Quality of Surface Waters for Irrigation Western States 1964

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1960

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PREFACE

This report was prepared by the Geological Survey in cooperation with other State and Federal Agencies by personnel of the Water Resources Division, E. L. Hendricks, chief hydrologist, G. W. Whetstone, assistant chief for Reports and Data Processing, under the general direction of S. M. Lang, chief, Reports Section, and B. A. Anderson, chief, Data Reports Unit.

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QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES, 1964

INTRODUCTION

The records of chemical analyses, other physical measurements, and discharge given in this report comprise the fourteenth annual compilation of data for 72 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 Committee on Hydrology, Water Resources Council (formerly the Subcommittee on Hydrology, Interagency Committee on Water Resources) 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 committee 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). Four stations on the list were discontinued at the end of the 1963 water year. Two stations were added to the list in 1963 and two in 1964. This increased the original list to 113 stations.

Irrigation-Quality Network Stations, Western States

[Selected by Committee on Hydrology, Water Resources Council, 1950]

Irrigation network no.	Geological Survey station ident. no.	Stream and location	Date established	Date discontinued
1	5-1240	Souris (Mouse) River near Westhope, N. Dak.	June 1954	9-30-64
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[a]	12-15-50	.....
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[b]	11-24-53	.....
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	7-31-63
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	9-30-63
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	11-30-64
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	.....

See footnotes at end of table.

Irrigation-Quality Network Stations, Western States--Continued

Irrigation network no.	Geological Survey station ident. no.	Stream 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	Sept. 1963
47	-3640	Rio Grande near El Paso, Tex[c]	1930	.....
48	-3705	Rio Grande at Fort Quitman, Tex[c].....	1930	.....
49	-3715	Rio Grande above Rio Conchos near, Presidio, Tex[c].	1935	.....
50	-3775	Rio Grande at Langtry, Tex[c].....	1945	.....
51	-4580	Rio Grande at Eagle Pass, Tex[c].....	1938	1-30-55
	-4590	Rio Grande at Laredo, Tex[c]	7- 1-55	.....
52	-4625	Rio Grande at Roma, Tex[c].....	1944	1-31-55
	-4615	Rio Grande at Chapeno, Tex[c]	July 1955	9-30-56
	-4613	Rio Grande below Falcon Dam, Tex[c].....	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[c].....	1935	Dec. 1954
	-4474	Pecos River near Shumla, Tex[c].....	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.....	May 1962	.....
79	-3350	Humboldt River near Rye Patch, Nev	12-10-51	.....
80	11-2510	San Joaquin River below Friant Dam, Calif...	.....	.....
81	-2540	San Joaquin River near Mendota, Calif.....	.....	.....
82	-3035	San Joaquin River near Vernalis, Calif.....	3- 1-51	6-30-63

See footnotes at end of table.

Irrigation-Quality Network Stations, Western States--Continued

Irrigation network no.	Geological Survey station ident. no.	Stream and location	Date established	Date discontinued
83	11-3372	San Joaquin River at Antioch, Calif.	.....	.....
84	-3105	Calaveras River (Stockton diverting canal) at Stockton, Calif.	3- 1-51	10- 3-52
	-2535	San Joaquin River near Biola, Calif	1952	Sept. 1961
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	5-31-60
88	-4250	Feather River at Nicolaus, Calif	2-26-51	9-30-62
89	-4465	American River at Fair Oaks, Calif	5- 1-51	9-30-62
90	12-3995	Columbia River at international boundary, Wash.	11-15-51	.....
91	-4365	Columbia River at Grand Coulee Dam, Wash.	11-25-50	9-30-58
92	-3320	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[d]	1- 8-51	.....
107	6-6875	North Platte River at Lewellen, Nebr[d]	.....	.....
108	-8055	Platte River near Louisville, Nebr[d]	.....	.....
109	9-4150	Virgin River at Littlefield, Ariz[d]	July 1949	.....
110	7-3310	Washita River near Durwood, Okla[e]	May 1944	.....
111	10-3120.2	Carson River near Silver Springs, Nev[e]	10- 1-62	.....
112	9-2510	Yampa River near Maybell, Colo[f]	10- 1-63	.....
113	10-3459	Truckee River at Floriston, Calif.[f]	Jan. 1964	.....

[a]Reactivated August 1963.
[b]Reactivated December 1960, irrigation records from October 1962.
[c]Operated by International Boundary and Water Commission.
[d]Stations added by Committee, October 1952.
[e]Added to the list in 1963 water year.
[f]Added to the list in 1964 water year.

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 113 network stations on streams in the Western States. The 72 stations in operation in 1964 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 Committee, 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 numerical order because all the main stem stations on a river are reported before listing the stations on the tributaries.

The complete number for each station has 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 1963-64, 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 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 33 and 34 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 1963 and 1964. Analyses for six 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 co-

operation is acknowledged with appreciation.

COLLECTION OF SAMPLES

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

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

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

REPORTING OF DATA

In order to release the data in the form most widely used in the evaluation of irrigation waters, the results of analyses in this compilation are given in equivalents per million, rather than the conventional unit part per million. Some agencies that actively participate in irrigation water-quality investigations prefer to express results in milligrams per liter (mg/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 names 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.

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Remarks include sources of data and additional explanation concerning the records.

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.

Analytical values are reported in equivalents per million (epm) for cations and anions. An equivalent per million is a unit chemical combining weight of a constituent in a million unit weights of water. 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 Committee, 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 compo-

sition 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 tendency 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:

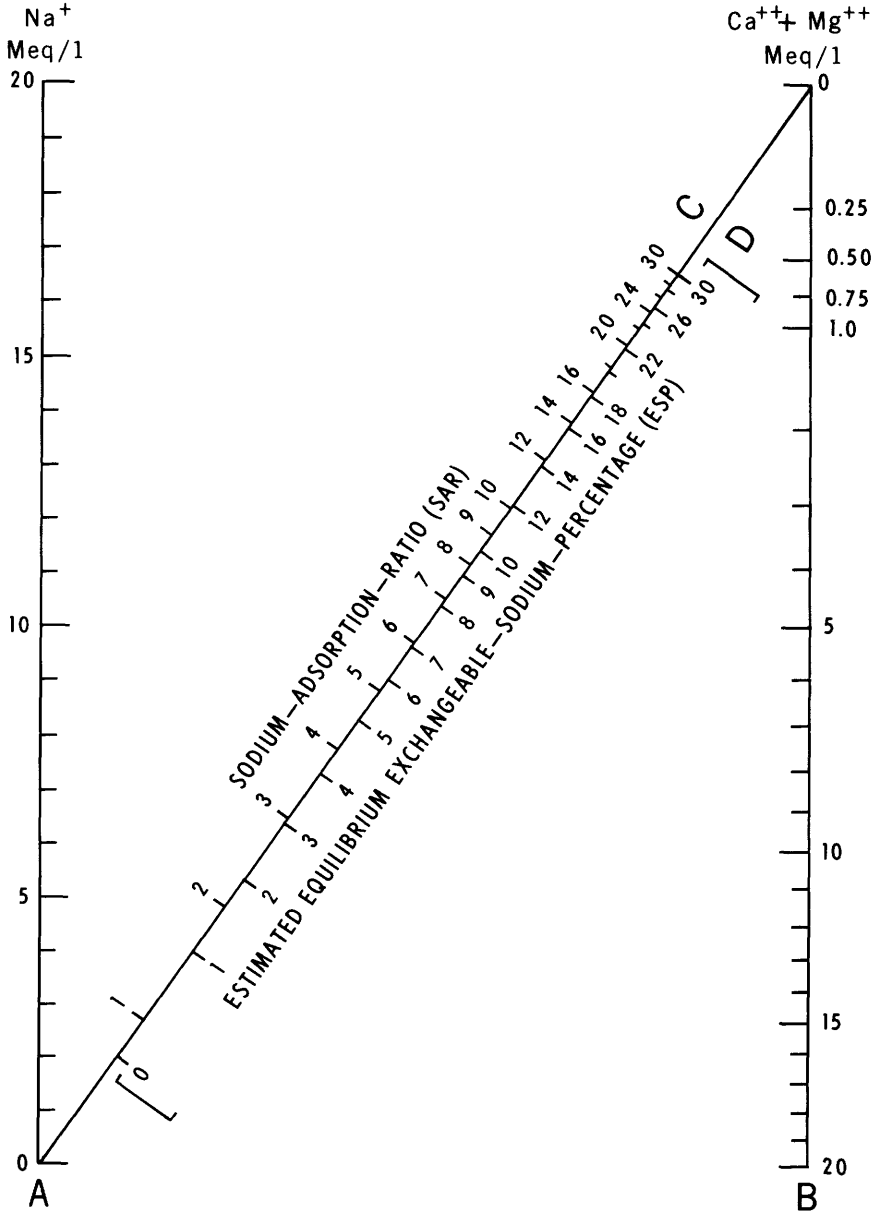

Figure 1.--Nomogram for determining the SAR value of irrigation water and for estimating the corresponding ESP value of a soil that is at equilibrium with the water (U. S. Salinity Laboratory Staff, 1954).

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

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 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.

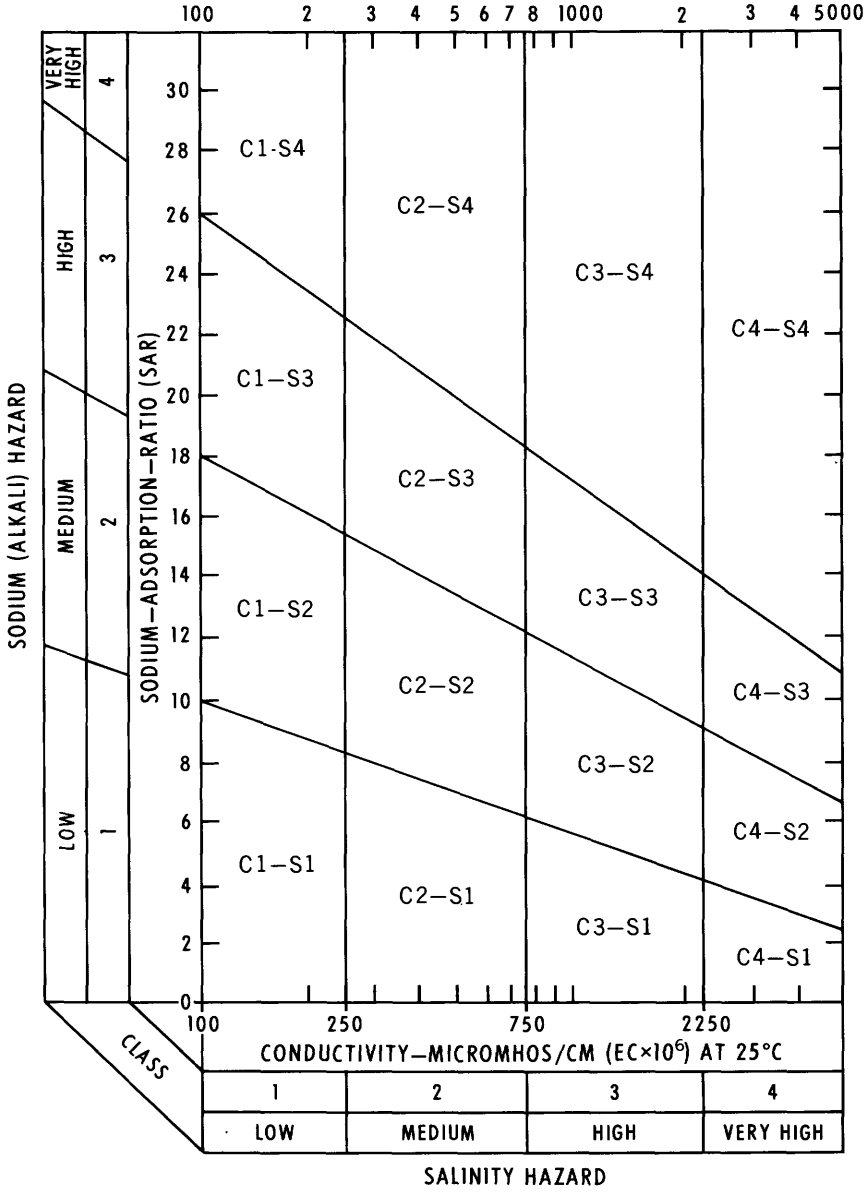

Figure 2.--Diagram for the classification of irrigation waters (U. S. Salinity Laboratory Staff, 1954).

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.

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, 1967.)

DISCUSSION OF RESULTS

MISSOURI RIVER BASIN

Missouri River main stem.---Streamflow records at the Williston, N. Dak., station indicate that runoff in the Missouri River basin above the station was below median during the first 6 months, and above median during the second 6 months of the water year. Total runoff was slightly above median. The weighted-average of dissolved-solids content near Williston was 439 ppm (0.60 ton per acre-foot) as compared with 442 ppm (0.60 ton per acre-foot) for 1963 and 422 ppm (0.57 ton per acre-foot) for the 14-year period of record.

Yellowstone River basin.---Runoff from the Yellowstone River basin was near the long-term median and nearly the same as during the 1963 water year. Amounts of dissolved solids in streamflow of the basin were generally lower than in 1963 and the 13-year period of record. The weighted-average of dissolved-solids content near Sidney, Mont., was 402 ppm (0.55 ton per acre-foot) as compared with 429 (0.58 ton per acre-foot) for 1963 and 434 ppm (0.59 ton per acre-foot) for the 13-year period of record. Data collected from the Bighorn River at Bighorn, Mont., showed that the weighted average of dissolved-solids content in the 1964 water year was 611 ppm (0.83 ton per acre-foot) as compared with 625 ppm (0.85 ton per acre-foot) for 1963 and 722 ppm (0.98 ton per acre-foot) for the 12-year period of record. At Tongue River near Miles City, Mont., the weighted-average of dissolved solids was 376 ppm (0.51 ton per acre-foot) as compared with 370 ppm (0.50 ton per acre-foot) for 1963 and 467 ppm (0.63 ton per acre-foot) for the 12-year period of record.

James River basin.--Runoff in the basin in 1964 was low. Run-

off of the James River at Huron, S. Dak., was only 48 percent of the 25-year average. The weighted average of dissolved-solids content decreased from 718 ppm (0.98 ton per acre-foot) in 1963 to 640 ppm (0.87 ton per acre-foot) in 1964.

At Huron, samples are collected just upstream from the stream-flow gage and just upstream from the diversion of water to the city of Huron. At times, the diversions exceed inflow so that no water passes the gage. The weighted averages for the James River at Huron reflect only the quality of the water that passes the gage.

Platte River basin.--Runoff was only 56 percent of average at the Colorado-Wyoming line but increased to 79 percent at Seminoe Reservoir. Release from Alcova Reservoir was average. At the Wyoming-Nebraska line runoff was 79 percent of average. Water levels in the mainstream reservoirs, with the exception of Alcova, declined during the year.

The dissolved-solids content above Seminoe was 17 percent greater than in 1963 but 17 percent below average. At Glenrock the load was 14 percent above average whereas in 1963 the load was about average.

LOWER MISSISSIPPI RIVER BASIN

Arkansas River basin.--Runoff at Arkansas River below John Martin Reservoir, Colo., was about 33 percent below the 1963 flow, and was only 24.6 percent of the average for the 26 years of record. The weighted average concentration of dissolved solids increased slightly from 2,289 ppm (2.98 tons per acre-foot) to 2,220 ppm (3.02 tons per acre-foot) in 1964, while the sodium adsorption ratio remained the same, at 3.4.

Runoff of the Arkansas River at Arkansas City, Kans., was about two-thirds of that in 1963 and less than half of the long-term average. The weighted average dissolved-solids content of 806 ppm (1.19 tons per acre-foot) was 5.3 percent lower than in 1963 and 5.9 percent lower than the 14-year average. The sodium adsorption ratio weighted average values were about the same for 1963 and 1964.

The normally expected increase in dissolved-solids content of the Arkansas River water, which usually accompanies a decrease in flow, did not occur in 1964. This is probably related, in part at least, to the difference in runoff characteristics between 1963 and 1964. Examination of the hydrographs indicates that the 1964 runoff was characterized by a relatively large number of abrupt rises. This characteristic indicates the occurrence of rapid storm runoff of water low in dissolved-solid content and suggests that the percentage of runoff consisting of dilute storm water was greater in 1964 than in 1963.

Runoff at the Arkansas River station at Van Buren, Ark., was 40 percent less than 1963 runoff and 75 percent less than the 37-year average. The lower runoff resulted in higher dissolved-solids content.

Red River basin.--Water discharge of the Red River at Denison Dam, near Denison, Tex., during the 1964 water year was only 30 percent of the average for the 41 years of record and 50 percent of the 1963 average. The weighted average of dissolved-solids concentration was 1200 ppm (1.63 tons per acre-foot) in 1964 as compared to 989 ppm (1.35 tons per acre-foot) in 1963.

WESTERN GULF OF MEXICO BASINS

In the Western Gulf of Mexico basins in Texas from the Sabine River to the Nueces River, streamflow was well below normal. The weighted average of dissolved-solids content in 1964 was less than in 1963 for the Sabine and Neches Rivers, but greater for the Trinity and Brazos, and about the same as in 1963 in the other basins. Runoff in the Trinity River at Romayor during 1964 was only about half as much as during 1963 and less than one-fourth of the 40-year average. The weighted average of dissolved-solids content increased from 287 ppm (0.39 ton per acre-foot) in 1963 to 351 ppm (0.48 ton per acre-foot) in 1964.

Rio Grande basin.--In the 1964 water year, streamflow of the Pecos River below Red Bluff Dam near Orla, Tex., was only 16-percent of the 27-year average and about half as much as the 1963 streamflow. However, the weighted average of dissolved-solids content decreased from 9,790 ppm (13.3 tons per acre-foot) in 1963 to 9,080 ppm (12.4 tons per acre-foot) in 1964. Storage in Red Bluff Reservoir at the end of the 1964 water year was

18,710 acre feet, only 6 percent of capacity.

COLORADO RIVER BASIN

Colorado River main stem.--Runoff of the Colorado River at Glenwood Aprings, Colo., was about 5.6 percent lower than the 1963 flow, and was only 51 percent of the average for 65 years of record. The weighted average of dissolved-solids concentration of the Colorado River near Glenwood Springs increased slightly from 365 ppm (0.50 ton per acre-foot) in 1963 to 376 ppm (0.51 ton per acre-foot) in 1964. The weighted average sodium adsorption ratio did not change from 1963 to 1964, staying at 1.8.

The flow of Colorado River near Cisco, Utah was 19 percent greater than that during the preceding year, and was about 60 percent of the average for 53 years of record. Weighted average dissolved-solids content was 774 ppm (1.05 tons per acre-foot) or about 150 ppm less than that during the preceding year.

The salinity and the total flow of the water of the Colorado River at Lees Ferry, Ariz., have been effected by the filling of Lake Powell since March 1963. Total flow (release) for the water year 1964 was about 2.4 million acre-feet compared to about 2.5 acre-feet for the 1963 water year. The weighted-average concentration of dissolved solids was 889 ppm (1.21 tons per acre-foot) which was about 11 percent less than the previous year.

At the station near Grand Canyon, Ariz., the total runoff and weighted-average concentration of dissolved solids were about the same as for the 1963 water year.

The amount of water released from Hoover Dam was about 7 percent less than the previous year and the dissolved-solids concentration remained the same.

Diversions and return flows at and below Imperial Dam.--The total flow of Yuma Main Canal below Colorado River siphon at Yuma, Ariz., was the same as the previous year, however, the concentration of dissolved solids increased slightly from about 800 ppm (1.09 tons per acre-foot) to 836 ppm (1.14 tons per acre-foot).

Gunnison River basin.--In 1964 the flow of the Gunnison River near Grand Junction, Colo., was about 47 percent higher than in 1963, but was only 95 percent of the average for the 56 years of record. The weighted average of dissolved-solids concentration reflected the increase in flow and dropped from 974 ppm (1.28 tons per acre-foot) in 1963 to 714 ppm (0.97 ton per acre-foot) in 1964. The sodium adsorption ratio also decreased from 1.8 in 1963 to 1.1 in 1964.

Green River basin.--The flow of Green River at Greendale, Utah was about 400 percent greater than that during the 1963 water year when most of the water was used for the filling of Flaming Gorge Reservoir. Flow was about 60 percent of the long-term average flow at the station. Average dissolved-solids content was 449 ppm (0.61 ton per acre-foot) or about 200 ppm less than that during 1963. The content of Flaming Gorge Reservoir nearly doubled during additional filling of the reservoir in 1964; the records for 1964 should not be regarded as representative of pre-reservoir conditions or of conditions after reservoir stage becomes fairly stable.

The flow of Green River at Green River, Utah was 68 percent greater than that in 1963 but was only 60 percent of the long-term average. Continued filling of Flaming Gorge Reservoir affected the flow at this station. Average dissolved-solids content was 464 ppm (0.69 ton per acre-foot) or about 25 percent lower than that during 1963.

San Juan River basin.--The discharge at San Juan River near Bluff, Utah was 26 percent greater than that in 1963 but was only 41 percent of the long-term average. Average dissolved-solids content was 703 ppm (0.96 ton per acre-foot), which is about 150 ppm less than that during 1963. The decrease in dissolved-solids content and the increase in water discharge resulted in similar dissolved-solids loads in 1963 and 1964.

Virgin River basin.--Flow at Virgin River at Littlefield, Ariz., was 7 percent greater than that in 1963, and was 54 percent of the long-term average flow. Weighted average of dissolved-solids content was 2,200 ppm (2.99 tons per acre-foot) or about 100 ppm less than that during 1963.

Gila River basin.--The total flow of the Gila River at Kelvin,

Ariz., was about 15 percent less than the previous year and the concentration of dissolved solids was about 14 percent higher. The flow of the Gila River is controlled by Coolidge Dam (San Carlos Reservoir) above the confluence of the San Pedro River. The salinity of the water at Kelvin varies over a wide range throughout the period of record. The salinity at Kelvin is a function of the salinity of the water in the reservoir and the salinity of the water from the San Pedro River. The effects of waste water from the smelter at Hayden, Ariz., have been noticed at times in the past during extremely low-flow periods.

At the Salt River below Stewart Mountain Dam the total flow (release) for the year was about 28 percent less than the previous year and the concentration of dissolved solids was about 6 percent greater.

The total amount of water released through Bartlett Dam on the Verde River was about 44 percent greater during the 1963-64 water year than it was during the 1962-63 water year. The dissolved solids for 1963-64 water year were about 11 percent less than the previous year.

The dissolved-solids content of the water below Gillespie Dam was about 31 percent less than the previous year, whereas the combined flow below the dam was 42 percent greater than in the 1962-63 water year.

THE GREAT BASIN

Sevier Lake basin.--Discharge of Sevier River below Piute Dam near Marysvale, Utah was 7 percent less than that during the preceding year, and was 47 percent of the long-term average discharge. Weighted average dissolved-solids content was 288 ppm (0.39 ton per acre-foot), which is slightly less than that during 1963.

Average flow of Sevier River near Lynndyl, Utah (at gage) was 109 cfs and was 107 cfs at the water-quality station. A large well discharges into the stream between the water-quality station and the gaging station. Average dissolved-solids content was 1,440 ppm (1.96 tons per acre-foot), which is about the same as that in 1963.

Carson River basin.--Flow of the Carson River at Fort Churchill, Nev., 4.5 miles upstream from the sampling station near Silver Springs, was 53 percent of the 53-year average and 40 percent of the preceding year's total discharge. Although flow at the gage dropped to less than measureable amounts during the latter months of the water year, no significant new maximums were established.

Humboldt River basin.--Flow in the upper basin increased by 25 percent over the preceding year and was 122 percent of the 57-year average. Increased flow slightly lowered the dissolved-solids content, but the ratios remained the same. Release from Rye Patch Reservoir averaged 138 percent of that in the 1963 water year; however, the quality remained about the same.

Pyramid and Winnemucca Lakes basin.--A new chemical-quality and water-temperature station was established on the Truckee River at Floriston, Calif. Discharge records for this station are obtained from Truckee River at Farad, Calif. The runoff for the 1963-64 water year was about 32 percent below the average for the 65 year period of record. Flow at this station is regulated by upstream controls, chiefly Lake Tahoe, and is low in dissolved-solids content.

PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

Columbia River main stem.--Runoff in the Columbia River at international boundary totaled 77,190,000 acre-feet which is a 9.0 percent increase over total runoff at this station during the 1963 water year. However, there was no significant change in chemical quality. The weighted average of dissolved-solids content was 84 ppm or 0.11 ton per acre-foot. In the previous year the weighted average was 86 ppm dissolved solids or 0.12 ton per acre-foot.

Yakima River basin.--Runoff in the Yakima River at Kiona, Wash., was lower than in the 1963 water year. It decreased from 2,442,000 acre-feet to 1,796,000 acre-feet. The average dissolved-solids content did not increase significantly although the weighted average increased from 146 ppm (0.20 ton per acre-foot) to 169 ppm (0.23 ton per acre-foot).

Summary of water discharge, and tonnages of dissolved solids--1963-64

Station	Runoff (acre-feet)	Dissolved solids (tons per acre-foot)
Red River of the North basin:		
Sheyenne River near Warwick, N. Dak.	13,730	0.56
Souris (Mouse) River near Westhope, N. Dak	26,310	.82
Missouri River main stem:		
Missouri River near Williston, N. Dak.	14,300,000	.60
Missouri River at Nebraska City, Nebr.	20,730,000	.68
Yellowstone River basin:		
Yellowstone River at Billings, Mont.	5,394,000	.23
Yellowstone River near Sidney, Mont.	9,798,000	.55
Wind River below Boysen Reservoir, Wyo	1,113,000	.64
Bighorn River at Bighorn, Mont	3,397,000	.83
Tongue River at Miles City, Mont.	355,600	.51
James River basin:		
James River at Huron, S. Dak.	75,070	.87
Platte River basin:		
Platte River at Brady, Nebr.	217,400	.61
Supply Canal (Tri-County diversion) near Maxwell, Nebr.	915,227	.73
South Platte River at Julesburg, Colo	102,500	2.19
Arkansas River basin:		
Arkansas River below John Martin Reservoir, Colo.	59,910	3.01
Arkansas River at Arkansas City, Kans	357,600	1.10
Arkansas River at Van Buren, Ark.	5,617,000	.79
Red River basin:		
Red River at Denison Dam, near Denison, Tex.	1,096,064	1.63
Washita River near Durwood, Okla.	246,900	.75
Sabine River basin:		
Sabine River near Ruliff, Tex	2,359,000	.12
Neches River basin:		
Neches River at Evadale, Tex	1,889,000	.13
Trinity River basin:		
Trinity River at Romayor, Tex.	1,171,000	.48
Brazos River basin:		
Brazos River at Richmond, Tex	1,245,000	.57
Colorado River basin:		
Colorado River at Austin, Tex.	529,500	.48
Colorado River at Wharton, Tex.	446,400	.45
Guadalupe River basin:		
Guadalupe River at Victoria, Tex.	412,600	.38
Nueces River basin:		
Nueces River near Mathis, Tex.	75,370	.49
Rio Grande basin:		
Rio Grande above Culebra Creek, near Lobatos, Colo.	51,530	.29
Rio Grande at Otowi Bridge, near San Ildefonso, N. Mex.	383,600	.33
Rio Grande conveyance channel at San Marcial, N. Mex.	161,700	.78
Rio Grande floodway at San Marcial, N. Mex.	2,444	1.34
Rio Grande at El Paso, Tex.	77,629	1.55
Rio Grande at Fort Quitman, Tex.	11,600	5.12
Rio Grande above Rio Conchos, near Presidio, Tex.	.....	.....
Rio Grande at Langtry, Tex.	918,300	.74
Rio Grande at Laredo, Tex.	2,750,000	.47
Rio Grande at Falcon Dam, Tex	1,240,000	.84
Pecos River below Alamogordo Dam, N. Mex.	84,950	2.74
Pecos River near Artesia, N. Mex.	47,090	5.18
Pecos River below Red Bluff Dam, near Orla, Tex	23,120	12.35
Pecos River near Shumla, Tex	277,800	1.54
Colorado River main stem:		
Colorado River near Glenwood Springs, Colo.	1,011,000	.51

Summary of water discharge, and tonnages of dissolved solids--1963-64--Continued

Station	Runoff (acre-feet)	Dissolved solids (tons per acre-foot)
Colorado River main stem--Continued		
Colorado River near Cisco, Utah	3,357,000	1.05
Colorado River at Lees Ferry, Ariz.	2,413,361	1.21
Colorado River near Grand Canyon, Ariz	2,726,270	1.41
Colorado River below Hoover Dam, Ariz.-Nev.	8,233,988	.96
Diversions and return flows at and below Imperial Dam:		
Yuma Main Canal below Colorado River siphon, at Yuma, Ariz.	339,600	1.14
Gunnison River basin:		
Gunnison River near Grand Junction, Colo	1,347,000	.97
Green River basin:		
Green River near Greendale, Utah	838,100	.61
Green River at Green River, Utah	2,797,000	.63
Yampa River near Maybell, Colo.	865,200	.20
San Juan River basin:		
San Juan River near Archuleta, N. Mex.	427,239	.27
San Juan River near Bluff, Utah	792,300	.96
Virgin River basin:		
Virgin River at Littlefield, Ariz	89,500	2.99
Gila River basin:		
Gila River at Kelvin, Ariz	168,600	1.33
Gila River below Gillespie Dam, Ariz	18,690	3.43
Salt River below Stewart Mountain Dam, Ariz	445,733	.94
Verde River below Bartlett Dam, Ariz.	272,578	.44
Sevier Lake basin:		
Sevier River below Piute Dam, near Marysvale, Utah	75,350	.39
Sevier River near Lynndyl, Utah	77,440	1.96
Carson River basin:		
Carson River near Silver Springs, Nev.	136,200	.27
Humboldt River basin:		
Humboldt River at Palisade, Nev.	311,800	.40
Humboldt River near Rye Patch, Nev	136,970	.73
Pyramid and Winnemucca Lakes basin:		
Truckee River at Floriston, Calif	381,590	.09
Columbia River main stem:		
Columbia River at international boundary, Wash.	77,002,509	.11
Yakima River basin:		
Yakima River at Kiona, Wash.	1,796,367	.23
Snake River main stem:		
Snake River near Heise, Idaho	5,062,754	.29
Snake River at King Hill, Idaho	7,354,000	.45
Boise River basin:		
Boise River at Notus, Idaho	726,800	.34
Columbia River main stem:		
Columbia River near The Dalles, Oreg	133,713,753	.13
Willamette River basin:		
Willamette River at Salem, Oreg.	17,109,485	.07

SNAKE RIVER BASIN

Snake River main stem.--The chemical quality of the water at the Heise and King Hill stations in Idaho remained essentially the same as during the 1963 water year. Runoff increased 13 and 8 percent, respectively, at these stations and the average tons per day dissolved-solids content increased 12 and 8 percent, respectively.

Boise River basin.--Runoff increased 18 percent above that of the 1963 water year and the average tons per day of dissolved-solids content increased 12 percent. The average dissolved-solids content decreased 6 percent during the same period.

PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

Columbia River main stem.--The chemical quality for the 1964 water year showed no significant change when compared to the previous water year. The runoff increased 6 percent.

Willamette River basin.--The chemical quality for the 1964 water year was essentially the same as the previous water year. The runoff increased 5 percent.

Discharge data and dissolved-solids loads for stations operated in 1964 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, on left bank on downstream side of highway bridge, 3.3 miles south of Warwick, Benson County.
DRAINAGE AREA.--2,070 square miles, approximately, of which about 1,310 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1964.
Water temperatures: January 1951 to September 1962, October 1963 to September 1964 (discontinued).
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,010 micromhos Mar. 21, 22; minimum daily, 320 micromhos Apr. 12.
Percent sodium: Maximum, 56 June 26-27; minimum, 10 Oct. 1-15.
Sodium-adsorption-ratio: Maximum, 3.51 June 26-27; minimum, 0.35 Oct. 1-15.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 1,940 micromhos Feb. 1, 1955; minimum daily, 192 micromhos Mar. 18, 1963.
Percent sodium: Maximum, 66 July 8-18, 1955; minimum, 10 Aug. 15-31, 1959, Oct. 1-15, 1963.
Sodium-adsorption-ratio (1961-64): Maximum, 3.51 June 26-27, 1964; minimum, 0.35 Sept. 22-30, Oct. 1-15, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	33	--	4.46		0.52	--	4.06	0.00	--	--	--	--	--	284	0.39	13	10	0.35	445	7.8
Oct. 16-31.....	38	--	4.38		1.44	--	4.56	.00	--	--	--	--	--	338	.46	18	25	.97	539	7.8
Nov. 1-30.....	113	--	4.44		1.17	--	4.44	.00	--	--	--	--	--	320	.44	49	21	.79	511	8.0
Dec. 1-31.....	61	25	3.19	1.40	1.17	0.08	4.57	.00	0.98	0.20	0.02	0.02	0.05	328	.45	27	20	.78	522	8.2
Jan. 1-Feb. 15, 1964.....	100	--	4.44		1.04	--	4.44	.00	--	--	--	--	--	318	.43	43	19	.70	503	7.9
Feb. 16-Mar. 3..	51	27	2.54	1.66	1.04	.18	4.26	.00	.79	.31	.02	.00	.08	314	.43	22	20	.73	499	7.8
Mar. 4-Apr. 1...	86	--	5.20		1.96	--	5.75	.00	--	--	--	--	--	414	.56	49	27	1.21	661	7.7
Apr. 2-7.....	298	--	4.66		2.09	--	5.23	.00	--	--	--	--	--	408	.55	165	31	1.37	644	7.6
Apr. 8.....	230	9.8	1.15	.90	1.13	.23	2.18	.00	.92	.23	.01	.08	.10	228	.31	71	33	1.12	336	7.4
Apr. 9-13.....	2,033	--	2.80		1.57	--	3.28	.00	--	--	--	--	--	294	.40	813	36	1.32	440	7.6
Apr. 14-17.....	1,301	--	2.16		1.26	--	2.36	.00	--	--	--	--	--	239	.33	423	37	1.21	355	7.5
Apr. 18-22.....	760	--	2.80		2.35	--	3.39	.00	--	--	--	--	--	344	.47	355	46	1.99	520	7.5
Apr. 23-30.....	644	--	3.22		3.57	--	4.56	.00	--	--	--	--	--	435	.59	381	53	2.81	667	7.5
May 1-5.....	325	--	3.90		3.96	--	5.39	.00	--	--	--	--	--	482	.66	213	50	2.83	746	7.9
May 6-9.....	578	--	4.26		3.65	--	5.47	.00	--	--	--	--	--	492	.67	386	46	2.50	755	8.1

May 10-17, 1964.	695	--	4.54	3.48	--	5.47	.00	--	--	--	--	--	493	.67	466	43	2.31	753	7.8
May 18.....	67	16	2.79 | 2.30	4.35	.25	6.42	.00	2.56	.51	.02	.02	.22	572	.78	52	45	2.72	867	8.0
May 19-24.....	258	--	5.28	4.74	--	6.62	.00	--	--	--	--	--	611	83	215	47	2.92	916	7.9
May 25-31.....	96	--	5.52	5.31	--	7.03	.00	--	--	--	--	--	662	.90	86	49	3.19	991	7.8
June 1-2.....	13	--	5.48	5.22	--	7.05	.00	--	--	--	--	--	645	.88	11	49	3.15	971	7.6
June 3-7.....	45	--	4.96	3.48	--	5.95	.00	--	--	--	--	--	506	.69	31	41	2.21	781	7.6
June 8-12.....	553	--	4.80	4.35	--	6.39	.00	--	--	--	--	--	562	.76	423	48	2.81	852	8.0
June 13.....	206	--	3.52	2.61	--	4.33	.00	--	--	--	--	--	380	.52	107	43	1.97	586	7.8
June 14-22.....	671	--	4.72	2.65	--	5.67	.00	--	--	--	--	--	446	.61	407	36	1.73	679	7.8
June 23-24.....	480	--	4.40	4.00	--	5.97	.00	--	--	--	--	--	519	.71	339	48	2.70	782	7.6
June 25.....	300	--	5.16	5.05	--	6.97	.00	--	--	--	--	--	625	85	255	49	3.14	932	8.1
June 26-27.....	563	--	3.86	4.87	--	5.77	.00	--	--	--	--	--	540	.73	414	56	3.51	818	7.4
June 28-30.....	631	18	1.90 | 1.73	4.05	.23	5.39	.00	2.25	.34	.02	.04	.23	512	.70	439	51	3.01	734	7.7
July 1-4.....	468	--	3.60	3.65	--	5.18	.00	--	--	--	--	--	449	.61	286	50	2.72	683	7.8
July 5-31.....	1,007	--	3.68	3.09	--	5.20	.00	--	--	--	--	--	403	.55	552	46	2.28	627	7.1
Aug. 1-13.....	150	--	4.44	1.26	--	4.59	.00	--	--	--	--	--	329	.45	67	22	.85	523	7.6
Aug. 14-31.....	182	--	3.92	3.48	--	5.93	.00	--	--	--	--	--	436	.59	108	47	2.49	683	7.5
Sept. 1-9.....	261	--	4.32	3.35	--	6.11	.00	--	--	--	--	--	464	.63	164	44	2.28	707	7.8
Sept. 10-25.....	190	--	4.38	3.22	--	6.13	.00	--	--	--	--	--	449	.61	116	42	2.18	706	7.8
Sept. 26-30.....	246	--	4.34	3.57	--	6.29	.00	--	--	--	--	--	461	.63	154	45	2.42	730	7.8
Total or weighted average	13,730	11	3.68	2.91	--	4.73	0.00	--	--	--	--	--	413	0.56	7,720	44	1.60	628	7.5

RED RIVER OF THE NORTH BASIN--Continued

5-1240. SOURIS (MOUSE) RIVER NEAR WESTHOPE, N. DAK.

LOCATION.--At gaging station on left bank, 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, 11 miles downstream from Boundary Creek, and at mile 358.2 downstream from international boundary (Geological Survey river plan and profile).
DRAINAGE AREA.--17,600 square miles, approximately, of which about 10,700 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: June 1954 to September 1964 (discontinued).
Water temperatures: October 1954 to September 1955, October 1956 to September 1959, October 1960 to September 1964 (discontinued).
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,330 micromhos Apr. 15; minimum daily, 330 micromhos Apr. 4.
Percent sodium: Maximum, 54 Sept. 1-29; minimum, 38 Mar. 12-14, 21-26, Apr. 1-2.
Sodium-adsorption-ratio: Maximum, 3.70 Sept. 12-29; minimum, 2.12 Mar. 12-14, 21-26, Apr. 1-2.
EXTREMES, 1956-64.--Specific conductance: Maximum daily, 4,750 micromhos Feb. 21, 1961; minimum daily, 232 micromhos Apr. 18, 1957.
Percent sodium: Maximum, 72 Aug. 19-31, 1961; minimum, 29 Mar. 26 to Apr. 12, 1957.
Sodium-adsorption-ratio (1961-64): Maximum, 5.50 Mar. 20-30, 1963; minimum, 1.60 Apr. 1-7, 1962.
REMARKS.--Daily samples for chemical analyses composited by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	1,420	--	5.52		5.44	--	6.16	0.00	3.41	--	--	--	--	720	0.98	1,391	50	3.27	1,030	8.2
Nov. 1.....	61	27	2.50	3.95	5.66	0.38	6.93	.00	4.27	1.30	0.03	0.24	0.22	796	1.08	67	45	3.15	1,150	8.2
Nov. 2-5.....	25	--	6.52		5.74	--	6.54	.47	4.06	--	--	--	--	795	1.08	27	47	3.18	1,140	8.4
Mar. 12-14, 21-26, Apr. 1-2, 1964.....	11	13	1.95	2.80	3.26	.56	4.61	.00	2.83	.82	.02	.21	.14	543	.74	8	38	2.12	810	7.4
Apr. 3-May 6....	40	--	5.68		3.96	--	5.49	.00	3.37	--	--	--	--	618	.84	34	41	2.35	921	7.8
May 7-9.....	361	--	4.36		3.61	--	4.38	.00	2.87	--	--	--	--	501	.68	246	45	2.45	771	7.6
May 10-11.....	1,071	--	4.08		3.48	--	4.28	.00	2.58	--	--	--	--	468	.64	682	46	2.44	728	7.6
May 12-15.....	3,80	--	4.32		3.48	--	4.43	.00	2.66	--	--	--	--	488	.66	2,243	45	2.37	756	7.4
May 16.....	1,027	6.1	1.85	2.55	3.31	.31	4.61	.00	2.62	.73	.02	.05	.15	496	.67	693	41	2.23	763	7.7
May 17-18.....	1,928	--	4.80		3.74	--	4.82	.00	2.94	--	--	--	--	548	.75	1,437	44	2.41	832	7.7
May 19-20.....	730	--	5.12		3.96	--	5.05	.00	3.21	--	--	--	--	568	.77	564	44	2.47	861	8.0
May 21.....	163	--	5.44		4.05	--	5.41	.00	3.29	--	--	--	--	710	.97	157	43	2.45	911	7.5
May 22-25.....	24	--	5.92		4.13	--	5.83	.00	3.31	--	--	--	--	630	.86	20	41	2.40	949	7.6
May 26-31.....	7	--	6.02		4.48	--	6.11	.00	3.50	--	--	--	--	660	.90	6	43	2.58	1,000	7.4
June 1-24.....	1,138	19	2.40	3.21	4.26	.38	5.67	.00	3.48	1.04	.03	.11	.22	634	.86	981	42	2.55	955	7.5

June 25-July 8, 1964.....	3,582	--	5.58	4.44	--	5.52	.00	3.50	--	--	--	--	636	.86	3,098	44	2.66	959	7.6
July 9-15.....	2,819	--	5.26	4.57	--	5.72	.00	3.21	--	--	--	--	623	.85	2,388	46	2.82	938	7.6
July 16-20.....	1,140	--	5.06	4.65	--	5.77	.00	3.12	--	--	--	--	615	.84	954	48	2.93	928	7.2
July 21-31.....	430	--	5.02	4.70	--	5.77	.00	3.08	--	--	--	--	528	.72	309	48	2.97	929	7.4
Aug. 1-31.....	1,045	--	4.76	5.09	--	5.38	.00	3.27	--	--	--	--	601	.82	854	52	3.30	938	7.8
Sept. 1-11.....	428	--	4.56	5.44	--	5.62	.00	3.27	--	--	--	--	632	.86	368	54	3.60	964	7.8
Sept. 12-29.....	5,141	--	4.90	5.79	--	6.21	.00	3.23	--	--	--	--	662	.90	4,629	54	3.70	1,000	7.6
Sept. 30.....	337	18	2.30 | 3.29	5.79	.38	7.38	.00	3.08	1.13	.02	.10	.20	699	.95	321	49	3.46	1,060	7.7
Total or weighted average	A 26,310	--	4.98	4.55	--	5.45	--	3.13	--	--	--	--	600	0.82	21,480	48	2.89	910	7.6

A Represents 100 percent of flow 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, 29.3 (revised) miles downstream from Yellowstone River, and at mile 1,552.7.
DRAINAGE AREA.--164,500 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1964.
Water temperatures: May 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,010 micromhos May 7, 13; minimum daily, 351 micromhos June 12.
Percent sodium: Maximum, 44 Aug. 7-19, 30; minimum, 29 June 20 to July 6.
Sodium-adsorption-ratio: Maximum, 2.25 Aug. 30; minimum, 1.11 June 20 to July 6.
EXTREMES, 1950-64.--Specific conductance: Maximum daily, 1,360 micromhos Dec. 28, 1961; minimum daily, 297 micromhos Mar. 19, 1960.
Percent sodium: Maximum, 44 Aug. 7-19, 30, 1964; minimum, 24 May 27 to June 2, 1956.
Sodium-adsorption-ratio (1961-64): Maximum, 2.27 Aug. 29 to Sept. 19, 1963; minimum, 1.04 July 1-15, 1962.
REMARKS.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	735,392	--	5.24		3.05	--	3.46	0.00	--	--	--	--	--	533	0.72	533,071	37	1.88	808	7.5
Nov. 1-30.....	722,380	--	5.34		3.13	--	3.49	.00	--	--	--	--	--	540	.73	530,516	37	1.92	810	7.4
Dec. 1-31.....	777,818	11	3.59	2.30	3.05	0.11	3.75	.00	4.71	0.37	0.03	0.00	0.17	557	.76	589,213	34	1.77	837	7.3
Jan. 1-31, 1964.	1,016,390	--	5.44		2.78	--	3.61	.00	--	--	--	--	--	525	.71	725,702	34	1.69	790	7.6
Feb. 1-29.....	843,828	--	4.90		2.39	--	3.25	.00	--	--	--	--	--	456	.62	523,308	33	1.53	705	7.6
Mar. 1-5.....	134,479	--	5.70		3.31	--	3.65	.00	--	--	--	--	--	580	.79	106,077	37	1.96	859	7.6
Mar. 6-12.....	137,718	--	4.24		2.22	--	2.52	.00	--	--	--	--	--	429	.58	80,350	34	1.52	641	7.6
Mar. 13-23.....	244,800	--	4.48		2.26	--	2.69	.00	--	--	--	--	--	438	.60	145,822	34	1.51	656	7.6
Mar. 24-Apr. 8..	371,623	--	5.42		3.26	--	3.39	.00	--	--	--	--	--	555	.75	280,501	38	1.98	825	7.8
Apr. 9.....	35,702	8.3	3.34	1.97	3.18	.10	3.23	.00	4.85	.45	.03	.02	.14	552	.75	26,803	37	1.95	811	7.5
Apr. 10-29.....	491,107	--	5.56		3.39	--	3.49	.00	--	--	--	--	--	575	.78	384,046	38	2.03	846	7.9
Apr. 30-May 6...	259,081	--	5.48		3.52	--	3.52	.00	--	--	--	--	--	587	.80	206,830	39	2.13	858	7.3
May 7-17.....	567,709	--	5.40		3.65	--	3.54	.00	--	--	--	--	--	579	.79	447,037	40	2.22	854	7.6
May 18-22.....	216,992	--	4.90		3.05	--	3.21	.00	--	--	--	--	--	514	.70	151,686	38	1.95	761	7.2
May 23-31.....	560,172	--	3.86		1.87	--	2.75	.00	--	--	--	--	--	373	.51	284,164	33	1.35	566	7.1
June 1-11.....	766,473	--	3.94		1.74	--	2.66	.00	--	--	--	--	--	360	.49	375,265	31	1.24	549	7.1
June 12-19.....	940,324	--	3.56		.52	--	2.56	.00	--	--	--	--	--	321	.44	410,508	30	1.14	496	6.7
June 20-July 6..	2,112,496	11	3.78		1.52	--	2.82	.00	--	--	--	--	--	333	.45	956,707	29	1.11	517	6.9
July 7-10.....	397,091	11	2.15	.90	1.39	.08	2.34	.00	2.06	.14	.02	.00	.09	296	.40	159,853	31	1.13	447	7.4
July 11-21.....	754,036	--	3.68		1.78	--	2.66	.00	--	--	--	--	--	343	.47	351,743	33	1.31	532	6.9

July 22-27, 1964	285,977	--	3.92	1.70	--	2.92	0.00	--	--	--	--	--	352	.48	136,903	30	1.21	539	7.4
July 28-Aug. 6..	340,760	--	4.18	2.57	--	3.03	.00	--	--	--	--	--	390	.53	180,739	38	1.78	646	7.8
Aug. 7-19.....	327,213	--	4.04	3.22	--	3.21	.00	--	--	--	--	--	454	.62	202,035	44	2.26	700	7.6
Aug. 20.....	21,421	9.3	2.25 | 2.14	2.48	.10	3.10	.00	3.60	.26	.04	.00	.14	431	.59	12,556	36	1.67	668	7.5
Aug. 21-29.....	238,850	--	3.66	2.04	--	2.69	.00	--	--	--	--	--	357	.49	115,966	36	1.51	567	7.1
Aug. 30.....	30,942	--	4.22	3.26	--	2.74	.00	--	--	--	--	--	446	.61	18,768	44	2.25	692	7.5
Aug. 31.....	48,000	--	4.16	2.18	--	3.00	.00	--	--	--	--	--	395	.54	25,786	34	1.51	624	7.5
Sept. 1-4.....	149,157	--	4.96	3.00	--	3.33	.00	--	--	--	--	--	501	.68	101,630	38	1.91	767	7.3
Sept. 5-28, 30..	718,017	--	4.56	2.61	--	3.18	.00	--	--	--	--	--	443	.60	432,591	36	1.73	692	7.4
Sept. 29.....	27,570	8.4	2.94 | 1.89	2.74	.12	3.26	.00	4.16	.31	.03	.00	.15	477	.65	17,885	36	1.76	730	8.1
Total or weighted average	14,300,000	--	4.53	2.39	--	3.10	0.00	--	--	--	--	--	439	0.60	8,514,000	35	1.57	667	7.2

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 1964.
Water temperatures: May 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 978 micromhos Dec. 16; minimum daily, 273 micromhos June 17.
Percent sodium: Maximum, 41 Aug. 19; minimum, 31 May 25, 27-29.
Sodium-adsorption-ratio: Maximum, 2.19 Aug. 19; minimum, 0.87 June 17-18.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 994 micromhos Dec. 17, 1962; minimum daily, 273 micromhos June 17, 1964.
Percent sodium: Maximum, 48 May 29, 1956; minimum, 16 Apr. 11-15, 1960, Apr. 1-5, 1962.
Sodium-adsorption-ratio (1961-64): Maximum, 2.19 Aug. 19, 1964; minimum, 0.46 Apr. 1-5, 1962.
REMARKS.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	2,036,469	--	4.92		3.09	--	3.15	0.00	--	--	--	--	--	513	0.70	1,420,804	39	1.97	768	7.4
Nov. 1-13.....	860,965	--	4.84		3.05	--	3.11	.00	--	--	--	--	--	506	.69	592,482	39	1.96	767	7.5
Nov. 14.....	69,620	11	3.29	1.73	3.00	0.14	3.21	.00	4.39	0.51	0.03	0.00	0.10	517	.70	48,951	37	1.89	773	7.6
Nov. 15-28.....	884,152	--	4.88		3.00	--	3.15	.00	--	--	--	--	--	515	.70	619,260	38	1.92	765	7.6
Nov. 29-Dec. 11.	375,689	--	5.18		3.00	--	3.65	.00	--	--	--	--	--	526	.72	268,753	37	1.87	785	7.8
Dec. 12-31.....	373,884	18	3.89	1.89	3.44	.17	4.08	.00	4.29	.96	.03	.07	.14	594	.81	302,039	37	2.02	891	7.5
Jan. 1-31, 1964.	744,615	--	5.42		3.05	--	3.74	.00	--	--	--	--	--	536	.73	542,794	36	1.85	798	7.8
Feb. 1-29.....	828,297	--	4.80		2.61	--	3.47	.00	--	--	--	--	--	471	.64	530,574	35	1.68	713	7.9
Mar. 1-18.....	498,050	--	4.64		2.44	--	3.52	.00	--	--	--	--	--	455	.62	308,193	34	1.60	694	8.0
Mar. 19.....	25,587	26	3.24	1.32	2.26	.18	3.52	.00	2.62	.85	.03	.05	.08	443	.60	15,416	32	1.50	678	7.7
Mar. 20-23.....	160,106	--	4.48		2.35	--	3.44	.00	--	--	--	--	--	445	.61	96,896	34	1.57	683	7.9
Mar. 24-31.....	499,517	--	4.24		2.26	--	2.98	.00	--	--	--	--	--	430	.58	292,118	35	1.55	847	9.0
Apr. 1-20.....	1,309,884	--	4.68		2.65	--	3.21	.00	--	--	--	--	--	480	.65	855,092	36	1.73	726	7.4
Apr. 21-23.....	235,458	--	4.66		2.61	--	3.25	.00	--	--	--	--	--	476	.65	152,426	36	1.71	725	7.3
Apr. 24-26.....	187,438	--	4.68		2.57	--	3.21	.00	--	--	--	--	--	471	.64	120,065	35	1.88	715	7.6
Apr. 27-30.....	314,817	--	4.50		2.48	--	3.15	.00	--	--	--	--	--	455	.62	194,808	36	1.65	698	7.4
May 1-6.....	404,033	--	4.82		2.65	--	3.25	.00	--	--	--	--	--	474	.64	260,456	36	1.71	718	7.5
May 7-9.....	266,995	--	4.86		2.39	--	3.51	.00	--	--	--	--	--	451	.61	163,764	33	1.53	898	7.5
May 10-24.....	985,091	--	4.88		2.61	--	3.25	.00	--	--	--	--	--	480	.65	643,067	35	1.67	731	7.1
May 25, 27-29...	395,742	--	4.40		1.96	--	3.08	.00	--	--	--	--	--	400	.54	215,284	31	1.32	823	7.4

May 26, 1964....	138,446	12	2.64 | 1.40	1.96	.17	2.69	.00	2.91	.31	.03	.04	.09	392	.53	73,808	32	1.38	590	7.3
May 30-June 11..	879,273	--	5.04	3.00	--	3.34	.00	--	--	--	--	--	511	.69	611,059	37	1.89	781	7.3
June 12-14.....	247,537	--	4.50	2.57	--	3.02	.00	--	--	--	--	--	456	.62	153,513	36	1.71	703	7.5
June 15-16.....	226,116	--	3.82	2.09	--	2.72	.00	--	--	--	--	--	382	.52	117,472	35	1.51	596	7.5
June 17-18.....	397,091	5.5	1.50 | .72	.91	.18	1.80	.00	1.15	.19	.02	.08	.06	240	.33	129,610	28	.87	332	7.1
June 19-25.....	691,299	--	4.00	1.91	--	2.84	.00	--	--	--	--	--	377	.51	354,443	32	1.35	589	7.3
June 26-July 14.	1,348,780	--	4.60	2.44	--	3.06	.00	--	--	--	--	--	451	.61	827,288	35	1.61	686	6.7
July 15-Aug. 18.	2,372,132	--	4.96	3.18	--	3.23	.00	--	--	--	--	--	617	.84	1,990,504	39	2.02	793	7.4
Aug. 19.....	68,628	10	3.24 | 1.56	3.39	.15	3.25	.00	4.50	.54	.03	.01	.12	533	.72	49,747	41	2.19	806	7.3
Aug. 20-Sept. 30	2,901,540	--	4.68	3.00	--	2.66	.00	--	--	--	--	--	523	.71	2,063,808	39	1.96	754	7.4
Total or weighted average	20,730,000	--	4.73	2.76	--	3.13	0.00	--	--	--	--	--	497	0.68	14,014,000	37	1.79	731	7.3

YELLOWSTONE RIVER BASIN

6-2145. YELLOWSTONE RIVER AT BILLINGS, MONT.

LOCATION.--At gaging station near left bank at City of Billings water department intake, 1 mile east of Billings, and 12 miles upstream from Prior Creek.
DRAINAGE AREA.--11,783 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1958, July 1963 to September 1964.
Water temperatures: December 1950 to September 1958, July 1963 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 660 micromhos Mar. 26; minimum daily, 140 micromhos June 30.
Percent sodium: Maximum, 41 Apr. 26, 27; minimum, 20 May 23-31.
Sodium-adsorption-ratio: Maximum, 1.92 Apr. 26, 27; minimum, 0.44 May 23-31.
EXTREMES, 1950-58, 1963-64.--Specific conductance: Maximum daily, 1,210 micromhos Feb. 2, 1951; minimum daily, 129 micromhos May 22, 1954.
Percent sodium: Maximum, 41 Apr. 26, 27, 1964; minimum, 13 May 20-23, June 15, 1956.
REMARKS.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, water year October 1963 to September 1964

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. 1-16, 1963.	107,171	14	2.10	1.23	1.26	0.16	2.70	0.00	1.69	0.17	0.03	0.01	0.18	281	0.38	40,956	27	0.98	450	7.6
Oct. 17-31.....	92,261	15	2.15	1.40	1.35	.08	2.84	.00	1.83	.18	.03	00	.21	302	.41	37,894	27	1.01	475	7.2
Nov. 1-18.....	120,817	15	2.20	1.23	1.26	.07	2.75	.00	1.79	.19	.03	.01	.23	291	.40	47,815	26	.96	464	7.4
Nov. 18-30.....	77,498	17	2.15	1.32	1.22	.08	2.72	.00	1.77	.20	.03	.01	.24	292	.40	30,776	26	.93	462	7.2
Dec. 1-9.....	84,190	16	2.45	1.07	1.26	.09	2.80	.00	1.87	.20	.03	.02	24	303	.41	34,693	26	.95	476	7.4
Dec. 20-31.....	67,549	17	2.45	1.15	1.31	.08	2.82	.00	1.83	.20	.03	.02	.22	306	.42	28,111	26	.97	478	7.5
Jan. 1-6, 1964..	32,727	15	2.54	1.07	1.31	.07	2.72	.00	1.96	.21	.03	.02	.22	294	.40	13,086	26	.97	470	7.7
Jan. 7-19.....	53,169	18	3.54	.70	1.57	.08	3.15	.00	2.33	.23	.04	.03	26	350	.48	25,308	27	1.08	547	7.6
Jan. 20-31.....	58,909	17	2.64	1.07	1.35	.09	2.80	.00	2.00	.21	.04	.02	.26	306	42	24,516	26	.99	485	7.7
Feb. 1-14.....	82,028	17	2.59	1.07	1.39	.08	2.74	.00	2.00	.22	.04	02	27	304	.41	33,914	27	1.03	477	8.0
Feb. 15-23.....	43,539	16	2.89	.82	1.35	.08	2.79	.00	2.04	.21	04	.02	.29	308	.42	18,238	26	.99	488	7.7
Feb. 24-29.....	25,789	16	2.89	.99	1.48	.08	2.88	.00	2.17	.21	04	.02	.28	322	.44	11,294	27	1.06	509	7.5
Mar. 1-24.....	118,389	17	2.25	1.32	1.31	.08	2.69	.00	1.96	.24	.02	.01	.27	307	.42	49,430	26	.98	482	7.7
Mar. 25-27.....	11,901	16	2.59	1.65	1.61	.10	2.88	.00	2.62	.31	.02	.05	.27	381	.52	6,167	27	1.11	567	7.2
Mar. 28-Apr. 10.	68,227	16	2.50	1.15	1.61	.13	2.72	.00	2.31	.23	.04	.00	.28	300	.41	27,837	30	1.19	495	7.5
Apr. 11-25.....	90,506	15	2.20	.99	1.31	.12	2.54	.00	1.83	.21	.04	.00	.27	256	.35	31,510	28	1.03	440	7.4
Apr. 26, 27.....	38,202	--	3.96		2.70	--	3.10	.00	3.29	--	--	--	--	408	.55	21,197	41	1.92	624	7.4
Apr. 28-May 22..	407,802	19	1.25	1.40	1.13	.09	2.18	.00	1.46	.11	.04	.01	.12	220	.30	122,014	29	.98	373	7.6

May 23-31, 1964.	332,212	13	1.05	.39	.37	.05	1.28	.00	.48	.01	.02	.01	.06	106	.14	47,892	20	.44	182	7.1
June 1-8.....	355,438	13	.95	.43	.37	.05	1.25	.00	.56	.03	.02	.00	.06	96	.13	46,406	21	.45	175	7.3
June 9-24.....	932,707	12	1.15	.39	.52	.05	1.38	.00	.69	.04	.03	.00	.06	116	.16	147,144	25	.60	206	6.9
June 25-30.....	440,926	11	.85	.31	.34	.04	1.07	.00	.37	.03	.02	.00	.07	A 93	.13	55,768	22	.45	153	6.8
July 1-20.....	926,678	11	.90	.28	.39	.04	1.11	.00	.40	.04	.02	.00	.07	A 97	.13	122,247	24	.50	162	7.3
July 21-31.....	238,909	11	1.10	.54	.65	.06	1.49	.00	.73	.10	.04	.00	.11	138	.19	44,838	28	.72	234	7.4
Aug. 1-10.....	148,245	12	1.40	.72	.87	.07	1.79	.00	1.02	.15	.03	.00	.14	180	.24	36,290	28	.84	288	7.1
Aug. 11-31.....	208,973	13	1.80	.90	1.17	.08	2.21	.00	1.44	.17	.03	.00	.18	228	.31	64,798	30	1.01	373	7.5
Sept. 1-15.....	131,415	13	2.00	.90	1.22	.08	2.46	.00	1.52	.17	.03	.01	.16	252	.34	45,039	29	1.01	402	7.8
Sept. 16-30.....	97,795	14	2.30	1.07	1.48	.09	2.70	.00	1.94	.18	.03	.00	.20	282	.38	37,506	30	1.14	461	8.0
Total or weighted average	5,394,000	13	1.42	0.71	0.77	0.06	1.75	0.00	1.02	0.09	0.03	0.01	0.12	171	0.23	1,203,000	26	0.72	282	7.2

A Calculated from determined constituents.

YELLOWSTONE RIVER BASIN--Continued

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.--69,103 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1964.
Water temperatures: January 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,080 micromhos Mar. 23; minimum daily, 193 micromhos Aug. 15.
Percent sodium: Maximum, 46 Aug. 30 to Sept. 13; minimum, 7 Aug. 11-29.
Sodium-adsorption-ratio: Maximum, 2.62 Aug. 30 to Sept. 13; minimum, 0.16 Aug. 11-29.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 2,780 micromhos Jan. 14, 1951; minimum daily, 193 micromhos Aug. 15, 1964.
Percent sodium: Maximum, 48 May 1-30, 1953; minimum, 7 Aug. 11-29, 1964.
Sodium-adsorption-ratio (1951-64): Maximum, 2.62 Aug. 30 to Sept. 13, 1964; minimum, 0.16 Aug. 11-29, 1964.
REMARKS.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo. No appreciable inflow between gaging station and sampling point.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	411,782	12	3.44	2.22	3.48	0.09	3.57	.00	5.37	0.31	0.03	0.00	0.17	597	.81	334,334	38	2.07	877	7.7
Nov. 1-16.....	241,317	--	5.84		3.52	--	3.56	.00	5.52	--	--	--	--	604	.82	198,227	38	2.06	890	7.9
Nov. 17-30.....	184,633	--	6.40		3.96	--	3.58	.00	6.33	--	--	--	--	670	.91	168,238	38	2.21	973	7.9
Dec. 1-15.....	159,769	--	5.80		3.31	--	3.57	.00	5.21	--	--	--	--	584	.79	126,895	36	1.94	864	7.8
Dec. 16-31.....	156,710	--	5.80		3.31	--	3.57	.00	5.14	--	--	--	--	585	.80	124,679	36	1.94	859	8.1
Jan. 1-12, 1964.	175,347	--	5.50		3.35	--	3.20	.00	5.33	--	--	--	--	578	.79	137,837	38	2.02	850	8.1
Jan. 13-31.....	217,787	14	3.34	2.14	3.26	.11	3.18	.00	5.23	.39	.03	.01	.22	576	.78	170,606	37	1.97	848	8.0
Feb. 1-9.....	124,173	--	5.96		3.52	--	3.44	.00	5.58	--	--	--	--	611	.83	103,183	37	2.04	892	8.1
Feb. 10-20.....	132,305	--	6.22		3.57	--	3.64	.00	5.80	--	--	--	--	620	.84	111,560	36	2.02	912	8.0
Feb. 21-29.....	95,611	--	6.36		3.52	--	3.67	.00	5.56	--	--	--	--	620	.84	80,619	36	1.98	912	8.2
Mar. 1-18.....	182,670	11	2.69	2.71	3.92	.14	2.82	.00	6.18	.42	.02	.02	.16	623	.85	154,772	41	2.38	904	7.6
Mar. 17-31.....	195,174	13	2.54	3.13	4.09	.15	3.06	.00	6.33	.42	.02	.04	.17	648	.88	172,003	41	2.43	940	7.5
Apr. 1-14.....	237,588	--	5.56		3.87	--	3.11	.00	5.73	--	--	--	--	614	.84	198,396	41	2.32	888	7.8
Apr. 15-19.....	78,962	12	3.64	2.39	4.00	.13	3.39	.00	6.18	.48	.03	.02	.18	656	.89	70,447	39	2.31	942	8.0
Apr. 20-30.....	228,873	--	5.20		3.83	--	3.00	.00	5.54	--	--	--	--	589	.80	183,336	42	2.37	860	7.6
May 1-14.....	382,096	--	3.14		1.17	--	2.29	.00	1.92	--	--	--	--	277	.38	143,943	27	.94	423	7.8
May 15-30.....	715,002	--	3.06		1.17	--	2.23	.00	1.92	--	--	--	--	271	.37	263,521	28	.95	420	7.5

May 31-June 2, 1964.....	176,132	13	2.20	.82	1.13	.05	2.29	.00	1.77	.19	.02	.26	.07	268	.36	64,197	27	.92	412	7.6
June 3-15.....	1,052,549	--	3.88		1.70	--	2.33	.00	3.08	--	--	--	--	361	.49	516,759	30	1.22	545	7.6
June 16-28.....	1,366,612	--	3.80		1.70	--	2.21	.00	3.08	--	--	--	--	359	.49	667,234	31	1.23	540	7.7
June 29-July 7..	997,884	--	3.08		1.26	--	2.23	.00	1.96	--	--	--	--	273	.37	370,494	29	1.02	424	7.8
July 8-22.....	979,140	12	1.85	.82	1.31	.05	2.03	.00	1.81	.16	.02	.00	.06	254	.35	338,234	32	1.13	400	7.4
July 23-31.....	279,729	--	3.18		1.61	--	2.29	.00	2.25	--	--	--	--	297	.40	112,988	34	1.28	464	7.2
Aug. 1-10.....	197,137	--	3.72		1.91	--	2.82	.00	2.62	--	--	--	--	350	.48	93,837	34	1.40	476	7.6
Aug. 11-29.....	275,447	1.1	1.45	.48	.15	.07	1.84	.00	.27	.03	.01	.03	.02	119	.16	44,578	7	.16	206	7.8
Aug. 30-Sept. 13	329,950	--	4.56		3.96	--	3.46	.00	4.91	--	--	--	--	542	.74	243,213	46	2.62	815	7.5
Sept. 14-30.....	210,339	--	5.54		3.57	--	3.38	.00	5.33	--	--	--	--	577	.78	165,057	39	2.14	856	7.8
Total or weighted average	9,798,000	--	4.08		2.18	--	2.61	0.00	3.42	--	--	--	--	403	0.55	5,359,000	35	1.46	603	7.6

YELLOWSTONE RIVER BASIN--Continued

6-2590. WIND RIVER BELOW BOYSEN RESERVOIR, WYO.

LOCATION.--At tailrace of powerplant at Boyeen Dam, 0.6 mile upstream from gaging station, and 12.4 miles north of Shoshoni, Fremont County.
DRAINAGE AREA.--7,701 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: November 1953 to September 1954, December 1960 to September 1964.
Water temperatures: December 1953 to September 1954, December 1960 to Septembsr 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,030 micromhos Apr. 2; minimum daily, 517 micromhos Aug. 20.
Percent sodium: Maximum, 47 Apr. 1-3; minimum, 38 Aug. 1-31.
Sodium-adsorption-ratio: Maximum, 3.04 Apr. 1-3; minimum, 1.61 Aug. 11-30.
EXTREMES, 1953-54, 1960-64.--Specific conductance: Maximum daily, 1,380 micromhos June 18, 1954; minimum daily, 484 micromhos Aug. 11, 1962.
Percent sodium: Maximum, 51 June 18, 19, 1954; minimum, 38 July 15-31, 1962, Aug. 1-31, 1964.
REMARKS.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	22,112	9.3	2.54	1.23	2.65	0.07	2.43	0.00	3.75	0.24	0.02	0.00	0.08	444	0.60	13,352	41	1.93	647	7.1
Oct. 13-31.....	54,607	9.8	2.59	1.32	2.87	.07	2.54	.00	3.87	.24	.02	.00	.10	436	.59	32,380	42	2.05	655	7.6
Nov. 1-11.....	31,375	10	2.69	1.23	2.87	.07	2.56	.00	4.00	.23	.02	.00	.07	445	.61	18,988	42	2.05	673	7.2
Nov. 12-30.....	62,672	9.9	2.69	1.32	2.87	.07	2.62	.00	4.08	.21	.02	.01	.06	458	.62	39,037	41	2.03	685	7.4
Dec. 1-13.....	45,227	9.8	2.69	1.40	2.87	.07	2.62	.00	4.27	.23	.02	.00	.09	462	.63	28,417	41	2.01	695	7.2
Dec. 14-31.....	74,261	9.9	2.79	1.40	2.96	.07	2.69	.00	4.39	.23	.02	.00	.09	478	.65	48,276	41	2.04	714	7.2
Jan. 1-12, 1964.	49,793	10	2.84	1.40	3.00	.07	2.77	.00	4.43	.24	.02	.00	.09	482	.66	32,640	41	2.06	721	7.6
Jan. 13-31.....	60,938	10	2.89	1.48	3.05	.07	2.80	.00	4.50	.25	.02	.01	.10	489	.67	40,526	41	2.06	736	7.5
Feb. 1-13.....	19,107	10	2.99	1.48	3.09	.07	2.84	.00	4.54	.28	.02	.00	.10	504	.69	13,097	40	2.06	752	7.7
Feb. 14-29.....	21,802	9.9	2.99	1.48	3.09	.08	2.87	.00	4.54	.28	.02	.00	.09	501	.68	14,855	40	2.06	752	7.7
Mar. 1-19.....	26,569	10	2.99	1.65	3.18	.08	2.88	.00	4.54	.28	.03	.00	.16	494	.67	17,850	40	2.09	747	7.3
Mar. 20-31.....	19,708	10	2.99	1.65	3.26	.07	2.90	.00	4.73	.25	.02	.00	.10	497	.68	13,321	41	2.14	751	7.6
Apr. 1-3.....	8,110	--	5.90		5.22	--	3.34	.00	7.10	--	--	--	--	722	.98	7,964	47	3.04	1,030	7.4
Apr. 4-18.....	47,484	11	2.25	2.63	3.61	.07	3.03	.00	5.16	.31	.02	.00	.12	552	.75	35,647	42	2.31	815	7.8
Apr. 19-30.....	43,033	10	2.15	2.63	3.44	.07	3.02	.00	4.98	.27	.02	.00	.10	536	.73	31,370	41	2.22	797	8.0
May 1-15.....	56,737	9.8	3.14	1.89	3.44	.12	3.05	.00	5.16	.28	.02	.00	.05	552	.75	42,594	40	2.17	812	8.0
May 16-31.....	62,456	9.4	3.19	1.81	3.52	.07	3.15	.00	5.27	.28	.01	.00	.06	571	.78	48,500	41	2.23	826	8.2
June 1-9.....	33,685	9.2	3.19	1.73	3.52	.08	3.03	.00	5.18	.28	.02	.00	.10	560	.76	25,655	41	2.25	814	7.8
June 10-19.....	36,992	8.0	2.99	1.56	3.18	.08	2.85	.00	4.75	.27	.02	.00	.09	510	.69	25,657	41	2.10	754	7.8
June 20-30.....	41,040	8.4	2.64	1.40	2.70	.08	2.57	.00	4.08	.23	.02	.01	.09	450	.61	25,116	40	1.90	666	7.7

July 1-18, 1964.	76,368	8.4	2.64	1.15	2.44	.06	2.33	.00	3.64	.21	.01	.00	.02	400	.54	41,544	39	1.77	611	7.4
July 19-31.....	56,753	8.3	2.54	1.07	2.31	.06	2.26	.00	3.46	.20	.01	.00	.04	381	.52	29,407	39	1.72	588	7.1
Aug. 1-10.....	38,043	9.1	2.15	1.40	2.18	.06	2.25	.00	3.33	.17	.01	.00	.07	380	.52	19,661	38	1.63	570	7.7
Aug. 11-31.....	51,733	8.5	2.15	1.23	2.09	.06	2.21	.00	3.14	.17	.01	.00	.06	362	.49	25,469	38	1.61	548	7.7
Sept. 1-30.....	71,881	8.5	2.30	1.07	2.31	.06	2.26	.00	3.21	.17	.02	.00	.04	364	.50	35,584	40	1.78	564	7.2
Total or weighted average	1,113,000	9.4	2.68	1.50	2.92	0.07	2.67	0.00	4.26	0.24	0.02	0.00	0.08	467	0.64	706,900	41	2.00	698	7.4

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.
DRAINAGE AREA.--22,885 square miles.
RECORDS AVAILABLE.--Chemical analyses: February 1950 to September 1964.
Water temperatures: April 1949 to September 1951, August 1952 to November 1958, June 1959 to September 1964.
Sediment records: July 1947 to September 1954, October 1955 to September 1958, October 1959 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,320 micromhos Nov. 28; minimum daily, 469 micromhos July 8.
Percent sodium: Maximum, 43 Apr. 27 to May 12; minimum, 30 May 24-31, June 29 to July 9.
Sodium-adsorption-ratio: Maximum, 2.73 Aug. 19-26; minimum, 1.15 June 29 to July 9.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 1,940 micromhos July 10, 1961; minimum daily, 384 micromhos June 20, 1951.
Percent sodium: Maximum, 49 May 23-28, 1952; minimum, 27 June 20-21, 1955.
Sodium-adsorption-ratio (1961-64): Maximum, 2.97 Aug. 24-31, 1963; minimum, 1.15 June 29 to July 9, 1964.
REMARKS.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	183,295	12	4.44	2.63	4.57	0.09	3.70	0.00	7.39	0.34	0.02	0.02	0.13	763	1.04	190,201	39	2.43	1,080	7.6
Nov. 1-11.....	81,033	--	6.66		4.26	--	3.72	.00	6.75	--	--	--	--	731	.99	80,559	38	2.30	1,030	7.9
Nov. 12-25.....	66,110	--	7.64		4.63	--	3.87	.00	7.89	--	--	--	--	820	1.12	96,030	39	2.47	1,140	7.6
Nov. 26-28.....	17,893	--	9.06		5.48	--	4.52	.00	9.16	--	--	--	--	960	1.31	23,361	38	2.58	1,300	8.2
Nov. 29-Dec. 11.	67,721	--	7.36		4.57	--	3.93	.00	7.41	--	--	--	--	769	1.05	91,742	38	2.38	1,080	7.8
Dec. 12-Jan. 12, 1964.....	203,869	--	6.64		3.96	--	3.65	.00	6.58	--	--	--	--	689	.94	191,033	37	2.17	985	7.9
Jan. 13-21.....	57,124	--	6.64		3.96	--	3.65	.00	6.58	--	--	--	--	689	.94	53,527	37	2.17	985	7.9
Jan. 22-31.....	63,471	--	6.56		3.57	--	3.67	.00	6.08	--	--	--	--	650	.88	56,108	35	1.97	944	8.0
Feb. 1-6.....	33,525	--	6.44		3.61	--	3.67	.00	6.08	--	--	--	--	651	.89	29,681	36	2.01	947	8.1
Feb. 7-19.....	58,919	--	7.40		4.16	--	3.90	.00	7.08	--	--	--	--	748	1.02	59,937	36	2.17	1,060	7.8
Feb. 20-29.....	42,645	--	7.04		4.05	--	3.56	.00	6.97	--	--	--	--	728	.99	42,222	36	2.16	1,030	7.6
Mar. 1-14.....	70,005	--	6.72		4.13	--	3.36	.00	6.85	--	--	--	--	684	.93	65,121	38	2.25	976	7.1
Mar. 15-22.....	50,221	--	6.88		4.65	--	3.62	.00	7.29	--	--	--	--	732	1.00	49,996	40	2.51	1,040	7.7
Mar. 23-31.....	48,270	--	7.64		5.31	--	3.67	.00	8.27	--	--	--	--	822	1.12	53,962	41	2.72	1,140	7.7
Apr. 1-14.....	111,713	--	7.28		4.92	--	3.70	.00	7.62	--	--	--	--	781	1.06	118,657	40	2.58	1,090	7.5
Apr. 15-26.....	101,300	--	6.88		4.57	--	3.65	.00	6.95	--	--	--	--	726	.99	100,019	40	2.46	1,020	7.8
Apr. 27-May 12..	225,640	--	6.86		5.22	--	3.41	.00	8.06	--	--	--	--	798	1.09	244,882	43	2.82	1,120	7.9
May 13-23.....	160,211	--	5.76		3.22	--	3.26	.00	5.45	--	--	--	--	581	.79	126,592	36	1.90	844	8.1

May 24-31, 1964.	140,192	11	2.89	1.40	1.83	.06	2.67	.00	3.33	.18	.01	.01	.03	403	.55	76,836	30	1.25	593	7.9
June 1-10.....	207,074	--	5.06		2.74	--	3.05	.00	4.39	--	--	--	--	496	.67	139,684	35	1.72	731	7.9
June 11-20.....	296,926	--	4.72		2.61	--	3.05	.00	4.06	--	--	--	--	462	.63	186,564	36	1.70	691	8.0
June 21-28.....	196,602	--	4.94		2.44	--	2.88	.00	4.31	--	--	--	--	474	.64	126,737	33	1.55	696	7.6
June 29-July 9..	277,745	12	2.45	1.23	1.57	.06	2.56	.00	2.62	.14	.01	.00	.04	343	.47	129,563	30	1.15	521	7.7
July 10-21.....	193,936	--	3.94		1.87	--	2.56	.00	3.10	--	--	--	--	355	.48	93,632	32	1.33	556	7.9
July 22-31.....	77,236	--	5.16		3.00	--	3.00	.00	4.79	--	--	--	--	525	.71	55,147	37	1.87	773	7.8
Aug. 1-18.....	76,903	--	6.66		4.35	--	3.36	.00	7.20	--	--	--	--	715	.97	74,781	40	2.38	1,020	7.2
Aug. 19-26.....	37,543	12	4.49	2.96	5.26	.10	3.64	.00	8.45	.39	.03	.03	.16	821	1.12	41,919	41	2.73	1,200	7.2
Aug. 27-Sept. 18	143,794	--	7.04		4.87	--	3.54	.00	7.75	--	--	--	--	772	1.05	150,972	41	2.60	1,090	7.6
Sept. 19-30.....	66,454	9.5	5.44	1.89	4.87	.10	3.57	.00	7.87	.37	.03	.02	.15	792	1.08	71,579	40	2.54	1,110	7.7
Total or weighted average	A3,397,000	--	5.91		3.55	--	3.28	0.00	5.75	--	--	--	--	611	0.83	2,821,000	37	2.02	878	7.7

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

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.--5,379 square miles.
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1964.
Water temperatures: April 1949 to September 1964.
Sediment records: June 1946 to September 1951.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,660 micromhos Dec. 15; minimum daily, 332 micromhos June 14.
Percent sodium: Maximum, 48 Aug. 22-31; minimum, 15 June 13-16.
Sodium-adsorption-ratio: Maximum 2.75 Oct. 22-31; minimum, 0.45 June 13-16.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 2,390 micromhos Sept. 11, 1958; minimum daily, 260 micromhos Feb. 8, 1963.
Percent sodium: Maximum, 69 May 4, 1955; minimum, 15 June 13-16, 1964.
Sodium-adsorption-ratio (1961-64): Maximum, 3.39 July 30 to Aug. 6, 1963; minimum, 0.45 June 13-16, 1964.
REMARKS.--Values reported for dissolved solids less than 1,000 ppm are residues at 180°C, and values more than 1,000 ppm are calculated from the determined constituents unless otherwise noted. Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Worland, Wyo.

Chemical analyses, water year October 1963 to September 1964

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. 1-9, 1963..	569	--	7.52		4.35	--	5.51	0.00	6.20	--	--	--	--	735	1.00	569	37	2.24	1,070	8.0
Oct. 10-21.....	566	--	8.00		5.09	--	6.08	.00	6.79	--	--	--	--	807	1.10	622	39	2.54	1,170	8.1
Oct. 22-31.....	430	13	3.69	4.52	5.57	0.07	6.26	.00	7.31	0.16	0.02	0.00	0.23	849	1.15	497	40	2.75	1,240	7.9
Nov. 1-19.....	2,804	--	7.94		4.31	--	5.41	.00	6.56	--	--	--	--	742	1.01	2,829	35	2.16	1,080	8.0
Nov. 20-Dec. 7..	2,488	--	8.06		4.35	--	5.28	.00	6.89	--	--	--	--	762	1.04	2,579	35	2.17	1,110	7.5
Dec. 8-13.....	515	--	9.04		5.22	--	5.77	.00	8.45	--	--	--	--	892	1.21	625	37	2.46	1,270	7.9
Dec. 14-19.....	476	17	4.99	6.33	6.35	.20	7.21	.00	10.58	.24	.02	.00	.25	1,080	1.47	699	36	2.67	1,540	7.8
Dec. 20-31.....	2,571	--	9.74		4.65	--	6.31	.00	7.81	--	--	--	--	880	1.20	3,076	32	2.11	1,260	8.0
Jan. 1-31, 1964.	8,731	--	7.74		2.96	--	4.62	.00	6.10	--	--	--	--	673	.92	7,992	28	1.50	973	8.0
Feb. 1-17.....	5,968	--	7.90		2.70	--	4.85	.00	5.52	--	--	--	--	646	.88	5,243	25	1.36	944	8.2
Feb. 18-29.....	4,403	--	7.14		2.74	--	4.23	.00	5.54	--	--	--	--	612	.83	3,665	28	1.45	923	8.1
Mar. 1-19.....	7,160	--	6.48		2.91	--	3.85	.00	5.31	--	--	--	--	575	.78	5,599	31	1.62	847	7.7
Mar. 20-31.....	4,832	--	7.24		3.00	--	4.39	.00	5.50	--	--	--	--	615	.84	4,041	29	1.58	905	7.5
Apr. 1-15.....	9,104	--	7.72		2.83	--	4.85	.00	5.35	--	--	--	--	626	.85	7,751	27	1.44	924	7.7
Apr. 16-30.....	8,866	--	7.28		2.70	--	4.61	.00	5.10	--	--	--	--	597	.81	7,199	27	1.41	886	7.6
May 1-15.....	13,805	7.8	2.99	3.70	2.09	.11	4.16	.00	4.50	.16	.02	.00	.09	542	.74	10,176	23	1.14	798	8.1
May 16-28.....	29,369	10	2.94	3.29	1.65	.11	3.85	.00	3.96	.09	.02	.01	.08	485	.66	19,372	21	.94	721	7.8
May 29-June 12..	33,977	--	4.18		1.09	--	2.88	.00	1.89	--	--	--	--	291	.40	13,447	21	.75	460	7.5
June 13-16.....	25,428	9.8	1.90	1.23	.57	.07	2.51	.00	1.17	.06	.01	.00	.01	231	.31	7,988	15	.45	361	7.5
June 17-30.....	97,995	--	3.22		1.04	--	2.72	.00	1.54	--	--	--	--	258	.35	34,385	24	.82	405	7.7

July 1-10, 1964.	40,145	--	3.62	.83	--	2.62	.00	1.67	--	--	--	--	264	.36	14,414	19	.61	410	7.8
July 11-31.....	19,827	--	4.18	1.39	--	3.11	.00	2.37	--	--	--	--	332	.45	8,952	25	.96	520	7.8
Aug. 1-21.....	7,498	--	5.18	2.00	--	3.87	.00	3.16	--	--	--	--	422	.57	4,303	28	1.24	661	7.5
Aug. 22-31.....	10,413	--	3.40	3.09	--	3.43	.00	2.83	--	--	--	--	395	.54	5,594	48	2.37	616	7.6
Sept. 1-19.....	11,796	--	5.20	1.70	--	3.74	.00	3.12	--	--	--	--	412	.56	6,609	25	1.05	639	8.0
Sept. 20-30.....	5,869	--	5.84	1.83	--	4.00	.00	3.46	--	--	--	--	455	.62	3,632	24	1.07	700	7.8
Total or weighted average	355,600	--	4.68	1.57	--	3.32	0.00	2.79	--	--	--	--	376	0.51	181,900	25	0.99	573	7.7

JAMES RIVER BASIN

6-4760. JAMES RIVER AT HURON, S. DAK.

LOCATION.--At 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 1964.
Water temperatures: August 1956 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,270 micromhos Jan. 18-22; minimum daily, 631 micromhos July 18.
Percent sodium: Maximum, 52 Nov. 29 to Dec. 1; minimum, 36 July 29 to Aug. 9.
Sodium-adsorption-ratio: Maximum, 4.55 Jan. 13-21; minimum, 1.78 July 27-28.
EXTREMES, 1956-64.--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, Oct. 12-20, 22-26, 28-30, 1962; minimum, 24 Mar. 29-30, 1960, Mar. 27-29, 1962.
Sodium-adsorption-ratio (1961-64): Maximum, 6.28 Oct. 12-20, 22-26, 28-30, 1961; minimum, 0.55 Mar. 27-29, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office in Lincoln, Nebr. During some periods, all flow is diverted from the channel near the sampling site and, therefore, does not pass the gaging station.

Chemical analyses, water year October 1963 to September 1964

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. 31-Nov. 1, 1963.....	49	--	5.76		5.39	--	5.31	0.00	3.85	--	--	--	--	714	0.97	48	48	3.18	1,090	7.5
Nov. 2-14, 16-18, 21-28.....	305	--	5.74		5.44	--	5.38	.00	3.89	--	--	--	--	717	.98	297	49	3.21	1,100	7.9
Nov. 29-Dec. 1..	52	--	5.16		5.66	--	4.72	.00	4.14	--	--	--	--	701	.95	49	52	3.52	1,080	7.9
Dec. 2-14.....	897	--	6.86		6.53	--	5.57	.00	5.48	--	--	--	--	862	1.17	1,052	49	3.52	1,300	7.9
Dec. 15.....	71	20	4.89	6.09	8.53	0.38	7.21	.00	9.68	3.13	0.02	0.14	0.44	A1,200	1.63	117	43	3.64	1,770	7.6
Dec. 16-31.....	1,250	--	11.74		8.27	--	8.49	.00	8.58	--	--	--	--	1,270	1.73	2,160	41	3.41	1,800	7.9
Jan. 1-12, 1964.	795	--	10.86		9.48	--	9.23	.00	7.33	--	--	--	--	1,280	1.74	1,384	47	4.07	1,880	7.9
Jan. 13-21.....	916	--	12.46		11.35	--	9.83	.00	8.74	--	--	--	--	1,510	2.05	1,881	48	4.55	2,210	7.9
Feb. 1-22.....	663	--	12.36		9.79	--	9.24	.00	8.02	--	--	--	--	1,370	1.86	1,236	44	3.94	1,980	8.1
Feb. 23.....	32	22	5.64	6.83	8.70	.41	10.00	.00	7.77	3.58	.02	.05	.49	A1,240	1.69	54	40	3.48	1,850	7.8
Feb. 24-Mar. 9..	434	--	11.70		8.70	--	9.57	.00	7.66	--	--	--	--	1,260	1.71	744	43	3.60	1,860	8.2
Mar. 18.....	3	15	4.89	4.28	6.53	.33	7.28	.00	6.18	2.60	.02	.08	.39	973	1.32	4	41	3.05	1,470	8.0
Mar. 19-31.....	474	--	10.48		7.48	--	7.80	.30	7.29	--	--	--	--	1,100	1.50	710	42	3.27	1,640	8.3
Apr. 1-11.....	779	--	8.46		5.87	--	6.11	.00	6.41	--	--	--	--	896	1.22	949	41	2.86	1,350	8.2
Apr. 12.....	69	7.1	4.59	3.13	5.26	.26	5.41	.00	6.08	1.83	.02	.05	.33	848	1.15	80	40	2.68	1,230	8.1
Apr. 13-30.....	1,889	--	8.04		5.79	--	6.11	.00	5.85	--	--	--	--	864	1.18	2,219	42	2.89	1,320	8.2
May 1-7.....	790	--	8.58		7.96	--	6.72	.00	7.18	--	--	--	--	1,020	1.39	1,096	48	3.84	1,550	7.7
May 8-14.....	2,083	--	6.68		5.96	--	5.20	.00	5.37	--	--	--	--	786	1.07	2,226	47	3.26	1,220	7.6
May 15-21.....	3,763	--	6.28		5.57	--	4.64	.00	5.00	--	--	--	--	729	.99	3,730	47	3.14	1,140	7.5

A Calculated from determined constituents.

May 22, 1964.....	873	11	2.59 | 2.47	4.35	.31	4.06	.00	3.77	1.52	.02	.04	.28	607	.83	720	45	2.73	939	7.6
May 23-June 4...	9,721	--	4.96	4.57	--	4.08	.00	3.79	--	--	--	--	574	.78	7,589	48	2.90	963	7.4
June 5-9.....	1,597	--	5.10	4.35	--	4.31	.00	3.52	--	--	--	--	593	.81	1,288	46	2.72	934	7.4
June 10-25.....	1,638	--	5.84	4.70	--	4.77	.00	4.18	--	--	--	--	670	.91	1,492	45	2.75	1,040	7.3
June 26-27.....	12	--	6.64	5.26	--	5.33	.00	4.71	--	--	--	--	750	1.02	12	44	2.89	1,160	7.4
June 29-July 5..	666	--	6.56	5.48	--	5.24	.00	4.83	--	--	--	--	763	1.04	692	46	3.03	1,180	7.1
July 6-10.....	2,499	--	7.14	6.00	--	5.77	.00	5.31	--	--	--	--	834	1.13	2,835	46	3.18	1,280	7.4
July 11-26.....	15,900	--	4.70	3.09	--	4.23	.00	2.77	--	--	--	--	508	.69	10,985	40	2.01	802	7.1
July 27-28.....	2,400	--	4.16	2.57	--	3.90	.00	2.12	--	--	--	--	436	.59	1,423	38	1.78	684	7.3
July 29-Aug. 9..	12,996	21	2.45 | 1.73	2.61	.41	4.03	.00	1.98	1.04	.02	.01	.18	441	.60	7,794	36	1.81	680	7.0
Aug. 10-20.....	7,047	--	5.76	4.18	--	5.70	.00	2.87	--	--	--	--	629	.86	6,029	42	2.46	968	7.4
Aug. 21.....	476	17	4.09 | 2.30	5.18	.43	6.34	.00	3.37	2.09	.02	.01	.33	719	.98	465	43	2.89	1,100	7.6
Aug. 22-25.....	1,476	--	6.54	5.35	--	6.52	.00	3.54	--	--	--	--	725	.99	1,455	45	2.96	1,130	7.4
Aug. 26-Sept. 3.	1,328	--	6.76	5.57	--	6.65	.00	3.83	--	--	--	--	752	1.02	1,358	45	3.03	1,180	7.6
Sept. 4-12.....	707	--	6.78	5.74	--	6.49	.00	4.10	--	--	--	--	777	1.06	747	46	3.12	1,210	7.5
Sept. 13-18.....	123	--	6.48	5.92	--	6.16	.00	4.23	--	--	--	--	755	1.03	126	48	3.29	1,190	7.8
Sept. 19.....	46	--	6.46	5.92	--	6.18	.00	4.27	--	--	--	--	757	1.03	47	48	3.29	1,200	7.6
Sept. 20.....	44	7.5	3.14 | 3.37	5.96	.46	6.13	.00	4.10	2.34	.02	.00	.35	784	1.07	47	46	3.30	1,180	7.2
Sept. 21-24.....	152	--	6.50	5.92	--	6.23	.00	4.25	--	--	--	--	758	1.03	157	48	3.28	1,200	7.8
Sept. 25-29.....	59	--	6.56	5.96	--	6.56	.00	4.31	--	--	--	--	763	1.04	61	48	3.29	1,200	7.6
Total or weighted average	75,070		5.74	4.41	--	4.98	0.00	3.69	--	--	--	--	640	0.87	65,360	43	2.55	995	7.3

PLATTE RIVER BASIN

6-7660. PLATTE RIVER AT BRADY, NEBR.

LOCATION.--At gaging station at highway bridges, 0.5 mile and 2.5 miles south of Brady, Lincoln County, and 18 miles downstream from confluence of North Platte and South Platte Rivers.
DRAINAGE AREA.--56,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: November 1950 to September 1964.
Water temperatures: March 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 860 micromhos June 3 (chan. 4); minimum daily, 400 micromhos Mar. 19 (chan. 1.).
Percent sodium: Maximum, 44 July 24 to Aug. 17; minimum, 29 Mar. 1-20.
Sodium-adsorption-ratio: Maximum, 2.19 July 24 to Aug. 17; minimum, 1.18 Mar. 1-20.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 1,460 micromhos Jan. 22, 1962 (chan. 1); minimum daily, 305 micromhos Jan. 13, 1956, Jan. 10, 1957 (chan. 1).
Percent sodium: Maximum, 46 Aug. 1-2, 1955; minimum, 22 Nov. 26, 1952.
Sodium-adsorption-ratio (1961-64): Maximum, 2.19 July 24 to Aug. 17, 1964; minimum, 1.18 Mar. 1-20, 1964.
REMARKS.--Daily samples for chemical analysis from each of two major channels composited by discharge. Composite period normally identical to those of Supply Canal (Tri-County diversion) near Maxwell, Nebr. Records of specific conductance of daily samples taken at each of two major channels available in district office at Lincoln, Nebr.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	9,777	--	4.44		2.39	--	3.75	0.00	--	--	--	--	--	461	0.63	6,129	35	1.61	673	7.6
Nov. 1-30.....	9,223	--	4.46		2.35	--	3.69	.00	--	--	--	--	--	463	.63	5,808	34	1.57	651	7.7
Dec. 1-16.....	6,093	40	3.49	1.32	2.39	0.26	3.93	.00	2.85	0.51	0.03	0.04	0.10	478	.65	3,961	32	1.54	698	7.4
Dec. 17-31.....	6,605	--	4.18		2.00	--	3.57	.00	--	--	--	--	--	428	.58	3,845	32	1.38	610	7.9
Jan. 1-31, 1964.	12,482	--	4.40		2.18	--	3.64	.00	--	--	--	--	--	439	.60	7,452	33	1.47	635	7.7
Feb. 1-29.....	11,044	--	4.14		1.83	--	3.47	.00	--	--	--	--	--	412	.56	6,188	31	1.27	589	7.6
Mar. 1-20.....	8,251	--	4.10		1.70	--	3.46	.00	--	--	--	--	--	399	.54	4,477	29	1.18	585	8.1
Mar. 21-28.....	5,935	--	4.24		1.78	--	3.65	.00	--	--	--	--	--	414	.56	3,341	30	1.22	603	8.1
Mar. 29-Apr. 30.	19,178	--	4.32		1.87	--	3.72	.00	--	--	--	--	--	429	.58	11,189	30	1.27	622	7.7
May 1-21.....	7,289	--	4.28		1.96	--	3.62	.00	--	--	--	--	--	398	.54	3,946	31	1.34	627	7.7
May 22-31.....	5,415	--	4.34		2.52	--	3.57	.00	--	--	--	--	--	454	.62	3,343	37	1.71	671	7.6
June 1-20.....	6,545	18	3.24	1.32	2.44	.26	3.67	.00	3.00	.51	.03	.02	.11	473	.64	4,211	34	1.61	696	7.6
June 21-30.....	4,820	--	4.06		2.04	--	3.47	.00	--	--	--	--	--	415	.56	2,720	33	1.43	612	7.5
July 1-5.....	1,567	--	4.26		2.61	--	3.62	.00	--	--	--	--	--	464	.63	989	38	1.79	683	7.9
July 6-10.....	6,522	--	4.18		2.96	--	3.79	.00	--	--	--	--	--	480	.65	4,257	41	2.05	709	7.7
July 10-13.....	11,330	--	3.96		2.83	--	3.75	.00	--	--	--	--	--	451	.61	6,949	42	2.01	669	6.7
July 14-23.....	13,726	--	4.00		2.91	--	3.84	.00	--	--	--	--	--	457	.62	8,531	42	2.06	683	7.0
July 24-31.....	17,851	--	3.98		3.09	--	3.87	.00	--	--	--	--	--	465	.63	11,289	44	2.19	699	7.3
Aug. 1-17.....	38,878	--	3.98		3.09	--	3.93	.00	--	--	--	--	--	465	.63	24,586	44	2.19	702	7.4
Aug. 18-19.....	2,777	--	3.88		2.96	--	3.82	.00	--	--	--	--	--	452	.61	1,707	43	2.12	681	6.8

Aug. 20-21, 1964	1,793	--	3.68	2.48	--	3.47	.00	--	--	--	--	--	412	.56	1,005	40	1.83	617	7.0
Aug. 22-31.....	2,817	--	4.32	2.65	--	3.83	.00	--	--	--	--	--	467	.64	1,789	38	1.81	691	7.4
Sept. 1-15.....	3,689	--	4.48	2.57	--	3.80	.00	--	--	--	--	--	436	.59	2,188	36	1.71	669	7.6
Sept. 16.....	294	35	3.19 1.32	2.65	.28	3.90	.00	2.87	.59	.03	.03	.12	478	.65	191	36	1.77	704	7.7
Sept. 17-30.....	3,499	--	4.30	2.48	--	3.70	.00	--	--	--	--	--	441	.60	2,098	37	1.69	672	7.4
Total or weighted average	217,400	--	4.19	2.50	--	3.74	0.00	--	--	--	--	--	447	0.61	132,200	37	1.74	661	7.4

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 1964.
Water temperatures: March 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,100 micromhos May 21; minimum daily, 646 micromhos Mar. 19.
Percent sodium: Maximum, 48 July 24 to Aug. 17; minimum, 32 Mar. 1-20.
Sodium-adsorption-ratio: Maximum, 2.57 Aug. 1-17; minimum, 1.59 Mar. 1-20.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 1,680 micrombos Jan. 23, 1962; minimum daily, 403 micrombos Jan. 9, 1957.
Percent sodium: Maximum, 48 Aug. 1 to Sept. 15, 1955, July 24 to Aug. 17, 1964; minimum, 32 Feb. 25 to Mar. 22, May 19-28, 1957, and Mar. 1-20, 1964.
Sodium-adsorption-ratio (1961-64): Maximum, 2.57 Aug. 1-17, 1964; minimum, 1.59 Mar. 1-20, 1964.
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 given in reports of State Engineer.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	53,863	--	4.62		2.91	--	3.61	.00	--	--	--	--	--	505	0.69	37,165	39	1.91	731	7.7
Nov. 1-30.....	52,483	--	4.42		2.83	--	3.47	.00	--	--	--	--	--	486	.66	34,689	39	1.90	714	7.7
Dec. 1-16.....	27,578	24	3.49	1.73	3.26	0.28	3.80	.00	4.14	0.71	0.03	0.03	0.13	560	.76	21,004	37	2.02	825	7.4
Dec. 17-31.....	34,364	--	5.62		3.52	--	3.84	.00	--	--	--	--	--	616	.84	28,788	39	2.10	895	7.6
Jan. 1-31, 1964.	65,238	--	5.58		3.44	--	3.82	.00	--	--	--	--	--	609	.83	54,033	38	2.06	880	7.7
Feb. 1-29.....	59,074	--	5.76		3.31	--	3.87	.00	--	--	--	--	--	618	.84	49,650	36	1.95	885	7.6
Mar. 1-20.....	40,304	--	5.78		2.70	--	3.74	.00	--	--	--	--	--	583	.79	31,956	32	1.59	848	8.1
Mar. 21-28.....	16,280	--	5.24		3.05	--	3.57	.00	--	--	--	--	--	548	.75	12,133	37	1.88	788	8.0
Mar. 29-Apr. 30.	70,822	--	4.92		2.70	--	3.52	.00	--	--	--	--	--	525	.71	50,567	35	1.72	762	7.5
May 1-21.....	47,818	--	5.70		3.70	--	3.47	.00	--	--	--	--	--	620	.84	40,320	39	2.19	904	8.2
May 22-31.....	35,266	--	6.20		4.31	--	3.59	.00	--	--	--	--	--	697	.95	33,429	41	2.45	1,020	7.5
June 1-20.....	58,314	9.0	3.24	1.56	3.52	.28	3.49	.00	4.37	.71	.03	.03	.15	557	.76	44,174	41	2.27	836	7.3
June 21-30.....	29,812	--	4.16		3.22	--	3.44	.00	--	--	--	--	--	488	.66	19,785	44	2.23	742	7.4
July 1-5.....	17,633	--	4.08		3.39	--	3.54	.00	--	--	--	--	--	491	.67	11,775	45	2.38	740	7.0
July 6-9.....	16,066	--	4.16		3.48	--	3.61	.00	--	--	--	--	--	502	.68	10,969	46	2.41	753	6.9

July 10-13, 1964	16,201	--	4.00	3.09	--	3.61	.00	--	--	--	--	--	470	.64	10,356	44	2.18	710	7.0
July 14-23.....	40,562	--	3.92	3.39	--	3.57	.00	--	--	--	--	--	476	.65	26,258	46	2.42	732	7.4
July 24-31.....	32,767	--	3.80	3.48	--	3.51	.00	--	--	--	--	--	478	.65	21,301	48	2.52	734	7.3
Aug. 1-17.....	71,147	--	3.86	3.57	--	3.61	.00	--	--	--	--	--	479	.65	46,348	48	2.57	733	7.6
Aug. 18-19.....	8,172	--	3.94	3.31	--	3.74	.00	--	--	--	--	--	477	.65	5,301	46	2.36	724	7.5
Aug. 20-21.....	7,815	--	3.76	3.26	--	3.56	.00	--	--	--	--	--	469	.64	4,985	46	2.38	709	7.3
Aug. 22-31.....	28,860	--	4.08	3.13	--	3.65	.00	--	--	--	--	--	474	.64	18,604	43	2.19	721	6.7
Sept. 1-15.....	44,896	--	3.92	3.35	--	3.61	.00	--	--	--	--	--	460	.63	28,087	46	2.39	725	6.8
Sept. 16.....	2,876	.25	2.79 1.23	3.05	.26	3.61	.00	3.29	.56	.03	.02	.12	472	.64	1,846	42	2.15	703	7.4
Sept. 17-30.....	37,016	--	3.90	3.18	--	3.54	.00	--	--	--	--	--	451	.61	22,704	45	2.27	701	6.9
Total or weighted average	915,227	--	4.76	3.29	--	3.62	0.00	--	--	--	--	--	535	0.73	666,227	41	1.64	793	7.3

PLATTE RIVER BASIN -Continued

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

LOCATION.--At gaging station at bridge on U.S. 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.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1964.
Water temperatures: October 1945 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,300 micromhos Jan. 14; minimum daily, 1,440 micromhos July 9.
Percent sodium: Maximum, 37 Apr. 1 to May 31; minimum, 33 Dec. 1, 1963 to Jan. 31, 1964.
Sodium-adsorption-ratio: Maximum, 3.24 Apr. 1-30; minimum, 2.86 July 9-31.
EXTREMES, 1945-64.--Specific conductance: Maximum daily, 3,000 micromhos Dec. 28, 30, 1962; 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.
Sodium-adsorption-ratio (1961-64): Maximum, 3.32 Jan. 15-31, 1963; minimum, 1.78 May 31, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Lincoln, Nebr.

Chemical analyses, water October 1963 to September 1964

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, 1963.	12,298	--	15.22		8.09	--	5.24	0.00	--	--	--	--	--	1,560	2.12	26,072	35	2.93	2,000	7.5
Nov. 1-30.....	12,555	--	15.92		8.53	--	5.72	.00	--	--	--	--	--	1,660	2.26	28,345	35	3.02	2,110	7.5
Dec. 1-31.....	13,343	29	4.59	12.42	8.70	0.46	6.18	.00	16.86	2.12	0.03	0.06	0.26	1,560	2.12	28,308	33	2.98	2,130	7.5
Jan. 1-31, 1964.	15,372	--	17.00		8.53	--	6.72	.00	--	--	--	--	--	1,720	2.34	35,958	33	2.92	2,180	7.5
Feb. 1-11.....	5,651	--	16.60		8.53	--	6.49	.00	--	--	--	--	--	1,700	2.31	13,065	34	2.96	2,140	7.7
Feb. 12-29.....	8,854	--	15.86		8.53	--	5.41	.00	--	--	--	--	--	1,660	2.26	19,989	35	3.03	2,100	7.7
Mar. 1-31.....	11,929	27	10.48	4.94	8.48	.36	5.10	.00	16.49	2.14	.04	.06	.26	1,530	2.08	24,821	35	3.06	2,050	7.9
Apr. 1-30.....	11,663	--	15.04		8.87	--	4.56	.00	--	--	--	--	--	1,640	2.23	26,013	37	3.24	2,070	8.2
May 1-31.....	3,745	--	14.44		8.31	--	4.28	.00	--	--	--	--	--	1,560	2.12	7,945	37	3.09	1,980	8.0
June 1-30.....	2,969	15	9.78	4.61	8.48	.41	4.25	.00	16.14	2.06	.03	.01	.25	1,450	1.97	5,855	36	3.16	1,970	7.4
July 1-7.....	397	--	14.18		7.83	--	4.39	.00	--	--	--	--	--	1,520	2.07	821	36	2.94	1,910	7.2
July 8.....	79	30	9.83	4.11	7.92	.46	4.13	.00	15.82	2.09	.04	.00	.23	1,440	1.96	155	35	3.00	1,910	7.4
July 9-31.....	2,222	--	13.24		7.35	--	4.08	.00	--	--	--	--	--	1,420	1.93	4,291	36	2.86	1,810	7.5
Aug. 1-31.....	867	--	14.32		8.31	--	4.21	.00	--	--	--	--	--	1,530	2.08	1,804	37	3.11	1,930	7.0
Sept. 1-30.....	565	29	9.88	4.69	8.35	.46	4.33	.00	15.99	2.12	.03	.00	.25	1,470	2.00	1,130	36	3.09	1,960	7.8
Total or weighted average	102,509	--	15.83		8.49	--	5.53	--	--	--	--	--	--	1,610	2.19	224,572	35	3.02	2,080	7.6

PART 7. LOWER MISSISSIPPI RIVER BASIN

ARKANSAS RIVER BASIN

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

LOCATION.--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, January 1951 to September 1964.
Water temperatures: January 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 4,640 micromhos Dec. 16; minimum daily, 848 micromhos May 27.
Percent sodium: Maximum, 42 May 25-26, June 3-18; minimum, 4 May 27.
Sodium-adsorption-ratio: Maximum, 6.05 June 3-18; minimum, 0.17 May 27.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 5,180 micromhos Apr. 21, 1955; minimum daily, 643 micromhos July 6, 1960.
Percent sodium: Maximum, 44 Feb. 23-28, Mar. 1-31, 1962; minimum, 4 May 27, 1964.
Sodium-adsorption-ratio (1961-64): Maximum 6.28 Nov. 3-13, 1961; minimum 0.17 May 27, 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	2,306	--	28.80	17.31	--	3.84	0.00	38.73	3.53	--	--		3,300	4.49	10,348	38	4.56	3,600	7.5
Nov. 1-30.....	2,344	--	30.00	18.57	--	4.20	.00	41.02	3.33	--	--		3,350	4.56	10,681	38	4.80	3,590	7.4
Dec. 1-31.....	609	--	35.60	24.75	--	4.36	.00	52.05	3.95	--	--		4,280	5.82	3,543	41	5.87	4,360	8.0
Jan. 1-31, 1964.	178	--	37.60	25.14	--	4.18	.00	53.92	4.65	--	--		4,460	6.07	1,082	40	5.80	4,540	7.9
Feb. 1-29.....	144	--	37.20	23.27	--	4.59	.00	51.22	4.65	--	--		4,360	5.93	853	38	5.40	4,510	7.7
Mar. 1-31.....	178	--	34.80	23.49	--	4.00	.00	49.55	4.74	--	--		4,310	5.86	1,045	40	5.63	4,490	8.1
Apr. 1-30.....	11,008	--	32.00	22.01	--	3.97	.00	46.43	3.61	--	--		3,810	5.18	57,040	41	5.50	3,990	8.0
May 1-20.....	1,507	--	31.60	21.36	--	4.23	.00	45.18	3.55	--	--		3,720	5.06	7,626	40	5.37	3,890	8.0
May 21-24.....	825	--	24.80	13.83	--	4.31	.23	31.65	2.45	--	--		2,670	3.63	2,996	36	3.93	2,940	8.3
May 25-26.....	1,547	--	7.80	5.61	--	3.31	.00	9.35	.73	--	--		904	1.23	1,902	42	2.84	1,190	8.2
May 27.....	1,103	--	9.30	.36	--	3.15	.00	6.06	.45	--	--		636	.86	954	4	.17	848	7.0
May 28-29.....	2,860	--	13.30	5.22	--	3.98	.00	13.82	.71	--	--		1,250	1.70	4,862	28	2.02	1,500	7.5
May 30-31.....	43	--	22.20	14.01	--	3.70	.00	29.98	2.54	--	--		2,520	3.43	147	39	4.20	2,800	7.3
June 1-2.....	17	--	30.80	21.32	--	3.56	.00	44.55	3.98	--	--		3,700	5.03	84	41	5.43	3,900	7.4
June 3-18.....	1,361	--	35.80	25.58	--	4.52	.00	52.47	4.37	--	--		4,280	5.82	7,925	42	6.05	4,420	7.2

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1963 to September 1964--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 19-24, 1964	11,175	--	10.80		5.92	--	2.51	0.00	13.24	0.96	--	--		1,130	1.54	17,174	35	2.55	1,440	7.1
June 25.....	248	--	26.40		15.01	--	5.21	.00	33.73	2.57	--	--		2,850	3.88	961	36	4.13	3,080	6.6
June 26-28.....	863	--	11.90		5.70	--	3.02	.00	13.45	1.13	--	--		1,210	1.65	1,420	32	2.34	1,510	7.2
June 29-30.....	339	--	18.80		10.44	--	3.67	.00	23.53	2.03	--	--		2,010	2.73	927	36	3.41	2,320	7.4
July 1.....	401	9.5	8.58	4.03	6.09	0.13	3.54	.00	14.26	1.27	0.01	0.06		1,300	1.77	708	32	2.43	1,620	7.7
July 2-8.....	3,735	8.2	5.94	4.03	3.52	.12	3.41	.00	9.66	.79	.05	.05		868	1.18	4,409	26	1.58	1,150	8.0
July 9-16.....	698	8.9	11.28	7.40	12.31	.21	3.25	.00	26.65	2.23	.05	.02		2,220	3.02	2,108	39	4.03	2,520	8.0
July 17-20.....	2,095	9.9	14.62	11.52	17.40	.19	3.54	.00	38.10	3.24	--	.00		3,130	4.26	8,916	40	4.81	3,370	8.0
July 21-22.....	738	13	9.13	4.20	3.57	.22	4.29	.00	12.93	.54	.02	.00		1,150	1.56	1,154	21	1.38	1,440	8.0
July 23-24.....	97	11	11.98	7.24	9.57	.23	3.54	.00	24.78	1.78	.02	.05		2,170	2.95	287	33	3.09	2,320	8.1
July 25-26.....	151	12	15.52	10.69	16.31	.22	4.00	.00	36.64	2.91	.04	.02		3,040	4.13	623	38	4.51	3,240	8.1
July 27-28.....	157	8.3	9.03	5.92	9.87	.26	3.08	.00	20.42	1.69	.03	.00		1,720	2.34	367	39	3.61	2,050	8.0
July 29-31.....	87	8.1	14.42	10.78	17.01	.19	3.74	.00	36.44	3.10	.05	.00		3,030	4.12	360	40	4.79	3,270	8.0
Aug. 1-5.....	190	--	28.40		18.44	--	3.92	.00	39.14	3.78	--	--		3,360	4.57	870	39	4.89	3,580	8.2
Aug. 6-7.....	2,075	--	15.00		4.39	--	4.31	.00	13.95	1.13	--	--		1,410	1.92	3,978	23	1.60	1,740	7.7
Aug. 8-13.....	5,403	--	11.84		4.00	--	3.34	.00	11.78	.73	--	--		1,090	1.48	8,009	25	1.64	1,350	7.6
Aug. 14-17.....	1,206	--	18.00		5.18	--	3.79	.00	17.57	1.81	--	--		1,900	2.58	3,116	22	1.73	2,220	8.0
Aug. 18-19.....	452	--	13.60		6.22	--	3.47	.00	15.07	1.27	--	--		1,350	1.84	830	31	2.39	1,670	7.8
Aug. 20-31.....	924	--	22.00		11.27	--	3.80	.00	26.86	2.51	--	--		2,400	3.26	3,014	34	3.40	2,720	7.8
Sept. 1-20.....	1,983	--	22.80		11.14	--	3.75	.00	27.69	2.37	--	--		2,360	3.21	6,366	33	3.30	2,670	8.0
Sept. 21-30.....	865	--	28.80		17.40	--	4.57	.00	38.10	3.53	--	--		3,280	4.46	3,858	38	4.59	3,530	7.9
Total or weighted average	59,910	--	20.04		11.60	--	3.57	0.00	26.09	2.07	--	--		2,220	3.01	180,500	31	3.41	2,471	7.4

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

LOCATION.--At gaging station at bridge on U.S. Highway 166, 0.1 mile downstream from St. Louis-San Francisco Railway Co. bridge, 0.5 mile west of Arkansas City, Cowley County, 5.4 miles upstream from Walnut River, and at mile 701.4.
DRAINAGE AREA.--43,713 square miles, of which 7,607 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1951 to September 1964.
Water temperatures: October 1951 to September 1964.
Sediment records: September 1961 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,760 micromhos July 13; minimum daily, 311 micromhos Aug. 29.
Percent sodium: Maximum, 74 Aug. 8-10; minimum, 49 June 7.
Sodium-adsorption-ratio: Maximum, 8.91 Aug. 1-7; minimum, 2.28 June 7.
EXTREMES, 1951-64.--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.
Sodium-adsorption-ratio: Maximum, 16 Oct. 5, 1953, Aug. 7, 1955; minimum, 0.9 May 31, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla.

Chemical analyses, water year October 1963 to September 1964

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, 1963....	1,529		5.48		10.44		3.41	0.27	2.71	9.08				974	1.32	2,026	66	6.31	1,580	8.5
Oct. 2-6.....	8,013		4.56		6.70		3.08	.00	1.87	6.71				721	.98	7,857	59	4.44	1,210	8.2
Oct. 7-18.....	13,400		5.64		9.74		3.28	.13	2.66	9.73				960	1.31	17,495	63	5.80	1,620	8.4
Oct. 19.....	3,729		4.32		6.00		3.18	.13	1.71	5.42				640	.87	3,246	58	4.08	1,070	8.4
Oct. 20-21.....	11,226		2.28		2.52		1.87	.00	.73	2.06				296	.40	4,519	53	2.36	489	8.0
Oct. 22-23.....	8,390		3.00		4.52		2.10	.00	1.23	4.20				477	.65	5,443	60	3.69	806	8.1
Oct. 24-27.....	20,763		2.48		3.18		1.93	.00	.85	2.74				345	.47	9,742	56	2.85	587	8.0
Oct. 28-31.....	9,092		4.40		6.31		2.92	.07	1.69	6.54				692	.94	8,557	59	4.25	1,170	8.3
Nov. 1-9.....	12,710		5.60		9.35		--	--	2.48	9.03				951	1.29	16,439	63	5.59	1,540	--
Nov. 10.....	1,220		6.28		8.27		1.90	.00	2.66	10.01				1,020	1.39	1,692	57	4.66	1,690	8.0
Nov. 11-20.....	11,544		6.40		10.79		--	--	2.66	10.44				1,000	1.36	15,700	63	6.03	1,750	--
Nov. 21-30.....	13,329		6.00		10.14		--	--	2.50	9.87				950	1.29	17,221	63	5.85	1,670	--
Dec. 1-10.....	11,683		6.80		11.27		--	--	2.81	11.00				1,060	1.44	16,842	62	6.11	1,840	--
Dec. 11-23.....	9,205		8.30		14.49		--	--	3.44	14.95				1,370	1.86	17,151	64	7.11	2,410	--
Dec. 24-31.....	8,346		6.60		10.70		--	--	2.71	10.49				1,030	1.40	11,692	62	5.89	1,770	--
Jan. 1-12, 1964.	18,541		6.10		10.88		--	--	2.54	10.01				1,020	1.39	25,721	64	6.23	1,710	--
Jan. 13-15.....	2,678		9.00		14.70		--	--	3.71	14.95				1,490	2.03	5,426	62	6.93	2,440	--
Jan. 16-31.....	20,596		6.60		11.48		--	--	2.75	10.95				1,090	1.48	30,532	64	6.32	1,850	--
Feb. 1-7.....	9,844		7.00		10.44		--	--	2.71	9.73				1,010	1.37	13,522	60	5.58	1,700	--
Feb. 8-22.....	16,542		7.60		12.05		--	--	2.87	11.34				1,140	1.55	25,647	61	6.18	1,920	--

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

Chemical analyses, water year October 1963 to September 1964--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. 23-29, 1964	7,220		7.00		13.14		--	--	3.23	12.69				1,240	1.69	12,176	65	7.02	2,070	--
Mar. 1-20	21,263		7.10		13.14		--	--	3.23	12.69				1,220	1.66	35,279	65	6.97	2,090	--
Mar. 21-31	12,720		6.50		11.96		--	--	2.87	11.90				1,120	1.52	19,375	65	6.64	1,920	--
Apr. 1-4	4,443		6.70		13.70		--	--	3.02	13.54				1,200	1.63	7,251	67	7.49	2,080	--
Apr. 5-7	11,086		3.72		4.31		--	--	1.56	4.01				485	.66	7,312	54	3.16	828	--
Apr. 8-9	3,166		5.36		9.31		--	--	2.39	9.03				900	1.22	3,875	63	5.69	1,520	--
Apr. 10-21	12,377		6.50		12.75		--	--	3.02	12.69				1,170	1.59	19,694	66	7.07	2,010	--
Apr. 22	3,074		3.28		3.83		--	--	1.29	3.53				430	.58	1,798	54	2.99	753	--
Apr. 23-25	4,814		5.80		11.48		--	--	2.66	11.62				1,070	1.46	7,005	66	6.74	1,830	--
Apr. 26-27	8,668		3.44		A 4.52		--	--	1.31	4.34				512	.70	6,036	57	3.45	861	--
Apr. 28-30	6,200		4.48		7.40		--	--	2.00	7.19				743	1.01	6,265	62	4.94	1,260	--
May 1-6	7,628		5.80		11.22		--	--	2.81	11.06				1,050	1.43	10,893	66	6.59	1,820	--
May 7-10	19,613		3.36		4.13		--	--	1.27	3.89				468	.64	12,483	55	3.19	813	--
May 11-15	8,549		5.28		9.09		--	--	2.44	8.80				877	1.19	10,196	63	5.60	1,500	--
May 16-28	13,718		7.20		12.53		--	--	3.12	12.92				1,140	1.55	21,268	64	6.60	2,010	--
May 29-31	9,086		3.84		4.96		--	--	1.58	4.77				522	.71	6,451	56	3.58	936	--
June 1-6	18,006		4.00		5.48		2.56	0.07	1.48	5.78				757	1.03	18,537	58	3.88	1,050	8.4
June 7	4,364		2.88		2.74		1.90	.07	.96	2.62				382	.52	2,267	49	2.28	594	8.4
June 8-17	18,803		5.68		8.00		2.75	.27	3.33	7.56				964	1.31	24,652	58	4.75	1,430	8.4
June 18-21	13,107		4.32		5.09		2.36	.07	2.85	4.23				662	.90	11,800	54	3.46	988	8.4
June 22-26	7,874		6.00		9.40		2.75	.27	4.06	8.46				1,020	1.39	10,923	61	5.42	1,590	8.5
June 27-30	4,681		6.88		12.18		3.15	.40	4.27	11.28				1,220	1.66	7,767	64	6.57	1,940	8.5
July 1	1,736		5.52		9.40		2.82	.27	22.90	8.18				958	1.30	2,261	63	5.66	1,500	8.5
July 2-3	6,347		3.20		4.00		2.10	.13	1.69	3.27				496	.67	4,282	56	3.16	750	8.3
July 4-7	5,570		5.24		8.18		2.95	.13	2.81	7.76				890	1.21	6,741	61	5.05	1,430	8.3
July 8-21	10,108		6.20		11.96		2.95	.33	3.44	11.71				1,140	1.55	15,671	66	6.79	1,890	8.5
July 22-31	4,304		6.68		13.62		2.88	.13	3.33	14.33				1,300	1.77	7,610	67	7.45	1,960	8.3
Aug. 1-7	2,055		7.00		16.66		--	--	3.50	16.93				1,480	2.01	4,136	70	8.91	2,450	--
Aug. 8-10	1,476		4.10		11.53		--	--	2.91	11.06				990	1.35	1,987	74	8.05	1,680	--
Aug. 11-12	2,055		4.30		6.18		--	--	2.14	5.22				642	.87	1,794	59	4.21	1,060	--

A Calculated Na plus K, reported as Na.

Aug. 13-18, 1964	5,117		4.80	10.79		--	--	2.33	10.44				954	1.30	6,639	69	6.96	1,610	--
Aug. 19.....	2,896		4.20	7.83		--	--	1.58	7.05				728	.99	2,867	65	5.40	1,220	--
Aug. 20.....	4,602		1.96	2.44		--	--	.73	2.09				299	.41	1,871	55	2.46	463	--
Aug. 21.....	2,003		3.04	4.18		--	--	1.27	3.39				464	.63	1,264	58	3.39	775	--
Aug. 22-25.....	5,300		4.40	8.40		--	--	1.98	7.56				768	1.04	5,536	66	5.66	1,300	--
Aug. 26-28.....	16,661		2.08	2.65		--	--	.87	2.45				298	.41	6,752	56	2.60	506	--
Aug. 29-31.....	25,027		1.12	1.96		--	--	.60	1.72				210	.29	7,148	64	2.62	338	--
Sept. 1.....	4,760		2.40	2.96		--	--	1.04	2.74				363	.49	2,350	55	2.70	578	--
Sept. 2-5.....	7,156		3.76	5.48		--	--	1.50	5.36				577	.78	5,616	59	4.00	997	--
Sept. 6-9.....	3,491		7.40	8.83		--	--	2.04	8.46				824	1.12	3,912	54	4.59	1,400	--
Sept. 10-11.....	1,369		5.70	10.74		--	--	2.39	10.86				1,000	1.36	1,861	65	6.36	1,690	--
Sept. 12-16.....	7,398		4.00	6.26		--	--	1.73	6.49				631	.86	6,349	61	4.43	1,100	--
Sept. 17-20.....	15,550		2.68	2.65		--	--	.96	2.31				336	.46	7,106	50	2.29	567	--
Sept. 21-23.....	5,373		3.60	5.74		--	--	1.56	5.33				570	.78	4,165	61	4.28	974	--
Sept. 24-30.....	6,359		5.70	9.92		--	--	2.19	9.73				914	1.24	7,905	64	5.87	1,570	--
Total or weighted average	579,600		4.95	8.07		--	--	2.26	7.77				806	1.10	635,600	62	4.93	1,348	--

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ARKANSAS RIVER BASIN--Continued

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

LOCATION.--At gaging station near right bank on downstream side of pier of 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 1964.
Water temperatures: October 1945 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 4,680 micromhos Feb. 28; minimum daily, 104 micromhos May 10.
Percent sodium: Maximum, 96 Apr. 21-24; minimum, 35 June 16-20.
Sodium-adsorption-ratio: Maximum, 15.87 Feb. 25 to May 1; minimum, 1.11 May 10.
EXTREMES, 1945-64: Specific conductance: Maximum daily, 8,980 micromhos Apr. 1, 1954; minimum daily, 104 micromhos May 10, 1964.
Percent sodium: Maximum, 96 Apr. 21-24, 1964; minimum, 18 July 22, 1959.
Sodium-adsorption-ratio (1961-64): Maximum, 15.87 Feb. 25 to Mar. 1, 1964; minimum, 1.11 May 10, 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Little Rock, Ark.

Chemical analyses, water year October 1963 to September 1964

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, 1963..	55,440	11	3.29	1.23	8.05	0.13	2.72	0.07	1.77	8.27	0.03	0.02	--	771	1.05	58,132	63	5.35	1,390	8.5
Oct. 8-13.....	38,523	11	4.29	1.65	13.53	.17	3.08	.33	2.48	13.54	.04	.03	--	1,160	1.58	60,774	69	7.85	2,070	8.6
Oct. 14-16.....	12,121	9.2	3.89	1.65	9.14	.12	2.84	.50	2.10	9.45	.04	.02	--	886	1.20	14,605	62	5.49	1,590	8.6
Oct. 17-28.....	60,194	9.8	4.89	2.06	17.05	.18	3.38	.47	2.85	17.35	.06	.02	--	1,440	1.96	117,885	71	9.15	2,550	8.6
Oct. 29-Nov. 1..	43,160	12.0	2.89	1.23	10.70	.14	2.18	.10	1.83	11.06	.04	.06	--	924	1.26	54,237	71	7.45	1,690	8.4
Nov. 2-8.....	44,305	11	3.09	.99	7.74	.14	2.26	.17	1.79	7.76	.03	.06	--	741	1.01	44,649	65	5.42	1,330	8.4
Nov. 9-17.....	30,044	11	4.29	1.73	12.53	.17	3.06	.30	2.37	12.95	.05	.04	--	1,130	1.54	46,171	67	7.22	2,000	8.5
Nov. 18-Dec. 10.	96,577	11	4.64	2.22	15.88	.14	3.49	.00	2.81	16.64	.08	.03	0.16	1,380	1.88	181,256	69	8.57	2,510	8.0
Dec. 11.....	4,086	--	6.39	2.80	--	--	3.34	.33	--	27.03	--	--	--	1,900	2.58	10,558			3,450	8.5
Dec. 12-22.....	42,720	8.7	4.89	2.22	16.88	.13	3.59	.00	2.71	18.05	.07	.03	--	1,440	1.96	83,663	70	8.95	2,620	8.2
Dec. 23-31.....	19,922	10	4.94	1.97	15.36	.16	3.72	.13	2.39	15.80	.06	.04	--	1,340	1.82	36,306	68	8.26	2,320	8.4
Jan. 1-22, 1964.	78,764	8.4	5.69	2.30	19.84	.18	3.95	.00	3.44	20.31	.07	.04	--	1,680	2.28	179,959	71	9.92	2,890	8.2
Jan. 23-30.....	28,879	7.3	5.54	2.47	24.71	.19	3.82	.00	3.44	26.09	.06	.04	--	1,990	2.71	78,159	75	12.35	3,520	8.1
Jan 31-Feb. 24..	128,132	8.7	4.44	2.06	19.05	.12	3.15	.13	2.89	19.80	.05	.03	--	1,520	2.07	264,875	74	10.57	2,780	8.4
Feb. 25-Mar. 1..	22,814	4.8	5.29	2.30	30.93	.16	3.26	.17	3.77	31.31	.08	.02	--	2,280	3.10	70,741	80	15.87	4,140	8.4
Mar. 2-8.....	25,686	4.3	5.09	2.39	24.66	.13	3.51	.00	3.73	24.77	.08	.02	--	1,900	2.58	66,372	76	12.76	3,420	8.2
Mar. 9-26.....	264,305	4.3	2.40	.99	8.92	.07	1.70	.00	1.54	9.20	.04	.03	.10	736	1.00	264,559	72	6.86	1,410	8.0
Mar. 27-31.....	21,421	15	3.74	1.56	14.22	.11	2.59	.13	2.33	14.47	.02	.03	--	1,190	1.62	34,669	72	8.73	2,160	8.4
Apr. 1-3.....	13,966	6.9	3.89	1.73	16.62	.07	2.98	.00	2.35	17.21	.03	.01	--	1,340	1.82	25,451	74	9.91	2,370	8.1
Apr. 4.....	28,364	--	--	--	--	--	--	--	--	5.78	--	--	--	555	.75	21,409	--	--	972	--

Apr. 5, 1964....	66,843	--	--	--	--	--	--	--	--	0.87	--	--	--	129	.18	11,727	--	--	192	--
Apr. 6.....	92,033	--	--	--	--	--	--	--	--	1.38	--	--	--	212	.29	26,535	--	--	316	--
Apr. 7.....	124,562	--	--	--	--	--	--	--	--	5.30	--	--	--	610	.83	103,337	--	--	911	--
Apr. 8-10.....	262,413	11	1.50	.62	2.61	.10	1.38	.00	.65	2.60	.03	.04	--	344	.47	122,767	54	2.54	508	7.8
Apr. 11-12.....	108,496	11	2.35	.82	3.48	.09	2.03	.07	.75	3.84	.02	.05	--	440	.60	64,924	52	2.77	734	8.3
Apr. 13-20.....	143,207	11	2.30	.99	5.35	.08	1.87	.00	1.31	5.70	.03	.03	--	543	.74	105,755	61	4.18	949	7.8
Apr. 21-24.....	36,575	9.4	2.69	1.32	9.61	.09	2.26	.00	1.60	8.89	.02	.01	--	796	1.08	39,595	96	6.79	1,360	8.0
Apr. 25.....	12,238	--	1.15	.46	--	--	1.02	.00	--	2.12	--	--	--	256	.35	4,261	--	--	449	8.0
Apr. 26.....	12,238	--	1.65	.82	--	--	1.48	.00	--	4.65	--	--	--	455	.62	7,573	--	--	798	8.1
Apr. 27-28.....	21,045	--	1.25	.64	2.78	.06	1.18	.00	.62	2.71	.01	.02	--	320	.44	9,159	59	2.86	533	8.0
Apr. 29.....	10,195	--	1.75	.52	--	--	1.38	.00	--	4.09	--	--	--	409	.56	5,671	--	--	718	8.1
Apr. 30-May 3...	49,603	8.1	2.40	1.15	8.35	.08	2.03	.00	1.52	8.80	.03	.01	--	732	1.00	49,380	70	6.27	1,310	7.8
May 4-6.....	33,757	8.1	2.45	1.07	5.61	.13	2.10	.00	1.31	5.92	.02	.01	--	540	.73	24,791	61	4.23	992	8.0
May 7.....	11,326	--	2.94	1.15	--	--	2.13	.10	--	8.04	--	--	--	741	1.01	11,414	--	--	1,300	8.3
May 8.....	10,631	--	2.54	.99	--	--	2.08	.07	--	6.07	--	--	--	616	.84	8,907	--	--	1,080	8.3
May 9.....	11,782	--	2.10	.82	--	--	1.82	.10	--	4.37	--	--	--	473	.64	7,579	--	--	830	8.3
May 10.....	25,983	--	.52	.57	.02	.43	.00	.13	.42	.01	.07	--	62	.08	2,191	51	1.11	104	7.4	
May 11.....	87,074	--	.65	.19	--	--	.61	.00	--	.82	--	--	--	89	.12	10,539	--	--	191	7.7
May 12.....	108,496	--	1.20	.35	--	--	1.10	.00	--	1.81	--	--	--	214	.29	31,577	--	--	375	8.0
May 13.....	85,289	--	1.25	.49	--	--	1.18	.00	--	2.03	--	--	--	249	.34	28,882	--	--	436	8.0
May 14.....	74,579	--	1.55	.49	--	--	1.33	.00	--	2.48	--	--	--	288	.39	29,211	--	--	505	8.1
May 15.....	73,587	--	1.80	.57	--	--	1.51	.00	--	3.89	--	--	--	404	.55	40,432	--	--	708	8.1
May 16.....	65,058	--	2.64	.90	--	--	2.16	.07	--	7.67	--	--	--	718	.98	63,528	--	--	1,260	8.3
May 17.....	48,793	--	2.10	.72	--	--	1.84	.00	--	5.59	--	--	--	554	.75	36,763	--	--	972	8.2
May 18-23.....	120,674	12	1.90	.74	3.74	.08	1.87	.00	.94	3.67	.03	.04	--	404	.55	66,303	58	3.26	689	7.8
May 24-25.....	17,931	--	2.59	.82	4.92	.09	.85	.00	1.19	5.02	.02	1.32	--	561	.76	13,680	58	3.76	936	7.6
May 26.....	7,339	--	2.94	.99	--	--	2.33	.07	--	6.77	--	--	--	667	.91	6,657	--	--	1,170	8.3
May 27-June.....	38,083	8.8	3.34	1.23	9.57	.12	2.92	.00	1.81	9.53	.03	.00	--	836	1.14	43,298	67	6.33	1,490	8.1
June 2-5.....	34,338	8.8	3.99	1.97	14.53	.13	3.21	.00	2.33	14.95	.04	.00	--	1,250	1.70	58,374	70	8.41	2,130	8.1
June 6-14.....	124,191	11	3.19	1.40	8.27	.14	2.49	.00	1.83	8.60	.02	.05	--	780	1.06	131,742	64	5.45	1,380	8.1

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1963 to September 1964--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 15, 1964...	52,562	--	3.34	1.15	--	--	2.26	0.00	--	14.81	--	--	--	1,210	1.65	86,496	--	--	2,130	8.2
June 16-20.....	664,264	11	2.20	.68	1.61	0.08	1.90	.00	0.98	1.64	0.03	0.02	--	280	.38	252,952	35	1.34	476	7.8
June 21-23.....	131,921	6.9	2.30	.78	2.70	.14	1.90	.00	1.23	2.76	.03	.03	--	364	.50	65,306	46	2.17	615	7.8
June 24-25.....	96,992	16	2.69	.81	5.05	.10	2.23	.13	1.37	4.71	.02	.07	--	559	.76	73,737	58	3.81	932	8.3
June 26-July 7..	378,922	6.9	2.45	.82	2.87	.09	2.07	.00	1.33	2.88	.04	.04	--	392	.53	202,011	46	2.25	649	7.8
July 8-14.....	91,373	4.4	2.79	1.23	6.66	.10	2.10	.00	1.85	6.71	.06	.04	--	660	.90	82,016	62	4.69	1,110	7.9
July 15.....	7,339	--	3.14	1.15	--	--	2.25	.03	--	9.03	--	--	--	900	1.22	8,983	--	--	1,500	8.3
July 16.....	8,132	--	2.35	.90	--	--	1.88	.00	--	5.64	--	--	--	612	.83	6,769	--	--	1,020	8.2
July 17-18.....	19,438	4.5	3.09	1.32	9.74	.03	2.36	.07	1.81	10.04	.03	.03	--	900	1.22	23,792	69	6.56	1,580	8.3
July 19.....	13,190	--	2.69	.90	--	--	2.05	.00	--	5.36	--	--	--	618	.84	11,086	--	--	1,030	8.2
July 20-29.....	92,291	4.1	2.30	.82	2.78	.08	1.87	.00	1.35	2.82	.05	.02	--	357	.49	44,809	47	2.23	634	7.6
July 30.....	9,997	--	2.45	.82	--	--	1.67	.00	--	4.74	--	--	--	522	.71	7,097	--	--	870	8.1
July 31-Aug. 3..	36,893	6.1	2.05	.72	2.13	.09	1.77	.00	1.10	2.03	.03	.05	--	300	.41	15,052	43	1.81	545	8.1
Aug. 4.....	5,157	--	2.20	.90	--	--	1.56	.07	--	3.53	--	--	--	443	.60	3,107	--	--	738	8.3
Aug. 5.....	5,355	--	2.05	.99	--	--	1.80	.07	--	2.26	--	--	--	359	.49	2,615	--	--	598	8.4
Aug. 6.....	9,164	--	2.20	.82	--	--	1.46	.07	--	3.53	--	--	--	478	.65	5,957	--	--	797	8.3
Aug. 7-10.....	38,360	8.7	2.15	.72	1.96	.09	1.93	.00	1.12	1.86	.03	.03	0.00	296	.40	15,442	40	1.63	537	8.2
Aug. 11-12.....	8,846	12	2.69	.82	3.44	.12	2.29	.13	1.29	3.16	.02	.03	--	425	.58	5,113	49	2.59	746	8.3
Aug. 13.....	7,339	--	2.30	.74	--	--	1.97	.13	--	1.75	--	--	--	322	.44	3,214	--	--	536	8.4
Aug. 14.....	6,149	--	4.14	.29	--	--	2.10	.20	--	6.49	--	--	--	696	.95	5,820	--	--	1,160	8.5
Aug. 15.....	5,752	--	2.30	.82	--	--	1.93	.13	--	2.03	--	--	--	353	.48	2,761	--	--	588	8.4
Aug. 16-18.....	21,225	10	2.64	.90	3.74	.12	2.07	.13	1.48	3.81	.04	.03	--	459	.62	13,250	51	2.81	822	8.4
Aug. 19.....	7,914	--	2.25	.82	---	--	2.07	.07	--	2.12	--	--	--	346	.47	3,724	--	--	577	8.4
Aug. 20.....	11,782	--	3.49	1.23	--	--	1.90	.13	--	8.18	--	--	--	804	1.09	12,883	--	--	1,340	8.4
Aug. 21-22.....	24,476	12	2.54	.76	3.44	.12	2.00	.13	1.27	3.36	.03	.05	--	422	.57	14,047	50	2.67	740	8.4
Aug. 23-24.....	26,420	8.5	3.24	1.07	8.35	.13	2.10	.13	1.73	8.75	.05	.06	--	815	1.11	29,284	65	5.69	1,430	8.4
Aug. 25-27.....	37,666	16	2.50	.82	5.74	.11	1.93	.07	1.37	5.78	.04	.05	--	580	.79	29,711	63	4.46	1,030	8.4
Aug. 28.....	23,008	--	2.15	.66	--	--	1.64	.07	--	4.09	--	--	--	475	.65	14,863	--	--	791	8.3
Aug. 29.....	29,752	--	2.30	.67	--	--	1.87	.13	--	2.26	--	--	--	358	.49	14,486	--	--	597	8.4
Aug. 30-31.....	67,240	13	2.69	.82	6.79	.11	1.90	.07	1.23	6.97	.03	.07	--	670	.91	61,269	65	5.12	1,180	8.3

Sept. 1, 1964...	55,140	--	2.79	.82	--	--	1.74	.07	--	11.85	--	--	--	1,020	1.39	76,491	--	--	1,700	8.3
Sept. 2-3.....	110,479	14	1.85	.49	3.61	.11	1.61	.07	.67	3.64	.03	.06	--	407	.55	61,153	60	3.34	714	8.3
Sept. 4-8.....	197,752	9.6	1.75	.56	2.18	.10	1.57	.07	.71	2.06	.03	.06	--	286	.39	76,918	47	2.03	506	8.3
Sept. 9-12.....	67,636	10	2.05	.63	4.13	.12	1.74	.07	.96	4.01	.03	.05	--	416	.57	38,266	60	3.58	763	8.3
Sept. 13.....	15,709	--	2.50	.73	--	--	1.80	.13	--	5.42	--	--	--	579	.79	12,370	--	--	965	8.4
Sept. 14.....	11,107	--	2.59	.81	--	--	1.97	.07	--	6.83	--	--	--	684	.93	10,333	--	--	1,140	8.4
Sept. 15.....	8,529	--	2.40	.74	--	--	1.97	.13	--	3.72	--	--	--	470	.64	5,452	--	--	784	8.4
Sept. 16-17.....	24,357	14	2.79	.82	6.53	.09	2.16	.20	1.44	6.63	.01	.03	--	650	.88	21,532	64	4.85	1,140	8.6
Sept. 18.....	12,694	--	2.45	.65	--	--	1.97	.07	--	3.16	--	--	--	428	.58	7,389	--	--	714	8.3
Sept. 19-21.....	40,683	7.0	2.69	.78	5.66	.08	2.13	.07	1.35	5.87	.01	.03	--	569	.77	31,482	61	4.29	1,050	8.4
Sept. 22-24.....	43,914	7.6	2.30	.69	4.00	.08	1.97	.07	1.10	3.95	.00	.03	--	436	.59	26,039	57	3.28	796	8.4
Sept. 25-29.....	96,912	8.2	1.90	.60	2.44	.09	1.64	.07	.94	2.37	.01	.03	--	312	.42	41,122	49	2.18	557	8.3
Sept. 30.....	15,174	--	2.54	.90	--	--	1.97	.07	--	4.37	--	--	--	510	.69	10,524	--	--	850	8.4
Total or weighted average	5,617,000	9.4	2.54	0.95	6.93	0.10	2.02	0.04	1.43	5.95	0.04	0.04	--	578	0.79	4,418,000	56	4.71	1,010	8.0

RED RIVER BASIN

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

LOCATION.--At gaging station, immediately below Denison Dam, 1.7 miles upstream from Sand Creek, and 4 miles northwest of Denison, Grayson County.
DRAINAGE AREA.--39,719 square miles, of which 5,936 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: May 1944 to September 1964.
Water temperatures: October 1945 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,580 micromhos Oct. 18; minimum daily, 1,870 micromhos Oct. 1.
Percent sodium: Maximum, 61 Sept. 1-30; minimum, 57 Nov. 1-30, Jan. 1 to Feb. 29, Apr. 1 to July 31.
Sodium-adsorption-ratio: Maximum, 6.34 Sept. 1-30; minimum, 5.36 Nov. 1-30.
EXTREMES, 1944-64.--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.
Sodium-adsorption-ratio: Maximum, 6.34 Sept. 1-30, 1964; minimum, 4.48 July 1-31, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	66,345	9.3	5.69	2.88	11.96	0.15	2.00	0.00	6.31	12.69	0.02	0.02		1,250	1.70	112,787	58	5.78	2,160	6.9
Nov. 1-30.....	47,782	8.4	5.54	2.88	11.01	--	2.13	.00	5.93	11.34	.02	.00		1,160	1.58	75,381	57	5.36	2,000	7.4
Dec. 1-31.....	68,067	7.7	6.09	2.14	11.57	--	2.21	.00	5.98	11.57	.02	.02		1,190	1.62	110,159	56	5.71	2,020	8.0
Jan. 1-31, 1964.	75,445	8.2	5.59	2.71	11.35	.15	2.16	.00	6.08	11.79	.02	.02		1,200	1.63	123,127	57	5.57	2,040	8.0
Feb. 1-29.....	61,564	8.9	5.39	3.21	11.27	--	2.16	.00	6.04	11.62	.02	.02		1,180	1.60	130,894	57	5.43	2,030	7.4
Mar. 1-31.....	66,530	7.8	5.44	2.88	11.66	--	2.16	.00	6.00	11.79	.02	.02		1,190	1.62	107,671	58	5.72	2,040	7.3
Apr. 1-30.....	95,088	8.6	5.49	3.04	11.70	.15	2.20	.00	6.00	11.71	.02	.03		1,200	1.63	155,183	57	5.67	2,030	7.8
May 1-31.....	101,639	7.4	5.54	3.13	11.46	--	2.26	.00	6.12	11.71	.03	.02		1,200	1.63	165,875	57	5.52	2,020	7.0
June 1-30.....	118,651	8.8	5.69	2.80	11.31	--	2.26	.00	5.93	11.57	.02	.02		1,180	1.60	190,412	57	5.49	2,030	7.4
July 1-31.....	154,272	9.1	5.44	2.96	11.31	.16	2.25	.00	6.04	11.71	.03	.02		1,190	1.62	249,674	57	5.52	2,020	7.4
Aug. 1-31.....	150,645	8.3	5.44	2.96	11.83	--	2.13	.00	5.91	12.13	.03	.02		1,210	1.65	247,901	58	5.77	2,060	7.3
Sept. 1-30.....	70,036	8.1	5.49	2.88	12.96	--	2.62	.00	6.25	12.41	.02	.03		1,270	1.73	120,967	61	6.34	2,060	7.3
Total or weighted average	1,096,064	8.4	5.55	2.90	11.60	--	2.21	0.00	6.04	11.84	0.02	0.02		1,200	1.63	1,790,000	58	5.64	2,040	7.3

7-3310. WASHITA RIVER NEAR DURWOOD, OKLA.

LOCATION.--At gaging station at bridge on State Highway 18, 1.3 miles downstream from Caddo Creek, and 4 miles north of Durwood, Carter County, and at mile 63.4.
DRAINAGE AREA.--7,202 square miles.
RECORDS AVAILABLE.--Chemical analyses: May 1944 to September 1964.
Water temperatures: April 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,120 micromhos Nov. 15; minimum daily, 328 micromhos Aug. 18.
Percent sodium: Maximum, 42 Aug. 1-14; minimum, 13 Apr. 1-4.
Sodium-adsorption-ratio: Maximum, 2.71 Aug. 1-14; minimum, 0.44 May 10-11.
EXTREMES, 1944-64.--Specific conductance: Maximum daily, 2,120 micromhos Nov. 15, 1963; minimum daily, 94.9 micromhos Nov. 2, 1951.
Percent sodium: Maximum, 42 Aug. 1-14, 1964; minimum, 13 Apr. 1-4, 1964.
REMARKS.--Sodium (Na) and potassium (K) values are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla.

Chemical analyses, water year October 1963 to September 1964

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, 1963..	843		3.89	2.30	2.52		2.16	0.00	4.37	2.17				571	0.78	654	29	1.43	871	8.2
Oct. 8-15.....	473		4.69	2.96	3.57		2.62	.00	5.93	2.71				727	.99	468	32	1.82	1,050	8.2
Oct. 16-27.....	409		4.49	3.37	4.65		3.02	.00	5.73	3.81				794	1.08	442	37	2.35	1,180	8.2
Oct. 28-31.....	141		5.09	4.69	5.26		3.02	.00	7.12	4.91				963	1.31	185	35	2.38	1,410	8.2
Nov. 1-18.....	1,292		13.60		6.35		2.75	.00	12.18	5.02				1,360	1.85	2,390	32	2.44	1,800	8.2
Nov. 19-23.....	1,150		8.80		4.09		2.85	.07	6.20	3.75				838	1.14	1,311	32	1.95	1,220	8.3
Nov. 24.....	432		8.10		2.83		2.92	.33	5.45	2.23				692	.94	407	26	1.40	991	8.6
Nov. 25.....	317		12.00		5.39		1.57	.07	9.58	6.15				1,430	1.94	617	31	2.20	1,630	8.3
Nov. 26-27.....	532		9.70		2.57		3.11	.33	6.29	2.54				744	1.01	538	21	1.17	1,110	8.5
Nov. 28-30.....	649		12.60		3.57		3.51	.27	8.85	3.53				1,050	1.43	926	22	1.42	1,420	8.4
Dec. 1-15.....	3,094		12.60		4.70		3.21	.40	9.58	4.09				1,120	1.52	4,713	27	1.87	1,540	8.6
Dec. 16-31.....	3,364		12.40		4.70		3.28	.07	9.58	4.18				1,090	1.48	4,987	27	1.89	1,520	8.3
Jan. 1-10, 1964.	2,261		12.20		4.87		2.16	.13	10.83	3.95				1,130	1.54	3,475	29	1.97	1,540	8.4
Jan. 11-31.....	4,499		14.20		5.13		2.95	.33	11.66	4.37				1,290	1.75	7,892	27	1.93	1,700	8.5
Feb. 1-4.....	1,285		13.50		4.48		3.25	.47	9.89	4.37				1,200	1.63	2,098	25	1.72	1,620	8.6

RED RIVER BASIN--Continued

7-3310. WASHITA RIVER NEAR DURWOOD, OKLA.--Continued

Chemical analyses, water year October 1963 to September 1964--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. 5-16, 1964.	7,640		11.60	3.87		2.69	0.27	9.26	3.24				1,050	1.43	10,910	25	1.61	1,400	8.4
Feb. 17-21.....	2,003		9.60	2.87		2.56	.13	7.04	2.76				838	1.14	2,283	23	1.31	1,160	8.3
Feb. 22-29.....	2,507		12.40	3.74		2.92	.27	9.79	3.16				1,080	1.47	3,682	23	1.50	1,440	8.5
Mar. 1-10.....	3,372		13.40	4.31		3.21	.40	10.41	3.67				1,160	1.58	5,320	24	1.66	1,540	8.6
Mar. 11-15.....	3,352		9.20	3.44		3.38	.33	6.04	2.88				805	1.09	3,670	27	1.60	1,130	8.5
Mar. 16-31.....	5,585		12.30	3.87		3.08	.40	9.16	3.53				1,050	1.43	7,976	24	1.56	1,430	8.5
Apr. 1-4.....	1,127		12.90	1.96		2.82	.33	10.20	1.50				1,160	1.58	1,777	13	.77	1,540	8.5
Apr. 5.....	3,828		5.48	1.31		2.56	.20	2.91	1.13				600	.82	3,124	19	.79	866	8.5
Apr. 6-7.....	6,085		2.64	1.17		1.57	.07	1.31	.85				232	.32	1,920	31	1.02	379	8.4
Apr. 8-9.....	1,749		3.92	2.22		1.25	.00	3.27	1.64				448	.61	1,066	36	1.58	612	8.2
Apr. 10-15.....	2,428		8.00	3.13		1.77	.13	6.56	2.65				753	1.02	2,486	28	1.57	1,060	8.4
Apr. 16-30.....	4,879		12.20	4.18		2.16	.27	10.24	3.70				1,120	1.52	7,432	26	1.69	1,480	8.3
May 1-3.....	1,511		16.10	4.57		2.03	.27	14.47	3.89				1,440	1.96	2,960	22	1.61	1,760	8.4
May 4-5.....	702		6.04	2.13		2.03	.13	4.37	1.64				580	.79	554	26	1.23	798	8.5
May 6-9.....	4,157		9.40	2.61		2.23	.13	7.54	2.09				822	1.12	4,648	22	1.20	1,100	8.4
May 10-11.....	43,240		2.84	.52		1.97	.13	.83	.45				206	.28	12,114	16	.44	337	8.5
May 12-13.....	17,950		5.64	.91		2.39	.07	3.41	.68				438	.60	10,693	14	.54	601	8.4
May 14-31.....	35,131		6.66	1.35		2.56	.07	4.33	1.07				552	.75	26,374	17	.74	754	8.4
June 1-5.....	10,413		5.32	1.44		2.43	.27	2.96	1.10				437	.59	6,189	21	.88	647	8.4
June 6-14.....	6,426		9.00	2.35		2.49	.27	6.77	1.81				738	1.00	6,450	21	1.11	1,020	8.4
June 15.....	962		3.32	1.04		2.07	.07	1.50	.73				277	.38	362	24	.81	442	8.3
June 16-19.....	3,269		5.12	1.70		2.36	.13	3.02	1.30				438	.60	1,947	25	1.06	661	8.4

June 20-25, 1964	4,570		9.60	2.26		2.49	.07	7.70	1.61				798	1.09	4,960	19	1.03	1,070	8.3
June 26-30.....	1,805		5.60	1.52		2.49	.13	3.33	1.18				473	.64	1,161	21	.91	683	8.3
July 1-7.....	1,205		7.40	2.39		2.75	.13	5.04	1.89				641	.87	1,051	24	1.24	919	8.8
July 8-31.....	724		8.40	3.35		2.95	.20	5.62	2.99				758	1.03	746	29	1.63	1,090	8.4
Aug. 1-14.....	17		7.04	5.09		2.88	.00	4.27	4.96				744	1.01	17	42	2.71	1,270	8.2
Aug. 15-16.....	102		4.08	1.22		2.10	.00	2.19	1.02				448	.61	62	23	.85	700	7.9
Aug. 17.....	323		6.60	3.87		2.49	.00	4.75	3.24				664	.90	292	37	2.13	1,040	8.1
Aug. 18.....	1,432		2.48	.74		2.03	.00	.77	.42				190	.26	370	23	.66	328	8.0
Aug. 19-22.....	2,785		2.96	1.78		1.97	.00	1.52	1.24				286	.39	1,083	38	1.47	438	8.1
Aug. 23-27.....	7,498		6.24	.96		1.90	.00	4.79	.51				462	.63	4,711	13	.54	660	8.0
Aug. 28-31.....	5,792		3.16	.87		1.90	.00	1.44	.68				258	.35	2,032	22	.69	405	8.0
Sept. 1-8.....	3,158		3.95	1.13		1.97	.00	2.27	.87				322	.44	1,383	22	.80	503	8.1
Sept. 9-15.....	769		6.68	2.44		2.43	.00	4.79	1.92				586	.80	613	27	1.33	856	8.2
Sept. 16-28.....	24,573		3.56	1.17		2.29	.00	1.39	1.07				303	.41	10,126	25	.88	480	8.2
Sept. 29-30.....	3,078		4.88	1.74		2.59	.00	2.62	1.41				414	.56	1,733	26	1.11	631	8.2
Total or weighted average	246,900		6.48	1.84		2.36	0.13	4.31	1.53				552	0.75	185,400	21	0.96	777	8.3

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 12, 2.4 miles north of Ruliff, Newton County, 4.2 miles upstream from The Kansas City Southern Railway Co. bridge, 4.5 miles downstream from Cypress Creek, and at mile 40.
DRAINAGE AREA.--9,329 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1946, October 1947 to September 1964.
Water temperatures: October 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 514 micromhos Aug. 31; minimum daily, 81 micromhos Apr. 19.
Percent sodium: Maximum, 80 Aug. 24-31; minimum, 56 Apr. 1-7.
Sodium-adsorption-ratio: Maximum, 4.77 Aug. 24-31; minimum, 1.13 Apr. 28-30.
EXTREMES, 1945-46, 1947-64.--Specific conductance: Maximum daily, 774 micromhos Dec. 26, 1948; minimum daily, 28 micromhos Sept. 19, 1963.
Percent sodium: Maximum, 86 Dec. 26-27, 1948; minimum, 14 Sept. 18-22, 27, 1958.
Sodium-adsorption-ratio (1961-64): Maximum, 4.77 Aug. 24-31, 1964; minimum, 0.55 Sept. 18-21, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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. 1-9, 1963..	12,210	15	0.37	0.25	1.52	0.06	0.61	0.00	0.18	1.44	0.01	0.00		141	0.19	2,341	69	2.73	254	6.6
Oct. 10-31.....	16,058	19	.45	.27	1.87	--	.74	.00	.19	1.64	--	.00		164	.22	3,582	72	3.12	310	6.7
Nov. 1-4.....	2,499	16	.44	.26	2.00	--	.79	.00	.19	1.72	.02	.00		168	.23	571	74	3.38	306	7.0
Nov. 5-7.....	4,106	18	.36	.22	1.70	--	.62	.00	.17	1.50	--	.00		147	.20	821	74	3.15	254	6.9
Nov. 8-14.....	20,701	9.2	.22	.12	.87	--	.30	.00	.14	.76	--	.01		78	.11	2,196	71	2.09	137	6.5
Nov. 15-22.....	10,219	14	.32	.20	1.52	--	.51	.00	.18	1.35	--	.00		130	.18	1,807	74	2.98	227	6.7
Nov. 23-25.....	13,192	11	.23	.13	1.13	--	.31	.00	.13	1.02	--	.01		95	.13	1,704	76	2.66	169	6.8
Nov. 26-30.....	28,066	7.9	.21	.09	.52	--	.20	.00	.02	.59	--	.01		54	.07	2,061	64	1.35	107	6.6
Dec. 1-12.....	36,964	13	.27	.21	1.48	--	.43	.00	.20	1.30	.01	.01		125	.17	6,284	75	2.99	224	6.8
Dec. 13-14.....	9,203	13	.25	.17	1.13	--	.36	.00	.20	.96	--	.01		101	.14	1,264	73	2.46	175	7.2
Dec. 15-18.....	47,484	7.9	.15	.09	.52	--	.16	.00	.13	.48	--	.01		53	.07	3,423	68	1.51	91	6.8
Dec. 19-20.....	15,788	9.6	.20	.10	.74	--	.21	.00	.14	.68	--	.01		69	.09	1,482	71	1.91	124	6.9
Dec. 21-27.....	46,665	11	.20	.13	.78	--	.21	.00	.11	.82	--	.01		76	.10	4,823	70	1.91	145	6.9
Dec. 28-31.....	16,344	15	.39	.21	1.48	--	.36	.00	.35	13.82	--	.01		137	.19	3,045	71	2.69	239	7.3
Jan. 1-6, 1964..	20,029	13	.32	.20	1.13	.05	.26	.00	.29	1.16	.01	.01		114	.16	3,105	66	2.21	210	7.0
Jan. 7-18.....	74,642	12	.30	.14	.96	--	.23	.00	.25	.90	--	.01		93	.13	9,441	69	2.04	161	6.6
Jan. 19-31.....	147,336	10	.26	.14	.87	--	.20	.00	.25	.79	--	.01		83	.11	16,631	69	1.95	142	6.3
Feb. 1-9.....	55,535	13	.31	.21	.87	--	.25	.00	.27	.85	.01	.00		92	.13	6,949	62	1.70	164	6.8
Feb. 10-26.....	94,953	13	.42	.22	1.44	--	.30	.00	.42	1.35	--	.00		134	.18	17,304	69	2.53	243	6.3
Feb. 27-29.....	34,631	10	.26	.14	.74	--	.20	.00	.23	.71	--	.00		76	.10	3,580	65	1.65	135	6.6

Mar. 1-2, 1964..	18,268	11	.27	.16	.78	--	.18	.00	.29	.73	.01	.01		82	.11	2,037	64	1.67	145	6.5
Mar. 3-10.....	258,962	6	.16	.12	.52	--	.10	.00	.21	.48	.01	.01		54	.07	19,018	65	1.39	97	6.5
Mar. 11-14.....	70,770	10	.30	.18	.65	--	.13	.00	.35	.65	--	.01		78	.11	7,507	58	1.33	148	6.2
Mar. 15-31.....	249,419	11	.39	.26	1.00	--	.26	.00	.44	.93	--	.01		108	.15	36,635	61	1.76	195	6.2
Apr. 1-7.....	46,776	15	.45	.27	1.00	.06	.39	.00	.44	.96	.01	.00		120	.16	7,634	56	1.67	208	6.2
Apr. 8-17.....	175,160	9.9	.27	.21	.74	--	.26	.00	.31	.62	--	.01		80	.11	19,057	60	1.50	138	6.1
Apr. 18-24.....	123,862	8.4	.21	.15	.52	--	.21	.00	.20	.48	--	.00		59	.08	9,939	59	1.23	105	5.6
Apr. 25-27.....	28,818	12	.30	.22	.74	--	.34	.00	.27	.65	--	.01		84	.11	3,292	59	1.45	145	6.7
Apr. 28-30.....	56,487	8.4	.20	.16	.48	--	.23	.00	.18	.42	--	.01		57	.08	4,379	57	1.13	100	6.4
May 1-10.....	276,694	8.5	.25	.13	.61	--	.23	.00	.25	.51	.01	.00		66	.09	24,836	62	1.40	114	6.0
May 11-31.....	111,005	17	.55	.27	1.17	--	.56	.00	.35	1.10	--	.00		132	.18	19,928	59	1.83	231	6.2
June 1-5.....	38,380	12	.35	.21	1.13	--	.39	.00	.25	1.04	.01	.01		109	.15	5,689	67	2.13	197	7.0
June 6-9.....	25,071	9.3	.24	.14	.70	--	.31	.00	.20	.56	--	.01		71	.10	2,421	65	1.60	123	6.3
June 10-22.....	33,985	14	.40	.24	.91	--	.56	.00	.23	.76	--	.01		101	.14	4,668	59	1.62	175	6.6
June 23-30.....	14,297	17	.50	.30	1.44	--	.72	.00	.27	1.24	--	.00		143	.19	2,780	64	2.28	247	6.8
July 1-14.....	25,131	16	.45	.31	1.57	.07	.59	.00	.27	1.50	.01	.01		152	.21	5,195	65	2.54	272	6.5
July 15-31.....	28,223	14	.36	.18	1.13	--	.51	.00	.14	1.02	--	.01		108	.15	4,145	68	2.18	193	6.4
Aug. 1-10.....	12,417	16	.32	.20	1.09	--	.56	.00	.15	.87	.01	.01		106	.14	1,790	68	2.13	178	6.6
Aug. 11-23.....	13,924	18	.34	.24	1.31	--	.62	.00	.17	1.10	--	.01		124	.17	2,348	69	2.43	216	6.6
Aug. 24-31.....	13,139	14	.42	.28	2.83	--	.72	.00	.27	2.54	--	.00		216	.29	3,860	80	4.77	397	6.7
Sept. 1-4.....	4,951	14	.55	.33	2.96	--	.79	.00	.27	2.76	.01	.01		233	.32	1,569	77	4.46	436	6.4
Sept. 5-22.....	19,601	14	.36	.24	1.57	--	.66	.00	.20	1.30	--	.01		136	.18	3,625	72	2.86	242	6.5
Sept. 23-30.....	7,347	15	.30	.18	1.00	--	.49	.00	.14	.85	--	.01		98	.13	979	68	2.04	171	6.3
Total or weighted average	2,359,000	11	0.30	0.18	0.87	--	0.28	0.00	0.27	0.88	--	0.01		89	0.12	285,700	64	1.76	158	6.2

NECHES RIVER BASIN

8-410. NECHES RIVER AT EVADALE, TEX.

LOCATION (revised).--At gaging station at bridge on U.S. Highway 96 at Evadale, Jasper County, 0.8 mile upstream from Mill Creek, and 16 miles upstream from Village Creek. Prior to Nov. 9, 1963, at site 1.2 miles downstream.
DRAINAGE AREA (revised).--7,951 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1964.
Water temperatures: October 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 397 micromhos Aug. 27; minimum daily, 54 micromhos Nov. 25.
Percent sodium: Maximum, 70 Jan. 21-27; minimum, 42 Mar. 10-13.
Sodium-adsorption-ratio: Maximum, 2.72 Jan. 21-27; minimum, 70 Nov. 22-26.
EXTREMES, 1947-64.--Specific conductance: Maximum daily, 422 micromhos Jan. 25, 1957; minimum daily, 23 micromhos Sept. 19, 1963.
Percent sodium: Maximum, 76 Jan. 21-31, 1957; minimum, 14 June 4-18, 1950.
Sodium-adsorption-ratio (1961-64): Maximum, 2.72 Jan. 21-27, 1964; minimum, 0.40 Sept. 17-23, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	35,232	12	0.65	0.33	1.78	--	0.82	0.00	0.35	1.58	0.01	0.00		168	0.23	8,050	65	2.55	318	6.3
Nov. 1-4, 6-8...	6,720	15	.65	.31	1.70	--	.80	.00	.33	1.47	.02	.02		164	.22	1,499	64	2.45	287	6.8
Nov. 5.....	895	19	.50	.24	1.22	--	.69	.00	.27	.96	--	.02		129	.18	157	62	2.01	211	7.2
Nov. 9-21.....	11,036	14	.55	.25	1.31	--	.64	.00	.29	1.16	--	.01		132	.18	1,981	62	2.07	232	7.3
Nov. 22-26.....	18,436	5.9	.16	.10	.25	0.03	.16	.00	.17	.20	--	.01		38	.05	953	46	.70	61	6.6
Nov. 27-30.....	5,760	7.7	.21	.13	.52	--	.23	.00	.17	.45	--	.01		57	.08	447	60	1.26	98	6.9
Dec. 1-13.....	17,250	14	.49	.21	1.31	--	.56	.00	.33	1.10	.02	.01		130	.18	3,050	65	2.20	221	6.8
Dec. 14-18.....	24,496	9.7	.26	.14	.70	--	.23	.00	.25	.59	--	.01		73	.10	2,432	64	1.56	125	6.5
Dec. 19-31.....	38,729	12	.44	.20	1.39	--	.49	.00	.33	1.18	--	.01		129	.18	6,795	69	2.47	230	6.9
Jan. 1-16, 1964.	58,393	14	.46	.22	1.39	.07	.51	.00	.40	1.24	.01	.01		140	.19	11,118	65	2.39	247	6.9
Jan. 17-20.....	21,168	13	.35	.17	.87	--	.33	.00	.31	.76	--	.01		95	.13	2,735	63	1.70	161	7.2
Jan. 21-27.....	45,402	13	.42	.24	1.57	--	.43	.00	.44	1.33	--	.01		142	.19	8,768	70	2.72	252	6.9
Jan. 28-31.....	20,930	14	.40	.20	1.09	--	.49	.00	.40	.79	--	.01		112	.15	3,188	65	1.99	192	7.4
Feb. 1-29.....	136,784	15	.45	.17	1.04	--	.38	.00	.46	.79	.01	.01		112	.15	20,835	63	1.87	192	6.6
Mar. 1-2.....	13,706	12	.47	.20	1.22	--	.33	.00	.58	1.04	--	.01		128	.17	2,386	62	1.97	232	7.5
Mar. 3-4.....	30,228	10	.22	.22	.43	--	.21	.00	.25	.39	.01	.01		60	.08	2,467	49	.91	106	7.3
Mar. 5-9.....	150,347	7.6	.29	.25	.52	--	.21	.00	.27	.59	--	.00		69	.09	14,109	49	1.01	141	6.5
Mar. 10-13.....	54,680	9.6	.27	.29	.41	--	.26	.00	.29	.39	.01	.02		66	.09	4,908	42	.77	112	7.2

Mar. 14-22, 1964	88,007	11	.35	.25	.61	--	.33	.00	.37	.48	--	.03		82	.11	9,814	51	1.12	140	7.2
Mar. 23-31.....	109,035	12	.46	.32	.74	--	.31	.00	.54	.68	--	.01		102	.14	15,125	49	1.18	184	6.3
Apr. 1-15.....	163,815	14	.50	.28	.87	.07	.33	.00	.62	.73	.02	.01		117	.16	26,066	50	1.39	195	6.2
Apr. 16-30.....	201,362	12	.41	.27	.65	--	.36	.00	.46	.51	--	.02		91	.12	24,921	49	1.12	154	5.9
May 1-3.....	121,805	8.8	.44	.20	.61	--	.43	.00	.33	.45	.01	.01		80	.11	13,252	49	1.08	137	6.9
May 4-9.....	219,570	9.2	.27	.15	.37	.06	.33	.00	.23	.27	.01	.01		59	.08	17,618	43	.81	96	6.4
May 10-15.....	63,396	12	.39	.19	.44	--	.39	.00	.27	.34	--	.02		70	.10	6,035	43	.81	120	6.0
May 16.....	4,245	8.1	.50	.24	1.09	--	.56	.00	.37	.90	--	.00		113	.15	652	60	1.79	203	6.8
May 17-31.....	37,458	15	.50	.24	.74	--	.52	.00	.37	.56	--	.02		100	.14	5,094	50	1.22	165	6.1
June 1-30.....	90,268	16	.60	.26	1.13	--	.56	.00	.46	.96	.02	.00		131	.18	16,082	57	1.72	223	6.5
July 1-8.....	11,171	19	.65	.33	1.22	.08	.79	.00	.42	1.02	.02	.02		148	.20	2,248	54	1.74	245	6.5
July 9-15.....	18,341	16	.60	.28	1.39	--	.62	.00	.48	1.13	--	.02		146	.20	3,642	61	2.10	252	6.5
July 16-31.....	25,135	16	.60	.32	1.39	--	.69	.00	.44	1.18	--	.02		149	.20	5,093	60	2.05	263	6.4
Aug. 1-31.....	25,702	22	.70	.34	1.57	--	.90	.00	.37	1.30	.02	.02		168	.23	5,872	60	2.18	295	6.8
Sept. 1-30.....	19,934	20	.70	.38	1.96	--	1.18	.00	.33	1.47	.02	.02		186	.26	5,097	65	2.67	312	6.6
Total or weighted average	1,889,000	12.0	0.42	0.24	0.81	--	0.40	0.00	0.39	0.68	--	0.01		98	0.13	252,500	55	1.39	171	6.3

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, 1.9 miles downstream from Gulf, Colorado and Santa Fe Railway Co. bridge, and 3.7 miles downstream from Big Creek.
DRAINAGE AREA.--17,186 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to November 1949, February 1950 to September 1951, April 1953 to September 1964.
Water temperatures: February 1950 to September 1951, April 1953 to January 1959, March 1961 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,450 micromhos Oct. 21; minimum daily, 168 micromhos Mar. 4.
Percent sodium: Maximum, 75 Feb. 5-7; minimum, 29 Sept. 29-30.
Sodium-adsorption-ratio: Maximum, 7.13 Feb. 5-7; minimum, 0.98 Mar. 2-4.
EXTREMES, 1945-50, 1953-64.--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.
Sodium-adsorption-ratio: Maximum, 7.13 Feb. 5-7, 1964; minimum, 0.98 Mar. 2-4, 1964.
REMARKS.--Where no potassium (K) is reported, sodium and potassium are calculated as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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. 1-27, 1963.	20,136	13	2.94	0.54	8.00	0.21	3.57	0.00	1.62	6.54	0.04	0.04		691	0.94	18,923	68	6.06	1,240	7.4
Oct. 28-31.....	3,253	16	2.69	.63	7.13	--	3.25	.00	1.27	5.92	--	.02		611	.83	2,703	68	5.53	1,090	7.7
Nov. 1-4.....	3,110	16	2.99	.59	8.57	--	3.64	.00	1.58	6.83	.04	.06		712	.97	3,012	70	6.40	1,280	7.7
Nov. 5-9.....	7,319	13	2.15	.19	4.87	--	2.20	.00	.92	4.09	--	.02		426	.58	4,240	68	4.51	793	6.9
Nov. 10-23, 25-30.....	20,311	17	2.59	.55	7.57	--	3.08	.00	1.39	6.15	--	.07		631	.86	17,430	71	6.04	1,140	7.3
Nov. 24.....	1,210	19	1.80	.44	4.05	--	2.15	.00	.60	3.47	--	.06		373	.51	614	64	3.83	709	7.5
Dec. 1-13.....	13,950	20	2.45	.82	8.09	--	2.95	.00	1.46	6.77	.02	.14		673	.92	12,768	71	6.33	1,210	7.7
Dec. 14-26.....	41,359	18	1.60	.60	5.13	--	1.80	.00	1.25	4.12	--	.16		445	.61	25,031	70	4.90	803	7.2
Dec. 27-31.....	7,269	14	1.45	.39	3.35	--	1.38	.00	.94	2.76	--	.12		316	.43	3,124	65	3.50	568	7.0
Jan. 1, 1964....	1,131	19	1.55	.47	3.61	--	1.57	.00	.94	2.96	--	.13		344	.47	529	64	3.60	614	8.1
Jan. 2-16.....	16,453	17	2.20	.50	5.31	.18	2.08	.00	1.46	4.57	.01	.21		504	.69	11,277	65	4.57	910	7.7
Jan. 17-28.....	48,841	13	1.30	.54	3.26	--	1.28	.00	1.04	2.62	--	.15		311	.42	20,658	64	3.40	565	7.3
Jan. 29-31.....	5,177	15	2.15	.61	5.92	--	1.70	.00	1.83	4.85	--	.29		530	.72	3,731	68	5.04	958	7.4
Feb. 1-4.....	7,632	16	2.05	.47	5.13	--	1.66	.00	1.42	4.20	.03	.23		466	.63	4,837	67	4.58	840	7.2
Feb. 5-7.....	13,014	16	2.20	.52	8.31	--	1.69	.00	1.37	7.56	--	.29		664	.90	11,752	75	7.13	1,220	7.0
Feb. 8-11.....	17,439	14	1.70	.38	3.87	--	1.28	.00	1.42	2.96	--	.21		368	.50	8,728	65	3.80	662	6.8
Feb. 12-24.....	26,249	14	2.20	.42	5.31	--	1.74	.00	1.58	4.29	--	.23		482	.66	17,207	67	4.64	878	6.8
Feb. 25-29.....	20,013	11	1.60	.24	2.52	--	1.33	.00	.81	2.12	--	.07		263	.36	7,158	58	2.63	473	7.1

Mar. 1, 1964....	2,221	10	1.90	.12	3.13	--	.00	A1.33	.81	2.68	--	.00		302	.41	912	61	3.12	593	10.0
Mar. 2-4.....	61,706	5.8	1.10	.18	.78	--	.89	.30	.31	.56	.01	.00		119	.16	9,986	38	.98	211	8.8
Mar. 5-9.....	31,537	12	1.25	.33	2.26	--	1.02	.00	.77	1.95	--	.06		234	.32	10,036	59	2.55	421	7.8
Mar. 10-20.....	65,585	15	1.80	.52	3.74	--	1.46	.00	1.44	2.96	--	.15		373	.51	33,270	62	3.48	667	7.7
Mar. 21-26.....	45,818	12	1.40	.34	1.83	--	1.16	.00	.85	1.47	--	.07		219	.30	13,646	51	1.96	391	7.0
Mar. 27-31.....	25,190	11	2.59	.49	4.52	--	2.15	.00	1.67	3.55	--	.19		459	.62	15,725	59	3.64	821	7.9
Apr. 1-6.....	19,422	17	2.59	.41	2.57	.15	2.21	.00	1.50	1.81	.02	.18		353	.48	9,324	45	2.09	582	7.7
Apr. 7-9.....	21,082	17	1.20	.24	1.26	--	1.10	.00	.71	.85	--	.05		173	.24	4,960	47	1.49	276	7.7
Apr. 10-19.....	39,253	15	2.10	.38	2.65	--	1.62	.00	1.23	2.20	--	.08		314	.43	16,763	52	2.39	551	7.5
Apr. 20-22.....	10,514	19	1.30	.20	1.52	--	1.15	.00	.69	1.18	--	.00		192	.26	2,746	50	1.76	334	7.5
Apr. 23-26.....	8,085	16	2.10	.38	3.26	--	1.80	.00	1.29	2.51	--	.08		349	.47	3,837	57	2.93	605	7.2
Apr. 27-30.....	135,035	11	1.85	.19	1.57	--	1.79	.00	.81	.93	--	.06		217	.30	39,851	43	1.55	377	7.7
May 1-6.....	107,107	12	1.55	.23	1.13	--	1.41	.00	.69	.73	.02	.04		176	.24	25,637	39	1.20	305	7.0
May 7-12.....	29,300	15	2.10	.36	2.18	--	1.79	.00	3.21	1.64	--	.05		281	.38	11,197	47	1.96	492	7.2
May 13-31.....	38,477	12	2.64	.44	3.22	--	2.51	.00	1.29	2.43	--	.05		371	.50	19,414	51	2.59	655	7.0
June 1-8.....	50,317	14	2.30	.38	4.22	--	2.16	.00	1.44	3.10	.03	.14		417	.57	28,536	61	3.65	725	6.8
June 9-18.....	31,279	12	2.50	.38	2.52	--	2.29	.00	1.31	1.61	--	.15		324	.44	13,783	47	2.10	554	7.4
June 19-23.....	20,053	12	1.80	.34	1.78	--	1.69	.00	.92	1.21	--	.08		237	.32	6,463	46	1.73	417	6.8
June 24-30.....	17,272	10	2.40	.38	3.00	--	2.39	.00	1.19	2.09	--	.08		341	.46	8,010	52	2.55	599	7.3
July 1-27.....	29,455	10	2.84	.52	3.05	.16	3.13	.00	1.17	2.26	.04	.03		384	.52	15,382	46	2.35	667	7.3
July 28-31.....	3,205	11	3.24	.58	4.52	--	3.51	.00	1.04	3.72	--	.01		477	.65	2,079	54	3.27	844	7.6
Aug. 1-29.....	33,880	12	2.69	.55	6.74	--	3.39	.00	1.62	4.85	.03	.03		584	.79	26,909	68	5.29	1,060	8.0
Aug. 30-31.....	2,896	18	1.75	.51	4.79	--	2.25	.00	1.48	3.13	--	.08		426	.58	1,678	68	4.50	716	7.4
Sept. 1-7.....	6,165	8.7	1.80	.36	3.78	--	2.26	.00	1.29	2.26	.03	.01		350	.48	2,934	64	3.64	611	7.2
Sept. 8-19.....	11,915	6	2.50	.42	6.05	--	2.93	.00	1.98	4.01	--	.01		528	.72	8,579	67	5.01	929	7.1
Sept. 20-24.....	7,428	11	2.10	.30	5.09	--	2.18	.00	1.04	4.18	--	.01		439	.60	4,435	68	4.65	792	7.1
Sept. 25-28.....	17,534	10	2.69	.51	9.00	--	2.77	.00	2.25	6.91	--	.14		727	.99	17,336	74	7.11	1,290	7.2
Sept. 29-30.....	24,992	5.9	2.69	.31	1.22	--	2.57	.00	.77	.76	--	.10		240	.33	8,157	29	.99	439	7.5
Total or weighted average	1,171,000	12	2.00	0.38	3.48	--	1.95	--	1.25	2.60	--	0.09		351	0.48	535,300	57	3.07	623	7.2

A Includes 0.04 equivalents per million of hydroxide (OH).

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.
DRAINAGE AREA.--44,020 square miles, approximately, of which 9,240 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1964.
Water temperatures: November 1950 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,920 micromhos Oct. 12, 14; minimum daily, 262 micromhos Sept. 29.
Percent sodium: Maximum, 58 Oct. 8-29; minimum, 21 Sept. 28-30.
Sodium-adsorption-ratio: Maximum, 5.27 Oct. 8-29; minimum, 0.52 Sept. 28-30.
EXTREMES, 1945-64.--Specific conductance: Maximum daily, 2,540 micromhos Sept. 4, 1951; minimum daily, 167 micromhos Aug. 31, 1947.
Percent sodium: Maximum, 76 Dec. 3-4, 1945; minimum, 18 Aug. 27-31, 1947.
Sodium-adsorption-ratio (1961-63): Maximum, 5.48 Aug. 1-10, 1962; minimum, 0.52 Sept. 28-30, 1964.
REMARKS.--Where no potassium (K) is reported, sodium and potassium are calculated as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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. 1-7, 1963..	8,636	13	4.24	1.81	7.00	--	3.54	0.00	2.96	6.49	0.02	0.04		762	1.04	8,950	54	4.03	1,340	7.2
Oct. 8-29.....	35,651	9.7	5.34	2.06	10.14	--	2.92	.00	4.37	10.21	--	.03		1,040	1.41	50,425	58	5.27	1,830	7.0
Oct. 30-31.....	8,112	11	3.09	1.07	4.39	--	2.20	.00	1.92	4.43	--	.02		503	.68	5,550	51	3.05	911	7.1
Nov. 1-2.....	5,236	12	4.39	1.56	7.44	--	3.05	.00	3.31	7.00	.02	.02		790	1.07	5,626	56	4.31	1,390	7.7
Nov. 3-7.....	11,266	9.2	2.50	.70	2.52	--	2.33	.00	1.15	2.17	--	.05		330	.45	5,065	44	2.00	601	7.4
Nov. 8-14.....	16,536	8.1	3.54	.99	5.31	--	2.49	.00	2.25	5.08	--	.02		577	.78	12,976	54	3.53	1,050	7.3
Nov. 15-30.....	30,561	7.2	4.19	1.40	6.35	--	2.98	.00	2.73	6.21	--	.00		694	.94	26,845	53	3.60	1,250	7.5
Dec. 1-12.....	16,138	7.6	4.29	1.40	6.39	--	3.49	.00	2.50	6.07	.02	.02		699	.95	15,341	53	3.79	1,210	7.3
Dec. 13-15.....	5,671	8.0	3.54	1.23	4.39	--	3.05	.00	1.96	4.09	--	.04		528	.72	4,072	48	2.84	937	7.8
Dec. 16-18.....	6,938	16	4.49	1.48	6.31	--	3.65	.00	2.62	5.98	--	.02		718	.96	6,727	51	3.65	1,220	6.1
Dec. 19-24.....	17,256	8.6	2.25	.69	2.70	--	2.02	.00	1.19	2.40	--	.04		328	.45	7,698	48	2.23	594	7.5
Dec. 25-28.....	12,615	6.7	3.09	.99	4.13	--	2.44	.00	1.87	3.86	--	.02		477	.65	8,184	50	2.89	660	7.6
Dec. 29-31.....	5,754	9.5	1.65	.53	1.91	--	1.84	.00	.67	1.55	--	.04		251	.34	1,964	45	1.76	444	7.5
Jan. 1-7, 1964..	8,497	12	3.19	.82	3.39	--	2.92	.00	1.48	2.91	.02	.06		430	.58	4,969	46	2.39	745	8.0
Jan. 8-22.....	24,635	7.7	4.79	1.56	5.52	0.11	4.16	.00	2.58	5.13	.02	.01		686	.93	22,983	46	3.10	1,220	7.4
Jan. 23-31.....	20,672	8.3	2.59	.71	3.00	--	2.13	.00	1.42	2.74	--	.03		369	.50	10,374	48	2.34	679	6.9
Feb. 1-4.....	17,137	8.3	3.14	.99	4.00	--	2.72	.00	1.85	3.53	.02	.03		474	.64	11,047	49	2.78	837	7.4
Feb. 5-7.....	24,772	11	2.15	.57	2.22	--	1.93	.00	1.00	1.95	--	.05		290	.39	9,770	45	1.90	511	7.3
Feb. 8-12.....	26,579	10	2.69	.90	3.22	--	2.26	.00	1.60	2.88	--	.06		400	.54	14,459	47	2.40	707	7.4
Feb. 13-22.....	25,369	10	3.04	.90	3.22	--	2.75	.00	1.33	3.02	--	.06		414	.56	14,264	45	2.29	733	7.9

Feb. 23-29, 1964	23,228	6.8	2.50	.99	3.35	--	2.20	.00	1.37	3.22	--	.03		394	.54	12,447	49	2.54	711	7.3
Mar. 1-2.....	10,988	15	2.99	.82	3.70	--	2.69	.00	1.50	3.30	.02	.02		442	.60	6,605	49	2.68	769	8.0
Mar. 3-11.....	67,317	12	2.10	.78	1.26	--	2.00	.00	.77	1.35	--	.04		240	.33	21,972	30	1.05	436	7.2
Mar. 12-21.....	46,136	11	2.89	.90	3.74	--	2.33	.00	1.71	3.47	--	.03		443	.60	27,796	50	2.71	783	7.0
Mar. 22-31.....	89,415	11	2.30	.46	1.52	--	2.13	.00	.94	1.18	--	.05		252	.34	30,644	36	1.30	445	7.0
Apr. 1-10.....	29,217	15	2.99	.99	2.26	.10	2.79	.00	1.19	2.20	.02	.05		365	.50	14,503	36	1.60	628	7.5
Apr. 11-29.....	56,454	11	3.19	1.32	3.74	--	2.62	.00	1.75	3.67	--	.01		477	.65	36,623	45	2.49	845	7.3
Apr. 30.....	12,258	12	2.45	.67	1.35	--	2.54	.00	.81	1.07	--	.06		208	.28	3,468	30	1.08	445	7.8
May 1-7.....	79,474	12	2.05	.55	1.26	--	2.11	.00	.69	1.02	.02	.04		224	.30	24,211	33	1.11	394	7.5
May 8-16.....	47,806	11	2.74	.99	2.39	--	2.29	.00	1.27	2.54	--	.04		356	.48	23,146	39	1.75	650	7.4
May 17-31.....	35,911	7.5	3.24	1.48	3.87	--	2.69	.00	1.79	4.09	--	.01		492	.67	24,029	45	2.52	877	7.1
June 1-20.....	62,479	11	3.74	1.23	5.66	--	2.87	.00	2.42	5.30	.02	.01		622	.85	52,853	53	3.59	1,090	7.2
June 21-27.....	69,421	11	2.15	.39	1.22	--	2.33	.00	.67	.73	--	.04		217	.30	20,488	32	1.08	367	7.3
June 28-30.....	16,858	10	2.99	.69	2.57	--	2.59	.00	1.17	2.43	--	.05		360	.49	8,253	41	1.89	635	7.3
July 1-22.....	71,064	12	2.69	.99	2.61	.12	2.52	.00	1.29	2.65	.03	.02		377	.51	36,446	41	1.92	666	7.2
July 23-31.....	11,835	13	3.34	1.32	5.35	--	2.79	.00	2.29	4.91	--	.02		588	.80	9,465	53	3.51	1,010	7.1
Aug. 1-31.....	33,818	8.2	4.24	1.56	7.83	--	2.92	.00	3.27	7.39	.02	.02		801	1.09	36,840	57	4.60	1,410	7.1
Sept. 1-21.....	40,403	9.2	3.39	1.32	6.18	--	2.49	.00	2.44	5.92	.02	.01		638	.87	35,057	57	4.03	1,150	7.2
Sept. 22-27.....	54,887	10	2.05	.57	2.26	--	2.00	.00	1.00	1.83	--	.03		285	.39	21,274	46	1.98	505	7.1
Sept. 28-30.....	55,874	18	1.65	.37	.52	--	1.80	.00	.46	.25	--	.03		154	.21	11,702	21	.52	272	7.1
Total or weighted average	1,245,000	11	2.88	0.93	3.35	--	2.47	0.00	1.54	3.14	--	0.03		419	0.57	709,100	47	2.29	742	7.2

COLORADO RIVER BASIN

8-1580. COLORADO RIVER AT AUSTIN, TEX.

LOCATION.--At raw water intake at Austin City waterplant, just downstream from Lamar Boulevard 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 1964.
Water temperatures: October 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 737 micromhos Jan. 12; minimum daily, 518 micromhos Sept. 26.
Percent sodium: Maximum, 38 Sept. 1-30; minimum, 27 Jan. 1-31.
Sodium-adsorption-ratio: Maximum, 1.69 Sept. 1-30; minimum, 1.17 Jan. 1-31.
EXTREMES, 1947-64.--Specific conductance: Maximum daily, 737 micromhos Jan. 12, 1964; 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, Dec. 1-31, 1960, Jan. 1-31, 1961.
Sodium-adsorption-ratio (1961-64): Maximum, 1.69 Sept. 1-30, 1964; minimum, 0.75 Mar. 1-31, 1963.
REMARKS.--Where no potassium (K) is reported, sodium and potassium are calculated as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex. No appreciable inflow between sampling point and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	9,654	11	2.40	1.97	2.09	0.10	3.21	0.00	0.98	2.29	0.03	0.02		361	0.49	4,740	32	1.41	660	7.6
Nov. 1-30.....	2,469	9	2.79	1.89	2.22	--	3.70	.00	.96	2.20	.02	.03		376	.51	1,263	32	1.45	679	7.4
Dec. 1-31.....	2,699	9.7	3.09	1.97	2.13	--	4.02	.00	.98	2.12	.02	.04		389	.53	1,428	30	1.34	685	7.9
Jan. 1-31, 1964.	3,800	9.0	2.99	1.89	1.83	.08	3.64	.00	.96	1.95	.02	.03		370	.50	1,912	27	1.17	673	7.9
Feb. 1-29.....	2,859	7.5	3.09	1.73	1.91	--	3.88	.00	.94	1.86	.01	.04		365	.50	1,419	28	1.23	655	7.7
Mar. 1-31.....	3,382	7.9	2.84	1.97	1.87	--	3.79	.00	.94	1.92	.02	.03		361	.49	1,660	28	1.21	651	7.8
Apr. 1-30.....	66,050	8.5	2.30	1.89	2.26	.12	3.05	.00	1.00	2.40	.02	.01		359	.49	32,248	34	1.56	651	7.5
May 1-31.....	98,319	10	2.40	2.22	2.09	--	3.18	.00	1.00	2.51	.02	.01		366	.50	48,939	31	1.37	654	7.7
June 1-30.....	110,083	9.2	2.30	1.73	2.35	--	2.98	.00	.96	2.40	.02	.02		352	.48	52,699	37	1.66	626	7.6
July 1-31.....	96,413	8.1	2.10	1.81	2.04	.10	2.85	.00	.94	2.31	.02	.02		336	.46	44,319	34	1.46	610	7.5
Aug. 1-31.....	72,063	9.8	2.10	1.81	2.31	--	2.90	.00	.94	2.34	.03	.02		343	.47	33,616	37	1.65	623	8.2
Sept. 1-30.....	61,706	8.9	2.15	1.73	2.35	--	2.82	.00	.96	2.40	.02	.01		344	.47	28,868	38	1.69	618	7.3
Total or weighted average	529,500	9.1	2.26	1.88	2.21	--	3.00	0.00	0.97	2.38	0.02	0.02		351	0.48	253,100	35	1.54	632	7.6

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 and 12 miles upstream from Jones Creek.
DRAINAGE AREA.--41,380 square miles, approximately, of which 11,900 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: April 1944 to September 1964.
Water temperatures: October 1945 to September 1948, March 1950 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 904 micromhos Oct. 29; minimum daily, 290 micromhos Mar. 23.
Percent sodium: Maximum, 39 Sept. 1-18; minimum, 24 Sept. 19-30.
Sodium-adsorption-ratio: Maximum, 1.82 Sept. 1-18; minimum, .77 Sept. 19-30.
EXTREMES, 1944-64.--Specific conductance: Maximum daily, 904 micromhos Oct. 29, 1963; minimum daily, 146 micromhos Sept. 27, 1957.
Percent sodium: Maximum, 43 Nov. 30, 1951; minimum, 7 Jan. 19-24, 1945.
Sodium-adsorption-ratio (1961-64): Maximum, 1.82 Sept. 1-18, 1964; minimum, 0.72 Feb. 20-25, 1963.
REMARKS.--Where no potassium (K) is reported, sodium and potassium are calculated as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	21,705	12	2.79	1.81	2.13	0.12	3.67	0.00	0.92	2.29	0.02	0.01		379	0.52	11,188	31	1.40	681	7.3
Nov. 1-30.....	15,709	15	2.89	1.65	1.91	--	3.87	.00	.83	1.72	.02	.00		354	.48	7,563	30	1.27	625	7.5
Dec. 1-13.....	5,931	12	2.99	1.65	2.13	--	4.06	.00	.87	1.78	.02	.02		370	.50	2,984	31	1.40	644	8.0
Dec. 14-16.....	2,469	11	2.40	1.15	1.44	--	3.02	.00	.67	1.24	--	.05		275	.37	924	29	1.08	488	7.5
Dec. 17-31.....	7,260	11	3.39	1.65	1.96	--	4.39	.00	.92	1.69	--	.01		381	.52	3,762	28	1.23	665	7.8
Jan. 1-31, 1964.	13,773	6.7	3.04	1.65	1.96	.11	3.97	.00	.98	1.83	.02	.02		370	.50	6,931	29	1.28	656	8.0
Feb. 1-29.....	21,973	8.6	2.35	1.65	1.83	--	3.38	.00	.85	1.58	.01	.02		317	.43	9,473	31	1.29	569	7.5
Mar. 1-15.....	24,873	6.2	2.20	.74	1.13	--	2.56	.00	.60	.85	.02	.02		222	.30	7,510	28	.93	404	7.8
Mar. 16-31.....	24,182	5.7	2.45	.75	1.26	--	2.74	.00	.73	.96	--	.01		245	.33	8,058	28	1.00	445	7.5
Apr. 1-30.....	37,904	6.9	2.79	1.81	1.96	.12	3.56	.00	1.00	2.12	.02	.00		365	.50	18,816	29	1.29	662	8.0
May 1-31.....	52,141	13	2.74	1.89	2.52	--	3.28	.00	1.06	2.76	.03	.04		399	.54	28,294	35	1.66	667	7.9
June 1-30.....	70,393	13	2.45	1.56	1.74	--	2.82	.00	.92	1.92	.03	.04		321	.44	30,731	30	1.23	578	7.2
July 1-31.....	44,271	10	2.45	1.81	2.18	.10	3.21	.00	.96	2.34	.03	.01		361	.49	21,735	33	1.49	648	7.8
Aug. 1-31.....	24,964	9.1	2.64	1.73	2.39	--	3.49	.00	.92	2.34	.02	.00		371	.50	12,596	35	1.62	664	7.4
Sept. 1-18.....	24,635	7.4	2.40	1.73	2.61	--	3.31	.00	.96	2.43	.03	.00		368	.50	12,329	39	1.82	650	7.3
Sept. 19-30.....	54,220	9.0	2.10	.99	.96	--	2.46	.00	.56	1.02	--	.01		223	.30	16,444	24	.77	407	6.9
Total or weighted average	446,400	10	2.53	1.53	1.87	--	3.16	0.00	0.87	1.89	0.02	0.02		328	0.45	199,300	32	1.30	584	7.4

GUADALUPE RIVER BASIN

8-1765. GUADALUPE RIVER AT VICTORIA, TEX.

LOCATION.--At gaging station at bridge on U.S. Highway 59 in Victoria, Victoria County, 1,300 feet upstream from Texas and New Orleans Railroad Co. bridge, and 10 miles upstream from Coleto Creek.
DRAINAGE AREA.--5,161 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1946, October 1948 to September 1964.
Water temperatures: November 1950 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 714 micromhos Jan. 1; minimum daily, 204 micromhos Sept. 19.
Percent sodium: Maximum, 36 Aug. 1-7; minimum, 17 Feb. 1-7.
Sodium-adsorption-ratio: Maximum, 1.45 Aug. 1-17, Sept. 1-17; minimum, 0.55 Sept. 18-19.
EXTREMES, 1945-46, 1948-64.--Specific conductance: Maximum daily, 1,950 micromhos Jan. 11-17, 1946; minimum daily, 160 micromhos Oct. 31, 1960.
Percent sodium: Maximum, 67 July 23-24, 1950; minimum, 13 May 7-10, 1958.
Sodium-adsorption-ratio (1961-64): Maximum, 1.56 Sept. 10-15, 1962; minimum, 0.55 Sept. 18-19, 1964.
REMARKS.--Where no potassium (K) is reported, sodium and potassium are calculated as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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. 1-14, 1963.	5,054	16	2.79	1.40	1.70	0.07	3.87	0.00	0.62	1.55	0.02	0.02		333	0.45	2,289	28	1.17	586	7.3
Oct. 15-31.....	8,059	17	2.89	1.56	1.52	--	4.03	.00	.62	1.30	--	.02		327	.44	3,584	25	1.02	571	7.2
Nov. 1-9.....	5,587	16	2.94	1.48	1.44	--	3.97	.00	.60	1.21	.02	.04		320	.44	2,432	24	.97	555	7.7
Nov. 10-20.....	30,589	9.2	1.70	.48	.87	--	1.98	.00	.40	.62	--	.05		173	.24	7,197	29	.83	304	7.2
Nov. 21-30.....	9,957	13	2.59	.99	1.22	--	3.06	.00	.54	1.16	--	.05		267	.36	3,616	25	.91	473	7.4
Dec. 1-15.....	14,073	13	3.04	1.15	1.65	--	3.80	.00	.65	1.33	.01	.04		320	.44	6,124	28	1.14	557	7.7
Dec. 16-31.....	15,043	14	3.44	1.40	1.70	--	4.46	.00	.67	1.35	--	.04		355	.48	7,263	26	1.09	614	7.6
Jan. 1-15, 1964.	12,615	11	3.34	1.48	1.39	.06	4.23	.00	.65	1.38	.02	.03		339	.46	5,816	22	.90	600	8.2
Jan. 16-31.....	15,074	8.1	2.54	2.06	1.39	--	4.06	.00	.62	1.30	--	.02		316	.43	6,478	23	.92	573	8.1
Feb. 1-7.....	18,411	10	2.40	1.48	.78	--	3.05	.00	.56	.99	.01	.05		250	.34	6,260	17	.56	458	7.7
Feb. 8-29.....	28,058	12	3.24	1.23	1.44	--	4.00	.00	.62	1.21	--	.06		322	.44	12,287	24	.96	564	7.7
Mar. 1-4.....	12,551	16	3.04	1.15	1.52	--	3.80	.00	.67	1.16	.02	.06		317	.43	5,411	27	1.05	550	7.0
Mar. 5-11.....	16,980	12	1.75	.49	.91	--	2.02	.00	.42	.65	--	.05		180	.24	4,157	29	.86	328	7.2
Mar. 12-31.....	44,152	13	2.50	.90	1.13	--	2.98	.00	.54	.96	--	.05		252	.34	15,132	25	.87	451	7.8
Apr. 1-30.....	40,344	14	2.59	1.23	1.22	.08	3.38	.00	.62	1.10	.03	.06		286	.50	19,972	24	.88	500	8.0
May 1-10.....	11,742	15	2.79	1.07	1.13	--	3.34	.00	.52	1.04	.02	.05		276	.38	4,408	23	.81	486	7.6
May 11-20.....	8,271	17	3.49	1.65	1.13	--	4.29	.00	.60	1.33	--	.05		341	.46	3,836	18	.71	596	7.8
May 21-31.....	7,462	16	3.24	1.65	1.17	--	4.26	.00	.60	1.18	--	.03		329	.45	3,339	19	.75	573	7.8
June 1-19.....	16,846	16	2.35	1.40	1.57	--	3.44	.00	.58	1.27	.02	.02		294	.40	6,736	29	1.14	513	7.3
June 20-30.....	16,407	16	2.30	.99	1.26	--	2.98	.00	.50	.99	--	.05		254	.35	5,668	28	.98	438	7.2

July 1-31, 1964.	15,987	17	2.50	1.23	1.26	.07	3.49	.00	.48	1.04	.02	.02		281	.38	6,110	25	.92	488	7.7
Aug. 1-7.....	2,569	23	1.95	1.23	1.83	--	3.15	.00	.58	1.21	.02	.03		286	.39	999	36	1.45	473	7.7
Aug. 8-11.....	5,189	16	1.75	.58	.83	--	2.31	.00	.27	.54	--	.03		180	.24	1,270	26	.77	306	6.6
Aug. 12-31.....	8,926	20	2.40	1.32	1.39	--	3.44	.00	.52	1.16	--	.01		286	.39	3,472	27	1.02	497	7.3
Sept. 1-17.....	9,475	16	2.59	1.23	2.00	--	3.70	.27	.54	1.27	.02	.01		320	.44	4,124	34	1.45	525	8.4
Sept. 18-19.....	3,955	14	1.35	.45	.52	--	1.75	.07	.15	.34	--	.01		134	.18	721	22	.55	217	8.4
Sept. 20-30.....	29,193	12	2.10	.70	1.22	--	2.72	.13	.42	.71	--	.03		223	.30	8,854	30	1.03	378	8.4
Total or weighted average	412,600	13	2.56	1.12	1.26	--	3.30	0.02	0.54	1.05	--	0.04		281	0.38	157,600	26	0.93	479	7.5

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 1964.
Water temperatures: October 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 788 micromhos Dec. 14; minimum daily, 555 micromhos Sept. 30.
Percent sodium: Maximum, 62 Sept. 1-30; minimum, 44 Jan. 1-31, Feb. 1-29.
Sodium-adsorption-ratio: Maximum, 3.64 Sept. 1-30; minimum, 2.07 Feb. 1-29.
EXTREMES, 1947-64.--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.
Sodium-adsorption-ratio (1961-64): Maximum, 3.64 Sept. 1-30, 1964; minimum, 1.46 Nov. 1-30, 1961.
REMARKS.--Where no potassium (K) is reported, sodium and potassium are calculated as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1963 to September 1964

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, 1963..	6,579	18	2.59	0.55	2.96	0.25	3.64	0.00	0.75	2.00	0.03	0.00	--	371	0.50	3,320	47	2.36	633	7.7
Nov. 1-30.....	5,064	18	2.59	.53	3.39	--	3.77	.00	.73	1.97	.02	.01	--	374	.51	2,576	52	2.72	643	7.2
Dec. 1-31.....	4,618	14	2.54	.64	3.26	--	3.75	.00	.71	1.95	.02	.01	--	365	.50	2,292	51	2.58	637	7.9
Jan. 1-31, 1964..	4,636	15	2.64	.54	2.74	.25	3.65	.00	.71	1.89	.02	.01	--	359	.49	2,264	44	2.17	627	8.2
Feb. 1-29.....	3,946	16	2.59	.90	2.74	--	3.64	.00	.69	1.89	.02	.01	--	352	.48	1,889	44	2.07	616	8.1
Mar. 1-31.....	5,085	14	2.59	.57	3.00	--	3.61	.00	.71	1.81	.02	.02	--	349	.47	2,414	49	2.39	612	8.0
Apr. 1-30.....	6,486	16	2.35	.51	2.87	.25	3.47	.00	.69	1.86	.02	.01	--	349	.47	3,078	48	2.40	598	7.8
May 1-31.....	6,333	17	2.25	.99	2.87	--	3.47	.00	.73	1.86	.04	.01	--	346	.47	2,980	47	2.26	602	7.7
June 1-30.....	7,914	17	2.10	.62	3.22	--	3.25	.00	.69	1.95	.04	.02	--	341	.46	3,670	54	2.76	596	7.3
July 1-31.....	8,178	19	1.90	.54	3.18	.23	3.15	.00	.67	2.09	.02	.01	--	347	.47	3,859	54	2.88	606	7.8
Aug. 1-31.....	9,654	19	1.90	.54	3.83	--	3.23	.00	.69	2.31	.02	.02	--	366	.50	4,805	61	3.47	631	7.8
Sept. 1-30.....	6,902	23	1.95	.53	4.05	--	3.41	.00	.69	2.37	.02	.02	--	382	.52	3,586	62	3.64	634	7.7
Total or weighted average	75,370	18	2.27	0.61	3.23	--	3.46	0.00	0.70	2.02	0.02	0.01	--	358	0.49	36,730	53	2.72	619	7.7

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

LOCATION.--Half a mile southeast of La Sauses, 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 northern part of San Luis Valley, Colo.).
RECORDS AVAILABLE.--Chemical analyses: October 1946 to September 1964.
Water temperatures: July to September 1964.
EXTREMES, 1961-62.--Specific conductance: Maximum daily, 692 micromhos June 18; minimum daily, 152 micromhos Nov. 9.
Percent sodium: Maximum, 49 Aug. 1-15; minimum, 28 Jan. 1-29.
Sodium-adsorption-ratio: Maximum, 2.25 July 5-31; minimum, 0.65 Nov. 10-13.
EXTREMES, 1946-64.--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.
Sodium-adsorption-ratio (1961-64): Maximum, 2.25 July 5-31, 1964; minimum, 0.55 Nov. 6-12, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analyses and do not include potassium (K). Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. 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.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	467	37	1.85	0.72	2.04	0.19	3.34		1.06	0.34	0.04	0.00	0.10	308	0.42	195	43	1.80	448	7.9
Oct. 15-31.....	1,251	--	1.65	.55	1.39	--	2.72		--	--	--	--	--	245	.33	417	39	1.33	356	7.7
Nov. 1-4.....	332	--	1.70	.50	1.39	--	2.72		--	--	--	--	--	249	.34	112	39	1 33	356	8.2
Nov. 5-9.....	549	--	1.50	.42	1.04	--	2.29		--	--	--	--	--	211	.29	158	35	1.06	295	7.1
Nov. 10-13.....	2,047	--	.90	.20	.48	--	1.18		.31	.04	--	--	--	116	.16	323	30	.65	155	7.1
Nov. 14-16.....	389	--	1.40	.36	1.00	--	2.13		--	--	--	--	--	198	.27	105	36	1.07	277	7.9
Nov. 17-30.....	1,222	--	1.65	.49	1.31	--	2.62		--	--	--	--	--	242	.33	402	38	1.26	342	8.2
Dec. 1.....	85	--	2.35	.57	1.48	--	3.80		--	--	--	--	--	282	.38	33	34	1.23	416	7.9
Dec. 2-15.....	1,275	--	1.80	.52	1.39	--	2.72		--	--	--	--	--	250	.34	433	38	1.29	365	7.9
Dec. 16-18.....	298	--	2.05	.53	1.48	--	2.59		--	--	--	--	--	284	.39	115	37	1.30	407	7.4
Dec. 19-24.....	702	--	1.75	.41	1.17	--	2.20		--	--	--	--	--	236	.32	225	35	1.13	340	7.5
Dec. 25-31.....	1,430	--	1.50	.26	.74	--	1.84		--	--	--	--	--	188	.26	366	30	.79	263	7.4
Jan. 1-31, 1964.	7,010	--	1.45	.25	.70	--	1.84		--	--	--	--	--	176	.24	1,678	29	.76	245	7.4
Jan. 1-29.....	7,420	33	1.35	.21	.65	.14	1.74		.46	.14	.02	.01	.06	169	.23	1,705	28	.74	234	7.3
Mar. 1-10.....	3,392	--	1.20	.28	.70	--	1.67		--	--	--	--	--	166	.23	766	32	.81	228	7.4
Mar. 11-29.....	9,120	--	1.40	.30	.83	--	1.70		--	--	--	--	--	186	.25	2,307	33	.90	261	7.2
Mar. 30,31.....	861	--	1.55	.37	1.00	--	1.88		--	--	--	--	--	209	.28	245	34	1.02	302	7.1
Apr. 1-10.....	3,233	--	1.70	.52	1.09	--	2.13		--	--	--	--	--	234	.32	1,029	33	1.03	339	7.2

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1963 to September 1964--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. 11-24, 1964	1,680	--	2.30	0.64	1.78	--	2.64		--	--	--	--	--	326	0.44	745	38	1.47	474	7.4
Apr. 25-30	265	--	2.74	.82	2.31	--	3.11		--	--	--	--	--	407	.55	147	39	1.73	588	7.3
May 1-8	527	32	2.99	.90	2.65	0.26	3.16		2.96	0.62	0.05	0.03	0.24	452	.61	324	39	1.90	644	7.3
May 9, 10	133	--	2.10	.62	1.74	--	3.13		--	--	--	--	--	310	.42	56	39	1.49	443	7.4
May 11-15	571	--	1.75	.51	1.39	--	2.92		--	--	--	--	--	276	.38	214	38	1.31	377	7.3
May 16-20	1,180	--	1.55	.41	1.04	--	2.33		--	--	--	--	--	226	.31	363	35	1.06	311	7.2
May 21-23	314	--	1.85	.63	1.57	--	3.44		--	--	--	--	--	283	.38	121	39	1.41	404	7.4
May 24-31	1,777	--	1.65	.53	1.31	--	2.98		--	--	--	--	--	246	.33	595	38	1.25	352	7.3
June 1-6	589	--	1.70	.46	1.13	--	2.98		--	--	--	--	--	224	.30	179	34	1.09	328	7.5
June 7, 8	161	--	1.90	.62	1.35	--	3.21		--	--	--	--	--	256	.35	56	35	1.20	389	7.2
June 9, 10	202	--	1.85	.51	1.13	--	3.18		--	--	--	--	--	237	.32	65	32	1.04	343	7.2
June 11-16	378	--	2.05	.63	1.31	--	3.34		--	--	--	--	--	261	.35	134	33	1.13	390	7.4
June 17-19	162	--	2.94	1.07	2.61	--	3.44		--	--	--	--	--	436	.59	96	39	1.84	648	7.9
June 20-29	294	--	2.50	.78	2.31	--	3.34		--	--	--	--	--	385	.52	154	41	1.80	557	7.6
June 30	30	--	2.45	.75	1.70	--	4.00		--	--	--	--	--	316	.43	13	35	1.34	472	7.6
July 1-4	109	--	2.30	.74	1.70	--	3.87		--	--	--	--	--	304	.41	45	36	1.38	458	7.4
July 5-31	418	40	2.00	.80	2.65	.19	3.44		1.71	.48	.06	.01	.27	356	.48	202	47	2.25	537	7.8
Aug. 1-15	256	--	1.85	.69	2.48	--	3.39		--	--	--	--	--	342	.47	119	49	2.20	503	7.8
Aug. 16-23	387	--	2.74	.99	2.70	--	3.65		--	--	--	--	--	421	.57	222	42	1.97	629	7.7
Aug. 24-31	427	--	2.10	.70	2.35	--	3.34		--	--	--	--	--	328	.45	190	46	1.99	498	7.3
Sept. 1-20	353	--	2.00	.74	2.44	--	3.34		--	--	--	--	--	335	.46	161	47	2.08	507	7.7
Sept. 21-30	236	--	2.15	.77	2.65	--	3.54		--	--	--	--	--	356	.48	114	48	2.20	539	7.5
Total or wieghted average	51,530	--	1.56	0.38	1.00	--	2.12		--	--	--	--	--	213	0.29	14,929	34	1.02	302	7.3

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 1964.
Water temperatures: October 1948 to September 1964.
Sediment records: October 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,010 micromhos July 31; minimum daily, 223 micromhos May 30.
Percent sodium: Maximum, 31 Oct. 1-31; minimum, 18 July 9, Aug. 4-6.
Sodium-adsorption-ratio: Maximum, 1.50 Aug. 12, 13; minimum, 0.48 May 21-31.
EXTREMES, 1946-64.--Specific conductance: Maximum daily, 1,310 micromhos Aug. 5, 1963; minimum daily, 165 micromhos June 13, 1952.
Percent sodium: Maximum, 43 Sept. 13-30, 1958; minimum, 10 Aug. 5, 1963.
Sodium-adsorption-ratio (1961-64): Maximum, 1.56 July 5-13, 1962; minimum, 0.40 Apr. 19-30, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1963 to September 1964

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. 1-21, 1963.	8,539	28	2.15	0.53	1.17	--	2.88		0.83	0.21	--	0.00		239	0.33	2,775	31	1.02	369	7.9
Oct. 22-31.....	5,970	28	2.30	.74	1.39	--	2.92		1.33	.25	--	.00		276	.38	2,241	31	1.13	419	8.0
Nov. 1-30.....	34,096	25	2.45	.75	1.35	--	2.79		1.50	.24	--	.00		279	.38	12,937	30	1.07	421	8.1
Dec. 1-31.....	21,828	26	2.50	.78	1.35	--	2.95		1.42	.27	--	.00		283	.38	8,401	29	1.05	431	8.2
Jan. 1-31, 1964.	26,378	31	2.15	.65	1.17	--	2.69		1.15	.22	--	.01		254	.35	9,112	30	.99	383	8.2
Feb. 1-29.....	26,114	26	2.00	.58	1.09	--	2.52		1.00	.21	--	.01		232	.32	8,240	30	.96	354	8.2
Mar. 1-31.....	34,802	28	2.05	.51	1.09	0.08	2.39		1.15	.21	0.03	.01		239	.33	11,312	29	.96	361	8.2
Apr. 1-20.....	25,864	25	2.25	.69	1.22	--	2.51		1.48	.23	--	.02		262	.36	9,216	29	1.01	409	8.0
Apr. 21-30.....	15,650	20	2.00	.54	.83	--	2.21		1.04	.17	--	.01		208	.28	4,427	25	.73	335	7.9
May 1-20.....	51,293	19	1.80	.34	.57	--	2.00		.62	.12	--	.02		168	.23	11,719	21	.55	266	7.9
May 21-31.....	37,069	18	1.70	.30	.48	--	1.87		.54	.09	--	.02		153	.21	7,713	19	.48	243	7.9
June 1-12.....	18,303	21	1.90	.42	.74	.06	2.20		.81	.14	.02	.02		195	.27	4,854	24	.69	301	7.9
June 13-30.....	8,390	24	2.10	.60	1.13	.08	2.72		.96	.21	.03	.01		239	.33	2,727	29	.97	374	8.0
July 1-6.....	5,224	22	1.95	.41	.78	--	2.16		.85	.14	--	.01		196	.27	1,393	25	.72	309	7.8
July 7, 8.....	833	25	2.25	.51	1.17	--	2.79		1.00	.23	--	.01		244	.33	276	30	1.00	383	7.9
July 9.....	510	44	4.19	.69	1.09	--	5.90		.08	.08	--	.02		346	.47	240	18	.70	560	7.5
July 10-13.....	2,666	27	2.50	.56	1.17	--	3.08		1.00	.22	--	.01		260	.35	943	28	.95	412	7.7
July 14.....	690	27	3.29	.77	1.74	--	3.54		2.12	.28	--	.01		361	.49	339	30	1.22	554	7.7

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1963 to September 1964--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				
July 15-20, 1964	3,356	29	2.54	0.56	1.13	--	3.08		1.02	0.22	--	0.02		263	0.36	1,200	27	0.91	410	7.7
July 21.....	528	31	3.14	.70	1.52	--	3.47		1.75	.28	--	.00		336	.46	241	28	1.10	516	7.6
July 22-25.....	1,793	33	2.40	.50	1.26	--	2.92		1.10	.23	--	.03		267	.36	651	30	1.05	410	7.8
July 26-26.....	1,500	25	5.19	.81	1.83	--	3.20		4.54	.25	--	.03		506	.69	1,032	23	1.05	737	7.5
July 29, 30.....	920	31	3.29	.51	1.22	--	3.75		1.12	.17	--	.02		306	.42	383	24	.88	477	7.7
July 31.....	540	24	7.93	1.15	2.13	--	3.47		7.62	.22	--	.01		724	.98	531	19	1.00	1,010	7.7
Aug. 1-3.....	2,678	23	4.59	1.15	1.78	--	3.56		3.83	.21	--	.00		469	.64	1,708	24	1.05	696	7.6
Aug. 4-6.....	4,516	22	4.39	.99	1.17	--	3.05		3.46	.12	--	.01		411	.56	2,524	18	.72	618	7.5
Aug. 7-11.....	3,838	25	3.19	.69	1.48	--	3.00		2.17	.18	--	.03		333	.45	1,738	28	1.06	515	7.6
Aug. 12, 13.....	3,554	16	5.34	1.32	2.74	--	3.28		6.08	.12	--	.00		597	.81	2,886	29	1.50	873	7.6
Aug. 14, 15.....	5,177	18	3.99	.81	1.22	---	2.62		3.29	.15	--	.02		379	.52	2,668	20	.79	579	7.6
Aug. 16-18.....	3,660	20	3.29	.73	1.09	--	2.54		2.42	.15	--	.05		320	.44	1,593	21	.77	497	7.7
Aug. 19-31.....	5,570	28	2.45	.67	1.22	--	2.70		1.46	.21	--	.01		272	.37	2,060	28	.98	424	8.0
Sept. 1-5.....	4,641	27	2.45	.63	1.13	--	2.92		1.15	.19	--	.01		260	.35	1,641	27	.91	408	7.8
Sept. 6, 7.....	2,928	22	3.44	.64	1.04	--	2.49		2.52	.12	--	.03		325	.44	1,294	20	.73	497	7.7
Sept. 8-21.....	8,331	26	2.45	.63	1.17	--	2.75		1.33	.21	--	.02		265	.36	3,002	28	.95	414	7.9
Sept. 22-25.....	3,253	21	3.04	.72	1.44	--	2.62		2.39	.21	--	.02		327	.44	1,447	28	1.05	508	7.7
Sept. 26-30.....	2,568	26	2.40	.64	1.22	--	2.75		1.31	.25	--	.01		265	.36	933	29	.99	417	7.8
Total or weighted average	383,600	24	2.24	0.57	1.03	--	2.49		1.24	0.19	--	0.01		242	0.33	126,400	27	0.86	373	7.9

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 the site of the former village of San Marcial, Socorro County.
RECORDS AVAILABLE.--Chemical analyses: March 1954 to September 1964.
Water temperatures: March 1954 to September 1964.
Sediment records: March 1954 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,560 micromhos Aug. 4; minimum daily, 489 micromhos May 26.
Percent sodium: Maximum, 65 Oct. 3-18; minimum, 31 July 12, 13.
Sodium-adsorption-ratio: Maximum, 7.73 Oct. 3-18; minimum, 1.39 June 1-7.
EXTREMES, 1954-64.--Specific conductance: Maximum daily, 2,860 micromhos Oct. 25, 1956; minimum daily, 353 micromhos Jan. 8, 1963.
Percent sodium: Maximum, 66 Oct. 1-20, Nov. 1-21, 1956, Oct. 1-9, 1959; minimum, 29 Nov. 9-30, 1961.
Sodium-adsorption-ratio (1961-64): Maximum, 7.73 Oct. 3-18, 1963; minimum, 1.10 Jan. 8-9, 1962.
REMARKS.--Calculated (Na) plus (K) reported as sodium. Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. 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 Surface Water Records. Chemical analyses for Rio Grande floodway given on page 86.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	54	--	4.84	1.56	6.22	--	3.87	0.00	--	--	--	--	--	882	1.20	64	49	3.48	1,290	8.1
Oct. 3-18.....	83	41	5.24	2.22	14.92	0.41	4.33	.00	8.45	9.87	0.04	0.01	0.33	1,460	1.99	164	65	7.73	2,230	8.1
Oct. 19.....	7	--	3.64	.90	4.26	--	3.08	.00	--	--	--	--	--	566	.77	5	48	2.83	837	8.2
Oct. 20-23.....	263	--	7.78	2.71	12.70	--	4.13	.00	--	--	--	--	--	1,540	2.09	552	55	5.54	2,170	7.8
Oct. 24, 25.....	171	--	9.88	2.71	8.79	--	4.46	.00	--	--	--	--	--	1,410	1.92	327	41	3.50	1,890	7.8
Oct. 26-29.....	165	--	6.59	1.89	8.96	--	3.84	.00	--	--	--	--	--	1,170	1.59	263	51	4.35	1,650	7.9
Oct. 30, 31.....	28	--	5.69	1.73	11.92	--	4.33	.00	--	--	--	--	--	1,290	1.75	49	62	6.19	1,900	8.1
Nov. 1.....	13	--	5.29	1.81	10.88	--	4.26	.27	--	--	--	--	--	1,260	1.71	22	61	5.77	1,780	8.3
Nov. 2-5.....	355	--	4.44	1.15	4.79	--	4.03	.00	--	--	--	--	--	717	.98	347	46	2.86	1,040	7.9
Nov. 6.....	242	--	11.58	3.29	12.27	--	5.44	.00	--	--	--	--	--	1,740	2.37	573	45	4.50	2,290	7.7
Nov. 7.....	101	--	7.34	1.97	9.22	--	4.85	.00	--	--	--	--	--	1,200	1.63	165	50	4.27	1,680	7.6
Nov. 8-14.....	569	--	5.29	1.48	8.00	--	4.13	.00	--	--	--	--	--	972	1.32	753	54	4.35	1,400	7.7
Nov. 15-30.....	11,425	--	4.04	.82	3.22	--	3.70	.00	3.14	1.18	--	--	--	529	.72	8,219	40	2.06	746	7.7
Dec. 1-31.....	17,893	27	3.89	.67	3.26	.14	3.54	.00	3.10	1.30	.03	.05	.14	523	.71	12,727	41	2.16	771	7.8
Jan. 1-13, 1964.	9,979	--	3.79	.69	2.96	--	3.64	.00	--	--	--	--	--	472	.64	6,406	40	1.98	714	7.6
Jan. 14-16.....	1,648	--	3.99	.90	3.83	--	3.87	.00	--	--	--	--	--	563	.77	1,262	44	2.45	841	7.6
Jan. 17-31.....	11,425	--	3.64	.90	2.96	--	3.61	.00	--	--	--	--	--	477	.65	7,411	39	1.96	721	7.7
Feb. 1-29.....	26,862	--	3.59	.73	3.00	--	3.47	.00	--	--	--	--	--	474	.64	17,316	41	2.04	715	7.6

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

Chemical analyses, water year October 1963 to September 1964--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. 1-21, 1964.	12,454	--	3.49	0.71	3.05	--	3.38	0.00	--	--	--	--	--	476	0.65	8,062	42	2.10	711	7.8
Mar. 22-31.....	3,233	--	3.69	1.07	3.70	--	3.64	.00	--	--	--	--	--	558	.76	2,454	44	2.40	829	7.8
Apr. 1-5.....	1,626	--	4.14	1.07	5.18	--	3.87	.00	--	--	--	--	--	666	.91	1,473	50	3.21	1,020	8.0
Apr. 6-13.....	3,919	--	3.74	.90	4.00	--	3.56	.00	--	--	--	--	--	552	.75	2,942	46	2.63	854	7.9
Apr. 14-18.....	823	--	4.34	1.07	5.26	--	3.88	.00	--	--	--	--	--	664	.90	743	49	3.20	1,040	8.0
Apr. 19-30.....	1,316	--	4.59	1.32	5.79	--	4.13	.00	--	--	--	--	--	743	1.01	1,330	49	3.37	1,140	8.2
May 1-9.....	1,701	--	4.29	1.07	4.87	--	3.98	.00	--	--	--	--	--	657	.89	1,520	48	2.98	1,000	8.0
May 10-14.....	2,410	--	3.39	.82	3.26	--	3.36	.00	--	--	--	--	--	479	.65	1,570	44	2.25	736	7.9
May 15-18.....	2,594	--	3.09	.73	2.70	--	3.15	.00	--	--	--	--	--	429	.58	1,514	41	1.95	644	7.8
May 19-31.....	17,689	25	2.84	.64	1.96	0.12	2.98	.00	1.92	0.68	0.03	0.06	0.11	342	.47	8,227	35	1.48	534	7.8
June 1-7.....	10,816	--	2.94	.70	1.87	--	3.05	.00	--	--	--	--	--	352	.48	5,178	34	1.39	546	7.8
June 8-11.....	1,309	--	3.34	.82	2.87	--	3.34	.00	--	--	--	--	--	440	.60	783	41	1.99	701	7.7
June 12.....	115	--	3.64	.99	3.65	--	3.74	.00	--	--	--	--	--	508	.69	79	44	2.40	826	8.1
June 13-19.....	307	--	4.29	1.23	6.48	--	4.00	.00	--	--	--	--	--	766	1.04	320	54	3.90	1,210	8.1
June 20-26.....	64	--	4.69	1.56	8.61	--	4.20	.00	--	--	--	--	--	916	1.25	80	58	4.87	1,480	8.2
July 12, 13.....	2,491	--	4.74	1.32	2.78	--	4.56	.00	--	--	--	--	--	544	.74	1,843	31	1.60	847	7.6
July 14-17.....	1,698	--	8.88	2.96	7.13	--	3.44	.00	--	--	--	--	--	1,250	1.70	2,886	38	2.93	1,710	7.6
July 18.....	109	--	4.89	1.32	3.57	--	3.34	.00	--	--	--	--	--	624	.85	93	36	2.02	934	8.2
July 19-30.....	804	--	4.79	1.56	6.53	--	3.70	.00	--	--	--	--	--	832	1.13	910	51	3.66	1,260	7.8
July 31.....	60	--	6.94	2.06	9.57	--	4.06	.00	--	--	--	--	--	1,240	1.69	100	52	4.51	1,770	7.6
Aug. 1.....	228	--	6.59	2.39	9.44	--	5.21	.00	--	--	--	--	--	1,200	1.63	372	51	4.46	1,680	7.5
Aug. 2.....	1,071	--	5.84	2.06	5.31	--	6.33	.00	--	--	--	--	--	828	1.13	1,206	40	2.67	1,210	7.4
Aug. 3, 4.....	1,583	23	13.82	4.61	11.09	.21	6.97	.00	21.44	1.75	.04	.00	.30	2,000	2.72	4,305	37	3.65	2,450	7.2
Aug. 5, 6.....	1,198	--	8.93	2.88	9.83	--	5.21	.00	--	--	--	--	--	1,420	1.93	2,314	45	4.05	1,880	7.4
Aug. 7.....	623	--	13.87	4.77	9.74	--	5.31	.00	--	--	--	--	--	1,940	2.64	1,643	34	3.19	2,380	7.2
Aug. 8, 9.....	655	--	8.38	2.63	8.48	--	4.72	.00	--	--	--	--	--	1,290	1.75	1,148	44	3.61	1,730	7.3
Aug. 10, 11.....	468	--	5.29	1.81	5.74	--	4.65	.00	--	--	--	--	--	830	1.13	528	45	3.05	1,230	7.4
Aug. 12-16.....	5,871	--	10.18	3.13	9.31	--	5.08	.00	--	--	--	--	--	1,520	2.07	12,137	41	3.61	1,970	7.4
Aug. 17-19.....	406	--	7.19	2.06	7.31	--	3.47	.00	--	--	--	--	--	1,130	1.54	625	44	3.40	1,550	7.4
Aug. 20.....	60	--	5.04	1.56	5.35	--	3.74	.00	--	--	--	--	--	796	1.08	64	45	2.94	1,160	7.5

Aug. 21-Sept 1, 1964.....	131	--	5.74	1.89	6.87	--	3.47	.00	--	--	--	--	--	988	1.34	176	47	3.52	1,440	7.8
Sept. 6, 7.....	27	--	6.29	2.30	6.18	--	6.62	.00	--	--	--	--	--	900	1.22	33	42	2.98	1,340	7.5
Sept. 8.....	1	--	4.49	1.32	3.65	--	3.70	.00	--	--	--	--	--	604	.82	0	39	2.14	895	8.2
Sept. 11.....	16	--	5.49	2.14	9.74	--	4.16	.00	--	--	--	--	--	1,090	1.48	24	56	4.99	1,710	7.6
Sept. 12-24.....	1,792	--	4.99	1.65	6.22	--	3.97	.00	--	--	--	--	--	818	1.11	1,994	48	3.42	1,260	7.7
Sept. 25-30.....	777	17	8.08	2.71	9.74	.18	4.72	.00	14.28	1.61	.03	.01	.26	1,350	1.84	1,427	47	4.19	1,820	7.5
Total or weighted average	161,700	--	4.19	1.01	3.64	--	3.63	0.00	--	--	--	--	--	576	0.78	126,700	41	2.20	841	7.6

RIO GRANDE BASIN--Continued

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: May 1905 to April 1907, July 1946 to September 1964.
Water temperatures: January 1949 to September 1964.
Sediment records: July 1946 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,280 micromhos Aug. 16; minimum daily, 704 micromhos July 14.
Percent sodium: Maximum, 65 Oct. 4-8; minimum, 3 July 12.
Sodium-adsorption-ratio: Maximum, 7.73 Oct. 4-8; minimum, 0.18 July 12.
EXTREMES, 1946-64.--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, Oct. 4-8, 1963; minimum, 3 July 12, 1964.
Sodium-adsorption-ratio (1961-64): Maximum, 7.73 Oct. 4-8, 1963; minimum, 0.18 July 12, 1964.
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 1962 to September 1963 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 Surface Water Records. Chemical analyses for Rio Grande conveyance channel given on page 83.

Chemical analyses, water year October 1963 to September 1964

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. 4-8, 1963 A	2	41	5.24	2.22	14.92	0.41	4.33		8.45	9.87	0.04	0.01	0.33	1,460	1.99	4	65	7.73	2,230	8.1
July 12, 1964...	1,242	--	13.72	2.30	.52	--	3.28		--	--	--	--	--	1,140	1.55	1,925	3	.18	1,350	7.8
July 13.....	813	--	9.93	1.73	.57	--	2.75		--	--	--	--	--	820	1.12	907	5	.23	1,050	7.5
July 14.....	238	16	5.24	.90	1.13	.17	1.80		4.93	.56	.02	.06	.15	505	.69	163	15	.65	704	7.7
July 15.....	52	--	10.38	2.80	7.57	--	2.85		--	--	--	--	--	1,420	1.93	100	36	2.95	1,850	7.7
July 19, 20.....	7	--	16.07	2.96	1.31	--	2.92		--	--	--	--	--	1,420	1.93	13	6	.42	1,610	7.6
Aug. 16-18.....	29	23	11.93	3.95	10.53	.18	5.77		19.53	1.13	.03	.03	.28	1,750	2.38	68	40	3.74	2,280	7.5
Aug. 20.....	22	--	15.22	2.80	2.04	--	1.44		--	--	--	--	--	1,440	1.96	43	10	.68	1,630	7.6
Sept. 14-16 A...	39	--	4.99	1.65	6.22	--	3.97		--	--	--	--	--	818	1.11	44	48	3.42	1,260	7.7
Total or weighted average	2,444	--	11.42	2.00	0.98	--	2.97		--	--	--	--	--	984	1.34	3,270	4	0.41	1,210	7.7

A Analysis estimated from conveyance channel at San Marcial.

8-3640. RIO GRANDE AT EL PASO, TEX.
(Formerly published as Rio Grande near El Paso)

LOCATION.--At gaging station at Courchesne Bridge, 5.6 miles upstream from the Santa Fe Street-Juarez Avenue Bridge between El Paso, Tex., and Ciudad, Juarez, and 1.7 miles upstream from the American Dam.
DRAINAGE AREA.--29,267 square miles (from International Boundary and Water Commission Water Bulletin Number 31).
RECORDS AVAILABLE.--Chemical analyses: 1933 to 1964.
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 1963 to September 1964 given in International Boundary and Water Commission Water Bulletin Numbers 33 and 34. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1963 to September 1964

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 1963	31	6,089	--	6.74	2.38	15.34	--	4.80	0.20	11.38	8.35	--	0.01	0.36	1,654	2.25	13,700	63	7.2	2,350	8.2
November....	30	4,563	--	6.58	2.54	15.64	--	4.95	.32	11.20	8.75	--	.01	.39	1,625	2.21	10,100	63	7.3	2,400	8.3
December....	31	4,186	--	6.48	2.36	16.02	--	5.52	.00	10.71	8.70	--	.01	.37	1,644	2.24	9,380	64	7.6	2,430	8.0
January 1964	31	3,513	29	6.40	2.36	16.60	0.26	5.32	.00	11.35	9.02	0.05	.02	.45	1,683	2.29	8,050	65	7.9	2,460	7.9
Febuary.....	29	2,324	--	6.63	2.78	18.32	--	5.23	.00	12.73	10.04	--	.01	.35	1,770	2.41	5,600	66	8.5	2,660	7.8
March.....	31	7,879	--	5.23	1.92	9.51	--	3.95	.00	6.20	6.55	--	.02	.22	1,069	1.45	11,400	57	5.0	1,650	7.7
April.....	30	12,050	--	4.98	1.82	8.72	--	3.79	.00	6.61	6.22	--	.01	.20	1,012	1.38	16,600	56	5.1	1,540	8.0
May.....	31	1,205	--	5.72	2.46	21.61	--	4.97	.00	13.14	12.00	--	.02	.54	1,916	2.61	3,150	73	11	2,900	8.1
June.....	30	6,316	--	4.80	1.84	9.72	--	3.80	.00	7.33	5.35	--	.01	.21	1,090	1.48	9,350	59	5.4	1,650	7.8
July.....	30	9,652	15	4.32	1.56	7.95	.23	3.45	.00	6.00	4.49	.05	.02	.21	880	1.20	11,600	57	4.6	1,380	7.8
August.....	31	10,421	--	4.02	1.50	7.00	--	3.26	.00	5.34	3.90	--	.02	.12	808	1.10	11,500	56	4.2	1,250	8.2
September...	29	9,431	--	4.20	1.44	6.88	--	3.13	.00	5.94	3.72	--	.02	.17	812	1.10	10,400	55	4.1	1,250	8.0
Total or weighted average	--	77,629	--	5.12	1.89	10.50	--	3.98	--	7.66	6.13	--	1.54	0.24	1,140	1.55	120,830	61	5.61	1,720	--

RIO GRANDE BASIN--Continued

8-3705. RIO GRANDE AT FORT QUITMAN, TEX.

LOCATION.--At gaging station at the rectified channel for the Rio Grande, 1.5 miles below Old Fort Quitman, and 81.1 river miles downstream from 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 31).
RECORDS AVAILABLE.--Chemical analyses: 1933 to 1964.
REMARKS.--Chemical analyses by the U.S. Department of Agriculture, Agricultural Research Serivce, U.S. Salinity Laboratory, Riverside, Calif. Records of discharge, electrical and conductivity of individual water samples, and these same chemical analyses for water year October 1963 to September 1964 given in International Boundary and Water Commission Water Bulletin Numbers 23 and 34. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1963 to September 1964

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 1963	5	2,766		14.04	6.16	37.40		4.63		18.85	34.55		0.06	0.53	3,771	5.13	14,200	65	12	5,520	8.2
November	4	3,550		12.22	5.24	30.43		5.35		16.56	26.28		.05	.49	3,091	4.20	14,900	64	10	4,520	8.0
December	4	2,269		14.82	6.48	36.28		5.94		19.09	32.90		.01	.58	3,735	5.08	11,500	63	11	5,390	7.7
January 1964	5	890	25	26.91	13.39	73.20	0.32	4.69		33.45	76.12	0.06	.01	.87	7,260	9.87	8,780	64	16	10,300	7.7
February	4	431		27.92	14.71	79.92		4.46		34.65	84.12		.01	.93	7,664	10.4	4,480	65	17	11,100	7.8
March	4	220		27.34	16.45	81.12		4.05		34.17	87.30		.02	.93	7,964	10.8	2,380	65	17	11,000	7.9
April	4	136		24.04	24.00	89.45		3.81		37.72	96.50		.02	1.10	8,740	11.9	1,620	65	18	12,400	7.8
May	3	75		20.40	11.07	60.97		3.33		25.58	63.48		.03	.68	5,792	7.88	588	66	15	8,360	7.8
June	4	285		6.02	2.22	9.90		4.12		4.38	10.05		.01	.21	1,170	1.59	453	55	4.9	1,840	8.0
August	3	730		3.20	.52	2.78		3.50		1.74	1.15		.06	.14	406	.55	402	43	2.0	622	8.2
September	1	252		3.46	.62	1.89		4.10		1.32	.53		.02	.06	357	.49	123	32	1.3	570	8.1
Total or weighted average	--	11,600	--	14.44	6.68	37.34	--	4.98		18.65	35.20	--	0.04	0.54	3,769	5.12	59,430	62	11	5,459	--

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RIO GRANDE BASIN--Continued

8-3715. RIO GRANDE ABOVE RIO CONCHOS, NEAR PRESIDIO, TEX.

LOCATION.--At gaging station, 7.8 river miles above the junction of the Rio Conchos, and 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 31).
RECORDS AVAILABLE.--Chemical analyses: 1935 to 1964.
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 1963 to September 1964 given in International Boundary and Water Commission Water Bulletin Numbers 33 and 34. Records for previous years are given in earlier Bulletins. No flow on many days during January to September.

Chemical analyses, water year October 1963 to September 1964

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 1963	4	286		10.26		15.29		2.46			13.15				1,708	2.32	664	60	6.7	2,560	
November....	7	664		10.78		19.01		2.85			15.75				1,945	2.65	1,760	64	8.2	2,990	
December....	8	364		16.56		30.94		4.30			27.10				3,135	4.26	1,550	65	11	4,620	
May 1964....	3	146		5.46		1.89		1.45			1.10				499	.68	99	26	1.1	749	
June.....	2	71		2.54		1.76		1.15			.55				307	.42	30	41	1.6	435	
September...	3	733		4.14		2.10		3.00			52				411	.56	410	34	1.5	610	

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 31).
RECORDS AVAILABLE.--Chemical analyses: 1944 to 1964.
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 1963 to September 1964 given in International Boundary and Water Commission Water Bulletin Numbers 33 and 34. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1963 to September 1964

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 1963	9	70,256	--	4.18	1.00	3.83	--	3.15		4.56	1.28	--	0.06	0.19	632	0.86	60,400	43	2.4	865	8.0
November....	6	45,773	--	4.54	1.48	5.72	--	3.18		6.56	2.20	--	.03	.27	779	1.06	48,500	49	3.3	1,130	7.9
December....	9	49,847	--	4.70	1.52	5.47	--	3.36		6.42	2.10	--	.05	.22	783	1.06	52,800	47	3.1	1,130	7.8
January 1964	8	46,906	22	4.42	1.36	4.99	0.14	3.20		5.68	2.00	0.07	.06	.26	725	.99	46,400	46	2.9	1,040	7.7
February....	8	37,651	--	4.51	1.69	5.44	--	3.22		6.32	2.15	--	.05	.22	746	1.01	38,000	47	3.1	1,130	8.0
March.....	8	47,023	--	4.29	1.42	5.10	--	3.07		5.84	1.85	--	.05	.25	719	.98	46,100	47	3.0	1,050	7.7
April.....	8	58,960	--	3.62	.96	2.55	--	3.10		2.84	1.18	--	.06	.11	463	.63	37,100	36	1.7	706	8.0
May.....	8	50,181	--	4.40	1.38	4.46	--	3.25		5.33	1.82	--	.06	.21	666	.91	45,700	44	2.6	1,000	7.9
June.....	8	110,314	--	4.72	.76	2.93	--	3.62		4.00	.95	--	.04	.15	573	.78	86,000	35	1.8	796	7.8
July.....	5	56,748	14	4.22	1.06	3.20	.14	3.20		4.04	1.30	.06	.03	.19	539	.73	41,400	37	2.0	808	8.0
August.....	6	66,898	--	5.24	1.12	4.56	--	3.10		6.01	1.75	--	.06	.14	722	.98	65,600	42	2.6	1,030	8.2
September...	7	277,740	--	3.62	.46	.86	--	3.40		1.12	.40	--	.02	.06	282	.39	108,000	17	.6	465	8.0
Total or weighted average	--	918,300	--	4.21	0.96	3.16	--	3.30		3.85	1.22	--	0.04	0.15	540	0.74	676,000	34	1.9	798	--

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 31).
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1964.
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 1963 to September 1964 given in International Boundary and Water Commission Water Bulletin Numbers 33 and 34. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1963 to September 1964

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 1963	31	138,543	--	4.28		3.40	--	2.52		--	1.95	--	--	--	538	0.73	101,000	44	2.3	775	--
November....	30	76,315	--	4.66		4.07	--	2.82		--	2.40	--	--	--	590	.80	61,000	47	2.7	907	--
December....	31	88,453	--	5.64		4.81	--	3.12		--	2.88	--	--	--	700	.95	84,000	46	2.9	1,040	--
January 1964	31	74,395	20	3.92	1.80	5.38	0.11	2.86		4.86	3.45	0.06	0.06	0.26	734	1.00	74,400	48	3.2	1,120	7.8
February....	29	84,979	--	5.53		4.62	--	2.86		--	3.38	--	--	--	637	.87	73,900	46	2.8	1,030	--
March.....	31	77,393	--	5.71		5.75	--	2.60		--	3.90	--	--	--	749	1.02	78,900	50	3.4	1,160	--
April.....	30	101,881	--	5.04		4.28	--	2.45		--	3.45	--	--	--	586	.80	81,500	46	2.7	941	--
May.....	31	93,545	--	4.64		3.08	--	2.35		--	2.55	--	--	--	468	.64	59,900	40	2.0	768	--
June.....	30	130,411	--	5.22		3.91	--	2.68		--	2.55	--	--	--	632	.86	112,000	43	2.4	929	--
July.....	30	50,408	18	4.02	1.20	4.40	.16	2.50		4.46	2.65	.05	.07	.19	634	.86	43,400	45	2.7	962	8.0
August.....	31	159,927	--	3.96		2.68	--	2.25		--	1.52	--	--	--	423	.58	92,800	40	1.9	667	--
September...	30	1,674,055	--	2.42		.70	--	1.81		--	.45	--	--	--	184	.25	419,000	22	.6	309	--
Total of weighted average	--	2,750,000	--	3.40		2.00	--	2.12		--	1.31	--	--	--	342	0.47	1,282,000	31	1.4	542	--

RIO GRANDE BASIN--Continued

8-4613. RIO GRANDE AT FALCON DAM, TEX.

LOCATION.--U.S. Tailrace at Falcon Dam.
DRAINAGE AREA.--164,482 square miles (from International Boundary and Water Commission Water Bulletin Number 31).
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1964.
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 1963 to September 1964 available in International Boundary and Water Commission Bulletin Numbers 33 and 34. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1963 to September 1964

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 1963	8	61,584	--	3.46	1.36	4.56	--	2.10		4.33	3.02	--	0.01	0.17	649	0.88	54,200	49	2.9	953	7.8
November....	7	28,632	--	3.46	1.26	4.42	--	2.20		4.28	2.98	--	.01	.19	588	.80	22,900	48	2.9	945	8.0
December....	11	45,468	--	3.40	1.34	4.39	--	2.24		4.24	2.85	--	.01	.20	603	.82	37,300	48	2.9	932	7.7
January 1964	11	59,081	13	3.52	1.27	4.38	0.16	2.24		4.19	2.92	0.04	.01	.17	604	.82	48,400	47	2.8	941	7.7
February....	8	42,508	--	3.59	1.27	4.32	--	2.30		4.28	2.87	--	.01	.14	579	.79	33,600	47	2.8	933	7.9
March.....	13	95,353	--	3.69	1.36	4.46	--	2.40		4.31	2.90	--	.01	.15	612	.83	79,100	47	2.8	968	7.8
April.....	12	284,406	--	3.72	1.48	4.68	--	2.40		4.40	3.15	--	.01	.16	635	.86	245,000	47	2.9	987	8.0
May.....	9	284,001	--	3.50	1.62	4.60	--	2.31		4.40	3.10	--	.01	.20	608	.83	236,000	47	2.9	986	8.0
June.....	9	119,917	--	3.42	1.48	4.61	--	2.18		4.40	3.25	--	.01	.21	624	.85	102,000	48	2.9	966	7.8
July.....	11	91,239	8	3.36	1.52	4.84	.16	2.20		4.32	3.33	.04	.01	.20	621	.84	76,600	49	3.1	979	8.0
August.....	12	79,120	--	3.50	1.60	4.84	--	2.12		4.59	3.25	--	.01	.13	641	.87	68,800	49	3.0	983	8.2
September...	10	48,578	--	3.24	1.38	4.64	--	2.00		4.42	3.15	--	.01	.22	595	.81	39,300	50	3.1	957	7.8
Total or weighted average	--	1,240,000	--	3.53	1.48	4.61	--	2.27		4.37	3.11	--	0.01	0.18	619	0.84	1,043,000	48	2.9	973	--

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

LOCATION.--At gaging station on left bank, 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 1964.
Water temperatures: June 1959 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,840 micromhos Aug. 3; minimum daily, 1,160 micromhos Oct. 1.
Percent sodium: Maximum, 13 Dec. 1 to Feb. 29; minimum, 9 Sept. 16-30.
Sodium-adsorption-ratio: Maximum, 1.06 July 1-31; minimum, 0.69 Sept. 16-30.
EXTREMES, 1937-64.--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.
Sodium-adsorption-ratio (1961-64): Maximum, 1.06 July 1-31, 1964; minimum, 0.40 Aug. 27, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1963 to September 1964

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. 1-22, 1963.	3,600	14	11.48	1.81	1.74	0.09	2.20		11.83	1.30		0.00		990	1.35	4,847	12	0.68	1,290	7.7
Oct. 23-31.....	1,084	15	13.52	2.55	2.04	.10	2.26		14.45	1.64		.01		1,190	1.62	1,754	11	.72	1,520	7.9
Nov. 1-30.....	24	14	14.57	3.04	2.44	.08	2.49		15.91	1.92		.01		1,310	1.78	42	12	.82	1,650	7.6
Dec. 1-31.....	43	16	16.47	4.36	3.09	.10	2.72		19.26	2.37		.01		1,570	2.14	92	13	.96	1,920	7.7
Jan. 1-31, 1964.	37	19	18.01	4.77	3.39	.07	2.88		20.82	2.60		.01		1,700	2.31	85	13	1.01	2,040	7.8
Feb. 1-29.....	357	19	18.16	4.44	3.31	.07	2.77		21.03	2.54		.01		1,700	2.31	825	13	.98	2,050	7.8
Mar. 1-31.....	4,304	15	19.96	3.62	3.13	.08	2.34		22.07	2.60		.02		1,760	2.39	10,302	12	.91	2,110	7.8
Apr. 1-30.....	30,466	15	21.21	4.36	3.31	.08	2.23		24.36	2.79		.01		1,910	2.60	79,139	11	.92	2,230	7.6
May 1-31.....	4,839	15	23.10	4.52	3.70	.08	2.15		26.44	3.05		.01		2,060	2.80	13,557	12	.99	2,380	7.7
June 1-30.....	12,496	16	23.95	4.85	3.74	.09	2.03		27.69	3.24		.04		2,150	2.92	36,538	11	.99	2,500	7.7
July 1-31.....	18,569	16	25.75	5.26	4.18	.09	1.84		30.40	3.55		.02		2,340	3.18	59,095	12	1.06	2,680	7.5
Aug. 1-31.....	4,642	15	24.85	5.35	3.78	--	1.80		29.15	3.30		.03		2,240	3.05	14,142	11	.97	2,580	7.5
Sept. 1-15.....	2,264	16	26.45	5.35	3.65	--	1.97		30.40	3.10		.03		2,330	3.17	7,175	10	.92	2,650	7.5
Sept. 16-30.....	2,225	13	21.21	3.78	2.44	--	1.77		23.94	1.97		.06		1,820	2.48	5,508	9	.69	2,130	7.5
Total or weighted average	84,950	15	22.46	4.53	3.51	0.08	2.08		25.91	2.96		0.02		2,020	2.74	233,100	11	0.95	2,350	7.6

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 mouth of Rio Penasco, and 17 miles north of McMillan Dam.
DRAINAGE AREA.--15,300 square miles, approximately (contributing area).
RECORDS AVAILABLE.--Chemical analyses: July 1937 to September 1964.
Water temperatures: April 1949 to September 1964.
Sediment records: January 1949 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 19,200 micromhos Sept. 24; minimum daily, 1,620 micromhos June 14.
Percent sodium: Maximum, 66 Sept. 24-27; minimum, 16 Apr. 15-22, July 5-12.
Sodium-adsorption-ratio: Maximum, 23.11 Sept. 24-27; minimum, 1.51 Apr. 15-22.
EXTREMES, 1937-64.--Specific conductance: Maximum daily, 22,600 micromhos June 23, 1959; minimum daily, 682 micromhos Aug. 1, 1962.
Percent sodium: Maximum, 71 May 16, 1950; minimum, 12 Mar. 25-31, 1951.
Sodium-adsorption-ratio (1961-64): Maximum, 24.48 May 29, 1963; minimum, 0.98 Aug. 1-2, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. No flow July 30, 31, Aug. 1-7, 10-31, Sept. 1-23.

Chemical analyses, water year October 1963 to September 1964

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. 1-5, 1963..	135	19	34.58	21.63	76.13		2.47		50.36	80.12		0.02		8,060	10.96	1,478	58	14.36	11,500	7.4
Oct. 6, 7.....	54	16	37.87	23.36	98.31		2.47		54.13	102.40		.01		9,630	13.10	701	62	17.77	13,800	7.5
Oct. 8-23.....	644	20	32.83	20.40	66.12		2.62		47.68	70.53		.06		7,320	9.96	6,413	55	12.82	10,400	7.4
Oct. 24-31.....	468	15	29.99	17.44	52.20		2.23		42.89	54.16		.02		6,080	8.27	3,871	52	10.72	8,590	7.2
Nov. 1-5.....	363	14	28.04	15.55	44.37		2.16		39.97	46.26		.03		5,410	7.36	2,671	50	9.50	7,620	7.2
Nov. 6-13.....	808	14	27.45	13.98	35.41		2.43		37.66	37.24		.01		4,750	6.46	5,218	46	7.78	6,580	7.6
Nov. 14-30.....	1,578	13	29.44	16.53	46.55		3.02		39.56	50.21		.01		5,640	7.67	12,104	50	9.71	7,970	7.8
Dec. 1-31.....	3,351	12	29.79	16.62	48.72		3.57		39.56	51.06		.04		5,750	7.82	26,205	51	10.11	8,130	7.9
Jan. 1-31, 1964.	2,712	16	29.69	18.10	52.64		3.05		41.64	56.42		.05		6,130	8.34	22,606	52	10.77	8,610	7.7
Feb. 1-29.....	2,663	12	26.54	17.27	51.33		2.46		40.81	54.45		.04		5,940	8.08	21,514	53	10.72	8,410	7.6
Mar. 1-8.....	520	12	30.84	19.99	58.29		2.43		44.97	61.78		.02		6,640	9.03	4,700	53	11.56	9,250	7.3
Mar. 9-14.....	361	9.5	31.64	21.55	67.86		2.29		46.65	71.65		.02		7,330	9.97	3,595	56	13.16	10,300	7.1
Mar. 15-25.....	751	8.7	31.84	16.78	57.42		2.31		45.60	59.52		.06		6,540	8.89	6,676	54	11.65	9,170	7.4
Mar. 26-31.....	258	11	34.68	22.13	70.47		2.36		51.22	73.63		.05		7,740	10.53	2,718	55	13.22	10,700	7.1
Apr. 1-6.....	95	14	36.08	22.70	73.95		2.44		54.13	76.17		.04		8,090	11.00	1,048	56	13.64	11,200	7.3
Apr. 7-9.....	52	15	39.07	25.34	102.23		2.54		58.09	105.22		.04		10,100	13.74	711	61	18.01	14,100	7.2
Apr. 10.....	853	41	30.94	12.83	30.10		3.87		42.47	27.93		.00		4,660	6.34	5,405	51	6.43	5,900	7.4
Apr. 11-14.....	5,205	22	26.10	6.09	6.61		2.66		30.19	7.62		.08		2,620	3.56	18,545	[illegible]	2.15	3,200	7.4
Apr. 15-22.....	10,473	19	24.95	5.02	5.83		2.26		28.11	5.22		.05		2,320	3.16	33,04[illegible]	[illegible]	1.51	2,780	7.4
Apr. 23-25.....	631	18	26.95	6.66	11.61		2.07		31.65	11.51		.03		2,900	3.94	2,488	26	2.83	3,600	7.5

Apr. 26-30, 1964	492	16	29.04	9.38	19.53		1.77		36.44	19.83		.01		3,670	4.99	2,455	34	4.46	4,720	7.2
May 1-3.....	220	16	30.89	12.75	30.62		1.77		41.64	31.03		.02		4,650	6.32	1,392	41	6.56	6,100	7.3
May 4-8.....	232	16	33.68	16.12	41.96		1.97		46.64	42.88		.03		5,670	7.71	1,790	46	8.41	7,550	7.3
May 9-18.....	369	16	35.63	19.74	59.60		2.64		51.22	60.65		.03		7,030	9.56	3,527	52	11.33	9,490	7.4
May 19-21.....	107	20	39.17	24.27	83.96		2.64		55.80	88.02		.03		8,910	12.12	1,298	57	14.91	12,300	7.5
May 22-31.....	182	17	36.33	22.29	69.17		2.67		53.51	71.37		.02		7,790	10.59	1,933	54	12.78	10,700	7.4
June 1, 2.....	42	16	36.28	22.70	83.96		2.79		53.30	87.45		.05		8,700	11.83	493	59	15.46	12,100	7.4
June 3-7.....	36	12	38.92	26.32	114.84		2.28		55.80	124.12		.06		10,900	14.82	529	64	20.11	15,500	7.2
June 8-11.....	8	13	35.33	23.28	96.14		2.03		53.51	100.15		.06		9,400	12.78	101	62	17.76	13,300	7.1
June 12, 13.....	714	12	25.65	6.99	29.58		1.77		30.19	31.03		.14		3,910	5.32	3,797	47	7.30	5,470	7.1
June 14-16.....	2,469	12	8.83	5.35	6.09		1.84		13.74	5.02		.06		1,290	1.75	4,332	30	2.29	1,850	7.4
June 17.....	26	16	12.16	7.65	10.53		2.16		19.03	9.37		.10		1,910	2.60	67	35	3.34	2,670	7.5
June 18.....	14	17	14.32	9.71	15.09		2.36		23.73	13.77		.09		2,470	3.36	47	39	4.35	3,430	7.4
June 19, 20.....	20	16	17.47	12.17	23.01		2.43		29.36	21.44		.10		3,290	4.47	69	44	5.98	4,550	7.3
June 21-30.....	95	20	21.46	15.14	30.89		2.96		36.02	29.06		.11		4,200	5.71	544	46	7.22	5,700	7.3
July 1.....	6	25	27.69	15.71	34.80		2.66		42.89	32.72		.05		4,870	6.62	39	44	7.47	6,530	7.4
July 2-4.....	2,017	20	30.14	9.05	12.62		2.29		38.31	11.06		.07		3,330	4.53	9,135	24	2.85	4,000	7.3
July 5-12.....	7,712	18	26.84	6.56	6.74		1.64		34.14	5.98		.04		2,740	3.73	28,737	16	1.60	3,200	7.4
July 13-15.....	240	19	30.59	6.39	12.48		1.54		38.10	11.62		.02		3,310	4.50	1,079	24	2.83	4,000	7.3
July 16, 17.....	26	22	32.48	9.95	18.10		1.54		41.64	17.21		.02		3,870	5.26	136	30	3.93	4,770	7.4
July 18-24.....	54	17	31.34	12.26	30.19		1.87		42.26	29.34		.07		4,620	6.28	340	41	6.47	6,090	7.2
July 25, 26.....	8	13	35.83	16.21	45.68		1.59		52.05	44.01		.04		6,090	8.28	66	47	6.95	8,030	7.1
July 27-29.....	6	14	40.42	16.18	59.16		1.72		56.30	57.83		.04		7,310	9.94	59	50	10.93	9,720	7.0
Aug. 8, 9.....	4	13	41.42	20.57	63.09		1.18		61.21	83.50		.06		8,940	12.16	48	57	14.92	12,300	7.0
Sept. 24-27.....	8	9.1	45.26	27.31	139.20		1.13		71.00	139.36		.04		12,800	17.41	138	66	23.11	17,900	7.1
Sept. 26, 29....	4	15	33.78	17.44	85.70		1.02		51.01	86.04		.03		8,410	11.44	45	63	16.93	12,000	6.9
Sept. 30.....	4	23	20.31	9.30	38.02		2.29		28.32	36.39		.27		4,150	5.64	22	56	9.68	5,980	6.9
Total or weighted average	47,090	17	27.12	10.17	23.66		2.41		34.37	24.14		0.05		3,810	5.18	243,900	39	5.08	5,030	7.4

RIO GRANDE BASIN--Continued

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 1964.
Water temperatures: March 1953 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 19,700 micromhos Sept. 22; minimum daily, 9,740 micromhos Nov. 4.
Percent sodium: Maximum, 75 Sept. 20-30; minimum, 63 Jan. 1-31, Apr. 1-30.
Sodium-adsorption-ratio: Maximum, 31.50 Sept. 20-30; minimum, 16.36 Jan. 1-31.
EXTREMES, 1937-64.--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.
Sodium-adsorption-ratio (1961-64): Maximum, 31.50 Sept. 20-30, 1964; minimum 15.15 Feb. 1-28, 1962.
REMARKS.--Where no potassium (K) is reported, sodium and potassium are calculated as sodium (Na). Records of discharge are given for gaging station near Orla. Mean discharge values reported below have been adjusted to exclude inflow from Salt (Screwbsan) Draw which enters Pecos River between sampling point and gaging station.

Chemical analyses, water year October 1963 to September 1964

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. 1-19, 1963.	260	10	24.80	18.84	123.98	2.12	1.75	0.00	39.35	128.92				10,200	13.87	3,607	73	26.54	14,700	6.3
Oct. 20-31.....	893	12	26.80	16.21	96.57	--	1.69	.00	39.56	98.17				8,400	11.42	10,197	69	20.83	12,200	6.8
Nov. 1-30.....	660	9.7	27.54	18.26	95.27	--	1.75	.00	41.85	97.32				8,490	11.55	7,626	68	19.91	12,200	6.8
Dec. 1-31.....	707	11	27.45	16.95	79.61	--	1.77	.00	40.39	81.81				7,490	10.19	7,203	64	16.90	10,800	7.5
Jan. 1-31, 1964.	486	10	28.44	16.37	77.43	1.33	1.77	.00	41.64	81.81				7,560	10.28	4,994	63	16.36	10,800	7.1
Feb. 1-29.....	2,439	7.5	28.69	16.53	80.91	--	1.84	.00	42.06	82.37				7,640	10.39	25,341	64	17.01	10,900	6.8
Mar. 1-31.....	2,576	8.4	28.84	17.36	83.09	--	1.90	.00	43.10	84.35				7,820	10.64	27,400	64	17.29	11,200	6.9
Apr. 1-30.....	577	6.8	29.84	19.58	84.83	1.46	1.97	.00	44.97	88.58				8,210	11.17	6,445	63	17.06	11,200	7.4
May 1-31.....	5,251	8.5	32.53	20.89	95.70	--	1.98	.00	48.93	98.17				9,000	12.24	64,273	64	18.52	12,400	7.4
June 1-30.....	5,510	11	33.98	21.63	108.32	--	1.90	.00	52.47	109.45				9,900	13.46	74,188	66	20.54	13,400	6.6
July 1-31.....	713	14	35.53	22.87	108.32	1.74	1.88	.00	53.51	113.69				10,200	13.87	9,894	64	20.05	14,000	7.2
Aug. 1-31.....	1,506	17	36.73	21.63	115.71	--	1.79	.00	55.80	116.51				10,500	14.28	21,512	66	21.42	14,600	6.8
Sept. 1-19.....	1,440	18	37.43	23.36	116.15	--	1.80	.00	56.63	118.48				10,700	14.55	20,949	66	21.07	14,600	6.9
Sept. 20-30.....	103	17	31.69	23.12	164.87	--	2.02	.00	49.76	167.85				13,100	17.82	1,827	75	31.50	18,600	6.8
Total or weighted average	23,120	10.6	31.97	19.96	98.21	--	1.88	0.00	48.29	100.14				9,080	12.35	285,500	65	19.25	12,600	6.8

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 upstream from the confluence with the Rio Grande. This confluence is 638.2 river miles downstream from the American Dam at El Paso.
DRAINAGE AREA.--35,308 square miles (from International Boundary Water Commission Water Bulletin Number 31).
RECORDS AVAILABLE.--Chemical analyses January 1955 to September 1964. Chemical analyses for the 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 1963 to September 1964 given in International Boundary and Water Commission Bulletin Numbers 33 and 34. Records for 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 1963 to September 1964

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 1963	4	5,607		5.82	4.58	15.22	--	2.55		6.73	16.40	--	0.02	0.20	1,603	2.18	12,200	59	6.7	2,590	8.0
November....	3	6,222		5.82	4.22	13.91	--	2.78		6.31	15.00	--	.02	.18	1,501	2.04	12,700	58	6.2	2,430	7.8
December....	5	7,418		6.72	4.56	15.61	--	3.10		6.97	17.15	--	.04	.18	1,715	2.33	17,730	58	6.6	2,730	7.8
January 1964	3	8,341	10	7.69	5.52	19.02	0.17	2.86		8.69	21.42	0.05	.04	.18	2,087	2.84	23,700	59	7.4	3,270	7.7
February....	4	7,202		8.08	6.18	21.82	--	2.82		9.78	24.15	--	.02	.19	2,284	3.11	22,400	60	8.2	3,690	7.7
March.....	4	7,430		9.14	7.45	27.40	--	2.40		11.96	29.86	--	.02	.24	2,733	3.72	27,600	62	9.5	4,380	7.5
April.....	5	21,971		9.32	6.92	26.13	--	2.81		11.41	28.25	--	.02	.30	2,711	3.69	81,100	62	9.2	4,210	7.9
May.....	3	5,346		7.68	6.18	22.31	--	2.35		9.69	24.28	--	.01	.27	2,271	3.09	16,500	62	8.5	3,600	8.0
June.....	4	19,714		7.08	5.18	18.28	--	2.60		8.28	20.15	--	.01	.22	1,960	2.67	52,600	60	7.4	3,110	7.7
July.....	4	5,309		6.24	4.86	17.34	.19	2.37		7.66	18.75	.05	.01	.24	1,776	2.42	12,800	61	7.4	2,920	7.9
August.....	3	5,043		5.72	4.40	15.74	--	2.28		6.97	16.70	--	.01	.19	1,631	2.22	11,200	61	7.0	2,650	--
September...	4	178,156		4.16	1.10	3.95	--	3.05		1.92	4.30	--	.06	.12	572	.78	139,000	43	2.4	945	8.2
Total or weighted average	--	277,800	--	5.39	2.75	9.85	--	2.91		4.48	10.74	--	0.05	0.16	1,134	1.54	429,500	49	4.4	1,824	--

PART 9. COLORADO RIVER BASIN

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 1964.
Water temperatures: May 1949 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,150 micromhos Jan. 15; minimum daily, 276 micromhos May 29.
Percent sodium: Maximum, 51 Feb. 1-29; minimum, 20 May 16-23.
Sodium-adsorption-ratio: Maximum, 3.26 Feb. 1-29; minimum, 0.59 May 24-31.
EXTREMES, 1941-64.--Specific conductance: Maximum daily, 2,260 micromhos Aug. 10, 1947; minimum daily, 153 micromhos May 24, 1948.
Percent sodium: Maximum, 53 Dec. 11-20, 1954; minimum, 7 Apr. 8, 1962.
Sodium-adsorption-ratio (1961-64): Maximum, 3.26 Feb. 1-29, 1964; minimum, 0.22 Apr. 8, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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. 1-16, 1963.	39,701		3.74		3.09		2.16		1.94	2.71				396	0.54	21,381	45	2.26	685	7.2
Oct. 17-31.....	22,969		4.94		4.22		2.59		2.83	3.72				536	.73	16,743	46	2.68	901	7.5
Nov. 1-25.....	47,008		4.64		3.44		2.51		2.64	2.91				473	.64	30,239	43	2.26	784	8.0
Nov. 26-30.....	7,269		5.40		4.57		2.72		3.14	4.09				589	.80	5,823	46	2.78	977	8.1
Dec. 1-31.....	38,245		5.24		4.74		2.74		3.00	4.23				591	.80	30,740	48	2.93	991	8.0
Jan. 1-31, 1964.	35,970		5.06		4.96		2.67		2.79	4.57				590	.80	28,863	49	3.12	994	7.9
Feb. 1-29.....	33,132		4.72		5.00		2.56		2.35	4.80				574	.78	25,864	51	3.26	968	7.5
Mar. 1-31.....	39,475		4.40		4.39		2.39		1.87	4.51				522	.71	28,024	50	2.96	885	7.3
Apr. 1-20.....	38,281		4.24		4.00		2.34		2.35	3.53				484	.66	25,198	49	2.75	799	8.1
Apr. 21-30.....	25,884		3.56		2.83		2.18		1.67	2.54				390	.53	13,729	44	2.12	647	7.6
May 1-15.....	41,831		3.56		2.65		2.16		1.67	2.37				372	.51	21,163	43	1.99	616	8.0
May 16-23.....	76,324		3.02		.74		2.56		.62	.56				222	.30	23,044	20	.60	355	8.1
May 24-31.....	91,382		2.44		.65		1.97		.58	.54				186	.25	23,116	21	.59	300	7.6
June 1-18.....	149,950		2.44		1.00		1.64		.92	.87				211	.29	43,030	29	.91	341	7.4
June 19-30.....	65,288		3.00		1.61		1.75		1.42	1.44				251	.34	22,287	35	1.31	455	7.7
July 1-13.....	49,688		3.74		2.39		2.11		2.00	2.03				363	.49	24,530	39	1.75	606	8.0
July 14-24.....	28,735		6.94		3.39		2.69		4.87	2.76				636	.86	24,854	33	1.82	965	8.0
July 25-31.....	20,785		4.68		2.61		2.56		2.58	2.14				436	.59	12,325	36	1.71	709	8.1
Aug. 1-31.....	87,435		4.40		3.22		2.46		2.46	2.71				452	.61	53,748	42	2.17	745	7.9
Sept. 1-30.....	72,119		4.04		3.39		2.29		2.19	2.93				437	.59	42,862	46	2.39	735	7.9
Total or weighted average	1,011,000		3.77		2.59		2.23		1.83	2.29				376	0.51	517,600	41	1.81	624	7.6

COLORADO RIVER MAIN STEM--Continued

9-1805. COLORADO RIVER NEAR CISCO, UTAH

LOCATION.--At gaging station, 1 mile downstream from Dolores River, 11 miles south of Cisco, Grand County, 36 miles downstream from Colorado-Utah line, 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 1964.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,940 micromhos Mar. 27; minimum daily, 352 micromhos May 26.
Percent sodium: Maximum, 68 Mar. 26-28; minimum, 23 May 23-31, Aug. 31.
Sodium-adsorption-ratio: Maximum, 9.28 Mar. 26-28; minimum, 0.73 May 23-31.
EXTREMES, 1941-52, 1953-64.--Specific conductance: Maximum daily, 4,820 micromhos Dec. 13, 1957; minimum daily, 291 micromhos May 31, 1958.
Percent sodium: Maximum, 68 Mar. 26-28, 1964; minimum, 18 June 1-10, 1957.
Sodium-adsorption-ratio: Maximum, 9.28 Mar. 26-28, 1964; minimum, 0.63 May 1-17, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	134,227		14.50		9.27		3.51	0.00	15.16	4.94		0.16		1,570	2.14	286,602	39	3.44	2,060	7.3
Nov. 1-30.....	178,750		11.12		7.57		3.54	.00	10.64	4.37		.15		1,190	1.62	289,290	40	3.21	1,680	7.4
Dec. 1-31.....	138,347		12.20		9.14		3.80	.00	11.31	6.07		.13		1,350	1.84	254,005	43	3.70	1,930	7.7
Jan. 1-31, 1964.	131,952		11.00		11.14		3.84	.00	10.60	7.56		.12		1,360	1.85	244,059	50	4.75	2,000	7.6
Feb. 1-16.....	69,152		11.50		10.66		3.56	.00	9.76	8.69		.13		1,370	1.86	128,844	48	4.44	2,080	7.8
Feb. 17-29.....	51,777		8.80		11.53		3.38	.00	9.72	7.11		.11		1,250	1.70	88,020	57	5.50	1,870	8.0
Mar. 1-25.....	103,339		9.60		10.57		3.25	.00	8.93	7.84		.16		1,330	1.81	186,919	52	4.82	1,900	8.0
Mar. 26-28.....	12,419		9.80		20.53		2.36	.00	8.33	19.32		.29		1,890	2.57	31,921	68	9.28	2,940	7.2
Mar. 29-31.....	12,734		9.60		9.09		3.28	.00	8.66	6.63		.13		1,230	1.67	21,301	49	4.15	1,800	7.9
Apr. 1-17.....	99,168		8.64		7.05		3.33	.00	6.77	5.50		.10		1,060	1.44	142,960	45	3.39	1,560	7.7
Apr. 18-30.....	115,234		6.00		3.00		2.82	.00	3.81	2.31		.06		613	.83	96,068	33	1.73	928	7.9
May 1-14.....	118,794		6.88		5.35		2.75	.13	6.27	2.99		.07		787	1.07	127,148	44	2.88	1,150	8.4
May 15-18.....	99,412		5.44		2.65		3.10	.00	3.46	1.47		.06		494	.67	66,789	33	1.61	744	7.9
May 19-22.....	184,463		3.72		1.31		2.61	.00	1.64	.73		.04		311	.42	78,020	26	.96	476	7.8
May 23-31.....	458,063		2.88		.87		1.84	.00	1.44	.45		.02		250	.34	155,741	23	.73	375	7.8

COLORADO RIVER MAIN STEM--Continued

9-1805. COLORADO RIVER NEAR CISCO, UTAH--Continued

Chemical analyses, water year October 1963 to September 1964--Continued

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalents per million										Boron (B) ppm	Dissolved solids (residue at 190°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 1-20, 1964.	590,281		4.12		1.61		2.33	0.00	2.52	0.87		0.01		335	0.46	268,932	28	1.12	536	7.9
June 21-30.....	189,402		5.08		3.61		2.29	.00	4.93	1.47		.01		469	.64	120,808	42	2.27	722	7.9
July 1-9.....	123,066		5.76		3.52		2.43	.00	4.81	2.00		.03		558	.76	93,393	38	2.08	851	7.8
July 10-22.....	99,479		9.20		4.96		2.95	.00	8.33	2.82		.05		907	1.23	122,709	35	2.31	1,270	8.1
July 23-31.....	53,500		11.68		5.66		3.44	.00	10.78	3.05		.07		1,110	1.51	80,764	33	2.34	1,520	8.0
Aug. 1-5.....	45,620		15.20		6.35		4.26	.00	14.10	3.10		.09		1,380	1.88	85,619	29	2.30	1,780	8.1
Aug. 6-25.....	166,215		11.76		5.26		3.61	.00	10.68	2.65		.10		1,100	1.50	248,657	31	2.17	1,490	8.0
Aug. 26-30.....	24,099		7.36		3.78		2.69	.00	6.70	1.64		.11		600	.82	19,665	34	1.97	901	7.8
Aug. 31.....	5,058		13.80		4.22		3.61	.13	10.45	3.67		.14		1,380	1.88	9,493	23	1.61	1,800	8.2
Sept. 1-30.....	152,569		12.88		8.05		3.44	.00	12.97	4.40		.12		1,380	1.88	286,341	38	3.17	1,820	8.2
Total or weighted average	3,357,000		7.44		4.79		2.85	0.00	6.38	2.93		0.07		774	1.05	3,534,000	39	2.29	1,110	7.7

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 Glen Canyon Dam, 28 miles downstream from Utah-Arizona State line, 61.5 miles upstream from Little Colorado River, and 79 miles downstream from San Juan River.
DRAINAGE AREA.--107,900 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: January to July 1926, October 1926 to June 1927, October 1928 to September 1930, November 1942 to October 1945, October 1947 to September 1964.
Water temperatures: July 1949 to September 1964.
Sediment records: October 1928 to December 1933, November 1942 to September 1944, October 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,460 micromhos Feb. 10, 14; minimum daily, 685 micromhos Sept. 30.
Percent sodium: Maximum, 41 May 1-31; minimum, 32 Sept. 7-30.
Sodium-adsorption-ratio: Maximum, 3.80 June 1-30; minimum, 1.43 Sept. 7-30.
EXTREMES, 1942-45, 1947-64.--Specific conductance: Maximum daily, 2,430 micromhos Oct. 15, 1960; minimum daily, 318 micromhos June 9, 1948.
Percent sodium (1942-45, 1947-64): Maximum, 46 Mar. 2, 4, 7, 10, 1944; minimum, 17 June 1-11, 1958.
Sodium-adsorption-ratio (1961-64): Maximum, 3.80 June 1-30, 1964; minimum, 0.70 May 13-17, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	61,488	12	3.79	2.22	3.87	0.16	2.59		5.33	1.97	0.02	0.06	0.13	649	0 88	54,271	39	2.23	971	7.5
Nov. 1-23.....	45,620	--	4.14	1.97	3.92	--	2.59		--	--	--	--	--	660	90	40,948	39	2.24	984	7.6
Nov. 24-30.....	13,884	--	5.24	2.71	4.65	--	2.75		--	--	--	--	--	832	1 13	15,710	37	2.33	1,200	7.7
Dec. 1-31.....	62,717	--	6.14	3.13	5.35	--	2.98		--	--	--	--	--	984	1.34	83,931	37	2.49	1,370	7.8
Jan. 1-31, 1964.	70,895	10	6.09	3.13	5.48	.18	3.15		8.89	2.65	.02	.05	.13	980	1.33	94,489	37	2.55	1,360	7.9
Feb. 1-29.....	230,543	--	6.44	3.13	5.35	--	3.21		--	--	--	--	--	978	1.33	306,640	36	2.45	1,430	8.0
Mar. 1-31.....	388,294	--	6.54	2.63	5.44	--	3.21		--	--	--	--	--	952	1.29	502,732	37	2.54	1,390	8.0
Apr. 1-30.....	770,578	--	6.09	2.80	5.31	--	3.11		--	--	--	--	--	914	1.24	957,860	37	2.52	1,350	7.9
May 1-31.....	318,875	--	5.54	2.88	5.74	--	2.95		--	--	--	--	--	894	1.22	387,701	41	2.80	1,340	7.8
June 1-30.....	59,560	--	5.64	2.88	5.70	--	3.05		--	--	--	--	--	914	1.24	73,854	40	3.80	1,305	7.9
July 1-31.....	60,070	12	5.60	2.88	5.57	.15	3.02		7.97	3.07	.02	.65	.19	918	1.25	75,087	39	2.71	1,340	7.9
Aug. 1-29.....	161,863	--	5.74	2.88	5.48	--	3.02		--	--	--	--	--	922	1.25	202,963	39	2.64	1,330	7.8
Aug. 30-Sept. 3.	23,385	--	5.09	2.55	4.87	--	2.85		--	--	--	--	--	820	1.12	26,079	39	2.49	1,190	7.8
Sept. 4-6.....	16,584	--	3.69	1.81	3.22	--	2.52		--	--	--	--	--	575	.78	12,969	37	1.94	864	7.7
Sept. 7-30.....	129,005	9.8	3.14	1.48	2.18	.09	2.29		3.69	1.24	.02	.05	.12	468	.64	82,109	32	1.43	715	8.0
Total or weighted average	2,413,361	--	5.79	2.73	5.17	--	3.02		--	--	--	--	--	889	1.21	2,917,343	38	2.50	1,305	7.8

COLORADO RIVER MAIN STEM--Continued

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

LOCATION (revised).--At gaging station in Grand Canyon National Park at Kaibab Bridge, 0.2 mile upstream from Bright Angel Creek, 4.5 miles 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 1964.
Water temperatures: October 1936 to October 1942, September 1943 to September 1964.
Sediment records: October 1925 to November 1942, September 1943 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 3,400 micromhos July 28; minimum daily, 971 micromhos Sept. 13.
Percent sodium: Maximum, 61 Aug. 3-9, Sept. 12; minimum, 41 Apr. 1-30.
Sodium-adsorption-ratio: Maximum, 6.12 July 28; minimum, 2.95 Apr. 1-30.
EXTREMES, 1937-42, 1943-64.--Specific conductance: Maximum daily, 2,900 micromhos Sept. 6, 1940; minimum daily, 341 micromhos June 15, 1942.
Percent sodium (1941-42, 1943-64): Maximum, 61 Aug. 3-9, Sept. 12, 1964; minimum 16 June 11-20, 1952.
Sodium-adsorption-ratio (1961-64): Maximum, 6.12 July 28, 1964; minimum, 0.87 July 1-6, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). Records of specific conductance of daily samples available in district office at Tucson, Ariz.

Chemical analyses, water year October 1963 to September 1964

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. 1-21, 1963.	52,649	--	4.99	2.39	9.57	--	3.75		--	--	--	--	--	1,040	1.41	74,467	56	4.98	1,700	7.8
Oct. 22-23.....	5,415	--	4.34	2.06	8.00	--	3.95		--	--	--	--	--	878	1.19	6,466	56	4.48	1,420	7.7
Oct. 24-31.....	19,216	--	4.79	2.47	9.27	--	3.61		--	--	--	--	--	1,020	1.39	26,856	56	4.86	1,670	7.8
Nov. 1-30.....	75,927	--	4.49	2.63	9.35	--	3.69		--	--	--	--	--	1,030	1.40	106,359	57	4.96	1,680	7.9
Dec. 1-31.....	77,474	12	6.39	3.29	10.44	0.21	4.20		7.83	8.35	0.02	0.07	0.20	1,270	1.73	133,814	51	4.75	1,960	8.0
Jan. 1-31, 1964.	78,643	--	6.24	3.54	10.79	--	4.28		--	--	--	--	--	1,290	1.75	137,971	52	4.88	1,980	7.9
Feb. 1-29.....	245,096	--	6.39	3.37	7.44	--	3.62		--	--	--	--	--	1,120	1.52	373,330	43	3.37	1,630	7.8
Mar. 1-31.....	382,453	12	6.09	3.37	7.09	.16	3.57		8.70	4.46	.02	.08	.10	1,080	1.47	561,747	42	3.26	1,580	7.8
Apr. 1-30.....	795,570	--	5.99	2.80	6.18	--	3.38		--	--	--	--	--	976	1.33	1,056,008	41	2.95	1,410	7.8
May 1-14.....	310,453	--	5.84	2.88	6.26	--	3.18		--	--	--	--	--	974	1.32	411,238	42	3.00	1,410	7.8
May 15-31.....	45,453	--	5.54	3.37	10.57	--	3.80		--	--	--	--	--	1,220	1.66	75,416	54	5.01	1,910	8.0
June 1-30.....	76,701	--	5.49	3.45	10.96	--	3.87		--	--	--	--	--	1,220	1.66	127,262	55	5.18	1,960	7.9
July 1-27.....	67,692	--	5.59	3.29	11.05	--	3.80		--	--	--	--	--	1,270	1.73	116,917	55	5.24	1,990	7.9
July 28.....	4,721	17	6.99	3.37	13.92	.20	4.65		8.24	11.71	.02	.01	.26	1,540	2.09	9,887	57	6.12	2,400	7.8
July 29-31.....	11,663	--	6.84	2.47	10.79	--	4.88		--	--	--	--	--	1,270	1.73	20,144	54	5.00	1,940	7.7

Aug. 1-2, 1964..	10,136	--	6.79	2.47	9.74	--	4.88		--	--	--	--	--	1,220	1.66	16,817	51	4.53	1,850	7.7
Aug. 3-9.....	54,301	--	4.59	1.40	8.87	--	4.59		--	--	--	--	--	952	1.29	70,305	60	5.13	1,470	7.7
Aug. 10-13.....	15,630	--	5.84	2.47	10.31	--	4.75		--	--	--	--	--	1,160	1.58	24,657	55	5.06	1,840	7.8
Aug. 14-18.....	51,828	--	4.04	1.23	8.27	--	4.46		--	--	--	--	--	850	1.16	59,913	61	5.09	1,350	7.6
Aug. 19-31.....	154,659	--	5.89	2.71	6.74	--	3.57		--	--	--	--	--	968	1.32	203,606	44	3.25	1,470	7.9
Sept. 1-7.....	38,973	--	5.69	2.71	7.44	--	3.64		--	--	--	--	--	1,020	1.39	54,064	47	3.63	1,550	7.9
Sept. 8-11.....	24,373	--	3.69	1.89	5.44	.13	2.92		--	--	--	--	--	691	.94	22,905	49	3.25	1,130	7.8
Sept. 12.....	13,091	--	4.74	1.97	10.31	.17	4.52		--	--	--	--	--	1,050	1.43	18,694	60	5.63	1,770	7.7
Sept. 13-14.....	16,344	15	2.99	.82	6.09	.11	3.57		3.29	3.17	2.11	.04	.25	607	.83	13,492	61	4.41	1,010	7.8
Sept. 15-30.....	97,809	--	3.69	1.81	5.57	.14	3.34		--	--	--	--	--	687	.93	91,385	50	3.36	1,130	7.8
Total or weighted average	2,726,270	--	5.72	2.88	7.40	--	3.59		--	--	--	--	--	1,040	1.41	3,813,520	46	3.57	1,554	7.8

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 1964.
Water temperatures: October 1941 to September 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 25, 1963	527,379	11	6.56		3.78	0.11	2.59		5.68	2.26	0.01	0.03	0.13	660	0.90	473,376	36	2.09	979	7.5
Nov. 5, 15, 26	464,073	9.6	3.89	2.47	3.48	.09	2.56		--	2.20	.02	.04	.10	658	.89	415,289	35	1.95	980	7.4
Dec. 5, 18, 26	585,055	9.7	4.14	2.30	3.78	.10	2.57		5.70	2.17	.02	.02	.15	663	.90	527,532	37	2.11	967	7.4
Jan. 6, 15, 24, 1964	632,707	10	4.14	2.30	3.96	.10	2.43		5.93	2.29	.02	.03	.14	683	.93	587,709	38	2.21	997	7.5
Feb. 5, 14, 25	582,684	9.8	4.49	2.14	4.05	.10	2.41		5.95	2.34	.02	.02	.15	689	94	545,998	38	2.22	1,020	7.9
Mar. 6, 13, 25	799,954	9.9	4.14	2.39	4.18	.11	2.46		6.00	2.43	.02	.02	.14	696	.95	757,204	39	2.31	1,030	7.7
Apr. 6, 15, 29	859,240	10	4.39	2.14	4.52	.10	2.52		6 33	2.76	--	.02	.11	719	.98	840,199	41	2.50	1,050	7.9
May 5, 15, 25	844,225	9.9	6.68		4.31	.11	2.54		6.14	2.76	.02	.02	--	723	.98	830,109	39	2.36	1,060	7.7
June 5, 16, 25	718,810	9.9	6.68		4.18	.11	2.52		6.14	2.74	.02	.02	--	726	.99	709,724	38	2 29	1,060	7.7
July 6, 15, 24	866,360	9.2	4.59	2.14	4.39	.13	2.51		6.23	2.65	.02	.00	.15	718	.98	845,984	39	2.40	1,070	7.7
Aug. 5, 15, 25	731,088	9.4	4.49	2.30	4.65	.12	2.62		6.35	2.60	.02	02	.13	729	.99	724,829	40	2.53	1,060	7.6
Sept. 4, 15	622,413	10	4.59	2.22	4.48	.12	2.62		6.29	2 76	.02	.01	.11	726	99	614,546	39	2.43	1,070	7.6
Total or weighted average A	8,233,988	9.8	4.34	2.26	4.20	0.11	2.53		5.76	2.53	0.02	0.02	0.11	703	0.96	7,872,499	38	2.31	1,034	7.7

A Represents 100 percent of runoff for the water year and includes estimated data for missing periods.

DIVERSIONS AND RETURN FLOWS 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 0.2 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 1964.
Water temperatures: May 1960 to September 1964.
EXTREMES, 1963-64:--Specific conductance: Maximum daily, 1,380 micromhos Jan. 29; minimum daily, 1,130 micromhos Feb. 28, Apr. 20.
Percent sodium: Maximum, 46 Sept. 1-30; minimum, 43 Mar. 1 to Apr. 30.
Sodium-adsorption-ratio: Maximum, 3.23 Sept. 1-30; minimum, 2.88 Apr. 1-30.
EXTREMES, 1943-64.--Specific conductance: Maximum daily, 1,600 micromhos July 7, 1962; minimum daily, 795 micromhos Jan. 5, 1953.
Percent sodium: Maximum, 46 Nov. 21-30, 1953, Feb. 1-28, 1962, Jan. 1-31, 1963, Sept. 1-30, 1964; minimum, 32 several periods in 1945, 1946, 1948, 1949 and 1957.
Sodium-adsorption-ratio (1961-64): Maximum, 3.25 Jan. 1-31, 1963; minimum, 2.52 July 7, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	27,792	15	4.74	2.14	5.79	0.13	2.72		6.58	3.44	0.03	0.02	0.17	830	1.13	31,372	45	3.12	1,230	8.1
Nov. 1-30.....	19,755	14	4.79	2.30	6.00	.13	2.82		6.75	3.61	.03	.02	.16	844	1.15	22,676	45	3.19	1,270	8.1
Dec. 1-31.....	14,634	13	4.84	2.39	6.00	.13	2.85		6.70	3.67	.02	.05	.17	848	1.15	16,877	45	3.16	1,270	8.1
Jan. 1-31, 1964.	22,812	13	4.84	2.47	5.83	.14	2.85		6.68	3.67	.02	.04	.15	852	1.16	26,433	44	3.05	1,270	8.1
Feb. 1-29.....	26,977	17	4.59	2.30	5.52	.12	2.66		6.58	3.33	.02	.02	.13	808	1.10	29,645	44	2.98	1,200	8.1
Mar. 1-31.....	24,534	16	4.64	2.30	5.39	.13	2.77		6.52	3.19	.02	.03	.12	798	1.09	26,626	43	2.89	1,190	8.0
Apr. 1-30.....	30,883	15	4.64	2.39	5.39	.13	2.70		6.66	3.27	.02	.02	.13	818	1.11	34,356	43	2.88	1,200	8.1
May 1-31.....	36,893	14	4.79	2.39	5.66	.13	2.75		6.85	3.47	.02	.02	.13	842	1.15	42,246	44	2.99	1,240	8.1
June 1-30.....	31,240	16	4.84	2.22	5.57	.13	2.62		6.87	3.41	.03	.02	.21	847	1.15	35,986	44	2.96	1,250	8.1
July 1-31.....	35,847	17	4.79	2.30	5.61	.13	2.67		6.79	3.30	.03	.02	.22	844	1.15	41,147	44	2.98	1,250	8.0
Aug. 1-31.....	31,789	17	4.59	2.47	5.70	.14	2.64		6.79	3.39	.03	.02	.23	842	1.15	36,402	44	3.03	1,270	8.0
Sept. 1-30.....	36,476	17	4.74	2.39	6.09	.14	2.62		7.04	3.72	.03	.02	.24	856	1.16	42,464	46	3.23	1,310	8.2
Total or weighted average	339,600	16	4.73	2.34	5.70	0.13	2.71		6.75	3.44	0.03	0.02	0.18	836	1.14	386,200	44	3.03	1,250	8.1

GUNNISON RIVER BASIN

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

LOCATION.--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.--7,870 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1931 to September 1964.
Water temperatures: April 1949 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,470 micromhos Oct. 11; minimum daily, 296 micromhos May 25.
Percent sodium: Maximum, 33 Dec. 1-31; minimum, 14 May 22-26.
Sodium-adsorption-ratio: Maximum, 2.42 Dec. 1-31; minimum, 0.45 May 17-21.
EXTREMES, 1941-64.--Specific conductance: Maximum daily, 2,730 micromhos Sept. 10, 1956; minimum daily, 280 micromhos May 23, 1948.
Percent sodium (1950-64): Maximum, 39 Apr. 30, 1962; minimum, 10 June 2-5, 10, 1952.
Sodium-adsorption-ratio (1961-63): Maximum 2.64 Sept. 14-30, 1963; minimum, 0.34 Apr. 17, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	33,556		21.20		7.57		4.29		23.73	0.76				2,100	2.86	95,837	26	2.32	2,370	7.4
Oct. 23-31.....	21,118		15.80		4.74		4.36		15.64	.54				1,460	1.99	41,932	23	1.69	1,770	7.4
Nov. 1-30.....	65,514		12.80		5.05		4.00		13.32	.51				1,250	1.70	111,374	28	1.99	1,560	7.7
Dec. 1-31.....	49,067		7.14	5.18	6.00		3.28		14.47	.51				1,240	1.69	82,747	33	2.42	1,500	7.9
Jan. 1-31, 1964.	43,410		6.74	4.94	5.44		3.54		13.10	.48				1,160	1.58	68,484	32	2.25	1,420	8.0
Feb. 1-29.....	45,326		11.20		4.61		3.70		11.53	.56				1,110	1.51	68,425	29	1.95	1,390	7.9
Mar. 1-31.....	42,549		11.12		4.83		3.46		11.91	.59				1,120	1.52	64,811	30	2.05	1,420	7.6
Apr. 1-17.....	36,349		9.36		4.31		3.54		9.66	.48				905	1.23	44,738	32	1.99	1,160	8.0
Apr. 18-27.....	36,060		6.32		1.61		2.85		4.75	.34				567	.77	27,806	20	.91	775	8.2
Apr. 28-30.....	5,336		8.08		2.44		2.85		7.18	.48				753	1.02	5,466	23	1.21	983	7.9
May 1.....	4,602		9.12		3.35		3.44		8.56	.45				822	1.12	5,144	27	1.57	1,100	7.5
May 2-5.....	21,104		6.32		1.78		2.95		4.83	.34				549	.75	15,757	22	1.00	752	7.9
May 6-12.....	20,285		6.46		3.16		2.98		8.24	.42				783	1.06	21,601	27	1.54	1,020	7.7
May 13-16.....	41,336		5.24		1.13		2.82		3.39	.16				410	.56	23,049	18	.70	589	7.7
May 17-21.....	108,694		3.18		.57		2.10		1.58	.07				242	.33	35,773	15	.45	358	7.9

May 22-26, 1964.	122,380		2.60	.44		1.64		1.33	.08				203	.28	33,787	14	.38	303	7.9
May 27-31.....	99,273		3.24	.70		1.77		2.08	.08				260	.35	35,103	18	.55	380	7.7
June 1-21.....	252,417		4.00	1.04		1.97		2.96	.12				341	.46	117,061	21	.74	497	7.8
June 22-30.....	63,193		5.36	1.87		2.26		4.81	.14				471	.64	40,479	26	1.14	666	7.9
July 1-8.....	32,989		7.60	2.22		2.67		7.00	.16				665	.90	29,835	23	1.14	891	7.7
July 9-14.....	13,662		9.52	2.70		3.00		8.81	.39				892	1.21	16,574	22	1.24	1,130	7.8
July 15-17.....	6,212		14.60	3.48		3.74		13.82	.54				1,350	1.84	11,406	19	1.29	1,620	7.7
July 18-22.....	10,988		11.32	4.00		3.51		11.41	.39				1,060	1.44	15,841	26	1.68	1,300	7.8
July 23.....	1,964		8.36	3.18		5.57		5.62	.34				774	1.05	2,067	28	1.55	987	7.4
July 24-25.....	4,443		15.24	4.65		3.75		13.66	.48				1,210	1.65	7,311	26	1.81	1,480	7.8
July 26-31.....	12,603		11.04	3.13		3.47		10.35	.37				979	1.33	16,780	22	1.33	1,220	7.6
Aug. 1-3.....	8,229		12.80	2.83		4.03		11.16	.45				1,150	1.56	12,871	18	1.12	1,450	7.9
Aug. 4.....	3,848		17.40	5.66		4.20		18.36	.48				1,650	2.24	8,635	25	1.92	1,900	7.7
Aug. 5-26.....	72,436		14.00	2.39		3.84		12.16	.39				1,140	1.55	112,305	15	.90	1,420	7.6
Aug. 27-31.....	8,856		15.20	4.96		3.67		15.99	.48				1,390	1.89	16,742	25	1.80	1,670	7.9
Sept. 1-30.....	59,504		16.40	6.00		4.00		17.68	.71				1,460	1.99	118,151	27	2.10	1,740	8.0
Total or weighted average	1,347,000		7.86	7.36		2.77		7.36	0.29				714	0.97	1,308,000	25	1.17	916	7.7

GREEN RIVER BASIN

9-2345. GREEN RIVER NEAR GREENDALE, UTAH

LOCATION.--At gaging station, 0.5 mile downstream from Flaming Gorge Dam, 2 miles south of Dutch John, 4 miles northeast of Greendale, Daggett County, and 13 miles southeast of Linwood.
DRAINAGE AREA.--15,100 square miles approximately.
RECORDS AVAILABLE.--Chemical analyses: October 1956 to September 1964.
Water temperatures: October 1956 to September 1959, October 1963 to September 1964.
Sediment records: October 1956 to September 1959.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 933 micromhos Oct. 4; minimum daily, 606 micromhos Nov. 14, 22, Feb. 10, 19.
Percent sodium: Maximum, 37 Oct. 1-31; minimum, 28 Feb. 1-29.
Sodium-adsorption-ratio: Maximum, 2.08 Oct. 1-31; minimum, 1.17 Feb. 1-29.
EXTREMES, 1956-58, 1959-64.--Specific conductance: Maximum daily, 1,340 micromhos Aug. 30, 1961; minimum daily, 325 micromhos June 2, 1961.
Percent sodium (1959-64): Maximum, 53 Mar. 29-31, 1962; minimum, 16 May 8, 1962.
Sodium-adsorption-ratio (1961-64): Maximum, 3.72 Mar. 29-31, 1963; minimum, 0.60 May 8, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	7,870		6.44		3.74		3.57		5.73	0.87				623	0.85	6,668	37	2.08	896	7.3
Nov. 1-30.....	18,565		4.80		2.48		3.20		3.48	.59				427	.58	10,781	34	1.60	648	7.4
Dec. 1-31.....	45,685		4.66		2.26		3.15		3.21	.54				459	.62	28,519	33	1.48	625	7.9
Jan. 1-31, 1964.	58,352		4.68		2.39		3.15		3.35	.56				419	.57	33,251	34	1.56	631	7.9
Feb. 1-29.....	55,565		4.68		1.78		3.11		2.83	.54				424	.58	32,041	28	1.17	627	7.8
Mar. 1-31.....	36,831		5.02		2.26		3.18		3.46	.62				440	.60	22,040	31	1.43	672	7.6
Apr. 1-30.....	34,929		5.12		2.52		3.18		3.81	.65				458	.62	21,757	33	1.58	684	7.7
May 1-31.....	90,817		5.28		2.26		3.16		4.06	.31				471	.64	58,174	30	1.39	705	7.7
June 1-30.....	86,043		4.94		2.61		3.06		3.85	.62				451	.61	52,775	35	1.66	691	7.6
July 1-31.....	150,091		5.02		2.52		3.03		3.91	.62				450	.61	91,856	33	1.59	686	7.9
Aug. 1-31.....	122,483		4.92		2.70		3.00		3.98	.62				447	.61	74,460	35	1.72	690	7.7
Sept. 1-30.....	130,909		4.96		2.52		2.97		3.91	.59				449	.61	79,938	34	1.60	688	7.7
Total or weighted average	838,100		4.96		2.45		3.08		3.77	0.57				449	0.61	512,300	33	1.56	679	7.7

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 1964.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,730 micromhos Aug. 13; minimum daily, 360 micromhos May 27.
Percent sodium: Maximum, 48 Oct. 1-31; minimum, 24 May 24-31.
Sodium-adsorption-ratio: Maximum, 3.72 Oct. 1-31; minimum, 0.78 May 24-31.
EXTREMES, 1928-64.--Specific conductance: Maximum daily, 2,620 micromhos Aug. 6, 1963; minimum daily, 272 micromhos May 13, 1956.
Percent sodium (1950-64): Maximum, 53 Aug. 1-4, 1963; minimum, 19 Aug. 7, 1957.
Sodium-adsorption-ratio (1961-64): Maximum, 3.92 Oct. 1-6, 1963; minimum, 0.78 May 24-31, 1964.
REMARKS.--Specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	47,468		7.92		7.40		4.06		8.89	2.34				974	1.32	62,658	48	3.72	1,390	7.3
Nov. 1-30.....	73,904		8.00		6.35		4.23		7.93	2.20				927	1.26	93,172	44	3.18	1,320	7.8
Dec. 1-20.....	44,668		7.88		6.00		4.62		7.41	1.86				851	1.16	51,697	43	3.02	1,240	7.8
Dec. 21-31.....	39,556		7.32		4.70		4.39		6.23	1.41				734	1.00	39,487	39	2.46	1,060	7.6
Jan. 1-Feb. 29, 1964.....	235,279		5.60		3.74		3.51		4.68	1.13				562	.76	179,829	40	2.24	846	8.0
Mar. 1-31.....	128,325		6.12		4.13		3.74		5.23	1.30				637	.87	111,170	40	2 36	942	8.1
Apr. 1-30.....	189,878		6.16		4.74		4.10		5.48	1.30				654	.89	168,885	43	2.70	959	7.9
May 1-19.....	187,827		5.08		2.65		3.57		3.37	.79				481	.65	122,869	34	1.66	714	7.7
May 20-23.....	131,861		3.88		1.35		3.28		1.50	.45				317	.43	56,848	26	.97	480	8.2
May 24-31.....	314,023		3.04		.96		2.49		1.21	.31				250	.34	106,768	24	.78	384	8.0
June 1-30.....	724,760		3.60		1.31		2.82		1.71	.39				296	.40	291,760	27	.97	457	7.8
July 1-13.....	196,612		3.48		1.44		2.62		1.79	.51				306	.42	81,822	29	1 09	474	7.8
July 14-24.....	98,749		4.88		2.83		3.31		3.62	.76				473	.64	63,523	37	1.81	705	7.8
July 25-31.....	48,331		5.82		3.39		3.41		4.83	.96				579	.79	38,058	37	1.99	850	7.9
Aug. 1-12.....	90,875		6.84		4.22		4.23		5.85	.96				672	.91	83,052	38	2.28	965	8.0
Aug. 13.....	7,537		15.20		7.05		4.72		16.59	.93				1,440	1.96	14,761	32	2.56	1,730	7.9
Aug. 14-31.....	98,039		6.72		3.78		3.87		5.64	.99				635	.86	84,666	36	2.06	926	8.0
Sept. 1-30.....	139,537		5.96		3.96		3.51		5.29	1.13				600	.82	113,862	40	2.29	887	8.0
Total or weighted average	2,797,000		4.86		2.70		3.29		3.48	0.82				464	0.63	1,670,000	36	1.65	690	7.8

GREEN RIVER BASIN--Continued

9-2510. YAMPA RIVER NEAR MAYBELL, COLO.

LOCATION.--At county bridge, 1 mile north of Maybell, Moffat County, and about 3.5 miles downstream from gaging station.
DRAINAGE AREA.--3,410 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: November 1950 to September 1964.
Water temperatures: November 1950 to September 1964.
Sediment records: December 1950 to May 1958.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 837 micromhos Dec. 9; minimum daily, 108 micromhos June 1, 2, 17, 18.
Percent sodium: Maximum, 47 Dec. 1-18; minimum, 12 May 17-21, June 1-9.
Sodium-adsorption-ratio: Maximum, 2.73 Dec. 1-18; minimum, 0.18 June 1-9.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 947 micromhos Sept. 24, 1955; minimum daily, 94 mocromhos June 14, 1959.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	7,194		3.40		3.48		3.28	0.00	1.83	1.75				402	0.55	3,933	51	2.67	671	7.8
Nov. 1-30.....	11,960		3.80		2.96		3.44	.00	1.81	1.50				389	.53	6,327	44	2.15	644	7.6
Dec. 1-18.....	4,784		4.68		4.18		4.54	.00	2.37	1.95				499	.68	3,247	47	2.73	805	8.1
Dec. 19-31.....	3,661		3.58		2.35		3.43	.00	1.52	.96				339	.46	1,688	40	1.76	542	7.9
Jan. 1-31, 1964.	8,424		3.34		2.28		3.34	.00	1.46	.82				318	.43	3,643	40	1.75	511	8.0
Feb. 1-29.....	9,203		2.68		2.78		3.28	.00	1.42	.76				307	.42	3,843	51	2.41	508	8.0
Mar. 1-31.....	13,589		3.36		1.96		3.15	.00	1.44	.73				314	.43	5,803	37	1.51	501	7.8
Apr. 1-10.....	8,926		3.12		1.78		2.36	.00	1.52	1.04				308	.42	3,739	36	1.43	495	7.7
Apr. 11-28.....	52,447		3.52		1.22		2.59	.00	1.92	.23				293	.40	20,899	26	.92	449	7.6
Apr. 29-30.....	5,772		3.00		.70		2.29	.00	1.25	.17				230	.31	1,805	19	.57	354	7.7
May 1-16.....	84,512		2.70		.57		2.26	.00	.85	.14				202	.27	23,217	17	.49	318	7.8
May 17-21.....	83,425		1.80		.24		1.70	.00	.29	.05				128	.17	14,523	12	.25	196	7.5
May 22-31.....	165,798		1.12		.21		1.05	.00	.23	.05				87	.12	19,617	16	.28	134	7.2
June 1-9.....	103,930		1.00		.13		.89	.00	.19	.05				72	.10	10,177	12	.18	112	7.3
June 10-12.....	33,441		1.20		.26		1.11	.00	.29	.06				94	.13	4,275	18	.34	145	7.4
June 13.....	9,759		.96		.15		.85	.00	.21	.05				64	.09	849	13	.21	111	7.1
June 14-16.....	29,972		1.24		.32		1.15	.00	.35	.06				98	.13	3,995	21	.41	153	7.4
June 17-30.....	115,434		1.12		.20		1.00	.00	.27	.05				83	.11	13,030	15	.27	130	7.3

July 1-2, 1964..	15,967		1.52	.74		1.51	.00	.50	.23				133	.18	2,888	33	.85	206	7.7
July 3.....	6,783		1.04	.36		1.05	.00	.29	.06				92	.13	849	26	.50	126	7.7
July 4-5.....	11,445		1.52	.61		1.44	.00	.46	.21				139	.19	2,163	29	.70	206	7.9
July 6-31.....	48,682		2.36	.96		2.07	.13	.83	.28				193	.26	12,778	29	.88	307	8.4
Aug. 1-31.....	19,492		2.88	1.48		2.72	.00	1.21	.42				247	.34	6,548	34	1.23	403	8.1
Sept. 1-7.....	3,346		2.68	1.57		2.59	.00	1.10	.54				237	.32	1,079	37	1.35	392	8.2
Sept. 8-30.....	7,208		3.32	2.44		3.16	.00	1.79	.82				319	.43	3,127	42	1.89	542	8.2
Total or weighted average	865,200		1.37	0.61		1.62	--	0.60	0.19				148	0.20	174,042	30	2.33	232	7.4

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.
DRAINAGE AREA.--3,260 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1954 to September 1964.
Water temperatures: December 1954 to September 1964.
Sediment records: December 1954 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 454 micromhos May 26; minimum daily, 226 micromhos Oct. 1.
Percent sodium: Maximum, 32 Dec. 1-31, Mar. 10-13; minimum, 25 July 1-15, Aug. 1-16.
Sodium-adsorption-ratio: Maximum, 1.16 Mar. 10-13; minimum, 0.64 Aug. 1-16.
EXTREMES, 1954-64.--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.
Sodium-adsorption-ratio (1961-64): Maximum, 1.53 Mar. 20, 1962; minimum, 0.30 Apr. 17-23, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	23,919	14	1.50	0.32	0.65	0.06	1.64	0.00	0.83	0.08	0.01	0.00	0.05	166	0.23	5,400	26	0.68	244	7.6
Nov. 1-30.....	23,742	--	1.55	.43	.74	--	1.70	.00	--	--	--	--	--	174	.24	5,618	27	.74	271	7.8
Dec. 1-31.....	23,980	--	1.75	.02	.83	--	1.80	.00	--	--	--	--	--	203	.28	6,620	32	.88	308	8 2
Jan. 1-31, 1964.	17,401	--	2.00	.52	1.09	--	1.87	.07	--	--	--	--	--	234	.32	5,538	30	.97	353	8 3
Feb. 1-29.....	13,172	--	1.95	.51	1.04	--	1.98	.00	--	--	--	--	--	222	30	3,977	30	.94	348	7.9
Mar. 1-9.....	4,052	--	2.05	.51	1.09	--	2.00	.00	--	--	--	--	--	232	.32	1,279	30	.96	364	7.7
Mar. 10-13.....	405	12	2.25	.65	1.39	.07	2.08	.00	2.17	.16	.02	.01	.03	275	.37	151	32	1.16	429	7.7
Mar. 14-31.....	8,283	--	2.00	.58	1.09	--	2.05	.00	--	--	--	--	--	231	.31	2,602	30	.96	366	7.8
Apr. 1-30.....	14,519	--	2.05	.57	1.13	--	2.05	.00	--	--	--	--	--	235	.32	4,640	30	.99	372	7.8
May 1-25.....	22,760	--	2.00	.56	1.00	--	2.03	.00	--	--	--	--	--	299	.41	9,255	28	.89	355	8.0
May 26.....	1,904	--	2.89	.49	1.26	--	2.49	.00	--	--	--	--	--	322	.44	834	27	.97	454	7.9
May 27-31.....	9,213	--	1.90	.46	.96	--	1.90	.00	--	--	--	--	--	209	.28	2,619	29	.88	330	7.7
June 1-23.....	58,439	--	1.90	.50	.91	--	1.90	.00	--	--	--	--	--	212	.29	16,849	28	.83	327	7.9
June 24-30.....	23,451	--	1.65	.39	.74	--	1.70	.00	--	--	--	--	--	184	.25	5,868	27	.73	282	8.2
July 1-15.....	51,144	12	1.70	.44	.74	.06	1.69	.00	1.12	.11	.01	.00	.10	199	.27	13,842	25	.71	295	7.6

July 16-31, 1964	56,743	--	1.50	.38	.65	--	1.52	.00	--	--	--	--	--	172	.23	13,273	26	.67	253	7.7
Aug. 1-16.....	29,006	--	1.45	.35	.61	--	1.44	.00	--	--	--	--	--	160	.22	6,312	25	.64	245	7.9
Aug. 17-20.....	3,507	--	2.00	.68	1.04	--	2.03	.00	--	--	--	--	--	237	.32	1,130	28	.90	369	8.0
Aug. 21-26.....	10,663	--	1.40	.36	.61	--	1.44	.00	--	--	--	--	--	152	.21	2,204	26	.65	241	7.6
Aug. 27, 28.....	2,292	--	2.15	.50	1.09	--	1.97	.00	--	--	--	--	--	232	.32	733	29	.95	368	7.9
Aug. 29-31.....	2,522	13	1.30	.36	.61	.05	1.38	.00	.85	.07	.01	05	.08	150	.20	504	26	.67	230	7.9
Sept. 1-30.....	26,122	--	1.40	.36	.65	--	1.48	.00	--	--	--	--	--	161	.22	5,720	27	.70	246	7.7
Total or weighted average	427,239	--	1.70	0.44	0.83	--	1.74	0.00	--	--	--	--	--	198	0.27	110,108	28	0 80	295	7.8

SAN JUAN RIVER BASIN--Continued

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 1964.
Water temperatures: May 1944 to September 1962.
Sediment records: August to September 1928, July 1929 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,630 micromhos Mar. 17; minimum daily, 404 micromhos May 29.
Percent sodium: Maximum, 58 Aug. 1-6; minimum, 22 May 22-31.
Sodium-adsorption-ratio: Maximum, 4.62 Aug. 1-6; minimum, 0.74 May 22-31.
EXTREMES, 1929-64.--Specific conductance (1941-64): Maximum daily, 2,790 micromhos Sept. 19, 1959; minimum daily, 208 micromhos June 17, 1952.
Percent sodium: Maximum, 61 Sept. 26-30, 1962; minimum, 11 May 21, 23-27, 29-31, July 1-10, 1944.
Sodium-adsorption-ratio (1961-64): Maximum, 5.03 Sept. 26-30, 1962; minimum, 0.30 Apr. 17-23, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963..	6,151		8.64		4.96		3.11	0.00	9.51	0.99				930	1.26	7,779	36	2.39	1,240	7.5
Oct. 8-14.....	3,235		10.64		7.57		2.82	.00	13.99	1.38				1,240	1.69	5,456	42	3.28	1,600	7.1
Oct. 15-31.....	31,258		9.28		4.92		3.08	.00	10.26	.85				952	1.29	40,470	35	2.28	1,250	7.3
Nov. 1-30.....	47,068		6.08		3.87		3.05	.00	8.02	.90				807	1.10	51,658	32	1.93	1,100	7.5
Dec. 1-31.....	48,329		7.72		3.48		3.06	.00	7.35	.79				755	1.03	49,624	31	1.77	1,020	7.3
Jan. 1-17,1964..	24,682		8.28		4.70		3.51	.00	8.52	.96				829	1.13	27,828	36	2.31	1,130	7.8
Jan. 18-31.....	19,188		8.56		4.65		3.44	.00	8.77	1.02				852	1.16	22,234	35	2.25	1,150	7.6
Feb. 1-29.....	29,853		9.08		5.18		3.41	.00	9.79	1.04				933	1.27	37,880	36	2.43	1,230	7.7
Mar. 1-31.....	28,469		9.92		5.05		3.11	.00	10.60	1.24				1,070	1.46	41,428	34	2.27	1,380	7.5
Apr. 1-30.....	29,752		9.92		5.22		3.28	.00	10.72	1.13				1,030	1.40	41,677	34	2.34	1,330	7.9
May 1-16.....	12,948		9.20		4.96		3.21	.00	9.83	1.10				996	1.35	17,539	35	2.31	1,300	7.8
May 17-21.....	22,433		5.60		1.87		3.31	.00	3.73	.45				471	.64	14,370	25	1.12	696	7.6
May 22-31.....	67,081		3.64		1.00		2.36	.00	1.98	.31				293	.40	26,730	22	.74	448	7.8
June 1-3.....	10,395		3.89	1.48	1.67		2.69	.40	3.75	.37				482	.66	6,814	26	1.14	651	8.5
June 4-7.....	9,838		4.99	2.06	2.61		3.21	.40	5.41	.65				646	.88	8,643	27	1.39	859	8.3
June 8.....	2,717		2.79	1.07	1.39		2.36	.00	2.56	.34				326	.44	1,205	26	1.00	494	8.2
June 9-10.....	9,342		4.34	1.56	2.00		2.69	.40	4.23	.54				516	.70	6,556	25	1.16	710	8.4
June 11-30.....	88,661		3.14	1.15	1.87		2.31	.27	3.21	.34				390	.53	47,026	30	1.28	560	8.3

July 1-12, 1984.	38,940		3.54	1.48	2.22		2.98	.00	3.73	.48				462	.63	24,486	31	1.40	650	8.1
July 13-14.....	10,552		5.19	1.97	3.00		3.57	.33	5.81	.51				664	.90	9,529	30	1.59	896	8.4
July 15-18.....	7,716		6.74	1.56	8.44		4.49	.47	11.12	.85				1,180	1.58	12,172	50	4.14	1,400	8.4
July 17-19.....	10,574		5.04	1.40	2.52		3.84	.40	4.33	.39				576	.78	8,283	28	1.41	813	8.4
July 20-27.....	28,841		3.59	1.32	2.13		3.25	.00	3.37	.39				456	.82	17,762	30	1.36	643	8.2
July 28-31.....	17,121		4.04	1.23	3.74		3.18	.47	4.87	.48				590	.80	13,738	41	2.30	805	8.5
Aug. 1-8.....	59,683		5.44		7.61		3.46	.37	8.77	.45				838	1.14	68,019	58	4.82	1,230	8.4
Aug. 7-31.....	72,050		7.52		4.31		3.77	.00	7.43	.82				749	1.02	73,393	36	2.22	1,030	8.1
Sept. 1-19.....	20,852		10.82		6.53		2.87	.47	12.66	1.13				1,160	1.58	32,580	38	2.83	1,470	8.5
Sept. 20-30.....	34,975		8.84		6.53		3.10	.30	8.77	1.18				902	1.23	42,904	49	3.53	1,200	8.5
Total or weighted average	792,300		6.77		3.90		3.09	0.12	6.77	0.68				703	0.96	757,800	34	2.08	959	7.7

VIRGIN RIVER BASIN

9-4150. VIRGIN RIVER AT LITTLEFIELD, ARIZ.

LOCATION.--At gaging station, 0.4 mile downstream from Beaverdam 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 1964.
Water temperatures: October 1947 to September 1964.
Sediment records: October 1947 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 4,490 micromhos Aug. 12; minimum daily, 1,590 micromhos May 13.
Percent sodium: Maximum, 40 Apr. 20-30; minimum, 25 Aug. 1-11.
Sodium-adsorption-ratio: Maximum, 4.15 Apr. 20-30; minimum, 2.33 Nov. 17.
EXTREMES, 1949-64. --Specific conductance: Maximum daily, 4,490 micromhos Aug. 12, 1964; minimum daily, 734 micromhos Apr. 28, 1952.
Percent sodium: Maximum, 43 Dec. 28, 1962, Jan. 1, 3, 1963; minimum, 8 May 12, 1958.
Sodium-adsorption-ratio: Maximum, 5.23 Mar. 29, 1963: minimum, 1.25 Feb. 16-17, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	5,399		24.40		11.27		4.87	0.00	20.20	10.58				2,440	3.32	17,915	32	3.23	3,150	7.4
Nov. 1-16.....	5,554		22.80		13.27		5.08	.00	19.51	11.57				2,330	3.17	17,599	37	3.93	3,040	7.7
Nov. 17.....	593		17.00		6.79		3.61	.00	14.97	5.22				1,560	2.12	1,258	29	2.33	2,010	7.8
Nov. 18-30.....	3,300		20.40		12.75		5.43	.00	16.97	10.72				2,100	2.86	9,426	38	3.99	2,790	7.6
Dec. 1-31.....	6,825		21.60		13.22		5.47	.00	18.07	11.28				2,180	2.96	20,235	38	4.02	2,920	7.5
Jan. 1-31, 1964.	6,641		21.20		13.09		5.44	.00	17.99	10.86				2,180	2.96	19,688	38	4.02	2,880	7.9
Feb. 1-29.....	7,535		20.80		10.96		5.21	.00	15.26	11.28				2,120	2.88	21,726	35	3.40	2,900	7.7
Mar. 1-31.....	6,641		22.20		9.05		5.02	.00	14.95	11.28				2,200	2.99	19,869	29	2.72	2,930	7.7
Apr. 1-15.....	7,765		16.10		7.35		4.65	.00	10.49	8.32				1,590	2.16	16,792	31	2.59	2,210	7.7
Apr. 16-19.....	2,666		12.70		7.13		4.10	.00	9.26	6.49				1,300	1.77	4,713	36	2.83	1,840	7.6
Apr. 20-30.....	2,182		20.00		13.14		5.44	.00	17.09	10.72				2,200	2.99	6,528	40	4.15	2,860	7.9
May 1-12.....	4,189		17.50		11.01		4.82	.00	14.41	9.25				1,800	2.45	10,255	39	3.72	2,450	7.7
May 13-21.....	5,159		12.90		7.87		3.90	.00	10.35	6.54				1,300	1.77	9,121	38	3.10	1,850	7.7
May 22-31.....	1,492		22.60		12.01		4.08	.00	20.51	10.01				2,280	3.10	4,625	35	3.57	2,860	7.7
June 1-30.....	2,785		25.60		12.96		3.88	.00	23.94	10.72				2,570	3.50	9,733	34	3.62	3,110	7.6

July 1-31, 1964.	3,745	17.0	17.86	8.72	12.05	.72	3.64	.00	26.03	10.32	.05	.00		2,670	3.63	13,597	31	3.31	3,160	8.1
Aug. 1-11.....	4,996		32.00		10.88		3.47	.67	31.02	7.62				2,860	3.89	19,434	25	2.72	3,140	8.4
Aug. 12.....	278		45.00		17.66		6.62	.00	40.81	15.23				4,250	5.78	1,605	28	3.72	4,490	8.1
Aug. 13-31.....	8,630		29.40		11.83		3.90	.60	27.27	9.45				2,720	3.70	31,924	29	3.09	3,140	8.4
Sept. 1-30.....	3,172		27.80		12.14		4.85	.00	24.36	10.72				2,670	3.63	11,517	30	3.26	3,210	7.8
Total or weighted average	89,550		22.22		11.07		4.67	0.10	18.65	9.92				2,200	2.99	267,600	33	3.34	2,810	7.7

GILA RIVER BASIN

9-4740. GILA RIVER AT KELVIN, ARIZ.

LOCATION.--Just upstream from mouth of Mineral Creek, 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, upstream from gaging station, of which 5,125 square miles is downstream from Coolidge Dam.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1964.
Water temperatures: December 1950 to September 1964.
Sediment records: January 1958 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 2,780 micromhos Jan. 30; minimum daily, 586 micromhos Aug. 2.
Percent sodium: Maximum, 63 July 1-14; minimum, 13 Aug. 12.
Sodium-adsorption-ratio: Maximum, 7.56 July 1-14; minimum, 0.79 Aug. 12.
EXTREMES, 1950-64.--Specific conductance: Maximum daily, 5,120 micromhos May 22, 1961; minimum daily, 407 micromhos Jan. 20, 1952.
Percent sodium: Maximum, 67 July 15, 1955; minimum, 9 July 11-18, Sept. 10-30, 1956.
Sodium-adsorption-ratio (1961-64): Maximum, 7.56 July 1-14, 1964; minimum, 0.72 Jan. 25-26, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. No appreciable inflow from Mineral Creek between sampling point and gaging station, except during periods of heavy local rains.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	4,463	27	4.89	1.56	5.18	0.26	2.92	0.00	4.66	4.34	0.06	0.02	0 10	752	1.02	4,564	44	2.88	1,170	8.0
Oct. 16-31.....	3,967	--	6.24	1.89	5.83	--	2.66	.00	--	--	--	--	--	914	1.24	4,931	42	2.89	1,380	8.0
Nov. 1-11.....	2,836	--	5.99	1.81	5.70	--	2.69	.00	--	--	--	--	--	880	1.20	3,395	42	2.89	1,340	7.8
Nov. 12-17.....	1,250	--	8.33	2.55	6.26	--	2.33	.00	--	--	--	--	--	1,150	1.56	1,954	37	2.69	1,640	7.8
Nov. 18-22.....	1,547	--	6.09	1.81	6.22	--	2.52	.00	--	--	--	--	--	920	1.25	1,936	44	3.13	1,400	8.0
Nov. 23.....	270	--	9.18	3.21	6.61	--	1.77	.00	--	--	--	--	--	1,260	1.71	462	35	2.66	1,720	8.0
Nov. 24-30.....	1,555	--	6.29	1.81	6.35	--	2.69	.00	--	--	--	--	--	946	1.29	2,001	44	3.16	1,440	8.0
Dec. 1-9.....	2,463	--	6.59	2.14	6.74	--	2.79	.00	--	--	--	--	--	1,020	1.39	3,417	44	3.23	1,520	7.8
Dec. 10, 11.....	627	--	8.23	2.47	7.66	--	2.20	.00	--	--	--	--	--	1,210	1.65	1,031	42	3.31	1,770	7.6
Dec. 12-31.....	10,116	--	5.89	1.81	7.66	--	3.18	.00	--	--	--	--	--	964	1.31	13,262	50	3.90	1,530	7.9
Jan. 1-21, 1964.	5,207	23	7.44	2.39	8.31	.06	3.15	.00	7.89	7.28	.06	.00	.14	1,170	1.59	8,285	46	3.75	1,770	7.9
Jan. 22, 23.....	286	--	9.68	3.13	9.05	--	3.51	.00	--	--	--	--	--	1,450	1.97	563	41	3.58	2,030	8.0
Jan. 24-31.....	565	--	17.12	4.44	8.87	--	1.21	.00	--	--	--	--	--	2,160	2.94	1,659	29	2.70	2,600	7.2
Feb. 1-8.....	540	--	15.02	4.36	8.92	--	1.77	.00	--	--	--	--	--	1,950	2.65	1,431	32	2.86	2,450	7.4
Feb. 9-29.....	5,498	--	7.58	2.39	9.22	--	3.11	.00	--	--	--	--	--	1,240	1.69	9,272	48	4.13	1,900	7.9
Mar. 1-31.....	15,495	--	6.69	2.47	10.18	--	3.49	.00	--	--	--	--	--	1,200	1.63	25,288	53	4.76	1,930	7.9

Apr. 1-30, 1964.	11,722	--	7.04	2.88	11.83	--	3.47	.00	--	--	--	--	--	1,470	2.00	23,435	54	5.31	2,180	7.9
May 1-31.....	8,731	--	7.83	3.37	13.44	--	3.11	.00	--	--	--	--	--	1,700	2.31	20,187	55	5.68	2,440	7.9
June 1-30.....	9,045	24	7.78	3.45	15.23	.33	2.95	.00	8.45	15.29	.06	.02	.39	1,840	2.50	22,633	57	6.42	2,660	7.8
July 1-14.....	5,470	--	6.19	3.54	16.66	--	3.59	.00	--	--	--	--	--	1,620	2.20	12,052	63	7.56	2,690	7.8
July 15.....	621	--	7.83	3.54	10.05	--	6.10	.00	--	--	--	--	--	1,300	1.77	1,098	47	4.21	2,040	7.5
July 16-22.....	3,068	--	6.59	3.21	10.74	--	5.87	.00	--	--	--	--	--	1,560	2.12	6,510	52	4.86	2,580	7.5
July 23.....	807	--	7.68	3.29	6.61	--	13.05	.00	--	--	--	--	--	956	1.30	1,050	38	2.82	1,630	7.5
July 24. 25.....	4,403	--	4.34	1.40	3.35	--	6.65	.00	--	--	--	--	--	486	.66	2,910	37	1.98	882	7.5
July 26.....	621	--	3.94	.78	1.74	.26	3.15	.00	--	--	--	--	--	422	.57	356	26	1.13	645	7.7
July 27-29.....	373	--	7.39	2.88	8.96	--	4.69	.00	--	--	--	--	--	1,260	1.71	639	47	3.96	1,900	7.5
July 30, 31.....	3,035	--	4.09	1.32	3.74	.15	4.46	.00	--	--	--	--	--	574	.78	2,369	40	2.28	908	7.4
Aug. 1-4.....	7,442	18	3.59	1.23	2.04	.12	4.59	.00	1.71	.62	.05	.01	.16	421	.57	4,261	29	1.32	646	7.5
Aug. 5.....	188	--	4.49	1.81	3.35	--	4.33	.00	--	--	--	--	--	612	.83	157	35	1.89	930	7.5
Aug. 6, 7.....	2,630	--	3.64	1.15	2.18	--	4.75	.00	--	--	--	--	--	430	.58	1,538	31	1.40	654	7.5
Aug. 8-10.....	845	--	4.99	1.65	4.44	--	3.93	.00	--	--	--	--	--	706	.96	811	40	2.44	1,100	7.5
Aug. 11.....	1,258	--	3.49	1.23	2.04	--	5.90	.00	--	--	--	--	--	396	.54	677	30	1.33	640	7.5
Aug. 12.....	2,896	--	10.58	2.39	2.00	--	3.84	.00	--	--	--	--	--	888	1.21	3,497	13	.79	1,300	7.2
Aug. 13-15.....	6,694	--	4.69	1.23	2.74	--	3.72	.00	--	--	--	--	--	550	.75	5,007	32	1.59	829	7.6
Aug. 16-18.....	5,790	--	2.89	1.23	2.83	--	3.46	.00	--	--	--	--	--	433	.59	3,409	41	1.97	663	7.7
Aug. 19.....	436	--	4.49	1.48	3.26	--	4.56	.00	--	--	--	--	--	568	.77	337	35	1.89	865	7.4
Aug. 20.....	389	--	6.09	1.97	5.13	--	4.46	.00	--	--	--	--	--	826	1.12	437	39	2.56	1,300	7.5
Aug. 21-31.....	8,749	--	4.24	1.15	3.83	--	3.56	.00	--	--	--	--	--	567	.77	6,747	42	2.33	911	7.6
Sept. 1-10.....	7,200	--	3.99	1.23	4.39	.19	3.74	.00	--	--	--	--	--	568	.77	5,562	45	2.72	963	7.7
Sept. 11-16.....	14,352	--	4.14	1.07	2.18	--	4.16	.00	--	--	--	--	--	456	.62	8,901	29	1.35	704	7.7
Sept. 17.....	329	--	6.19	1.81	4.00	--	3.74	.00	--	--	--	--	--	756	1.03	339	33	2.00	1,120	7.6
Sept. 18-20.....	567	--	11.58	2.63	5.61	--	3.05	.00	--	--	--	--	--	1,330	1.81	1,026	28	2.11	1,770	7.5
Sept. 21-23.....	887	--	8.68	2.22	5.05	--	3.47	.00	--	--	--	--	--	1,050	1.43	1,266	32	2.16	1,470	7.6
Sept. 24.....	1,741	--	3.54	1.07	2.09	--	4.72	.00	--	--	--	--	--	414	.56	981	31	1.37	627	7.7
Sept. 25.....	486	--	6.14	1.65	3.35	--	3.02	.00	--	--	--	--	--	734	1.00	485	30	1.70	1,050	7.6
Sept. 26-30.....	1,160	--	8.43	2.22	5.26	--	3.15	.00	--	--	--	--	--	1,050	1.43	1,657	33	2.28	1,490	7.5
Total or weighted average	168,620	--	5.88	2.56	7.13	--	3.69	0.00	--	--	--	--	--	976	1.33	223,785	46	3.47	1,490	7.7

GILA RIVER BASIN--Continued

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

LOCATION.--About 1 mile downstream from gaging station on Gila Bend Canal, which is 200 feet downstream from 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.--49,650 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1964.
Water temperatures: December 1950 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 10,400 micromhos on several days during December; minimum daily, 454 micromhos Aug. 3.
Percent sodium: Maximum, 69 June 1-30; minimum, 27 Aug. 23.
Sodium-adsorption-ratio: Maximum, 17.58 Dec. 1-31; minimum, 1.01 Aug. 23.
EXTREMES, 1950-64.--Specific conductance: Maximum daily, 11,000 micromhos Nov. 10, 12-15, 1962; minimum daily, 370 micromhos Aug. 2, 1955.
Percent sodium: Maximum, 84 Oct. 1-5, 1962; minimum, 27 Aug. 23, 1964.
Sodium-adsorption-ratio (1961-64): Maximum, 18.37 Aug. 1-31, 1962; minimum, 1.01 Aug. 23, 1964.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). 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. No samples collected during November.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	143	--	15.32	12.26	56.12	--	3.87	0.00	--	--	--	--	--	5,290	7.19	1,027	67	15.11	7,710	7.7
Oct. 13-18.....	69	--	12.23	10.20	36.11	--	4.49	.00	--	--	--	--	--	3,560	4.84	334	62	10.78	5,430	7.7
Oct. 19-21.....	227	--	3.59	1.15	5.39	--	3.18	.00	--	--	--	--	--	625	.85	193	53	3.50	1,050	7.7
Oct. 22.....	188	--	10.58	7.65	35.06	--	3.08	.40	--	--	--	--	--	3,400	4.62	871	66	11.61	5,210	8.4
Oct. 23.....	186	--	3.44	1.23	5.48	--	2.88	.00	--	--	--	--	--	636	.86	161	54	3.58	1,050	7.9
Oct. 24-31.....	295	--	11.48	7.24	30.02	--	4.46	.00	--	--	--	--	--	3,230	4.39	1,296	62	9.81	4,760	7.8
Dec. 1-31.....	707	26	23.65	15.14	77.43	0.33	6.93	.00	38.31	70.24	0.16	0.89	3.60	7,430	10.10	7,145	66	17.58	10,300	8.0
Jan. 1-31, 1964.	633	--	20.66	14.97	68.73	--	6.33	.00	--	--	--	--	--	6,720	9.14	5,788	66	16.28	9,400	8.2
Feb. 1-29.....	627	--	19.81	16.21	70.04	--	5.16	.00	--	--	--	--	--	6,680	9.08	5,696	66	16.50	9,590	7.9
Mar. 1-15.....	411	--	19.31	15.30	66.12	--	5.16	.00	--	--	--	--	--	6,300	8.57	3,518	66	15.89	9,080	8.0
Mar. 16-18.....	82	--	14.97	11.02	45.68	--	4.65	.00	--	--	--	--	--	4,450	6.05	493	64	12.67	6,690	8.0
Mar. 19-31.....	343	--	18.61	15.22	65.25	--	5.00	.00	--	--	--	--	--	6,300	8.57	2,938	66	15.86	9,030	7.8
Apr. 1-30.....	714	--	17.81	13.57	65.69	--	4.62	.00	--	--	--	--	--	5,960	8.11	5,788	68	16.58	8,650	7.8
May 1-12.....	278	--	17.81	13.41	62.21	--	5.31	.00	--	--	--	--	--	5,720	7.78	2,166	67	15.74	8,330	7.6
May 13-18.....	139	28	16.22	11.76	57.42	.33	5.16	.00	27.90	50.78	.22	.39	2.80	5,210	7.09	987	67	15.35	7,690	7.8
May 19-31.....	180	--	18.56	14.64	70.47	--	4.95	.00	--	--	--	--	--	6,410	8.72	1,573	68	17.29	9,990	7.8
June 1-30.....	268	--	16.07	14.56	66.99	--	3.18	.00	--	--	--	--	--	6,160	8.38	2,243	69	17.12	8,990	7.5
July 1-13.....	98	--	15.97	14.07	64.38	--	3.00	.00	--	--	--	--	--	6,050	8.23	806	68	16.61	8,590	7.5

July 14, 1964...	6	--	5.94	2.14	7.83	--	6.06	.00	--	--	--	--	--	1,020	1.39	8	49	3.90	1,600	7.7
July 15,16.....	75	--	12.18	6.83	32.19	--	4.29	.00	--	--	--	--	--	3,360	4.57	344	63	10.44	4,920	7.7
July 17.....	11	--	16.47	13.90	64.38	--	3.67	.00	--	--	--	--	--	6,180	8.40	93	68	16.52	8,680	7.6
July 18.....	9	--	16.57	11.43	47.85	--	4.06	.00	--	--	--	--	--	4,890	6.65	58	63	12.79	6,930	7.6
July 19-24.....	40	--	16.22	14.15	65.69	--	2.88	.00	--	--	--	--	--	6,220	8.46	342	68	16.86	8,740	7.4
July 25.....	8	--	16.72	9.71	48.72	--	4.00	.00	--	--	--	--	--	4,850	6.60	50	65	13.40	6,930	7.5
July 26-31.....	357	26	11.33	6.91	31.06	.31	4.20	.00	15.41	28.77	.08	.24	2.10	3,160	4.30	1,534	63	10.29	4,690	7.6
Aug. 1.....	180	--	2.79	.45	2.44	.43	4.13	.00	--	--	--	--	--	360	.49	88	40	1.91	616	7.7
Aug. 2,3.....	504	23	1.80	.38	2.44	.33	2.88	.00	.37	1.61	.04	.01	.26	298	.41	204	49	2.34	497	8.0
Aug. 4-7.....	1,293	--	2.89	.79	4.96	--	3.34	.00	--	--	--	--	--	568	.77	999	57	3.65	903	7.7
Aug. 8,9.....	627	--	2.10	.26	3.92	--	3.47	.00	--	--	--	--	--	398	.54	339	62	3.60	641	8.0
Aug. 10-11.....	194	--	9.08	3.62	14.92	--	4.85	.00	--	--	--	--	--	1,750	2.38	463	54	5.92	2,720	7.6
Aug. 12.....	50	--	2.30	.26	2.26	.28	2.98	.00	--	--	--	--	--	328	.45	22	44	2.00	511	7.8
Aug. 13-16.....	728	--	3.54	.82	4.61	--	3.44	.00	--	--	--	--	--	580	.79	575	51	3.12	915	7.8
Aug. 17.....	379	--	4.24	1.15	6.48	--	3.54	.00	--	--	--	--	--	764	1.04	394	55	3.95	1,210	7.7
Aug. 18.....	492	--	3.14	.58	4.35	--	3.61	.00	--	--	--	--	--	498	.68	333	54	3.19	827	7.7
Aug. 19.....	516	--	16.57	9.46	47.85	--	5.80	.00	--	--	--	--	--	4,600	6.26	3,226	65	13.26	6,810	7.8
Aug. 20.....	387	--	3.49	.11	1.70	.16	3.31	.00	--	--	--	--	--	326	.44	171	31	1.26	489	7.7
Aug. 21.....	420	--	3.49	.57	3.96	--	3.47	.00	--	--	--	--	--	522	.71	299	49	2.78	806	7.7
Aug. 22.....	210	--	4.09	1.07	6.44	--	3.41	.00	--	--	--	--	--	756	1.03	216	56	4.01	1,170	7.9
Aug. 23.....	65	--	2.99	.59	1.35	--	3.28	.00	--	--	--	--	--	322	.44	29	27	1.01	490	7.6
Aug. 24.....	44	--	2.94	.46	3.92	--	2.69	.13	--	--	--	--	--	510	.69	30	53	3.00	759	8.4
Aug. 25-28.....	538	--	16.97	11.43	54.38	--	5.64	.00	--	--	--	--	--	5,330	7.25	3,899	66	14.43	7,500	7.8
Aug. 29.....	99	--	3.09	.63	1.96	--	3.34	.00	--	--	--	--	--	380	52	51	34	1.43	506	7.7
Aug. 30-31.....	329	--	9.98	5.43	27.19	--	3.74	.00	--	--	--	--	--	2,750	3.74	1,231	64	9.79	4,120	7.6
Sept. 1-14.....	614	--	4.69	1.56	10.09	--	2.46	.00	--	--	--	--	--	1,010	1.37	843	62	5.71	1,750	7.7
Sept. 15-18.....	2,071	--	2.54	.54	3.48	--	2.66	.00	--	--	--	--	--	407	.55	1,146	53	2.80	693	7.9
Sept. 19-20.....	1,004	--	18.56	12.67	59.60	--	6.82	.00	--	--	--	--	--	5,630	7.66	7,685	66	15.08	8,240	8.0
Sept. 21-24.....	747	--	2.40	.52	3.05	--	2.62	.00	--	--	--	--	--	365	.50	371	51	2.52	634	7.8
Sept. 25-30.....	271	--	19.56	12.83	63.08	--	6.59	.00	--	--	--	--	--	5,860	7.97	2,162	66	15.67	8,670	7.8
Total or weighted average	A 18,690	--	9.88	6.25	29.78	--	4.16	--	--	--	--	--	--	2,840	3.43	70,230	65	8.67	4,220	7.7

A Total runoff based on 366 days of flow; total runoff for 336 days of chemical analyses, 17,860 acre-feet.

GILA RIVER BASIN--Continued

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

LOCATION.--Just downstream from dam, 3.5 miles upstream from gaging station below Stewart Mountain Dam, which is 6 miles upstream from Verde River, Maricopa County.
DRAINAGE AREA.--6,232 square miles, upstream from gaging station, of which 21 square miles is downstream from Stewart Mountain Dam.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1964.
Water temperatures: December 1950 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 1,380 micromhos July 31, Aug. 7, 20, 23, 24, 27, Sept. 9; minimum daily, 1,100 micromhos Dec. 27-31, Feb. 19.
Percent sodium: Maximum, 70 July 1 to Sept. 30; minimum, 66 Dec. 1 to Feb. 29.
Sodium-adsorption-ratio: Maximum, 6.52 Sept. 1-30; minimum, 5.15 Dec. 1-31.
EXTREMES, 1950-64.--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.
Sodium-adsorption-ratio (1961-64): Maximum, 6.52 Sept. 1-30, 1962, Sept. 1-30, 1964; minimum, 4.87 Mar. 1-31, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. No inflow between sampling point and gaging station except during periods of heavy local rains.

Chemical analyses, water year October 1963 to September 1964

Date of collection	Ruaoff (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. 1-31, 1963.	6,395	--	2.45	0.99	6.74	--	2.56	0.00	--	--	--	--	--	615	0.84	5,349	66	5.15	1,110	8.0
Jan. 1-31, 1964.	1,623	--	2.40	1.15	6.96	--	2.61	.00	--	--	--	--	--	619	.84	1,367	66	5.23	1,120	7.8
Feb. 1-29.....	11,447	18	2.59	.81	7.00	0.15	2.61	.00	1.10	6.83	0.02	0.04	0.12	618	.84	9,621	66	5.37	1,110	8.0
Mar. 1-31.....	74,154	--	2.45	.90	7.22	--	2.62	.00	--	--	--	--	--	636	.86	64,140	68	5.58	1,130	8.0
Apr. 1-30.....	55,220	--	2.54	.99	7.74	--	2.67	.00	--	--	--	--	--	665	.90	49,941	69	5.83	1,210	8.0
May 1-31.....	61,426	18	2.50	1.07	7.87	.14	2.67	.00	.98	7.96	.02	.00	.08	680	.92	56,807	68	5.90	1,240	7.9
June 1-30.....	77,236	--	2.50	1.07	8.05	--	2.66	.00	--	--	--	--	--	716	.97	75,210	69	6.03	1,290	7.8
July 1-31.....	82,578	23	2.50	1.15	8.74	.14	2.75	.00	1.02	8.58	.02	.01	.12	730	.99	81,983	70	6.48	1,340	7.9
Aug. 1-31.....	36,278	--	2.54	1.23	8.92	--	2.79	.00	--	--	--	--	--	737	1.00	36,362	70	6.49	1,370	7.8
Sept. 1-30.....	30,764	19	2.59	1.15	8.92	.15	2.82	.00	.96	8.89	.02	.01	.08	742	1.01	31,044	70	6.52	1,370	7.9
Total or weighted average	445,733	--	2.51	1.06	8.05	--	2.69	0.00	--	--	--	--	--	693	0.94	411,824	69	6.03	1,260	7.9

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

LOCATION.--At gaging station, 0.2 mile downstream from Bartlett Dam, Maricopa County, 5.5 miles upstream from Camp Creek, and 18 miles east of Cave Creek.
DRAINAGE AREA.--6,185 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1964.
Water temperatures: December 1950 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 779 micromhos Dec. 26; minimum daily, 381 micromhos June 20.
Percent sodium: Maximum, 26 Aug. 1-7; minimum, 20 June 16-30.
Sodium-adsorption-ratio: Maximum, 1.20 Jan. 1-9; minimum, 0.65 June 16-30.
EXTREMES, 1950-64.--Specific conductance: Maximum daily, 958 micromhos Nov. 10, 1956; minimum daily, 234 micromhos Jan. 13, 15, 1952.
Percent sodium: Maximum, 32 Sept. 1-13, 1961; minimum, 9 Apr. 30, 1962.
Sodium-adsorption-ratio (1961-64): Maximum, 1.36 Aug. 1-17, 1963; minimum, 0.32 Apr. 30, 1962.
REMARKS.--Values reported for sodium (Na) are determined by analysis and do not include potassium (K). Records of specific conductance of daily samples available in district office at Tucson, Ariz.

Chemical analyses, water year October 1963 to September 1964

Date of collsction	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, 1963.	30,129	24	2.79	1.73	1.26	0.11	4.06	0.00	1.29	0.56	0.02	0.02	0.20	347	0.47	14,218	21	0.84	542	8.1
Nov. 1-30.....	18,625	--	2.59	2.22	1.48	--	4.29	.13	--	--	--	--	--	361	.49	9,144	23	.95	572	8.3
Dec. 1-25.....	31,438	--	2.69	2.22	1.48	--	4.43	.13	--	--	--	--	--	379	.52	16,204	23	.94	587	8.3
Dec. 26-31.....	3,416	20	3.54	3.04	2.04	.12	6.16	.00	1.52	.79	.02	.11	.23	491	.67	2,281	23	1.13	772	7.7
Jan. 1-9, 1964..	910	--	3.34	2.96	2.13	--	5.90	.00	--	--	--	--	--	454	.62	562	25	1.20	754	8.2
Jan. 10-31.....	11,782	--	3.14	2.47	1.57	--	5.21	.20	--	--	--	--	--	387	.53	6,201	22	.93	646	8.4
Feb. 1-29.....	9,779	--	3.19	2.14	1.65	--	5.10	.07	--	--	--	--	--	371	.50	4,934	24	1.01	642	8.3
Mar. 1-31.....	7,133	--	2.79	2.55	1.65	--	5.10	.17	--	--	--	--	--	377	.51	3,657	24	1.01	652	8.4
Apr. 1-30.....	5,558	--	2.59	2.63	1.65	--	4.87	.13	--	--	--	--	--	370	.50	2,797	24	1.02	621	8.3
May 1-13.....	2,282	--	2.45	2.39	1.48	--	4.51	.13	--	--	--	--	--	350	.48	1,086	23	.95	575	8.3
May 14-31.....	7,176	21	2.10	2.14	1.17	.07	3.98	.00	.92	.54	.02	.01	.10	290	.39	2,830	21	.81	494	8.2
June 1-15.....	9,283	--	1.95	1.73	1.00	--	3.51	.00	--	--	--	--	--	267	.36	3,371	21	.74	438	8.0
June 16-30.....	22,403	20	1.80	1.48	.83	.07	3.21	.00	.67	.31	.02	.02	.18	239	.33	7,282	20	.65	395	7.9
July 1-31.....	31,359	--	2.10	1.97	1.31	--	3.90	.00	--	--	--	--	--	309	.42	13,178	24	.91	513	8.0
Aug. 1-7.....	1,161	--	2.10	2.14	1.52	--	3.98	.00	--	--	--	--	--	339	.46	535	26	1.05	558	8.0
Aug. 8-31.....	34,132	--	2.00	1.48	1.00	--	3.23	.00	--	--	--	--	--	272	.37	12,626	22	.76	443	7.9
Sept. 1-16.....	28,879	--	2.20	1.65	1.04	--	3.41	.00	--	--	--	--	--	284	.39	11,154	21	.75	479	8.0
Sept. 17-30.....	17,133	--	2.25	2.06	1.31	--	3.90	.00	--	--	--	--	--	339	.46	7,899	23	.89	537	8.0
Total or weighted average	272,578	--	2.40	1.97	1.26	--	4.00	--	--	--	--	--	--	324	0.44	119,959	22	0.85	526	8.0

PART 10. THE GREAT BASIN

SEVIER LAKE BASIN

10-1915. SEVIER RIVER BELOW PIUTE DAM, NEAR MARYSVALE, UTAH

LOCATION (revised).--At gaging station, 0.8 mile downstream from Piute Dam, and 8 miles south of Marysvale, Piute County.
DRAINAGE AREA.--2,440 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1958 to September 1959, February 1961 to September 1964.
REMARKS.--Formerly 0.8 mile upstream at outlet below Piute Dam, and 9 miles south of Marysvale.

Chemical analyses, water year October 1963 to September 1964

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. 7, 1963A...	127	28	3.04	1.44	1.44	0.08	4.10		1.31	0.59	0.02	0.02	0.09	346	0.47	60	24	1.0	537	7.9
Nov. 13.....	137	--	4.24		1.84	--	4.33		1.10	.65	--	--	--	348	.47	64	30	1.3	540	7.3
Dec. 16.....	9.9	25	2.26	1.88	7.71	--	4.61		.79	.45	--	.00	--	310	.42	4	29	1.2	511	7.7
Jan. 23, 1964...	4.4	33	2.68	1.92	1.87	--	5.08		.75	.62	--	.02	--	367	.50	2	29	1.2	540	7.6
Feb. 13.....	4.8	34	2.46	1.82	1.30	.08	4.69		.62	.39	.02	.05	.11	321	.44	2	23	.9	503	8.0
Feb. 17.....	4.8	27	2.22	1.98	1.49	--	4.67		.62	.39	--	.01	--	300	.41	2	26	1.0	494	7.9
Mar. 6.....	91	26	2.26	1.82	1.41	--	4.49		.62	.37	--	.01	--	297	.40	36	26	1.0	479	8.0
Apr. 7.....	240	28	2.40	1.42	1.37	--	4.23		.56	.39	--	.01	--	283	.38	91	26	1.0	445	7.6
May 4.....	234	26	2.19	1.72	1.41	--	4.13		.65	.45	--	.00	--	285	.39	91	27	1.0	463	8.0
June 1.....	200	22	1.94	1.68	1.49	--	3.95		.65	.51	--	.00	--	273	.37	74	29	1.1	445	7.6
June 11.....	230	22	2.00	1.56	1.52	.08	3.97		.62	.34	.02	.01	.06	281	.38	87	29	1.1	441	8.1
June 26.....	137	20	2.04	1.44	1.40	--	4.03		.42	.42	--	.01	--	282	.38	52	29	1.1	454	7.6
July 29.....	349	20	2.08	1.62	1.25	--	3.93		.63	.40	--	.00	--	273	.37	129	25	.9	423	8.1
Aug. 19.....	797	21	2.32	1.68	1.29	--	4.15		.75	.40	--	.00	--	291	.40	319	24	.9	453	7.8
Sept. 15.....	329	--	4.08		1.29	--	4.16		.79	.42	--	--	--	304	.41	135	24	.9	481	7.8
Sept. 20.....	52	24	2.26	1.64	1.26	.11	4.10		.77	.48	.03	.02	.10	295	.40	21	24	.9	462	7.5
Sept. 20B.....	52	--	4.04		1.40	--	4.16		.83	.45	--	--	--	302	.41	21	26	1.0	482	8.0
Total or weighted average C	75,350	23	2.10	1.65	1.39	--	4.07		0.62	0.39	--	--	--	288	0.39	29,390	27	1.0	453	--

A Sample collected 2 miles north of Marysvale and about 10 miles downstream. Not included in weighted average.
B Sample collected at outlet of Piute Dam 0.8 mile upstream. Not included in weighted average.
C Includes estimated data for missing periods. Represents 100 percent of runoff for water year.

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 1964.
Water temperatures: March 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 4,480 micromhos Dec. 30, 31; minimum daily, 1,530 micromhos Feb. 25, Apr. 28.
Percent sodium: Maximum, 61 Aug. 25-31; minimum, 46 Nov. 1-30, Dec. 1-16, Feb. 12-29.
Sodium-adsorption-ratio: Maximum, 9.06 Jan. 1-6; minimum, 3.72 Feb. 12-29, May 1-4.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 8,300 micromhos Dec. 27, 1962; minimum daily, 431 micromhos Feb. 4, 1962.
Percent sodium: Maximum, 65 Aug. 20-23, 1963; minimum, 23 Feb. 3-11, 1962.
Sodium-adsorption-ratio (1961-63): Maximum, 12.84 Dec. 25-27, 1962; minimum, 0.82 Feb. 3-11, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah. Runoff is adjusted to compensate for inflow from deep well discharging to the river between the sampling site and the gaging station.

Chemical analyses, water year October 1963 to September 1964

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, 1963....	34		9.04	9.48		4.59	0.00	5.21	8.75				1,060	1.44	49	51	4.46	1,700	7.9
Oct. 2-5.....	214		12.60	16.79		4.79	.00	9.64	14.95				1,780	2.42	519	57	6.69	2,730	7.5
Oct. 6-9.....	218		10.08	11.88		4.69	.00	6.56	10.72				1,280	1.74	380	54	5.29	2,020	7.8
Oct. 10-31.....	1,331		9.12	8.66		4.46	.00	4.87	8.46				1,030	1.40	1,864	49	4.05	1,650	7.7
Nov. 1-30.....	2,243		9.68	8.35		4.56	.00	4.85	8.60				1,040	1.41	3,173	46	3.80	1,690	8.0
Dec. 1-16.....	996		10.32	8.96		5.11	.00	5.58	8.60				1,110	1.51	1,504	46	3.94	1,780	8.0
Dec. 17-31.....	226		18.60	27.54		6.62	.00	15.86	23.64				2,770	3.77	852	60	9.03	4,100	8.1
Jan. 1-6, 1964..	58		19.30	28.14		6.02	.00	16.61	24.82				3,050	4.15	242	59	9.06	4,420	8.2
Jan. 7-31.....	531		16.30	22.79		6.23	.00	13.53	19.32				2,420	3.29	1,746	58	7.98	3,540	8.2
Feb. 1-11.....	196		16.20	22.92		5.64	.00	12.76	20.73				2,390	3.25	638	59	8.05	3,580	8.2
Feb. 12-29.....	939		9.28	8.00		4.54	.00	4.12	8.60				980	1.33	1,251	46	3.72	1,620	8.0
Mar. 1-19.....	1,587		9.76	8.53		4.36	.00	4.62	9.31				1,090	1.48	2,352	47	3.86	1,730	7.9
Mar. 20-31.....	1,176		12.96	11.44		4.43	.00	8.41	11.57				1,490	2.03	2,383	47	4.49	2,230	7.9
Apr. 1-30.....	2,428		10.48	9.87		4.21	.00	6.54	9.59				1,240	1.69	4,094	49	4.31	1,920	8.0
May 1-4.....	361		9.04	7.92		4.29	.00	4.89	7.76				1,010	1.37	496	47	3.72	1,600	8.2
May 5-10.....	572		10.16	12.53		4.72	.00	7.08	10.86				1,370	1.86	1,067	55	5.56	2,130	8.0

SEVIER LAKE BASIN--Continued

10-2240. SEVIER RIVER NEAR LYNNDYL, UTAH--Continued

Chemical analyses, water year October 1963 to September 1964--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				
May 11-31, 1964.	26,491		10.24		14.36		4.97	0.00	7.77	11.85				1,500	2.04	54,042	58	6.34	2,310	7.9
June 1-30.....	6,605		11.60		15.44		4.69	.00	8.87	13.48				1,600	2.18	14,372	57	6.41	2,530	8.1
July 1-31.....	20,475		10.00		13.96		4.26	.47	7.66	11.57				1,390	1.89	38,707	58	6.24	2,250	8.4
Aug. 1-24.....	6,379		10.00		14.53		4.26	.00	7.85	12.41				1,500	2.04	13,013	59	6.50	2,340	8.1
Aug. 25-31.....	444		12.40		19.71		4.79	.00	10.68	16.64				1,980	2.69	1,196	61	7.91	2,980	8.0
Sept. 1-30.....	3,933		9.80		13.92		4.33	.00	7.27	12.13				1,450	1.97	7,756	59	6.29	2,240	7.5
Total or weighted average	77,440		10.34		13.73		4.61	0.12	7.60	11.74				1,440	1.96	151,700	57	6.03	2,260	8.0

CARSON RIVER BASIN

10-3120.2. CARSON RIVER NEAR SILVER SPRINGS, NEV.

LOCATION.--On U.S. Highway 95 alternate, at Weeks Bridge, 4.5 miles downstream from gaging station at Fort Churchill, and approximately 8.5 miles south of Silver Springs, Lyon County.
DRAINAGE AREA.--1,450 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: October 1962 to September 1964.
Water temperatures: October 1962 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 664 micromhos Aug. 10, 21-23; minimum daily, 165 micromhos May 15.
Percent sodium: Maximum, 39 Aug. 1 to Sept. 30; minimum, 32 Nov. 16-21, May 14-23.
Sodium-adsorption-ratio: Maximum, 1.84 Aug. 1 to Sept. 30; minimum, .74 May 14-23.
EXTREMES, 1962-64.--Specific conductance: Maximum daily, 468 micromhos Aug. 1-31, 1963; minimum daily, 83 micromhos June 16-22, 1963.
Percent sodium: Maximum, 39 Aug. 1 to Sept. 30, 1964; minimum, 25 May 13-31. 1963.
Sodium-adsorption-ratio: Maximum, 1.84 Aug. 1 to Sept. 30, 1964; minimum, 0.46 May 13-24, June 16-22, 1963.
REMARKS.--Records of specific conductance of daily samples available in subdistrict office at Sacramento, Calif. Records of discharge given for Carson River near Fort Churchill. No appreciable inflow between gaging station and sampling point.

Chemical analyses, water year October 1963 to September 1964

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. 1-17, 1963.	175		2.64	0.99	2.18	0.12	3.03	0.00	2.27	0.42	--	0.03	0.30	390	0.53	93	37	1.61	578	7.5
Oct. 18-31.....	2,041		2.35	.82	1.91	.11	2.79	.00	2.06	.39	--	.02	.30	340	.46	944	37	1.52	508	7.9
Nov. 1-7.....	2,110		1.95	.65	1.48	.11	2.29	.00	1.56	.34	--	.02	.30	279	.38	801	35	1.30	414	7.5
Nov. 8-15.....	3,951		1.45	.51	1.09	.10	1.85	.00	1.06	.28	--	.03	.20	213	.29	1,145	35	1.10	316	7.3
Nov. 16-21.....	5,581		1.00	.40	.70	.06	1.34	.00	.60	.17	--	.02	.10	149	.20	1,131	32	.83	216	7.2
Nov. 22-30.....	6,462		1.30	.50	.96	.08	1.75	.00	.83	.22	--	.03	.20	197	.27	1,731	34	1.01	281	7.4
Dec. 1-31.....	13,896		1.50	.54	1.22	.08	1.84	.00	1.21	.23	0.01	.01	.00	218	.30	4,120	36	1.21	312	7.6
Jan. 1-31, 1964.	11,252	27	1.65	.57	1.39	.10	1.93	.00	1.25	.34	.03	.02	.20	234	.32	3,581	38	1.32	354	7.6
Feb. 1-29.....	9,433		1.70	.60	1.44	.08	2.07	.00	1.19	.27	--	.02	.20	253	.34	3,246	38	1.34	369	7.9
Mar. 1-31.....	10,883		1.55	.59	1.31	.07	1.90	.00	1.33	.24	--	.04	.30	238	.32	3,523	37	1.26	348	7.8
Apr. 1-30.....	11,068		1.50	.58	1.22	.07	1.87	.00	1.25	.24	--	.03	.20	228	.31	3,432	36	1.19	334	7.5
May 1-13.....	11,552		1.20	.32	.83	.07	1.49	.00	.79	.16	--	.03	.10	167	.23	2,624	34	.95	248	7.2
May 14-23.....	13,091		1.00	.16	.57	.07	1.11	.00	.52	.11	--	.02	.10	125	.17	2,225	32	.74	181	7.3
May 24-31.....	11,683		1.00	.32	.74	.07	1.39	.00	.60	.11	--	.02	.10	147	.20	2,332	35	.91	215	7.5
June 1-11.....	12,807		.85	.51	.74	.07	1.39	.00	.60	.08	--	--	.20	147	.20	2,560	34	.90	212	7.7

CARSON RIVER BASIN--Continued

10-3120.2. CARSON RIVER NEAR SILVER SPRINGS, NEV.--Continued

Chemical analyses, water year October 1963 to September 1964--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 12-22, 1964	8,138		1.20	0.56	1.00	0.08	1.74	0.00	0.85	0.10	--	--	0.20	194	0.26	2,147	35	1.07	273	7.6
June 23-30.....	1,698		1.90	.90	1.65	.10	2.49	.00	1.75	.28	--	--	.30	298	.41	688	36	1.40	435	8.0
July 1-12.....	362		2.79	.99	2.13	.12	3.11	.00	2.58	.37	--	--	.30	395	.54	194	35	1.55	595	8.0
July 13-31.....	11		2.79	1.07	2.09	.11	3.34	.00	2.46	.37	--	--	.30	394	.54	6	34	1.50	581	7.8
Aug. 1-31.....	6		2.79	1.23	2.61	.14	3.65	.00	2.83	.39	--	0.03	.30	426	.58	4	39	1.84	646	7.7
Sept. 1-30.....	6		2.79	1.23	2.61	.13	3.52	.00	2.87	.39	--	.03	.30	427	.58	3	39	1.84	637	7.7
Total or weighted average	136,200		1.35	0.48	1.04	0.08	1.69	0.00	0.97	0.20	--	0.02	0.16	197	0.27	36,530	35	1.08	288	7.4

HUMBOLDT RIVER BASIN

10-3225. HUMBOLDT RIVER AT PALISADE, NEV.

LOCATION.--At gaging station, 0.3 mile downstream from Southern Pacific Railroad bridge, 0.5 mile downstream from Palisade, Eureka County, and 0.8 mile upstream from Pine Creek.
DRAINAGE AREA.--5,010 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: May 1962 to September 1964.
Water temperatures: May 1962 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 610 micromhos Jan. 13, 14; minimum daily, 331 micromhos May 21.
Percent sodium: Maximum, 35 Feb. 1-29; Apr. 1-30, Aug. 1-31; minimum, 30 July 1-20.
Sodium-adsorption-ratio: Maximum, 1.57 Aug. 1-31; minimum, 1.13 July 1-20.
EXTREMES, 1962-64.--Specific conductance: Maximum daily, 695 micromhos Jan. 13, 1963; minimum daily, 331 micromhos May 21, 1964.
Percent sodium: Maximum, 39 May 22-31, 1962; minimum, 28 July 1-20, 1963.
Sodium-adsorption-ratio: Maximum, 1.75 Aug. 11-31, 1962; minimum, 1.04 July 1-20, 1963.
REMARKS.--Records of specific conductance of daily samples available in subdistrict office at Sacramento, Calif.

Chemical analyses, water year October 1963 to September 1964

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, 1983.	2,029	--	2.54	1.23	2.00	0.26	4.36	0.00	1.02	0.62	--	0.03	0.20	366	0.50	1,010	33	1.46	576	7.9
Nov. 1-30.....	4,094	--	2.69	1.07	2.00	.22	4.51	.00	.75	.59	--	.02	.20	363	.49	2,021	33	1.46	556	8.1
Dec. 1-31.....	5,319	38	2.89	1.07	2.00	.19	4.75	.00	.90	.56	0.04	.02	.30	A371	.50	2,684	33	1.42	583	8.2
Jan. 1-8, 1964..	1,460	36	2.74	1.07	2.00	.21	4.56	.00	.65	.51	.03	.02	.30	350	.48	695	33	1.45	548	8.2
Jan. 9-18.....	1,486	40	2.94	1.32	2.13	.21	5.02	.00	.94	.56	.04	.01	.20	A390	.53	788	32	1.46	597	8.1
Jan. 19-31.....	2,171	36	2.74	1.15	1.96	.21	4.59	.00	.87	.51	.04	.02	.20	358	.49	1,057	32	1.40	558	8.0
Feb. 1-29.....	4,866	--	2.69	1.07	2.09	.19	4.33	.13	.83	.54	--	.02	.20	348	.47	2,303	35	1.52	538	8.3
Mar. 1-19.....	5,276	--	2.35	1.15	1.83	.18	4.21	.00	.79	.45	--	.03	.40	323	.44	2,318	33	1.38	510	8.2
Mar. 20-31.....	10,116	--	1.90	.99	1.57	.19	3.56	.00	.56	.37	--	.04	.50	284	.39	3,907	34	1.30	437	8.0
Apr. 1-30.....	70,631	--	2.15	.81	1.65	.18	3.44	.00	.71	.45	--	.03	.10	299	.41	28,722	35	1.36	457	7.7
May 1-16.....	28,181	--	2.15	.77	1.48	.14	3.41	.00	.75	.45	--	.03	.10	285	.39	10,923	33	1.22	451	7.7
May 17-31.....	30,734	--	2.00	.60	1.31	.12	3.15	.00	.52	.28	--	.03	.20	253	.34	10,575	32	1.15	374	7.8
June 1-30.....	113,831	--	2.30	.78	1.57	.16	4.00	.00	.50	.20	--	--	.20	292	.40	45,205	33	1.26	446	8.0
July 1-20.....	24,516	--	2.15	.90	1.39	.14	3.79	.00	.40	.17	--	--	.20	266	.36	8,869	30	1.13	412	8.1
July 21-31.....	2,815	--	2.50	.82	1.74	.17	4.21	.07	.56	.23	--	--	.30	320	.44	1,225	33	1.35	485	8.3
Aug. 1-31.....	2,416	--	2.45	1.23	2.13	.24	4.51	.00	1.06	.62	--	.02	.30	351	.48	1,154	35	1.57	578	7.9
Sept. 1-30.....	1,839	--	2.25	1.23	1.74	.20	4.33	.00	.69	.48	--	.02	.20	312	.42	780	32	1.32	508	8.1
Total or weighted average	311,800	--	2.23	0.82	1.58	0.16	3.76	0.00	0.60	0.32	--	--	0.19	293	0.40	124,200	33	1.28	450	7.9

A Calculated from determined constituents.

HUMBOLDT RIVER BASIN--Continued

10-3350. HUMBOLDT 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.--16,100 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1951 to September 1958, October 1959 to September 1961, May 1962 to September 1964.
Water temperatures: December 1951 to September 1958, October 1959 to September 1961, May 1962 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 994 micromhos May 10; minimum daily, 736 micromhos Aug. 1.
Percent sodium: Maximum, 60 Apr. 1-30; minimum, 53 July 1-31.
Sodium-adsorption-ratio: Maximum, 4.05 Apr. 1-30; minimum, 3.11 Aug. 1 to Sept. 30.
EXTREMES, 1951-58, 1959-61, May 1962 to September 1964.--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. Flow completely regulated by Rye Patch Reservoir.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	4,582		2.15	1.56	4.83	--	5.54	0.13		--			--	556	0.76	3,465	57	3.55	845	8.3
Oct. 16-Nov. 30.	137		2.30	1.40	5.09	--	5.44	.00		--			--	568	.77	106	58	3.75	885	8.2
Dec. 1-31.....	92		2.40	1.32	5.44	--	5.47	.00		--			--	570	.78	71	59	3.99	903	8.0
Jan. 1-31, 1964.	92		2.35	1.48	5.44	--	5.28	.13		--			--	569	.77	71	59	3.93	884	8.3
Feb. 1-29.....	86		2.40	1.48	5.31	--	5.51	.00		--			--	579	.79	68	58	3.81	933	8.2
Mar. 1-31.....	1,002		2.20	1.56	5.48	0.33	4.98	.53		--			--	569	.77	776	57	4.00	912	8.6
Apr. 1-30.....	17,137		2.25	1.48	5.52	--	5.41	.33		--			--	595	.81	13,867	60	4.05	933	8.4
May 1-31.....	27,792		2.30	1.48	5.52	--	5.02	.60		--			--	588	.80	22,225	59	4.02	961	8.5
June 1-14.....	7,525		2.10	1.48	5.18	.36	4.88	.37		2.09			--	558	.76	5,711	57	3.87	863	8.6
June 15-30.....	10,695		2.05	1.48	4.57	.33	4.75	.27		1.92			0.60	531	.72	7,723	54	3.44	811	8.4
July 1-31.....	35,601		2.10	1.32	4.26	.31	4.67	.13		1.69			.60	500	.68	24,209	53	3.26	767	8.3
Aug. 1-31.....	17,831		2.15	1.32	4.09	--	4.72	.20		--			--	489	.67	11,859	54	3.11	752	8.4
Sept. 1-30.....	14,400		2.15	1.32	4.09	--	5.10	.00		--			--	491	.67	9,616	54	3.11	770	8.2
Total or weighted average	136,970		2.17	1.40	4.74	--	4.94	0.27		--			--	536	0.73	99,770	57	3.54	838	8.4

PYRAMID AND WINNEMUCCA LAKES BASIN

10-3459. TRUCKEE RIVER AT FLORISTON, CALIF.

LOCATION.--At bridge at Floriston, Nevada County, 0.2 mile above flume diversion, 2.5 miles upstream from gage at Farad, and 1.8 miles upstream from Farad.
DRAINAGE AREA.--932 square miles, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: January to September 1964.
Water temperatures: January to September 1964.
EXTREMES, January to September 1964.--Specific conductance: Maximum daily, 141 micromhos Feb. 3; minimum daily, 64 micromhos May 20, 31.
Percent sodium: Maximum, 28 Jan. 1-31; minimum, 21 Apr. 14 to May 18.
Sodium-adsorption-ratio: Maximum, 0.54 Jan. 1-31; minimum, 0.30 May 1-18.
REMARKS.--Records of specific conductance of daily samples available in subdistrict office at Sacramento, Calif. Records of daily discharge data given for Truckee River at Farad.

Chemical analyses, January to September 1964

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. 1-31, 1964.	23,365	18	0.78		0.34	0.08	0.92	0.00	0.06	--	0.01	--	0.20	A 82	0.11	2,606	28	0.54	105	7.8
Feb. 1-29.....	20,765	20	.55	.29	.28	.05	.92	.00	.08	0.17	.00	0.01	.00	84	.11	2,372	24	.43	114	7.4
Mar. 1-31.....	19,000	21	.50	.36	.27	.04	.95	.00	.08	.07	.00	.03	.00	A 81	.11	2,093	23	.40	113	8.0
Apr. 1-13.....	13,563	20	.50	.29	.23	.03	.80	.00	.06	.06	.00	.02	.00	80	.11	1,476	22	.36	103	7.2
Apr. 14-30.....	25,458	20	.44	.22	.19	.03	.69	.00	.02	.04	.00	.03	.00	67	.09	2,320	21	.33	86	7.3
May 1-16.....	36,595	20	.40	.21	.17	.02	.64	.00	.06	.04	.00	.03	.00	A 61	.08	3,036	21	.30	78	7.3
May 19-31.....	29,008	17	.36	.17	.17	.02	.59	.00	.04	.05	.00	.02	.00	56	.08	2,209	23	.32	68	7.4
June 1-15.....	27,759	17	.38	.16	.17	.04	.56	.00	.04	.06	.01	.01	.00	58	.08	2,190	22	.32	74	7.0
June 16-30.....	15,798	17	.39	.15	.16	.04	.62	.00	.06	.04	.00	.02	.00	A 57	.08	1,225	24	.34	77	7.1
July 1-31.....	32,527	19	.43	.17	.19	.05	.69	.00	.04	.03	.01	.01	.00	A 61	.08	2,698	22	.34	81	7.2
Aug. 1-31.....	32,527	17	.46	.24	.25	.05	.84	--	.12	.03	.00	.01	.00	70	.10	3,097	25	.43	100	7.0
Sept. 1-30.....	29,752	17	.44	.26	.23	.05	.75	.00	.08	.03	.01	.02	.10	A 66	.09	2,671	23	.38	92	7.0
Total or weighted average	B 381,590	18	0.43	0.22	0.22	0.04	0.74	0.00	0.06	0.05	0.00	0.02	0.02	67	0.09	27,990	24	0.38	89	7.2

A Calculated from determined constituents.
B Total runoff based on 365 days; mean discharge for 274 days of chemical analyses 306,120 acre-feet, 98 percent of runoff.

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

COLUMBIA RIVER MAIN STEM

12-3995. COLUMBIA RIVER AT INTERNATIONAL BOUNDARY, WASH.
(Formerly published as 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, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: February 1910 to January 1911, November 1951 to September 1964.
Water temperatures: November 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 209 micromhos Mar. 22; minimum daily, 125 micromhos Aug. 3.
Percent sodium: Maximum, 7 Nov. 23 to Dec. 15; minimum, 4 July 26 to Aug. 15, Sept. 9-30.
Sodium-adsorption-ratio: Maximum, 0.13 Nov. 23 to Dec. 15, Mar. 22-27, Apr. 12-26; minimum, 0.07 July 26 to Aug. 15, Sept. 9-30.
EXTREMES, 1958-64.--Specific conductance: Maximum daily, 257 micromhos Feb. 23, 1963; minimum daily, 123 micromhos Aug. 2, 1960, Aug. 12, 1963.
Percent sodium (1961-64): Maximum, 7 on many days in 1962-64; minimum, 3 July 13 to Aug. 11, 1963.
Sodium-adsorption-ratio (1961-64): Maximum, 0.13 Nov. 23 to Dec. 15, 1963, Mar. 22-27, Apr. 12-26, 1964; minimum, 0.05 July 13 to Aug. 11, 1963.
REMARKS.--Samples were collected at international boundary, 2.2 miles downstream from gaging station February 1910 to January 1911, November 1951 to June 1958. Records of specific conductance of daily samples available in district office at Portland, Oreg. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	3,387,967	4.0	1.10	0.30	0.08	0.02	1.20		0.29	0.02	0.01	0.00		87	0.12	400,864	5	0.09	149	7.6
Nov. 1-22.....	2,181,818	4.5	1.10	.42	.09	.02	1.28		.31	.02	.01	.01		91	.12	270,022	5	.10	159	7.7
Nov. 23-Dec. 15.	1,824,793	4.9	1.15	.42	.11	.02	1.31		.35	.02	.01	.01		94	.13	233,282	7	.13	164	7.7
Dec. 16-Jan.6, 1964.....	1,902,942	5.1	1.15	.45	.10	.02	1.33		.35	.01	.01	.00		102	.14	263,976	6	.11	167	7.8
Jan. 7-21, 28-31	1,556,430	5.4	1.20	.46	.10	.02	1.38		.35	.03	.01	.00		100	.14	211,674	6	.11	172	7.7
Feb. 1-26.....	1,902,942	5.2	1.25	.44	.10	.02	1.41		.37	.03	.01	.00		101	.14	261,388	6	.11	177	7.8
Feb. 27-Mar. 21.	2,194,512	5.2	1.25	.49	.11	.02	1.48		.35	.02	.01	.01		102	.14	304,423	6	.12	179	7.4
Mar. 22-27.....	492,694	5.2	1.35	.53	.12	.03	1.52		.40	.02	.01	.01		112	.15	75,047	6	.13	191	7.5
Mar. 28-Apr. 11.	1,264,463	5.3	1.25	.49	.11	.02	1.44		.35	.01	.02	.00		103	.14	177,126	6	.12	179	7.4
Apr. 12-26.....	1,630,413	6.1	1.20	.47	.12	.04	1.38		.37	.03	.01	.02		102	.14	226,171	6	.13	177	7.6
Apr. 27-28.....	271,339	6.0	1.30	.47	.09	.03	1.46		.40	.01	.01	.01		106	.14	39,116	5	.10	185	7.7
Apr. 29-May 11..	2,155,636	5.6	1.10	.44	.09	.03	1.33		.31	.01	.01	.01		93	.13	272,645	5	.10	162	7.9
May 12-June 10..	12,126,942	5.2	1.05	.37	.08	.02	1.21		.25	.01	.01	.01		88	.12	1,451,352	5	.09	148	7.5
June 11-July 7..	19,627,437	5.0	1.00	.39	.07	.02	1.18		.23	.01	.01	.01		78	.11	2,082,079	5	.09	141	7.5
July 8-25.....	10,068,099	4.3	.90	.36	.06	.02	1.08		.23	.01	.01	.01		73	.10	999,561	5	.08	131	7.6
July 26-Aug. 15.	6,643,636	5.9	.95	.29	.05	.02	1.07		.21	.01	.01	.01		77	.10	695,722	4	.07	129	7.5
Aug. 16-Sept. 8.	4,698,446	5.7	1.00	.26	.06	.02	1.07		.23	.01	.01	.01		79	.11	504,801	5	.08	131	7.6
Sept. 9-30.....	3,072,000	3.2	1.00	.32	.06	.02	1.10		.27	.01	.01	.01		81	.11	338,412	4	.07	139	7.6
Total or weighted average	77,002,509	5.0	1.05	0.38	0.08	0.02	1.20		0.27	0.01	0.01	0.01		84	0.11	8,807,661	5	0.09	146	7.5

YAKIMA RIVER BASIN

12-5105. YAKIMA RIVER AT KIONA, WASH.

LOCATION.--At highway bridge 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 1964.
Water temperatures: December 1952 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 393 micromhos Oct. 15; minimum daily, 145 micromhos June 13-18.
Percent sodium: Maximum, 28 Dec. 14 to Jan. 3; minimum, 23 June 16-23.
Sodium-adsorption-ratio: Maximum, 0.88 Oct. 1-31, Dec. 14 to Jan. 3; minimum, 0.47 June 16-23.
EXTREMES, 1952-64.--Specific conductance: Maximum daily, 409 micromhos Oct. 3, 10, 1961; minimum daily, 99 micromhos Dec. 17, 1959.
Percent sodium (1961-64): Maximum, 28 Oct. 1-31, 1962, Dec. 14 to Jan. 3, 1964; minimum, 23 several days in 1962-64.
Sodium-adsorption-ratio (1961-64): Maximum, 0.89 many days in 1961-63, Sept. 1-30, 1963; minimum, 0.42 Apr. 8, 9, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg.

Chemical analyses, water year October 1963 to September 1964

Date of collection	Runoff (acre-feet)	Silica (SiO_2) ppm	Equivalsnts 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, 1963.	123,590	32	1.80	0.99	1.04	0.10	3.08		0.50	0.21	0.02	0.05		236	0.32	39,667	27	0.88	359	8.0
Nov. 1-17.....	73,170	30	1.70	.99	.96	.10	2.92		.48	.23	.02	.05		224	.30	22,291	26	.83	348	7.8
Nov. 18-Dec. 13.	119,127	28	1.40	.90	.87	.08	2.56		.42	.20	.01	.05		197	.27	31,917	27	.81	309	8.0
Dec. 14-Jan. 3, 1964.....	86,221	28	1.40	.99	.96	.08	2.62		.46	.21	.02	.04		205	.28	24,039	28	.88	317	7.8
Jan. 4-17.....	68,866	25	1.20	.81	.74	.08	2.20		.37	.17	.01	.04		173	.24	16,203	26	.74	267	7.6
Jan. 18-Feb. 9..	102,645	25	1.30	.77	.74	.07	2.29		.37	.20	.01	.04		177	.24	24,709	26	.73	276	7.8
Feb. 10-Mar. 2..	109,527	23	1.15	.79	.70	.06	2.13		.33	.18	.01	.03		163	.22	24,280	26	.71	256	7.8
Mar. 3-8.....	30,585	24	1.20	.69	.65	.06	2.07		.29	.15	.02	.03		157	.21	6,531	25	.67	244	8.0
Mar. 9-14.....	36,893	20	.85	.63	.48	.04	1.59		.23	.12	.01	.04		123	.17	6,171	24	.56	188	8.0
Mar. 15-Apr. 6..	104,013	21	1.10	.58	.57	.05	1.80		.27	.13	.02	.03		139	.19	19,663	25	.62	216	7.9
Apr. 7-16.....	32,132	21	1.20	.72	.65	.06	2.05		.33	.14	.02	.03		156	.21	6,817	25	.67	244	7.8
Apr. 17-May 6...	68,231	21	1.30	.77	.70	.07	2.18		.40	.16	.02	.04		A 178	.24	16,517	25	.69	271	7.8
May 7-19.....	47,702	23	1.40	.90	.83	.08	2.43		.42	.17	.02	.05		A 192	.26	12,456	26	.77	299	7.9
May 20-31.....	67,121	21	1.15	.71	.65	.06	1.97		.33	.13	.01	.04		A 159	.22	14,514	25	.68	246	7.7
June 1-15.....	197,851	18	.80	.43	.41	.04	1.31		.19	.08	.01	.03		A 108	.15	29,060	24	.52	162	7.4

A Calculated from determined constituents.

YAKIMA RIVER BASIN--Continued

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

Chemical analyses, water year October 1963 to September 1964--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 16-23, 1964	106,790	19	0.75	0.41	0.36	0.04	1.25		0.17	0.07	0.01	0.03		A 104	0.14	15,104	23	0.47	153	7.5
June 24-29.....	42,843	21	1.00	.50	.52	.06	1.61		.27	.11	.01	.03		A 132	.18	7,691	25	.60	198	7.9
June 30-July 5..	34,512	21	1.10	.59	.61	.06	1.84		.29	.13	.01	.03		A 147	.20	6,900	26	.66	223	7.8
July 6-13.....	57,441	19	.90	.55	.48	.05	1.57		.23	.10	.01	.03		A 126	.17	9,843	24	.56	191	7.6
July 14-20.....	35,960	21	1.15	.66	.61	.06	1.93		.31	.13	.01	.04		A 152	.21	7,434	25	.64	237	7.8
July 21-Aug. 14.	84,298	23	1.55	.90	.87	.09	2.66		.44	.18	.02	.05		200	.27	22,929	26	.79	317	7.7
Aug. 15-Sept. 2.	66,327	26	1.65	.90	.96	.09	2.84		.44	.17	.02	.05		212	.29	19,123	27	.85	332	8.2
Sept. 3-30.....	100,522	25	1.65	.90	.96	.10	2.87		.46	.18	.02	.05		A 215	.29	29,393	27	.85	342	8.1
Total or weighted average	1,796,367	24	1.25	0.74	0.70	0.69	2.18		0.35	0.16	0.01	0.04		169	0.23	413,306	26	0.72	261	7.7

A Calculated from determined constituents.

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, 4.8 miles east of Ririe, and approximately 21 miles upstream from Henrys Fork.
DRAINAGE AREA.--5,752 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: January 1953 to September 1964.
Water temperatures: January 1953 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 504 micromhos Nov. 30; minimum daily, 282 micromhos Aug. 6.
Percent sodium: Maximum, 22 Nov. 30; minimum, 11 May 25 to Aug. 31.
Sodium-adsorption-ratio: Maximum, 0.85 Nov. 30; minimum, 0.29 July 25 to Aug. 7.
EXTREMES, 1953-64.--Specific conductance: Maximum daily, 791 micromhos Nov. 13, 1956; minimum daily, 240 micromhos June 27, 1954.
Percent sodium: Maximum, 22 Nov. 30, 1963; minimum, 7 June 11-20, 1953, May 1-10, June 1-10, 1955.
Sodium-adsorption-ratio (1961-64): Maximum, 0.85 Nov. 30, 1963; minimum, 0.24 July 5-27, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. 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 1983 to September 1964

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. 1-28, 1963.	233,367	8.2	2.50	0.99	0.52	0.05	2.69		0.94	0.34	0.02	0.01	0.03	241	0.33	76,488	13	0.40	376	7.9
Oct. 29-Nov. 10.	62,168	--	3.78		.57	--	2.85		--	--	--	--	--	254	.35	21,475	13	.41	416	8.0
Nov. 11-22.....	41,700	--	4.18		.74	--	3.11		--	--	--	--	--	282	.38	15,993	15	.51	462	8.1
Nov. 23-25.....	10,812	--	3.56		.74	--	2.49		--	--	--	--	--	244	.33	3,588	17	.55	408	8.1
Nov. 26-29.....	13,289	--	4.04		.74	--	3.02		--	--	--	--	--	271	.37	4,898	15	.52	451	8.2
Nov. 30.....	3,273	--	4.42		1.26	--	3.38		--	--	--	--	--	298	.41	1,326	22	.85	504	7.8
Dec. 1-16.....	50,460	--	4.20		.78	--	3.16		--	--	--	--	--	280	.38	19,215	16	.54	468	8.1
Dec. 17-Jan. 10, 1964.....	75,818	--	4.14		.78	--	3.18		--	--	--	--	--	284	.39	29,284	16	.54	471	8.1
Jan. 11-Feb. 9..	91,934	7.5	2.89	1.32	.83	.07	3.15		1.25	.62	.02	.01	.00	295	.40	36,884	16	.57	471	8.1
Feb. 10-24.....	52,364	--	4.26		.78	--	3.15		--	--	--	--	--	290	.39	20,652	16	.54	468	8.2
Feb. 25-Mar. 24.	123,842	--	4.20		.70	--	3.15		--	--	--	--	--	279	.38	46,991	14	.48	459	8.0
Mar. 25-Apr. 9..	81,243	7.2	2.94	1.32	.70	.06	3.18		1.25	.51	.02	.01	.02	280	.38	30,937	14	.48	462	8.0
Apr. 10-16.....	54,524	--	4.30		.70	--	3.18		--	--	--	--	--	287	.39	21,282	14	.47	487	8.2
Apr. 17-May 9...	512,311	--	3.96		.52	--	2.92		--	--	--	--	--	282	.36	182,547	12	.37	429	8.2
May 10-24.....	459,372	--	3.64		.52	--	2.75		--	--	--	--	--	242	.33	151,188	13	.39	393	7.8
May 25-June 8...	444,793	--	3.40		.44	--	2.67		--	--	--	--	--	223	.30	134,897	11	.33	366	7.8
June 9-24.....	581,395	--	2.98		.37	--	2.49		--	--	--	--	--	189	.26	149,442	11	.30	323	7.8

SNAKE RIVER MAIN STEM--Continued

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

Chemical analyses, water year October 1963 to September 1964--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 25-July 2, 1964	223,418	--	2.90		0.37	--	2.46		--	--	--	--	--	186	0.25	56,516	11	0.31	319	7.7
July 3-24	689,455	8.5	1.95	0.77	.35	0.04	2.34		0.54	0.16	0.02	0.01	0.01	173	.24	162,215	11	.30	298	7.6
July 25-Aug. 7	356,826	--	2.62		.33	--	2.26		--	--	--	--	--	166	.23	80,557	11	.29	288	7.8
Aug. 8-31	449,566	--	2.74		.35	--	2.26		--	--	--	--	--	171	.23	104,551	11	.30	299	7.9
Sept. 1-21	336,347	--	2.94		.44	--	2.36		--	--	--	--	--	186	.25	85,082	13	.36	325	7.8
Sept. 22-30	114,837	--	3.02		.48	--	2.47		--	--	--	--	--	204	.28	32,154	12	.36	343	7.9
Total or weighted average	5,062,754	--	3.27		0.48	--	2.59		--	--	--	--	--	213	0.29	1,468,162	13	0.35	358	7.8

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SNAKE RIVER MAIN STEM--Continued

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 Big Wood River.
DRAINAGE AREA.--35,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1964.
Water temperatures: March 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 567 micromhos Jan. 24; minimum daily, 417 micromhos Apr. 2.
Percent sodium: Maximum, 27 Oct. 1 to Dec. 28, July 19 to Aug. 9; minimum 22 Apr. 18 to May 11, June 11-30.
Sodium-adsorption-ratio: Maximum, 1.11 Oct. 1-31; minimum, 0.78 June 11-30.
EXTREMES, 1951-64.--Specific conductance: Maximum daily, 594 micromhos Oct. 3, 1952; minimum daily, 355 ppm Feb. 11, 1962.
Percent sodium: Maximum, 30 Apr. 14, 15; minimum, 21 June 17 to July 4, 1963.
Sodium-adsorption-ratio (1961-64): Maximum, 1.26 Apr. 14, 15, 1963; minimum, 0.75 June 17 to July 4, 1963.
REMARKS.--Records of specific conductance of daily samples availahle in district office at Portland, Oreg. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	544,596	33	2.40	1.81	1.61	0.13	3.80	0.00	1.19	0.73	0.04	0.07	0.09	351	0.48	259,968	27	1.11	544	8.2
Nov. 1-28.....	516,607	--	4.26		1.61	--	3.85	.00	--	--	--	--	--	352	.48	247,310	27	1.10	548	8.2
Nov. 29-Dec. 28.	553,864	--	4.22		1.52	--	3.77	.00	--	--	--	--	--	340	.46	256,107	27	1.05	538	8.2
Dec. 29-Jan. 27, 1964.....	529,527	33	2.50	1.65	1.52	.13	3.75	.00	1.21	.73	.04	.07	.08	341	.46	245,574	26	1.06	539	8.2
Jan. 28-Feb. 26.	505,012	--	4.14		1.48	--	3.69	.00	--	--	--	--	--	333	.45	228,710	26	1.03	527	8.2
Feb. 27-Mar. 19.	358,778	--	4.20		1.48	--	3.65	.00	--	--	--	--	--	331	.45	161,508	26	1.02	524	8.1
Mar. 20-31.....	209,264	--	4.04		1.39	--	3.47	.00	--	--	--	--	--	317	.43	90,218	26	.98	501	8.0
Apr. 1-11.....	192,807	29	2.10	1.40	1.26	.11	3.16	.00	.96	.59	.04	.06	--	290	.39	76,043	26	.95	453	8.2
Apr. 12-17.....	94,790	--	3.76		1.31	--	3.28	.07	--	--	--	--	--	308	.42	39,706	26	.95	487	8.4
Apr. 18-May 11..	895,418	--	4.36		1.26	--	3.61	.00	--	--	--	--	--	330	.45	401,864	22	.85	531	7.6
May 12-June 10..	686,678	--	4.06		1.26	--	3.47	.00	--	--	--	--	--	324	.44	302,578	24	.89	510	8.0
June 11-30.....	808,859	--	3.92		1.09	--	3.29	.00	--	--	--	--	--	300	.41	330,015	22	.78	473	8.0
July 1-18.....	268,982	26	2.05	1.56	1.31	.11	3.18	.00	1.06	.62	.04	.05	.06	298	.41	109,013	26	.97	471	8.0
July 19-Aug. 9..	333,556	--	3.96		1.44	--	3.51	.00	--	--	--	--	--	320	.44	145,164	27	1.02	511	8.1
Aug. 10-31.....	343,200	--	4.02		1.39	--	3.64	.00	--	--	--	--	--	330	.45	154,028	26	.98	520	8.1
Sept. 1-30.....	512,271	--	4.18		1.48	--	3.75	.00	--	--	--	--	--	338	.46	235,481	26	1.02	538	8.2
Total or weighted average	7,354,000	--	4.10		1.39	--	3.59	0.00	--	--	--	--	--	328	0.45	3,283,000	26	0.97	519	8.0

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 1964.
Water temperatures: November 1950 to September 1964.
Sediment records: January 1939 to June 1940.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 694 micromhos July 3; minimum daily, 135 micromhos June 20-22.
Percent sodium: Maximum, 54 July 2, 3; minimum, 36 June 8-14.
Sodium-adsorption-ratio: Maximum, 3.00 July 2, 3; minimum, 0.78 June 15-23.
EXTREMES, 1939-40, 1950-64.--Specific conductance: Maximum daily, 1,470 micromhos July 30, Aug. 26, 1939; minimum daily, 82 micromhos Apr. 27, 1952.
Percent sodium (1961-64): Maximum, 55 June 27-28, 1962, May 16-19, 1963; minimum, 35 May 22 to June 18, 1963.
Sodium-adsorption-ratio (1961-64): Maximum, 3.37 Apr. 17-20, 1962; minimum, 0.75 June 14-18, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. No appreciable inflow between gaging station and sampling point except during periods of heavy local runoff.

Chemical analyses, water year October 1963 to September 1964

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. 1-16, 1963.	21,326	33	2.20	0.82	2.57	0.11	3.84	0.00	1.31	0.42	0.03	0.08	0.13	353	0.48	10,238	45	2.09	538	7.9
Oct. 17-Nov. 8..	39,963	--	3.66		3.18	--	4.52	.00	--	--	--	--	--	420	.57	22,827	46	2.35	636	7.7
Nov. 9-22.....	27,019	--	3.26		2.74	--	3.95	.00	--	--	--	--	--	368	.50	13,522	46	2.14	556	7.9
Nov. 23-Dec. 3..	17,171	--	3.66		3.05	--	4.43	.00	--	--	--	--	--	413	.56	9,645	45	2.25	622	7.6
Dec. 4-25.....	30,962	--	3.64		3.05	--	4.39	.00	--	--	--	--	--	410	.56	17,275	46	2.26	625	7.9
Dec. 26-Jan. 17, 1964.....	31,797	34	2.40	1.15	2.91	.12	4.29	.00	1.60	.51	.03	.13	.07	397	.54	17,166	44	2.19	617	7.6
Jan. 18-20.....	4,264	--	3.36		3.00	--	4.15	.00	--	--	--	--	--	410	.56	2,389	47	2.32	605	7.8
Jan. 21, 22.....	4,326	--	2.82		2.35	--	3.20	.00	--	--	--	--	--	337	.46	1,984	45	1.98	496	7.2
Jan. 23-Feb. 2..	17,062	--	3.24		2.74	--	3.92	.00	--	--	--	--	--	382	.52	8,864	46	2.15	577	7.7
Feb. 3-7.....	7,666	--	3.16		2.57	--	3.72	.00	--	--	--	--	--	366	.50	3,816	45	2.04	544	7.5
Feb. 8-12.....	9,412	--	2.72		2.09	--	3.05	.00	--	--	--	--	--	296	.40	3,789	43	1.79	452	7.4
Feb. 13-26.....	49,400	--	1.88		1.31	--	2.26	.00	--	--	--	--	--	209	.28	14,042	41	1.35	320	7.2
Feb. 27-Mar. 2..	27,332	--	1.46		.96	--	1.69	.00	--	--	--	--	--	154	.21	5,724	40	1.12	235	7.4
Mar. 3, 4.....	9,898	--	1.70		1.09	--	1.92	.07	--	--	--	--	--	182	.25	2,450	39	1.18	280	8.4
Mar. 5, 6.....	6,069	--	2.18		1.74	--	2.85	.00	--	--	--	--	--	247	.34	2,039	44	1.67	392	7.4
Mar. 7-20.....	21,465	--	3.04		2.61	--	3.85	.00	--	--	--	--	--	356	.48	10,393	46	2.12	548	7.8
Mar. 21-Apr. 11.	30,545	--	2.96		2.46	--	3.52	.00	--	--	--	--	--	332	.45	13,792	46	2.04	521	7.8
Apr. 12-15.....	6,339	--	2.26		1.91	--	2.88	.00	--	--	--	--	--	260	.35	2,242	46	1.60	409	7.8
Apr. 16-20.....	15,927	--	1.36		.87	--	1.61	.00	--	--	--	--	--	146	.20	3,163	39	1.06	225	7.6
Apr. 21-30.....	17,554	19	1.20	.44	1.09	.08	1.95	.00	.56	.20	.03	.06	.00	180	.24	4,297	39	1.20	277	7.6

May 1-7, 1964...	19,382	--	1.50	.96	---	1.79	.00	---	---	---	---	---	185	.22	4,349	39	1.11	254	7.4
May 8-11.....	8,227	--	1.60	1.09	---	1.88	.00	---	---	---	---	---	174	.24	1,947	40	1.22	269	7.4
May 12-22.....	6,807	--	2.08	1.61	---	2.52	.00	---	---	---	---	---	235	.32	2,176	44	1.58	369	7.5
May 23-June 7...	76,800	--	1.38	.87	---	1.59	.00	---	---	---	---	---	153	.21	15,981	39	1.06	228	7.4
June 8-14.....	50,914	--	1.02	.57	---	1.21	.00	---	---	---	---	---	112	.15	7,755	36	.79	163	7.4
June 15-23.....	72,547	--	.90	.52	---	1.08	.00	---	---	---	---	---	92	.13	9,077	37	.78	143	7.7
June 24.....	4,403	--	1.08	.70	---	1.33	.00	---	---	---	---	---	126	.17	755	39	.95	184	7.3
June 25.....	2,440	--	1.34	.96	---	1.66	.00	---	---	---	---	---	152	.21	504	42	1.17	231	7.3
June 26-28.....	3,302	--	1.86	1.48	---	2.31	.00	---	---	---	---	---	216	.29	970	44	1.53	332	7.8
June 29-30.....	1,440	--	2.08	1.65	---	2.59	.00	---	---	---	---	---	243	.33	476	44	1.62	376	7.7
July 1.....	438	--	2.50	2.52	---	3.20	.00	---	---	---	---	---	330	.45	197	50	2.26	485	7.6
July 2, 3.....	329	--	3.26	3.83	---	4.16	.00	---	---	---	---	---	436	.59	195	54	3.00	667	8.1
July 4-7.....	1,682	--	2.62	2.52	---	3.34	.00	---	---	---	---	---	315	.43	721	49	2.20	502	7.9
July 8-11.....	984	--	2.98	3.05	---	3.84	.00	---	---	---	---	---	380	.52	508	51	2.49	583	8.0
July 12-20.....	6,551	24	1.80 .60	2.04	.10	3.10	.00	.98	.34	.03	.08	.00	288	.39	2,566	45	1.87	439	7.7
July 21-29.....	5,177	---	2.78	2.57	---	3.56	.00	---	---	---	---	---	329	.45	2,316	48	2.18	507	7.8
July 30-Aug. 9..	10,167	---	2.70	2.31	---	3.41	.00	---	---	---	---	---	308	.42	4,259	46	1.98	487	7.7
Aug. 10-26.....	12,341	---	2.88	2.61	---	3.72	.00	---	---	---	---	---	338	.46	5,673	48	2.18	530	7.8
Aug. 27-Sept. 11	25,579	---	2.64	2.13	---	3.31	.00	---	---	---	---	---	287	.40	10,332	45	1.86	465	7.9
Sept. 12-30.....	21,745	---	2.84	2.35	---	3.59	.00	---	---	---	---	---	324	.44	9,582	45	1.87	499	7.9
Total or weighted average	726,800	--	2.24	1.76	---	2.73	0.00	---	---	---	---	---	253	0.34	250,000	43	1.57	387	7.6

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 1964.
Water temperatures: December 1950 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 254 micromhos Feb. 4; minimum daily, 97 micromhos June 11.
Percent sodium: Maximum, 23 Feb. 1-14; minimum, 9 July 11 to Aug. 4.
Sodium-adsorption-ratio: Maximum, 0.58 Feb. 1-14; minimum, 0.15 July 11 to Aug. 4.
EXTREMES, 1950-64.--Specific conductance: Maximum daily, 324 micromhos Dec. 7, 1955; minimum daily, 97 micromhos June 11, 1964.
Percent sodium (1961-64): Maximum, 28 Oct. 20-25, 1962; minimum, 9 July 11 to Aug. 4, 1964.
Sodium-adsorption-ratio (1961-64): Maximum, 0.71 Oct. 20-25, 1962; minimum, 0.15 July 11 to Aug. 4, 1964.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg. Samples were collected at 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. No appreciable inflow between sampling point and gaging station except during periods of heavy local runoff.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	5,639,643	9.2	1.10	0.55	0.43	0.04	1.52		0.42	0.14	0.02	0.01	0.04	124	0.17	951,069	20	0.47	204	7.6
Nov. 1-18.....	3,224,648	--	1.70		.48	--	1.59		--	--	--	--	--	132	.18	578,889	22	.52	215	7.8
Nov. 19-Dec. 3..	2,744,330	--	1.68		.48	--	1.61		--	--	--	--	--	130	.18	485,198	22	.52	214	7.9
Dec. 4-19.....	3,111,987	--	1.62		.44	--	1.54		--	--	--	--	--	119	.16	503,644	21	.48	205	7.9
Dec. 20-Jan. 2, 1964.....	2,523,054	--	1.78		.48	--	1.67		--	--	--	--	--	135	.18	463,233	21	.51	228	7.9
Jan. 3-31.....	5,370,129	13	1.10	.72	.48	.05	1.70		.50	.16	.01	.02	.02	141	.19	1,029,776	20	.50	232	7.8
Feb. 1-14.....	2,865,719	--	1.90		.57	--	1.75		--	--	--	--	--	147	.20	572,915	23	.58	242	7.9
Feb. 15-26.....	2,708,628	--	1.76		.44	--	1.62		--	--	--	--	--	130	.18	478,885	20	.46	216	7.8
Feb. 27-Mar. 26.	6,056,925	--	1.84		.44	--	1.69		--	--	--	--	--	136	.18	1,120,289	19	.45	228	8.1
Mar. 27-Apr. 12.	4,032,793	--	1.74		.44	--	1.62		--	--	--	--	--	135	.18	740,421	20	.47	220	8.1
Apr. 13-22.....	2,881,983	15	.95	.51	.38	.04	1.38		.35	.11	.02	.03	.00	116	.16	454,662	20	.45	186	7.9
Apr. 23-May 20..	11,468,429	--	1.34		.31		1.26							111	.15	1,731,274	19	.38	169	7.5
May 21-June 3...	11,382,347	--	1.20		.19	--	1.07		--	--	--	--	--	93	.13	1,439,639	13	.24	142	7.5
June 4-16.....	14,545,388	--	1.20		.12	--	.85		--	--	--	--	--	70	.10	1,384,721	11	.18	107	7.2
June 17-July 10.	25,667,702	--	1.12		.15	--	1.02		--	--	--	--	--	80	.11	2,792,646	12	.20	129	7.4
July 11-Aug. 4..	14,955,371	5	.90	.31	.12	.03	1.08		.21	.04	.01	.00	.00	78	.11	1,586,466	9	.15	133	7.5
Aug. 5-Sept. 2..	8,714,380	--	1.30		.17	--	1.21		--	--	--	--	--	81	.11	959,976	12	.21	147	7.5
Sept. 3-30.....	5,820,297	--	1.40		.28	--	1.33		--	--	--	--	--	96	.13	759,898	17	.34	171	7.7
Total or weighted average	133,713,753	--	1.38		0.26	--	1.25		--	--	--	--	--	99	0.13	18,033,601	16	0.31	161	7.5

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 1964.
Water temperatures: February 1951 to September 1964.
EXTREMES, 1963-64.--Specific conductance: Maximum daily, 67 micromhos Dec. 20, Sept. 15, 17; minimum daily, 37 micromhos Nov. 9.
Percent sodium: Maximum, 31 Sept. 1-30; minimum, 27 on many days during 1963-64.
Sodium-adsorption-ratio: Maximum, 0.42 Sept. 1-30; minimum, 0.29 May 12 to June 10.
EXTREMES, 1951-64.--Sepcific conductance: Maximum daily, 133 micromhos Nov. 7, 1954; minimum daily, 35 micromhos Jan. 20, 1953, Feb. 12, 1961.
Percent sodium (1961-64): Maximum, 31 Oct. 11 to Nov. 2, 1961, Sept. 1-30, 1964; minimum, 24 May 3-24, 1963.
Sodium-adsorption-ratio (1961-64): Maximum, 0.42 Sept. 1-30, 1964; minimum, 0.28 Feb. 19-23, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg.

Chemical analyses, water year October 1963 to September 1964

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, 1963.	679,438	17	0.30	0.12	0.17	0.03	0.43		0.07	0.08	0.00	0.02	0.02	54	0.07	49,898	27	0.36	64	6.7
Nov. 1-7.....	201,322	--	0.40		.16	--	.38		--	--	--	--	--	53	.07	14,511	29	.36	60	6.6
Nov. 8-11.....	476,192	--	.28		.12	--	.28		--	--	--	--	--	44	.06	28,495	30	.33	42	6.5
Nov. 12-28.....	1,621,884	--	.36		.14	--	.31		--	--	--	--	--	55	.07	121,317	28	.33	52	6.4
Nov. 29-Dec. 28.	1,364,430	--	.42		.16	--	.34		--	--	--	--	--	61	.08	113,193	27	.34	60	6.7
Dec. 29-Jan. 27, 1964.....	3,788,033	14	.22	.12	.13	.02	.33		.07	.06	.00	.02	.00	53	.07	273,041	27	.32	51	6.8
Jan. 28-Feb. 6..	1,409,058	--	.34		.13	--	.33		--	--	--	--	--	49	.07	93,900	28	.32	49	6.7
Feb. 7-26.....	865,587	--	.42		.15	--	.38		--	--	--	--	--	57	.08	67,100	27	.33	60	6.7
Feh. 27-Mar. 15.	988,959	--	.40		.15	--	.36		--	--	--	--	--	59	.08	79,354	27	.33	58	6.8
Mar. 16-30.....	750,942	--	.38		.15	--	.36		--	--	--	--	--	54	.07	55,149	28	.34	55	6.6
Mar. 31-Apr. 11.	502,215	14	.22	.13	.14	.01	.36		.07	.06	.01	.02	.00	41	.06	28,004	28	.33	51	6.5
Apr. 12-May 11..	1,005,025	--	.36		.14	--	.34		--	--	--	--	--	53	.07	72,442	29	.34	55	6.7
May 12-June 10..	1,330,512	--	.32		.12	--	.33		--	--	--	--	--	51	.07	92,284	27	.29	48	6.5
June 11-July 10.	922,314	--	.36		.14	--	.38		--	--	--	--	--	45	.06	56,446	29	.34	52	6.7
July 11-Aug. 9..	446,995	14	.25	.15	.16	.02	.46		.05	.07	.01	.01	.00	48	.07	29,180	28	.36	60	6.9
Aug. 10-31.....	293,280	--	.42		.18	--	.48		--	--	--	--	--	50	.07	19,943	30	.40	63	7.0
Sept. 1-30.....	463,299	--	.42		.19	--	.46		--	--	--	--	--	51	.07	32,134	31	.42	63	7.1
Total or weighted average	17,109,485	--	0.37		0.14	--	.35		--	--	--	--	--	53	0.07	1,226,391	27	0.34	53	6.6

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