,070	7.9
Nov. 11-30.....	2,330	22	26.45	13.55	38.75		2.59		36.64	39.48		.04		4,850	6.60	15,380	49	8.7	6,710	7.9
Dec. 1-20.....	2,530	21	26.95	14.65	44.24		2.80		37.89	45.12		.03		5,260	7.15	18,090	52	9.7	7,350	7.9
Dec. 21-27.....	1,130	21	24.95	12.25	37.24		2.47		33.31	38.63		.03		4,570	6.22	7,030	50	8.6	6,530	7.8
Dec. 28-Jan. 31, 1960.	5,880	23	26.95	14.45	45.13		3.00		36.64	46.81		.08		5,290	7.19	42,280	52	9.9	7,410	7.8
Feb. 1-17.....	2,630	22	27.69	15.51	47.79		3.23		37.48	50.20		.08		5,550	7.55	19,860	53	10	7,730	7.8
Feb. 18-29.....	1,370	19	28.69	17.71	55.67		2.34		41.64	58.09		--		6,220	8.46	11,590	55	12	8,730	8.1
Mar. 1-19.....	1,900	17	29.19	18.81	54.48		2.33		42.06	58.09		--		6,230	8.47	16,090	53	11	8,810	8.0

Mar. 20-22, 1960	2,390	27	22.70	7.30	12.00	2.05	28.73	11.14	.08	2,690	3.66	8,750	29	3.1	3,460	8.1
Mar. 23-31.....	11,290	19	20.86	5.14	6.61	2.23	24.57	5.78	.03	2,110	2.87	32,400	20	1.8	2,610	7.6
Apr. 1-5.....	4,650	17	21.66	5.14	7.83	1.80	25.61	7.19	.03	2,230	3.03	14,090	23	2.1	2,800	7.9
Apr. 6-8.....	480	15	23.95	7.45	19.78	2.33	29.36	19.46	.03	3,210	4.37	2,100	39	5.0	3,920	7.6
Apr. 9-10.....	218	17	25.75	8.85	22.71	2.39	32.90	22.00	.02	3,600	4.90	1,070	40	5.5	4,770	7.4
Apr. 11-14.....	512	17	26.95	11.45	28.98	1.97	36.64	28.76	.01	4,200	5.71	2,920	43	6.6	5,660	7.2
Apr. 15-20.....	631	21	29.94	14.86	41.45	2.29	41.64	42.30	.02	5,320	7.24	4,570	48	8.8	7,240	7.3
Apr. 21-30.....	674	23	32.93	17.87	55.61	2.39	47.05	56.96	.01	6,530	8.88	5,990	52	11	9,010	7.5
May 1-15.....	797	21	34.93	19.27	62.08	2.82	47.47	65.99	--	7,090	9.64	7,680	53	12	9,920	7.5
May 16-17.....	1,390	16	24.70	7.90	13.74	2.26	31.23	12.83	.02	2,950	4.01	5,570	30	3.4	3,790	7.3
May 18-31.....	16,570	16	21.21	4.39	5.08	1.90	23.53	5.22	.03	1,980	2.69	44,570	17	1.4	2,500	7.5
June 1-12.....	16,980	22	19.36	3.84	5.76	2.18	21.44	5.30	.04	1,870	2.54	43,130	20	1.7	2,370	7.8
June 13.....	1,100	24	8.28	1.72	3.71	2.46	7.37	3.84	.04	862	1.17	1,290	27	1.7	1,290	8.1
June 14.....	561	18	11.18	2.62	7.87	2.47	11.10	8.07	.03	1,350	1.84	1.030	36	3.0	2,020	7.7
June 15-16.....	605	25	14.77	4.43	13.22	2.44	16.11	13.82	.05	2,020	2.75	1,660	41	4.3	2,980	7.5
June 17-19.....	432	29	18.96	6.82	19.28	2.72	22.28	20.02	.06	2,800	3.81	1,650	43	5.4	3,990	8.0
June 20-25.....	260	23	26.35	9.25	31.84	2.10	33.73	31.58	.03	4,200	5.71	1,480	47	7.5	5,710	7.5
June 26-29.....	69	25	31.54	13.26	45.89	2.21	42.47	45.97	.04	5,620	7.64	527	51	9.7	7,580	7.8
June 30-July 5..	54	23	36.98	18.82	82.29	2.16	50.38	85.45	.10	8,400	11.4	616	60	16	11,700	7.8
July 6-7.....	6,810	17	6.49	1.01	4.00	1.97	6.12	3.33	.08	727	.99	6,740	35	2.1	1,090	8.3
July 8-12.....	62,270	16	22.55	2.65	6.30	1.74	24.98	4.74	.04	2,070	2.82	175,600	20	1.8	2,470	7.7
July 13-17.....	11,790	19	23.15	3.85	12.06	2.33	25.82	10.86	.05	2,510	3.41	40,200	31	3.3	3,180	7.7
July 18-25.....	5,950	22	26.75	7.65	22.36	2.59	32.27	21.86	.04	3,570	4.86	28,920	39	5.4	4,690	7.7
July 26-31.....	2,450	25	29.54	10.46	29.15	2.59	36.64	29.89	.03	4,310	5.86	14,360	42	6.5	5,730	7.7
Aug. 1-6.....	1,880	25	27.44	11.76	32.11	2.46	35.81	32.99	.05	4,420	6.01	11,300	45	7.3	6,060	7.7

a Determined by analysis and does not include potassium (K).

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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. 7-11, 1960.	934	24	31.94	15.06	45.66		2.43		42.26	47.94		0.03		5,700	7.75	7,240	49	9.4	7,920	7.7
Aug. 12.....	1,120	22	28.94	11.06	31.23		2.57		37.06	31.58		.02		4,430	6.02	6,740	44	7.0	6,050	7.8
Aug. 13.....	1,390	17	19.56	5.04	15.17		2.41		23.11	14.24		.01		2,510	3.41	4,740	38	4.3	3,470	7.4
Aug. 14-17.....	4,130	18	16.37	4.03	7.40		2.16		19.05	6.54		.05		1,780	2.42	9,990	27	2.3	2,360	7.6
Aug. 18-19.....	670	20	19.86	6.54	14.64		2.13		24.78	14.10		.03		2,590	3.52	2,360	36	4.0	3,460	7.5
Aug. 20-21.....	522	21	23.35	8.65	22.26		2.52		29.15	22.56		.03		3,380	4.60	2,400	41	5.6	4,640	7.5
Aug. 22-25.....	750	21	27.20	11.20	31.87		2.16		35.39	32.71		.01		4,360	5.93	4,450	45	7.3	5,970	7.6
Aug. 26-31.....	714	21	29.94	15.66	44.40		2.39		40.81	46.81		.01		5,520	7.51	5,360	49	9.3	7,670	7.4
Sept. 1-12.....	1,070	20	33.68	19.12	58.06		2.56		48.51	59.78		.01		6,790	9.23	9,880	52	11	9,330	7.4
Sept. 13-30.....	2,310	18	28.69	15.11	41.18		2.29		41.22	41.45		.02		5,240	7.13	16,470	48	8.8	7,210	7.2
Total or weighted average	185,000	19	22.41	5.76	14.44		2.10		26.44	13.93		0.04		2,700	3.67	679,000	34	3.8	3,510	--

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 1960.
Water temperatures: March 1953 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 18,400 micromhos July 9; minimum daily, 8,050 micromhos Oct. 6.
Percent sodium: Maximum, 75 July 8-18; minimum, 61 Nov. 1-30.
EXTREMES, 1937-60.--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.--Dashes omitted in potassium (K) column indicate sodium (Na) plus potassium (K) are calculated. 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 1959 to September 1960 given in WSP 1712. 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 1959 to September 1960

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. 1-31, 1959.	898	18	26.95	13.41	71.78	1.23	2.36		35.81	75.60				6,890	9.37	8,412	63	15.98	10,200	7.6
Nov. 1-30.....	77	17	26.45	14.81	65.25		2.26		38.73	65.45				6,480	8.81	682	61	14.37	9,300	7.7
Dec. 1-31.....	2,004	17	26.45	13.33	68.30		2.26		39.14	66.86				6,600	8.98	17,992	63	15.31	9,520	7.2
Jan. 1-31, 1960.	197	14	27.69	15.05	68.73		2.31		39.35	69.96				6,770	9.21	1,812	62	14.87	9,790	7.5
Feb. 1-29.....	121	13	27.69	14.15	69.17		4.23		39.77	67.14				6,750	9.18	1,109	62	15.12	9,450	7.6
Mar. 1-31.....	111	12	27.69	16.04	78.74		2.29		40.81	79.55				7,420	10.09	1,117	64	16.84	10,700	7.4
Apr. 1-30.....	13,388	11	27.45	16.53	78.74	1.30	2.33		41.85	78.99				7,500	10.20	136,562	63	16.79	10,700	7.1
May 1-31.....	7,010	10	28.84	17.19	83.09		2.11		43.93	82.94				7,820	10.64	74,548	64	17.32	11,100	7.2
June 1-30.....	4,308	10	29.54	17.69	91.35		2.15		46.01	90.55				8,400	11.42	49,216	66	18.80	11,900	7.2
July 1-7, 19-31.	4,630	10	23.79	18.34	93.08		2.07		45.80	93.38				8,540	11.61	53,906	66	18.98	12,000	7.3
July 8-18.....	212	14	29.69	23.36	156.91		2.05		49.14	158.82				12,600	17.14	3,627	75	30.49	18,000	7.3
Aug. 1-31.....	5,718	12	29.79	16.53	85.26		2.08		43.93	85.48				7,970	10.84	61,982	65	17.72	11,400	6.9
Sept. 1-30.....	6,426	15	26.70	14.89	76.13		2.13		38.73	76.73				7,120	9.68	62,229	65	16.69	10,300	7.0
Total or weighted average	45,100	12	28.25	16.51	82.22	--	2.19		42.57	82.36				7,710	10.50	473,200	65	17.36	11,000	7.1

RIO GRANDE BASIN--Continued

8-4474. 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 the 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 Number 28).
RECORDS AVAILABLE.--Chemical analyses: January 1955 to September 1960. Chemical analyses for period July 1954 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 1959 to September 1960 given in International Boundary and Water Commission Bulletin Numbers 29 and 30. Records of previous years are given in earlier Bulletins for a station near the mouth, and for a station 4.7 river miles upstream at the Pecos High Bridge.

Chemical analyses, water year October 1959 to September 1960

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)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
October 1959	5	101,000	--	4.34	2.27	6.70	--	2.60	0.00	3.58	7.10	--	0.10	0.11	842	1.15	116,000	50	3.7	1,380	7.7
November....	4	19,200	--	5.68	3.91	11.46	--	2.74	.36	5.63	12.35	--	.10	.19	1,262	1.72	33,000	54	5.2	2,120	8.4
December....	4	16,300	--	7.00	5.05	15.34	--	3.15	.00	7.45	16.65	--	.08	.20	1,744	2.37	38,600	56	6.3	2,770	7.8
January 1960	4	16,400	10	7.66	5.72	18.83	0.17	3.00	.00	8.65	20.75	0.04	.15	.21	2,104	2.86	46,900	58	7.2	3,280	8.1
February....	4	14,600	--	8.07	6.00	20.46	--	2.80	.00	9.51	22.55	--	.06	.22	2,293	3.12	45,600	59	7.7	3,480	8.0
March.....	5	14,300	--	8.41	6.34	21.64	--	2.81	.00	9.81	23.80	--	.06	.21	2,304	3.13	44,800	59	6.0	3,630	7.9
April.....	4	11,800	--	8.25	6.38	21.70	--	2.71	.00	9.84	24.00	--	.04	.24	2,315	3.15	37,200	60	8.0	3,640	7.7
May.....	5	9,450	--	7.36	5.47	18.03	--	2.55	.00	6.33	20.20	--	.02	.25	1,983	2.70	25,500	58	7.1	3,140	7.7
June.....	4	7,810	--	5.89	4.60	15.53	--	2.07	.00	7.15	17.20	--	.02	.24	1,651	2.25	17,600	59	6.7	2,690	7.7
July.....	4	19,100	16	7.03	5.70	19.36	.14	2.35	.00	8.85	21.00	.05	.04	.29	2,032	2.76	52,700	60	7.7	3,260	7.9
August.....	5	12,200	--	5.84	4.24	14.36	--	2.33	.00	6.47	15.70	--	.03	.26	1,519	2.07	25,300	59	6.4	2,500	8.1
September...	5	6,290	--	5.96	4.26	14.15	--	2.27	.00	6.47	15.78	--	.04	.19	1,526	2.06	17,200	58	6.3	2,520	7.8
Total or weighted average	--	250,450	--	5.98	4.07	13.07	--	2.64	--	6.26	14.26	--	0.08	0.18	1,468	2.00	500,400	55	5.6	2.352	--

COLORADO RIVER MAIN STEM

9-711. COLORADO RIVER NEAR GLENWOOD SPRINGS, COLO.

LOCATION.--At Shoshone powerplant, 6 miles upstream from gaging station at Glenwood Springs, Garfield County, and 6.5 miles upstream from Roaring Fork.
DRAINAGE AREA.--4,560 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1941 to September 1960.
Water temperatures: May 1949 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 889 micromhos Nov. 28; minimum daily, 246 micromhos June 7.
Percent sodium: Maximum, 45 Dec. 21, Feb. 1-29; minimum, 20 June 1-23.
EXTREMES, 1941-60.--Specific conductance: Maxiumu daily, 2,260 micromhos Aug. 10, 1947; minimum daily, 153 micromhos May 24, 1948.
Percent sodium: Maximum, 53 Dec. 11-20, 1954; minimum, 11 May 21-31, 1956.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for gaging station at Glenwood Springs for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	84,120	9.5	3.04	1.08	2.57	0.05	2.18		2.39	2.14		0.01	0.06	403	0.55	46,270	38	1.8	679	7.7
Nov. 1-27, 29...	65,540	9.9	2.92	1.06	2.70	.05	2.18		2.19	2.37		.01	.05	405	.55	36,050	40	1.9	687	7.7
Nov. 28, 30.....	3,020	9.2	3.40	1.38	3.78	.05	2.46		2.71	3.52		.01	.05	504	.69	2,080	44	2.4	865	8.1
Dec. 1.....	1,710	10	3.36	1.12	3.36	--	2.33		2.54	2.96		.01	--	472	.64	1,090	43	2.2	803	7.7
Dec. 2-20, 22-31	55,170	10	2.76	.90	2.57	.05	2.10		1.87	2.34		.01	.10	386	.52	28,690	41	1.9	654	7.6
Dec. 21.....	1,870	10	3.28	1.12	3.61	--	2.23		2.39	3.38		.01	--	492	.67	1,250	45	2.4	837	7.5
Jan. 1-31, 1960.	67,220	8.4	2.46	.86	2.57	.05	1.88		1.62	2.43		.00	.04	362	.49	32,940	43	2.0	615	7.6
Feb. 1-29.....	55,450	8.1	2.40	.88	2.74	.05	1.93		1.58	2.59		.00	.07	370	.50	27,720	45	2.1	643	7.6
Mar. 1-24.....	57,550	10	2.82	.86	2.44	.08	2.07		1.83	2.31		.00	.05	376	.51	29,350	39	1.8	637	7.8
Mar. 25-31.....	35,010	11	2.70	.66	1.35	.13	2.29		1.46	1.13		.02	.06	299	.41	14,350	28	1.0	470	7.8

COLORADO RIVER MAIN STEM--Continued

9-711. COLORADO RIVER NEAR GLENWOOD SPRINGS, COLO.--Continued

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Apr. 1-5, 1960..	15,370	12	2.60	0.84	2.26	0.08	2.03		1.69	2.03		0.01	0.06	348	0.47	7,220	39	1.7	586	7.6
Apr. 6-30.....	150,700	11	2.18	.60	1.04	.05	1.95		.98	.85		.01	.07	226	.31	46,720	27	.9	381	7.6
May 1-13.....	72,060	11	2.24	.66	1.30	.04	1.97		1.08	1.13		.01	.07	248	.34	24,500	31	1.1	424	7.8
May 14-31.....	216,000	10	1.76	.40	.57	.03	1.67		.65	.45		.01	.06	164	.22	47,520	21	.5	282	7.7
June 1-23.....	309,900	8.0	1.78	.42	.57	.03	1.51		.83	.48		.01	.02	175	.24	74,380	20	.5	279	7.6
June 24-30.....	46,770	7.8	2.02	.60	1.09	.03	1.57		1.27	.93		.01	.03	232	.32	14,970	29	1.0	379	7.7
July 1-17.....	75,150	7.9	2.60	.82	1.65	.05	1.95		1.81	1.38		.01	.06	322	.44	33,070	32	1.3	514	7.6
July 18-31.....	47,330	8.9	3.14	.98	2.52	.06	2.23		2.35	2.17		.01	.04	422	.57	26,980	38	1.8	673	7.8
Aug. 1-31.....	72,860	9.4	3.10	1.02	3.04	.06	2.20		2.35	2.71		.01	.03	439	.60	43,720	42	2.1	730	7.7
Sept. 1-30.....	66,730	9.4	3.06	1.02	3.00	.06	2.13		2.33	2.71		.02	.03	438	.60	40,040	42	2.1	733	7.8
Total or weighted average	1,500,000	9.3	2.35	0.69	1.57	0.05	1.87		1.39	1.38		0.01	a0.05	283	0.38	570,000	34	1.3	473	--

a Includes estimates where data are missing.

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 1960.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1960.
EXTREMES, 1959-60.--Sepcific conductance: Maximum daily, 2,480 micromhos Aug. 26; minimum daily, 405 micromhos May 18.
Percent sodium: Maximum, 49 Feb. 1-29; minimum, 26 June 1-24.
EXTREMES, 1941-52, 1953-60.--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.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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. 1-31, 1959.	250,582	12	6.54	4.03	5.96	0.18	3.41	0.00	10.31	3.07		0.18	0.03	1,050	1.43	357,802	36	2.59	1,500	7.6
Nov. 1-30.....	210,228	10	5.84	3.82	5.92	.12	3.13	.00	8.97	3.24		.16	.10	962	1.31	275,048	38	2.72	1,450	7.7
Dec. 1-31.....	183,065	11	5.99	4.20	8.00	.18	3.11	.00	9.79	4.94		.24	.12	1,130	1.54	250,598	44	3.55	1,720	7.5
Jan. 1-31, 1960.	163,926	13	5.34	4.11	8.35	.16	2.97	.00	9.10	5.64		.27	.08	1,110	1.51	247,483	46	3.84	1,710	8.2
Feb. 1-29.....	143,226	13	5.44	3.82	8.79	.18	2.72	.00	8.60	6.35		.26	.10	1,110	1.51	216,215	49	4.13	1,740	7.8
Mar. 1-24.....	171,515	13	5.59	3.37	7.53	.18	2.87	.00	8.79	4.65		.24	.24	1,030	1.40	240,258	45	3.56	1,580	7.5
Mar. 25-28.....	51,824	16	5.34	2.83	4.52	.15	3.33	.00	6.58	2.48		.16	.09	779	1.06	54,905	38	2.27	1,180	7.7
Mar. 29-Apr. 8..	158,095	17	3.74	1.89	3.05	.12	2.69	.00	4.16	1.75		.13	.07	541	.74	116,320	35	1.81	851	7.9
Apr. 9-30.....	521,018	12	2.74	1.15	1.65	.06	2.28	.00	2.23	.99		.06	.06	336	.46	238,084	29	1.18	548	7.6
May 1-11.....	138,764	15	3.69	1.73	2.96	.08	2.44	.00	4.12	1.72		.09	.09	518	.70	97,756	35	1.80	810	7.5
May 12-31.....	619,240	16	2.74	.99	1.48	.05	2.10	.00	2.23	.79		.06	.07	321	.44	270,335	28	1.08	506	7.8
June 1-24.....	948,258	11	2.54	.90	1.22	.05	1.92	.00	2.14	.68		.05	.08	291	.40	375,283	26	.93	463	7.7
June 25-30.....	119,722	10	3.14	1.40	2.04	.06	2.00	.00	3.39	1.16		.07	.08	408	.55	66,432	31	1.38	843	7.7
July 1-8.....	100,570	10	3.74	1.97	3.13	.07	2.15	.00	4.93	1.89		.09	.04	558	.76	78,320	35	1.85	862	7.9
July 9-20.....	97,301	9.4	5.04	2.80	4.74	.10	2.54	.00	7.22	2.85		.09	.06	787	1.07	104,143	37	2.40	1,190	7.8
July 21-31.....	52,691	9.4	6.94	4.11	6.79	.14	2.90	.00	11.20	3.89		.15	.12	1,130	1.54	80,975	38	2.89	1,840	7.6
Aug. 1-13.....	55,103	13	7.88	4.77	7.31	.10	3.10	.00	13.12	3.81		.16	.12	1,260	1.71	94,424	37	2.93	1,770	8.0
Aug. 14-31.....	50,448	12	9.38	8.99	9.22	.14	3.02	.00	17.93	4.80		.21	.17	1,640	2.23	112,518	36	3.22	2,240	7.9
Sept. 1-30.....	118,569	12	9.08	6.33	9.68	.13	3.11	.00	16.93	4.85		.27	.19	1,590	2.16	252,088	38	3.48	2,140	7.8
Total or weighted average	4,132,000	12	4.09	2.22	3.74	0.09	2.46	--	5.37	2.17		0.12	0.09	628	0.85	3,512,000	37	1.92	952	--

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, Novemher 1942 to October 1945, October 1947 to September 1960.
Water temperatures: July 1949 to September 1960.
Sediment records: October 1928 to December 1933, November 1942 to September 1944, October 1947 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,980 micromhos Sept. 16; minimum daily, 412 micromhos June 14.
Percent sodium: Maximum, 42 Mar. 1-23; minimum, 25 June 9-30.
EXTREMES, 1928-30, 1942-45, 1947-60.--Specific conductance (1942-45, 1947-60): Maximum daily, 2,280 micromhos Oct. 15, 1945; minimum daily, 318 micromhos June 9, 1948.
Percent sodium (1942-44, 1947-60): Maximum, 46 Mar. 2, 4, 7, 10, 1944; minimum, 17 June 1-11, 1958.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Jan. 3-10, 20-23.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959..	47,540	--	8.03	4.20	7.57	--	3.41		--	--	--	--	--	1,410	1.92	91,162	38	3.06	1,780	8.1
Oct. 5-31.....	454,510	21	6.59	2.55	5.35	0.15	3.90		8.43	2.20	0.02	0.13	0.16	1,000	1.36	618,134	37	2.50	1,340	7.5
Nov. 1-30.....	499,418	--	5.89	2.63	5.05	--	3.49		--	--	--	--	--	891	1.21	605,175	37	2.44	1,250	7.8
Dec. 1-31.....	351,771	--	5.89	3.04	5.92	--	3.70		--	--	--	--	--	1,020	1.39	487,976	40	2.80	1,390	7.7
Jan. 1-31, 1960.	304,979	18	5.94	3.29	6.61	.15	3.74		8.52	3.55	.02	.14	.15	1,130	1.54	468,691	41	3.08	1,480	7.8
Feb. 1-29.....	318,492	--	5.84	2.88	6.00	--	3.90		--	--	--	--	--	984	1.34	426,219	41	2.88	1,400	7.4
Mar. 1-23.....	416,327	--	5.94	2.30	6.09	--	3.98		--	--	--	--	--	948	1.29	536,762	42	3.00	1,350	7.5
Mar. 24-31.....	328,621	--	5.29	1.89	4.26	--	3.84		--	--	--	--	--	755	1.03	337,429	37	2.25	1,080	7.6
Apr. 1-12.....	550,532	20	4.69	1.48	2.96	.12	3.97		4.16	1.10	.02	.11	.12	588	.80	440,250	32	1.68	869	7.5
Apr. 13-16.....	287,048	--	3.49	1.23	2.13	--	3.05		--	--	--	--	--	450	.61	175,673	31	1.39	669	7.7
Apr. 17-30.....	772,245	--	2.89	1.07	1.48	--	2.70		--	--	--	--	--	364	.50	382,292	27	1.05	537	7.8
May 1-6.....	235,041	--	2.89	1.07	1.65	--	2.57		--	--	--	--	--	375	.51	119,871	29	1.17	559	7.7
May 7-16.....	347,702	--	3.74	1.32	2.22	--	3.00		--	--	--	--	--	472	.64	223,197	30	1.39	712	7.5
May 17-20.....	306,883	--	3.29	.99	1.65	--	2.90		--	--	--	--	--	372	.51	155,258	28	1.13	579	7.7
May 21-31.....	674,836	--	2.69	.90	1.31	--	2.44		--	--	--	--	--	323	.44	296,442	27	.97	483	7.8

June 1-8, 1960..	574,572	--	2.99	.90	1.44	--	2.56		--	--	--	--	--	343	.47	268,026	27	1.03	514	7.4
June 9-30.....	1,664,291	--	2.79	.77	1.22	--	2.38		--	--	--	--	--	309	.42	699,402	25	.91	464	7.5
July 1-7.....	249,084	--	2.94	.99	1.78	--	2.20		--	--	--	--	--	375	.51	127,033	31	1.27	559	7.6
July 8-13.....	140,430	--	3.64	1.23	2.48	--	2.43		--	--	--	--	--	491	.67	93,773	34	1.59	722	7.6
July 14-19.....	108,595	--	3.89	1.56	3.18	--	2.44		--	--	--	--	--	577	.78	85,217	37	1.92	836	7.6
July 20-31.....	148,570	13	4.54	2.06	3.96	.14	2.72		5.73	2.17	.02	.06	.10	699	.95	141,237	37	2.18	1,010	7.4
Aug. 1-9.....	81,437	--	5.59	2.39	5.31	--	2.88		--	--	--	--	--	893	1.21	98,904	40	2.66	1,240	7.5
Aug. 10-30.....	121,252	--	7.09	2.71	6.53	--	3.02		--	--	--	--	--	1,090	1.48	179,743	40	2.95	1,500	7.6
Aug. 31-Sept. 30	198,298	--	7.93	4.44	8.13	--	3.15		--	--	--	--	--	1,400	1.90	377,558	40	3.27	1,840	7.8
Total or weighted average	9,182,000	--	4.19	1.63	3.12	--	3.03		--	--	--	--	--	595	0.81	7,435,000	36	1.70	848	7.6

COLORADO RIVER MAIN STEM--Continued

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

LOCATION.--At gaging station at Kaibab Bridge, 0.2 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 1960.
Water temperatures: October 1936 to October 1942, September 1943 to September 1960.
Sediment records: October 1925 to November 1942, September 1943 to September 1960.
EXTREMES, 1959-60: Specific conductance: Maximum daily, 2,280 micromhos Oct. 1; minimum daily, 453 micromhos June 13.
Percent sodium: Maximum, 47 Jan. 5-13, Mar. 1-11, Aug. 27 to Sept. 3; minimum, 28 June 1-25.
EXTREMES, 1937-42, 1943-60.--Specific conductance: Maximum daily, 2,900 micromhos Sept. 6, 1940; minimum daily, 341 micromhos June 15, 1942.
Percent sodium (1941-42, 1943-60): Maximum, 50 Jan. 12-14, 1957; minimum, 16 June 11-20, 1952.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959..	44,112	--	11.68	4.52	9.61	--	3.75		--	--	--	--	--	1,700	2.31	101,988	37	3.38	2,230	7.7
Oct. 5-16.....	244,443	--	7.09	2.80	6.92	--	4.47		--	--	--	--	--	1,090	1.48	362,362	41	3.11	1,550	7.5
Oct. 17-31.....	239,831	21	6.09	2.71	5.96	0.16	3.79		7.83	3.30	0.03	0.11	0.18	974	1.32	317,690	40	2.84	1,400	7.6
Nov. 1-10.....	252,298	--	5.74	2.22	5.79	--	4.02		--	--	--	--	--	888	1.21	304,695	42	2.90	1,290	7.7
Nov. 11-30.....	316,998	--	6.04	2.80	5.74	--	3.93		--	--	--	--	--	946	1.29	407,837	39	2.73	1,370	7.5
Dec. 1-27.....	322,661	--	5.89	3.21	6.87	--	3.87		--	--	--	--	--	1,020	1.39	447,596	43	3.22	1,520	7.5
Dec. 28-Jan. 4, 1960..	123,070	--	5.69	2.55	6.53	--	4.13		--	--	--	--	--	930	1.26	155,659	44	3.21	1,400	7.7
Jan. 5-13.....	72,476	--	6.14	3.21	8.27	--	4.20		--	--	--	--	--	1,120	1.52	110,395	47	3.82	1,660	7.5
Jan. 14-31.....	223,605	18	5.89	3.04	7.57	.16	4.10		7.62	4.77	.02	.16	.18	1,040	1.41	316,266	45	3.58	1,570	7.7
Feb. 1-29.....	353,407	--	5.74	2.96	7.22	--	3.93		--	--	--	--	--	1,030	1.40	495,052	45	3.46	1,520	7.6
Mar. 1-11.....	146,902	--	5.64	2.96	7.61	--	3.95		--	--	--	--	--	1,020	1.39	203,782	47	3.67	1,550	7.5
Mar. 12-24.....	359,702	--	5.39	1.89	6.09	--	3.95		--	--	--	--	--	858	1.17	419,730	46	3.19	1,270	7.4
Mar. 25-31.....	313,369	--	4.79	2.06	4.70	--	3.64		--	--	--	--	--	744	1.01	317,079	41	2.54	1,110	7.7
Apr. 1-15.....	765,223	12	3.54	1.48	3.05	.12	3.02		3.54	1.47	.01	.05	.07	537	.73	558,858	37	1.92	788	7.7
Apr. 16-30.....	884,826	--	3.19	.99	1.87	--	2.85		--	--	--	--	--	396	.54	476,532	31	1.29	601	7.5
May 1-5.....	208,859	--	2.89	1.07	1.87	--	2.72		--	--	--	--	--	384	.52	109,075	32	1.33	584	7.6

May 6-16, 1960.	363,273	--	3.59	1.40	2.78	--	2.82		--	--	--	--	--	525	.71	259,377	36	1.76	771	7.5
May 17-31.....	1,008,000	--	2.89	1.07	1.74	--	2.75		--	--	--	--	--	369	.50	505,855	31	1.24	564	7.6
June 1-25.....	192,298	--	2.79	.90	1.44	--	2.49		--	--	--	--	--	338	.46	88,395	28	1.06	510	7.6
June 26-July 1.	334,413	17	2.79	.90	1.57	.09	2.46		1.94	.90	.02	.05	.06	323	.44	146,901	29	1.15	519	7.6
July 2-16.....	420,397	--	3.74	1.40	3.00	--	2.77		--	--	--	--	--	487	.66	278,437	37	1.87	799	7.5
July 17-31.....	212,549	--	4.64	1.97	4.79	--	3.00		--	--	--	--	--	694	.94	200,612	42	2.63	1,110	7.5
Aug. 1-5.....	48,179	--	4.69	2.39	5.63	--	3.08		--	--	--	--	--	838	1.14	54,908	44	3.06	1,280	7.7
Aug. 6-26.....	154,990	--	6.29	3.04	7.79	--	3.28		--	--	--	--	--	1,080	1.47	227,650	45	3.60	1,630	7.7
Aug. 27-Sept. 3	49,031	--	6.39	3.78	8.92	--	3.57		--	--	--	--	--	1,200	1.63	80,019	47	3.95	1,800	7.7
Sept. 4-30.....	198,899	--	8.18	4.20	9.57	--	3.61		--	--	--	--	--	1,430	1.94	386,818	44	3.85	2,030	7.6
Total or weighted average	9,584,000	--	4.19	1.73	3.74	--	3.15		--	--	--	--	--	624	0.85	8,146,000	39	2.65	930	--

COLORADO RIVER MAIN STEM--Continued

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

LOCATION.--At Hoover Dam, on State line between Mohave County, Ariz., and Clark County, Nev., just downstream from gaging station.
DRAINAGE AREA.--167,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1939 to September 1960.
Water temperatures: October 1941 to September 1960.
REMARKS.--Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Monthly runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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	Monthly total tons				
Oct. 15, 1959...	692,600	11	4.12	2.04	3.52	0.11	2.52		5.31	1.66	0.02	0.05	0.13	605	0.82	567,900	36	2.0	927	7.8
Nov. 2, 17.....	606,800	11	4.16	1.80	3.35	.11	2.57		5.18	1.80	--	.05	.12	595	.81	491,500	36	1.9	918	7.8
Dec. 1, 15.....	572,000	--	4.12	1.96	3.35		2.52		--	--	--	--	--	597	.81	463,300	36	1.9	918	7.8
Jan. 4, 15, 1960	628,600	18	4.08	2.08	3.48	.10	2.47		5.33	1.89	.02	.04	.09	634	.86	540,600	36	2.0	936	7.7
Feb. 1, 16.....	512,300	--	4.36	2.00	3.74		2.59		--	--	--	--	--	656	.89	455,900	37	2.1	983	7.6
Mar. 2, 15.....	710,100	--	4.28	2.04	3.74		2.56		--	--	--	--	--	654	.89	632,000	37	2.1	976	7.7
Apr. 4, 18.....	908,800	13	4.40	2.20	3.92	.10	2.64		5.73	2.23	.01	.04	.19	684	.93	845,200	37	2.2	1,020	7.9
May 3, 16.....	855,700	--	4.56	2.00	4.05		2.62		--	--	--	--	--	686	.93	795,800	36	2.2	1,020	7.2
June 1, 16.....	1,015,000	--	4.56	2.00	4.00		2.62		--	--	--	--	--	676	.92	933,800	38	2.2	1,010	7.6
July 1, 18.....	963,900	10	4.72	2.12	3.67	.09	2.59		5.79	2.23	.01	.04	.16	657	.89	875,700	36	2.1	1,000	7.2
Aug. 2, 15.....	959,100	--	4.44	2.12	4.00		2.66		--	--	--	--	--	682	.93	892,000	38	2.2	1,010	7.5
Sept. 1, 15.....	805,700	--	4.56	2.04	4.00		2.59		--	--	--	--	--	683	.93	749,300	36	2.2	1,000	7.5
Total or weighted average a	9,250,000	11	4.39	2.06	3.78	0.10	2.59		5.62	2.03	0.01	0.04	0.12	656	0.89	8,233,000	37	2.1	983	--

a Includes estimated data for missing periods. Represents 100 percent of runoff for water year.

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, 3.5 miles downstream from siphon-drop powerplant, and 0.3 mile downstream from upper highway bridge over Colorado River at Yuma, Yuma County.
RECORDS AVAILABLE.--Chemical analyses: September 1926 to September 1928, October 1942 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,220 micromhos Aug. 30-31. Sept. 15, 26-27; minimum daily, 1,040 micromhos Mar. 24.
Percent sodium: Maximum, 43 Dec. 1-31, June 1-30; minimum, 39 Apr. 1-30.
EXTREMES, 1943-60.--Specific conductance: Maximum daily, 1,520 micromhos Jan. 16, 1957; minimum daily, 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.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	26,501	20	4.29	2.30	4.96	0.12	2.56		6.02	3.02	0.03	0.02	0.20	754	1.03	27,175	42	2.73	1,120	7.7
Nov. 1-30.....	19,396	--	4.49	2.39	4.96		2.56		--	--	--	--	--	765	1.04	20,182	42	2.67	1,140	7.8
Dec. 1-31.....	10,130	--	4.69	1.95	4.92		2.67		--	--	--	--	--	743	1.01	10,230	43	2.7	1,120	7.7
Jan. 1-31, 1960.	10,207	20	4.39	2.30	4.57	.12	2.66		5.87	2.74	.03	.03	.20	748	1.02	10,383	40	2.50	1,080	7.8
Feb. 1-29.....	27,762	--	4.79	1.61	4.61		2.69		--	--	--	--	--	734	1.00	27,734	41	2.54	1,070	7.9
Mar. 1-31.....	27,792	--	4.79	1.89	4.44		2.75		--	--	--	--	--	726	.99	27,441	40	2.43	1,080	7.7
Apr. 1-30.....	31,121	16	4.69	2.06	4.35	.12	2.72		5.93	2.65	.02	.03	.16	731	.99	30,939	39	2.37	1,090	7.7
May 1-31.....	32,896	--	4.79	2.14	4.96		2.80		--	--	--	--	--	785	1.07	35,120	42	2.66	1,160	7.8
June 1-30.....	35,405	--	4.69	2.14	5.13		2.64		--	--	--	--	--	789	1.07	37,991	43	2.78	1,160	7.9
July 1-31.....	39,475	19	4.54	2.22	5.05	.12	2.66		6.29	3.05	.02	.02	.16	766	1.07	42,197	42	2.74	1,160	7.9
Aug. 1-31.....	32,097	--	4.69	2.22	5.05		2.62		--	--	--	--	--	782	1.06	34,135	42	2.71	1,180	7.9
Sept. 1-30.....	34,036	--	4.79	2.39	5.22		2.69		--	--	--	--	--	798	1.09	36,939	42	2.76	1,200	7.9
Total or weighted average	326,800	--	4.64	2.14	4.88	--	2.67		--	--	--	--	--	767	1.04	330,200	42	2.64	1,140	--

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

LOCATION (revised).--At bridge on State Highway 141, 180 feet downstream from gaging station, 0.4 mile downstream from Whitewater Creek, 0.5 mile south of Whitewater, and 8 miles southeast of Grand Junction, Mesa County.
DRAINAGE AREA (revised).--7,870 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1931 to September 1960.
Water temperatures: April 1949 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,180 micromhos Sept. 30; minimum daily, 348 micromhos Apr. 25.
Percent sodium: Maximum, 33 Mar. 1-25; minimum, 19 Apr. 23-26, May 10-20.
EXTREMES, 1941-60.--Specific conductance: Maximum daily, 2,730 micromhos Sept. 10, 1956; minimum daily, 280 micromhos May 23, 1948.
Percent sodium (1950-60): Maximum, 35 Sept. 21-30, 1956, Feb. 11-20, 1957; minimum, 10 June 2-5, 10, 1952.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Prior to October 1959, gaging station 11.5 miles downstream; and prior to January 1960, at sampling site 12 miles downstream.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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, 1959..	15,035	14	8.88	5.18	5.87	0.13	3.88	0.00	15.80	0.48		0.10	0.20	1,290	1.75	26,377	29	2.21	1,680	7.6
Oct. 5-31.....	81,134	14	7.19	4.36	4.57	.11	3.49	.00	12.26	.34		.08	.16	1,030	1.40	113,652	28	1.90	1,390	7.7
Nov. 1-30.....	72,060	15	6.74	4.44	4.65	.12	3.56	.00	12.03	.39		.08	.17	1,020	1.39	99,961	29	1.97	1,360	7.8
Dec. 1-31.....	50,297	14	7.14	5.02	5.35	.12	3.92	.00	13.41	.51		.11	.15	1,130	1.54	77,296	30	2.17	1,500	7.8
Jan. 1-31, 1960.	49,067	15	6.54	4.85	5.13	.12	3.77	.00	12.72	.45		.07	.19	1,070	1.46	71,402	31	2.15	1,470	7.8
Feb. 1-29.....	40,897	15	6.74	4.69	5.35	.12	3.59	.00	12.97	.54		.07	.17	1,090	1.48	60,626	32	2.24	1,460	8.0
Mar. 1-25.....	54,496	17	6.94	4.77	5.74	.13	3.49	.00	13.93	.28		.09	.20	1,140	1.55	84,490	33	2.37	1,530	7.9
Mar. 26-31.....	32,811	8	4.64	2.14	2.22	.09	3.15	.00	5.73	.28		.05	.10	564	.77	25,167	24	1.20	822	7.9
Apr. 1-7.....	32,392	14	4.39	2.30	2.39	.10	3.03	.00	5.95	.25		.03	.09	577	.78	25,419	26	1.31	837	7.4
Apr. 8-22, 27-30	190,502	15	3.04	1.07	1.09	.06	2.52	.00	2.52	.11		.01	.06	318	.43	82,389	21	.76	490	7.6
Apr. 23-26.....	46,850	13	2.30	.82	.74	.04	1.98	.00	1.75	.08		.01	.07	235	.32	14,973	19	.59	374	7.6
May 1-9.....	36,470	14	3.69	1.89	1.91	.06	2.34	.00	4.96	.23		.01	.12	474	.64	23,510	25	1.15	700	7.6
May 10-20.....	137,411	13	2.59	.90	.83	.04	2.05	.00	2.23	.10		.01	.10	269	.37	50,270	19	.62	423	7.6
May 21-31.....	85,396	15	3.04	1.32	1.35	.04	1.98	.00	3.66	.14		.00	.09	366	.50	42,507	23	.91	551	7.5
June 1-24.....	300,900	14	2.84	1.15	1.09	.04	1.98	.00	3.00	.11		.01	.09	320	.44	130,952	21	.77	488	7.5
June 25-30.....	34,965	14	3.59	1.65	1.87	.05	2.33	.00	4.73	.18		.03	.11	456	.62	21,684	26	1.16	675	8.0
July 1-14.....	38,432	13	5.84	2.96	3.18	.08	2.92	.00	9.02	.34		.01	.13	776	1.06	40,559	26	1.51	1,060	7.6
July 15-19.....	6,902	12	8.33	4.61	5.22	.11	3.34	.00	14.45	.45		.06	.25	1,170	1.59	10,983	29	2.05	1,510	7.5
July 20-31.....	12,615	15	10.38	5.51	6.31	.13	3.56	.00	18.47	.59		.07	.25	1,460	1.99	25,048	28	2.24	1,820	7.6
Aug. 1-10.....	14,063	16	9.58	5.26	5.61	.12	3.47	.00	16.76	.51		.05	.26	1,340	1.82	25,628	27	2.06	1,700	7.7
Aug. 11-31.....	19,660	14	11.58	6.58	7.35	.14	3.70	.00	21.44	.62		.09	.22	1,670	2.27	44,652	29	2.44	2,050	7.6
Sept. 1-30.....	37,607	17	11.48	6.50	6.92	.08	4.00	.00	20.82	.56		.09	.26	1,630	2.22	83,366	28	2.31	2,000	7.8
Total or weighted average	1,390,000	14	2.64	2.47	2.61	0.07	2.70	--	6.91	0.24		0.04	a0.12	625	0.85	1,182,000	27	1.63	868	--

a Includes estimates where data are missing.

GREEN RIVER BASIN

9-3150. GREEN RIVER AT GREEN RIVER, UTAH

LOCATION.--At bridge on U.S. Highways 50 and 6 in town of Green River, Emery County, 1 mile upstream from gaging station.
DRAINAGE AREA.--40,600 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: August 1928 to September 1960.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,620 micromhos Sept. 3; minimum daily, 321 micromhos June 8.
Percent sodium: Maximum, 48 Sept. 19; minimum, 27 May 15 to June 30.
EXTREMES, 1941-60.--Specific conductance: Maximum daily, 2,420 micromhos Sept. 29, 1943; minimum daily 272 micromhos May 13, 1956.
Percent sodium (1950-60): Maximum, 48 Sept, 19, 1960; minimum, 19 Aug. 7, 1957.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	178,200	9.0	3.44	2.16	4.52	0.09	3.44		5.54	1.16		0.04	0.17	631	0.86	153,300	44	2.7	957	7.7
Nov. 1-30.....	151,900	11	3.46	2.42	3.83	.06	3.38		5.39	1.02		.02	.18	613	.83	126,100	39	2.2	920	7.8
Dec. 1-31.....	106,300	11	4.12	3.16	4.57	.06	4.11		6.62	1.27		.02	.16	751	1.02	108,400	38	2.4	1,100	7.9
Jan. 1-31, 1960.	95,110	12	3.66	3.56	4.46	.07	4.29		6.20	1.24		.05	.18	772	1.05	99,870	37	2.3	1,100	8.1
Feb. 1-29.....	101,700	15	4.12	2.78	4.22	.07	4.00		6.04	1.24		.03	.19	699	.95	96,620	38	2.3	1,010	7.9
Mar. 1-31.....	320,300	15	3.52	2.06	4.00	.08	3.47		5.20	1.02		.03	.18	611	.83	265,800	41	2.4	900	7.8
Apr. 1-11.....	176,400	17	3.16	1.56	3.00	.09	3.28		3.93	.70		.03	.15	505	.69	121,700	38	2.0	736	7.7
Apr. 12-13.....	49,190	16	2.64	1.28	1.57	.08	2.95		2.21	.39		.01	.12	361	.49	24,100	28	1.1	543	7.7
Apr. 14-30.....	308,100	15	2.32	1.10	1.35	.06	2.62		1.85	.37		.03	.08	302	.41	126,300	28	1.0	464	7.8
May 1-4.....	118,600	15	2.44	1.32	2.18	.06	2.67		2.69	.62		.03	.11	370	.50	59,400	36	1.6	569	8.0
May 5-14.....	382,900	13	2.12	.90	1.13	.05	2.36		1.48	.28		.01	.11	254	.35	134,000	27	.9	400	7.8
May 15-31.....	662,500	11	1.98	.86	1.09	.04	2.23		1.42	.28		.02	.08	243	.33	225,200	27	.9	381	7.7
June 1-30.....	59,130	12	2.20	1.06	1.44	.05	2.43		1.96	.45		.02	.08	304	.41	24,240	30	1.1	457	7.8
July 1-7.....	111,100	11	2.72	1.48	2.39	.07	2.92		3.04	.79		.02	.10	426	.58	64,440	36	1.6	638	7.8
July 8-31.....	49,350	14	2.16	1.10	1.52	.05	2.31		2.08	.42		.01	.10	298	.41	20,230	31	1.2	465	8.0
Aug. 1, 4-24, 26-31.....	61,300	9.8	3.12	1.86	3.57	.09	3.31		4.06	1.16		.03	.10	522	.71	43,520	41	2.3	796	8.1

GREEN RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 2-3, 1960..	5,670	15	5.80	2.76	5.31	0.13	3.93		8.81	1.07		0.00	0.18	889	1.21	6,860	38	2.6	1,220	7.7
Aug. 25.....	1,970	10	4.04	2.96	5.52	.11	3.34		8.10	1.24		.04	.19	844	1.15	2,270	44	3.0	1,120	8.2
Sept. 1-2, 4-18, 20-24, 26-30..	52,380	8.4	3.92	2.12	4.26	.10	3.38		5.23	1.75		.04	.12	629	.86	45,050	41	2.5	937	7.9
Sept. 3.....	2,320	13	8.00	3.80	7.18	.21	3.61		14.47	1.04		.01	.42	1,260	1.71	3,970	37	3.0	1,820	7.9
Sept. 19.....	2,120	5.9	5.40	3.30	8.26	.13	3.21		12.14	1.52		.05	.14	1,120	1.52	3,220	48	4.0	1,520	7.9
Sept. 25.....	1,900	9.6	4.64	2.80	5.96	.10	3.21		8.16	1.89		.04	.19	840	1.14	2,170	45	3.1	1,210	8.0
Total or weighted average	3,019,000	13	2.79	1.56	2.44	0.06	2.90		3.25	0.68		0.03	0.12	428	0.58	1,751,000	36	1.6	643	--

SAN JUAN RIVER BASIN

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

LOCATION.--At gaging station, 0.5 mile upstream from Gobernador Canyon, 1 mile north of Archuleta, San Juan County, and 6.8 miles downstream from Navajo Dam. (Prior to Dec. 29, 1959 at site 4.6 miles upstream.)
DRAINAGE AREA.--3,260 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1954 to September 1960.
Water temperatures: December 1954 to September 1960.
Sediment records: December 1954 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 685 micromhos Jan. 5; minimum daily, 110 micromhos June 18.
Percent sodium: Maximum, 40 Mar. 10-14; minimum, 18 Mar. 24-31, Apr. 6-10.
EXTREMES, 1954-60.--Specific conductance: Maximum daily, 685 micromhos Jan. 5, 1960; minimum daily, 101 micromhos July 2, 1957.
Percent sodium: Maximum, 45 Feb. 13-17, 1957; minimum, 13 Apr. 17-23, 1958.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. Flow affected by ice Nov. 29 to Dec. 7, Dec. 29 to Jan. 13, Jan. 19, 20, Jan. 26 to Feb. 8, 10-15.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-7, 1959..	22,715	--	2.59	0.77	1.26	--	2.66		--	--	--	--	--	296	0.40	9,144	27	0.97	444	7.7
Oct. 8-13.....	7,676	--	1.90	.54	1.00	--	1.97		--	--	--	--	--	228	.31	2,380	29	.91	342	7.5
Oct. 14-30.....	25,997	20.0	1.45	.31	.74	0.07	1.52		0.96	0.08	0.02	0.00	0.04	176	.24	6,223	29	.79	256	7.4
Oct. 31.....	3,174	--	1.70	.36	1.04	--	1.72		--	--	--	--	--	202	.27	872	33	1.02	308	8.1
Nov. 1.....	2,440	--	2.40	.76	1.22	--	2.15		--	--	--	--	--	284	.39	942	28	.97	431	7.2
Nov. 2-30.....	36,123	--	1.80	.46	1.00	--	1.84		--	--	--	--	--	216	.29	10,611	31	.94	326	7.8
Dec. 1-29.....	18,752	--	2.10	.52	1.31	--	2.13		--	--	--	--	--	262	.36	6,682	33	1.14	385	8.0
Dec. 30-Jan. 4, 1960..	1,940	--	2.99	.71	2.04	--	2.79		--	--	--	--	--	376	.51	992	36	1.50	557	7.3
Jan. 5.....	278	--	3.59	.90	2.70	--	3.05		--	--	--	--	--	472	.64	178	37	1.80	685	7.4
Jan. 6-9.....	1,365	--	2.99	.99	1.91	--	2.92		--	--	--	--	--	368	.50	683	32	1.36	551	7.3
Jan. 10-31.....	11,564	18.0	2.54	.56	1.61	.09	2.39		2.10	.21	.03	.01	.08	304	.41	4,781	34	1.29	462	7.7
Feb. 1-Mar. 5...	18,800	--	2.50	.68	1.57	--	2.38		--	--	--	--	--	310	.42	7,900	33	1.20	467	7.8
Mar. 6-9.....	11,306	--	2.05	.39	1.26	--	2.26		--	--	--	--	--	247	.34	3,798	34	1.14	363	7.3
Mar. 10-14.....	25,785	--	2.05	.55	1.70	--	2.25		--	--	--	--	--	286	.39	10,029	40	1.49	426	7.6
Mar. 15-20.....	19,934	--	2.69	.81	1.70	--	2.52		--	--	--	--	--	336	.46	9,109	33	1.28	508	7.5

SAN JUAN RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 21-23, 1960	27,771	--	2.20	0.76	1.17	--	2.07		--	--	--	--	--	260	0.35	9,820	28	0.97	399	7.8
Mar. 24-31.....	87,273	--	2.00	.62	.57	--	1.85		--	--	--	--	--	216	.29	25,637	18	.49	316	7.7
Apr. 1-5.....	32,509	--	1.70	.52	.52	--	1.74		--	--	--	--	--	166	.25	8,223	19	.50	277	7.7
Apr. 6-10.....	47,641	--	1.35	.37	.38	--	1.44		--	--	--	--	--	141	.19	9,174	16	.41	210	7.1
Apr. 11-27.....	144,365	16.0	1.10	.34	.35	0.05	1.25		0.52	0.05	0.02	0.01	0.08	124	.17	24,349	19	.41	179	7.1
Apr. 28-May 4...	30,879	--	1.50	.30	.52	--	1.49		--	--	--	--	--	153	.21	6,425	23	.55	230	7.0
May 5-8.....	17,201	--	1.60	.38	.65	--	1.62		--	--	--	--	--	176	.24	4,117	25	.66	259	7.1
May 9-11.....	15,156	--	1.30	.30	.48	--	1.39		--	--	--	--	--	145	.20	2,969	23	.54	212	7.4
May 12-31.....	144,793	--	1.00	.16	.34	--	1.06		--	--	--	--	--	111	.15	21,656	23	.45	154	7.1
June 1-17.....	143,036	--	.65	.15	.30	--	.95		--	--	--	--	--	96	.13	19,064	23	.43	133	7.3
June 18-24.....	60,758	--	.85	.05	.27	--	.69		--	--	--	--	--	88	.12	7,271	23	.41	120	7.0
June 25-30.....	26,003	--	1.05	.19	.37	--	1.16		--	--	--	--	--	113	.15	4,303	23	.46	165	7.1
July 1-7.....	19,660	17.0	1.30	.22	.52	.05	1.39		.60	.05	.01	.01	.05	131	.18	3,503	25	.60	201	7.3
July 8-20.....	23,516	--	1.75	.27	.70	--	1.79		--	--	--	--	--	173	.24	5,533	26	.69	268	7.4
July 21-31.....	11,647	--	1.65	.43	.91	--	2.10		--	--	--	--	--	196	.27	3,158	29	.86	311	7.2
Aug. 1-31.....	24,841	--	2.00	.38	1.00	--	2.23		--	--	--	--	--	212	.29	7,162	30	.92	333	7.5
Sept. 1-15.....	11,455	--	2.05	.39	1.13	--	2.33		--	--	--	--	--	223	.30	3,474	32	1.03	353	7.4
Sept. 16-17.....	1,646	--	2.30	.46	1.35	--	2.57		--	--	--	--	--	261	.35	564	33	1.15	404	7.5
Sept. 18-29.....	6,902	--	2.15	.39	1.13	--	2.36		--	--	--	--	--	237	.32	2,669	31	1.01	365	7.4
Sept. 30.....	536	--	2.25	.43	1.35	--	2.49		--	--	--	--	--	250	.34	182	34	1.17	405	7.4
Total or weighted average	1,090,000	--	1.45	0.35	0.61	--	1.51		--	--	--	--	--	165	0.22	239,800	25	0.61	242	--

9-3795. SAN JUAN RIVER NEAR BLUFF, UTAH

LOCATION.--At bridge on State Highway 47, 1,800 feet downstream from gaging station, 20 miles southwest of Bluff, San Juan County, and 114 miles upstream from mouth.
DRAINAGE AREA.--23,000 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: February to June 1927, October 1929 to September 1960.
Water temperatures: May 1944 to September 1960.
Sediment records: August to September 1928, July 1929 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,060 micromhos Aug. 27; minimum daily, 250 micromhos June 21.
Percent sodium: Maximum, 47 Sept. 1, 3-16; minimum, 21 June 17-25.
EXTREMES, 1929-60.--Specific conductance (1941-60): 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.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959..	20,440	11	5.49	2.22	6.18	0.13	3.87	0.00	9.22	1.07		0.07	0.14	919	1.25	25,546	44	3.15	1,290	7.6
Oct. 4-31.....	71,421	13	3.94	1.48	3.13	.09	2.56	.00	5.29	.62		.09	.07	549	.75	53,326	36	1.90	812	7.8
Nov. 1-3, 6-30..	71,643	10	4.19	1.73	3.22	.08	2.64	.00	5.75	.68		.08	.07	585	.80	56,999	35	1.87	858	7.8
Nov. 4-5.....	10,354	17	4.89	1.23	4.96	.14	3.26	.00	7.39	.51		.06	.09	730	.99	10,279	44	2.83	1,040	7.8
Dec. 1-31.....	46,362	12	5.04	2.30	4.26	.09	3.02	.00	7.70	.93		.11	.08	750	1.02	47,289	36	2.22	1,070	8.2
Jan. 1-5, 13-31, 1960...	31,371	11	5.79	2.80	4.83	.10	3.34	.00	9.16	1.04		.13	.08	892	1.21	38,056	36	2.33	1,230	8.1
Jan. 6-12.....	5,332	13	7.14	3.70	6.57	.12	3.74	.00	12.20	1.44		.18	.11	1,160	1.58	8,411	37	2.82	1,540	8.1
Feb. 1-29.....	43,371	11	5.04	2.80	4.39	.08	3.15	.00	8.29	1.02		.11	.09	803	1.09	47,364	36	2.22	1,120	8.2
Mar. 1-10.....	49,864	10	5.24	1.89	5.48	.13	3.57	.00	8.47	.82		.09	.10	829	1.13	56,219	43	2.90	1,160	8.1
Mar. 11-23.....	103,914	14	3.94	1.07	4.05	.10	2.98	.00	5.93	.42		.05	.08	597	.81	84,370	44	2.56	861	8.0
Mar. 24-30.....	94,969	12	3.09	.90	1.31	.09	2.43	.00	2.71	.23		.06	.08	343	.47	44,301	24	.92	510	8.0
Mar. 31-Apr. 8..	88,024	11	2.54	.90	1.00	.07	2.13	.00	2.29	.18		.05	.08	284	.39	33,999	22	.76	429	8.0
Apr. 9-29.....	251,750	11	1.95	.64	.74	.05	1.74	.00	1.50	.13		.04	.06	215	.29	73,612	22	.65	331	8.0
Apr. 30.....	7,557	12	2.69	1.07	1.65		1.90	.00	3.14	.31		.05	.06	a339	.46	3,484	31	1.20	494	8.0
May 1-10.....	57,858	15	2.94	1.23	1.52	.05	2.18	.00	3.16	.34		.04	.06	368	.50	28,957	26	1.05	543	7.9
May 11-14.....	38,321	14	2.59	.82	1.13	.04	2.11	.00	2.17	.25		.03	.06	287	.39	14,957	25	.87	436	8.0
May 15-31.....	188,489	12	2.00	.56	.74	.04	1.70	.00	1.44	.22		.02	.05	208	.28	53,320	22	.65	319	7.9

a Calculated from determined constituents.

SAN JUAN RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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 1-16, 1960.	216,214	12	2.10	0.54	0.74	0.04	1.67	0.00	1.50	0.20		0.02	0.07	212	0.29	62,339	22	0.64	326	7.7
June 17-25.....	125,958	11	1.65	.42	.57	.03	1.38	.00	1.17	.17		.01	.07	170	.23	29,122	21	.56	269	7.9
June 26-30.....	40,126	12	1.65	.52	.83	.04	1.46	.00	1.58	.17		.02	.07	208	.28	11,351	26	.76	319	7.7
July 1-6.....	32,525	12	2.15	.70	1.13	.04	1.59	.00	2.17	.28		.05	.03	260	.35	11,501	28	.95	395	7.9
July 7-21.....	45,312	13	3.14	1.07	2.18	.07	2.13	.00	3.91	.51		.08	.06	434	.59	26,745	34	1.50	620	7.8
July 22-31.....	13,845	10	3.74	1.56	3.18	.08	2.34	.00	5.52	.71		.10	.07	560	.76	10,544	37	1.95	812	7.9
Aug. 1-16.....	13,853	10	4.29	1.89	4.65	.10	2.39	.00	7.52	1.04		.18	.13	721	.98	13,583	43	2.65	1,020	7.7
Aug. 19-23, 25-26, 28-31..	3,709	8.4	5.74	2.88	7.40	.12	2.62	.00	11.70	1.61		.45	.17	1,080	1.47	5,448	46	3.56	1,480	7.6
Aug. 24.....	325	21	2.20	2.39	3.57		4.85	1.57	.60	.79		.35	--	a448	.61	198	44	2.36	937	8.9
Aug. 27.....	536	10	8.98	5.10	10.31		2.43	.53	18.61	2.14		.69	--	a1,590	2.16	1,158	42	3.89	2,060	8.5
Sept. 1, 3-16...	5,921	5.7	4.99	2.96	7.13	.10	2.23	.00	11.16	1.52		.39	.18	1,000	1.36	8,052	47	3.58	1,390	7.6
Sept. 2.....	563	13	5.69	1.73	3.96		3.41	.40	6.64	.90		.01	--	a705	.96	540	35	2.06	962	8.3
Sept. 17-22.....	3,499	6.7	5.49	2.88	7.05	.11	2.80	.00	10.95	1.55		.37	.15	1,020	1.39	4,854	45	3.45	1,410	8.1
Sept. 23-30.....	6,998	5.7	4.84	2.22	4.96	.09	2.88	.00	8.08	1.10		.23	.25	793	1.08	7,547	41	2.64	1,120	8.0
Total or weighted average	1,690,000	12	2.89	1.07	1.91	0.06	2.15	--	3.39	0.37		0.05	b0.07	380	0.52	878,800	32	1.35	588	--

a Calculated from determined constituents.
b Includes estimates where data are missing.

318-770 O - 69 - 9

9-4150. VIRGIN RIVER AT LITTLEFIELD, ARIZ.

LOCATION.--At gaging station, 0.4 mile downstream from Beaver Dam Wash, 0.4 mile upstream from Littlefield, Mohave County, and 36 miles upstream from waterline 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 1960.
Water temperatures: October 1947 to September 1960.
Sediment records: October 1947 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 4,070 micromhos Sept. 2; minimum daily, 1,970 micromhos Mar. 15.
Percent sodium: Maximum, 36 Dec. 1-25; minimum, 26 Sept. 2.
EXTREMES, 1949-60.--Specific conductance: Maximum daily, 4,090 micromhos Oct. 5, 1955; minimum daily, 734 micromhos Apr. 28, 1952.
Percent sodium: Maximum, 37 Feb. 24-25, 27-28, 1958; minimum, 8 May 12, 1958.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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. 1-31, 1959.	4,661	20.0	15.82	9.71	12.96	0.74	5.05	0.00	22.90	11.28		0.01	0.84	2,430	3.30	15,403	33	3.63	3,350	7.8
Nov. 1-30.....	12,496	17.0	15.62	6.83	11.09	.56	5.21	.00	19.30	9.87		.03	.75	2,130	2.90	36,198	33	3.31	2,950	7.6
Dec. 1-25.....	6,298	17.0	13.82	6.99	12.01	.59	5.36	.00	17.88	10.16		.02	.71	2,060	2.80	17,643	36	3.72	2,880	7.8
Dec. 26-31.....	2,404	16.0	12.62	5.84	9.35	.49	5.15	.00	15.12	8.46		.01	.58	1,760	2.39	5,754	33	3.08	2,490	7.8
Jan. 1-31.....	11,252	18.0	12.48	6.50	10.35	.54	5.31	.00	15.45	8.75		.02	.62	1,820	2.48	27,852	35	3.36	2,630	7.7
Feb. 1-29.....	10,066	16.0	11.88	6.09	9.83	.51	5.28	.00	14.76	8.60		.02	.62	1,750	2.38	23,957	35	3.28	2,550	7.9
Mar. 1-14, 16-31	9,283	21.0	12.82	6.00	9.96	.54	5.05	.00	15.82	8.75		.03	.66	1,820	2.48	22,976	34	3.25	2,560	7.9
Mar. 15.....	420	16.0	10.58	4.20	7.70		4.56	.00	11.70	6.21		.05	--	1,380	1.88	789	34	2.83	1,970	7.6
Apr. 1-28.....	4,843	19.0	16.42	7.98	10.88	.64	5.41	.00	21.03	9.87		.05	.80	2,250	3.06	14,819	30	3.11	2,970	7.8
Apr. 29-30.....	936	14.0	10.98	5.18	8.92	.49	4.59	.00	13.70	7.48		.06	.59	1,590	2.16	2,024	35	3.14	2,280	7.8
May 1-31.....	4,667	20.0	15.62	8.72	11.14	.64	4.87	.00	21.24	9.59		.03	.94	2,230	3.03	14,154	31	3.19	2,920	7.8
June 1-30.....	3,326	20.0	16.82	8.72	11.09	.69	4.61	.00	22.69	9.73		.02	.88	2,320	3.16	10,495	30	3.10	3,070	8.0
July 1-31.....	3,640	20.0	16.82	9.30	11.09	.66	4.92	.00	22.69	9.87		.02	.83	2,340	3.18	11,584	29	3.07	3,100	8.0
Aug. 1-31.....	3,511	20.0	16.82	8.39	11.05	.69	4.31	.00	23.53	9.82		.03	.89	2,350	3.20	11,221	30	3.11	3,070	7.8
Sept. 1, 3-30...	4,607	18.0	17.81	8.23	10.74	.66	4.59	.00	23.53	9.45		.03	.80	2,350	3.20	14,725	29	2.98	3,090	7.8
Sept. 2.....	1,012	21.0	34.18	6.83	14.40	.66	5.28	.00	40.60	10.30		.03	.99	3,620	4.92	4,980	26	3.18	4,070	7.3
Total or weighted average a	83,450	18	14.67	7.24	10.79	0.59	5.08	--	18.88	9.42		0.03	0.74	2,070	2.82	235,300	32	3.26	2,840	--

a Includes estimates where data are missing.

GILA RIVER BASIN

9-4740. GILA RIVER AT KELVIN, ARIZ.

LOCATION.--Just above mouth of Mineral Creek, and 1,200 feet upstream from gaging station at Kelvin, Pinal County, 17 miles downstream from San Pedro River, and 19.5 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 1960.
Water temperatures: December 1950 to September 1960.
Sediment records: January 1958 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 2,310 micromhos Sept. 30; minimum daily, 501 micromhos Jan. 13.
Percent sodium: Maximum, 52 July 1-22; minimum, 17 Oct. 31.
EXTREMES, 1950-60.--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.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. No appreciable inflow from Mineral Creek between sampling point and gaging station, except during periods of heavy local rains.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-30, 1959.	12,020	--	3.39	1.23	4.09	--	3.75		--	--	--	--	--	568	0.77	9,285	47	2.69	859	8.1
Oct. 31.....	653	--	5.19	.77	1.22	--	4.95		--	--	--	--	--	465	.66	563	17	.71	675	7.9
Nov. 1.....	228	--	4.84	1.23	3.00	--	3.21		--	--	--	--	--	604	.62	187	33	1.72	877	8.0
Nov. 2-4.....	589	--	6.04	1.65	4.18	--	4.20		--	--	--	--	--	770	1.05	617	35	2.13	1,130	7.6
Nov. 5-30.....	1,666	--	7.53	3.04	7.13	--	4.92		--	--	--	--	--	1,160	1.58	2,628	40	3.10	1,640	8.0
Dec. 1-6.....	343	--	6.19	3.29	7.61	--	3.57		--	--	--	--	--	1,150	1.56	536	45	3.50	1,620	8.0
Dec. 7.....	179	--	4.74	1.56	6.26	--	3.97		--	--	--	--	--	838	1.14	203	50	3.53	1,260	7.7
Dec. 6-24.....	5,800	--	4.39	1.46	4.48	--	3.82		--	--	--	--	--	672	.91	5,300	43	2.61	1,020	7.8
Dec. 25-27.....	16,840	--	3.99	.73	1.26	--	3.69		--	--	--	--	--	379	.52	8,680	21	.82	576	7.6
Dec. 28-30.....	1,172	--	7.19	2.30	4.05	--	3.80		--	--	--	--	--	896	1.22	1,428	30	1.86	1,250	7.7
Dec. 31.....	484	--	5.19	1.40	3.67	--	3.02		--	--	--	--	--	680	.92	448	37	2.13	1,020	7.6
Jan. 1-6, 1960..	2,202	42	7.04	2.06	4.92	0.18	4.11		6.93	2.82	0.05	0.04	0.17	913	1.24	2,734	35	2.31	1,280	7.8
Jan. 7-10.....	1,047	--	8.63	2.80	6.53	--	3.64		--	--	--	--	--	1,190	1.62	1,695	36	2.73	1,620	7.8
Jan. 11-15.....	20,460	--	3.59	.90	1.48	--	3.26		--	--	--	--	--	389	.53	10,824	25	.99	567	7.7
Jan. 16-18.....	3,898	--	3.99	1.07	2.44	--	2.85		--	--	--	--	--	505	.69	2,677	32	1.53	727	7.8
Jan. 19-22.....	2,539	--	6.04	1.65	4.05	--	3.95		--	--	--	--	--	766	1.04	2,645	34	2.06	1,090	7.7
Jan. 23-31.....	3,249	--	7.88	2.55	5.74	--	4.29		--	--	--	--	--	1,040	1.41	4,595	35	2.51	1,470	7.7
Feb. 1-7.....	1,886	--	9.16	2.63	6.57	--	3.77		--	--	--	--	--	1,210	1.65	3,107	36	2.70	1,670	7.7

Feb. 8-10, 1960.	1,256	--	6.29	1.81	5.00	--	3.15		--	--	--	--	--	854	1.16	1,458	38	2.49	1,250	7.4
Feb. 11-29.....	9,685	--	4.94	1.48	4.26	--	3.11		--	--	--	--	--	688	.94	9,062	40	2.38	1,040	7.7
Mar. 1-21.....	17,494	--	4.34	1.32	4.65	--	3.02		--	--	--	--	--	672	.91	15,988	45	2.77	1,040	7.7
Mar. 22-31.....	14,360	--	3.39	1.32	4.31	--	2.75		--	--	--	--	--	571	.78	11,152	48	2.81	899	7.7
Apr. 1-30.....	27,372	27	3.29	1.15	4.05	.13	2.66		2.52	∘3.30	.04	.03	.13	557	.76	20,735	47	2.71	864	7.6
May 1-31.....	26,747	--	3.64	1.15	4.39	--	2.62		--	--	--	--	--	613	.83	22,299	48	2.84	934	7.8
June 1-30.....	35,345	--	3.64	1.15	4.79	--	2.98		--	--	--	--	--	595	.81	28,602	50	3.09	992	7.8
July 1-22.....	32,335	35	3.64	1.15	5.31	.14	3.28		2.02	4.96	.04	.02	.12	623	.85	27,396	52	3.43	1,050	7.9
July 23-31.....	15,602	--	4.39	1.23	5.83	--	3.69		--	--	--	--	--	703	.96	14,917	51	3.48	1,180	7.7
Aug. 1-31.....	44,333	--	4.49	1.32	6.00	--	3.72		--	--	--	--	--	731	.99	44,074	51	3.52	1,220	7.8
Sept. 1-8, 10-13	11,734	--	4.99	1.48	6.44	--	4.06		--	--	--	--	--	794	1.08	12,671	50	3.58	1,310	7.9
Sept. 9.....	2,162	--	4.79	.65	1.52	--	2.44		--	--	--	--	--	402	.55	1,182	22	.92	688	7.6
Sept. 14-21.....	5,681	--	5.49	1.56	7.35	--	4.15		--	--	--	--	--	869	1.18	6,714	51	3.92	1,430	8.1
Sept. 22-26.....	869	--	8.93	2.80	8.31	--	3.49		--	--	--	--	--	1,270	1.73	1,501	41	3.43	1,870	8.1
Sept. 27-30.....	300	--	12.62	3.70	9.05	--	3.05		--	--	--	--	--	1,660	2.26	677	36	3.17	2,250	7.9
Total or weighted average	320,800	--	4.14	1.23	4.57	--	3.29		--	--	--	--	--	634	0.86	275,900	46	2.79	1,010	--

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 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 10,400 micromhos Dec. 5; minimum daily, 505 micromhos Dec. 28.
Percent sodium: Maximum, 69 Sept. 23-24; minimum, 39 Aug. 10-11.
EXTREMES, 1950-60.--Specific conductance: Maximum daily, 10,400 micromhos Dec. 5, 1959; minimum daily, 370 micromhos Aug. 2, 1955.
Percent sodium: Maximum, 77 Nov. 5-7, 1957; minimum, 36 Jan. 23-24, 1952.
REMARKS.--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 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-26, 1959.	567	32	19.71	14.29	70.90	0.33	5.10		32.90	64.58	0.15	0.73	3.6	6,500	8.64	5,010	67	17	9,340	7.8
Oct. 29.....	19	--	8.28	4.61	20.66	--	2.95		--	--	--	--	--	2,030	2.76	53	62	8.14	3,260	7.6
Oct. 30-Nov. 2..	2,674	--	2.79	.77	4.00	--	2.72		--	--	--	--	--	452	.61	1,644	53	3.00	783	7.8
Nov. 3-4.....	889	--	3.29	.90	2.83	--	2.69		--	--	--	--	--	431	.59	521	40	1.95	693	7.8
Nov. 5.....	190	--	3.59	1.65	9.05	--	2.75		--	--	--	--	--	876	1.19	227	63	5.59	1,460	7.8
Nov. 6-8.....	234	--	18.96	12.83	58.29	--	6.10		--	--	--	--	--	5,760	7.83	1,832	65	14.62	6,250	7.9
Nov. 9-30.....	1,004	--	20.96	17.27	70.47	--	5.72		--	--	--	--	--	6,640	9.03	9,063	65	16.12	9,530	7.9
Dec. 1-10.....	389	--	22.95	15.63	71.78	--	6.00		--	--	--	--	--	7,050	9.59	3,727	65	16.34	9,940	7.7
Dec. 11.....	119	--	3.59	.81	5.44	--	2.62		--	--	--	--	--	628	.85	102	55	3.67	1,030	7.8
Dec. 12.....	56	--	14.97	9.46	43.50	--	5.21		--	--	--	--	--	4,220	5.74	319	64	12.45	6,300	8.0
Dec. 13-16.....	536	--	2.50	.58	3.00	--	2.43		--	--	--	--	--	382	.52	276	49	2.42	637	7.8
Dec. 17-18.....	83	--	12.23	7.40	37.85	--	4.65		--	--	--	--	--	3,500	4.76	397	66	12.08	5,350	8.1
Dec. 19-24.....	193	--	22.95	15.05	69.60	--	6.75		--	--	--	--	--	6,750	9.18	1,770	65	15.97	9,620	8.0
Dec. 25-26.....	262	--	3.19	.82	5.16	--	2.39		--	--	--	--	--	561	.76	200	56	3.65	962	7.7
Dec. 27-30.....	4,673	--	2.50	.56	2.35	--	2.56		--	--	--	--	--	337	.46	2,142	43	1.90	545	7.8

Dec. 31-Jan. 1, 1960..	1,587	--	3.14	.99	4.79	--	2.77	--	--	--	--	--	556	.76	1,200	54	3.33	910	7.5
Jan. 2-14.....	1,186	40	20.96	14.23	66.56	.31	6.16	30.61	63.75	.14	.82	3.50	6,340	8.62	10,227	65	15.87	9,100	8.0
Jan. 15.....	486	--	14.72	9.46	43.94	--	5.34	--	--	--	--	--	4,140	5.63	2,736	65	12.64	6,260	8.0
Jan. 16-19.....	4,649	--	2.84	.82	2.96	--	2.28	--	--	--	--	--	434	.59	2,744	45	2.18	670	7.7
Jan. 20-21.....	928	--	5.39	2.39	8.27	--	2.74	--	--	--	--	--	1,030	1.40	1,300	52	4.19	1,580	7.5
Jan. 22.....	244	--	7.98	4.03	17.57	--	3.26	--	--	--	--	--	1,920	2.61	637	59	7.17	2,920	7.7
Jan. 23-31.....	953	--	20.96	16.21	67.43	--	5.41	--	--	--	--	--	6,720	9.14	8,712	64	15.64	9,620	7.6
Feb. 1-29.....	2,203	--	22.95	15.05	66.56	--	5.34	--	--	--	--	--	6,730	9.15	20,164	64	15.27	9,590	7.7
Mar. 1-31.....	1,900	--	21.46	15.96	65.25	--	5.74	--	--	--	--	--	6,390	8.69	16,511	64	15.09	9,340	7.7
Apr. 1-30.....	1,446	40	20.71	14.31	64.36	.31	5.59	29.96	62.34	.15	.77	3.50	6,360	6.65	12,507	65	15.39	8,980	7.6
May 1-31.....	1,101	--	20.96	12.01	63.95	--	4.65	--	--	--	--	--	6,130	8.34	9,176	66	15.75	6,780	7.6
June 1-29.....	656	--	19.06	12.91	62.64	--	4.20	--	--	--	--	--	6,100	6.30	5,440	66	15.67	8,650	7.6
June 30-July 18.	407	34	17.17	12.01	57.86	.28	3.70	26.44	56.14	.15	.56	3.50	5,510	7.49	3,050	66	15.15	8,010	7.5
July 19-23.....	62	--	19.06	13.16	65.69	--	3.74	--	--	--	--	--	6,240	8.49	530	67	16.36	6,880	7.6
July 24-26.....	49	--	15.37	9.87	49.59	--	3.80	--	--	--	--	--	4,840	6.58	325	66	13.96	7,050	7.5
July 27-Aug. 2..	110	--	16.77	12.01	62.21	--	3.87	--	--	--	--	--	5,680	7.72	847	68	16.40	8,250	7.7
Aug. 3-5.....	64	--	13.97	9.87	49.16	--	3.18	--	--	--	--	--	4,660	6.34	404	67	14.24	6,850	7.7
Aug. 6-8.....	44	--	17.66	12.75	64.82	--	3.90	--	--	--	--	--	6,010	8.17	360	68	16.62	8,650	7.7
Aug. 9.....	22	--	14.07	8.72	46.11	--	3.87	--	--	--	--	--	4,360	5.93	129	67	13.66	6,480	7.4
Aug. 10-11.....	175	--	3.04	.72	2.44	--	3.11	--	--	--	--	--	403	.55	96	39	1.77	639	7.5
Aug. 12-13.....	121	--	10.08	5.51	26.93	--	3.64	--	--	--	--	--	2,740	3.73	451	63	9.64	4,120	7.5
Aug. 14-18.....	198	--	15.22	10.36	49.16	--	4.33	--	--	--	--	--	4,780	6.50	1,289	66	13.74	6,920	7.6
Aug. 19-31.....	289	--	16.97	12.67	61.77	--	3.79	--	--	--	--	--	5,780	7.86	2,270	68	16.05	8,330	7.4
Sept. 1-3.....	179	--	5.99	2.06	11.44	--	2.69	--	--	--	--	--	1,250	1.70	303	59	5.70	2,010	7.7
Sept. 4-22.....	198	--	16.22	11.76	57.86	--	4.13	--	--	--	--	--	5,530	7.52	1,492	67	15.47	8,040	7.5
Sept. 23-24.....	50	--	18.06	14.31	71.34	--	3.93	--	--	--	--	--	6,610	6.99	446	69	17.73	9,550	7.4
Sept. 25-30.....	76	--	18.21	12.83	65.69	--	4.15	--	--	--	--	--	6,120	8.32	634	68	16.67	8,940	7.6
Total or weighted average	31,450	--	10.93	6.91	31.23	--	3.79	--	--	--	--	--	3,100	4.22	132,700	64	10	4,500	--

GILA RIVER BASIN--Continued

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

LOCATION.--Just bslow dam, 3.5 miles upstream from 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 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,220 micromhos Oct. 17; minimum daily, 791 micromhos May 30.
Percent sodium: Maximum, 67 Oct. 1-31, Dec. 1-31, June 17-30, July 1-31; minimum, 62 Apr. 1-30.
EXTREMES, 1950-60.--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.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713. No inflow hetween sampling point and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1959 to Septemher 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	17,524	20	2.54	0.82	7.09	0.14	2.72		0.81	6.88	0.02	0.01	0.13	618	0.84	14,729	67	5.46	1,120	7.6
Nov. 1-30.....	2,600	--	2.20	.90	5.70	--	2.46		--	--	--	--	--	522	.71	1,846	65	4.58	966	6.0
Dec. 1-31.....	2,951	--	2.25	.90	6.26	--	2.66		--	--	--	--	--	566	.77	2,272	67	4.99	1,020	7.9
Jan. 1-Feb. 15, 1960.....	12,880	21	2.10	.90	5.13	.06	2.23		.73	5.08	.02	.03	.10	491	.67	8,630	63	4.19	673	7.6
Feb. 16-Mar. 31.	8,747	--	2.05	.90	5.05	--	2.28		--	--	--	--	--	490	.67	5,829	63	4.15	864	7.6
Apr. 1-30.....	18,149	21	2.10	.82	4.96	.06	2.28		.75	4.94	.02	.02	.10	488	.66	12,045	62	4.11	858	7.6
May 1-31.....	32,588	--	2.20	.68	4.87	--	2.31		--	--	--	--	--	468	.64	20,742	63	4.06	824	7.7
June 1-16.....	24,627	--	2.10	.74	5.09	--	2.20		--	--	--	--	--	475	.65	15,909	64	4.27	844	7.6
June 17-30.....	30,990	--	2.30	.82	6.44	--	2.41		--	--	--	--	--	573	.78	24,150	67	5.16	1,020	7.8
July 1-31.....	80,057	22	2.35	.90	6.96	.15	2.52		.87	6.88	.02	.02	.13	611	.83	66,524	67	5.46	1,100	7.7
Aug. 1-31.....	80,795	--	2.30	.90	6.18	--	2.57		--	--	--	--	--	571	.78	62,742	66	4.88	1,030	7.8
Sept. 1-30.....	64,086	--	2.25	.79	5.31	--	2.34		--	--	--	--	--	502	.68	43,753	64	4.31	915	7.6
Total or weighted average	367,029	--	2.27	0.84	5.97	--	2.44		--	--	--	--	--	547	0.74	273,156	65	4.78	981	--

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

LOCATION.--At gaging station, 2.2 miles downstream from Bartlett Dam, Maricopa County, and 3.5 miles upstream from Camp Creek.
DRAINAGE AREA.--6,188 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 814 micromhos July 23, 24; minimum daily, 281 micromhos Jan. 5.
Percent sodium: Maximum, 30 July 27, 29-31; minimum, 20 May 1-31.
EXTREMES, 1950-60.--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.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Records of discharge for water year October 1959 to September 1960 given in WSP 1713.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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-Nov. 1, 1959..	1,542	26	2.00	2.14	1.61	0.11	3.84	0.00	1.33	0.62	0.02	0.02	0.20	330	0.45	692	27	1.12	541	8.1
Nov. 2-5.....	165	--	1.35	.90	.78	--	2.13	.00	--	--	--	--	--	186	.25	42	26	.74	298	7.8
Nov. 6-30.....	3,461	--	1.85	1.56	1.22	--	3.16	.00	--	--	--	--	--	274	.37	1,290	26	.93	444	8.0
Dec. 1-23.....	3,116	--	1.80	1.73	1.31	--	3.26	.00	--	--	--	--	--	282	.38	1,195	27	.98	458	8.2
Dec. 24-31.....	1,374	--	1.50	.99	.78	--	2.41	.00	--	--	--	--	--	204	.28	381	24	.70	319	7.9
Jan. 1-31, 1960.	12,789	21	1.65	1.07	.74	.06	2.51	.00	.56	.31	.02	.02	.07	202	.27	3,514	21	.63	323	7.7
Feb. 1-29.....	34,052	--	1.70	1.15	.83	--	2.66	.00	--	--	--	--	--	206	.28	9,540	22	.69	340	7.8
Mar. 1-31.....	142,405	--	1.80	1.15	.83	--	2.77	.00	--	--	--	--	--	213	.29	41,252	22	.68	347	7.9
Apr. 1-30.....	79,050	21	1.60	1.32	.78	.06	2.85	.00	.50	.31	.02	.01	.12	214	.29	41,446	21	.65	344	8.0
May 1-31.....	52,141	--	1.55	1.23	.70	--	2.72	.00	--	--	--	--	--	208	.28	14,750	20	.59	331	7.9
June 1-17.....	39,418	--	1.75	1.32	.83	--	3.02	.00	--	--	--	--	--	229	.31	12,278	21	.67	359	7.9
June 18-July 5..	38,166	--	1.80	1.56	1.04	--	3.38	.00	--	--	--	--	--	262	.36	13,599	24	.81	415	8.1
July 6-20.....	19,964	23	2.50	1.89	1.52	.09	4.06	.00	1.21	.59	.02	.03	.17	336	.46	9,123	25	1.03	538	7.8
July 21-26, 28..	11,635	--	3.24	3.21	2.26	--	5.67	.00	--	--	--	--	--	490	.67	7,754	26	1.26	777	8.0
July 27, 29-31..	4,895	--	2.00	2.63	2.00	--	4.16	.00	--	--	--	--	--	390	.53	2,596	30	1.32	616	8.2
Aug. 1-31.....	12,236	--	2.40	2.47	1.70	--	4.43	.00	--	--	--	--	--	370	.50	6,157	26	1.09	604	8.2
Sept. 1-30.....	12,793	--	2.30	2.39	1.83	--	4.15	.13	--	--	--	--	--	374	.51	6,507	28	1.19	606	8.3
Total or weighted average	469,200	--	1.80	1.40	0.96	--	3.06	--	--	--	--	--	--	241	0.33	154,800	23	0.76	387	--

PART 10. THE GREAT BASIN

SEVIER LAKE BASIN

10-2240. SEVIER RIVER NEAR LYNNDYL, UTAH

LOCATION.--At bridge on county road, 1.5 miles upstream from gaging station and about 2 miles south of Lynndyl, Millard County.
DRAINAGE AREA.--6,270 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1960.
Water temperatures: March 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 4,720 micromhos Nov. 27; minimum daily, 1,600 micromhos Oct. 3-5.
Percent sodium: Maximum, 59 Aug. 1 to Sept. 29; minimum, 43 Feb. 14-29.
EXTREMES, 1951-60.--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.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Records of discharge for gaging station near Lynndyl for water year October 1959 to September 1960 given in WSP 1714. Discharges are adjusted to compensate for inflow from a deep well discharging to the river between the sampling point and gaging station.
REVISIONS.--Revised figures of runoff in acre-feet and total tons for water year October 1958 to September 1959 superseding figures published in WSP 1699, are given herewith:

Date	Runoff (acre-feet)	Total tons	Date	Runoff (acre-feet)	Total tons
Jan. 1-31, 1959...	845	2,590	June 1-30, 1959...	24,800	46,870
Feb. 1-19.....	516	1,560	July 1-31.....	19,830	40,450
Feb. 20-28.....	758	1,370	Aug. 1-31.....	15,740	31,640
Mar. 1-31.....	2,200	3,980	Sept. 1-13, 19-20.	3,300	7,330
Apr. 1-5.....	236	543	Sept. 14-18.....	543	472
Apr. 6-30.....	16,980	30,220	Sept. 21-30.....	827	1,180
May 1-31.....	29,290	54,480			
Weighted average	.....			124,400	241,300

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)			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. 1-31, 1959.	2,330	9.5	2.79	6.50	7.70	0.13	4.49	0.00	4.85	7.48		0.00	0.29	960	1.31	3,043	45	3.57	1,880	8.1
Nov. 1-15.....	1,259	13.0	3.54	6.09	7.92	.12	4.52	.00	5.14	7.90		.01	.19	1,010	1.37	1,729	45	3.81	1,710	8.1
Nov. 16-26.....	467	14.0	4.99	8.80	15.83	.15	5.21	.00	9.76	14.39		.02	.36	1,730	2.35	1,099	53	8.03	2,800	8.1
Nov. 27-Dec. 31.	632	19.0	7.19	11.27	24.36	.19	6.59	.00	14.49	21.44		.02	.54	2,520	3.43	2,165	57	8.02	4,040	7.8
Jan. 1-31, 1960.	572	19.0	7.09	11.76	24.23	.18	6.15	.00	14.82	22.43		.03	.49	2,560	3.48	1,991	56	7.89	4,040	7.9
Feb. 1-13.....	266	18.0	7.19	11.19	23.27	.20	6.36	.00	14.43	21.30		.03	.50	2,480	3.37	896	56	7.68	3,920	7.8
Feb. 14-29.....	1,123	13.0	4.14	5.84	7.66	.10	4.98	.00	4.93	7.62		.03	.17	1,000	1.36	1,528	43	3.43	1,700	7.8
Mar. 1-19.....	1,824	11.0	5.14	6.50	9.61	.12	5.02	.00	6.64	9.87		.04	.24	1,240	1.69	3,078	45	3.99	2,020	8.0
Mar. 20-26.....	383	15.0	5.64	8.80	16.23	.19	5.21	.00	10.16	15.52		.04	.40	1,810	2.46	943	53	8.04	2,870	8.1
Mar. 27-29.....	77	15.0	6.89	10.28	21.84	.21	5.70	.00	13.57	20.31		.04	.50	2,330	3.17	245	56	7.45	3,640	8.0
Mar. 30-Apr. 30.	12,060	19.0	4.49	5.51	11.70	.13	4.95	.00	6.91	9.59		.10	.32	1,280	1.74	20,993	54	5.23	2,050	7.9
May 1-31.....	32,220	20.0	4.09	5.92	12.18	.15	4.98	.00	7.10	10.01		.06	.39	1,310	1.78	57,402	55	5.44	2,120	7.8
June 1-30.....	18,625	16.0	3.74	6.33	12.66	.15	4.85	.00	7.31	10.44		.06	.39	1,340	1.82	33,942	55	5.64	2,200	8.0
July 1-13, 17-31	14,329	17.0	3.59	7.07	15.18	.17	4.47	.00	8.62	12.98		.03	.42	1,540	2.09	30,010	58	6.57	2,510	7.9
July 14-16.....	522	14.0	2.89	6.17	10.09	.15	4.26	.00	5.89	9.03		.01	.27	1,120	1.52	795	52	4.74	1,870	8.1
Aug. 1-31.....	4,464	13.0	3.29	7.73	16.18	.17	4.52	.00	8.81	13.54		.04	.40	1,590	2.16	9,653	59	6.89	2,590	8.2
Sept. 1-29.....	3,210	15.0	3.49	7.32	15.92	.16	4.74	.00	8.49	13.26		.02	.39	1,570	2.14	6,853	59	6.85	2,550	8.0
Sept. 30.....	40	11.0	3.69	6.09	7.96	.11	4.49	.00	5.64	8.12		.00	.02	1,040	1.41	57	45	3.60	1,780	8.0
Total or weighted average	94,380	17	3.99	6.41	12.92	0.15	4.85	--	7.50	10.89		0.05	0.38	1,370	1.86	175,600	55	5.67	2,230	--

HUMBOLT RIVER BASIN

10-3350. HUMBOLT RIVER NEAR RYE PATCH, NEV.

LOCATION.--At gaging station, 1,000 feet downstream from Rye Patch Dam, and 1.5 miles northwest of Rye Patch, Pershing County.
DRAINAGE AREA (revised).--16,100 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1951 to September 1958, October 1959 to September 1960.
Water temperatures: December 1951 to September 1958, October 1959 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,670 micromhos Apr. 10; minimum daily, 1,060 micromhos May 14, 15, 17, July 15.
Percent sodium: Maximum, 68 Apr. 4-30; minimum, 60 May 9 to July 27.
EXTREMES, 1951-58, 1959-60.--Specific conductance: Maximum daily, 4,010 micromhos Sept. 2, 1954; minimum daily, 384 micromhos June 24, 1956.
Percent sodium: Maximum, 71 Sept. 1-5, 1954; minimum, 21 June 24, 1956.
REMARKS.--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 1959 to September 1960 given in WSP 1714. Flow completely regulated by Rye Patch Reservoir.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Apr. 4-30, 1960.	13,600	42	2.52	2.00	11.18	0.64	6.02		2.96	7.30		0.00	1.2	981	1.33	18,090	68	7.5	1,620	7.8
May 1-8.....	5,520	36	2.28	1.84	9.00	.54	5.41		2.50	5.64		.01	1.0	815	1.11	6,130	66	6.3	1,350	8.2
May 9-31.....	7,930	35	2.48	1.52	6.70	.43	4.87		2.02	4.23		.01	.7	668	.91	7,220	60	4.7	1,100	8.1
June 1-30.....	4,610	34	2.80	1.68	7.57	.51	4.98		2.27	5.13		.00	.7	747	1.02	4,700	60	5.0	1,220	8.1
July 1-27.....	9,570	35	2.70	1.54	6.96	.49	4.88		1.92	4.74		.00	.7	695	.95	9,090	60	4.8	1,140	8.1
Aug. 12-18.....	294	41	2.68	1.96	10.09	.56	4.95		2.33	7.76		.00	1.0	904	1.23	362	66	6.7	1,510	8.0
Total or weighted average a	41,530	--	2.54	1.73	8.66	0.54	5.33		2.39	5.67		0.00	--	807	1.10	45,680	64	5.9	1,330	--

a Represents 93 percent of runoff for water year.

PART 11. PACIFIC SLOPE BASINS IN CALIFORNIA

SAN JOAQUIN RIVER BASIN

11-2535. SAN JOAQUIN RIVER NEAR BIOLA, CALIF.

LOCATION.--At Skaggs Bridge, 1.9 miles upstream from gaging station, and approximately 2.5 miles northwest of Biola, Fresno County.
DRAINAGE AREA.--1,805 square miles, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: November 1952 to September 1958, November 1959 to September 1960.
Water temperatures: November 1952 to September 1958, November 1959 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 133 micromhos Feb. 18; minimum daily, 64 micromhos June 28.
Percent sodium: Maximum, 48 Aug. 11-19; minimum 31 Feb. 28 to Mar. 31.
EXTREMES, 1952-58, 1959-60.--Specific conductance: Maximum daily, 178 micromhos Mar. 18, 1958; minimum daily, 33 micromhos June 18, 1956.
Percent sodium: Maximum 49 Nov. 1-5, 7-10, 1952; minimum 24 Nov. 29, 1957.
REMARKS.--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 1959 to September 1960 given in WSP 1715. Station was closed from September 1958 to November 1959.

Chemical analyses, November 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Nov. 18-Dec. 5, 1960..	2,500		0.36	0.10	0.27		0.49							50	0.07	175	37	0.6	74	6.6
Dec. 6-25.....	2,060		.32	.24	.30		.57							53	.07	144	35	.6	86	6.9
Dec. 26-31.....	345		.48	.12	.35		.70							--	--	31	37	.6	100	6.9
Jan. 1-6, 1960..	148		.65	.15	.44		.93							--	--	16	35	.7	116	7.0
Jan. 7-14.....	373		.75	.03	.48		.93							83	.11	41	38	.8	83	6.9
Jan. 15-31.....	893		.70	.04	.44		.85							73	.10	89	37	.7	115	7.2
Feb. 1-17.....	1,270		.65	.09	.44		.85							74	.10	127	37	.7	116	7.2
Feb. 18-27.....	1,130		.70	.10	.44		.85							81	.11	124	35	.7	123	7.2
Feb. 28-Mar. 10.	2,630		.34	.32	.29		.54									184	31	.5	81	7.0
Mar. 11-20.....	1,650		.34	.38	.33		.57							60	.08	132	31	.6	86	7.6
Mar. 21-31.....	1,890		.28	.46	.33		.54							58	.08	151	31	.5	82	7.0
Apr. 1-9.....	1,380		.28	.16	.31		.62							54	.07	97	41	.7	82	7.4
Apr. 10-21.....	2,250		.26	.16	.29		.57						•	47	.06	135	41	.6	77	7.4

SAN JOAQUIN RIVER BASIN--Continued

11-2535. SAN JOAQUIN RIVER NEAR BIOLA, CALIF.--Continued

Chemical analyses, November 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Apr. 22-30, 1960	2,150		0.28	0.24	0.25		0.69							53	0.07	150	32	0.6	70	7.3
May 1-11.....	1,710		.36	.12	.30		.56							60	.08	137	38	.6	83	6.9
May 12-20.....	1,760		.28	.12	.35		.52							--	--	123	47	.8	77	6.8
May 21-31.....	2,160		.30	.10	.35		.48							--	--	151	47	.8	74	6.8
June 1-16.....	3,080		.25	.12	.30		.51							46	.06	185	45	.7	73	6.8
June 17-30.....	3,370		.27	.11	.28		.49							43	.06	202	42	.6	69	6.9
July 1-9.....	2,230		.26	.10	.31		.34							--	--	156	46	.7	72	6.4
July 10-21.....	2,920		.35	.05	.31		.31							--	--	204	44	.7	74	6.4
July 22-31.....	2,430		.24	.12	.30		.39							--	--	170	45	.7	72	6.4
Aug. 1-10.....	2,260		.24	.12	.31		.38							56	.08	181	46	.7	75	6.3
Aug. 11-19.....	2,240		.24	.12	.33		.34							--	--	134	48	.6	72	6.3
Aug. 20-31.....	2,810		.28	.12	.34		.39							--	--	197	46	.8	77	6.4
Sept. 1-10.....	2,430		.32	.08	.33		.39							50	.07	170	45	.7	76	6.7
Sept. 11-20.....	2,180		.28	.12	.33		.46							--	--	153	45	.7	76	6.7
Sept. 21-30.....	1,810		.28	.12	.31		.36							46	.06	109	44	.7	73	6.6
Total or weighted average a	61,020		0.32	0.15	0.31		0.49							53	0.07	4,270	40	0.7	79	--

a Includes estimated data for missing period Oct. 1 to Nov. 18, 1959; represents 100 percent of runoff for water year.

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 northeast of Vernalis, San Joaquin County.
DRAINAGE AREA.--14,010 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1960.
Water temperatures: March 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 1,600 micromhos Aug. 19; minimum daily, 448 micromhos Feb. 14.
Percent sodium: Maximum, 55 Jan. 25-31; minimum, 48 May 1-4.
EXTREMES, 1951-58, 1959-60.--Specific conductance: Maximum daily, 1,600 micromhos Aug. 19, 1959; minimum daily, 60 micromhos June 21, 1953.
Percent sodium: Maximum, 56 Jan. 21-31, 1954; minimum, 27 Dec. 24-28, 1955.
REMARKS.--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 1959 to September 1960 given in WSP 1715.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)a	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Oct. 1-15, 1959.	22,710	38	2.59	2.01	4.92	0.14	3.11		1.60	5.22	0.01	0.05	0.3	600	0.82	18,620	51	3.2	1,010	7.6
Oct. 16-31.....	31,190	31	2.00	1.56	3.74	.12	2.36		1.35	3.86	.01	.06	.1	464	.63	19,650	50	2.8	781	7.3
Nov. 1-15.....	30,110	30	1.95	1.47	3.74	.10	2.23		1.27	3.81	.01	.06	.2	451	.61	18,370	52	2.9	764	7.3
Nov. 16-30.....	32,450	29	1.95	1.59	3.96	.09	2.20		1.44	3.98	.01	.08	.2	475	.65	21,090	52	3.0	783	7.4
Dec. 1-15.....	33,710	--	2.25	1.05	3.61	.10	2.15		1.31	3.55	.01	.08	.2	425	.58	19,550	51	2.8	743	7.9
Dec. 16-25.....	26,060	33	1.60	1.27	3.13	.11	1.85		1.06	3.21	.01	.06	.2	389	.53	13,810	51	2.6	623	7.8
Dec. 26-31.....	13,010	--	1.90	1.40	3.96	.13	2.21		1.48	3.72	.01	.10	.3	b428	.58	7,550	54	3.1	743	7.4
Jan. 1-11, 1960.	28,760	27	1.55	1.33	3.48	.15	1.80		1.23	3.33	.01	.05	.3	396	.54	15,530	53	2.9	667	8.0
Jan. 12-24.....	39,590	27	1.90	1.46	4.09	.19	2.23		1.85	3.61	.01	.07	.3	485	.66	26,130	54	3.2	783	8.2
Jan. 25-31.....	17,410	30	2.30	1.90	5.31	.21	2.59		2.27	4.79	.01	.05	.4	589	.80	13,930	55	3.7	1,010	7.6
Feb. 1-10.....	30,190	34	2.00	1.88	4.61	.16	2.57		2.04	4.31	.02	.06	.5	525	.71	21,430	53	3.3	862	8.2
Feb. 11-15.....	27,330	32	1.35	1.09	2.52	.17	1.92		1.08	2.03	.01	.05	.4	327	.44	12,030	49	2.3	520	7.3
Feb. 16-29.....	41,550	45	2.20	2.14	5.05	.15	2.84		2.12	4.29	.01	.06	.7	563	.77	31,990	53	3.4	912	8.3
Mar. 1-12.....	23,330	30	2.25	2.59	5.31	.14	2.56		2.23	5.19	.01	.03	.3	595	.81	18,900	52	3.4	997	8.3
Mar. 13-26.....	8,800	35	3.49	2.71	6.83	.22	3.02		1.92	8.49	.02	.05	.4	817	1.11	9,770	52	3.9	1,370	8.3

a Includes carbonate (CO_3).
b Calculated from determined constituents.

SAN JOAQUIN RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			Percent sodium	Sodium adsorption ratio	Specific conductance (micromhos at 25°C)	pH
			Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)a	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)		Parts per million	Tons per acre-foot	Total tons				
Mar. 27-31, 1960	4,460	34	2.89	2.67	5.52	0.23	2.92		1.58	6.29	0.02	0.05	0.6	659	0.90	4,010	49	3.3	1,110	8.1
Apr. 1-5.....	4,730	34	2.69	2.11	5.09	.20	2.93		1.60	5.64	.02	.03	.3	640	.87	4,120	50	3.3	1,040	7.5
Apr. 6-10.....	3,420	33	3.24	2.60	6.35	.22	3.13		1.71	7.30	.01	.03	.4	806	1.10	3,760	51	3.7	1,280	7.6
Apr. 11-27.....	15,410	34	2.84	2.12	5.18	.20	2.93		1.29	5.95	.01	.04	.3	664	.90	13,870	50	3.3	1,060	7.5
Apr. 28-30.....	7,220	30	2.00	1.60	3.70	.15	2.51		1.31	3.61	.01	.06	.2	464	.63	4,550	50	2.8	765	7.6
May 1-4.....	7,780	33	2.54	2.30	4.57	.18	2.95		1.46	5.30	.01	.04	.4	608	.83	6,460	48	2.9	980	8.1
May 5-15.....	10,210	34	2.99	2.77	5.74	.20	3.11		1.67	7.11	.01	.04	.5	728	.99	10,110	49	3.4	1,170	7.6
May 16-31.....	19,990	32	2.25	1.65	3.92	.15	2.79		1.50	3.92	.01	.05	.4	509	.69	13,790	49	2.8	844	7.8
June 1-9.....	6,190	33	3.39	2.09	6.00	.16	3.00		1.42	7.19	.01	.03	.3	720	.98	6,070	52	3.6	1,210	7.5
June 10-20.....	5,740	37	3.49	2.15	6.05	.17	2.85		1.29	7.90	.01	.05	.3	780	1.06	6,080	51	3.6	1,240	7.9
June 21-30.....	5,510	35	3.39	2.05	5.92	.16	2.92		1.33	7.19	.01	.04	.3	739	1.01	5,570	51	3.6	1,220	7.4
July 1-10.....	5,320	36	3.34	2.00	5.87	.13	2.98		1.25	6.77	.01	.03	.3	719	.98	5,210	52	3.6	1,180	7.5
July 11-20.....	3,810	30	3.84	2.10	6.57	.17	3.02		1.29	8.46	.01	.03	.4	824	1.12	4,270	52	3.8	1,340	7.5
July 21-31.....	4,530	35	3.74	2.24	6.83	.16	3.05		1.46	8.60	.01	.04	.4	835	1.14	5,160	53	3.9	1,370	7.5
Aug. 1-10.....	6,220	23	3.24	2.08	5.79	.14	3.02		1.33	7.05	.01	.03	.3	725	.99	6,160	51	3.6	1,200	7.5
Aug. 11-20.....	4,110	31	3.64	2.22	6.48	.15	3.03		1.50	8.12	.01	.04	.3	800	1.09	4,480	52	3.8	1,330	7.4
Aug. 21-31.....	6,120	32	3.49	2.39	6.66	.17	3.28		1.60	7.90	.01	.05	.3	803	1.09	6,670	52	3.9	1,330	8.3
Sept. 1-3.....	1,640	41	3.59	2.33	6.35	.16	3.26		1.46	8.01	.01	.03	.3	839	1.14	1,870	51	3.7	1,340	7.4
Sept. 4-16.....	9,570	36	3.29	2.31	6.05	.14	3.31		1.56	7.19	.01	.02	.3	780	1.06	10,140	51	3.6	1,250	8.3
Sept. 17-30.....	11,690	37	3.29	2.35	6.22	.15	3.34		1.67	7.05	.01	.04	.4	784	1.07	12,510	52	3.7	1,260	8.3
Total or weighted average c	549,900	d32	2.25	1.81	4.48	0.15	2.51		1.56	4.60	0.01	0.05	0.3	539	0.73	401,400	52	3.1	890	--

a Includes carbonate (CO_3).
c Represents 100 percent of runoff for water year.
d Includes estimates for missing data.

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 May 1958, December 1958 to May 1960 (discontinued).
Water temperatures: March 1951 to May 1958, December 1958 to May 1960.
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.--Records of specific conductance of daily samples available in district office at Sacramento, Calif. Records of discharge for water year October 1959 to September 1960 given in WSP 1715. 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, October 1959 to May 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-15, 1959.	180,400	31	0.80	0.68	0.52	0.05	1.57		0.19	0.23	0.01	0.01	0.0	124	0.17	30,670	25	0.6	185	7.8
Oct. 16-31.....	185,100	31	.85	.61	.52	.05	1.54		.15	.28	.01	.00	.0	127	.17	31,470	26	.6	184	7.8
Nov. 1-15.....	159,500	37	.75	.57	.52	.08	1.51		.23	.23	.00	.01	.0	139	.19	30,300	27	.6	189	7.5
Nov. 16-30.....	143,800	36	.75	.65	.57	.08	1.57		.27	.24	.00	.02	.1	151	.21	30,200	28	.7	189	7.5
Dec. 1-12.....	108,800	39	.75	.69	.57	.07	1.61		.21	.27	.00	.01	.0	138	.19	20,670	27	.7	200	7.5
Dec. 13-31.....	186,100	35	.80	.66	.65	.07	1.61		.19	.28	.00	.02	.0	140	.19	35,360	30	.8	213	7.6
Jan. 24-Feb. 3, 1960..	288,900	27	.65	.63	.70	.06	1.25		.50	.28	.01	.04	.1	167	.23	66,450	34	.9	206	7.2
Feb. 4-13.....	456,000	22	.55	.45	.25	.05	.89		.31	.14	.00	.00	.1	137	.19	86,640	19	.4	126	7.4
Feb. 14-19.....	215,200	29	.70	.56	.35	.05	1.23		.27	.15	.01	.03	.0	133	.18	38,740	21	.4	163	7.6
Feb. 20-29.....	227,300	33	.80	.74	.57	.05	1.62		.40	.22	.00	.00	.0	156	.21	47,730	26	.6	213	7.7
Mar. 1-5.....	84,040	28	.40	1.08	.48	.04	1.44		.35	.17	.01	.01	.1	131	.18	15,130	24	.6	189	7.3
Mar. 6-11.....	232,300	18	.44	.50	.21	.03	.87		.19	.10	.01	.01	.1	90	.12	27,880	18	.3	109	7.0
Mar. 12-19.....	246,900	22	.75	.53	.33	.04	1.26		.25	.16	.01	.01	.0	109	.15	37,040	20	.4	158	7.3
Mar. 20-31.....	245,100	25	.75	.79	.48	.04	1.48		.31	.21	.01	.01	.0	123	.17	41,670	23	.5	191	7.9
Apr. 1-13.....	190,200	29	.75	.69	.48	.04	1.51		.27	.23	.01	.01	.1	125	.17	32,330	24	.6	184	7.9
Apr. 14-28.....	121,100	28	.80	.60	.44	.04	1.51		.19	.22	.01	.00	.1	116	.16	19,380	23	.5	181	7.8
Apr. 29-May 12..	236,400	25	.85	.67	.96	.05	1.77		.35	.34	.02	.01	.1	164	.22	52,010	38	1.1	243	8.1
May 13-17.....	74,920	24	.90	1.02	1.48	.06	2.29		.65	.48	.01	.01	.2	209	.28	20,980	43	1.5	329	8.1
May 18-31.....	227,200	25	.75	.89	.96	.05	1.84		.52	.34	.01	.01	.1	166	.23	52,260	36	1.1	244	8.0

SACRAMENTO RIVER BASIN--Continued

11-4250. FEATHER RIVER AT NICOLAUS, CALIF.

LOCATION.--At gaging station at Nicolaus, Sutter County, at highway bridge, and 2.9 miles downstream from Bear River.
DRAINAGE AREA.--5,920 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1958, November 1959 to September 1960.
Water temperatures: March 1951 to September 1958, November 1959 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 183 micromhos Jan. 25; minimum daily, 57 micromhos Feb. 9.
Percent sodium: Maximum, 21 July 1-22; minimum, 12 Feb. 8-12.
EXTREMES, 1951-60.--Specific conductance (1951-55, 1956-58, 1959-60): Maximum daily, 291 micromhos July 26, 1958; minimum daily, 50 micromhos May 28, 1952.
Percent sodium (1951-54, 1957-58, 1959-60): Maximum, 27 Dec. 1-2, 4, 7, 1952; minimum, 8 June 21-30, 1951, Jan. 11-20, 1953.
REMARKS.--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 1959 to September 1960 given in WSP 1715. Station was closed from September 1958 to November 1959.

Chemical analyses, November 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Nov. 18-30, 1959	43,220		0.65	0.59	0.24		1.21							90	0.12	5,190	16	0.3	142	7.1
Dec. 1-18.....	53,300		.65	.55	.25		1.28							93	.13	6,930	17	.3	145	7.1
Dec. 19-31.....	42,410		.65	.55	.27		1.21							88	.12	5,090	18	.3	142	7.1
Jan. 1-18, 1960.	90,130		1.10	.04	.26		1.11							92	.13	11,720	19	.3	139	7.4
Jan. 19-26.....	53,040		1.20	.08	.27		1.10							104	.14	7,430	17	.3	156	7.3
Jan. 27-Feb. 7..	163,100		.90	.04	.22		.80							86	.12	19,570	19	.3	121	7.3
Feb. 8-12.....	609,900		.55	.15	.10		.43							66	.09	54,890	12	.2	73	6.9
Feb. 13-29.....	265,200		.85	.03	.16		.82							71	.10	26,520	15	.2	106	6.8
Mar. 1-4.....	34,930		.55	.39	.18		.98							72	.10	3,490	16	.3	114	7.0
Mar. 5-26.....	823,300		.36	.30	.12		.69							59	.08	65,860	15	.2	81	7.3
Mar. 27-31.....	158,100		.38	.24	.10		.66							50	.07	11,070	14	.2	70	7.5
Apr. 1-10.....	277,500		.48	.26	.11		.62							73	.10	27,570	13	.2	79	7.5
Apr. 11-16.....	120,800		.44	.28	.11		.69							74	.10	12,080	13	.2	81	7.0
Apr. 17-30.....	175,000		.55	.21	.13		.70							71	.10	17,500	15	.2	82	7.1

May 1-8, 1960...	83,600		.50	.30	.13		.75							83	.11	9,200	14	.2	90	7.0
May 9-19.....	126,200		.50	.18	.13		.70							68	.09	11,360	16	.2	84	7.5
May 20-31.....	112,600		.50	.24	.13		.72							67	.09	10,130	15	.2	88	7.4
June 1-9.....	81,460		.43	.27	.16		.80							64	.09	7,330	19	.3	90	6.3
June 10-19.....	43,620		.48	.40	.18		.95							75	.10	4,360	17	.3	104	7.1
June 21-30.....	28,640		.55	.48	.21		1.15							86	.12	3,440	17	.3	124	7.3
July 1-9.....	15,640		.60	.48	.28		1.21							102	.14	2,190	21	.4	137	7.3
July 10-22.....	19,220		.60	.52	.30		1.23							93	.13	2,500	21	.4	141	7.2
July 23-31.....	13,260		.70	.46	.26		1.25							98	.13	1,720	18	.3	137	7.2
Aug. 1-10.....	16,550		.65	.51	.27		1.28							91	.12	1,990	19	.4	139	7.9
Aug. 11-20.....	13,640		.70	.46	.27		1.31							94	.13	1,770	19	.4	146	7.4
Aug. 21-31.....	16,580		.65	.53	.27		1.36							92	.13	2,160	19	.4	147	7.0
Sept. 1-8.....	13,140		.70	.54	.27		1.20							95	.13	1,710	18	.3	149	7.3
Sept. 9-20.....	26,160		.65	.47	.28		1.26							81	.11	2,880	20	.4	139	7.5
Sept. 21-30.....	23,230		.70	.42	.28		1.08							99	.13	3,020	20	.4	143	7.4
Total or weighted average a	3,676,000		0.55	0.25	0.15		0.75							71	0.10	367,600	16	0.2	93	--

a Includes estimated data for missing period. Represents 100 percent of runoff for water year.

SACRAMENTO RIVER BASIN--Continued

11-4465. AMERICAN RIVER AT FAIR OAKS, CALIF.

LOCATION (revised).--At old highway bridge, 2.2 miles downstream from gaging station, 1,500 feet upstream from new highway bridge at Fair Oaks, 2.6 miles downstream from Nimbus Dam, and 10 miles downstream from South Fork.
DRAINAGE AREA (revised).--1,889 square miles, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: January to December 1906, March 1951 to September 1958, November 1959 to September 1960.
Water temperatures: March 1951 to September 1958, November 1959 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 82 micromhos Feb. 9; minimum daily, 50 micromhos several days during July and August, Sept. 1.
Percent sodium: Maximum, 23 July 21-31; minimum 14 Nov. 18-30, Feb. 1 to Mar. 15, Apr. 10-18, May 11-31.
EXTREMES, 1951-58, 1959-60.--Specific conductance: Maximum daily, 112 micromhos Aug. 28, 1951; minimum daily, 29 micromhos June 3, 1952.
Percent sodium (1951-54, 1957-58, 1959-60): Maximum, 34 Aug. 1, 1958; minimum, 8 Jan. 21-31, 1953.
REMARKS.--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 1959 to September 1960 given in WSP 1715.

Chemical analyses, November 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (calculated)a			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				
Nov. 18-30, 1959	19,860		0.40	0.22	0.11	0.03	0.48		0.15	0.12	0.00	0.03	0.00	52	0.07	1,390	14	0.2	74	6.6
Dec. 1-15.....	18,730		.40	.22	.11	.02	.51		.12	.11	.00	.01	.00	51	.07	1,310	15	.2	73	6.7
Dec. 16-31.....	19,180		.36	.24	.11	.02	.51		.06	.11	.00	.02	.00	52	.07	1,340	15	.2	74	6.7
Jan. 1-15, 1960.	17,010		.40	.24	.12	--	.56		--	--	--	--	--	55	.07	1,360	16	.2	78	6.8
Jan. 16-31.....	19,060		.44	.20	.11	--	.56		--	--	--	--	--	54	.07	1,520	15	.2	77	7.4
Feb. 1-12.....	52,360		.41	.23	.10	--	.26		--	--	--	--	--	53	.06	4,190	14	.2	76	6.4
Feb. 13-29.....	102,600		.38	.18	.09	--	.39		--	--	--	--	--	44	.06	6,160	14	.2	63	7.2
Mar. 1-15.....	98,740		.60	.00	.10	--	.46		--	--	--	--	--	48	.07	6,910	14	.2	69	7.2
Mar. 16-31.....	133,900		.50	.02	.09	--	.43		--	--	--	--	--	44	.06	8,030	15	.2	63	7.0
Apr. 1-9.....	64,800		.36	.16	.10	--	.52		--	--	--	--	--	45	.06	3,890	16	.2	64	7.4
Apr. 10-18.....	60,650		.36	.14	.08	--	.51		--	--	--	--	--	41	.06	3,640	14	.2	59	7.2
Apr. 19-30.....	62,060		.32	.16	.09	--	.49		--	--	--	--	--	42	.06	3,720	16	.2	60	7.2
May 1-10.....	41,730		.24	.18	.08	--	.48		--	--	--	--	--	41	.06	2,500	16	.2	58	7.1
May 11-20.....	41,710		.24	.24	.08	--	.48		--	--	--	--	--	39	.05	2,090	14	.2	56	7.2
May 21-31.....	33,440		.28	.20	.08	--	.48		--	--	--	--	--	38	.05	1,670	14	.2	54	7.2

June 1-9, 1960..	57,160		.30	.16	.09	--	.46		--	--	--	--	--	38	.05	2,860	16	.2	55	7.1
June 10-20.....	43,950		.28	.17	.09	--	.49		--	--	--	--	--	38	.05	2,200	17	.2	55	6.5
June 21-30.....	70,770		.26	.18	.08	--	.44		--	--	--	--	--	37	.05	3,540	15	.2	53	6.7
July 1-11.....	76,800		.28	.12	.09	--	.41		--	--	--	--	--	37	.05	3,840	18	.2	53	7.6
July 12-20.....	51,450		.26	.16	.10	--	.41		--	--	--	--	--	36	.05	2,570	19	.2	52	7.6
July 21-31.....	78,760		.32	.08	.12	--	.41		--	--	--	--	--	36	.05	3,940	23	.3	52	7.5
Aug. 1-10.....	55,560		.40	.02	.11	--	.41		--	--	--	--	--	36	.05	2,780	21	.2	52	7.3
Aug. 11-20.....	49,150		.40	.02	.10	--	.39		--	--	--	--	--	36	.05	2,460	19	.2	52	7.2
Aug. 21-31.....	40,900		.40	.04	.10	--	.43		--	--	--	--	--	36	.05	2,040	19	.2	52	7.5
Sept. 1-12.....	35,580		.28	.12	.10	--	.36		--	--	--	--	--	38	.05	1,780	20	.2	54	6.7
Sept. 13-20.....	15,790		.30	.10	.10	--	.34		--	--	--	--	--	38	.05	790	20	.2	54	6.6
Sept. 21-30.....	22,120		.26	.14	.10	--	.38		--	--	--	--	--	38	.05	1,110	20	.2	55	6.6
Total or weighted average b	1,444,000		0.36	0.13	0.10	--	0.44		--	--	--	--	--	42	0.06	86,640	17	0.2	60	--

a Calculated from specific conductance.
b Includes estimated data for missing period Oct. 1 to Nov. 17, 1959; represents 100 percent of runoff for water year.

PART 12. PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

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 1960.
Water temperatures: November 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 184 micromhos Mar. 17; minimum daily, 123 micromhos Aug. 2.
EXTREMES, 1958-60.--Specific conductance: Maximum daily, 188 micromhos Mar. 2, 1959; minimum daily, 123 micromhos Aug. 2, 1960.
REMARKS.--Samples were collected at International Boundary, 2.2 miles downstream from gaging station for November 1951 to June 1958. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records for water year October 1959 to September 1960 given in WSP 1716. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-31, 1959.	6,000,000	6.3	1.00	0.36	0.08	0.03	1.23		0.25	0.01	0.01	0.01	0.01	90	0.12	720,000	5	0.1	146	7.1
Nov. 1-24.....	3,846,000	--	--	--	.08	--	1.28		--	--	--	--	--	93	.13	500,000	--	--	156	7.1
Nov. 25-Dec. 9..	2,160,000	--	--	--	.10	--	1.34		--	--	--	--	--	100	.14	302,400	--	--	166	7.2
Dec. 10-31.....	2,596,000	--	--	--	.10	--	1.34		--	--	--	--	--	103	.14	363,400	--	--	172	7.0
Jan. 1-28, 1960.	2,353,000	6.1	1.20	.35	.09	.02	1.34		.33	.00	.01	.01	.04	100	.14	329,400	5	.1	173	7.4
Jan. 29-Feb. 15.	1,581,000	--	--	--	.09	--	1.34		--	--	--	--	--	98	.13	205,500	--	--	172	7.3
Feb. 16-Mar. 2..	1,351,000	--	--	--	.09	--	1.39		--	--	--	--	--	99	.13	175,600	--	--	175	7.3
Mar. 3-31.....	3,156,000	--	--	--	.11	--	1.44		--	--	--	--	--	105	.14	441,800	--	--	178	7.1
Apr. 1-30.....	6,919,000	6.6	1.15	.37	.09	.03	1.31		.25	.02	.01	.01	.01	95	.13	899,500	5	.1	161	7.6
May 1-16.....	4,198,000	--	--	--	.08	--	1.23		--	--	--	--	--	82	.11	461,800	--	--	149	7.7
May 17-28.....	4,598,000	--	--	--	.09	--	1.25		--	--	--	--	--	85	.12	551,800	--	--	152	7.7
May 29-June 25..	13,390,000	--	--	--	.08	--	1.18		--	--	--	--	--	80	.11	1,473,000	--	--	142	7.7
June 26-July 21.	12,960,000	4.7	.95	.37	.05	.02	1.15		.21	.00	.01	.01	.04	84	.11	1,426,000	4	.1	134	7.6
July 22-Aug. 14.	7,556,000	--	--	--	.04	--	1.10		--	--	--	--	--	78	.11	831,200	--	--	126	7.9
Aug. 15-Sept. 7.	4,026,000	--	--	--	.05	--	1.10		--	--	--	--	--	74	.10	831,200	--	--	126	7.9
Sept. 8-30.....	2,967,000	--	--	--	.05	--	1.11		--	--	--	--	--	76	.10	296,700	--	--	137	7.8
Total or weighted average	79,665,000	--	--	--	0.07	--	1.21		--	--	--	--	--	87	0.12	9,560,000	--	--	147	--

YAKIMA RIVER BASIN

12-5105. YAKIMA RIVER AT KIONA, WASH.

LOCATION.--At highway bridge just downstream from gaging station at Kiona, Benton County, 3.5 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 1960.
Water temperatures: December 1952 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 374 micromhos Aug. 14, 15; minimum daily, 99 micromhos Dec. 17.
EXTREMES, 1952-60.--Specific conductance: Maximum daily, 390 micromhos Oct, 10, 1958; minimum daily, 99 micromhos Dec. 17, 1959.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1716.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-6, 1959..	38,260	--	--	--	0.70	--	2.20		--	--	--	--	--	168	0.23	8,800	--	--	261	7.6
Oct. 7-13.....	44,290	28	1.35	0.78	.78	0.08	2.36		0.37	0.17	0.01	0.02	0.01	177	.24	10,630	26	0.8	282	7.5
Oct. 14-16.....	21,480	--	--	--	.65	--	1.92		--	--	--	--	--	151	.21	4,510	--	--	232	7.6
Oct. 17-18.....	16,860	--	--	--	.70	--	2.15		--	--	--	--	--	165	.22	3,710	--	--	259	7.4
Oct. 19-24.....	58,200	--	--	--	.52	--	1.74		--	--	--	--	--	137	.19	11,060	--	--	212	7.4
Oct. 25-Nov. 15.	210,000	--	--	--	.46	--	1.56		--	--	--	--	--	121	.16	33,600	--	--	188	7.4
Nov. 16-22.....	55,680	--	--	--	.52	--	1.66		--	--	--	--	--	127	.17	9,470	--	--	201	7.5
Nov. 23-Dec. 15.	411,400	--	--	--	.31	--	1.05		--	--	--	--	--	87	.12	49,370	--	--	129	7.1
Dec. 16-31.....	282,800	--	--	--	.27	--	.95		--	--	--	--	--	76	.10	28,280	--	--	114	7.1
Jan. 1-15, 1960.	200,900	15	.60	.26	.28	.03	.98		.12	.07	.01	.01	.00	76	.10	20,090	24	.4	120	7.4
Jan. 16-30.....	99,750	--	--	--	.52	--	1.51		--	--	--	--	--	116	.16	15,960	--	--	188	7.2
Jan. 31-Feb. 25.	166,200	--	--	--	.65	--	1.87		--	--	--	--	--	144	.20	33,240	--	--	231	7.2
Feb. 26-Mar. 19.	100,400	--	--	--	.74	--	2.20		--	--	--	--	--	164	.22	22,090	--	--	267	7.7
Mar. 20-23.....	29,280	--	--	--	.52	--	1.72		--	--	--	--	--	131	.18	5,270	--	--	208	7.4
Mar. 24-31.....	115,900	--	--	--	.32	--	1.18		--	--	--	--	--	98	.13	15,070	--	--	140	7.2
Apr. 1-6.....	69,120	23	.75	.43	.36	.04	1.31		.13	.08	.01	.02	.00	111	.15	10,370	23	.5	151	7.8

YAKIMA RIVER BASIN--Continued

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

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Apr. 7-14, 1960.	112,500	--	--	--	0.30	--	1.13		--	--	--	--	--	94	0.13	14,620	--	--	129	7.7
Apr. 15-30.....	108,400	--	--	--	.44	--	1.49		--	--	--	--	--	119	.16	17,340	--	--	177	7.9
May 1-13.....	79,720	--	--	--	.52	--	1.79		--	--	--	--	--	142	.19	15,150	--	--	210	7.9
May 14-June 2...	248,900	--	--	--	.35	--	1.28		--	--	--	--	--	107	.15	37,340	--	--	151	7.9
June 3-9.....	52,170	--	--	--	.44	--	1.54		--	--	--	--	--	124	.17	8,870	--	--	183	8.2
June 10-14.....	23,840	--	--	--	.61	--	2.07		--	--	--	--	--	164	.22	5,240	--	--	243	8.0
June 15-21.....	60,460	--	--	--	.44	--	1.48		--	--	--	--	--	120	.16	9,670	--	--	177	7.6
June 22-24.....	13,310	--	--	--	.61	--	1.97		--	--	--	--	--	153	.21	2,800	--	--	234	8.0
June 25-July 11.	44,090	--	--	--	1.00	--	a2.69		--	--	--	--	--	191	.26	11,460	--	--	323	8.3
July 12-30.....	44,650	24	1.70	0.56	.96	0.09	a2.82		0.48	0.22	0.02	0.03	0.00	211	.29	12,950	27	0.8	335	8.3
July 31-Aug. 29.	86,880	--	--	--	.91	--	2.84		--	--	--	--	--	219	.30	26,060	--	--	341	8.2
Aug. 30-Sept. 30	123,000	--	--	--	.87	--	2.79		--	--	--	--	--	210	.29	35,670	--	--	333	8.1
Total or weighted average	2,918,540	--	--	--	0.48	--	1.52		--	--	--	--	--	121	0.16	467,000	--	--	184	--

a Includes 0.07 equivalents of carbonate (CO_3).

PART 13. SNAKE RIVER BASIN

SNAKE RIVER MAIN STEM

13-375. SNAKE RIVER NEAR HEISE, IDAHO

LOCATION.--At Eagle Rock canal headgate, 1.2 miles upstream from Heise, Jefferson County, 1.6 miles downstream from Anderson Canal headgate, 1.8 miles downstream from gaging station, approximately 4.8 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 1960.
Water temperatures: January 1953 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 550 micromhos Apr. 2, 3; minimum daily, 308 micromhos July 27.
EXTREMES, 1953-60.--Specific conductance: Maximum daily, 791 micromhos Nov. 13, 1956; minimum daily, 240 micromhos June 27, 1954.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1717. Approximately 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 the months of 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 heavy local runoff.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-15, 1959.	77,040	6.7	2.59	1.00	0.61	0.05	2.82		1.04	0.45	0.02	0.01	0.00	251	0.34	26,190	14	0.4	415	7.9
Oct. 16-31.....	106,000	--	--	--	.57	--	2.79		--	--	--	--	--	244	.33	34,980	--	--	408	8.0
Nov. 1-15.....	100,600	--	--	--	.57	--	2.84		--	--	--	--	--	254	.35	35,210	--	--	414	8.0
Nov. 16-30.....	61,370	--	--	--	.74	--	3.18		--	--	--	--	--	294	.40	24,550	--	--	478	7.9
Dec. 1-16.....	59,130	--	--	--	.74	--	3.26		--	--	--	--	--	298	.41	24,240	--	--	488	8.1
Dec. 17-24.....	29,890	--	--	--	.78	--	3.21		--	--	--	--	--	282	.38	11,360	--	--	486	7.9
Dec. 25.....	3,730	--	--	--	.61	--	2.66		--	--	--	--	--	238	.32	1,190	--	--	418	7.7
Dec. 26-31.....	22,370	--	--	--	.74	--	3.11		--	--	--	--	--	283	.38	8,500	--	--	473	7.7
Jan. 1-15, 1960.	51,350	7.5	2.99	1.16	.74	.06	3.11		1.25	.56	.02	.00	.03	283	.38	19,510	15	.5	478	7.9
Jan. 16-Feb. 13.	94,000	--	--	--	.78	--	3.18		--	--	--	--	--	283	.38	35,720	--	--	485	8.1
Feb. 14-29.....	49,010	--	--	--	.78	--	3.25		--	--	--	--	--	294	.40	19,600	--	--	497	8.0
Mar. 1-21.....	65,650	--	--	--	.83	--	3.26		--	--	--	--	--	296	.40	26,260	--	--	504	7.9
Mar. 22-30.....	31,890	--	--	--	.74	--	3.10		--	--	--	--	--	277	.38	12,120	--	--	476	8.0
Mar. 31-Apr. 6..	20,350	--	--	--	.78	--	3.61		--	--	--	--	--	313	.43	8,750	--	--	527	8.1

SNAKE RIVER MAIN STEM--Continued

13-375. SNAKE RIVER NEAR HEISE, IDAHO--Continued

Chemical analyses, water year October 1959 to September 1960--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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				
Apr. 7-13, 1960.	24,220	7.8	2.89	1.22	0.65	0.06	3.06		1.10	0.56	0.02	0.02	0.03	271	0.37	8,960	13	0.5	466	8.0
Apr. 14-24.....	38,720	--	--	--	.74	--	3.38		--	--	--	--	--	302	.41	15,880	--	--	513	8.0
Apr. 25-May 1...	44,310	--	--	--	.61	--	3.02		--	--	--	--	--	266	.36	15,950	--	--	452	8.0
May 2-14.....	168,700	--	--	--	.48	--	2.79		--	--	--	--	--	241	.33	55,670	--	--	413	7.9
May 14-June 9...	860,900	--	--	--	.48	--	2.75		--	--	--	--	--	235	.32	211,500	--	--	385	8.0
June 10-28.....	491,500	--	--	--	.42	--	2.70		--	--	--	--	--	218	.30	147,400	--	--	364	8.0
June 29-July 7..	236,600	--	--	--	.39	--	2.57		--	--	--	--	--	208	.45	106,500	--	--	348	7.9
July 8-28.....	591,300	8.1	2.20	.84	.37	.05	2.43		.75	.18	.02	.01	.00	194	.26	153,700	11	.3	323	7.9
July 29-Aug. 27.	781,800	--	--	--	.40	--	2.41		--	--	--	--	--	196	.27	211,100	--	--	329	8.0
Aug. 28-Sept. 30	611,400	--	--	--	.52	--	2.43		--	--	--	--	--	204	.28	171,200	--	--	343	7.9
Total or weighted average	4,421,910	--	--	--	0.48	--	2.66		--	--	--	--	--	223	0.30	1,327,000	--	--	373	--

13-1545. SNAKE RIVER AT KING HILL, IDAHO

LOCATION.--At county highway bridge, approximately 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 1960.
Water temperatures: March 1951 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 574 micromhos Oct. 7; minimum daily, 454 micromhos. Mar. 23, 26.
EXTREMES, 1951-60.--Specific conductance: Maximum daily, 594 micromhos Oct. 3, 1952; minimum daily, 394 micromhos May 7, 1952.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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. 1-13, 1959.	278,200	37	2.74	1.49	1.57	0.12	3.44	0.27	1.25	0.76	0.04	0.05	0.10	344	0.47	130,800	27	1.1	511	8.3
Oct. 14-31.....	361,100	--	--	--	1.52	--	3.70	.00	--	--	--	--	--	336	.46	166,100	--	--	538	7.9
Nov. 1-15.....	280,500	--	--	--	1.52	--	3.67	.00	--	--	--	--	--	331	.45	126,200	--	--	537	7.7
Nov. 16-30.....	276,700	--	--	--	1.52	--	3.67	.00	--	--	--	--	--	330	.45	124,500	--	--	537	7.7
Dec. 1-24.....	422,100	--	--	--	1.52	--	3.61	.00	--	--	--	--	--	324	.44	185,700	--	--	534	7.7
Dec. 25-Jan. 11, 1960.	309,700	39	2.45	1.61	1.48	.12	3.64	.00	1.15	.70	.03	.05	.06	351	.48	148,700	26	1.0	544	7.8
Jan. 12-29.....	311,800	--	--	--	1.44	--	3.61	.00	--	--	--	--	--	342	.47	146,500	--	--	537	8.0
Jan. 30-Feb. 29.	532,600	--	--	--	1.39	--	3.47	.00	--	--	--	--	--	324	.44	234,300	--	--	513	7.8
Mar. 1-17.....	299,700	--	--	--	1.39	--	3.38	.00	--	--	--	--	--	310	.42	125,900	--	--	505	7.8
Mar. 18-23.....	102,000	--	--	--	1.31	--	3.18	.00	--	--	--	--	--	292	.40	40,800	--	--	476	7.8
Mar. 24-Apr. 6..	231,400	35	2.10	1.48	1.26	.10	3.21	.00	.94	.62	.03	.05	.04	303	.41	94,870	28	.9	470	7.7
Apr. 7-30.....	408,500	--	--	--	1.35	--	3.41	.00	--	--	--	--	--	325	.44	179,700	--	--	505	8.1
May 1-21.....	272,600	--	--	--	1.39	--	3.39	.00	--	--	--	--	--	314	.43	117,200	--	--	492	8.2
May 22-June 8...	245,300	--	--	--	1.39	--	3.36	.07	--	--	--	--	--	309	.42	103,000	--	--	492	8.3
June 9-26.....	261,100	--	--	--	1.44	--	3.36	.13	--	--	--	--	--	316	.43	112,300	--	--	501	8.3
June 27-July 15.	272,800	32	2.15	1.79	1.44	.12	3.44	.07	1.10	.70	.03	.05	.06	325	.44	120,000	26	.1	512	8.3
July 16-Aug. 1..	253,600	--	--	--	1.52	--	3.47	.07	--	--	--	--	--	326	.44	111,600	--	--	517	8.3
Aug 2-14.....	195,500	--	--	--	1.44	--	3.54	.00	--	--	--	--	--	331	.45	87,980	--	--	518	8.1
Aug. 15-Sept. 6.	359,500	--	--	--	1.48	--	3.65	.00	--	--	--	--	--	335	.46	165,400	--	--	528	8.2
Sept. 7-30.....	400,100	--	--	--	1.52	--	3.64	.10	--	--	--	--	--	342	.47	188,000	--	--	543	8.4
Total or weighted average	6,074,800	--	--	--	1.44	--	3.51	0.03	--	--	--	--	--	327	0.44	2,673,000	--	--	520	--

BOISE RIVER BASIN

13-2125. BOISE RIVER AT NOTUS, IDAHO

LOCATION.--At highway bridge, 1,100 feet downstream from gaging station, 0.2 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 1960.
Water temperatures: November 1950 to September 1960.
Sediment records: January 1939 to June 1940.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 759 micromhos Jan. 18; minimum daily, 131 micromhos Apr. 14.
EXTREMES, 1939-40, 1950-60.--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.--Records of specific conductance or daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1717.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959.	30,840	35	2.50	1.10	3.09	0.12	4.52		1.67	0.51	0.03	0.07	0.11	410	0.56	17,270	45	2.3	638	8.2
Oct. 21-Nov. 9..	30,650	--	--	--	3.31	--	4.59		--	--	--	--	--	422	.57	17,470	--	--	662	8.0
Nov. 10-Dec. 2..	31,390	--	--	--	3.31	--	4.57		--	--	--	--	--	419	.57	17,890	--	--	664	7.4
Dec. 3-24.....	26,880	--	--	--	3.35	--	4.59		--	--	--	--	--	422	.57	15,320	--	--	663	7.3
Dec. 25-Jan. 22, 1960.	32,530	37	2.74	.89	3.52	.14	4.85		1.79	.56	.04	.04	.10	440	.60	19,520	48	2.6	675	7.5
Jan. 23-30.....	9,840	--	--	--	3.31	--	5.18		--	--	--	--	--	445	.61	6,000	--	--	693	7.7
Jan. 31-Feb. 1..	5,300	--	--	--	1.83	--	4.28		--	--	--	--	--	290	.39	2,070	--	--	484	7.2
Feb. 2.....	2,940	--	--	--	1.57	--	2.34		--	--	--	--	--	245	.33	970	--	--	358	7.9
Feb. 3-11.....	13,610	--	--	--	2.91	--	4.13		--	--	--	--	--	378	.51	6,940	--	--	585	7.4
Feb. 12-Mar. 6..	27,890	--	--	--	3.22	--	4.38		--	--	--	--	--	404	.55	15,340	--	--	630	7.4
Mar. 7-Apr. 6...	40,210	--	--	--	2.70	--	3.69		--	--	--	--	--	356	.48	19,300	--	--	558	7.4
Apr. 7.....	3,350	--	--	--	1.04	--	1.84		--	--	--	--	--	188	.26	871	--	--	289	7.1
Apr. 8-15.....	76,200	15	.80	.17	.52	.03	1.11		.25	.08	.00	.05	.03	101	.14	10,670	34	.7	153	7.2
Apr. 16-18.....	8,310	--	--	--	.74	--	1.48		--	--	--	--	--	133	.18	1,500	--	--	205	7.3
Apr 19-20.....	2,240	--	--	--	1.09	--	1.85		--	--	--	--	--	172	.23	515	--	--	272	7.5

Apr. 21-22, 1960	1,050	--	--	--	1.96	--	2.69	--	--	--	--	--	268	.36	378	--	--	192	8.5
Apr. 23-27.....	1,330	--	--	--	3.35	--	3.74	--	--	--	--	--	406	.55	732	--	--	629	8.0
Apr. 28-May 13..	34,270	--	--	--	1.39	--	2.16	--	--	--	--	--	202	.27	9,250	--	--	320	7.6
May 14-20.....	52,110	--	--	--	.70	--	1.33	--	--	--	--	--	120	.16	8,340	--	--	180	7.6
May 21-28.....	29,630	--	--	--	1.09	--	1.90	--	--	--	--	--	171	.23	6,810	--	--	262	7.8
May 29-June 8...	18,040	--	--	--	1.65	--	2.51	--	--	--	--	--	231	.31	5,590	--	--	364	7.9
June 9-11.....	8,410	--	--	--	1.17	--	2.00	--	--	--	--	--	181	.25	2,100	--	--	280	7.8
June 12-19.....	13,620	--	--	--	1.57	--	2.47	--	--	--	--	--	224	.30	4,090	--	--	355	7.8
June 20-23.....	2,960	--	--	--	2.26	--	3.23	--	--	--	--	--	306	.42	1,240	--	--	464	8.2
June 24-July 6..	5,210	--	--	--	2.70	--	3.61	--	--	--	--	--	347	.47	2,450	--	--	527	8.0
July 7-16.....	1,640	33	2.40	1.11	3.78	.12	4.43	1.98	.76	.03	.05	.17	456	.62	1,020	51	2.9	686	8.2
July 17-21.....	2,270	--	--	--	2.96	--	3.88	--	--	--	--	--	372	.51	1,160	--	--	562	8.0
July 22-29.....	6,650	--	--	--	2.57	--	3.52	--	--	--	--	--	339	.46	3,060	--	--	515	7.9
July 30.....	754	--	--	--	3.00	--	3.95	--	--	--	--	--	392	.53	400	--	--	594	7.9
July 31-Aug. 6..	13,640	--	--	--	2.18	--	3.23	--	--	--	--	--	303	.41	5,590	--	--	462	7.8
Aug. 7-15.....	3,480	--	--	--	3.48	--	4.33	--	--	--	--	--	433	.59	2,050	--	--	654	8.4
Aug. 16-Sept. 4.	17,840	--	--	--	2.91	--	3.87	--	--	--	--	--	375	.51	9,100	--	--	572	8.1
Sept. 5-24.....	24,520	--	--	--	2.61	--	3.69	--	--	--	--	--	340	.46	11,280	--	--	521	8.0
Sept. 25-30.....	4,870	--	--	--	3.04	--	4.13	--	--	--	--	--	386	.52	2,530	--	--	591	8.3
Total or weighted average	584,460	--	--	--	2.13	--	3.13	--	--	--	--	--	298	0.39	227,900	--	--	448	--

PART 14. PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

COLUMBIA RIVER MAIN STEM

14-1057. COLUMBIA RIVER NEAR THE DALLES, 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, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1960.
Water temperatures: December 1950 to September 1960.
EXTREMES, 1959-60.--Specific conductance: Maximum daily, 225 micromhos Mar. 16, 17; minimum daily, 109 micromhos May 17.
EXTREMES, 1950-60.--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. Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959.	6,543,000	9.9	1.05	0.39	0.35	0.03	1.36		0.37	0.10	0.01	0.00	0.00	108	0.15	981,400	19	0.4	180	7.7
Oct. 21-Nov. 11.	7,924,000	--	--	--	.30	--	1.28		--	--	--	--	--	101	.14	1,109,000	--	--	167	7.8
Nov. 12-29.....	5,578,000	--	--	--	.30	--	1.34		--	--	--	--	--	104	.14	780,900	--	--	171	7.7
Nov. 30-Dec. 6..	2,618,000	--	--	--	.25	--	1.15		--	--	--	--	--	91	.12	314,200	--	--	149	7.9
Dec. 7-18.....	3,297,000	--	--	--	.33	--	1.36		--	--	--	--	--	105	.14	461,600	--	--	179	7.8
Dec. 19-31.....	3,267,000	--	--	--	.35	--	1.39		--	--	--	--	--	110	.15	90,000	--	--	184	7.9
Jan. 1-14, 1960.	3,057,000	12	1.05	.49	.38	.03	1.48		.37	.11	.01	.01	.08	120	.16	489,100	19	.4	194	7.9
Jan. 15-31.....	4,161,000	--	--	--	.41	--	1.52		--	--	--	--	--	126	.17	707,400	--	--	198	8.0
Feb. 1-29.....	7,204,000	--	--	--	.40	--	1.51		--	--	--	--	--	120	.16	1,153,000	--	--	200	7.8
Mar. 1-28.....	6,828,000	--	--	--	.48	--	1.61		--	--	--	--	--	135	.18	1,229,000	--	--	215	7.8
Mar. 29-31.....	1,319,000	--	--	--	.34	--	1.28		--	--	--	--	--	108	.15	197,800	--	--	167	7.3
Apr. 1-30.....	15,550,000	13	.90	.35	.21	.03	1.16		.25	.05	.01	.01	.00	93	.13	2,022,000	14	.3	148	7.8
May 1-15.....	7,180,000	--	--	--	.20	--	1.08		--	--	--	--	--	85	.12	861,600	--	--	135	7.7
May 16-19.....	2,838,000	--	--	--	.17	--	.92		--	--	--	--	--	77	.10	283,800	--	--	113	7.8
May 20-31.....	8,384,000	--	--	--	.18	--	1.08		--	--	--	--	--	84	.11	922,200	--	--	133	7.8

June 1-5, 1960..	3,794,000	--	--	--	.18	--	1.08	--	--	--	--	--	88	.12	455,300	--	--	131	8.1
June 6-18.....	10,730,000	--	--	--	.15	--	.95	--	--	--	--	--	81	.11	1,180,000	--	--	118	7.7
June 19-30.....	8,456,000	--	--	--	.14	--	1.18	--	--	--	--	--	84	.11	930,200	--	--	126	7.8
July 1-31.....	17,680,000	6.0	.90	.37	.15	.03	1.15	.23	.03	.01	.00	.05	80	.11	1,945,000	10	.2	140	8.0
Aug. 1-31.....	9,307,000	--	--	--	.20	--	1.26	--	--	--	--	--	97	.13	1,210,000	--	--	155	7.8
Sept. 1-22.....	4,389,000	--	--	--	.33	--	1.49	--	--	--	--	--	109	.15	658,400	--	--	183	8.2
Sept. 23-30.....	1,709,000	--	--	--	.42	--	1.39	--	--	--	--	--	113	.15	256,400	--	--	198	8.1
Total or weighted average	141,800,000	--	--	--	0.25	--	1.25	--	--	--	--	--	97	0.13	18,430,000	--	--	156	--

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 1960.
Water temperatures: February 1951 to September 1960.
EXTREMES, 1959-60.--Specific condcutance: Maximum daily, 67 micromhos Nov. 16, 17; minimum daily, 44 micromhos Nov. 21, 23, 24, Feb. 10.
EXTREMES, 1951-60.--Specific conductance: Maximum daily, 133 micromhos Nov. 7, 1954; minimum daily, 35 micromhos Jan. 20, 1953.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. Records of discharge for water year October 1959 to September 1960 given in WSP 1718.

Chemical analyses, water year October 1959 to September 1960

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 180°C)			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, 1959.	663,273	16.0	0.25	0.09	0.17	0.02	0.44		0.05	0.06	0.01	0.01	0.01	49	0.07	44,200	31	0.40	56	6.6
Oct. 21-Nov. 8..	673,825	--	.34		.17	--	.46		--	--	--	--	--	48	.07	43,987	34	.42	58	6.7
Nov. 9-19.....	232,582	--	.40		.16	--	.49		--	--	--	--	--	52	.07	16,448	31	.40	63	6.7
Nov. 20-Dec. 1..	532,443	--	.30		.15	--	.39		--	--	--	--	--	44	.06	31,861	34	.39	50	6.7
Dec. 2-13.....	266,340	--	.38		.19	--	.44		--	--	--	--	--	54	.07	19,560	33	.43	62	6.8
Dec. 14-31.....	521,970	--	.36		.17	--	.41		--	--	--	--	--	50	.07	35,494	32	.40	58	6.8
Jan. 1-31.....	1,094,479	16.0	.25	.11	.17	.02	.43		.05	.06	.01	.01	.07	54	.07	80,379	32	.41	60	6.7
Feb. 1-21.....	2,208,020	--	.32		.15	--	.38		--	--	--	--	--	49	.07	147,142	32	.37	53	6.5
Feb. 22-Mar. 6..	638,955	--	.36		.15	--	.39		--	--	--	--	--	54	.07	46,925	30	.36	59	6.5
Mar. 7-31.....	2,503,636	--	.32		.14	--	.41		--	--	--	--	--	51	.07	173,652	30	.35	54	6.6
Apr. 1-30.....	2,559,868	16.0	.22	.10	.14	.01	.34		.06	.06	.01	.01	.04	57	.06	198,441	30	.36	51	6.8
May 1-31.....	2,354,360	--	.34		.12	--	.39		--	--				53	.07	169,702	26	.30	50	7.2
June 1-30.....	922,909	--	.40		.14	--	.46		--	--	--	--	--	55	.07	69,034	26	.31	56	7.1
July 1-8.....	118,183	14.0	.27	.16	.16	.02	.52		.05	.08	.00	.00	.03	54	.07	8,679	26	.34	64	7.1
July 9-31.....	271,940	--	.44		.17	--	.52		--	--	--	--	--	57	.08	21,081	28	.37	65	7.0
Aug. 1-23.....	257,689	--	.46		.18	--	.49		--	--	--	--	--	53	.07	16,569	27	.36	64	6.9
Aug. 24-Sept. 30	497,907	--	.42		.17	--	.49		--	--	--	--	--	51	.07	34,535	29	.37	64	7.1
Total or weighted average	16,320,000	--	0.34		0.15	--	0.41		--	--	--	--	--	52	0.07	1,142,000	31	0.36	55	--

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