# Quality of Surface Waters for Irrigation Western States 1963



GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1952

# Quality of Surface Waters for Irrigation Western States 1963

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

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1952

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1967

UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

William T. Pecora, *Director*

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

## PREFACE

This report was prepared by the Geological Survey in cooperation with other State and Federal Agencies by personnel of the Water Resources Division under the direction of L. B. Leopold, chief hydrologist, and S. K. Love, chief, Quality of Water Branch. The data were collected under the supervision of the following:

Eugene Brown, district chemist.....Sacramento, Calif.
D. M. Culbertson, district engineer..... Lincoln, Nebr.
T. F. Hanly, district engineer..... Worland, Wyo.
C. H. Hembree, district geologist..... Austin, Tex.
J. H. Hubble, district chemist.....Little Rock, Ark.
L. B. Laird, district chemist.....Portland, Oreg.
R. H. Langford, district chemist.....Salt Lake City, Utah
R. P. Orth, district chemist..... Oklahoma City, Okla.
J. M. Stow, district chemist.....Albuquerque, N. Mex.

# CONTENTS

Quality of surface waters for irrigation--Continued

# ILLUSTRATIONS

# QUALITY OF SURFACE WATERS FOR IRRIGATION, WESTERN STATES, 1963

## INTRODUCTION

The records of chemical analyses, other physical measurements, and discharge given in this report comprise the thirteenth annual compilation of data for 73 irrigation network stations in operation west of the Mississippi river.

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

In recognition of this problem the Subcommittee on Hydrology, Interagency Committee on Water Resources (formerly the Federal Interagency River Basin Committee) on February 6, 1950, approved a list of 106 network stations on streams in the western conterminous United States at which water samples were to be collected and analyzed with particular reference to the use of these streams' waters for irrigation. These stations, with pertinent information about periods of operation, are shown in the following table. Of the 106 stations selected, 39 were already being operated by the Geological Survey and 7 by the International Boundary and Water Commission. From the remaining stations on the list, 30 were selected for activation by the U.S. Geological Survey during the fiscal year 1951. In addition, 3 stations previously operated in connection with other programs and scheduled to be discontinued were to be included in the list to be operated by the Geological Survey (the subcommittee amended the list on October 2, 1952, to include the three additional stations, bringing the recommended number of irrigation network stations to a total of 109). Pending approval by the subcommittee, two proposed stations were added to the list in 1962–63. These additions increased the number to 111.

*Irrigation-Quality Network Stations, Western States*

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

| Irrigation network no. | Geological Survey station ident. no. | Stream and location | Date established | Date discontinued |
|---|---|---|---|---|
| 1 | 5-1240 | Souris (Mouse) River near Westhope, N. Dak | June 1954 | |
| 2 | 6-3300 | Missouri River near Williston, N. Dak | 12- 5-50 | |
| 3 | -4400 | Missouri River at Pierre, S. Dak | 10- 3-50 | 9-30-58 |
| 4 | -8070 | Missouri River at Nebraska City, Nebr | 1- 4-51 | |
| 5 | -2145 | Yellowstone River at Billings, Mont[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 | |
| 27 | -2505 | Arkansas River at Van Buren, Ark | 10- 1-45 | |
| 28 | -1640 | Cimarron River at Mannford, Okla | 10- 1-49 | 9-30-52 |
| | -1610 | Cimarron River at Perkins, Okla | 10- 1-52 | |
| 29 | ------ | Canadian River near Tascosa, Tex | 6- 2-48 | 9-30-53 |
| 30 | -2450 | Canadian River near Whitefield, Okla | 9- 1-46 | |
| 31 | -3316 | Red River at Denison Dam, near Denison, Tex | 5- 1-44 | |
| 32 | -3280 | Washita River near Tabler, Okla | 9-10-46 | 10- 3-52 |
| 33 | 8- 305 | Sabine River near Ruliff, Tex | 10- 1-47 | |
| 34 | - 410 | Neches River at Evadale, Tex | 10- 1-47 | |
| 35 | - 665 | Trinity River at Romayor, Tex | 9- 1-45 | |
| 36 | ------ | San Jacinto River near Huffman, Tex | 9- 1-45 | 4- 5-54 |
| 37 | -1140 | Brazos River at Richmond, Tex | 9- 1-45 | |
| 38 | ------ | Colorado River at Robert Lee, Tex | 10- 1-47 | 9-30-51 |
| 39 | -1580 | Colorado River at Austin, Tex | 10- 1-47 | |
| 40 | -1620 | Colorado River at Wharton, Tex | 4-11-44 | |
| 41 | -1765 | Guadalupe River at Victoria, Tex | 9- 1-45 | |
| 42 | -2110 | Nueces River near Mathis, Tex | 10- 1-47 | |
| 43 | -2492 | Rio Grande above Culebra Creek, near Labatos, Colo. | 10-11-46 | |

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 | ---------- |
| 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 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 at Falcon Dam-U.S. tailrace[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 |
| 83 | ------- | San Joaquin River at Antioch, Calif | ---------- | ---------- |

See footnotes at end of table.

*Irrigation-Quality Network Stations, Western States*—Continued

| Irrigation network no. | Geological Survey station ident. no. | Stream or location | Date established | Date discontinued |
|---|---|---|---|---|
| 84 | 11-3105 | Calaveras River (Stockton diverting canal) at Stockton, Calif. | 3- 1-51 | 10- 3-52 |
| | -2535 | San Joaquin River near Biola, Calif. | 1952 | Oct. 1960 |
| 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 | May 1958 |
| 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 Northport, Wash. | 11-15-51 | ---------- |
| 91 | -4365 | Columbia River at Grand Coulee Dam, Wash. | 11-25-50 | 9-30-58 |
| 92 | -3220 | Kootenai River at Porthill, Idaho | ---------- | ---------- |
| 93 | -3985 | Pend Oreille River near Netaline Falls, Wash. | ---------- | ---------- |
| 94 | -5105 | Yakima River at Kiona, Wash | 12-30-52 | ---------- |
| 95 | 13- 375 | Snake River near Heise, Idaho | 1- 8-53 | ---------- |
| 96 | - 815 | Snake River near Minidoka, Idaho | ---------- | ---------- |
| 97 | -1545 | Snake River at King Hill, Idaho | 3-27-51 | ---------- |
| 98 | -2690 | Snake River at Weiser, Idaho | ---------- | ---------- |
| 99 | -3435 | Snake River near Clarkston, Wash. | 11-14-51 | Feb. 1956 |
| | ---------- | Snake River at Central Ferry, near Pomeroy, Wash. | 9-28-55 | 9-30-58 |
| 100 | ---------- | Boise River near Arrowrock, Idaho | ---------- | ---------- |
| 101 | -2125 | Boise River at Notus, Idaho | 11-21-50 | ---------- |
| 102 | 14-1057 | Columbia River near The Dalles, 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 | ---------- |

[a] Reactivated August 1963.
[b] Reactivated December 1960. Published as irrigation station, 1962–63 water year.
[c] Operated by International Boundary and Water Commission.
[d] Stations added by Subcommittee, October 1952.
[e] Additional proposed stations, records included in 1962–63 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 111 network stations on streams in the Western States. The 73 stations in operation in 1963 are identified by a solid circle. The period of record, in years, is also shown at each of these stations. In a few instances the period of record differs from that obtained from the date established by the Subcommittee, as earlier records were included also. Proposed stations are identified by an open circle. Discontinued stations are identified by a half circle.

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

The complete number for each station has eight digits, but the station number as shown in this report just to the left of the station name consists of only the digits essential for identification. For example, for a station with the complete number 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 1962–63, the United States Section of the International Boundary and Water Commission operated the stream gaging stations for the following Rio Grande stations included in this report: El Paso, Fort Quitman, Presidio, Langtry, Falcon Dam U.S. tailrace and it operated the station Pecos River near Shumla, also. The Mexican Section operated the stream gaging station on the main stem at Laredo. Each section operated the gaging stations on the tributary streams, floodways, and diversions within its own country.

Descriptive headings and discharge data for the seven stations operated by the International Boundary and Water Commission, were obtained from Water Bulletins 32 and 33 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 1962 and 1963. Analyses for eight Rio Grande main stem stations and for the Pecos River near Shumla, Tex., were obtained from the U.S. Salinity Laboratory, Riverside, Calif.

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

## COLLECTION OF SAMPLES

In accordance with the recommendation of the Subcommittee, where practicable, one sample was collected each day throughout the water year. In general, each sample was taken in an 8- or 12-ounce polyethylene bottle provided with a bakelite cap and 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 Subcommittee that during the second and third years the following series of 11 determinations (schedule 2) would be made on all composite samples: Calcium, magnesium, sodium, bicarbonate, carbonate, sulfate, chloride, nitrate, boron, dissolved solids, and specific conductance. Hardness, noncarbonate hardness, percent sodium, total tons and tons per-acre-foot would be calculated as in schedule 1.

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

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

## REPORTING OF DATA

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

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

## EXPLANATION OF TABLES

The tables of analyses beginning on page 28 include a brief descriptive heading summarizing the more pertinent features at each station as follows:

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

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

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

*Extremes* for the current year and for the period of record are reported for specific conductance, percent sodium, and sodium-adsorption-ratio, because of their widespread application in the evaluation of analyses of water used for irrigation. The results for specific conductance are based on the measurement made at the laboratory upon receipt of the sample from the field. Data for percent sodium and sodium-adsorption-ratio were obtained from composite-sample analysis.

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

*Discharge records* were obtained from the responsible Geological Survey Water Resources district offices except for the seven stations operated by the International Boundary and Water Commission. Discharge data are shown in acre-feet, calculated from the mean daily 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. The equivalent is the weight with reference to some standard (such as the combining weight—either of oxygen, 8, or of hydrogen, 1.008) of that quantity of an element, radical, or compound to complete a definite chemical reaction. An equivalent of an element or ion is exactly equal in combining power to one equivalent of another element or ion. As previously discussed, for concentrations of dissolved solids that are normally encountered in water for irrigation, an equivalent per million is equal to a milliequivalent per liter. Silica, which is considered to be present in the colloidal state, and boron, are reported in parts per million. Percent sodium is calculated as follows:

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

At the recommendation of the Subcommittee, sodium-adsorption-ratio (SAR) is published for all network stations beginning October 1952. The term is defined and described under "Sodium" on page 11.

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

## CRITERIA OF WATER QUALITY

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

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

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

*Total concentration* is probably the more important single criterion for irrigation water quality and may be expressed in terms of parts per million (ppm) of dissolved solids, or as specific conductance (micromhos at 25°C). The latter is preferred. More than half of the irrigation waters in use in the Western States have specific conductance values below 750 micromhos (about 500 ppm

dissolved solids). Saline waters with specific conductance values greater than 2,250 micromhos (about 1,500 ppm dissolved solids) make up less than 10 percent of the total number of waters and an even smaller fraction of the total quantity of water being used. There are very few waters with specific conductance values greater than 5,000 micromhos (about 3,200 ppm dissolved solids) that are being used successfully, although they can be used for certain crops under very special conditions. Such waters are important, however, in that they constitute the only available supply in many arid regions.

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

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

where concentrations are expressed in equivalents per million.

A nomogram for determining the SAR value of an irrigation water with an exchangeable-sodium percentage (ESP) scale opposite the SAR scale is shown in figure 1 on page 12. 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

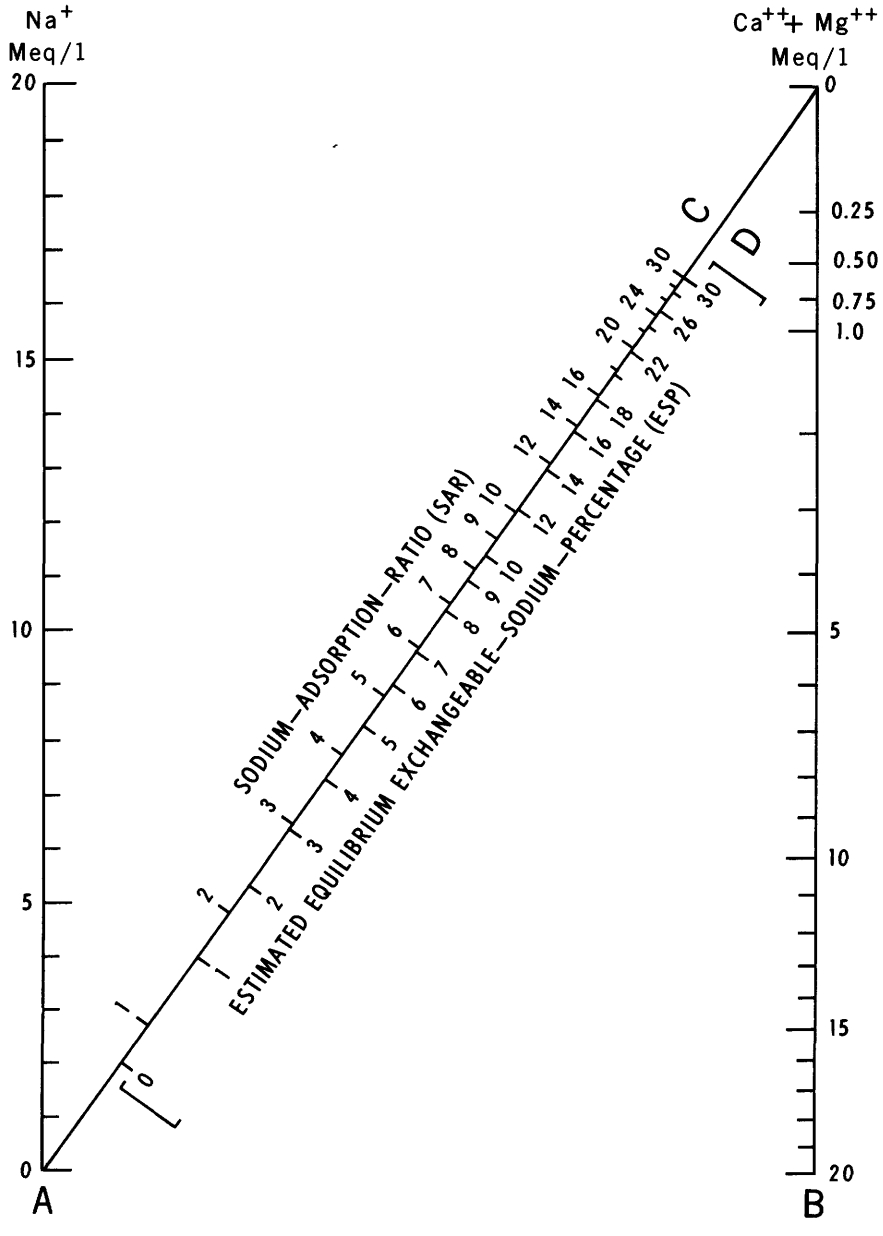


Figure 1.—Nomogram for determining the SAR value of irrigation water and for estimating the corresponding ESP value of a soil that is at equilibrium with the water (U. S. Salinity Laboratory Staff, 1954).

the soil, replacing calcium which reacts with bicarbonate and precipitates as $CaCO_3$. Ordinarily, magnesium will not replace calcium to any great extent but, if calcium is precipitated as it is released, the reaction proceeds toward completion.

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

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

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

*Phytotoxic substances*: Boron. The occurrence of boron in toxic concentrations in certain irrigation waters makes it necessary to consider this constituent when assessing the quality of water.

Plant species differ markedly in the 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. 14. The position of the point determines the quality classification of the

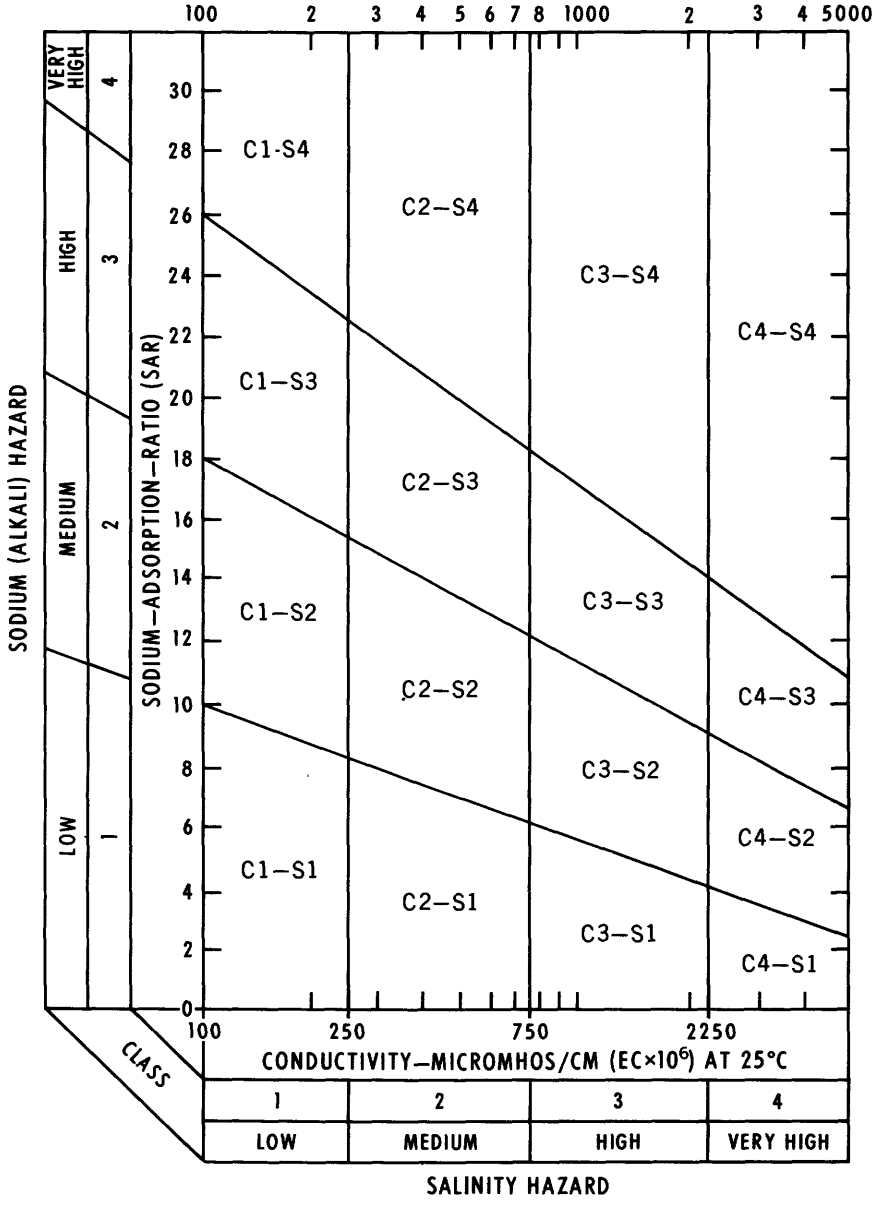


Figure 2.—Diagram for the classification of irrigation waters (U.S. Salinity Laboratory Staff, 1954).

water. The significance and interpretation of these quality ratings are summarized below.

Salinity Classification:

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

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

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

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

Sodium Classification:

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

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

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

S4. Very-high sodium water is generally unsatisfactory for irrigation except at low- or medium-salinity levels where the use

of gypsum or some other amendment makes it possible to use such water. (Wilcox and Durum, 1965.)

## DISCUSSION OF RESULTS

### HUDSON BAY AND UPPER MISSISSIPPI RIVER BASINS

*Red River of the North basin.*— Runoff in the basin generally was somewhat less than the long-term average. However, for the Sheyenne River and the Souris River in North Dakota, runoff was much below average. That of the Sheyenne River near Warwick, N. Dak., was only 22 percent of a 14-year average, and that of the Souris River near Westhope, N. Dak., was only 13 percent of a 33-year average. The runoff of the Sheyenne River near Warwick was the lowest in its 13 years of water-quality records. However, runoff of the Souris River near Westhope, while low, was still considerably more than in 1962. The weighted average of dissolved solids for the Sheyenne River station was 434 ppm (0.59 tons per acre-foot) compared with 389 ppm (0.53 tons per acre-foot) for 1962 and 420 ppm (0.57 tons per acre-foot) for the 13-year period of record. That for the Souris River station was 687 ppm (0.93 tons per acre-foot) compared with 921 ppm (1.25 tons per acre-foot) for 1962 and 652 ppm (0.89 tons per acre-foot) for the 9-year period of record.

### MISSOURI RIVER BASIN

*Missouri River main stem.*— The following dams regulate the Missouri River: Canyon Ferry and Fort Peck—upstream from Williston, N. Dak.; Garrison, Oahe, Fort Randall, and Gavins Point (Lewis and Clark)—between Williston, N. Dak., and Nebraska City, Nebr. Main stem reservoirs had a total of 41,951,000 acre-feet of water in storage on Sept. 30, 1963, an increase of 3,439,000 acre-feet from Sept. 30, 1962.

Runoff at Williston was only 87 percent of the long-term average because of drought conditions in northern Montana. Effects of the drought are evident if one considers that runoff near Great Falls, Mont., was slightly more than average, but runoff near Wolf Point, in northeastern Montana, was only 58 percent of average. Above average runoff from the Yellowstone River partly compensated for the deficiency of runoff near Wolf Point, Mont. The weighted-average of dissolved solids near Williston was 442 ppm (0.60 tons per acre-foot) as compared with 434 ppm (0.50 tons per acre-foot) for 1962 and 421 ppm (0.57 tons per acre-foot) for the 13-year period of record.

Runoff at Nebraska City, Nebr., was 84 percent of the long-term (34-year) average. The weighted average of dissolved solids was

506 ppm (0.69 tons per acre-foot), which was considerably higher than the average of 434 (0.59 tons per acre-foot) for the 13-year period of record and was the highest annual weighted average of record.

Most years much of the flow at Nebraska City is storm runoff from tributaries that enter the Missouri River downstream from Gavins Point Dam near Yankton, S. Dak. This storm runoff, occurring mainly in the spring and early summer, dilutes the Missouri River water. In 1963, however, the amount of such storm runoff was unusually small so that little dilution took place. Consequently, the weighted average of dissolved-solids content in 1963 was unusually high.

*Yellowstone River basin.*—Runoff from the basin was 104 percent of the long-term average although it was slightly less than the runoff in 1962. Runoff from each of the major tributaries was slightly higher than average except for the Tongue River, which was 163 percent of average and the third highest of record.

The dissolved-solids load for the basin was 126 percent of average but the concentration was near average. The Powder River had the highest dissolved-solids concentration but only contributed 13 percent of the total load for the basin. The Bighorn River furnished nearly one-half of the total load of the basin; of this more than 75 percent originated between Thermopolis, Wyo., and the mouth.

Major reservoirs in the Yellowstone River basin are Bull Lake, Pilot Butte, and Boysen on the Wind River; Buffalo Bill on the Shoshone River; and Tongue River Reservoir in Montana. Yellowtail Dam on the Bighorn River is presently under construction. No significant changes in impoundments or diversions were made during the year. Annual precipitation records for key points in the basin indicate variable but near average precipitation conditions. There were no variations in methodology from that proposed for regular station operation.

*James River basin.*— Runoff in the basin in 1963 was low. That of the James River at Huron, S. Dak., was only 47 percent of the 24-year average and was only 17 percent of the runoff for 1962, a high runoff year. The weighted average of dissolved solids of 718 ppm (0.98 tons per acre-foot) was 122 percent of the average for the 7 years of record and was nearly double that for 1962.

At Huron, samples are collected just upstream from the streamflow 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 from the North Platte River basin was 79 percent of the 34-year average owing largely to general drought conditions in southeastern Wyoming. In small local areas in the basin, precipitation exceeded average but the resulting higher than average runoff in some tributaries had very little effect on the mainstem runoff.

Runoff from the South Platte River basin was proportionately even less that that from the North Platte River basin. Runoff at Julesburg, Colo., was only 55 percent of the 61-year average and less than a third of that during 1962. The weighted average of dissolved solids was 1,510 ppm (2.05 tons per acre-foot) compared with 1,320 ppm (1.80 tons per acre-foot) for the 13-year period, and was the highest weighted average of record.

The flow and the quality of water in the Platte River, downstream from the confluence of the North Platte and South Platte rivers, is controlled considerably by releases of water from Lake McConaughy on the North Platte River. During years of low runoff from the South Platte River, greater volumes of water are released from Lake McConaughy to satisfy the needs for irrigation. Because the quality of water from the lake generally is better than that of water from the South Platte River, low runoff from the South Platte River basin usually improves the water quality in the Platte River.

Runoff of the Platte River at Brady, Nebr., was 33 percent greater than in 1962, reflecting generally greater releases for irrigation. The weighted average of dissolved solids was 466 ppm (0.63 tons per acre-foot) compared with 512 ppm (0.70 tons per acre-foot) in 1962 and 473 ppm (0.64 tons per acre-foot) for the 13-year period of record. Runoff of the Supply Canal near Maxwell, Nebr., which diverts from the Platte River, was slightly greater than in 1962. The weighted average of dissolved solids was 583 ppm (0.79 tons per acre-foot) compared with 742 ppm (0.01 tons per acre-foot) for 1962 and 570 ppm (0.78 tons per acre-foot) for the 13-year period of record.

### LOWER MISSISSIPPI RIVER BASIN

*Arkansas River basin.*— Runoff at Arkansas River below John Martin Reservoir, Colo., was about 53 percent of the 1962 discharge and about 35 percent of the average for the 25 years of record.

Runoff in 1963 at stations on the Arkansas River at Arkansas City, Kans., and at Ralston, Okla., was less than half of that in 1962. At Arkansas City, Kans., runoff was about 34 percent less than the long-term average. At Ralston, runoff was about 51 percent less than the long-term average. Runoff was also less in 1963 than in 1962 at both Cimarron River at Perkins and Canadian River near Whitefield. Compared to the long-term average, runoff at Cimarron River at Perkins was 27 percent less. At Canadian River near Whitefield runoff was about 67 percent less than the long-term average.

The lower runoff in 1963 resulted in higher dissolved-solids content at each of these stations. At Arkansas City, Kans., the weighted average dissolved-solids content increased 37 percent - from 619 ppm (0.84 tons per acre-foot) in 1962 to 851 ppm (1.16 tons per acre-foot) in 1963. At Ralston, weighted average dissolved-solids content increased from 613 ppm (0.83 tons per acre-foot) in 1962 to 965 ppm (1.31 tons per acre-foot) in 1963. At Cimarron River at Perkins, weighted average dissolved-solids content increased about 21 percent - from 2,410 ppm (3.27 tons per acre-foot) in 1962 to 2,920 ppm (3.98 tons per acre-foot) in 1963. At Canadian River near Whitefield, however, the increase was less than at other stations - from 416 ppm (0.57 tons per acre-foot) in 1962 to 460 ppm (0.63 tons per acre-foot) in 1963.

At most stations, weighted averages for percent sodium and sodium-adsorption-ratio were slightly higher than in 1962.

Runoff at the Arkansas River station at Van Buren, Ark., was much less in 1963 than in 1962. In 1963 the runoff was about 59 percent less than the long-term average. This lower runoff resulted in higher dissolved-solids content.

*Red River basin.*—Water discharge of the Red River at Dension Dam near Denison, Tex., during the 1963 water year was 59 percent of the average for the 40 years of record and 67 percent of the 1963 average. The weighted average of dissolved-solids content was 989 ppm (1.35 tons per acre-foot) in 1963 as compared to 1,150 ppm (1.56 tons per acre-foot) in 1962.

### WESTERN GULF OF MEXICO BASINS

In the Western Gulf of Mexico basins from the Sabine River to the Nueces River, streamflow was generally below normal. The weighted average of dissolved-solids content in 1963 was greater than in 1962 for the Sabine and Neches Rivers and was about the same in the other basins. Runoff in the Neches River basin during 1963 was less than half as much as during 1962 and was only

about one-third as much as the long-term average and the weighted average of dissolved-solids content increased from 102 ppm (0.14 tons per acre-foot) in 1962 to 122 ppm (0.17 tons per acre-foot) in 1963. The average discharge of the Brazos River at Richmond, Tex., was only about 60 percent of that in 1962. The weighted average of dissolved-solids content decreased from 556 ppm (0.75 tons per acre-foot) to 513 ppm (0.70 tons per acre-foot). The decrease in concentration was due principally to the improved quality of the water released from Whitney Reservoir.

*Rio Grande basin.*—Streamflow in the Rio Grande basin was only 40 to 80 percent of median (using the period 1931-60 as a standard). Adjusted July flow in the Rio Grande at Otowi Bridge was lowest since at least 1895. Flow was near median in the upper Pecos River, but it had decreased to 53 percent at Artesia and to less than 20 percent at Carlsbad. The storage content of major reservoirs was well below average because there was a below normal inflow and a heavy withdrawal for water for irrigation use.

Except for the Pecos River below Alamogordo, where the weighted average of dissolved-solids content increased from 1,390 ppm (1.89 tons per acre-foot) in 1962 to 1,700 ppm (2.32 tons per acre-foot) in 1963, the chemical quality of the water changed only slightly from previous years, despite low flow conditions.

In the 1963 water year, streamflow of the Pecos River below Red Bluff Dam near Orla, Tex., was less than 30 percent of the 26-year average and was about the same as the 1962 streamflow. The weighted average of dissolved-solids content increased from 9,190 ppm (12.5 tons per acre-foot) in 1962 to 9,790 ppm (13.3 tons per acre-foot) in 1963. Storage in Red Bluff Reservoir at the end of the 1963 water year was 30,300 acre-feet, only 10 percent of capacity.

### COLORADO RIVER BASIN

*Colorado River main stem.*— Runoff of Colorado River at Glenwood Springs, Colo., was 44 percent that of the preceding year. Flow was also about 55 percent of the average for 64 years of record. The flow of Colorado River near Cisco, Utah decreased to 42 percent of that of the preceding year. The flow at this station was about 49 percent of the average for 52 years of record.

In the Colorado River at Lees Ferry, Ariz., significant changes in streamflow and water quality have been observed during the 1962–63 water year. These changes were brought about by the closing of the Glen Canyon Dam in March 1963. Water is now

being stored in Lake Powell. The total flow (release) for the 1962–63 water year fell off to about one-sixth the total for the 1961–62 water year, and the load of dissolved-solids to one-third the total for the same period. The concentration of dissolved solids rose sharply as reflected by the average dissolved-solids content and the average specific conductance.

Significant changes also have been observed at the station near Grand Canyon. The total flow (release) during the 1962–63 water year fell off to approximately one-fifth the total for the 1961–62 water year and the load of dissolved solids to one-third of the total for the same period. The concentration of dissolved solids rose sharply as reflected by the average dissolved-solids content and the average specific conductance.

The amount of water released from Hoover Dam was up approximately 6 percent from the previous water year. The steady increase in mineral content in the past few years dropped off from 725 ppm (0.99 tons per acre-foot) in the 1961–62 water year to 699 ppm (0.95 tons per acre-foot) in the 1962–63 water year.

*Diversions and return flows at and below Imperial Dam.*—The total flow and the chemical quality of the water at Yuma Main Canal below Colorado River siphon at Yuma, Ariz., for the 1962–63 water year diviated only slightly from recent water years. This is due to the control of flow and the mixing of water in the several reservoirs upstream.

*Gunnison River basin.*—Flow of the Gunnison River near Grand Junction, Colo., decreased to 42 percent of that of the previous year. The flow at this station was about 48 percent of the average for 55 years of record.

*Green River basin.*— Discharge of the Green River near Greendale, Utah was only about 8 percent of that in 1962. This was due to the initial operation of the Flaming Gorge Dam in October of 1962. The flow in 1963 was strongly affected by the filling of the reservoir during this year. Weighted averages of dissolved-solids content for the 12 years of record should not be compared to those obtained in 1963.

The flow of the Green River at Green River, Utah was about 30 percent of that of the previous year and was about 35 percent of the average for 64 years of record.

*San Juan River basin.*— Streamflow for the entire reach of the river downstream from the newly completed Navajo Dam was affected by its regulation. Much of the water was impounded to create Navajo Lake.

Runoff at Animas River at Farmington, N. Mex., which is unaffected by regulation from Navajo Dam was 55 percent of the average. This would indicate that natural flow in the entire basin was lower than average.

The dissolved-solids content of the water in the San Juan River at Archuuleta remained more constant than in previous years. This demonstrates the effect of water impoundment on water quality.

The runoff of the San Juan River near Bluff, Utah was about 40 percent of that of the previous year and about 30 percent of the average for 49 years of record.

*Virgin River basin.*—Flow of the Virgin River at Littlefield, Ariz., was about 60 percent of that of the previous year. The flow at this station was about 50 percent of the average for 34 years of record.

*Gila River basin.*—The release of water at Gila River at Kelvin, Ariz., was down 30 percent from the release of the 1961–62 water year. The flow is controlled by Coolidge Dam and San Carlos Reservoir. The quality of the water fluctuates considerable according to the amount of water released at the dam. The total load of dissolved solids for the 1962–63 water year increased by about 23 percent over the total for the 1961–62 water year. One possible source for some of the dissolved material could be waste from the smelter located at Hayden, Ariz., about 15 miles upstream.

At Salt River below Stewart Mountain Dam, Ariz., the total amount of water released at the dam increased more than 15 percent over the total for the 1961–62 water year. The concentration of dissolved solids was approximately 5 percent less in the 1962–63 water year than in the previous water year.

The total amount of dam release at Verde River below Bartlett Dam, Ariz., fell off by approximately 50 percent during the past water year, and the tons per acre-foot of dissolved-solids content increased by more than 40 percent.

The amount of water released at Gila River below Gillespie Dam, Ariz., was up about 25 percent over the previous water year (1961–62), but the total dissolved-solids content was down more than 10 percent.

### THE GREAT BASIN

*Sevier Lake basin.*— Discharge of the Sevier River below Piute Dam near Marysvale, Utah decreased to about 49 percent of the 1962 discharge. The discharge at this station was about 37 percent of the average of the previous 51 years of record.

Flow of Sevier River near Lynndyl, Utah (at gage) was about 70 percent of the 1962 discharge, and was about 60 percent of the average for 26 years of record. During the 1963 water year, about 2,100 acre-feet of water from a deep well entered the river. This well is located just upstream from the gaging station and downstream from the sampling station. Discharges have been adjusted to compensate for the water from this well.

*Carson River basin.*— A new chemical-quality and water-temperature station was established on the Carson River at Silver Springs, Nev. Discharge records for this station are obtained from Carson River at Fort Churchill, Nev. The runoff for the 1962–63 water year at Fort Churchill was about 13 percent above the average for 52 years of record.

*Humboldt River basin.*— Flow in the upper basin was only about 65 percent of the preceding year. Chemical analyses indicate water quality remained about the same. For the Humboldt River near Rye Patch, the sodium-adsorption-ratio value and the dissolved-solids content increased slightly over the preceding water year. Flow was about 80 percent of the 1961–62 water year and only 71 percent of the average for 50 years record.

### PACIFIC SLOPE BASINS IN CALIFORNIA

*San Joaquin River basin.*— Flow in the basin increased about 19 percent over the preceding year.

Because of extensive development and widespread irrigation practices in the basin, the San Joaquin River channel at times carries mainly irrigation return water of poor chemical quality. Recycling the water from near the mouth to mid-basin by pumps and canals often causes further deterioration of the water quality. The station near Vernalis, Calif., which had been in operation since March 1, 1951 was discontinued on June 30, 1963.

### PACIFIC SLOPE BASINS IN WASHINGTON AND UPPER COLUMBIA RIVER BASIN

*Columbia River main stem.*— At Columbia River at Northport, Wash., runoff and water quality were essentially the same as the 1962 water year.

*Summary of water discharge, and tonnages of dissolved solids—1962-63*

| Station | Runoff (acre-feet) | Dissolved solids (tons per acre-foot |
|---|---|---|
| Red River of the North basin: | | |
| Sheyenne River near Warwick, N. Dak | 7,698 | 0.59 |
| Souris (Mouse) River near Westhope, N. Dak | 15,890 | .93 |
| Missouri River main stem: | | |
| Missouri River near Williston, N. Dak | 13,830,000 | .60 |
| Missouri River at Nebraska City Nebr | 20,380,000 | .69 |
| Yellowstone River basin: | | |
| Yellowstone River at Billings, Mont | | |
| Yellowstone River near Sidney, Mont | 9,641,000 | .58 |
| Wind River below Boysen Reservoir, Wyo | 1,014,000 | .61 |
| Bighorn River at Bighorn, Mont | 3,000,000 | .85 |
| Tongue River at Miles City, Mont | 431,300 | .50 |
| Powder River near Locate, Mont | 532,500 | 1.34 |
| James River basin: | | |
| James River at Huron, S. Dak | 74,600 | .98 |
| Platte River basin: | | |
| Platte River at Brady, Nebr | 270,800 | .63 |
| Supply Canal (Tri-County Diversion) near Maxwell, Nebr | 994,500 | .79 |
| South Platte River at Julesburg, Colo | 183,000 | 2.05 |
| Arkansas River basin: | | |
| Arkansas River below John Martin Reservoir, Colo | 89,650 | 2.98 |
| Arkansas River at Arkansas City, Kans | 845,400 | 1.16 |
| Arkansas River at Ralston, Okla | 1,662,000 | 1.31 |
| Cimarron River at Perkins, Okla | 672,400 | 3.98 |
| Arkansas River at Van Buren, Ark | | |
| Canadian River near Whitefield, Okla | 1,421,000 | .63 |
| Red River basin: | | |
| Washita River near Durwood, Okla | 445,500 | .90 |
| Red River at Denison Dam, near Denison, Tex | 2,193,000 | 1.35 |
| Sabine River basin: | | |
| Sabine River near Ruliff, Tex | 2,049,400 | .18 |
| Neches River basin: | | |
| Neches River at Evadale, Tex | 1,558,000 | .17 |
| Trinity River basin: | | |
| Trinity River at Romayor, Tex | 2,530,000 | .39 |
| Brazos River basin: | | |
| Brazos River at Richmond, Tex | 1,997,800 | .70 |
| Colorado River basin: | | |
| Colorado River at Austin, Tex | 764,300 | .46 |
| Colorado River at Wharton, Tex | 721,500 | .44 |
| Guadalupe River basin: | | |
| Guadalupe River Victoria, Tex | 409,200 | .43 |
| Nueces River basin: | | |
| Nueces River near Mathis, Tex | 79,200 | .52 |
| Rio Grande basin: | | |
| Rio Grande above Culebra Creek, near Lobatos, Colo | 101,700 | .33 |
| Rio Grande at Otowi Bridge, near San Ildefonso, N. Mex | 560,300 | .30 |
| Rio Grande conveyance channel at San Marical, N. Mex | 404,100 | .58 |
| Rio Grande floodway at San Marcial, N. Mex | 1,476 | 1.26 |
| Rio Grande below Elephant Butte Dam, N. Mex | 509,890 | .47 |
| Rio Grande near El Paso, Tex | 279,106 | 1.22 |
| Rio Grande at Fort Quitman, Tex | 44,070 | 4.61 |
| Rio Grande above Presido, Tex | | |
| Rio Grande at Langtry, Tex | 858,400 | .93 |
| Rio Grande at Laredo, Tex | 1,499,500 | .87 |
| Rio Grande at Falcon Dam - U.S. tailrace | 1,665,000 | .87 |
| Pecos River below Alamogordo Dam, N. Mex | 127,960 | 2.32 |

*Summary of water discharge, and tonnages of dissolved solids—1962–63—Continued*

| Station | Runoff (acre-feet) | Dissolved solids (tons per acre-foot) |
|---|---|---|
| Rio Grande basin:—Continued | | |
| Pecos River near Artesia, N. Mex | 121,100 | 4.02 |
| Pecos River below Red Bluff Dam, near Orla, Tex | 38,790 | 13.32 |
| Pecos River near Shumla, Tex | 145,300 | 2.89 |
| Colorado River main stem: | | |
| Colorado River near Glenwood Springs, Colo | 1,055,000 | .50 |
| Colorado River near Cisco, Utah | 2,820,000 | 1.27 |
| Colorado River at Lees Ferry, Ariz | 2,500,000 | 1.36 |
| Colorado River near Grand Canyon, Ariz | 2,743,000 | 1.43 |
| Colorado River below Hoover Dam, Ariz.-Nev | 8,810,000 | .95 |
| Diversions and return flows at and below Imperial Dam: | | |
| Yuma Main Canal below Colorado River siphon, at Yuma, Ariz. | 345,900 | 1.09 |
| Gunnison River basin: | | |
| Gunnison River near Grand Junction, Colo | 913,800 | 1.28 |
| Green River basin: | | |
| Green River near Greendale, Utah | 167,400 | .88 |
| Green River at Green River, Utah | 1,663,000 | .82 |
| San Juan River basin: | | |
| San Juan River near Archuleta, N. Mex | 202,800 | .29 |
| San Juan River near Bluff, Utah | 625,500 | 1.16 |
| Virgin River basin: | | |
| Virgin River at Littlefield, Ariz | 83,310 | 3.14 |
| Gila River basin: | | |
| Gila River at Kelvin, Ariz | 200,100 | 1.15 |
| Gila River below Gillespie Dam, Ariz | 10,900 | 5.72 |
| Salt River below Stewart Mountain Dam, Ariz | 613,000 | .88 |
| Verde River below Bartlett Dam, Ariz | 152,000 | .50 |
| Sevier Lake basin: | | |
| Sevier River below Piute Dam, near Marysvale, Utah | 81,310 | .43 |
| Sevier River near Lynndyl, Utah | 82,800 | 1.94 |
| Carson River basin: | | |
| Carson River near Silver Spring, Nev | 338,400 | .20 |
| Humboldt River basin: | | |
| Humboldt River at Palisade, Nev | 250,300 | .41 |
| Humboldt River near Rye Patch, Nev | 100,000 | .75 |
| San Joaquin River basin: | | |
| San Joaquin River near Vernalis, Calif | 2,812,000 | .26 |
| Columbia River main stem: | | |
| Columbia River at Northport, Wash | 70,850,000 | .12 |
| Yakima River basin: | | |
| Yakima River at Kiona, Wash | 2,442,000 | .20 |
| Snake River main stem: | | |
| Snake River near Heise, Idaho | 4,460,000 | .29 |
| Snake River at King Hill, Idaho | 6,762,000 | .45 |
| Boise River basin: | | |
| Boise River at Notus, Idaho | 611,800 | .36 |
| Columbia River main stem: | | |
| Columbia River near The Dalles, Oreg | 126,100,000 | .14 |
| Willamette River basin: | | |
| Willamette River at Salem, Oreg | 16,620,000 | .07 |

*Yakima River basin.*—Runoff in the 1963 water was 23 percent greater than in the 1962 water year. The average tons per day of dissolved-solids content increased 14 percent over the previous year. However, the average dissolved-solids content decreased from 158 ppm (0.21 tons per acre-foot) to 146 ppm (0.20 tons per acre-foot).

### SNAKE RIVER BASIN

*Snake River main stem.*— The chemical quality of the water at the stations at Heise and King Hill remained essentially the same as the 1962 water year. Runoff increased 1 and 11 percent respectively.

*Boise River basin.*— Although runoff increased almost 100 percent over the 1962 water year, the average tons per day of dissolved-solids content increased only 33 percent. The average dissolved-solids content decreased from 401 ppm (0.55 tons per acre-foot) to 268 ppm (0.36 tons per acre-foot) a 35 percent decrease.

### PACIFIC SLOPE BASINS IN OREGON AND LOWER COLUMBIA RIVER BASIN

*Columbia River main stem.*—The station near The Dalles, Oreg., showed no significant change in runoff or chemical quality when compared with the previous water year.

*Willamette River basin.*— There were no significant changes in runoff or chemical quality from the 1962 water year.

Discharge data and dissolved-solids loads for stations operated in 1963 are summarized in the table on p. 24.

## SELECTED REFERENCES

Eaton, F.M., 1935, Boron in soils and irrigation waters and its effect on plants: U.S. Dept. Agriculture Tech, Bull. 448, p. 1–133.

———1942, Toxicity and accumulation of chloride and sulfate salts in plants: Jour. Agriculture Res. 64, p. 357–399.

———1950, Significance of carbonates in irrigation water: Soil Science v. 69, p. 123–133.

Federal Interagency River Basin Committee, 1950, Minutes of the fifty-sixth meeting, Subcommittee on Hydrology (mimiographed).

Kelly, W. P., 1951: Alkali soils their formation, properties and reclamation, Am. Chem. Soc., mono. ser. 111, p. 91–111.

Magistad, O. C., and Christiansen, J. E., 1944, Saline soils, their nature and management: U.S. Dept. Agriculture Circ. 707, p. 8–9.

President's Water Resources Policy Commission, 1950. A water policy for the American people: v. 1: General Report, p. 152–153.

Scofield, C. S., and Headley, F. B., 1921, Quality of irrigation water in relation to land reclamation: Jour. Agriculture Res. 21, p. 265–278.

Scofield, C. S., 1936, The salinity of irrigation water: Smithsonian Institution Ann. Rpt., 1935, p. 275–287.

———1940, Salt balance in irrigated areas: Jour. Agriculture Res., v. 61, no. 1, p. 17–40.

———1949, Trends of irrigation development in the United States; Symposium, Am. Chem. Soc., p. 1–11 (mimiographed).

Straus, Michael, 1952, Use of water for irrigation, The physical basis of water supply and its principal uses: Interior and Insular Affairs Committee, U.S. House of Representative; v. 2.

Thorne, J. P., and Thorne, D. W., 1951, Irrigation waters of Utah; Utah Agriculture Expt. Sta. Bull. 349.

U.S. Geol. Survey 1951–62, Quality of surface waters for irrigation, Western United States: Water-Supply Papers, 1264, 1362, 1380, 1430, 1465, 1485, 1524, 1575, 1699, 1946, 1746, 1886 (last 2 in preparation).

U.S. Salinity Laboratory Staff, 1954, Diagnosis and improvement of saline and alkali soils; U.S. Dept. Agriculture, Agriculture Handbook 60, p. 1–160.

Wilcox, L. V., 1955, Classification and use of irrigation waters; U.S. Dept. Agriculture Circ. 969.

———1957, Discharge and salt burden of the Rio Grande above Fort Quitman, Tex., and salt balance conditions of the Rio Grande project for the year 1956: U.S. Dept. Agriculture, Salinity Laboratory research report no. 85, 26 p.

Wilcox, L. V., and Durum, W. H., 1965, Irrigation of agricultural lands; quality of irrigation water: Amer. Soc. Agronomy mon. chap. 9 (in press).

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 (includes 227 square miles in closed basins).
RECORDS AVAILABLE.--Chemical analyses: January 1951 to September 1963.
Water temperatures: January 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 981 micromhos June 7, 9, 10; minimum daily, 192 micromhos Mar. 18.
Percent sodium: Maximum, 52 Sept. 1-9; minimum, 11 Sept. 22-30.
Sodium-adsorption-ratio: Maximum, 3.30 Aug. 14-19; minimum, 0.35 Sept. 22-30.
EXTREMES, 1951-63.--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.
Sodium-adsorption-ratio (1961-63): Maximum, 3.30 Aug. 14-19, 1963; minimum, 0.35 Sept. 22-30, 1963.
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 1962 to September 1963

| 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, 1962. | 375 | -- | 4.48 | | 3.09 | -- | 5.83 | 0.00 | -- | -- | -- | -- | -- | 432 | 0.59 | 220 | 41 | 2.06 | 684 | 7.2 |
| Nov. 1-30..... | 375 | -- | 4.92 | | 4.48 | -- | 7.31 | .00 | -- | -- | -- | -- | -- | 544 | .74 | 277 | 48 | 2.86 | 852 | 7.2 |
| Dec. 1-13..... | 152 | -- | 5.60 | | 4.13 | -- | 7.54 | .00 | -- | -- | -- | -- | -- | 552 | .75 | 114 | 42 | 2.47 | 865 | 7.8 |
| Dec. 14-31..... | 132 | 26.0 | 2.79 | 2.55 | 2.09 | 0.12 | 6.02 | .00 | 1.25 | 0.25 | 0.01 | 0.03 | 0.11 | 423 | .56 | 76 | 28 | 1.28 | 681 | 7.7 |
| Jan. 1-24, 1963. | 114 | -- | 5.20 | | 1.96 | -- | 5.57 | .00 | -- | -- | -- | -- | -- | 415 | .56 | 64 | 27 | 1.21 | 654 | 7.8 |
| Jan. 25..... | 3 | 29.0 | 3.34 | 1.48 | .67 | .08 | 4.64 | .00 | .94 | .18 | .01 | .00 | .06 | 356 | .48 | 1 | 15 | .56 | 514 | 8.2 |
| Jan. 26-Feb. 28. | 101 | -- | 4.64 | | .78 | -- | 4.38 | .00 | -- | -- | -- | -- | -- | 320 | .44 | 44 | 14 | .51 | 505 | 7.6 |
| Mar. 1-18..... | 71 | -- | 3.48 | | .61 | -- | 3.33 | .00 | -- | -- | -- | -- | -- | 244 | .33 | 24 | 15 | .46 | 399 | 7.6 |
| Mar. 19-31..... | 980 | -- | 3.54 | | .83 | -- | 3.54 | .00 | -- | -- | -- | -- | -- | 267 | .36 | 356 | 19 | .62 | 429 | 7.6 |
| Apr. 1-4..... | 286 | -- | 4.48 | | .61 | -- | 4.13 | .00 | -- | -- | -- | -- | -- | 313 | .43 | 122 | 12 | .41 | 463 | 7.9 |
| Apr. 5-10..... | 533 | -- | 4.14 | | 3.35 | -- | 5.57 | .00 | -- | -- | -- | -- | -- | 469 | .64 | 340 | 45 | 2.33 | 705 | 8.1 |
| Apr. 11-25..... | 848 | -- | 3.48 | | 2.13 | -- | 3.97 | .00 | -- | -- | -- | -- | -- | 352 | .48 | 406 | 38 | 1.62 | 532 | 7.8 |
| Apr. 26..... | 44 | 5.0 | 2.35 | 1.48 | 2.57 | .20 | 4.56 | .00 | 1.50 | .37 | .01 | .01 | .11 | 369 | .50 | 22 | 39 | 1.86 | 598 | 7.6 |
| Apr. 27-May 12.. | 701 | -- | 4.30 | | 2.91 | -- | 5.20 | .00 | -- | -- | -- | -- | -- | 454 | .62 | 433 | 40 | 1.99 | 674 | 7.6 |
| May 13-31..... | 863 | -- | 5.14 | | 3.70 | -- | 6.41 | .00 | -- | -- | -- | -- | -- | 544 | .74 | 638 | 42 | 2.31 | 827 | 8.0 |
| June 1-16..... | 584 | 12.0 | 2.89 | 2.63 | 5.00 | .23 | 7.26 | .00 | 2.62 | .59 | .02 | .07 | .21 | 615 | .84 | 488 | 46 | 3.01 | 935 | 7.6 |
| June 17-24..... | 152 | -- | 5.28 | | 4.13 | -- | 6.97 | .00 | -- | -- | -- | -- | -- | 546 | .74 | 113 | 44 | 2.54 | 854 | 7.5 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 25-27, 1963 | 462 | -- | 4.50 | | 3.05 | -- | 5.92 | .00 | -- | -- | -- | -- | -- | 474 | .64 | 298 | 40 | 2.03 | 696 | 7.6 |
| June 28-30..... | 173 | -- | 3.84 | | 2.57 | -- | 4.87 | .00 | -- | -- | -- | -- | -- | 402 | .55 | 94 | 40 | 1.85 | 602 | 7.7 |
| July 1-9..... | 257 | -- | 4.08 | | 2.48 | -- | 5.16 | .00 | -- | -- | -- | -- | -- | 392 | .53 | 137 | 38 | 1.74 | 605 | 7.6 |
| July 10-22..... | 124 | -- | 4.38 | | 2.18 | -- | 5.11 | .00 | -- | -- | -- | -- | -- | 391 | .53 | 66 | 33 | 1.47 | 606 | 7.6 |
| July 23-Aug. 13. | 92 | -- | 4.34 | | .65 | -- | 4.20 | .00 | -- | -- | -- | -- | -- | 299 | .41 | 37 | 13 | .44 | 458 | 7.6 |
| Aug. 14-19..... | 31 | 10.0 | 1.80 | 2.88 | 5.05 | .23 | 7.44 | .00 | 2.06 | .62 | .03 | .01 | .07 | 582 | .79 | 24 | 51 | 3.30 | 873 | 7.9 |
| Aug. 20-31..... | 143 | -- | 4.28 | | 3.61 | -- | 5.80 | .00 | 1.69 | -- | -- | -- | -- | 470 | .64 | 91 | 46 | 2.47 | 729 | 7.9 |
| Sept. 1-9..... | 41 | -- | 4.40 | | 4.74 | -- | 6.65 | .00 | -- | -- | -- | -- | -- | 549 | .75 | 31 | 52 | 3.20 | 838 | 6.0 |
| Sept. 10-21..... | 36 | -- | 3.96 | | .70 | -- | 3.60 | .00 | .75 | -- | -- | -- | -- | 276 | .38 | 13 | 15 | .49 | 428 | 7.7 |
| Sept. 22-30..... | 25 | 28.0 | 3.04 | 1.32 | .52 | .05 | 4.11 | .00 | .73 | .05 | .01 | .00 | .02 | 286 | .39 | 10 | 11 | .35 | 440 | 7.8 |
| Total or weighted average | 7,698 | -- | 4.40 | | 2.77 | -- | 5.37 | 0.00 | -- | -- | -- | -- | -- | 434 | 0.59 | 4,540 | 42 | 1.83 | 664 | 7.6 |

## 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 1963.
Water temperatures: October 1954 to September 1955, October 1956 to September 1959, October 1960 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,900 micromhos Mar. 20-30; minimum daily, 827 micromhos Aug. 25.
Percent sodium: Maximum, 58 Aug. 29; minimum, 36 Mar. 31.
Sodium-adsorption-ratio: Maximum, 3.98 Mar. 20-30; minimum, 2.50 June 24-30.
EXTREMES, 1956-63.--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 (1961-63): Maximum, 5.50 Mar. 20-30, 1963; minimum, 1.60 Apr. 1-7, 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 1962 to September 1963

| 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, 1962. | 1,045 | -- | 8.10 | | 6.13 | -- | 5.20 | 0.00 | 7.81 | -- | -- | -- | -- | 929 | 1.26 | 1,321 | 43 | 3.05 | 1,310 | 7.2 |
| Nov. 1-12..... | 17 | 14.0 | 3.49 | 5.43 | 6.26 | 0.43 | 5.74 | .00 | 8.22 | 1.21 | 0.02 | 0.11 | 0.25 | 982 | 1.34 | 22 | 40 | 2.97 | 1,390 | 7.2 |
| Mar. 20-30, 1963 | 15 | -- | 22.40 | | 13.31 | -- | 12.52 | .00 | 20.82 | -- | -- | -- | -- | 2,300 | 3.13 | 48 | 37 | 3.98 | 2,900 | 7.8 |
| Mar. 31..... | 0 | 21.0 | 7.14 | 12.26 | 11.35 | .54 | 10.95 | .00 | 18.11 | 2.09 | .03 | .19 | .34 | 1,880 | 2.56 | 1 | 36 | 3.65 | 2,540 | 8.1 |
| Apr. 1-2..... | 0 | -- | 16.44 | | 9.66 | -- | 9.26 | .00 | 15.30 | -- | -- | -- | -- | 1,700 | 2.31 | 1 | 37 | 3.37 | 2,240 | 8.2 |
| May 22-June 16.. | 57 | -- | 8.60 | | 5.70 | -- | 5.36 | .00 | 8.47 | -- | -- | -- | -- | 964 | 1.31 | 74 | 40 | 2.75 | 1,330 | 7.5 |
| June 17-22..... | 3,642 | -- | 6.96 | | 4.87 | -- | 4.85 | .00 | 6.45 | -- | -- | -- | -- | 787 | 1.07 | 3,898 | 41 | 2.61 | 1,120 | 7.4 |
| June 23..... | 1,051 | 14.0 | 2.64 | 3.70 | 4.48 | .36 | 4.84 | .00 | 5.37 | .90 | .02 | .16 | .24 | 760 | 1.03 | 1,087 | 40 | 2.52 | 1,040 | 7.7 |
| June 24-30..... | 4,846 | -- | 5.56 | | 4.18 | -- | 4.98 | .00 | 4.18 | -- | -- | -- | -- | 643 | .87 | 4,237 | 43 | 2.50 | 932 | 7.4 |
| July 1-13..... | 1,658 | -- | 5.26 | | 4.09 | -- | 5.44 | .00 | 3.39 | -- | -- | -- | -- | 601 | .82 | 1,355 | 44 | 2.52 | 903 | 7.9 |
| July 14..... | 50 | 24.0 | 1.50 | 3.37 | 4.65 | .36 | 5.44 | .00 | 3.35 | .85 | .02 | .31 | .21 | 592 | .81 | 40 | 47 | 2.98 | 877 | 7.6 |
| July 15-31..... | 951 | -- | 4.16 | | 4.35 | -- | 4.77 | .00 | 3.23 | -- | -- | -- | -- | 574 | .78 | 742 | 51 | 3.02 | 856 | 7.5 |
| Aug. 1-28..... | 1,216 | -- | 3.70 | | 4.87 | -- | 4.59 | .00 | 3.04 | -- | -- | -- | -- | 574 | .78 | 949 | 57 | 3.58 | 850 | 7.5 |
| Aug. 29..... | 40 | 25.0 | 1.15 | 2.30 | 5.09 | .31 | 4.51 | .00 | 3.00 | .85 | .02 | .34 | .20 | 552 | .75 | 30 | 58 | 3.87 | 828 | 7.4 |
| Aug. 30-Sept. 30 | 1,288 | 25.0 | 1.30 | 2.55 | 5.09 | .33 | 4.98 | .00 | 3.08 | 1.02 | .02 | .27 | .22 | 593 | .81 | 1,039 | 55 | 3.67 | 879 | 7.4 |
| Total or weighted average | A 15,890 | 20.18 | 5.73 | | 4.63 | -- | 4.97 | 0.00 | 4.73 | -- | -- | -- | -- | 687 | 0.93 | 1,484 | 49 | 2.78 | 992 | 7.4 |

A Represents 100 percent of flow for water year.

## 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 1552.7.
DRAINAGE AREA.--164,500 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1963.
Water temperatures: May 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 976 micromhos Oct. 14; minimum daily, 407 micromhos June 4, July 3.
Percent sodium: Maximum, 42 Aug. 29 to Sept. 19; minimum, 27 June 22.
Sodium-adsorption-ratio: Maximum, 2.27 Aug. 29 to Sept. 19; minimum, 1.11 June 22.
EXTREMES, 1950-63.--Specific conductance: Maximum daily, 1,360 micromhos Dec. 28, 1961; minimum daily, 297 micromhos Mar. 19, 1960.
Percent sodium: Maximum, 43 Apr. 25-30, 1957; minimum, 24 May 27 to June 2, 1956.
Sodium-adsorption-ratio (1961-63): 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 distirct office at Lincoln, Nebr.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 791,345 | -- | 5.36 | | 3.00 | -- | 3.36 | 0.00 | -- | -- | -- | -- | -- | 539 | 0.73 | 580,088 | 36 | 1.83 | 806 | 7.1 |
| Nov. 1-30..... | 765,818 | -- | 5.36 | | 2.91 | -- | 3.46 | .00 | -- | -- | -- | -- | -- | 528 | .72 | 549,919 | 35 | 1.78 | 787 | 7.4 |
| Dec. 1-11..... | 371,782 | 8.9 | 3.29 | 1.89 | 2.70 | 0.10 | 3.41 | .00 | 4.25 | 0.31 | 0.03 | 0.00 | 0.18 | 500 | .68 | 252,812 | 34 | 1.67 | 751 | 7.2 |
| Dec. 12-31..... | 449,851 | -- | 5.58 | | 3.00 | -- | 3.59 | .00 | -- | -- | -- | -- | -- | 526 | .72 | 321,806 | 35 | 1.80 | 789 | 7.2 |
| Jan. 1-31, 1963. | 616,721 | -- | 5.92 | | 3.13 | -- | 3.82 | .00 | -- | -- | -- | -- | -- | 552 | .75 | 462,985 | 35 | 1.82 | 838 | 7.5 |
| Feb. 1-9..... | 380,231 | -- | 4.92 | | 2.83 | -- | 3.29 | .00 | -- | -- | -- | -- | -- | 497 | .68 | 257,006 | 36 | 1.80 | 746 | 7.3 |
| Feb. 10-14..... | 273,659 | -- | 5.36 | | 2.74 | -- | 3.47 | .00 | -- | -- | -- | -- | -- | 511 | .69 | 190,182 | 34 | 1.67 | 767 | 7.4 |
| Feb. 15-28..... | 495,669 | -- | 4.60 | | 2.61 | -- | 2.88 | .00 | -- | -- | -- | -- | -- | 465 | .63 | 313,461 | 36 | 1.72 | 693 | 7.2 |
| Mar. 1-29..... | 1,140,059 | -- | 4.58 | | 2.48 | -- | 2.98 | .00 | -- | -- | -- | -- | -- | 460 | .63 | 713,221 | 35 | 1.64 | 696 | 7.7 |
| Mar. 30..... | 33,719 | 9.5 | 3.09 | 1.81 | 2.70 | .11 | 3.21 | .00 | 4.06 | .28 | .03 | .00 | .14 | 460 | .63 | 21,095 | 35 | 1.72 | 723 | 7.5 |
| Mar. 31-Apr. 30. | 729,858 | -- | 5.26 | | 3.39 | -- | 3.54 | .00 | -- | -- | -- | -- | -- | 556 | .76 | 551,889 | 39 | 2.09 | 840 | 7.9 |
| May 1-12..... | 451,279 | -- | 5.36 | | 3.70 | -- | 3.47 | .00 | -- | -- | -- | -- | -- | 586 | .80 | 359,652 | 41 | 2.26 | 875 | 7.7 |
| May 13..... | 44,628 | 12.0 | 3.29 | 1.65 | 2.83 | .11 | 3.39 | .00 | 4.21 | .28 | .03 | .01 | .12 | 498 | .68 | 30,226 | 36 | 1.80 | 743 | 7.7 |
| May 14-29..... | 781,646 | -- | 3.98 | | 1.96 | -- | 3.49 | .00 | -- | -- | -- | -- | -- | 380 | .52 | 403,955 | 33 | 1.39 | 580 | 7.8 |
| May 30-June 2... | 280,859 | -- | 3.52 | | 1.35 | -- | 2.84 | .00 | -- | -- | -- | -- | -- | 317 | .43 | 121,084 | 28 | 1.02 | 470 | 7.4 |
| June 3-21..... | 2,270,578 | -- | 3.52 | | 1.61 | -- | 2.66 | .00 | -- | -- | -- | -- | -- | 346 | .47 | 1,068,443 | 31 | 1.21 | 508 | 7.3 |

MISSOURI RIVER MAIN STEM--Continued

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

Chemical analyses, water year October 1962 to September 1963--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 22, 1963... | 141,025 | 14.0 | 3.04 | 1.15 | 1.61 | 0.09 | 2.85 | 0.00 | 2.91 | 0.21 | 0.02 | 0.00 | 0.12 | 440 | 0.60 | 84,389 | 27 | 1.11 | 549 | 8.2 |
| June 23-30..... | 940,800 | -- | 3.24 | | 1.44 | -- | 2.49 | .00 | -- | -- | -- | -- | -- | 316 | .43 | 404,318 | 31 | 1.13 | 464 | 7.0 |
| July 1-13..... | 892,939 | -- | 3.12 | | 1.61 | -- | 2.21 | .00 | -- | -- | -- | -- | -- | 296 | .40 | 359,461 | 34 | 1.29 | 463 | 7.0 |
| July 14-21..... | 378,922 | -- | 3.44 | | 2.04 | -- | 2.41 | .00 | -- | -- | -- | -- | -- | 354 | .48 | 182,428 | 37 | 1.56 | 543 | 7.0 |
| July 22-31..... | 311,008 | -- | 4.06 | | 2.35 | -- | 2.82 | .00 | -- | -- | -- | -- | -- | 395 | .54 | 167,074 | 37 | 1.65 | 606 | 7.1 |
| Aug. 1-8..... | 191,841 | -- | 4.22 | | 2.57 | -- | 3.05 | .00 | -- | -- | -- | -- | -- | 440 | .60 | 114,798 | 38 | 1.77 | 660 | 7.6 |
| Aug. 9-27..... | 307,970 | -- | 4.72 | | 3.00 | -- | 3.29 | .00 | -- | -- | -- | -- | -- | 496 | .67 | 207,744 | 39 | 1.95 | 744 | 7.5 |
| Aug. 28..... | 18,545 | 9.8 | 2.89 | 1.97 | 3.39 | .12 | 3.49 | .00 | 4.58 | .25 | .03 | .00 | .16 | 517 | .70 | 13,040 | 40 | 2.17 | 782 | 7.4 |
| Aug. 29-Sept. 19 | 462,616 | -- | 4.96 | | 3.57 | -- | 3.43 | .00 | 5.04 | -- | -- | -- | -- | 557 | .76 | 365,593 | 42 | 2.27 | 827 | 7.5 |
| Sept. 20-30..... | 287,127 | 11.0 | 3.39 | 2.14 | 3.09 | .11 | 3.39 | .00 | 5.10 | .28 | .03 | .01 | .15 | 558 | .76 | 217,895 | 35 | 1.86 | 817 | 7.7 |
| Total or weighted average | 13,830,000 | -- | 4.43 | | 2.41 | -- | 3.06 | 0.00 | -- | -- | -- | -- | -- | 442 | 0.60 | 8,315,000 | 34 | 1.60 | 662 | 7.3 |

## 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 1963.
Water temperatures: May 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 994 micromhos Dec. 17; minimum daily, 467 micromhos June 26.
Percent sodium: Maximum, 38 July 1-31, Aug. 1 to Sept. 30; minimum, 26 Mar. 10-31.
Sodium-adsorption-ratio: Maximum, 1.96 July 1-31; minimum, 1.10 Mar. 10-31.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 994 micromhos Dec. 17, 1962; minimum daily, 327 micromhos Apr. 4, 1960.
Percent sodium: Maximum, 48 May 29, 1956; minimum, 16 Apr. 11-15, 1960, Apr. 1-5, 1962.
Sodium-adsorption-ratio (1961-63): Maximum, 1.96 July 1-31, 1963; 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 1962 to September 1963

| 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, 1962. | 2,021,712 | -- | 4.92 | | 2.65 | -- | 3.20 | 0.00 | -- | -- | -- | -- | -- | 494 | 0.67 | 1,358,267 | 35 | 1.69 | 738 | 7.2 |
| Nov. 1-30..... | 1,858,314 | -- | 5.00 | | 2.87 | -- | 3.25 | .00 | -- | -- | -- | -- | -- | 512 | .70 | 1,293,981 | 36 | 1.82 | 768 | 7.3 |
| Dec. 1-31..... | 636,846 | 21.0 | 3.74 | 1.69 | 2.96 | 0.17 | 4.00 | .00 | 3.71 | 0.79 | 0.03 | 0.06 | 0.13 | 544 | .74 | 619,132 | 34 | 1.76 | 817 | 7.3 |
| Jan. 1-11, 1963. | 348,436 | -- | 5.64 | | 3.00 | -- | 3.93 | .00 | -- | -- | -- | -- | -- | 554 | .75 | 262,526 | 35 | 1.79 | 823 | 7.4 |
| Jan. 12-31..... | 416,116 | -- | 5.82 | | 2.87 | -- | 4.21 | .00 | -- | -- | -- | -- | -- | 556 | .76 | 316,162 | 33 | 1.68 | 816 | 7.8 |
| Feb. 1-28..... | 779,742 | -- | 5.00 | | 2.74 | -- | 3.57 | .00 | -- | -- | -- | -- | -- | 495 | .67 | 524,922 | 35 | 1.73 | 749 | 7.5 |
| Mar. 1-9..... | 330,962 | -- | 4.60 | | 2.18 | -- | 3.44 | .00 | -- | -- | -- | -- | -- | 438 | .60 | 197,147 | 32 | 1.43 | 676 | 7.5 |
| Mar. 10-31..... | 1,330,909 | 20.0 | 3.04 | 1.23 | 1.61 | .22 | 3.21 | .00 | 2.25 | .48 | .02 | .13 | .08 | 383 | .52 | 693,244 | 26 | 1.10 | 588 | 7.4 |
| Apr. 1-30..... | 1,993,388 | -- | 5.22 | | 2.78 | -- | 3.34 | .00 | -- | -- | -- | -- | -- | 515 | .70 | 1,396,169 | 35 | 1.72 | 780 | 7.4 |
| May 1-31..... | 2,046,922 | -- | 5.52 | | 3.09 | -- | 2.74 | .00 | -- | -- | -- | -- | -- | 555 | .75 | 1,545,017 | 36 | 1.86 | 824 | 7.8 |
| June 1-25..... | 1,888,264 | -- | 4.90 | | 2.61 | -- | 3.15 | .00 | -- | -- | -- | -- | -- | 487 | .66 | 1,250,635 | 35 | 1.67 | 737 | 7.4 |
| June 26..... | 139,835 | 11.0 | 2.15 | .82 | 1.57 | .18 | 2.20 | .00 | 2.00 | .45 | .02 | .05 | .07 | 360 | .49 | 68,463 | 33 | 1.29 | 467 | 7.3 |
| June 27-30..... | 311,405 | -- | 4.14 | | 2.18 | -- | 2.82 | .00 | -- | -- | -- | -- | -- | 420 | .57 | 177,875 | 34 | 1.51 | 638 | 7.4 |
| July 1-30..... | 1,978,512 | -- | 5.12 | | 3.13 | -- | 3.26 | .00 | -- | -- | -- | -- | -- | 543 | .74 | 1,461,092 | 38 | 1.96 | 810 | 7.6 |
| July 31..... | 67,041 | 7.8 | 3.59 | 1.81 | 3.18 | .16 | 3.41 | .00 | 4.63 | .51 | .03 | .00 | .14 | 553 | .75 | 50,420 | 36 | 1.93 | 823 | 7.4 |
| Aug. 1-31..... | 2,062,909 | -- | 4.94 | | 3.05 | -- | 3.16 | .00 | -- | -- | -- | -- | -- | 522 | .71 | 1,464,500 | 38 | 1.94 | 781 | 7.1 |
| Sept. 1-30..... | 1,967,207 | 11.0 | 2.89 | 1.81 | 2.96 | .16 | 3.11 | .00 | 4.31 | .51 | .03 | .01 | .11 | 500 | .68 | 1,337,700 | 38 | 1.93 | 753 | 7.6 |
| Total or weighted average | 20,360,000 | -- | 5.01 | | 2.78 | -- | 3.23 | 0.00 | -- | -- | -- | -- | -- | 506 | 0.69 | 14,017,000 | 33 | 1.75 | 759 | 7.4 |

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 Pryor Creek.
DRAINAGE AREA.--11,783 square miles, at site used prior to Jan. 10, 1963, 11,795 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1950 to September 1958, July to September 1963.
Water temperatures: December 1950 to September 1956, July to September 1963.
EXTREMES, 1951-58.--Specific conductance: Maximum daily, 1,210 micromhos Feb. 2, 1951; minimum daily, 129 micromhos May 22, 1954.
Percent sodium: Maximum, 37 Dec. 1, 1950; 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, July to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| July 2, 1963.... | 32,331 | 12.0 | 0.90 | 0.46 | 0.48 | 0.05 | 1.31 | 0.00 | 0.44 | 0.07 | 0.00 | 0.00 | -- | 120 | 0.16 | 5,276 | 25 | 0.58 | 189 | 7.5 |
| July 18-31..... | 221,066 | 12.0 | 1.25 | .73 | .74 | .06 | 1.74 | .00 | .90 | .12 | .02 | .00 | 0.11 | 166 | .23 | 49,908 | 27 | .74 | 274 | 7.4 |
| Aug. 1-16..... | 145,031 | 13.0 | 1.50 | .99 | 1.00 | .08 | 2.16 | .00 | 1.23 | .13 | .03 | .00 | .18 | 222 | .30 | 43,788 | 26 | .90 | 346 | 7.1 |
| Aug. 17-31..... | 101,841 | 13.0 | 1.80 | 1.15 | 1.17 | .09 | 2.49 | .00 | 1.52 | .14 | .02 | .00 | .18 | 266 | .36 | 36,842 | 28 | .97 | 410 | 7.2 |
| Sept. 1-20..... | 146,777 | 15.0 | 2.10 | 1.23 | 1.31 | .09 | 2.72 | .00 | 1.71 | .18 | .03 | .01 | .20 | 281 | .38 | 56,092 | 28 | 1.01 | 459 | 7.8 |
| Sept. 21-30..... | 100,423 | 15.0 | 2.10 | .82 | 1.09 | .11 | 2.52 | .00 | 1.39 | .14 | .03 | .01 | .16 | 246 | .33 | 33,598 | 26 | .90 | 398 | 7.4 |

### 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 1963.
Water temperatures: January 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,190 micromhos Jan. 23, 24; minimum daily, 350 micromhos June 2.
Percent sodium: Maximum, 41 Apr. 12-16, May 1-12; minimum, 27 May 25-31.
Sodium-adsorption-ratio: Maximum, 2.46 Apr. 12-16; minimum, 0.92 May 25-31.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 2,780 micromhos Jan. 14, 1951; minimum daily, 257 micromhos June 15, 1956.
Percent sodium: Maximum, 48 May 1-30, 1953; minimum, 21 June 14-26, 1959.
Sodium-adsorption-ratio (1961-63): Maximum, 2.46 Apr. 12-16, 1963; minimum, 0.92 May 25-31, 1963.
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 station.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-11,1962.. | 194,924 | 12.0 | 3.44 | 2.06 | 3.35 | 0.10 | 3.28 | 0.00 | 5.27 | 0.34 | 0.02 | 0.01 | 0.18 | 577 | 0.78 | 152,960 | 37 | 2.02 | 847 | 7.3 |
| Oct. 12-14..... | 58,986 | 11.0 | 4.59 | 2.39 | 4.35 | .12 | 3.36 | .00 | 7.27 | .62 | .02 | .03 | .21 | 742 | 1.01 | 59,524 | 38 | 2.33 | 1,060 | 7.6 |
| Oct. 15-31..... | 302,325 | 11.0 | 3.49 | 1.89 | 3.22 | .11 | 3.18 | .00 | 5.14 | .21 | .02 | .01 | .17 | 557 | .76 | 229,017 | 37 | 1.96 | 826 | 7.4 |
| Nov. 1-30..... | 454,909 | -- | 5.74 | | 3.26 | -- | 3.47 | .00 | 5.29 | -- | -- | -- | -- | 592 | .81 | 366,256 | 36 | 1.93 | 864 | 7.5 |
| Dec. 1-31..... | 290,404 | -- | 5.80 | | 3.22 | -- | 3.56 | .00 | 5.25 | -- | -- | -- | -- | 593 | .81 | 234,205 | 36 | 1.89 | 864 | 7.4 |
| Dec. 22-31..... | 99,570 | -- | 6.44 | | 3.61 | -- | 3.90 | .00 | 5.93 | -- | -- | -- | -- | 665 | .90 | 90,051 | 36 | 2.01 | 950 | 7.5 |
| Jan. 1-19, 1963. | 198,341 | -- | 6.56 | | 3.61 | -- | 4.26 | .00 | 5.89 | -- | -- | -- | -- | 661 | .90 | 178,301 | 35 | 1.99 | 945 | 7.9 |
| Jan. 20-31..... | 86,876 | 18.0 | 4.74 | 3.21 | 4.43 | .12 | 4.72 | .00 | 7.20 | .48 | .03 | .05 | .26 | 803 | 1.09 | 94,876 | 36 | 2.25 | 1,120 | 7.6 |
| Feb. 1-6..... | 108,504 | -- | 6.42 | | 3.35 | -- | 3.97 | .00 | 5.56 | -- | -- | -- | -- | 638 | .87 | 94,147 | 34 | 1.87 | 912 | 7.8 |
| Feb. 9-16..... | 278,955 | 9.8 | 2.50 | 1.32 | 2.26 | .12 | 2.43 | .00 | 3.56 | .28 | .02 | .04 | .13 | 407 | .55 | 154,407 | 37 | 1.64 | 612 | 7.1 |
| Feb. 17-28..... | 213,215 | -- | 5.04 | | 2.87 | -- | 2.98 | .00 | 4.83 | -- | -- | -- | -- | 541 | .74 | 156,875 | 36 | 1.81 | 775 | 7.7 |
| Mar. 1-5..... | 147,769 | -- | 4.62 | | 2.78 | -- | 2.82 | .00 | 4.43 | -- | -- | -- | -- | 466 | .63 | 93,650 | 38 | 1.83 | 727 | 7.4 |
| Mar. 6-10..... | 90,050 | -- | 5.42 | | 3.18 | -- | 3.11 | .00 | 5.14 | -- | -- | -- | -- | 567 | .77 | 69,439 | 37 | 1.93 | 819 | 7.4 |
| Mar. 11-25..... | 234,655 | -- | 6.02 | | 3.44 | -- | 3.46 | .00 | 5.68 | -- | -- | -- | -- | 605 | .82 | 193,074 | 36 | 1.98 | 894 | 7.7 |
| Mar. 26-Apr. 11. | 232,493 | -- | 6.24 | | 3.96 | -- | 3.65 | .00 | 6.14 | -- | -- | -- | -- | 644 | .88 | 203,626 | 39 | 2.24 | 955 | 7.5 |

YELLOWSTONE RIVER BASIN—Continued

6-3295. YELLOWSTONE RIVER NEAR SIDNEY, MONT.—Continued

Chemical analyses, water year October 1962 to September 1963—Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 160°) | | | 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. 12-16, 1963 | 71,504 | 10.0 | 3.64 | 2.47 | 4.31 | 0.11 | 3.54 | 0.00 | 6.56 | 0.51 | 0.03 | 0.02 | 0.21 | 684 | 0.93 | 66,516 | 41 | 2.46 | 994 | 7.9 |
| Apr. 17-30..... | 179,357 | -- | 5.94 | | 4.00 | -- | 3.44 | .00 | 6.12 | -- | -- | -- | -- | 627 | .85 | 152,942 | 40 | 2.32 | 939 | 7.8 |
| May 1-12..... | 355,121 | -- | 5.42 | | 3.70 | -- | 3.34 | .00 | 5.48 | -- | -- | -- | -- | 596 | .81 | 287,847 | 41 | 2.25 | 676 | 7.9 |
| May 13-24..... | 485,076 | -- | 3.84 | | 1.74 | -- | 2.69 | .00 | 2.79 | -- | -- | -- | -- | 362 | .49 | 238,813 | 31 | 1.26 | 551 | 7.4 |
| May 25-31..... | 379,180 | 15.0 | 2.10 | .90 | 1.13 | .05 | 2.25 | .00 | 1.75 | .11 | .02 | .12 | .06 | 278 | .38 | 143,360 | 27 | .92 | 413 | 7.7 |
| June 1-20..... | 3,234,645 | -- | 3.14 | | 1.74 | -- | 2.29 | .00 | 2.17 | -- | -- | -- | -- | 293 | .40 | 1,288,941 | 36 | 1.39 | 453 | 7.2 |
| July 1-10..... | 612,893 | -- | 2.84 | | 1.35 | -- | 2.08 | .00 | 1.96 | -- | -- | -- | -- | 267 | .36 | 222,554 | 32 | 1.13 | 417 | 7.1 |
| July 11-17..... | 290,182 | -- | 3.22 | | 1.70 | -- | 2.20 | .00 | 2.50 | -- | -- | -- | -- | 315 | .43 | 124,314 | 35 | 1.34 | 490 | 7.1 |
| July 18-31..... | 314,696 | -- | 3.66 | | 2.18 | -- | 2.54 | .00 | 3.08 | -- | -- | -- | -- | 370 | .50 | 158,456 | 37 | 1.61 | 576 | 7.2 |
| Aug. 1-5..... | 76,046 | -- | 4.00 | | 2.52 | -- | 2.79 | .00 | 3.58 | -- | -- | -- | -- | 420 | .57 | 43,438 | 39 | 1.78 | 642 | 7.6 |
| Aug. 6-14..... | 88,971 | -- | 4.64 | | 3.05 | -- | 3.02 | .00 | 4.33 | -- | -- | -- | -- | 496 | .67 | 60,016 | 40 | 2.00 | 737 | 7.3 |
| Aug. 15-31..... | 128,807 | -- | 7.16 | | 3.65 | -- | 7.82 | .00 | 2.52 | -- | -- | -- | -- | 627 | .85 | 109,836 | 34 | 1.93 | 944 | 8.1 |
| Sept. 1-18..... | 246,597 | -- | 5.96 | | 3.65 | -- | 3.85 | .00 | 5.29 | -- | -- | -- | -- | 628 | .65 | 210,614 | 38 | 2.12 | 912 | 7.7 |
| Sept. 19-30..... | 185,320 | -- | 5.62 | | 3.48 | -- | 3.38 | .00 | 5.33 | -- | -- | -- | -- | 605 | .82 | 152,481 | 38 | 2.08 | 672 | 7.6 |
| Total or weighted average | 9,641,000 | -- | 4.30 | | 2.44 | -- | 2.86 | 0.00 | 3.59 | -- | -- | -- | -- | 429 | 0.58 | 5,631,000 | 34 | 1.63 | 642 | 7.3 |

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

LOCATION.--At tailrace of power plant at Boysen Dam, 0.6 mile upstream from gaging station, and 12.4 miles north of Shoshoni, Fremont County.
DRAINAGE AREA.--7,701 square miles (revised).
RECORDS AVAILABLE.--Chemical analyses: November 1953 to September 1954, December 1960 to September 1963.
Water temperatures: December 1953 to September 1954, December 1960 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,140 micromhos Apr. 2; minimum daily, 553 micromhos Oct. 3.
Percent sodium: Maximum, 46 Apr. 2; minimum, 39 Feb. 1-28, Mar. 24-Apr. 1, July 11-21.
Sodium-adsorption-ratio: Maximum, 3.04 Apr. 2; minimum, 1.74 July 11-21.
EXTREMES, 1953-54, 1960-63.--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.
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 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-18, 1962. | 53,482 | 7.7 | 2.30 | 1.07 | 2.35 | 0.08 | 2.31 | 0.00 | 3.29 | 0.19 | 0.02 | 0.01 | 0.08 | 376 | 0.51 | 27,349 | 41 | 1.81 | 564 | 7.4 |
| Oct. 19-31..... | 34,707 | 7.9 | 2.64 | 1.07 | 2.57 | .08 | 2.44 | .00 | 3.69 | .21 | .02 | .00 | .07 | 412 | .56 | 19,447 | 40 | 1.88 | 620 | 7.1 |
| Nov. 1-30..... | 66,704 | 8.9 | 2.54 | 1.23 | 2.61 | .06 | 2.49 | .00 | 3.77 | .37 | .01 | .00 | .10 | 415 | .56 | 37,648 | 40 | 1.90 | 636 | 7.6 |
| Dec. 1-31..... | 89,772 | 8.6 | 2.54 | 1.40 | 2.65 | .07 | 2.56 | .00 | 3.91 | .19 | .02 | .01 | .04 | 427 | .58 | 52,132 | 40 | 1.89 | 654 | 7.5 |
| Jan. 1-31, 1963. | 58,536 | 9.0 | 2.69 | 1.48 | 2.78 | .07 | 2.69 | .00 | 4.21 | .16 | .02 | .01 | .07 | 449 | .61 | 35,745 | 40 | 1.93 | 685 | 7.2 |
| Feb. 1-28..... | 39,154 | 9.6 | 3.34 | .99 | 2.83 | .07 | 2.79 | .00 | 4.27 | .19 | .02 | .01 | .08 | 453 | .62 | 24,122 | 39 | 1.92 | 703 | 7.2 |
| Mar. 1-23..... | 37,317 | 9.0 | 2.89 | 1.56 | 2.96 | .07 | 2.92 | .00 | 4.41 | .25 | .02 | .01 | .08 | 489 | .67 | 24,817 | 40 | 1.98 | 721 | 7.5 |
| Mar. 24-Apr. 1.. | 12,532 | 9.3 | 3.04 | 1.56 | 3.00 | .07 | 2.98 | .00 | 4.71 | .20 | .02 | .01 | .09 | 507 | .69 | 8,641 | 39 | 1.98 | 745 | 7.3 |
| Apr. 2..... | 1,434 | -- | 6.52 | | A 5.48 | -- | 3.56 | .00 | 8.31 | -- | -- | -- | -- | 888 | 1.21 | 1,732 | 46 | 3.04 | 1,150 | 7.8 |
| Apr. 3-9..... | 11,954 | 8.6 | 2.94 | 1.65 | 3.18 | .09 | 2.88 | .00 | 4.96 | .22 | .02 | .01 | .09 | 516 | .70 | 8,389 | 40 | 2.10 | 757 | 7.4 |
| Apr. 10-30..... | 30,781 | 8.5 | 3.09 | 1.73 | 3.31 | .08 | 2.97 | .00 | 5.14 | .27 | .02 | .01 | .08 | 539 | .73 | 22,564 | 40 | 2.13 | 788 | 7.4 |
| May 1-9..... | 14,995 | 9.1 | 3.09 | 1.65 | 3.22 | .07 | 2.92 | .00 | 5.04 | .27 | .02 | .01 | .10 | 530 | .72 | 10,808 | 40 | 2.09 | 781 | 7.7 |
| May 10-20..... | 19,265 | 8.9 | 3.04 | 1.73 | 3.35 | .08 | 2.95 | .00 | 5.10 | .25 | .02 | .00 | .11 | 544 | .74 | 14,253 | 41 | 2.17 | 793 | 7.7 |
| May 21-31..... | 23,542 | 8.2 | 3.04 | 1.81 | 3.35 | .08 | 2.97 | .00 | 5.21 | .25 | .02 | .01 | .09 | 533 | .72 | 17,065 | 40 | 2.15 | 799 | 7.6 |
| June 1-11..... | 23,411 | 8.8 | 3.04 | 1.65 | 3.39 | .07 | 2.82 | .00 | 5.14 | .26 | .03 | .00 | .11 | 527 | .72 | 16,779 | 42 | 2.22 | 782 | 7.8 |
| June 12-23..... | 96,682 | 8.5 | 2.89 | 1.56 | 3.22 | .10 | 2.80 | .00 | 4.93 | .24 | .02 | .01 | .09 | 493 | .67 | 64,824 | 41 | 2.16 | 744 | 7.6 |
| June 24-30..... | 99,786 | 9.0 | 2.69 | 1.40 | 2.87 | .08 | 2.54 | .00 | 4.29 | .24 | .02 | .01 | .07 | 451 | .61 | 61,205 | 41 | 2.01 | 681 | 7.2 |
| July 1-10..... | 89,831 | 9.3 | 2.54 | 1.32 | 2.70 | .07 | 2.39 | .00 | 4.04 | .20 | .02 | .00 | .07 | 418 | .57 | 51,067 | 41 | 1.94 | 646 | 7.0 |
| July 11-21..... | 60,698 | 9.7 | 2.40 | 1.23 | 2.35 | .07 | 2.26 | .00 | 3.64 | .19 | .02 | .00 | .07 | 438 | .60 | 36,157 | 39 | 1.74 | 596 | 7.3 |
| July 22-26..... | 11,940 | 9.7 | 2.54 | 1.32 | 2.57 | .07 | 2.41 | .00 | 3.87 | .21 | .02 | .01 | .06 | 437 | .59 | 7,096 | 40 | 1.85 | 635 | 7.4 |
| July 27-Aug. 6.. | 28,167 | 9.4 | 2.35 | 1.15 | 2.39 | .07 | 2.25 | .00 | 3.48 | .17 | .01 | .00 | .07 | 376 | .51 | 14,404 | 40 | 1.81 | 579 | 7.8 |
| Aug. 7-16..... | 25,944 | 9.1 | 2.45 | 1.07 | 2.39 | .07 | 2.29 | .00 | 3.60 | .16 | .02 | .00 | .06 | 380 | .52 | 13,408 | 40 | 1.80 | 582 | 7.7 |
| Aug. 19-31..... | 25,811 | 8.8 | 2.59 | 1.15 | 2.52 | .06 | 2.26 | .00 | 3.62 | .34 | .02 | .00 | .06 | 402 | .55 | 14,111 | 40 | 1.84 | 598 | 7.1 |
| Sept. 1-19..... | 36,895 | 8.9 | 2.45 | 1.15 | 2.48 | .07 | 2.26 | .00 | 3.50 | .17 | .02 | .00 | .06 | 386 | .52 | 19,368 | 40 | 1.85 | 595 | 7.6 |
| Sept. 20-30..... | 20,880 | 9.1 | 2.59 | 1.07 | 2.57 | .07 | 2.38 | .00 | 3.69 | .17 | .02 | .00 | .08 | 407 | .55 | 11,557 | 41 | 1.90 | 621 | 7.9 |
| Total or weighted average | 1,014,200 | 8.9 | 2.68 | 1.35 | 2.78 | 0.07 | 2.57 | 0.00 | 4.16 | 0.22 | 0.02 | 0.01 | 0.08 | 446 | 0.61 | 614,700 | 40 | 1.95 | 670 | 7.3 |

A Calculated Na plus K, reported as Na.

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 1963.
Water temperatures: April 1949 to September 1951, August 1952 to November 1958, June 1959 to September 1963.
Sediment records: July 1947 to September 1954, October 1955 to September 1958, October 1959 to September 1983.
EXTREMES, 1982-63.--Specific conductance: Maximum daily, 1,580 micromhos Sept. 24; minimum daily, 554 micromhos June 24.
Percent sodium: Maximum, 44 Aug. 24-31; minimum, 30 June 1-4.
Sodium-adsorption-ratio: Maximum, 2.97 Aug. 24-31; minimum, 1.31 June 1-4.
EXTREMES, 1951-83.--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 (1961-63): Maximum, 2.97 Aug. 24-31,1963; minimum, 1.31 June 1-4, 1963.
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 1982 to September 1963

| 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, 1962. | 216,990 | -- | 8.50 | | 4.09 | -- | 3.44 | 0.00 | 6.75 | -- | -- | -- | -- | 890 | 0.94 | 203,623 | 39 | 2.27 | 988 | 7.3 |
| Nov. 1-30..... | 183,451 | 12.0 | 4.59 | 2.47 | 4.35 | 0.12 | 3.77 | .00 | 7.18 | 0.37 | 0.02 | 0.02 | 0.16 | 743 | 1.01 | 185,374 | 38 | 2.32 | 1,040 | 7.5 |
| Dec. 1-31..... | 174,625 | -- | 7.30 | | 4.44 | -- | 3.90 | .00 | 7.35 | -- | -- | -- | -- | 777 | 1.08 | 184,530 | 38 | 2.32 | 1,080 | 7.3 |
| Jan. 1-31, 1963. | 134,858 | -- | 6.92 | | 3.70 | -- | 3.80 | .00 | 6.84 | -- | -- | -- | -- | 713 | .97 | 130,575 | 35 | 1.99 | 997 | 8.0 |
| Feb. 1-13..... | 95,199 | -- | 5.60 | | 3.35 | -- | 3.03 | .00 | 5.75 | -- | -- | -- | -- | 612 | .83 | 79,236 | 37 | 2.00 | 862 | 7.3 |
| Feb. 14-28..... | 96,010 | -- | 7.28 | | 4.52 | -- | 3.77 | .00 | 7.62 | -- | -- | -- | -- | 785 | 1.07 | 102,500 | 38 | 2.37 | 1,090 | 7.5 |
| Mar. 1-14..... | 73,898 | -- | 7.88 | | 5.13 | -- | 3.98 | .00 | 8.22 | -- | -- | -- | -- | 827 | 1.12 | 82,889 | 39 | 2.59 | 1,180 | 7.9 |
| Mar. 15-31..... | 84,702 | 12.0 | 4.79 | 3.13 | 4.65 | .10 | 4.13 | .00 | 8.08 | .45 | .02 | .01 | .19 | 823 | 1.12 | 94,805 | 37 | 2.34 | 1,140 | 7.5 |
| Apr. 1-20..... | 77,514 | -- | 8.08 | | 5.09 | -- | 3.93 | .00 | 8.58 | -- | -- | -- | -- | 854 | 1.16 | 90,028 | 39 | 2.53 | 1,170 | 7.5 |
| Apr. 21-28..... | 36,886 | -- | 7.64 | | 5.05 | -- | 3.69 | .00 | 8.14 | -- | -- | -- | -- | 814 | 1.11 | 40,613 | 40 | 2.58 | 1,120 | 7.6 |
| Apr. 29-May 10.. | 142,929 | -- | 6.06 | | 4.35 | -- | 3.46 | .00 | 6.54 | -- | -- | -- | -- | 887 | .93 | 133,541 | 42 | 2.50 | 975 | 7.8 |
| May 11-27..... | 131,740 | 11.0 | 4.04 | 1.89 | 3.05 | .07 | 3.44 | .00 | 5.27 | .22 | .02 | .02 | .10 | 581 | .79 | 104,096 | 34 | 1.77 | 831 | 7.8 |
| May 28-31..... | 51,396 | -- | 4.92 | | 2.78 | -- | 3.05 | .00 | 4.37 | -- | -- | -- | -- | 495 | .67 | 34,600 | 38 | 1.78 | 731 | 7.7 |
| June 1-4..... | 68,271 | -- | 4.48 | | 1.96 | -- | 3.02 | .00 | 3.21 | -- | -- | -- | -- | 405 | .55 | 37,804 | 30 | 1.31 | 619 | 7.5 |
| June 5-19..... | 381,719 | -- | 5.12 | | 2.48 | -- | 2.95 | .00 | 4.39 | -- | -- | -- | -- | 488 | .86 | 252,301 | 33 | 1.55 | 719 | 7.8 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 20-30, 1963 | 406,909 | 13.0 | 2.74 | 1.15 | 2.18 | .07 | 2.64 | .00 | 3.29 | .16 | .02 | .01 | .07 | 399 | .54 | 220,805 | 35 | 1.56 | 598 | 7.5 |
| July 1-11..... | 220,364 | -- | 4.14 | | 2.31 | -- | 2.67 | .00 | 3.50 | -- | -- | -- | -- | 414 | .56 | 124,074 | 36 | 1.60 | 628 | 7.7 |
| July 12-24..... | 115,156 | -- | 5.04 | | 3.05 | -- | 2.98 | .00 | 4.87 | -- | -- | -- | -- | 534 | .73 | 83,631 | 38 | 1.92 | 780 | 7.8 |
| July 25-31..... | 26,977 | -- | 7.02 | | 4.79 | -- | 3.54 | .00 | 7.77 | -- | -- | -- | -- | 796 | 1.08 | 29,204 | 41 | 2.55 | 1,020 | 7.8 |
| Aug. 1-9..... | 33,435 | -- | 6.86 | | 5.18 | -- | 3.15 | .00 | 8.33 | -- | -- | -- | -- | 812 | 1.10 | 36,923 | 43 | 2.80 | 1,120 | 7.3 |
| Aug. 10-23..... | 46,151 | -- | 7.56 | | 5.57 | -- | 3.46 | .00 | 8.99 | -- | -- | -- | -- | 882 | 1.20 | 55,360 | 42 | 2.86 | 1,220 | 7.4 |
| Aug. 24-31..... | 27,118 | -- | 7.38 | | 5.70 | -- | 3.28 | .00 | 9.14 | -- | -- | -- | -- | 888 | 1.21 | 32,750 | 44 | 2.97 | 1,230 | 7.4 |
| Sept. 1-23..... | 126,230 | -- | 8.16 | | 5.26 | -- | 3.77 | .00 | 8.95 | -- | -- | -- | -- | 894 | 1.22 | 153,476 | 39 | 2.61 | 1,220 | 7.9 |
| Sept. 24..... | 9,441 | -- | 12.86 | | 6.00 | -- | 3.84 | .00 | 13.64 | -- | -- | -- | -- | 1,270 | 1.73 | 16,307 | 32 | 2.37 | 1,570 | 8.1 |
| Sept. 25-30..... | 38,999 | -- | 7.04 | | 4.61 | -- | 3.61 | .00 | 7.60 | -- | -- | -- | -- | 778 | 1.06 | 41,264 | 40 | 2.46 | 1,090 | 7.5 |
| Total or weighted average | 3,000,000 | -- | 5.98 | | 3.56 | -- | 3.30 | 0.00 | 5.87 | -- | -- | -- | -- | 625 | 0.85 | 2,550,100 | 36 | 2.03 | 890 | 7.5 |

YELLOWSTONE RIVER BASIN--Continued

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

LOCATION.--At gaging station, on right bank, 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 1963.
Water temperatures: April 1949 to September 1963.
Sediment records: June 1946 to September 1951.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,390 micromhos Aug. 6; minimum daily, 260 micromhos Feb. 8.
Percent sodium: Maximum, 46 July 30 to Aug. 6, Sept. 1-13; minimum, 18 May 19-31, June 10-21.
Sodium-adsorption-ratio: Maximum, 3.39 July 30 to Aug. 6; minimum, 0.54 June 10-21.
EXTREMES, 1951-63.--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, 17 June 2-15, 1956, June 7-16, June 30 to July 12, 1957.
Sodium-adsorption-ratio (1961-63): Maximum, 3.39 July 30 to Aug. 6, 1963: minimum, 0.54 June 10-21, 1963.
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 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-19, 1962. | 10,929 | -- | 6.40 | | 2.09 | -- | 4.10 | 0.00 | 4.27 | -- | -- | -- | -- | 515 | 0.70 | 7,655 | 25 | 1.17 | 773 | 7.4 |
| Oct. 20-31..... | 3,665 | -- | 7.30 | | 2.78 | -- | 4.79 | .00 | 5.04 | -- | -- | -- | -- | 607 | .83 | 3,026 | 28 | 1.46 | 904 | 7.2 |
| Nov. 1-30..... | 12,258 | 7.6 | 3.44 | 3.78 | 2.52 | 0.12 | 4.79 | 0.00 | 4.77 | 0.11 | 0.01 | 0.01 | 0.17 | 585 | .80 | 9,752 | 26 | 1.33 | 874 | 7.8 |
| Dec. 1-23..... | 7,573 | -- | 7.84 | | 2.83 | -- | 5.08 | .00 | 5.48 | -- | -- | -- | -- | 649 | .88 | 6,684 | 27 | 1.43 | 953 | 7.8 |
| Dec. 24-31..... | 2,983 | -- | 9.36 | | 3.48 | -- | 6.03 | .00 | 6.68 | -- | -- | -- | -- | 795 | 1.08 | 3,225 | 27 | 1.61 | 1,120 | 7.6 |
| Jan. 1-26, 1963. | 7,529 | -- | 8.06 | | 2.70 | -- | 5.03 | .00 | 5.66 | -- | -- | -- | -- | 668 | .91 | 6,840 | 25 | 1.34 | 960 | 8.0 |
| Jan. 27-Feb. 5.. | 2,460 | -- | 8.18 | | 3.22 | -- | 5.31 | .00 | 6.23 | -- | -- | -- | -- | 710 | .97 | 2,375 | 28 | 1.59 | 1,020 | 8.1 |
| Feb. 6-12..... | 20,313 | 6.1 | 1.20 | .90 | 1.22 | .13 | 2.07 | .00 | 1.35 | .06 | .01 | .01 | .08 | 219 | .30 | 6,050 | 35 | 1.19 | 342 | 7.1 |
| Feb. 13-28..... | 16,217 | -- | 5.06 | | 1.91 | -- | 3.57 | .00 | 3.46 | -- | -- | -- | -- | 445 | .61 | 9,814 | 27 | 1.20 | 662 | 7.8 |
| Mar. 1-5..... | 4,740 | -- | 5.70 | | 2.18 | -- | 3.90 | .00 | 4.04 | -- | -- | -- | -- | 480 | .65 | 3,095 | 28 | 1.29 | 726 | 7.5 |
| Mar. 6-30..... | 23,157 | -- | 7.38 | | 2.26 | -- | 4.75 | .00 | 4.77 | -- | -- | -- | -- | 598 | .81 | 18,833 | 23 | 1.18 | 853 | 7.9 |
| Mar. 31-Apr. 11. | 4,856 | -- | 7.26 | | 3.74 | -- | 5.00 | .00 | 5.98 | -- | -- | -- | -- | 670 | .91 | 4,424 | 34 | 1.96 | 985 | 7.6 |
| Apr. 12-14..... | 1,529 | -- | 5.10 | | 3.96 | -- | 4.16 | .00 | 5.00 | -- | -- | -- | -- | 565 | .77 | 1,175 | 44 | 2.48 | 852 | 7.6 |
| Apr. 15-28..... | 5,970 | 5.6 | 3.14 | 3.87 | 3.18 | .16 | 4.75 | .00 | 5.35 | .10 | .02 | .01 | .14 | 627 | .85 | 5,091 | 31 | 1.70 | 913 | 8.0 |
| Apr. 29-May 4... | 6,355 | -- | 5.34 | | 2.91 | -- | 3.93 | .00 | 4.29 | -- | -- | -- | -- | 511 | .69 | 4,416 | 35 | 1.78 | 774 | 7.6 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May 5-13, 1963.. | 23,492 | -- | 6.00 | 1.70 | -- | 3.74 | .00 | 3.85 | -- | -- | -- | -- | 472 | .64 | 15,080 | 22 | .98 | 708 | 7.6 |
| May 14-18..... | 18,823 | -- | 5.20 | 1.26 | -- | 3.34 | .00 | 3.04 | -- | -- | -- | -- | 396 | .54 | 10,137 | 20 | .78 | 603 | 7.7 |
| May 19-31..... | 39,761 | 7.7 | 2.10 \| 1.65 | .83 | .07 | 2.79 | .00 | 1.85 | .05 | .01 | .01 | .06 | 284 | .39 | 15,357 | 18 | .60 | 437 | 7.8 |
| June 1-9..... | 46,110 | -- | 2.98 | 1.39 | -- | 2.84 | .00 | 1.52 | -- | -- | -- | -- | 263 | .36 | 16,493 | 32 | 1.14 | 424 | 7.5 |
| June 10-21..... | 76,403 | -- | 2.96 | .65 | -- | 2.38 | .00 | 1.23 | -- | -- | -- | -- | 216 | .29 | 22,444 | 18 | .54 | 355 | 7.4 |
| June 22-30..... | 53,982 | -- | 3.44 | 1.09 | -- | 2.62 | .00 | 1.83 | -- | -- | -- | -- | 281 | .38 | 20,630 | 24 | .83 | 443 | 7.1 |
| July 1-8..... | 11,964 | -- | 3.98 | 1.22 | -- | 2.97 | .00 | 2.10 | -- | -- | -- | -- | 315 | .43 | 5,126 | 23 | .86 | 499 | 7.7 |
| July 9-21..... | 9,644 | -- | 4.42 | 2.00 | -- | 3.41 | .00 | 2.87 | -- | -- | -- | -- | 394 | .54 | 5,167 | 31 | 1.35 | 603 | 7.8 |
| July 22-29..... | 1,176 | -- | 6.02 | 3.13 | -- | 4.56 | .00 | 4.39 | -- | -- | -- | -- | 548 | .75 | 876 | 34 | 1.81 | 831 | 8.2 |
| July 30-Aug. 6.. | 257 | 15.0 | 3.84 \| 3.95 | 6.70 | .20 | 6.62 | .00 | 7.68 | 14.13 | .02 | .02 | .25 | 912 | 1.24 | 319 | 46 | 3.39 | 1,300 | 7.6 |
| Aug. 7-21..... | 756 | -- | 6.24 | 5.13 | -- | 5.87 | .00 | 6.20 | -- | -- | -- | -- | 748 | 1.02 | 769 | 45 | 2.91 | 1,110 | 7.6 |
| Aug. 22-31..... | 6,823 | -- | 5.44 | 2.31 | -- | 4.00 | .00 | 3.69 | -- | -- | -- | -- | 467 | .64 | 4,334 | 30 | 1.40 | 711 | 7.9 |
| Sept. 1-13..... | 9,695 | -- | 3.92 | 3.31 | -- | 3.80 | .00 | 3.46 | -- | -- | -- | -- | 454 | .62 | 5,986 | 46 | 2.36 | 698 | 7.5 |
| Sept. 14-30..... | 1,844 | -- | 6.76 | 3.39 | -- | 4.92 | .00 | 5.08 | -- | -- | -- | -- | 621 | .84 | 1,558 | 33 | 1.85 | 921 | 7.7 |
| Total or weighted average | 431,300 | -- | 4.46 | 1.56 | -- | 3.27 | 0.00 | 2.71 | -- | -- | -- | -- | 370 | 0.50 | 216,700 | 25 | 1.02 | 564 | 7.5 |

YELLOWSTONE RIVER BASIN--Continued

## 6-3265. POWDER RIVER NEAR LOCATE, MONT.

LOCATION.--At gaging station at bridge on U.S. Highway 12, at present site of Locate (5 miles west of former site of Locate), Custer County, 3 miles upstream from Locate Creek, and 25 miles east of Miles City.
DRAINAGE AREA.--13,189 square miles.
RECORDS AVAILABLE.--Chemical analyses: December 1949 to July 1963 (discontinued).
Water temperatures: February 1951 to May 1954, October 1954 to July 1963 (discontinued).
Sediment records: March 1950 to September 1953.
EXTREMES, October 1962 to July 1963.--Specific conductance: Maximum daily, 2,730 micromhos Jan. 26; minimum daily, 231 micromhos July 18.
Percent sodium: Maximum, 48 Apr. 9-11; minimum, 33 June 1-20, 21-30.
Sodium-adsorption-ratio: Maximum, 4.37 July 26-31; minimum, 1.66 June 21-30.
EXTREMES, 1951 to July 1963.--Specific conductance: Maximum daily, 9,270 micromhos Dec. 16, 1955; minimum daily, 231 micromhos July 18, 1963.
Percent sodium: Maximum, 83 Oct. 22-24, 1953; minimum, 17 Aug. 11-13, 1955.
Sodium-adsorption-ratio (1961-63): Maximum, 4.75 Jan. 3, 1962; minimum, 1.66 June 21-30, 1963.
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, October 1962 to July 1963

| 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, 1962. | 17,940 | -- | 14.28 | | 9.79 | -- | 3.11 | 0.00 | 19.67 | -- | -- | -- | -- | 1,720 | 2.34 | 41,966 | 41 | 3.66 | 2,140 | 7.4 |
| Oct. 16-31..... | 10,695 | -- | 14.60 | | 8.92 | -- | 3.70 | .00 | 18.57 | -- | -- | -- | -- | 1,670 | 2.27 | 24,290 | 38 | 3.30 | 2,080 | 7.4 |
| Nov. 1-30..... | 16,245 | -- | 14.68 | | 9.14 | -- | 3.98 | .00 | 17.86 | -- | -- | -- | -- | 1,660 | 2.26 | 36,674 | 38 | 3.37 | 2,100 | 7.8 |
| Dec. 1-31..... | 9,900 | -- | 15.12 | | 10.44 | -- | 3.80 | .00 | 19.78 | -- | -- | -- | -- | 1,830 | 2.49 | 24,638 | 41 | 3.80 | 2,270 | 7.5 |
| Jan. 1-24, 1963. | 5,903 | -- | 16.50 | | 11.66 | -- | 3.77 | .00 | 23.11 | -- | -- | -- | -- | 2,000 | 2.72 | 16,056 | 41 | 4.06 | 2,470 | 7.7 |
| Jan. 25-Feb. 5.. | 5,474 | -- | 15.26 | | 10.35 | -- | 4.28 | .00 | 18.95 | -- | -- | -- | -- | 1,830 | 2.49 | 13,625 | 40 | 3.75 | 2,270 | 7.9 |
| Feb. 6-8..... | 12,300 | 7.4 | 2.45 | .99 | 2.35 | 0.12 | 2.47 | .00 | 3.35 | 0.12 | 0.01 | 0.02 | 0.10 | 394 | .54 | 6,591 | 40 | 1.79 | 589 | 7.2 |
| Feb. 9-28..... | 47,603 | -- | 6.40 | | 4.35 | -- | 2.75 | .00 | 7.47 | -- | -- | -- | -- | 718 | .98 | 46,484 | 40 | 2.43 | 1,050 | 7.7 |
| Mar. 1..... | 4,721 | -- | 4.98 | | 3.31 | -- | 2.43 | .00 | 5.54 | -- | -- | -- | -- | 608 | .83 | 3,903 | 40 | 2.10 | 817 | 7.8 |
| Mar. 2-9..... | 19,279 | -- | 8.24 | | 6.13 | -- | 3.02 | .00 | 9.41 | -- | -- | -- | -- | 938 | 1.28 | 24,594 | 43 | 3.02 | 1,300 | 7.7 |
| Mar. 10-19..... | 11,088 | -- | 13.00 | | 9.96 | -- | 4.26 | .00 | 16.20 | -- | -- | -- | -- | 1,510 | 2.05 | 22,770 | 43 | 3.91 | 1,940 | 7.8 |
| Mar. 20-Apr. 8.. | 17,574 | 9.6 | 8.73 | 4.69 | 9.70 | .17 | 4.16 | .00 | 17.18 | 2.14 | .02 | .01 | .18 | A1,500 | 2.04 | 35,850 | 42 | 3.74 | 2,020 | 7.6 |
| Apr. 9-11..... | 3,677 | -- | 9.84 | | 8.96 | -- | 3.57 | .00 | 13.57 | -- | -- | -- | -- | 1,230 | 1.67 | 6,151 | 48 | 4.04 | 1,690 | 7.7 |
| Apr. 12-30..... | 16,733 | -- | 12.42 | | 10.48 | -- | 4.10 | .00 | 16.45 | -- | -- | -- | -- | 1,500 | 2.04 | 34,134 | 46 | 4.21 | 1,960 | 7.8 |
| May 1-8..... | 14,820 | -- | 12.12 | | 9.70 | -- | 3.74 | .00 | 15.93 | -- | -- | -- | -- | 1,460 | 1.99 | 29,428 | 44 | 3.94 | 1,890 | 7.6 |
| May 9-14..... | 14,733 | -- | 6.84 | | 5.00 | -- | 3.16 | .00 | 7.43 | -- | -- | -- | -- | 770 | 1.05 | 15,429 | 42 | 2.71 | 1,080 | 7.5 |
| May 15-20..... | 15,150 | 11.0 | 3.79 | 1.56 | 2.83 | .09 | 2.66 | .00 | 5.16 | .51 | .02 | .01 | .09 | 553 | .75 | 11,394 | 34 | 1.73 | 781 | 7.6 |
| May 21-31..... | 21,775 | -- | 6.06 | | 3.78 | -- | 2.69 | .00 | 6.39 | -- | -- | -- | -- | 658 | .89 | 19,486 | 38 | 2.17 | 932 | 7.6 |

A Calculated.

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 1-20..... | 146,975 | — | 8.74 | 4.22 | -- | 3.08 | .00 | 9.35 | -- | -- | -- | -- | 869 | 1.18 | 173,701 | 33 | 2.02 | 1,160 | 7.6 |
| June 21-30..... | 50,221 | -- | 5.64 | 2.78 | -- | 2.64 | .00 | 5.45 | -- | -- | -- | -- | 559 | .76 | 38,180 | 33 | 1.66 | 801 | 7.0 |
| July 1-13..... | 31,664 | -- | 7.00 | 3.96 | -- | 2.90 | .00 | 7.16 | -- | -- | -- | -- | 726 | .99 | 31,264 | 36 | 2.12 | 1,020 | 7.6 |
| July 14-27..... | 16,967 | -- | 10.28 | 7.31 | -- | 3.46 | .00 | 12.39 | -- | -- | -- | -- | 1,200 | 1.63 | 27,690 | 42 | 3.22 | 1,580 | 7.7 |
| July 28-31..... | 1,968 | -- | 14.76 | 11.88 | -- | 4.05 | .00 | 20.40 | -- | -- | -- | -- | 1,810 | 2.46 | 4,843 | 45 | 4.37 | 2,200 | 7.7 |
| Total or weighted average | B 532,500 | -- | 9.00 | 5.61 | -- | 3.16 | 0.00 | 10.47 | -- | -- | -- | -- | 987 | 1.34 | 689,100 | 39 | 2.57 | 1,320 | 7.5 |

B Total runoff based on 365 days of flow; total runoff for 304 days of chemical analyses, 513,000 ac-ft.

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 1963.
Water temperatures: August 1956 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,870 micromhos Feb. 6, 7; minimum daily, 623 micromhos Nov. 5.
Percent sodium: Maximum, 49 Aug. 15-17; minimum, 37 Oct. 1-15.
Sodium-adsorption-ratio: Maximum, 3.06 Apr. 17-22; minimum, 1.57 Oct. 1-15.
EXTREMES, 1956-63.--Specific conductance: Maximum daily, 2,640 micromhos Mar. 1, 1959; minimum daily, 176 micromhos Mar. 30, Apr. 2, 1980.
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 (1961-63): 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 1962 to September 1963

| 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, 1962. | 10,235 | -- | 5.34 | | 2.57 | -- | 5.65 | 0.00 | 1.60 | -- | -- | -- | -- | 476 | 0.65 | 6,626 | 32 | 1.57 | 743 | 7.4 |
| Oct. 16-31..... | 6,442 | -- | 6.92 | | 3.57 | -- | 7.06 | .00 | 2.52 | -- | -- | -- | -- | 640 | .87 | 5,607 | 34 | 1.92 | 983 | 7.5 |
| Nov. 1-24..... | 5,665 | -- | 8.40 | | 4.31 | -- | 7.39 | .00 | 3.66 | -- | -- | -- | -- | 744 | 1.01 | 5,732 | 34 | 2.10 | 1,130 | 7.4 |
| Nov. 25..... | 135 | 18.0 | 4.24 | 3.37 | 3.96 | 0.36 | 6.59 | .00 | 3.73 | 1.41 | 0.02 | 0.00 | 0.28 | 732 | 1.00 | 134 | 33 | 2.03 | 1,070 | 7.5 |
| Nov. 26-Dec. 12. | 3,028 | -- | 7.30 | | 3.83 | -- | 6.31 | .00 | 3.52 | -- | -- | -- | -- | 666 | .91 | 2,743 | 34 | 2.00 | 1,010 | 7.4 |
| Dec. 13-31..... | 2,808 | -- | 10.98 | | 5.92 | -- | 8.90 | .00 | 5.73 | -- | -- | -- | -- | 1,010 | 1.37 | 3,857 | 35 | 2.52 | 1,480 | 7.7 |
| Jan. 1-26, 1963. | 2,635 | -- | 10.86 | | 6.18 | -- | 9.03 | .00 | 5.54 | -- | -- | -- | -- | 993 | 1.35 | 3,559 | 36 | 2.65 | 1,480 | 7.8 |
| Jan. 27..... | 81 | 12.0 | 6.39 | 5.35 | 6.53 | .46 | 10.11 | .00 | 6.00 | 2.48 | .02 | .01 | .38 | A 1,050 | 1.43 | 116 | 35 | 2.69 | 1,600 | 8.2 |
| Jan. 28-Feb. 15. | 1,353 | -- | 13.12 | | 7.35 | -- | 11.21 | .00 | 7.18 | -- | -- | -- | -- | 1,220 | 1.66 | 2,245 | 36 | 2.87 | 1,790 | 8.0 |
| Feb. 16-28..... | 846 | -- | 11.52 | | 6.66 | -- | 9.59 | .00 | 6.66 | -- | -- | -- | -- | 1,090 | 1.48 | 1,254 | 37 | 2.77 | 1,630 | 7.8 |
| Mar. 1-23..... | 2,035 | -- | 8.92 | | 5.26 | -- | 8.00 | .00 | 5.27 | -- | -- | -- | -- | 854 | 1.16 | 2,363 | 37 | 2.49 | 1,310 | 7.7 |
| Mar. 24..... | 123 | 2.7 | 3.29 | 2.80 | 3.44 | .23 | 4.61 | .00 | 3.98 | 1.07 | .01 | .00 | .20 | 572 | .78 | 96 | 35 | 1.97 | 924 | 7.7 |
| Mar. 25-Apr. 1.. | 993 | -- | 6.08 | | 3.44 | -- | 4.52 | .00 | 4.04 | -- | -- | -- | -- | 582 | .79 | 786 | 36 | 1.97 | 905 | 7.7 |
| Apr. 2-12..... | 925 | -- | 8.04 | | 5.22 | -- | 6.10 | .00 | 5.50 | -- | -- | -- | -- | 777 | 1.06 | 978 | 39 | 2.60 | 1,210 | 7.7 |
| Apr. 13-16..... | 349 | -- | 9.66 | | 6.70 | -- | 7.42 | .00 | 6.79 | -- | -- | -- | -- | 996 | 1.35 | 473 | 41 | 3.05 | 1,490 | 7.8 |
| Apr. 17-22..... | 1,184 | -- | 8.62 | | 6.35 | -- | 6.72 | .00 | 6.16 | -- | -- | -- | -- | 912 | 1.24 | 1,469 | 42 | 3.06 | 1,380 | 7.9 |
| Apr. 23..... | 186 | 10.0 | 3.14 | 4.11 | 5.13 | .31 | 5.72 | .00 | 5.02 | 1.83 | .02 | .00 | .32 | 754 | 1.03 | 191 | 40 | 2.69 | 1,160 | 7.5 |
| Apr. 24-May 11.. | 5,177 | -- | 6.64 | | 4.18 | -- | 5.15 | .00 | 4.31 | -- | -- | -- | -- | 666 | .91 | 4,689 | 39 | 2.29 | 1,040 | 7.8 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May 12-21, 1963. | 4,562 | -- | 7.76 | 4.65 | -- | 5.52 | .00 | 5.60 | -- | -- | -- | -- | 767 | 1.04 | 4,759 | 37 | 2.36 | 1,160 | 7.7 |
| May 22-31..... | 3,570 | -- | 7.70 | 5.05 | -- | 5.74 | .00 | 5.06 | -- | -- | -- | -- | 782 | 1.06 | 3,797 | 40 | 2.57 | 1,190 | 7.8 |
| June 1-29..... | 11,369 | -- | 7.24 | 4.48 | -- | 5.70 | .00 | 4.71 | -- | -- | -- | -- | 717 | .98 | 11,106 | 36 | 2.35 | 1,100 | 6.1 |
| June 30..... | 516 | 12.0 | 3.74 \| 3.37 | 5.31 | .41 | 5.74 | .00 | 4.79 | 2.31 | .02 | .00 | .37 | 810 | 1.10 | 568 | 41 | 2.61 | 1,190 | 6.0 |
| July 1-7..... | 3,860 | -- | 6.90 | 5.66 | -- | 5.61 | .00 | 4.83 | -- | -- | -- | -- | 784 | 1.07 | 4,116 | 45 | 3.04 | 1,220 | 7.3 |
| July 8-20..... | 5,286 | -- | 5.98 | 4.05 | -- | 5.28 | .00 | 3.56 | -- | -- | -- | -- | 628 | .85 | 4,515 | 40 | 2.34 | 983 | 7.3 |
| July 21-24,26-31 | 609 | -- | 6.16 | 4.13 | -- | 5.74 | .00 | 3.27 | -- | -- | -- | -- | 638 | .67 | 702 | 40 | 2.35 | 992 | 7.9 |
| Aug. 1-6..... | 270 | -- | 5.68 | 4.35 | -- | 5.46 | .00 | 3.29 | -- | -- | -- | -- | 628 | .65 | 231 | 43 | 2.58 | 980 | 7.6 |
| Aug. 7-14..... | 106 | -- | 5.26 | 4.48 | -- | 5.16 | .00 | 3.41 | -- | -- | -- | -- | 621 | .84 | 90 | 46 | 2.76 | 974 | 7.6 |
| Aug. 15-17..... | 4 | -- | 4.86 | 4.65 | -- | 5.20 | .00 | 3.46 | -- | -- | -- | -- | 646 | .88 | 3 | 49 | 2.99 | 994 | 7.5 |
| Total or weighted average | 74,600 | -- | 7.43 | 4.40 | -- | 6.34 | 0.00 | 4.09 | -- | -- | -- | -- | 718 | 0.98 | 72,800 | 39 | 2.27 | 1,100 | 7.6 |

A Calculated from determined constituents.

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 16 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 1963.
Water temperatures: March 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,130 micromhos Jan. 13 (chan. 1); minimum daily, 346 micromhos Dec. 12 (chan. 1.).
Percent sodium: Maximum, 44 July 1 to Aug. 31; minimum, 29 Mar. 29.
Sodium-adsorption-ratio: Maximum, 2.18 July 1-31; minimum, 1.22 May 30 to June 5.
EXTREMES, 1951-63.--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 (1961-63): Maximum, 2.18 July 1-31, 1963; minimum, 1.22 May 30 to June 5, 1963.
REMARKS.--Daily samples for chemical analysis from each of two major channels composited by discharge. Composite periods normally identical to those of Supply Canal (Tri-County Diversion) near Maxwell, Nebr. Records of specific conductance of daily samples taken at each of two major channels available in district office at Lincoln, Nebr.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 8,793 | -- | 4.64 | | 2.35 | -- | 3.64 | 0.00 | -- | -- | -- | -- | -- | 463 | 0.63 | 5,537 | 34 | 1.54 | 686 | 7.1 |
| Nov. 1-30..... | 12,615 | -- | 4.26 | | 2.18 | -- | 3.52 | .00 | -- | -- | -- | -- | -- | 435 | .59 | 7,463 | 34 | 1.49 | 641 | 7.2 |
| Dec. 1-31..... | 15,126 | 36.0 | 3.34 | 1.40 | 2.35 | 0.25 | 3.74 | .00 | 3.06 | 0.48 | 0.02 | 0.03 | 0.09 | 474 | .64 | 9,751 | 32 | 1.53 | 700 | 7.1 |
| Jan. 1-11, 13-31, 1963..... | 23,147 | -- | 5.02 | | 2.74 | -- | 3.79 | .00 | -- | -- | -- | -- | -- | 519 | .71 | 16,338 | 35 | 1.73 | 755 | 7.6 |
| Jan. 12..... | 476 | 44.0 | 3.14 | 1.89 | 2.74 | .31 | 3.54 | .00 | 3.85 | .62 | .02 | .04 | .10 | 533 | .72 | 345 | 34 | 1.73 | 771 | 8.0 |
| Feb. 1-28..... | 25,603 | -- | 4.66 | | 2.35 | -- | 3.57 | .00 | -- | -- | -- | -- | -- | 472 | .64 | 16,435 | 34 | 1.54 | 685 | 7.6 |
| Mar. 1-28..... | 13,662 | -- | 4.66 | | 2.04 | -- | 3.61 | .00 | -- | -- | -- | -- | -- | 449 | .61 | 8,343 | 30 | 1.34 | 665 | 7.6 |
| Mar. 29..... | 345 | 38.0 | 3.29 | 1.32 | 2.00 | .26 | 3.64 | .00 | 2.79 | .42 | .03 | .01 | .07 | 450 | .61 | 211 | 29 | 1.32 | 656 | 7.4 |
| Mar. 30-Apr. 30. | 12,694 | -- | 4.32 | | 1.96 | -- | 3.46 | .00 | -- | -- | -- | -- | -- | 423 | .58 | 7,303 | 31 | 1.33 | 631 | 7.6 |
| May 1-29..... | 10,614 | -- | 4.90 | | 2.35 | -- | 3.52 | .00 | -- | -- | -- | -- | -- | 476 | .65 | 7,000 | 32 | 1.50 | 699 | 7.9 |
| May 30-June 5... | 5,776 | 33.0 | 2.64 | .82 | 1.61 | .22 | 3.28 | .00 | 1.85 | .26 | .02 | .00 | .06 | 353 | .46 | 2,773 | 30 | 1.22 | 516 | 7.6 |
| June 6-30..... | 8,231 | -- | 4.34 | | 2.18 | -- | 3.62 | .00 | -- | -- | -- | -- | -- | 450 | .61 | 5,038 | 33 | 1.48 | 649 | 7.7 |
| July 1-31..... | 79,012 | -- | 4.00 | | 3.09 | -- | 4.00 | .00 | -- | -- | -- | -- | -- | 480 | .65 | 51,579 | 44 | 2.18 | 703 | 7.8 |
| Aug. 1-31..... | 43,779 | -- | 3.82 | | 2.96 | -- | 3.87 | .00 | -- | -- | -- | -- | -- | 453 | .62 | 26,971 | 44 | 2.14 | 679 | 7.5 |
| Sept. 1-31..... | 10,711 | 37.0 | 2.94 | 1.32 | 2.44 | .31 | 3.79 | .00 | 2.71 | .45 | .03 | .01 | .11 | 449 | .61 | 6,540 | 35 | 1.67 | 659 | 7.5 |
| Total or weighted average | 270,800 | -- | 4.29 | | 2.64 | -- | 3.77 | 0.00 | -- | -- | -- | -- | -- | 466 | 0.63 | 171,600 | 33 | 1.81 | 685 | 7.5 |

## 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 1963.
Water temperatures: March 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,270 micromhos Feb. 12; minimum daily, 633 micromhos Sept. 16, 20.
Percent sodium: Maximum, 46 July 1-31; minimum, 36 Mar. 1-29.
Sodium-adsorption-ratio: Maximum, 2.42 Jan. 1-8, 10-31; minimum, 1.86 June 6-30.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 1,680 micromhos Jan. 23, 1962; minimum daily, 403 micromhos Jan. 9, 1957.
Percent sodium: Maximum, 48 Aug. 1 to Sept. 15, 1955; minimum, 32 Feb. 25 to Mar. 22, May 19-28, 1957.
Sodium-adsorption-ratio (1961-63): Maximum, 2.42 Jan. 1-31, 1962, Jan. 1-8, 10-31, 1963; minimum, 1.86 June 1-30, 1962.
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 Engineers.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_3$) 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, 1962. | 64,009 | -- | 5.02 | | 3.13 | -- | 3.56 | 0.00 | -- | -- | -- | -- | -- | 545 | 0.74 | 47,443 | 38 | 1.98 | 806 | 7.3 |
| Nov. 1-30..... | 84,674 | -- | 4.96 | | 3.39 | -- | 3.59 | .00 | -- | -- | -- | -- | -- | 554 | .75 | 63,797 | 41 | 2.15 | 824 | 7.3 |
| Dec. 1-31..... | 68,067 | 24.0 | 3.79 | 1.97 | 3.65 | 0.28 | 3.74 | .00 | 5.25 | 0.71 | 0.02 | 0.02 | 0.18 | 626 | .85 | 57,949 | 38 | 2.15 | 925 | 7.5 |
| Jan. 1-8, 10-31, 1963..... | 62,777 | -- | 6.44 | | 4.35 | -- | 3.90 | .00 | -- | -- | -- | -- | -- | 703 | .96 | 60,020 | 40 | 2.42 | 1,020 | 7.6 |
| Jan. 9..... | 2,460 | 28.0 | 3.84 | 1.89 | 3.44 | .26 | 3.84 | .00 | 4.89 | .65 | .02 | .00 | .12 | 604 | .82 | 2,020 | 36 | 2.03 | 893 | 7.5 |
| Feb. 1-28..... | 70,532 | -- | 6.56 | | 3.83 | -- | 3.92 | .00 | -- | -- | -- | -- | -- | 682 | .93 | 65,420 | 37 | 2.11 | 984 | 7.5 |
| Mar. 1-28..... | 72,754 | -- | 6.52 | | 3.61 | -- | 3.74 | .00 | -- | -- | -- | -- | -- | 683 | .93 | 67,579 | 36 | 2.00 | 982 | 7.5 |
| Mar. 29..... | 2,698 | 22.0 | 4.59 | 2.39 | 4.05 | .28 | 3.54 | .00 | 6.85 | .85 | .03 | .01 | .14 | 744 | 1.01 | 2,729 | 36 | 2.17 | 1,060 | 7.4 |
| Mar. 30-Apr. 30. | 88,098 | -- | 7.10 | | 4.26 | -- | 3.39 | .00 | -- | -- | -- | -- | -- | 760 | 1.03 | 91,058 | 38 | 2.26 | 1,090 | 7.3 |
| May 1-29..... | 80,414 | -- | 6.04 | | 3.78 | -- | 3.38 | .00 | -- | -- | -- | -- | -- | 661 | .90 | 72,289 | 39 | 2.18 | 959 | 8.1 |
| May 30-June 5... | 20,424 | 21.0 | 2.89 | 1.40 | 2.91 | .26 | 3.43 | .00 | 3.56 | .56 | .03 | .01 | .14 | 482 | .66 | 13,388 | 39 | 1.99 | 722 | 7.7 |
| June 6-30..... | 66,496 | -- | 4.64 | | 2.83 | -- | 3.69 | .00 | -- | -- | -- | -- | -- | 508 | .69 | 45,941 | 38 | 1.86 | 745 | 7.4 |
| July 1-31..... | 124,328 | -- | 3.86 | | 3.31 | -- | 3.67 | .00 | -- | -- | -- | -- | -- | 488 | .66 | 82,514 | 46 | 2.38 | 730 | 7.7 |
| Aug. 1-31..... | 117,072 | -- | 3.88 | | 3.18 | -- | 3.67 | .00 | -- | -- | -- | -- | -- | 465 | .63 | 74,037 | 45 | 2.28 | 708 | 7.4 |
| Sept. 1-30..... | 69,679 | 30.0 | 2.69 | 1.32 | 2.74 | .25 | 3.52 | .00 | 2.98 | .51 | .03 | .02 | .11 | 453 | .62 | 42,928 | 39 | 1.94 | 673 | 7.7 |
| Total or weighted average | 994,500 | -- | 5.26 | | 3.48 | -- | 3.64 | 0.00 | -- | -- | -- | -- | -- | 583 | 0.79 | 789,100 | 38 | 2.16 | 857 | 7.5 |

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 1963.
Water temperatures: October 1945 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 3,000 micromhos Dec. 28, 30; minimum daily, 988 micromhos May 31.
Percent sodium: Maximum, 37 Jan. 15-31, May 1-30, Aug. 1-31; minimum, 31 Jan. 1-8.
Sodium-adsorption-ratio: Maximum, 3.32 Jan. 15-31; minimum, 1.78 May 31.
EXTREMES, 1945-63.--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 (1961-63): 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 year October 1962 to September 1963

| 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, 1962. | 20,967 | -- | 15.06 | | 8.61 | -- | 5.11 | 0.00 | -- | -- | -- | -- | -- | 1,590 | 2.16 | 45,340 | 36 | 3.14 | 2,020 | 7.1 |
| Nov. 1-30..... | 20,588 | -- | 15.34 | | 8.61 | -- | 5.41 | .00 | -- | -- | -- | -- | -- | 1,600 | 2.18 | 44,800 | 36 | 3.11 | 2,040 | 7.5 |
| Dec. 1-31..... | 19,000 | 49.0 | 10.68 | 4.94 | 8.70 | 0.43 | 5.70 | .00 | 16.03 | 1.95 | 0.04 | 0.05 | 0.30 | A 1,550 | 2.11 | 40,051 | 35 | 3.11 | 2,050 | 7.4 |
| Jan. 1-8, 1963.. | 5,490 | -- | 12.92 | | 5.79 | -- | 4.00 | .00 | -- | -- | -- | -- | -- | 1,250 | 1.70 | 9,333 | 31 | 2.28 | 1,590 | 7.5 |
| Jan. 9-14..... | 3,392 | 30.0 | 10.68 | 5.10 | 8.27 | .41 | 6.10 | .00 | 15.86 | 1.83 | .03 | .00 | .24 | A 1,520 | 2.07 | 7,011 | 34 | 2.94 | 2,020 | 7.6 |
| Jan. 15-31..... | 8,598 | -- | 16.44 | | 9.53 | -- | 5.87 | .00 | -- | -- | -- | -- | -- | 1,720 | 2.34 | 20,113 | 37 | 3.32 | 2,140 | 7.5 |
| Feb. 1-28..... | 34,100 | -- | 14.74 | | 7.96 | -- | 5.24 | .00 | -- | -- | -- | -- | -- | 1,540 | 2.09 | 71,419 | 35 | 2.93 | 1,920 | 7.6 |
| Mar. 1-31..... | 45,808 | 23.0 | 9.48 | 5.35 | 7.83 | .28 | 5.21 | .00 | 15.16 | 1.72 | .04 | .10 | .28 | A 1,420 | 1.93 | 88,465 | 34 | 2.88 | 1,920 | 7.5 |
| Apr. 1-30..... | 8,152 | -- | 14.44 | | 7.74 | -- | 4.74 | .00 | -- | -- | -- | -- | -- | 1,520 | 2.07 | 16,852 | 35 | 2.88 | 1,920 | 7.9 |
| May 1-30..... | 2,874 | -- | 13.68 | | 7.87 | -- | 4.69 | .00 | -- | -- | -- | -- | -- | 1,440 | 1.96 | 5,629 | 37 | 3.01 | 1,850 | 7.8 |
| May 31..... | 329 | -- | 6.90 | | 3.31 | -- | 3.23 | .00 | -- | -- | -- | -- | -- | 740 | 1.01 | 331 | 32 | 1.78 | 988 | 7.4 |
| June 1-30..... | 3,035 | 30.0 | 9.53 | 4.28 | 7.53 | .41 | 4.43 | .00 | 15.30 | 1.95 | .03 | .02 | .24 | A 1,400 | 1.90 | 5,778 | 35 | 2.86 | 1,860 | 7.7 |
| July 1-31..... | 1,980 | -- | 13.24 | | 7.05 | -- | 4.16 | .00 | -- | -- | -- | -- | -- | 1,410 | 1.92 | 3,797 | 35 | 2.74 | 1,810 | 7.5 |
| Aug. 1-31..... | 1,617 | -- | 13.12 | | 7.70 | -- | 3.84 | .00 | -- | -- | -- | -- | -- | 1,420 | 1.93 | 3,123 | 37 | 3.01 | 1,810 | 7.4 |
| Sept. 1-30..... | 7,081 | 13.0 | 8.93 | 4.61 | 7.79 | .46 | 4.06 | .00 | 15.45 | 1.78 | .04 | .02 | .25 | A 1,370 | 1.86 | 13,193 | 36 | 2.99 | 1,850 | 7.6 |
| Total or weighted average | 183,000 | -- | 14.87 | | 8.12 | -- | 5.18 | 0.00 | -- | -- | -- | -- | -- | 1,510 | 2.05 | 375,200 | 35 | 2.98 | 1,950 | 7.4 |

A Calculated from determined constituents.

## ARKANSAS RIVER BASIN

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

LOCATION.--At gaging station on left bank, 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 1963.
Water temperatures: January 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 4,620 micromhos Mar. 24; minimum daily, 866 micromhos Aug. 29.
Percent sodium: Maximum, 44 June 27-30; minimum, 25 Aug. 12-13, 26-28, Sept. 22, 23-26.
Sodium-adsorption-ratio: Maximum, 5.58 June 27-30; minimum, 1.55 Aug. 4.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 5,160 micromhos Apr. 21, 1955; minimum daily, 643 micromhos July 6, 1960.
Percent sodium: Maximum, 44 Feb. 23 to Mar. 31, 1962, June 27-30, 1963; minimum, 23 July 1-10, 1955.
Sodium-adsorption-ratio (1961-63): Maximum, 6.28 Nov. 3-13, 1961; minimum, 1.50 July 2-6, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 2,038 | | 30.20 | | 19.14 | | 4.70 | | 41.22 | 3.41 | | | | 3,460 | 4.71 | 9,589 | 39 | 4.93 | 3,650 | 7.6 |
| Oct. 23-31..... | 2,249 | | 22.00 | | 11.70 | | 4.52 | | 27.07 | 2.12 | | | | 2,340 | 3.18 | 7,158 | 35 | 3.53 | 2,700 | 7.4 |
| Nov. 1-8..... | 1,293 | | 27.20 | | 16.66 | | 5.11 | | 35.81 | 2.93 | | | | 3,040 | 4.13 | 5,347 | 38 | 4.52 | 3,460 | 7.4 |
| Nov. 9-17..... | 1,351 | | 26.40 | | 15.01 | | 5.06 | | 33.52 | 2.71 | | | | 2,880 | 3.92 | 5,293 | 36 | 4.13 | 3,230 | 7.5 |
| Nov. 18-30..... | 199 | | 32.00 | | 20.62 | | 4.38 | | 44.35 | 3.78 | | | | 3,680 | 5.00 | 994 | 39 | 5.15 | 4,060 | 7.3 |
| Dec. 1-31..... | 203 | | 35.60 | | 23.01 | | 4.03 | | 50.18 | 4.37 | | | | 4,050 | 5.51 | 1,118 | 39 | 5.45 | 4,410 | 7.4 |
| Jan. 1-31, 1963. | 221 | | 35.20 | | 22.75 | | 4.52 | | 49.34 | 4.09 | | | | 4,040 | 5.49 | 1,216 | 39 | 5.42 | 4,390 | 7.4 |
| Feb. 1-28..... | 189 | | 34.00 | | 21.88 | | 4.23 | | 47.68 | 3.95 | | | | 3,890 | 5.29 | 999 | 39 | 5.31 | 4,230 | 7.4 |
| Mar. 1-31..... | 646 | | 32.60 | | 19.71 | | 4.51 | | 43.93 | 3.84 | | | | 3,770 | 5.13 | 3,310 | 38 | 4.86 | 4,160 | 7.4 |
| Apr. 1-30..... | 24,218 | | 31.20 | | 19.31 | | 4.79 | | 42.47 | 3.33 | | | | 3,530 | 4.80 | 116,267 | 38 | 4.89 | 3,930 | 7.4 |
| May 1-21..... | 1,429 | | 32.60 | | 21.10 | | 4.67 | | 45.39 | 3.61 | | | | 3,720 | 5.06 | 7,228 | 39 | 5.23 | 4,130 | 7.4 |
| May 22-26..... | 3,650 | | 14.40 | | 7.22 | | 3.16 | | 17.09 | 1.35 | | | | 1,430 | 1.94 | 7,098 | 33 | 2.69 | 1,840 | 7.3 |
| May 27-31..... | 2,698 | | 19.20 | | 12.44 | | 3.13 | | 26.23 | 2.26 | | | | 2,120 | 2.88 | 7,777 | 39 | 4.02 | 2,550 | 7.3 |
| June 1-10..... | 2,618 | | 19.90 | | 13.14 | | 3.41 | | 27.27 | 2.37 | | | | 2,370 | 3.22 | 6,439 | 40 | 4.16 | 2,650 | 7.2 |
| June 11-16..... | 603 | | 26.60 | | 17.53 | | 3.95 | | 37.27 | 3.10 | | | | 3,070 | 4.18 | 2,519 | 40 | 4.79 | 3,520 | 7.6 |
| June 17-21..... | 2,390 | | 17.10 | | 9.22 | | 3.75 | | 21.03 | 1.55 | | | | 1,810 | 2.46 | 5,883 | 35 | 3.15 | 2,180 | 7.1 |
| June 22-25..... | 2,079 | | 12.80 | | 6.74 | | 3.43 | | 14.91 | 1.18 | | | | 1,310 | 1.76 | 3,703 | 35 | 2.67 | 1,670 | 7.2 |
| June 26..... | 149 | | 18.30 | | 10.31 | | 3.67 | | 23.11 | 1.81 | | | | 1,970 | 2.66 | 399 | 36 | 3.41 | 2,330 | 7.5 |
| June 27-30..... | 286 | | 26.20 | | 20.18 | | 4.33 | | 38.93 | 3.10 | | | | 3,140 | 4.27 | 1,220 | 44 | 5.58 | 3,580 | 7.2 |
| July 1-10..... | 549 | | 26.80 | | 19.53 | | 3.13 | | 39.77 | 3.44 | | | | 3,220 | 4.38 | 2,406 | 42 | 5.34 | 3,620 | 7.5 |
| July 11-12..... | 186 | | 18.80 | | 12.44 | | 2.20 | | 26.65 | 2.40 | | | | 2,170 | 2.95 | 550 | 40 | 4.06 | 2,540 | 7.4 |
| July 13-16..... | 817 | | 15.12 | | 8.61 | | 3.34 | | 18.88 | 1.52 | | | | 1,630 | 2.22 | 1,612 | 36 | 3.13 | 1,990 | 7.5 |
| July 17..... | 173 | | 20.00 | | 8.61 | | 3.93 | | 23.32 | 1.47 | | | | 1,970 | 2.68 | 462 | 30 | 2.72 | 2,270 | 7.2 |

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| July 18-27, 1963 | 659 | | 25.60 | | 15.62 | | 3.43 | | 34.77 | 2.99 | | | | 2,940 | 4.00 | 2,633 | 38 | 4.36 | 3,360 | 7.4 |
| July 28-29..... | 2,436 | | 7.60 | | 3.09 | | 3.36 | | 6.83 | .51 | | | | 705 | .96 | 2,335 | 29 | 1.58 | 1,010 | 7.5 |
| July 30-31..... | 476 | | 13.40 | | 6.79 | | 3.28 | | 15.76 | 1.16 | | | | 1,390 | 1.89 | 900 | 34 | 2.62 | 1,710 | 7.4 |
| Aug. 1-3..... | 1,023 | | 22.20 | | 13.62 | | 4.16 | | 29.36 | 2.26 | | | | 2,410 | 3.28 | 3,355 | 38 | 4.09 | 2,770 | 7.8 |
| Aug. 4..... | 1,311 | | 7.04 | | 2.91 | | 3.57 | | 5.89 | .51 | | | | 600 | .82 | 1,070 | 29 | 1.55 | 945 | 7.9 |
| Aug. 5-7..... | 1,077 | | 12.60 | | 5.87 | | 2.88 | | 14.70 | .87 | | | | 1,230 | 1.67 | 1,802 | 32 | 2.34 | 1,530 | 8.1 |
| Aug. 8-11..... | 722 | | 20.80 | | 11.92 | | 4.61 | | 26.03 | 2.00 | | | | 2,230 | 3.03 | 2,190 | 36 | 3.70 | 2,590 | 7.7 |
| Aug. 12-13..... | 1,396 | | 15.60 | | 5.31 | | 4.13 | | 16.03 | .73 | | | | 1,420 | 1.93 | 2,697 | 25 | 1.90 | 1,700 | 7.6 |
| Aug. 14-20..... | 5,165 | | 13.70 | | 5.18 | | 3.20 | | 14.82 | .85 | | | | 1,270 | 1.73 | 8,921 | 27 | 1.98 | 1,570 | 7.6 |
| Aug. 21..... | 111 | | 19.20 | | 11.05 | | 3.31 | | 24.98 | 1.97 | | | | 2,100 | 2.86 | 317 | 37 | 3.57 | 2,390 | 7.9 |
| Aug. 22-23..... | 212 | | 26.00 | | 16.70 | | 3.84 | | 36.02 | 2.82 | | | | 2,960 | 4.03 | 854 | 39 | 4.63 | 3,240 | 7.8 |
| Aug. 24..... | 468 | | 10.30 | | 3.61 | | 4.46 | | 8.89 | .54 | | | | 880 | 1.20 | 560 | 26 | 1.59 | 1,200 | 7.1 |
| Aug. 25..... | 179 | | 22.20 | | 11.05 | | 9.24 | | 22.07 | 1.95 | | | | 2,190 | 2.98 | 532 | 33 | 3.32 | 2,520 | 7.5 |
| Aug. 26-28..... | 2,047 | | 12.10 | | 4.13 | | 3.38 | | 12.30 | .56 | | | | 1,060 | 1.44 | 2,951 | 25 | 1.68 | 1,340 | 7.7 |
| Aug. 29-31..... | 3,302 | | 8.40 | | 3.35 | | 3.57 | | 7.70 | .48 | | | | 725 | .99 | 3,256 | 29 | 1.63 | 1,000 | 7.5 |
| Sept. 1-2..... | 1,595 | | 10.80 | | 3.96 | | 2.88 | | 11.28 | .59 | | | | 1,000 | 1.36 | 2,169 | 27 | 1.70 | 1,260 | 7.6 |
| Sept. 3-5..... | 625 | | 15.40 | | 8.40 | | 2.62 | | 19.76 | 1.41 | | | | 1,660 | 2.26 | 1,411 | 35 | 3.03 | 1,980 | 7.2 |
| Sept. 6..... | 353 | | 10.80 | | 4.39 | | 3.08 | | 11.45 | .68 | | | | 1,040 | 1.41 | 499 | 29 | 1.89 | 1,320 | 7.2 |
| Sept. 7-9..... | 490 | | 29.20 | | 17.92 | | 4.79 | | 38.93 | 3.39 | | | | 3,310 | 4.50 | 2,205 | 38 | 4.69 | 3,570 | 7.4 |
| Sept. 10-14..... | 4,582 | | 10.44 | | 4.18 | | 3.02 | | 10.93 | .65 | | | | 987 | 1.34 | 6,150 | 29 | 1.83 | 1,260 | 7.5 |
| Sept. 15-18..... | 722 | | 16.80 | | 9.27 | | 3.61 | | 20.82 | 1.61 | | | | 1,790 | 2.43 | 1,758 | 36 | 3.20 | 2,140 | 7.4 |
| Sept. 19-21..... | 224 | | 36.20 | | 23.36 | | 3.64 | | 51.43 | 4.46 | | | | 4,280 | 5.62 | 1,306 | 39 | 5.49 | 4,430 | 7.5 |
| Sept. 22..... | 1,256 | | 14.40 | | 4.74 | | 4.52 | | 14.10 | .51 | | | | 1,260 | 1.71 | 2,155 | 25 | 1.77 | 1,650 | 7.3 |
| Sept. 23-26..... | 6,029 | | 11.20 | | 3.78 | | 3.05 | | 11.45 | .48 | | | | 1,020 | 1.39 | 11,138 | 25 | 1.60 | 1,300 | 7.4 |
| Sept. 27-30..... | 952 | | 21.40 | | 10.44 | | 4.15 | | 25.82 | 1.86 | | | | 2,290 | 3.11 | 2,965 | 33 | 3.19 | 2,610 | 7.3 |
| Total or weighted average | 89,650 | | 20.33 | | 11.38 | | 3.92 | | 25.86 | 1.95 | | | | 2.189 | 2.98 | 266,900 | 36 | 3.35 | 2,540 | 7.4 |

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

LOCATION.--At gaging station near left bank on downstream side of pier of 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 1963.
Water temperatures: October 1951 to September 1983.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,770 micromhos July 13; minimum daily, 392 micromhos Sept. 8.
Percent sodium: Maximum, 74 July 13; minimum, 40 May 27-28, Sept. 4-7.
Sodium-adsorption-ratio: Maximum, 10.85 July 13; minimum, 1.47 Sept. 4-7.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 5,770 micromhos Jan. 18, 1957; minimum daily, 227 micromhos Aug. 28, 1980.
Percent sodium: Maximum, 79 Apr. 28, 1955; minimum, 27 Aug. 15, 1960.
Sodium-adsorption-ratio: Maximum, 18 Oct. 5, 1953, Aug. 7, 1955; minimum, 0.9 May 31, 1962.
REMARKS.--Where no postassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla.

Chemical analyses, water year October 1982 to September 1963

| 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. 1-5, 1962.. | 25,726 | -- | 4.08 | | 4.48 | -- | 2.56 | 0.00 | 1.89 | 4.09 | -- | -- | -- | 536 | 0.73 | 18,753 | 52 | 3.14 | 906 | 8.1 |
| Oct. 6-10..... | 20,886 | -- | 4.80 | | 5.61 | -- | 3.11 | .00 | 2.19 | 5.13 | -- | -- | -- | 653 | .89 | 18,548 | 54 | 3.62 | 1,100 | 8.2 |
| Oct. 11-20..... | 24,952 | 18.0 | 4.79 | 1.23 | 8.79 | 0.17 | 3.74 | .13 | 3.02 | 8.24 | 0.02 | 0.07 | 0.15 | 942 | 1.28 | 31,967 | 59 | 5.06 | 1,550 | 8.3 |
| Oct. 21-31..... | 24,044 | -- | 6.88 | | 9.48 | -- | 4.16 | .00 | 3.33 | 8.89 | -- | -- | -- | 1,010 | 1.37 | 33,026 | 58 | 5.11 | 1,680 | 8.0 |
| Nov. 1-21..... | 43,902 | -- | 7.20 | | 10.18 | -- | 4.36 | .00 | 3.44 | 9.59 | -- | -- | -- | 1,090 | 1.48 | 65,081 | 59 | 5.36 | 1,760 | 8.0 |
| Nov. 22-30..... | 22,457 | -- | 6.84 | | 9.27 | -- | 3.93 | .13 | 3.10 | 8.75 | -- | -- | -- | 1,000 | 1.36 | 30,541 | 58 | 5.09 | 1,620 | 8.3 |
| Dec. 1-10..... | 25,250 | -- | 6.92 | | 10.31 | -- | 4.26 | .00 | 3.23 | 9.73 | -- | -- | -- | 1,060 | 1.44 | 38,400 | 60 | 5.54 | 1,750 | 7.8 |
| Dec. 11-26..... | 30,276 | -- | 7.56 | | 11.01 | -- | 4.33 | .27 | 3.50 | 10.44 | -- | -- | -- | 1,140 | 1.55 | 46,939 | 59 | 5.66 | 1,880 | 8.4 |
| Dec. 27-28..... | 1,884 | -- | 8.80 | | 13.83 | -- | 4.88 | .00 | 3.85 | 13.88 | -- | -- | -- | 1,400 | 1.90 | 3,550 | 61 | 6.59 | 2,290 | 7.2 |
| Dec. 29-31..... | 5,117 | -- | 7.60 | | 10.40 | -- | 4.39 | .27 | 3.44 | 9.87 | -- | -- | -- | 1,110 | 1.51 | 7,725 | 58 | 5.33 | 1,810 | 8.4 |
| Jan. 1-10, 1963. | 24,615 | -- | 6.76 | | 9.48 | -- | 3.90 | .27 | 3.08 | 8.97 | -- | -- | -- | 1,000 | 1.36 | 33,476 | 58 | 5.18 | 1,650 | 8.4 |
| Jan. 11-31..... | 23,117 | -- | 9.10 | | 13.01 | -- | 4.79 | .40 | 4.06 | 12.84 | -- | -- | -- | 1,380 | 1.88 | 43,387 | 59 | 6.10 | 2,220 | 8.5 |
| Feb. 1-7..... | 18,856 | -- | 7.00 | | 10.53 | -- | 3.77 | .27 | 3.29 | 10.21 | -- | -- | -- | 1,100 | 1.50 | 25,218 | 60 | 5.83 | 1,870 | 8.8 |
| Fel. 8-10..... | 9,521 | -- | 5.40 | | 7.87 | -- | 3.18 | .13 | -- | -- | -- | - | -- | 840 | 1.14 | 10,876 | 59 | 4.79 | 1,360 | 8.4 |
| Feb. 11-28..... | 35,345 | 22.0 | 5.59 | 2.22 | 10.66 | .14 | 4.00 | .27 | 4.12 | 10.58 | .02 | .16 | .30 | 1,120 | 1.52 | 53,838 | 57 | 5.39 | 1,910 | 8.5 |
| Mar. 1-7..... | 14,884 | -- | 8.00 | | 11.79 | -- | 3.57 | .67 | 4.96 | 10.58 | -- | -- | -- | 1,220 | 1.66 | 24,695 | 60 | 5.89 | 1,990 | 8.6 |
| Mar. 8-12..... | 16,919 | -- | 5.76 | | 8.27 | -- | 2.82 | .40 | 3.18 | 7.62 | -- | -- | -- | 880 | 1.20 | 20,249 | 59 | 4.87 | 1,470 | 8.5 |

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--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. 13-31, 1963 | 38,327 | -- | 7.80 | | 12.48 | -- | 3.64 | 0.67 | 4.41 | 11.57 | -- | -- | -- | 1,250 | 1.70 | 65,155 | 62 | 6.32 | 2,050 | 8.6 |
| Apr. 1-20 | 28,443 | 15.0 | 4.44 | 2.39 | 12.31 | 0.15 | 3.44 | .07 | 4.06 | 11.85 | 0.02 | 0.10 | 0.16 | 1,150 | 1.56 | 44,485 | 64 | 6.66 | 1,990 | 8.3 |
| Apr. 21-May 10 | 26,023 | -- | 7.20 | | 13.62 | -- | 3.57 | .13 | 4.06 | 13.03 | -- | -- | -- | 1,250 | 1.70 | 44,239 | 65 | 7.18 | 2,100 | 8.3 |
| May 11-26 | 17,550 | -- | 6.90 | | 14.44 | -- | 3.21 | .13 | 3.91 | 14.11 | -- | -- | -- | 1,280 | 1.74 | 30,551 | 68 | 7.78 | 2,200 | 8.3 |
| May 27-28 | 11,187 | -- | 3.12 | | 2.09 | -- | 2.10 | .00 | 1.35 | 1.75 | -- | -- | -- | 324 | .44 | 4,929 | 40 | 1.67 | 529 | 7.9 |
| May 29-June 2 | 16,612 | -- | 4.36 | | 6.48 | -- | 2.49 | .13 | 2.23 | 5.98 | -- | -- | -- | 696 | .95 | 15,724 | 60 | 4.39 | 1,120 | 8.5 |
| June 3-4 | 7,458 | -- | 3.12 | | 3.61 | -- | 2.03 | .00 | 1.31 | 3.39 | -- | -- | -- | 456 | .62 | 4,625 | 54 | 2.89 | 715 | 8.0 |
| June 5-9 | 16,126 | -- | 3.32 | | 7.57 | -- | 1.11 | .93 | -- | -- | -- | -- | -- | 708 | .96 | 15,527 | 70 | 5.87 | 1,110 | 9.3 |
| June 10-17 | 16,169 | -- | 5.00 | | 9.70 | -- | 2.43 | .67 | 2.64 | 8.97 | -- | -- | -- | 956 | 1.30 | 21,023 | 66 | 6.14 | 1,510 | 8.9 |
| June 18-21 | 13,091 | 19.0 | 2.94 | .62 | 5.70 | .15 | 2.03 | .40 | 1.75 | 5.33 | .02 | .02 | .08 | 592 | .81 | 10,540 | 61 | 4.27 | 994 | 8.8 |
| June 22-July 2 | 21,818 | -- | 4.56 | | 8.09 | -- | 2.59 | .40 | 2.46 | 7.19 | -- | -- | -- | 836 | 1.14 | 24,806 | 64 | 5.36 | 1,310 | 8.6 |
| July 3-12 | 10,711 | -- | 6.08 | | 11.48 | -- | 3.34 | .27 | 3.44 | 10.49 | -- | -- | -- | 1,140 | 1.55 | 16,606 | 65 | 6.59 | 1,790 | 8.5 |
| July 13 | 1,273 | -- | 6.70 | | 19.49 | -- | 2.69 | .13 | 4.16 | 19.18 | -- | -- | -- | 1,680 | 2.28 | 2,909 | 74 | 10.65 | 2,730 | 8.4 |
| July 14 | 3,590 | -- | 6.56 | | 8.68 | -- | 3.11 | .20 | 3.44 | 8.46 | -- | -- | -- | 1,000 | 1.36 | 4,883 | 57 | 4.78 | 1,560 | 8.4 |
| July 15-23 | 49,269 | -- | 2.80 | | 3.00 | -- | 2.07 | .00 | 1.02 | 2.71 | -- | -- | -- | 405 | .55 | 27,138 | 52 | 2.54 | 626 | 8.2 |
| July 24-25 | 7,061 | -- | 3.04 | | 4.22 | -- | 2.33 | .00 | 1.19 | 3.75 | -- | -- | -- | 486 | .66 | 4,667 | 58 | 3.42 | 773 | 8.1 |
| July 26-29 | 8,727 | -- | 4.24 | | 6.87 | -- | 2.69 | .13 | 1.94 | 6.35 | -- | -- | -- | 692 | .94 | 8,213 | 62 | 4.72 | 1,140 | 8.3 |
| July 30-Aug. 1 | 4,945 | -- | 5.12 | | 9.96 | -- | 2.66 | .67 | 2.71 | 9.03 | -- | -- | -- | 878 | 1.19 | 5,904 | 66 | 6.23 | 1,490 | 8.8 |
| Aug. 2-4 | 3,630 | -- | 5.84 | | 11.40 | -- | 2.98 | .47 | 3.02 | 10.78 | -- | -- | -- | 1,030 | 1.40 | 5,085 | 66 | 6.87 | 1,740 | 8.6 |
| Aug. 5-18 | 10,941 | -- | 6.24 | | 13.75 | -- | 2.92 | .27 | 3.54 | 13.26 | -- | -- | -- | 1,200 | 1.63 | 17,855 | 69 | 7.78 | 2,030 | 8.5 |
| Aug. 19 | 988 | -- | 5.60 | | 10.83 | -- | 2.82 | .20 | 2.81 | 10.58 | -- | -- | -- | 1,000 | 1.36 | 1,343 | 66 | 6.47 | 1,680 | 8.4 |
| Aug. 20 | 1,595 | -- | 4.20 | | 8.61 | -- | 2.23 | .07 | 2.19 | 8.32 | -- | -- | -- | 793 | 1.08 | 1,720 | 67 | 5.94 | 1,350 | 8.3 |
| Aug. 21-26 | 5,903 | -- | 5.04 | | 11.01 | -- | 2.69 | .20 | 2.66 | 10.49 | -- | -- | -- | 954 | 1.30 | 7,859 | 69 | 6.93 | 1,640 | 8.5 |
| Aug. 21-Sept. 2 | 5,387 | -- | 5.68 | | 12.22 | -- | 2.82 | .13 | 2.87 | 12.07 | -- | -- | -- | 1,090 | 1.48 | 7,986 | 68 | 7.25 | 1,850 | 8.4 |
| Sept. 3 | 1,724 | -- | 4.56 | | 7.53 | -- | 2.69 | .13 | 2.08 | 7.19 | -- | -- | -- | 754 | 1.03 | 1,767 | 62 | 4.98 | 1,240 | 8.3 |
| Sept. 4-7 | 53,474 | -- | 2.40 | | 1.61 | -- | 1.84 | .00 | .56 | 1.61 | -- | -- | -- | 250 | .34 | 18,181 | 40 | 1.47 | 409 | 8.2 |
| Sept. 8-12 | 46,294 | -- | 2.40 | | 2.65 | -- | 1.90 | .00 | .75 | 2.40 | -- | -- | -- | 319 | .43 | 20,084 | 53 | 2.42 | 531 | 8.2 |
| Sept. 13-21 | 35,899 | -- | 3.44 | | 4.44 | -- | 2.46 | .13 | 1.17 | 4.12 | -- | -- | -- | 498 | .68 | 24,314 | 56 | 3.38 | 821 | 8.3 |
| Sept. 22-23 | 5,197 | -- | 4.12 | | 5.87 | -- | 2.79 | .20 | 1.52 | 5.50 | -- | -- | -- | 624 | .85 | 4,410 | 59 | 4.09 | 1,020 | 8.4 |
| Sept. 24-30 | 10,219 | -- | 5.20 | | 8.70 | -- | 3.28 | .27 | 2.12 | 8.24 | -- | -- | -- | 820 | 1.12 | 11,396 | 63 | 5.40 | 1,400 | 8.5 |
| Total or weighted average | 845,400 | -- | 5.47 | | 8.19 | -- | 3.12 | 0.19 | 2.67 | 7.75 | -- | -- | -- | 851 | 1.16 | 978,000 | 60 | 4.77 | 1,400 | 8.3 |

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

LOCATION.--At gaging station near left bank on downstream side of pier of bridge on State Highway 18 at Ralston, Pawnee County, 2 miles downstream from Salt Creek, 2 miles upstream from Grayhorse Creek, and at mile 594.0.
DRAINAGE AREA.--54,465 square miles, of which 7,615 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: January 1950 to September 1983.
Water temperatures: January 1950 to September 1963.
EXTREMES, 1962-83.--Specific conductance: Maximum daily, 5,890 micromhos June 28; minimum daily, 439 micromhos July 17.
Percent sodium: Maximum, 85 June 27-28; minimum, 43 July 18-18.
Sodium-adsorption-ratio: Maximum, 22.34 June 27-28; minimum, 1.72 July 18-18.
EXTREMES, 1950-83.--Specific conductance: Maximum daily, 7,510 micromhos Sept. 14, 1955; minimum daily, 234 micromhos Sept. 13, 1981.
Percent sodium: Maximum, 87 May 1-2, 1957; minimum, 21 Aug. 14, 1981.
Sodium-adsorption-ratio (1951-63): Maximum, 25 May 1-2, 1957; minimum, 0.8 Aug. 14, 1981.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla.

Chemical analyses, water year October 1962 to September 1983

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-10, 1962. | 81,917 | -- | 4.46 | | 6.92 | -- | 2.69 | 0.00 | 1.98 | 6.71 | -- | -- | -- | 711 | 0.97 | 79,211 | 81 | 4.62 | 1,230 | 8.1 |
| Oct. 11-12..... | 14,083 | -- | 5.32 | | 8.00 | -- | 3.31 | .00 | 2.23 | 7.76 | -- | -- | -- | 824 | 1.12 | 15,782 | 80 | 4.91 | 1,380 | 8.0 |
| Oct. 13-20..... | 44,097 | -- | 6.20 | | 10.22 | -- | 3.70 | .00 | 2.91 | 9.82 | -- | -- | -- | 998 | 1.36 | 59,851 | 82 | 5.81 | 1,690 | 8.2 |
| Oct. 21-31..... | 41,956 | 15.0 | 4.44 | 1.65 | 9.66 | 0.15 | 3.47 | .00 | 2.91 | 9.37 | 0.02 | 0.04 | 0.08 | 994 | 1.35 | 58,718 | 81 | 5.54 | 1,710 | 8.1 |
| Nov. 1-20..... | 58,830 | -- | 7.04 | | 10.35 | -- | 4.13 | .00 | 3.10 | 10.16 | -- | -- | -- | 1,060 | 1.44 | 84,809 | 60 | 5.52 | 1,770 | 7.8 |
| Nov. 21-Dec. 1.. | 36,785 | -- | 7.28 | | 10.31 | -- | 3.97 | .27 | 3.19 | 10.16 | -- | -- | -- | 1,090 | 1.48 | 54,531 | 59 | 5.40 | 1,780 | 8.4 |
| Dec. 2-4..... | 16,679 | -- | 7.00 | | 8.61 | -- | 4.13 | .00 | 2.98 | 8.52 | -- | -- | -- | 968 | 1.32 | 21,958 | 55 | 4.60 | 1,580 | 8.2 |
| Dec. 5-20..... | 63,598 | -- | 8.60 | | 10.96 | -- | 4.26 | .07 | 3.25 | 11.99 | -- | -- | -- | 1,210 | 1.65 | 104,657 | 58 | 5.29 | 1,990 | 8.3 |
| Dec. 21-Jan. 7, 1963..... | 60,837 | -- | 7.80 | | 11.92 | -- | 4.10 | .33 | 3.16 | 12.13 | -- | -- | -- | 1,250 | 1.70 | 103,423 | 60 | 6.04 | 2,020 | 8.4 |
| Jan. 8-10..... | 16,739 | -- | 6.96 | | 8.96 | -- | 4.00 | .00 | 2.75 | 9.17 | -- | -- | -- | 999 | 1.36 | 22,742 | 58 | 4.80 | 1,830 | 8.1 |
| Jan. 11-31..... | 46,901 | -- | 8.80 | | 12.35 | -- | 5.02 | .00 | 3.48 | 12.84 | -- | -- | -- | 1,320 | 1.80 | 84,197 | 58 | 5.89 | 2,140 | 8.1 |
| Feb. 1-14..... | 49,484 | 17.0 | 5.29 | 1.81 | 10.18 | .11 | 3.93 | .20 | 2.96 | 10.30 | .01 | .14 | .30 | 1,020 | 1.39 | 88,844 | 59 | 5.40 | 1,770 | 8.4 |
| Feb. 15-28..... | 48,428 | -- | 8.10 | | 13.66 | -- | 4.29 | .00 | 4.00 | 13.48 | -- | -- | -- | 1,340 | 1.82 | 88,258 | 83 | 8.79 | 2,120 | 7.7 |
| Mar. 1-11..... | 48,480 | -- | 7.88 | | 12.09 | -- | 3.51 | .53 | 3.75 | 12.19 | -- | -- | -- | 1,250 | 1.70 | 82,418 | 81 | 6.09 | 2,040 | 8.8 |
| Mar. 12-16..... | 42,288 | -- | 6.32 | | 6.79 | -- | 3.18 | .33 | 2.50 | 7.11 | -- | -- | -- | 833 | 1.13 | 47,907 | 52 | 3.82 | 1,380 | 8.5 |
| Mar. 17-20..... | 22,731 | -- | 6.60 | | 9.05 | -- | 3.41 | .40 | 2.96 | 8.89 | -- | -- | -- | 994 | 1.35 | 30,728 | 58 | 4.98 | 1,810 | 8.5 |
| Mar. 21-Apr. 10. | 73,434 | -- | 8.40 | | 12.01 | -- | 2.95 | .13 | 3.54 | 11.85 | -- | -- | -- | 1,170 | 1.59 | 118,848 | 59 | 5.86 | 1,940 | 8.4 |
| Apr. 11-30..... | 46,572 | 11.0 | 4.39 | 2.55 | 12.75 | .15 | 3.31 | .13 | 3.64 | 12.84 | .02 | .03 | .35 | 1,160 | 1.58 | 73,472 | 84 | 6.84 | 2,080 | 8.3 |
| May 1-18..... | 35,004 | -- | 7.30 | | 17.40 | -- | 3.15 | .27 | 4.06 | 17.21 | -- | -- | -- | 1,510 | 2.05 | 71,885 | 70 | 9.11 | 2,550 | 8.5 |
| May 17-28..... | 16,971 | -- | 7.00 | | 14.70 | -- | 3.21 | .27 | 3.54 | 14.67 | -- | -- | -- | 1,320 | 1.80 | 30,466 | 88 | 7.86 | 2,230 | 8.5 |

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--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 29, 1963.... | 7,557 | -- | 5.00 | | 5.79 | -- | 2.85 | 0.20 | 2.33 | 5.42 | -- | -- | -- | 690 | 0.94 | 7,092 | 54 | 3.66 | 1,100 | 8.5 |
| May 30-June 1... | 20,945 | -- | 3.72 | | 3.61 | -- | 2.16 | .07 | 1.44 | 3.67 | -- | -- | -- | 467 | .64 | 13,303 | 49 | 2.65 | 769 | 8.3 |
| June 2-3..... | 9,362 | -- | 4.40 | | 6.48 | -- | 2.49 | .27 | 1.98 | 8.15 | -- | -- | -- | 750 | 1.02 | 9,549 | 80 | 4.37 | 1,130 | 8.5 |
| June 4-6..... | 20,249 | 18.0 | 2.94 | 0.82 | 4.13 | 0.12 | 2.46 | .00 | 1.46 | 4.01 | 0.02 | 0.04 | 0.01 | 503 | .68 | 13,852 | 52 | 3.01 | 843 | 8.2 |
| June 7-10..... | 18,026 | -- | 4.12 | | 5.96 | -- | 2.56 | .07 | 1.81 | 5.64 | -- | -- | -- | 639 | .87 | 15,885 | 59 | 4.15 | 1,060 | 8.3 |
| June 11-12..... | 7,279 | -- | 4.76 | | 11.66 | -- | 2.69 | .20 | 2.19 | 11.34 | -- | -- | -- | 1,090 | 1.48 | 10,791 | 71 | 7.56 | 1,720 | 8.4 |
| June 13-19..... | 19,355 | -- | 5.96 | | 16.92 | -- | 2.95 | .27 | 3.02 | 16.64 | -- | -- | -- | 1,420 | 1.93 | 37,378 | 74 | 9.80 | 2,380 | 8.5 |
| June 20-24..... | 21,183 | -- | 4.80 | | 10.18 | -- | 2.69 | .00 | 2.29 | 10.01 | -- | -- | -- | 984 | 1.34 | 28,349 | 68 | 6.57 | 1,590 | 8.1 |
| June 25-26..... | 7,339 | -- | 5.72 | | 15.49 | -- | 2.88 | .00 | 2.75 | 15.57 | -- | -- | -- | 1,380 | 1.88 | 13,774 | 73 | 9.16 | 2,260 | 8.2 |
| June 27-28..... | 16,621 | -- | 8.20 | | 45.24 | -- | 2.69 | .00 | 5.73 | 45.14 | -- | -- | -- | 3,380 | 4.60 | 76,406 | 85 | 22.34 | 5,610 | 8.2 |
| June 29-July 1.. | 28,163 | -- | 5.84 | | 24.66 | -- | 1.87 | .40 | 4.12 | 24.12 | -- | -- | -- | 1,840 | 2.50 | 70,476 | 81 | 14.43 | 3,170 | 8.8 |
| July 2-3..... | 15,074 | -- | 5.88 | | 15.75 | -- | 2.36 | .07 | 3.96 | 15.23 | -- | -- | -- | 1,380 | 1.88 | 28,292 | 73 | 9.18 | 2,310 | 8.3 |
| July 4-11..... | 35,417 | -- | 6.88 | | 23.75 | -- | 2.56 | .27 | 4.37 | 23.41 | -- | -- | -- | 1,890 | 2.57 | 91,035 | 78 | 12.81 | 3,220 | 8.4 |
| July 12..... | 8,906 | -- | 4.96 | | 15.05 | -- | 2.33 | .13 | 2.60 | 14.95 | -- | -- | -- | 1,240 | 1.89 | 15,019 | 75 | 9.56 | 2,160 | 8.4 |
| July 13-14..... | 64,860 | -- | 2.16 | | 2.31 | -- | 1.70 | .00 | .71 | 2.06 | -- | -- | -- | 294 | .40 | 25,933 | 52 | 2.22 | 496 | 8.2 |
| July 15..... | 17,554 | -- | 4.84 | | 5.61 | -- | 2.36 | .13 | 1.85 | 5.92 | -- | -- | -- | 643 | .87 | 15,350 | 55 | 3.68 | 1,060 | 8.4 |
| July 16-18..... | 59,462 | -- | 2.80 | | 1.96 | -- | 1.93 | .00 | .77 | 1.86 | -- | -- | -- | 307 | .42 | 24,827 | 43 | 1.72 | 481 | 8.2 |
| July 19..... | 8,529 | -- | 2.76 | | 4.00 | -- | 1.74 | .13 | 1.02 | 3.89 | -- | -- | -- | 439 | .60 | 5,092 | 59 | 3.41 | 724 | 8.4 |
| July 20-31..... | 75,999 | -- | 3.56 | | 8.13 | -- | 2.23 | .00 | 1.52 | 5.92 | -- | -- | -- | 596 | .81 | 81,801 | 63 | 4.80 | 1,020 | 8.2 |
| Aug. 1-3..... | 11,484 | -- | 5.20 | | 12.40 | -- | 2.88 | .00 | 2.46 | 12.27 | -- | -- | -- | 1,020 | 1.39 | 15,931 | 70 | 7.69 | 1,800 | 7.7 |
| Aug. 4-7..... | 10,847 | -- | 6.92 | | 20.10 | -- | 2.88 | .27 | 3.85 | 20.03 | -- | -- | -- | 1,640 | 2.23 | 23,748 | 74 | 10.80 | 2,810 | 8.5 |
| Aug. 8-22..... | 21,838 | -- | 5.40 | | 18.23 | -- | 1.84 | .00 | 3.44 | 18.34 | -- | -- | -- | 1,390 | 1.89 | 41,283 | 77 | 11.09 | 2,450 | 8.2 |
| Aug. 23-29..... | 8,775 | -- | 5.92 | | 14.62 | -- | 2.49 | .13 | 3.08 | 14.81 | -- | -- | -- | 1,240 | 1.89 | 14,798 | 71 | 8.50 | 2,150 | 8.3 |
| Aug. 30-Sept. 4. | 12,722 | -- | 4.80 | | 11.18 | -- | 2.23 | .00 | 2.46 | 11.28 | -- | -- | -- | 990 | 1.35 | 17,129 | 70 | 7.22 | 1,680 | 8.2 |
| Sept. 5..... | 3,729 | -- | 3.80 | | 6.53 | -- | 2.23 | .00 | 1.56 | 6.35 | -- | -- | -- | 596 | .81 | 3,023 | 64 | 4.86 | 1,050 | 8.0 |
| Sept. 6-7..... | 56,926 | -- | 2.72 | | 2.87 | -- | 2.23 | .00 | .81 | 2.57 | -- | -- | -- | 332 | .45 | 25,703 | 51 | 2.46 | 582 | 7.9 |
| Sept. 8-14..... | 119,183 | -- | 2.64 | | 5.26 | -- | 1.84 | .00 | 1.02 | 5.02 | -- | -- | -- | 466 | .63 | 75,533 | 67 | 4.58 | 832 | 7.8 |
| Sept. 15-30..... | 89,209 | -- | 4.32 | | 10.01 | -- | 2.59 | .00 | 1.87 | 9.87 | -- | -- | -- | 848 | 1.15 | 102,882 | 70 | 6.81 | 1,510 | 8.2 |
| Total or weighted average | 1,662,000 | -- | 5.83 | | 10.09 | -- | 2.98 | 0.10 | 2.55 | 10.01 | -- | -- | -- | 965 | 1.31 | 2,182,000 | 80 | 5.86 | 1,620 | 8.1 |

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

LOCATION.--At gaging station at bridge on State Highway 40, 1 mile south of Perkins, Payne County, 1.5 miles upstream from Dugout Creek, 4 miles downstream from Wildhorse Creek, and at mile 87.3.
DRAINAGE AREA.--17,852 square miles, of which 4,926 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1952 to September 1963.
Water temperatures: October 1952 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 18,200 Feb. 2; minimum daily, 539 Sept. 19.
Percent sodium: Maximum, 92 June 14; minimum, 65 July 30-31.
Sodium-adsorption-ratio: Maximum, 62.27 June 14; minimum, 3.75 July 30-31.
EXTREMES, 1952-63.--Specific conductance: Maximum daily, 32,400 micromhos Mar. 18, 1957; minimum daily, 438 micromhos Oct. 5, 1955.
Percent sodium: Maximum, 94 Feb. 18-20, 1955, Apr. 1-2, 1957; minimum, 50 June 8, 1961.
Sodium-adsorption-ratio: Maximum, 98 Feb. 18-20, 1955; minimum, 1.5 Oct. 5-7, 1955.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962.... | 1,287 | -- | 9.60 | | 66.99 | -- | 3.02 | 0.00 | 5.31 | 68.27 | -- | -- | -- | 4,580 | 6.23 | 8,018 | 87 | 30.58 | 7,760 | 8.2 |
| Oct. 2-10..... | 7,980 | 19.0 | 7.73 | 3.45 | 82.22 | 0.18 | 3.61 | .00 | 5.10 | 84.63 | 0.04 | -- | 0.25 | 5,470 | 7.44 | 59,361 | 88 | 34.76 | 9,550 | 8.0 |
| Oct. 11-12..... | 1,333 | -- | 11.40 | | 73.08 | -- | 3.70 | .00 | 6.87 | 73.91 | -- | -- | -- | 5,140 | 6.99 | 9,317 | 87 | 30.81 | 8,830 | 8.2 |
| Oct. 13-19..... | 3,540 | -- | 15.76 | | 107.01 | -- | 3.98 | .00 | 7.79 | 111.15 | -- | -- | -- | 7,400 | 10.06 | 35,632 | 87 | 38.12 | 12,100 | 8.2 |
| Oct. 20..... | 1,023 | -- | 12.10 | | 82.65 | -- | 3.87 | .33 | 8.54 | 81.81 | -- | -- | -- | 5,590 | 7.60 | 7,781 | 87 | 33.60 | 9,320 | 8.3 |
| Oct. 21..... | 1,718 | -- | 7.20 | | 32.23 | -- | 3.28 | .13 | 3.58 | 32.44 | -- | -- | -- | 2,330 | 3.17 | 5,443 | 82 | 16.99 | 4,120 | 8.3 |
| Oct. 22..... | 2,757 | -- | 8.20 | | 53.94 | -- | 3.02 | .00 | 4.79 | 54.16 | -- | -- | -- | 3,720 | 5.06 | 13,948 | 87 | 26.64 | 6,370 | 8.2 |
| Oct. 23-25..... | 3,749 | -- | 4.78 | | 18.23 | -- | 2.10 | .00 | 2.81 | 18.05 | -- | -- | -- | 1,350 | 1.84 | 6,883 | 79 | 11.81 | 2,410 | 7.8 |
| Oct. 26..... | 627 | -- | 8.70 | | 41.54 | -- | 3.21 | .00 | 4.68 | 42.32 | -- | -- | -- | 2,980 | 4.03 | 2,523 | 83 | 19.92 | 5,120 | 8.2 |
| Oct. 27-31..... | 2,965 | -- | 11.40 | | 71.34 | -- | 3.90 | .00 | 6.87 | 71.94 | -- | -- | -- | 4,810 | 6.54 | 19,398 | 86 | 29.88 | 8,140 | 7.9 |
| Nov. 1-5..... | 2,836 | -- | 12.60 | | 83.96 | -- | 4.23 | .00 | 7.50 | 84.63 | -- | -- | -- | 5,840 | 7.94 | 22,528 | 87 | 33.45 | 9,620 | 7.9 |
| Nov. 6-10..... | 2,608 | -- | 14.32 | | 103.53 | -- | 4.31 | .20 | 8.91 | 104.38 | -- | -- | -- | 7,080 | 9.63 | 25,114 | 88 | 38.69 | 11,700 | 8.4 |
| Nov. 11-27..... | 9,880 | -- | 14.32 | | 96.14 | -- | 4.67 | .07 | 8.70 | 96.76 | -- | -- | -- | 6,530 | 8.88 | 87,739 | 87 | 35.93 | 11,000 | 8.3 |
| Nov. 28-29..... | 4,213 | -- | 8.60 | | 56.99 | -- | 3.51 | .00 | 5.10 | 56.98 | -- | -- | -- | 3,860 | 5.25 | 22,116 | 87 | 27.48 | 8,840 | 8.0 |
| Nov. 30..... | 1,313 | -- | 7.00 | | 40.85 | -- | 2.92 | .20 | 4.37 | 40.34 | -- | -- | -- | 2,820 | 3.84 | 5,036 | 85 | 21.83 | 4,880 | 8.5 |
| Dec. 1-3..... | 3,767 | -- | 9.70 | | 64.82 | -- | 3.47 | .13 | 5.62 | 60.65 | -- | -- | -- | 4,320 | 5.88 | 22,130 | 87 | 29.43 | 7,030 | 8.3 |
| Dec. 4-7..... | 8,243 | -- | 7.32 | | 43.50 | -- | 2.82 | .00 | 4.27 | 43.73 | -- | -- | -- | 3,190 | 4.34 | 35,763 | 88 | 22.74 | 5,240 | 8.2 |
| Dec. 8-11..... | 3,872 | -- | 12.00 | | 81.35 | -- | 3.67 | .13 | 7.50 | 81.81 | -- | -- | -- | 5,730 | 7.79 | 30,172 | 87 | 33.21 | 9,250 | 8.4 |
| Dec. 12-15..... | 3,102 | -- | 15.32 | | 123.54 | -- | 4.38 | .27 | 9.33 | 124.97 | -- | -- | -- | 8,530 | 11.60 | 35,987 | 89 | 44.84 | 13,700 | 8.4 |
| Dec. 16-31..... | 11,012 | 14.0 | 9.53 | 4.44 | 97.44 | .19 | 4.49 | .40 | 8.68 | 96.76 | .02 | -- | .53 | 6,500 | 8.84 | 97,348 | 87 | 36.86 | 11,000 | 8.5 |

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Jan. 1-7, 1963.. | 4,651 | -- | 14.36 | | 94.83 | -- | 4.34 | 0.13 | 8.93 | 95.63 | -- | -- | -- | 6,586 | 8.96 | 41,661 | 87 | 35.39 | 10,600 | 8.3 |
| Jan. 8-10..... | 2,392 | -- | 15.54 | | 125.72 | -- | 4.31 | .27 | 10.26 | 126.38 | -- | -- | -- | 8,660 | 11.78 | 28,173 | 89 | 45.10 | 13,900 | 8.4 |
| Jan. 11-13..... | 7,914 | -- | 14.76 | | 92.22 | -- | 4.38 | .00 | 9.14 | 93.38 | -- | -- | -- | 6,480 | 8.81 | 69,745 | 86 | 33.95 | 10,600 | 8.2 |
| Feb. 1-5..... | 3,005 | -- | 14.00 | | 79.61 | -- | 4.06 | .00 | 7.70 | 81.81 | -- | -- | -- | 5,750 | 7.82 | 23,499 | 85 | 30.09 | 9,420 | 8.2 |
| Feb. 6-11..... | 4,308 | -- | 13.94 | | 94.40 | -- | 3.98 | .20 | 8.37 | 95.63 | -- | -- | -- | 6,600 | 8.98 | 38,669 | 87 | 35.75 | 10,800 | 8.3 |
| Feb. 12..... | 1,081 | -- | 17.08 | | 170.52 | -- | 2.74 | .07 | 10.95 | 173.77 | -- | -- | -- | 11,700 | 15.91 | 17,201 | 91 | 58.35 | 18,400 | 8.3 |
| Feb. 13..... | 1,031 | -- | 11.54 | | 103.53 | -- | 2.47 | .13 | 8.45 | 103.81 | -- | -- | -- | 7,160 | 9.74 | 10,043 | 90 | 43.10 | 11,600 | 8.4 |
| Feb. 14-20..... | 5,220 | -- | 11.60 | | 74.39 | -- | 3.87 | .27 | 7.08 | 74.76 | -- | -- | -- | 5,340 | 7.26 | 37,913 | 87 | 30.89 | 8,710 | 8.4 |
| Feb. 21-Mar. 7.. | 10,026 | 11.0 | 7.98 \| 5.35 | | 103.53 | 0.20 | 2.93 | .13 | 9.12 | 104.94 | 0.03 | -- | 0.51 | 6,870 | 9.34 | 93,679 | 88 | 40.10 | 11,700 | 8.3 |
| Mar. 8-10..... | 2,255 | -- | 12.00 | | 80.04 | -- | 1.90 | .00 | 8.33 | 81.81 | -- | -- | -- | 5,670 | 7.71 | 17,390 | 87 | 32.68 | 9,390 | 8.2 |
| Mar. 11-20..... | 6,426 | -- | 14.36 | | 100.05 | -- | 3.33 | .27 | 9.47 | 101.27 | -- | -- | -- | 7,040 | 9.57 | 61,529 | 87 | 37.34 | 11,500 | 8.4 |
| Mar. 21-30..... | 4,522 | -- | 15.72 | | 107.45 | -- | 3.72 | .20 | 9.54 | 109.45 | -- | -- | -- | 7,630 | 10.38 | 46,927 | 87 | 38.32 | 12,300 | 8.4 |
| Mar. 31..... | 833 | -- | 13.20 | | 80.48 | -- | 2.26 | .27 | 7.91 | 83.22 | -- | -- | -- | 5,820 | 7.92 | 6,594 | 86 | 31.32 | 9,500 | 8.4 |
| Apr. 1-2..... | 1,809 | -- | 8.60 | | 43.94 | -- | 3.54 | .00 | 4.62 | 44.57 | -- | -- | -- | 3,270 | 4.45 | 8,045 | 84 | 21.19 | 5,500 | 7.9 |
| Apr. 3-13..... | 5,956 | -- | 12.40 | | 71.34 | -- | 3.47 | .33 | 8.02 | 71.94 | -- | -- | -- | 5,110 | 6.95 | 41,394 | 85 | 28.65 | 8,360 | 8.4 |
| Apr. 14-19..... | 2,404 | -- | 14.74 | | 93.53 | -- | 3.49 | .27 | 9.22 | 95.07 | -- | -- | -- | 6,610 | 8.99 | 21,611 | 86 | 34.45 | 10,800 | 8.4 |
| Apr. 20..... | 524 | -- | 10.20 | | 56.55 | -- | 3.61 | .60 | 5.93 | 56.42 | -- | -- | -- | 4,000 | 5.44 | 2,849 | 85 | 25.04 | 6,740 | 8.6 |
| Apr. 21-24..... | 1,373 | -- | 12.30 | | 73.95 | -- | 3.77 | .07 | 7.70 | 74.76 | -- | -- | -- | 5,320 | 7.24 | 9,931 | 86 | 29.82 | 8,700 | 8.3 |
| Apr. 25-28..... | 2,713 | 15.0 | 3.79 \| 2.39 | | 22.88 | .12 | 3.74 | .00 | 3.08 | 22.85 | .02 | .08 | .24 | 1,730 | 2.35 | 6,384 | 78 | 13.02 | 3,100 | 8.2 |
| Apr. 29-30..... | 1,206 | -- | 9.00 | | 33.84 | -- | 4.03 | .13 | 4.83 | 33.85 | -- | -- | -- | 2,610 | 3.55 | 4,281 | 79 | 15.95 | 4,410 | 8.3 |
| May 1-3..... | 1,226 | -- | 9.80 | | 56.55 | -- | 3.08 | .13 | 6.87 | 56.42 | -- | -- | -- | 4,170 | 5.67 | 6,952 | 85 | 25.55 | 6,990 | 8.4 |
| May 4-5..... | 936 | -- | 12.76 | | 90.48 | -- | 2.62 | .07 | 10.39 | 89.99 | -- | -- | -- | 6,160 | 8.38 | 7,843 | 88 | 35.82 | 10,100 | 8.3 |
| May 6-13..... | 2,475 | -- | 11.60 | | 63.51 | -- | 2.95 | .13 | 8.64 | 63.47 | -- | -- | -- | 4,580 | 6.23 | 15,419 | 85 | 26.37 | 7,600 | 8.5 |
| May 14-15..... | 730 | -- | 10.40 | | 56.55 | -- | 3.61 | .00 | 6.45 | 57.83 | -- | -- | -- | 4,000 | 5.44 | 3,971 | 84 | 24.80 | 6,760 | 8.0 |
| May 16-19..... | 4,276 | -- | 5.00 | | 18.40 | -- | 2.69 | .07 | 3.12 | 17.49 | -- | -- | -- | 1,390 | 1.89 | 8,084 | 79 | 11.64 | 2,440 | 8.4 |
| May 20-22..... | 1,065 | -- | 11.80 | | 61.34 | -- | 3.28 | .13 | 8.33 | 61.50 | -- | -- | -- | 4,430 | 6.02 | 6,417 | 84 | 25.25 | 7,330 | 8.4 |
| May 23-25..... | 815 | -- | 12.00 | | 51.77 | -- | 3.61 | .13 | 7.81 | 52.19 | -- | -- | -- | 3,850 | 5.24 | 4,268 | 81 | 21.13 | 6,610 | 8.4 |
| May 26..... | 748 | -- | 6.96 | | 32.63 | -- | 2.13 | .13 | 4.00 | 33.29 | -- | -- | -- | 2,260 | 3.07 | 2,298 | 82 | 17.49 | 4,200 | 8.4 |
| May 27..... | 1,500 | -- | 4.72 | | 14.88 | -- | 2.59 | .13 | 2.19 | 14.67 | -- | -- | -- | 1,150 | 1.56 | 2,345 | 76 | 9.68 | 2,100 | 8.4 |
| May 28..... | 1,162 | -- | 6.24 | | 24.88 | -- | 2.75 | .20 | 3.33 | 24.82 | -- | -- | -- | 1,780 | 2.42 | 2,814 | 80 | 14.09 | 3,290 | 8.4 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May 29, 1963.... | 1,012 | -- | 8.90 | 57.86 | -- | 2.66 | 0.27 | 6.04 | 57.83 | -- | -- | -- | 3,940 | 5.36 | 5,420 | 87 | 27.43 | 6,890 | 8.4 |
| May 30..... | 754 | -- | 4.76 | 22.66 | -- | 2.26 | .07 | 3.08 | 22.00 | -- | -- | -- | 1,610 | 2.19 | 1,650 | 83 | 14.69 | 2,950 | 8.4 |
| May 31..... | 579 | -- | 9.70 | 52.20 | -- | 2.49 | .13 | 6.25 | 53.03 | -- | -- | -- | 3,680 | 4.98 | 2,883 | 84 | 23.70 | 6,390 | 8.4 |
| June 1..... | 1,160 | -- | 7.88 | 29.67 | -- | 2.69 | .27 | 6.08 | 28.49 | -- | -- | -- | 2,320 | 3.16 | 3,661 | 79 | 14.95 | 3,910 | 8.5 |
| June 2-3..... | 1,587 | -- | 4.80 | 13.75 | -- | 2.49 | .07 | 2.60 | 13.40 | -- | -- | -- | 1,300 | 1.77 | 2,805 | 74 | 8.87 | 1,930 | 8.3 |
| June 4-6..... | 2,487 | -- | 8.40 | 36.41 | -- | 2.79 | .27 | 5.62 | 36.11 | -- | -- | -- | 2,660 | 3.62 | 8,998 | 81 | 17.77 | 4,580 | 8.5 |
| June 7-13..... | 10,177 | -- | 14.72 | 113.10 | -- | 2.38 | .00 | 10.37 | 115.10 | -- | -- | -- | 7,890 | 10.73 | 109,205 | 88 | 41.69 | 13,000 | 8.2 |
| June 14..... | 2,023 | -- | 14.92 | 170.09 | -- | 2.80 | .27 | 10.97 | 170.95 | -- | -- | -- | 10,900 | 14.82 | 29,991 | 92 | 62.27 | 17,700 | 8.4 |
| June 15-23..... | 30,668 | -- | 18.60 | 60.04 | -- | 2.29 | .13 | 7.18 | 88.86 | -- | -- | -- | 5,880 | 8.00 | 245,249 | 81 | 26.25 | 9,890 | 8.3 |
| June 24-26..... | 151,557 | 18.0 | 3.34 \| 1.07 | 19.36 | .15 | 1.97 | .00 | 2.60 | 19.18 | .02 | .08 | .09 | 1,420 | 1.93 | 292,687 | 81 | 13.03 | 2,520 | 8.2 |
| June 27-29..... | 27,372 | -- | 4.92 | 26.01 | -- | 1.84 | .00 | 3.12 | 25.95 | -- | -- | -- | 1,910 | 2.60 | 71,101 | 84 | 16.59 | 3,330 | 8.2 |
| June 30-July 2.. | 9,164 | -- | 6.40 | 37.45 | -- | 2.29 | .13 | 4.16 | 37.24 | -- | -- | -- | 2,640 | 3.59 | 32,901 | 85 | 20.94 | 4,590 | 8.5 |
| July 3-4..... | 3,864 | -- | 7.80 | 45.24 | -- | 2.36 | .20 | 5.31 | 45.14 | -- | -- | -- | 3,190 | 4.34 | 16,763 | 85 | 22.91 | 5,440 | 8.5 |
| July 5-6..... | 3,062 | -- | 9.20 | 54.81 | -- | 2.69 | .07 | 6.35 | 55.01 | -- | -- | -- | 3,920 | 5.33 | 16,327 | 86 | 25.56 | 8,570 | 8.3 |
| July 7-12..... | 13,293 | -- | 10.00 | 67.43 | -- | 1.80 | .13 | 7.18 | 68.27 | -- | -- | -- | 4,660 | 6.34 | 84,247 | 87 | 30.15 | 7,950 | 8.3 |
| July 13..... | 22,017 | -- | 2.92 | 8.79 | -- | 1.84 | .00 | 1.12 | 8.75 | -- | -- | -- | 701 | .95 | 20,990 | 75 | 7.27 | 1,290 | 8.2 |
| July 14..... | 13,507 | -- | 1.76 | 3.44 | -- | 1.48 | .00 | .56 | 3.16 | -- | -- | -- | 301 | .41 | 5,529 | 66 | 3.86 | 544 | 8.2 |
| July 15-17..... | 34,988 | -- | 2.40 | 6.83 | -- | 1.25 | .20 | .77 | 7.00 | -- | -- | -- | 576 | .78 | 27,409 | 74 | 6.23 | 1,040 | 8.6 |
| July 18-19..... | 5,812 | -- | 3.44 | 13.27 | -- | 1.41 | .00 | 2.19 | 13.12 | -- | -- | -- | 1,010 | 1.37 | 7,983 | 79 | 10.12 | 1,800 | 8.2 |
| July 20-21..... | 4,681 | -- | 8.40 | 65.69 | -- | 2.13 | .13 | 5.62 | 66.29 | -- | -- | -- | 4,520 | 6.15 | 28,775 | 89 | 32.05 | 7,710 | 8.3 |
| July 22..... | 1,690 | -- | 8.00 | 44.37 | -- | 2.23 | .13 | 5.41 | 44.57 | -- | -- | -- | 3,170 | 4.31 | 7,286 | 85 | 22.19 | 5,370 | 8.3 |
| July 23-24..... | 2,404 | -- | 10.40 | 74.39 | -- | 2.62 | .20 | 7.08 | 74.76 | -- | -- | -- | 5,040 | 6.85 | 16,478 | 88 | 32.62 | 8,490 | 8.3 |
| July 25-27..... | 2,707 | -- | 8.40 | 52.64 | -- | 3.05 | .33 | 5.62 | 52.19 | -- | -- | -- | 3,690 | 5.02 | 13,587 | 86 | 25.68 | 6,290 | 8.5 |
| July 28-29..... | 11,766 | -- | 6.80 | 30.62 | -- | 2.75 | .13 | 1.87 | 32.44 | -- | -- | -- | 2,360 | 3.21 | 37,764 | 82 | 16.86 | 4,090 | 8.4 |
| July 30-31..... | 24,476 | -- | 2.08 | 3.83 | -- | 1.51 | .00 | .77 | 3.61 | -- | -- | -- | 343 | .47 | 11,418 | 65 | 3.75 | 629 | 7.9 |
| Aug. 1-4..... | 6,648 | -- | 4.24 | 12.16 | -- | 1.97 | .00 | 2.46 | 11.99 | -- | -- | -- | 999 | 1.36 | 11,749 | 74 | 8.37 | 1,740 | 8.2 |
| Aug. 5..... | 1,081 | -- | 7.60 | 27.62 | -- | 2.82 | .13 | 4.33 | 27.93 | -- | -- | -- | 2,160 | 2.94 | 3,176 | 78 | 14.17 | 3,680 | 8.3 |
| Aug. 6-7..... | 1,666 | -- | 12.56 | 98.75 | -- | 2.66 | .13 | 7.06 | 101.27 | -- | -- | -- | 6,560 | 8.92 | 15,041 | 89 | 39.40 | 11,000 | 8.4 |
| Aug. 8-13..... | 3,784 | -- | 9.20 | 64.38 | -- | 3.31 | .13 | 5.31 | 64.88 | -- | -- | -- | 4,400 | 5.98 | 22,646 | 87 | 30.02 | 7,540 | 8.4 |
| Aug. 14-15..... | 2,071 | -- | 8.80 | 53.07 | -- | 3.05 | .00 | 5.41 | 53.60 | -- | -- | -- | 3,750 | 5.10 | 10,561 | 86 | 25.30 | 6,430 | 8.0 |

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Aug. 16-19,1963. | 2,301 | -- | 6.40 | | 31.15 | -- | 2.69 | 0.27 | 3.54 | 31.03 | -- | -- | -- | 2,210 | 3.01 | 6,915 | 83 | 17.41 | 3,880 | 8.5 |
| Aug. 20..... | 397 | -- | 7.30 | | 44.81 | -- | 1.84 | .00 | 4.58 | 45.70 | -- | -- | -- | 3,090 | 4.20 | 1,667 | 86 | 23.45 | 5,380 | 8.1 |
| Aug. 21-23..... | 1,160 | -- | 9.80 | | 58.29 | -- | 2.62 | .00 | 5.73 | 59.81 | -- | -- | -- | 4,080 | 5.55 | 6,438 | 86 | 26.33 | 6,950 | 8.2 |
| Aug. 24-26..... | 1,125 | -- | 12.00 | | 77.00 | -- | 3.08 | .27 | 9.47 | 76.17 | -- | -- | -- | 5,240 | 7.13 | 8,015 | 87 | 31.43 | 8,800 | 8.5 |
| Aug. 27-Sept 5.. | 3,669 | -- | 9.10 | | 53.51 | -- | 2.66 | .00 | 6.25 | 53.60 | -- | -- | -- | 3,700 | 5.03 | 18,465 | 85 | 25.08 | 6,420 | 8.1 |
| Sept. 6..... | 4,979 | -- | 15.82 | | 130.50 | -- | 2.08 | .00 | 9.54 | 13.48 | -- | -- | -- | 8,630 | 11.74 | 58,432 | 89 | 46.40 | 14,100 | 8.1 |
| Sept. 7..... | 12,655 | -- | 5.12 | | 50.90 | -- | 2.39 | .00 | 2.87 | 50.78 | -- | -- | -- | 3,330 | 4.53 | 57,310 | 91 | 31.81 | 5,990 | 8.2 |
| Sept. 8-13..... | 21,874 | -- | 4.20 | | 31.80 | -- | 1.51 | .00 | 2.87 | 31.60 | -- | -- | -- | 2,120 | 2.88 | 63,066 | 88 | 21.94 | 3,800 | 8.0 |
| Sept. 14-15..... | 4,586 | -- | 4.52 | | 18.66 | -- | 1.70 | .20 | 2.66 | 18.62 | -- | -- | -- | 1,400 | 1.90 | 8,731 | 81 | 12.41 | 2,490 | 8.4 |
| Sept. 16..... | 1,799 | -- | 6.00 | | 40.24 | -- | 1.31 | .00 | 4.00 | 40.90 | -- | -- | -- | 2,730 | 3.71 | 6,679 | 87 | 23.23 | 4,760 | 8.1 |
| Sept. 17..... | 21,421 | -- | 2.80 | | 10.88 | -- | 1.77 | .13 | 1.00 | 10.78 | -- | -- | -- | 784 | 1.07 | 22,840 | 80 | 9.19 | 1,500 | 8.4 |
| Sept. 18-19..... | 22,929 | -- | 1.52 | | 3.61 | -- | 1.05 | .27 | .58 | 3.24 | -- | -- | -- | 294 | .40 | 9,168 | 70 | 4.14 | 539 | 8.4 |
| Sept. 20..... | 2,083 | -- | 2.92 | | 9.61 | -- | 1.67 | .00 | 1.25 | 9.59 | -- | -- | -- | 744 | 1.01 | 2,107 | 77 | 7.98 | 1,360 | 8.1 |
| Sept. 21-22..... | 2,670 | -- | 6.00 | | 30.75 | -- | 2.69 | .13 | 2.91 | 31.03 | -- | -- | -- | 2,140 | 2.91 | 7,770 | 84 | 17.76 | 3,790 | 8.4 |
| Sept. 23-30..... | 6,236 | -- | 8.80 | | 51.77 | -- | 2.95 | .00 | 4.06 | 53.60 | -- | -- | -- | 3,700 | 5.03 | 31,380 | 85 | 24.68 | 6,430 | 8.3 |
| Total or weighted average | 672,400 | -- | 7.20 | | 41.43 | -- | 2.33 | 0.08 | 4.09 | 41.16 | -- | -- | -- | 2,920 | 3.98 | 2,673,400 | 82 | 19.5 | 4,965 | 8.2 |

## 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, 8.8 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 1963.
Water temperatures: October 1945 to September 1963.
EXTREMES, 1962-83.--Specific conductance: Maximum daily, 8,860 micromhos July 10; minimum daily, 404 micromhos Nov. 2.
Percent sodium: Maximum, 80 June 24-25; minimum, 47 Mar. 15-23.
Sodium-adsorption-ratio: Maximum, 15.52 June 24-25, minimum, 2.37 Mar. 15-23.
EXTREMES, 1945-83.--Specific conductance: Maximum daily, 8,980 micromhos, Apr. 1, 1954; minimum daily, 132 micromhos May 11, 1948.
Percent sodium: Maximum, 80 Oct. 21-24, 1946, Aug. 3-4, 1956, June 24-25, 1963; minimum, 18 July 22, 1959.
Sodium-adsorption-ratio (1961-63): Maximum, 15.52 June 24-25, 1963; minimum 1.73 Oct. 10-31, 1961.
REMARKS.--Records of specific conductance of daily samples available in district office at Little Rock, Ark.

Chemical analyses, water year October 1962 to September 1963

| 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. 23-26, 1962 | 193,190 | 11.0 | 2.35 | 0.77 | 3.57 | 0.09 | 2.07 | 0.00 | 1.06 | 3.55 | 0.02 | 0.04 | | 421 | 0.57 | 110,613 | 53 | 2.86 | 713 | 7.1 |
| Nov. 8-15..... | 345,917 | 14.0 | 2.15 | .78 | 2.87 | .09 | 1.98 | .00 | .94 | 2.88 | .02 | .03 | | 365 | .50 | 171,713 | 49 | 2.37 | 610 | 7.5 |
| Dec. 27-29..... | 65,455 | 13.0 | 3.19 | 1.23 | 7.92 | .09 | 2.67 | .00 | 1.58 | 7.90 | .02 | .05 | | 749 | 1.02 | 66,875 | 84 | 5.32 | 1,280 | 7.7 |
| Jan. 10-14, 1963 | 183,471 | 9.9 | 2.84 | .99 | 4.48 | .08 | 2.36 | .00 | 1.21 | 4.65 | .02 | .05 | | 520 | .71 | 129,751 | 53 | 3.24 | 883 | 7.6 |
| Feb. 24-28..... | 55,299 | 8.6 | 4.29 | 1.81 | 13.27 | .10 | 3.54 | .00 | 2.50 | 13.26 | .03 | .04 | | 1,160 | 1.58 | 87,240 | 68 | 7.60 | 1,990 | 7.6 |
| Mar. 15-23..... | 481,805 | 7.8 | 2.89 | 1.07 | 3.65 | .11 | 2.49 | .00 | 1.29 | 3.66 | .03 | .05 | | 499 | .68 | 326,972 | 47 | 2.60 | 841 | 8.2 |
| Apr. 14-25..... | 109,821 | 6.0 | 3.64 | 1.56 | 7.53 | .16 | 3.16 | .00 | 1.83 | 7.79 | .03 | .01 | | 863 | 1.17 | 128,895 | 58 | 4.66 | 1,440 | 8.2 |
| May 26-27..... | 17,137 | 2.4 | 3.69 | 2.80 | 11.09 | .13 | 2.80 | .40 | 2.08 | 12.55 | .04 | .01 | | 1,100 | 1.50 | 25,637 | 63 | 6.16 | 1,890 | 8.5 |
| June 24-25..... | 13,488 | 7.9 | 4.89 | 2.55 | 29.93 | .26 | 3.00 | .13 | 3.54 | 31.03 | .04 | .00 | | 2,250 | 3.06 | 41,272 | 80 | 15.52 | 4,060 | 8.3 |
| July 3-5..... | 67,061 | 20.0 | 4.24 | 1.73 | 20.92 | .22 | 2.62 | .00 | 3.12 | 21.33 | .03 | .01 | | 1,630 | 2.22 | 148,661 | 77 | 12.11 | 2,930 | 7.6 |
| Aug. 5-10..... | 92,505 | 15.0 | 2.25 | .99 | 5.05 | .09 | 1.93 | .13 | 1.27 | 5.02 | .02 | .05 | 0.08 | 498 | .68 | 62,652 | 60 | 3.97 | 940 | 8.4 |
| Aug. 28..... | 6,545 | 1.9 | 2.99 | 1.23 | 5.57 | .09 | 2.74 | .00 | 1.48 | 5.50 | .01 | .02 | | 600 | .82 | 5,341 | 56 | 3.83 | 1,040 | 8.2 |
| Sept. 1-4..... | 23,088 | 7.2 | 3.09 | 1.56 | 7.44 | .12 | 2.39 | .17 | 2.04 | 7.67 | .04 | .07 | | 746 | 1.01 | 23,424 | 61 | 4.87 | 1,340 | 8.4 |

ARKANSAS RIVER BASIN--Continued

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

LOCATION.--At gaging station near right bank on downstream side of pier of bridge on State Highway 2, 0.8 mile north of Whitefield, Haskell County, 5.5 miles upstream from Snake Creek, 8.2 miles downstream from Eufaula Dam, and at mile 18.8.
DRAINAGE AREA.--47,576 square miles, of which 9,700 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: September 1944 to February 1945, September 1946 to September 1963.
Water temperatures: September 1944 to February 1945, September 1946 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,950 Sept. 14; minimum daily, 261 Oct. 31.
Percent sodium: Maximum, 65 Aug. 27 to Sept. 16; minimum, 29 Dec. 21.
Sodium-adsorption-ratio: Maximum, 6.33 Sept. 14-16; minimum, 0.85 Dec. 21.
EXTREMES, 1944-45, 1946-63.--Specific conductance: Maximum daily, 22,900 micromhos Nov. 11, 1956; minimum daily, 71 micromhos Jan. 2, 1948.
Percent sodium: Maximum, 80 Nov. 6-14, Dec. 21-23, 1947; minimum, 21 Mar. 5, 1959.
Sodium-adsorption-ratio (1951-63): Maximum, 33 Nov. 11, 1956; minimum, 0.4 Mar. 5, 1959.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Oklahoma City, Okla.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-5, 1962.. | 10,324 | -- | 3.80 | | 3.87 | -- | 2.13 | 0.00 | 1.50 | 4.06 | -- | -- | -- | 476 | 0.65 | 6,683 | 50 | 2.81 | 820 | 7.1 |
| Oct. 6-9..... | 5,006 | -- | 4.32 | | 4.74 | -- | 2.56 | .00 | 1.39 | 5.11 | -- | -- | -- | 559 | .76 | 3,806 | 52 | 3.23 | 956 | 7.7 |
| Oct. 10-13..... | 7,553 | -- | 2.96 | | 3.31 | -- | 1.77 | .00 | 1.02 | 3.47 | -- | -- | -- | 389 | .53 | 3,996 | 53 | 2.72 | 669 | 7.5 |
| Oct. 14-16..... | 8,807 | -- | 2.56 | | 2.61 | -- | 1.61 | .00 | .96 | 2.60 | -- | -- | -- | 321 | .44 | 3,845 | 50 | 2.31 | 547 | 7.8 |
| Oct. 17-19..... | 5,617 | -- | 3.40 | | 3.78 | -- | 2.03 | .00 | .94 | 4.23 | -- | -- | -- | 451 | .61 | 3,445 | 53 | 2.90 | 769 | 8.0 |
| Oct. 20..... | 1,341 | -- | 4.52 | | 5.18 | -- | 2.33 | .00 | 1.17 | 6.21 | -- | -- | -- | 606 | .82 | 1,105 | 53 | 3.44 | 1,010 | 8.2 |
| Oct. 21-24..... | 4,292 | -- | 3.28 | | 4.05 | -- | 1.84 | .00 | 1.04 | 4.46 | -- | -- | -- | 472 | .64 | 2,755 | 55 | 3.16 | 777 | 7.6 |
| Oct. 25-27..... | 5,290 | -- | 5.28 | | 5.00 | -- | 2.36 | .00 | 2.96 | 4.94 | -- | -- | -- | 645 | .88 | 4,640 | 49 | 3.08 | 1,060 | 7.9 |
| Oct. 28..... | 3,471 | -- | 4.44 | | 4.44 | -- | 2.20 | .00 | 2.37 | 4.29 | -- | -- | -- | 559 | .76 | 2,639 | 50 | 2.98 | 903 | 8.2 |
| Oct. 29..... | 50,380 | -- | 2.84 | | 2.13 | -- | 2.03 | .00 | 1.04 | 1.92 | -- | -- | -- | 309 | .42 | 21,172 | 43 | 1.79 | 525 | 8.1 |
| Oct. 30-31..... | 53,355 | -- | 1.80 | | 1.17 | -- | 1.51 | .00 | .37 | 1.10 | -- | -- | -- | 181 | .25 | 13,134 | 39 | 1.24 | 312 | 7.9 |
| Nov. 1..... | 6,942 | -- | 2.24 | | 1.87 | -- | 1.54 | .07 | .48 | 2.03 | -- | -- | -- | 280 | .38 | 2,644 | 46 | 1.77 | 429 | 8.3 |
| Nov. 2-3..... | 6,684 | -- | 3.16 | | 3.74 | -- | 1.87 | .00 | .65 | 4.37 | -- | -- | -- | 405 | .55 | 3,682 | 54 | 2.98 | 741 | 8.1 |
| Nov. 4-7..... | 9,481 | -- | 4.12 | | 4.79 | -- | 2.20 | .00 | .85 | 5.87 | -- | -- | -- | 591 | .80 | 7,620 | 54 | 3.33 | 981 | 7.9 |
| Nov. 8-9..... | 10,076 | -- | 2.80 | | 3.00 | -- | 1.80 | .00 | .65 | 3.36 | -- | -- | -- | 363 | .49 | 4,974 | 52 | 2.54 | 624 | 7.9 |
| Nov. 10-27..... | 51,876 | 10.0 | 2.94 | 1.73 | 5.22 | 0.12 | 2.66 | .00 | 1.08 | 6.26 | -- | -- | -- | 618 | .84 | 43,600 | 52 | 3.42 | 1,070 | 8.2 |
| Nov. 28-30..... | 66,823 | -- | 2.32 | | 1.65 | -- | 1.48 | .00 | .48 | 2.00 | -- | -- | -- | 253 | .34 | 22,993 | 42 | 1.53 | 422 | 7.7 |
| Dec. 1-7..... | 52,746 | -- | 2.92 | | 2.74 | -- | 1.80 | .00 | .81 | 3.05 | -- | -- | -- | 376 | .51 | 26,972 | 48 | 2.27 | 604 | 7.6 |
| Dec. 8-20..... | 37,105 | -- | 5.12 | | 4.74 | -- | 2.88 | .13 | 1.48 | 5.36 | -- | -- | -- | 662 | .90 | 33,406 | 48 | 2.96 | 1,020 | 8.4 |
| Dec. 21..... | 43,636 | -- | 2.08 | | .87 | -- | 1.38 | .00 | .56 | 1.02 | -- | -- | -- | 217 | .30 | 12,878 | 29 | .85 | 330 | 8.2 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec. 22-27, 1962 | 71,345 | -- | 2.58 | 2.39 | -- | 1.77 | .00 | 0.60 | 2.60 | -- | -- | -- | 333 | .45 | 32,311 | 48 | 2.11 | 526 | 8.1 |
| Dec. 28-31..... | 11,464 | -- | 4.20 | 3.65 | -- | 2.62 | .00 | 1.19 | 4.06 | -- | -- | -- | 530 | .72 | 8,264 | 47 | 2.52 | 811 | 8.2 |
| Jan. 1-5, 1963.. | 12,833 | -- | 5.32 | 4.87 | -- | 3.18 | .00 | 1.52 | 5.50 | -- | -- | -- | 660 | .90 | 11,519 | 48 | 2.99 | 1,030 | 8.2 |
| Jan. 6-8..... | 14,204 | -- | 3.88 | 3.74 | -- | 2.33 | .00 | 1.17 | 4.12 | -- | -- | -- | 502 | .68 | 9,697 | 49 | 2.69 | 795 | 8.2 |
| Jan. 9-15..... | 17,744 | 14.0 | 3.19 \| 1.81 | 4.92 | .10 | 2.75 | .00 | 1.62 | 5.64 | .02 | .04 | -- | 644 | .88 | 15,541 | 49 | 3.11 | 1,040 | 8.3 |
| Jan. 16-31..... | 20,184 | -- | 6.88 | 7.48 | -- | 3.51 | .13 | 2.12 | 8.60 | -- | -- | -- | 896 | 1.22 | 24,595 | 52 | 4.03 | 1,440 | 8.3 |
| Feb. 1-15..... | 21,838 | -- | 7.68 | 7.74 | -- | 3.97 | .33 | 2.25 | 8.89 | -- | -- | -- | 959 | 1.30 | 28,482 | 50 | 3.95 | 1,530 | 8.4 |
| Feb. 16-28..... | 17,224 | -- | 8.50 | 8.66 | -- | 4.06 | .00 | 3.29 | 9.82 | -- | -- | -- | 1,080 | 1.47 | 25,299 | 50 | 4.20 | 1,700 | 8.1 |
| Mar. 1-13..... | 38,600 | 7.8 | 3.59 \| 2.96 | 7.31 | .12 | 2.85 | .00 | 2.71 | 8.69 | .02 | .01 | .21 | 883 | 1.20 | 46,354 | 52 | 4.04 | 1,490 | 7.8 |
| Mar. 14-20..... | 27,060 | -- | 4.48 | 4.79 | -- | 2.29 | .00 | 1.46 | 5.50 | -- | -- | -- | 601 | .82 | 22,118 | 52 | 3.20 | 982 | 8.0 |
| Mar. 21-23..... | 15,965 | -- | 3.24 | 3.13 | -- | 1.90 | .00 | 1.25 | 3.22 | -- | -- | -- | 408 | .55 | 8,859 | 49 | 2.46 | 668 | 7.9 |
| Mar. 21-Apr. 1.. | 30,579 | -- | 4.96 | 5.35 | -- | 2.52 | .00 | 1.56 | 6.21 | -- | -- | -- | 673 | .92 | 27,989 | 52 | 3.40 | 1,110 | 7.8 |
| Apr. 2-4..... | 43,753 | -- | 3.28 | 3.39 | -- | 2.16 | .00 | .77 | 3.72 | -- | -- | -- | 407 | .55 | 24,218 | 51 | 2.65 | 705 | 8.0 |
| Apr. 5-16..... | 37,464 | -- | 4.72 | 4.70 | -- | 2.62 | .07 | 1.60 | 5.13 | -- | -- | -- | 562 | .76 | 28,634 | 50 | 3.06 | 982 | 8.4 |
| Apr. 17-26..... | 10,929 | -- | 6.00 | 6.79 | -- | 3.15 | .27 | 1.60 | 7.76 | -- | -- | -- | 784 | 1.07 | 11,653 | 53 | 3.92 | 1,300 | 8.5 |
| Apr. 27-28..... | 97,388 | -- | 3.60 | 3.74 | -- | 2.36 | .00 | .73 | 4.23 | -- | -- | -- | 438 | .60 | 58,012 | 51 | 2.79 | 780 | 8.0 |
| Apr. 29-May 2... | 178,909 | -- | 2.24 | 1.65 | -- | 1.64 | .00 | .44 | 1.81 | -- | -- | -- | 243 | .33 | 59,126 | 42 | 1.56 | 417 | 8.0 |
| May 3-7..... | 48,790 | 12.0 | 1.95 \| .90 | 2.87 | .10 | 1.90 | .13 | .67 | 2.93 | .02 | .04 | .08 | 356 | .48 | 22,654 | 49 | 2.40 | 579 | 8.4 |
| May 8-10..... | 10,907 | -- | 3.84 | 3.87 | -- | 2.46 | .13 | .77 | 4.34 | -- | -- | -- | 466 | .63 | 6,912 | 50 | 2.79 | 797 | 8.4 |
| May 11-18..... | 14,503 | -- | 4.80 | 5.35 | -- | 2.69 | .20 | .90 | 6.35 | -- | -- | -- | 604 | .82 | 11,913 | 53 | 3.45 | 1,050 | 8.5 |
| May 19-28..... | 13,269 | -- | 5.76 | 7.74 | -- | 2.95 | .33 | 1.06 | 9.17 | -- | -- | -- | 804 | 1.09 | 14,509 | 57 | 4.56 | 1,390 | 8.5 |
| May 29-30..... | 15,987 | -- | 3.72 | 4.74 | -- | 1.93 | .00 | .62 | 5.92 | -- | -- | -- | 544 | .74 | 11,828 | 56 | 3.48 | 913 | 8.2 |
| May 31-June 2... | 12,835 | -- | 2.72 | 3.61 | -- | 1.38 | .00 | .46 | 4.51 | -- | -- | -- | 435 | .59 | 7,593 | 57 | 3.10 | 702 | 8.2 |
| June 3-9..... | 12,801 | -- | 3.88 | 5.61 | -- | 2.03 | .20 | .62 | 6.63 | -- | -- | -- | 597 | .81 | 10,394 | 59 | 4.03 | 1,020 | 8.4 |
| June 10-27..... | 30,918 | -- | 6.80 | 8.87 | -- | 3.08 | .00 | 4.06 | 8.52 | -- | -- | -- | 1,020 | 1.39 | 42,890 | 57 | 4.81 | 1,610 | 8.1 |
| June 28-July 2.. | 7,458 | -- | 5.08 | 8.18 | -- | 2.43 | .00 | 3.33 | 5.50 | -- | -- | -- | 716 | .97 | 7,262 | 55 | 3.88 | 1,160 | 8.3 |

ARKANSAS RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| July 3-12, 1962. | 12,833 | -- | 5.88 | | 7.79 | -- | 2.66 | 0.20 | 1.87 | 8.75 | -- | -- | -- | 859 | 1.17 | 14,992 | 58 | 4.62 | 1,420 | 8.4 |
| July 13-15..... | 23,165 | -- | 3.12 | | 3.31 | -- | 1.97 | .00 | .67 | 3.78 | -- | -- | -- | 397 | .54 | 12,507 | 51 | 2.65 | 677 | 8.2 |
| July 16-18..... | 10,104 | -- | 1.84 | | 2.13 | -- | 1.25 | .00 | .37 | 2.37 | -- | -- | -- | 257 | .35 | 3,531 | 54 | 2.22 | 432 | 7.8 |
| July 19..... | 934 | -- | 2.80 | | 3.44 | -- | 1.64 | .00 | .58 | 4.01 | -- | -- | -- | 412 | .56 | 523 | 55 | 2.90 | 681 | 8.1 |
| July 20-23..... | 2,380 | -- | 3.52 | | 3.61 | -- | 1.84 | .00 | .08 | 5.19 | -- | 0.01 | -- | 533 | .72 | 1,725 | 51 | 2.72 | 812 | 6.2 |
| July 24-29..... | 2,440 | -- | 4.24 | | 6.66 | -- | 2.23 | .00 | 1.06 | 7.62 | -- | -- | -- | 697 | .95 | 2,313 | 61 | 4.57 | 1,160 | 8.2 |
| July 30..... | 9,322 | -- | 3.44 | | 4.57 | -- | 1.80 | .00 | .75 | 5.44 | -- | -- | -- | 509 | .69 | 8,453 | 57 | 3.48 | 865 | 8.2 |
| July 31-Aug. 3.. | 56,767 | -- | 1.92 | | 2.04 | -- | 1.31 | .00 | .44 | 2.20 | -- | -- | -- | 248 | .34 | 19,146 | 52 | 2.09 | 432 | 8.1 |
| Aug. 4-11..... | 15,455 | -- | 2.88 | | 4.05 | -- | 1.67 | .00 | .73 | 4.51 | -- | -- | -- | 511 | .69 | 10,741 | 58 | 3.37 | 716 | 8.2 |
| Aug. 12-18..... | 4,360 | -- | 3.68 | | 3.61 | -- | 2.46 | .07 | .73 | 4.01 | -- | -- | -- | 432 | .59 | 2,581 | 50 | 2.66 | 773 | 8.3 |
| Aug. 19-22..... | 1,317 | -- | 4.48 | | 4.35 | -- | 2.75 | .20 | .79 | 5.08 | -- | -- | -- | 517 | .70 | 926 | 49 | 2.91 | 915 | 8.4 |
| Aug. 23-26..... | 889 | -- | 4.56 | | 5.61 | -- | 2.92 | .07 | .81 | 8.35 | -- | -- | -- | 588 | .80 | 711 | 55 | 3.72 | 1,050 | 8.3 |
| Aug. 27-Sept. 13 | 3,085 | -- | 4.28 | | 7.87 | -- | 2.07 | .00 | 1.02 | 9.08 | -- | -- | -- | 724 | .98 | 3,037 | 85 | 5.38 | 1,330 | 7.9 |
| Sept. 14-16..... | 958 | -- | 5.76 | | 10.74 | -- | 2.62 | .00 | 1.23 | 12.64 | -- | -- | -- | 978 | 1.33 | 1,274 | 65 | 8.33 | 1,760 | 7.9 |
| Sept. 17-30..... | 3,082 | -- | 5.04 | | 7.53 | -- | 2.43 | .00 | 1.10 | 9.03 | -- | -- | -- | 747 | 1.02 | 3,131 | 60 | 4.74 | 1,360 | 8.0 |
| Total or weighted average | 1,421,000 | -- | 3.60 | | 3.65 | -- | 2.13 | 0.03 | 1.03 | 4.08 | -- | -- | -- | 450 | 0.83 | 888,200 | 60 | 2.60 | 764 | 8.0 |

## 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.
DRAINAGE AREA.--7,202 square miles.
RECORDS AVAILABLE.--Chemical analyses: May 1944 to September 1963.
Water temperatures: April 1947 to September 1983.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,920 micromhos July 28; minimum daily, 318 micromhos Oct. 29.
Percent sodium: Maximum, 40 Aug. 9-17, 19-30; minimum, 11 Oct. 27.
Sodium-adsorption-ratio: Maximum, 2.82 Sept. 12; minimum, 0.50 Oct. 27.
EXTREMES, 1944-63.--Specific conductance: Maximum daily, 1,920 micromhos July 28, 1963; minimum daily, 94.9 micromhos Nov. 2, 1951.
REMARKS.--Records of specific conductance of daily samples available in district office at Oklahoma City, Okla.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-10, 1962. | 9,679 | -- | 8.08 | 2.55 | 2.04 | -- | 3.41 | 0.20 | 7.12 | 1.92 | -- | -- | 0.29 | 826 | 1.12 | 10,873 | 16 | 0.89 | 1,160 | 8.4 |
| Oct. 11-20..... | 9,382 | 11.0 | 7.39 | 3.78 | 3.18 | 0.13 | 2.95 | .13 | 9.12 | 2.54 | 0.02 | 0.02 | .20 | 972 | 1.32 | 12,402 | 22 | 1.34 | 1,290 | 8.3 |
| Oct. 21-26..... | 8,212 | -- | 9.98 | 4.36 | 3.57 | -- | 3.38 | .20 | 11.58 | 2.74 | -- | -- | .28 | 1,090 | 1.48 | 12,173 | 20 | 1.33 | 1,540 | 8.4 |
| Oct. 27..... | 1,765 | -- | 5.64 | 2.30 | 1.00 | -- | 2.00 | .07 | 6.04 | .82 | -- | -- | -- | 545 | .74 | 1,308 | 11 | .50 | 834 | 8.4 |
| Oct. 28-31..... | 43,716 | -- | 2.35 | .99 | .65 | -- | 2.00 | .00 | 1.31 | .65 | -- | -- | .09 | 260 | .35 | 15,458 | 16 | .51 | 412 | 8.2 |
| Nov. 1..... | 3,055 | -- | 3.49 | 1.40 | 1.22 | -- | 2.46 | .07 | 2.62 | .93 | -- | -- | .04 | 406 | .55 | 1,687 | 20 | .78 | 577 | 8.4 |
| Nov. 2..... | 2,975 | -- | 5.34 | 2.55 | 2.22 | -- | 2.92 | .40 | 5.52 | 1.27 | -- | -- | .06 | 614 | .84 | 2,484 | 22 | 1.12 | 906 | 8.6 |
| Nov. 3..... | 2,838 | -- | 4.04 | 1.97 | 1.31 | -- | 2.59 | .27 | 3.33 | 1.13 | -- | -- | .08 | 481 | .65 | 1,726 | 18 | .75 | 692 | 8.5 |
| Nov. 4-5..... | 3,729 | -- | 6.69 | 3.04 | 1.70 | -- | 3.44 | .20 | 8.35 | 1.41 | -- | -- | .12 | 760 | 1.03 | 3,854 | 15 | .77 | 1,040 | 8.4 |
| Nov. 6..... | 1,388 | -- | 4.89 | 2.14 | 1.83 | -- | 2.98 | .33 | 4.16 | 1.35 | -- | -- | .05 | 591 | .80 | 1,116 | 21 | .97 | 827 | 8.5 |
| Nov. 7-10..... | 9,505 | -- | 3.69 | 1.81 | 1.39 | -- | 2.92 | .00 | 2.60 | 1.33 | -- | -- | .09 | 453 | .62 | 5,856 | 20 | .84 | 675 | 8.2 |
| Nov. 11-25..... | 14,281 | -- | 6.89 | 4.44 | 3.00 | -- | 3.57 | .00 | 8.33 | 2.40 | -- | -- | .21 | 966 | 1.31 | 18,762 | 21 | 1.26 | 1,280 | 8.2 |
| Nov. 26-28..... | 18,607 | -- | 3.34 | 1.23 | 1.35 | -- | 2.59 | .07 | 2.25 | 1.04 | -- | -- | .08 | 381 | .52 | 9,641 | 23 | .89 | 583 | 8.3 |
| Nov. 19-Dec. 1.. | 6,766 | -- | 5.09 | 1.81 | 2.00 | -- | 3.51 | .20 | 3.68 | 1.50 | -- | -- | .07 | 554 | .75 | 5,097 | 22 | 1.08 | 818 | 8.4 |
| Dec. 2-11..... | 22,017 | -- | 5.99 | 2.55 | 3.09 | -- | 3.74 | .13 | 5.62 | 2.09 | -- | -- | .26 | 729 | .99 | 21,828 | 27 | 1.49 | 1,020 | 8.4 |
| Dec. 12-20..... | 14,227 | 19.0 | 7.73 | 3.45 | 3.05 | .12 | 4.16 | .00 | 7.70 | 2.51 | .02 | .08 | .33 | 952 | 1.29 | 18,421 | 21 | 1.29 | 1,270 | 8.2 |
| Dec. 21-22..... | 16,086 | -- | 3.44 | 1.23 | 1.39 | -- | 2.98 | .20 | 1.89 | 1.18 | -- | -- | .26 | 371 | .50 | 8,116 | 23 | .91 | 560 | 8.5 |

RED RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Dec. 23-Jan. 5, 1963 | 24,520 | -- | 5.09 | 3.78 | 3.18 | -- | 3.08 | 0.00 | 6.41 | 2.57 | -- | -- | 0.19 | 779 | 1.06 | 25,977 | 26 | 1.51 | 1,090 | 8.2 |
| Jan. 6 | 1,101 | -- | 6.59 | 4.61 | 3.52 | -- | 3.77 | .00 | 8.12 | 2.85 | -- | -- | .33 | 970 | 1.32 | 1,452 | 24 | 1.49 | 1,310 | 8.2 |
| Jan. 7-20 | 11,385 | -- | 6.69 | 5.10 | 3.61 | -- | 3.67 | .00 | 8.64 | 3.10 | -- | -- | .26 | 914 | 1.24 | 14,152 | 23 | 1.49 | 1,360 | 8.2 |
| Jan. 21-31 | 6,044 | -- | 7.29 | 5.51 | 3.96 | -- | 4.00 | .00 | 9.41 | 3.36 | -- | -- | .34 | 995 | 1.35 | 8,178 | 24 | 1.56 | 1,470 | 8.0 |
| Feb. 1-17 | 17,062 | 17.0 | 6.79 | 5.59 | 3.65 | 0.08 | 2.79 | .00 | 10.31 | 3.22 | 0.01 | 0.10 | .31 | 1,010 | 1.37 | 23,436 | 23 | 1.47 | 1,400 | 8.2 |
| Feb. 18-26 | 10,407 | -- | 6.59 | 5.18 | 2.83 | -- | 3.28 | .00 | 8.79 | 2.57 | -- | -- | .31 | 976 | 1.33 | 13,814 | 19 | 1.17 | 1,310 | 8.2 |
| Mar. 1-11 | 10,844 | -- | 4.49 | 5.18 | 4.13 | -- | 1.38 | .00 | 9.54 | 2.91 | -- | -- | .34 | 954 | 1.30 | 14,069 | 30 | 1.88 | 1,260 | 8.1 |
| Mar. 12-13 | 5,772 | -- | 2.15 | 2.55 | 2.65 | -- | 1.02 | .00 | 4.33 | 2.03 | -- | -- | .36 | 482 | .66 | 3,784 | 36 | 1.73 | 727 | 7.8 |
| Mar. 14-30 | 16,792 | -- | 3.84 | 4.77 | 3.05 | -- | 1.18 | .00 | 7.75 | 2.71 | -- | -- | .37 | 810 | 1.10 | 18,498 | 26 | 1.47 | 1,110 | 7.7 |
| Mar. 31-Apr. 2 | 27,533 | -- | 2.00 | 1.32 | 1.48 | -- | 2.03 | .00 | 1.56 | 1.21 | -- | -- | .15 | 305 | .41 | 11,421 | 31 | 1.15 | 486 | 8.1 |
| Apr. 3-5 | 9,521 | -- | 3.29 | 2.47 | 2.09 | -- | 2.43 | .13 | 3.54 | 1.69 | -- | -- | .13 | 484 | .66 | 6,267 | 27 | 1.23 | 751 | 8.4 |
| Apr. 6-26 | 25,325 | -- | 4.54 | 4.52 | 3.35 | -- | 1.57 | .00 | 7.95 | 2.91 | -- | -- | .29 | 839 | 1.14 | 28,897 | 27 | 1.57 | 1,170 | 8.2 |
| Apr. 27-28 | 16,086 | -- | 3.49 | 2.22 | 1.65 | -- | 2.72 | .13 | 3.12 | 1.35 | -- | -- | .19 | 463 | .63 | 10,129 | 22 | .98 | 702 | 8.4 |
| Apr. 29-30 | 11,722 | -- | 2.10 | 1.07 | 1.31 | -- | 1.57 | .00 | 2.10 | .85 | -- | -- | .12 | 274 | .37 | 4,368 | 29 | 1.04 | 442 | 8.2 |
| May 1-3 | 6,962 | -- | 3.79 | 2.39 | 1.70 | -- | 2.88 | .40 | 3.44 | 1.13 | -- | -- | .21 | 489 | .67 | 4,630 | 22 | .97 | 731 | 8.6 |
| May 4-15 | 12,448 | -- | 5.29 | 4.11 | 2.83 | -- | 3.05 | .33 | 6.66 | 2.20 | -- | -- | .35 | 789 | 1.07 | 13,357 | 23 | 1.30 | 1,100 | 8.5 |
| May 16-29 | 6,054 | -- | 7.19 | 5.51 | 4.48 | -- | 3.61 | .27 | 10.10 | 3.19 | -- | -- | .42 | 1,030 | 1.40 | 8,480 | 26 | 1.78 | 1,490 | 8.5 |
| May 30-31 | 944 | -- | 5.44 | 4.44 | 3.61 | -- | 3.44 | .00 | 7.29 | 2.79 | -- | -- | -- | 903 | 1.23 | 1,159 | 27 | 1.62 | 1,240 | 7.8 |
| June 1-15 | 7,289 | 13.0 | 7.14 | 5.26 | 4.31 | .14 | 3.02 | .27 | 10.41 | 3.27 | .01 | .06 | .34 | 1,040 | 1.41 | 10,310 | 26 | 1.73 | 1,480 | 8.5 |
| June 16-24 | 4,463 | -- | 6.64 | 2.55 | 4.52 | -- | 2.46 | .13 | 9.16 | 1.97 | -- | -- | -- | 929 | 1.26 | 5,638 | 33 | 2.11 | 1,210 | 8.3 |
| June 25 | 1,803 | -- | 4.64 | 2.55 | 2.04 | -- | 2.69 | .33 | 5.00 | 1.21 | -- | -- | -- | 608 | .83 | 1,491 | 22 | 1.08 | 825 | 8.6 |
| June 26-27 | 3,039 | -- | 2.94 | 1.65 | 1.26 | -- | 2.69 | .00 | 2.39 | .79 | -- | -- | -- | 388 | .53 | 1,603 | 22 | .83 | 565 | 7.9 |
| June 28-30 | 7,396 | -- | 9.40 | | 1.87 | -- | 2.33 | .00 | 7.91 | 1.02 | -- | -- | .16 | 772 | 1.05 | 7,766 | 17 | .86 | 994 | 8.2 |
| July 1-14 | 8,580 | -- | 7.24 | | 2.13 | -- | 2.49 | .13 | 5.62 | 1.13 | -- | -- | .40 | 607 | .83 | 7,083 | 23 | 1.12 | 850 | 8.3 |
| July 15 | 1,212 | -- | 3.88 | | 1.57 | -- | 2.00 | .07 | 1.98 | 1.41 | -- | -- | -- | 349 | .47 | 575 | 29 | 1.12 | 550 | 8.3 |
| July 16 | 583 | -- | 5.60 | | 2.13 | -- | 2.23 | .13 | 3.85 | 1.52 | -- | -- | -- | 492 | .67 | 390 | 28 | 1.27 | 718 | 8.4 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July 17-21, 1963 | 1,924 | -- | 9.00 | | 3.09 | -- | 2.16 | .00 | 7.54 | 2.37 | -- | -- | .29 | 790 | 1.07 | 2,067 | 26 | 1.46 | 1,090 | 8.0 |
| July 22..... | 450 | -- | 5.72 | | 2.09 | -- | 1.80 | .00 | 4.54 | 1.47 | -- | -- | | 503 | .68 | 308 | 27 | 1.23 | 740 | 8.2 |
| July 23-28..... | 962 | -- | 15.20 | | 4.74 | -- | 2.33 | .00 | 13.95 | 3.67 | -- | -- | .41 | 1,450 | 1.97 | 1,896 | 24 | 1.72 | 1,730 | 8.2 |
| July 29-Aug. 1.. | 801 | -- | 11.60 | | 3.39 | -- | 1.77 | .00 | 10.10 | 3.10 | -- | -- | .28 | 1,010 | 1.37 | 1,101 | 23 | 1.41 | 1,380 | 8.0 |
| Aug. 2-3..... | 468 | -- | 4.80 | | 1.83 | -- | 2.46 | .07 | 2.58 | 1.52 | -- | -- | .19 | 419 | .57 | 267 | 28 | 1.18 | 651 | 8.3 |
| Aug. 4-6..... | 309 | -- | 7.88 | | 3.09 | -- | 2.72 | .00 | 6.04 | 2.20 | -- | -- | .21 | 708 | .96 | 298 | 28 | 1.56 | 1,020 | 8.2 |
| Aug. 7-8..... | 157 | -- | 6.08 | | 2.70 | -- | 3.08 | .27 | 3.54 | 1.89 | -- | -- | .24 | 540 | .73 | 115 | 31 | 1.55 | 823 | 8.4 |
| Aug. 9-17..... | 428 | -- | 6.64 | | 4.35 | -- | 2.29 | .00 | 5.04 | 3.67 | -- | -- | .37 | 707 | .96 | 412 | 40 | 2.39 | 1,080 | 8.0 |
| Aug. 18..... | 34 | -- | 6.24 | | 3.00 | -- | 3.41 | .13 | 3.33 | 2.37 | -- | -- | | 575 | .78 | 26 | 32 | 1.70 | 875 | 8.3 |
| Aug. 19-30..... | 328 | -- | 8.20 | | 5.39 | -- | 3.15 | .00 | 6.00 | 4.43 | -- | -- | .45 | 853 | 1.16 | 381 | 40 | 2.66 | 1,290 | 8.1 |
| Aug. 31-Sept. 11 | 505 | -- | 4.04 | 4.20 | 5.31 | -- | 2.59 | .00 | 6.56 | 4.37 | -- | -- | .43 | 854 | 1.16 | 586 | 39 | 2.62 | 1,290 | 7.9 |
| Sept. 12..... | 242 | -- | 6.09 | 6.09 | 6.96 | -- | 2.56 | .00 | 10.83 | 5.78 | -- | -- | .40 | 1,160 | 1.58 | 382 | 36 | 2.82 | 1,750 | 8.1 |
| Sept. 13-19..... | 911 | -- | 5.34 | 5.10 | 5.05 | -- | 2.16 | .00 | 9.16 | 4.12 | -- | -- | .41 | 936 | 1.27 | 1,159 | 33 | 2.21 | 1,430 | 7.9 |
| Sept. 20..... | 500 | -- | 7.68 | 5.92 | 6.22 | -- | 3.21 | .00 | 11.35 | 5.25 | -- | -- | .37 | 1,200 | 1.63 | 816 | 31 | 2.38 | 1,800 | 8.2 |
| Sept. 21-30..... | 4,602 | -- | 2.69 | 1.65 | 1.35 | -- | 2.23 | .00 | 2.54 | .93 | -- | -- | .40 | 363 | .49 | 2,272 | 24 | .92 | 558 | 7.8 |
| Total or weighted average | 455,500 | -- | 4.74 | 3.04 | 2.43 | -- | 2.65 | 0.07 | 5.59 | 1.93 | -- | -- | 0.23 | 662 | 0.90 | 409,800 | 23 | 1.21 | 938 | 8.2 |

RED RIVER BASIN--Continued

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 is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: May 1944 to September 1963.
Water temperatures: October 1945 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,890 micromhos Sept. 30; minimum daily, 1,530 micromhos May 16, 17.
Percent sodium: Maximum, 57 Oct. 1 to Nov. 30; minimum, 51 July 1-31.
Sodium-adsorption-ratio: Maximum, 5.04 Nov. 1-30; minimum, 4.48 July 1-31.
EXTREMES, 1944-63.--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 (1961-63): Maximum, 6.32 Nov. 1-30, 1962; minimum, 4.48 July 1-31, 1963.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 276,387 | 10.0 | 4.74 | 2.39 | 9.44 | | 2.02 | | 5.04 | 9.45 | 0.02 | 0.02 | | 990 | 1.35 | 372,127 | 57 | 5.00 | 1,710 | 7.5 |
| Nov. 1-30..... | 242,777 | 10.0 | 4.94 | 2.14 | 9.48 | | 2.07 | | 5.16 | 9.31 | .02 | .01 | | 994 | 1.35 | 328,195 | 57 | 5.04 | 1,710 | 7.5 |
| Dec. 1-31..... | 364,683 | 8.5 | 4.99 | 2.39 | 9.44 | | 2.03 | | 5.23 | 9.53 | .02 | .00 | | 1,010 | 1.37 | 500,929 | 56 | 4.92 | 1,730 | 7.3 |
| Jan. 1-31, 1963. | 270,607 | 9.9 | 4.89 | 2.30 | 9.35 | | 2.11 | | 5.16 | 9.25 | .02 | .00 | | 990 | 1.35 | 364,345 | 57 | 4.93 | 1,650 | 7.6 |
| Feb. 1-28..... | 63,090 | 8.2 | 4.94 | 2.30 | 9.05 | | 2.13 | | 5.08 | 9.03 | .02 | .02 | | 972 | 1.32 | 83,400 | 56 | 4.75 | 1,640 | 7.3 |
| Mar. 1-31..... | 89,096 | 8.3 | 4.94 | 2.22 | 8.87 | | 2.15 | | 5.04 | 8.80 | .02 | .02 | | 958 | 1.30 | 116,081 | 55 | 4.69 | 1,610 | 7.4 |
| Apr. 1-30..... | 170,301 | 8.5 | 4.89 | 2.22 | 8.66 | | 2.29 | | 4.91 | 8.52 | .02 | .02 | | 941 | 1.28 | 217,944 | 55 | 4.59 | 1,570 | 7.7 |
| May 1-31..... | 159,622 | 8.9 | 4.99 | 2.30 | 8.74 | | 2.36 | | 4.91 | 8.75 | .01 | .01 | | 956 | 1.30 | 207,534 | 55 | 4.58 | 1,550 | 7.8 |
| June 1-30..... | 151,081 | 9.7 | 5.04 | 2.47 | 8.79 | | 2.39 | | 5.00 | 8.80 | .02 | .09 | | 972 | 1.32 | 199,717 | 54 | 4.54 | 1,580 | 7.5 |
| July 1-31..... | 177,638 | 9.7 | 4.99 | 2.55 | 8.70 | 0.66 | 2.29 | | 5.04 | 9.17 | .02 | .04 | | 1,010 | 1.37 | 244,003 | 51 | 4.48 | 1,630 | 6.7 |
| Aug. 1-31..... | 138,409 | 10.0 | 5.14 | 2.55 | 9.18 | | 2.46 | | 4.98 | 9.37 | .02 | .02 | | 1,000 | 1.36 | 188,236 | 54 | 4.68 | 1,710 | 7.1 |
| Sept. 1-30..... | 89,316 | 9.2 | 5.24 | 2.55 | 9.79 | | 2.46 | | 5.18 | 9.87 | .02 | .03 | | 1,050 | 1.43 | 127,543 | 56 | 4.96 | 1,820 | 6.9 |
| Total or weighted average | 2,193,000 | 9.3 | 4.95 | 2.36 | 9.18 | -- | 2.19 | | 5.08 | 9.21 | 0.02 | 0.02 | | 989 | 1.35 | 2,950,000 | 52 | 4.80 | 1,670 | 7.3 |

## SABINE RIVER BASIN

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

LOCATION.--At gaging station near right bank at downstream side of 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.
DRAINAGE AREA.--9,329 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1946, October 1947 to September 1963.
Water temperatures: October 1947 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 575 micromhos May 7; minimum daily, 28 micromhos Sept. 19.
Percent sodium: Maximum, 78 Aug. 28-31; minimum 41 Sept. 18-20.
Sodium-adsorption-ratio: Maximum, 3.65 Aug. 28-31; minimum 0.55 Sept. 18-20.
EXTREMES, 1945-46, 1947-63.--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, 1956.
Sodium-adsorption-ratio (1961-63): Maximum, 3.85 Aug. 28-31, 1963; minimum, 0.55 Sept. 18-21, 1963.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-15, 1962. | 36,893 | 14.0 | 0.37 | 0.28 | 1.04 | -- | 0.54 | | 0.23 | 0.90 | 0.01 | 0.00 | | 108 | 0.15 | 5,419 | 61 | 1.83 | 183 | 6.6 |
| Oct. 16-31..... | 44,366 | 13.0 | .45 | .34 | 1.70 | -- | .52 | | .31 | 1.64 | -- | .00 | | 163 | .22 | 9,835 | 68 | 2.71 | 277 | 6.6 |
| Nov. 1-10..... | 20,112 | 17.0 | .50 | .38 | 2.22 | -- | .56 | | .35 | 2.17 | .01 | .00 | | 194 | .26 | 5,306 | 72 | 3.35 | 349 | 6.8 |
| Nov. 11-20..... | 20,172 | 17.0 | .46 | .33 | 2.16 | -- | .56 | | .33 | 2.06 | -- | .01 | | 187 | .25 | 5,130 | 73 | 3.46 | 333 | 6.6 |
| Nov. 21-30..... | 40,602 | 15.0 | .36 | .27 | 1.61 | -- | .39 | | .27 | 1.58 | -- | .01 | | 151 | .21 | 8,338 | 72 | 2.87 | 255 | 6.6 |
| Dec. 1-10..... | 52,086 | 15.0 | .47 | .24 | 1.63 | -- | .33 | | .33 | 1.86 | .01 | .00 | | 162 | .22 | 11,476 | 72 | 3.06 | 299 | 6.6 |
| Dec. 11-20..... | 55,617 | 14.0 | .47 | .24 | 1.48 | -- | .28 | | .48 | 1.41 | -- | .02 | | 142 | .19 | 10,741 | 67 | 2.48 | 262 | 6.1 |
| Dec. 21-31..... | 100,473 | 12.0 | .30 | .12 | .96 | -- | .23 | | .27 | .85 | -- | .01 | | 92 | .13 | 12,571 | 69 | 2.08 | 159 | 6.0 |
| Jan. 1-10, 1963. | 150,208 | 14.0 | .45 | .32 | 1.31 | -- | .23 | | .46 | 1.38 | .01 | .01 | | 136 | .18 | 27,783 | 63 | 2.10 | 243 | 6.2 |
| Jan. 11-20..... | 85,706 | 16.0 | .55 | .39 | 1.61 | -- | .26 | | .58 | 1.72 | -- | .01 | | 167 | .23 | 19,465 | 63 | 2.34 | 296 | 6.1 |
| Jan. 21-31..... | 90,393 | 16.0 | .44 | .33 | 1.17 | -- | .30 | | .46 | 1.16 | -- | .01 | | 128 | .17 | 15,736 | 60 | 1.90 | 221 | 6.2 |
| Feb. 1-18..... | 96,075 | 19.0 | .50 | .39 | 1.61 | -- | .36 | | .50 | 1.64 | .01 | .00 | | 176 | .24 | 22,997 | 65 | 2.42 | 282 | 6.5 |
| Feb. 19-28..... | 161,792 | 11.0 | .31 | .25 | 1.00 | -- | .18 | | .37 | 1.02 | -- | .01 | | 103 | .14 | 22,664 | 64 | 1.90 | 180 | 6.1 |
| Mar. 1-18..... | 186,867 | 14.0 | .40 | .30 | 1.26 | -- | .25 | | .48 | 1.21 | .01 | .01 | | 129 | .18 | 32,784 | 64 | 2.14 | 216 | 6.2 |
| Mar. 19-31..... | 74,132 | 15.0 | .65 | .44 | 1.87 | -- | .44 | | .65 | 1.86 | -- | .00 | | 186 | .25 | 18,752 | 63 | 2.53 | 332 | 6.2 |
| Apr. 1-11..... | 57,316 | 17.0 | .65 | .43 | 2.04 | -- | .48 | | .65 | 1.97 | .02 | .01 | | 198 | .27 | 15,434 | 66 | 2.79 | 343 | 6.5 |
| Apr. 12-22..... | 80,291 | 12.0 | .45 | .33 | 1.35 | -- | .34 | | .50 | 1.27 | -- | .01 | | 136 | .18 | 14,851 | 63 | 2.16 | 236 | 6.5 |

SABINE RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (calculated) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Apr. 23-30, 1963 | 24,357 | 16.0 | 0.60 | 0.41 | 1.74 | -- | 0.54 | | 0.48 | 1.72 | -- | 0.00 | | 173 | 0.24 | 5,731 | 63 | 2.45 | 302 | 6.5 |
| May 1-5 | 15,154 | 19.0 | .60 | .40 | 2.00 | -- | .59 | | .48 | 1.92 | 0.01 | .01 | | 192 | .26 | 3,957 | 67 | 2.83 | 323 | 6.9 |
| May 6-7 | 14,658 | 12.0 | .85 | .55 | 3.26 | -- | .49 | | .83 | 3.33 | -- | .01 | | 284 | .39 | 5,661 | 70 | 3.90 | 520 | 6.9 |
| May 8-20 | 153,808 | 9.3 | .37 | .25 | 1.17 | -- | .26 | | .35 | 1.10 | -- | .02 | | 112 | .15 | 23,428 | 65 | 2.11 | 194 | 6.1 |
| May 21-31 | 87,164 | 12.0 | .60 | .30 | 1.39 | -- | .56 | | .37 | 1.35 | -- | .01 | | 143 | .19 | 16,952 | 61 | 2.08 | 258 | 6.3 |
| June 1-7 | 22,368 | 16.0 | .60 | .40 | 1.83 | -- | .67 | | .40 | 1.72 | .02 | .01 | | 176 | .24 | 5,354 | 65 | 2.58 | 304 | 6.3 |
| June 8-22 | 38,707 | 17.0 | .70 | .42 | 2.52 | -- | .67 | | .46 | 2.48 | -- | .01 | | 225 | .31 | 11,844 | 69 | 3.37 | 402 | 6.6 |
| June 23-30 | 21,183 | 13.0 | .47 | .29 | 1.87 | -- | .49 | | .37 | 1.78 | -- | .01 | | 166 | .23 | 4,782 | 71 | 3.03 | 296 | 6.3 |
| July 1-17 | 53,984 | 12.0 | .36 | .24 | 1.31 | 0.06 | .49 | | .21 | 1.24 | .01 | .01 | | 124 | .17 | 9,104 | 67 | 2.39 | 220 | 6.0 |
| July 18-26 | 21,439 | 12.0 | .45 | .27 | 1.78 | -- | .52 | | .23 | 1.75 | -- | .00 | | 154 | .21 | 4,490 | 71 | 2.97 | 284 | 6.2 |
| July 27-31 | 15,669 | 10.0 | .25 | .15 | 1.00 | -- | .33 | | .14 | .90 | -- | .01 | | 89 | .12 | 1,897 | 72 | 2.24 | 155 | 6.2 |
| Aug. 1-11 | 17,389 | 16.0 | .37 | .23 | 1.52 | -- | .56 | | .17 | 1.38 | .01 | .01 | | 136 | .18 | 3,216 | 72 | 2.77 | 243 | 6.5 |
| Aug. 12-26 | 22,017 | 15.0 | .44 | .28 | 2.39 | -- | .66 | | .21 | 2.23 | -- | .02 | | 192 | .26 | 5,749 | 77 | 3.99 | 360 | 6.4 |
| Aug. 27 | 1,622 | 10.0 | .22 | .14 | 1.00 | -- | .30 | | .15 | .90 | -- | .02 | | 88 | .12 | 194 | 73 | 2.34 | 165 | 6.2 |
| Aug. 28-31 | 4,594 | 13.0 | .32 | .26 | 2.09 | -- | .49 | | .35 | 1.83 | -- | .01 | | 168 | .23 | 1,050 | 78 | 3.85 | 294 | 6.2 |
| Sept. 1-17 | 15,072 | 15.0 | .36 | .28 | 1.61 | -- | .64 | | .19 | 1.38 | .01 | .01 | | 140 | .19 | 2,870 | 72 | 2.85 | 256 | 6.3 |
| Sept. 18-20 | 101,931 | .0 | .15 | .09 | .19 | .03 | .16 | | .06 | .15 | .03 | .02 | | 25 | .03 | 3,466 | 41 | .55 | 40 | 5.8 |
| Sept. 21-22 | 37,408 | 3.0 | .10 | .05 | .33 | .02 | .11 | | .09 | .31 | .00 | .02 | | 34 | .05 | 1,730 | 65 | 1.19 | 62 | 6.0 |
| Sept. 23-25 | 17,453 | 4.6 | .20 | .14 | .70 | -- | .23 | | .09 | .71 | .00 | .01 | | 64 | .09 | 1,519 | 67 | 1.69 | 126 | 6.0 |
| Sept. 26-30 | 10,334 | 13.0 | .37 | .23 | 1.70 | -- | .56 | | .21 | 1.50 | .01 | .01 | | 143 | .19 | 2,010 | 74 | 3.09 | 262 | 6.5 |
| Total or weighted average | 2,049,400 | 13.0 | 0.43 | 0.29 | 1.37 | -- | 0.34 | | 0.39 | 1.33 | -- | 0.01 | | 134 | 0.18 | 374,300 | 53 | 2.25 | 235 | 6.2 |

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

LOCATION.--At gaging station near left bank on downstream side of pier of bridge on U.S. Highway 96, 200 feet upstream from Gulf, Colorado and Santa Fe Railway Co. bridge at Evadale, Jasper County, 600 feet downstream from Mill Creek, and 15 miles upstream from Village Creek.
DRAINAGE AREA.--7,952 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1963.
Water temperatures: October 1947 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 292 micromhos Sept. 11; minimum daily, 23 micromhos Sept. 19.
Percent sodium: Maximum, 66 Dec. 1-10; minimum, 40 Sept. 17-21.
Sodium-adsorption-ratio: Maximum, 2.37 Dec. 1-10; minimum, 0.40 Sept. 17-21.
EXTREMES, 1947-63.--Specific conductance: Maximum daily, 422 micromhos Jan. 25, 1957; minimum daily, 44 micromhos Sept. 22, 1958.
Percent sodium: Maximum, 76 Jan. 21-31, 1957; minimum, 0.40 Sept. 17-21, 1963.
Sodium-adsorption-ratio (1961-63): Maximum, 2.37 Dec. 1-10, 1962; minimum, 0.40 Sept. 17-21, 1963.
REMARKS.--Where no potassium (K) is reported, sodium (Na) and potassium (K) are calculated and reported as sodium (Na). Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-15, 1962. | 15,917 | 18.0 | 0.55 | 0.38 | 1.44 | -- | 0.69 | | 0.40 | 1.24 | 0.01 | 0.01 | | 151 | 0.21 | 3,269 | 61 | 2.11 | 251 | 6.4 |
| Oct. 16-31..... | 22,120 | 16.0 | .50 | .35 | 1.31 | -- | .59 | | .42 | 1.13 | -- | .00 | | 138 | .19 | 4,151 | 61 | 2.01 | 233 | 6.2 |
| Nov. 1-30..... | 73,309 | 16.0 | .50 | .30 | 1.44 | -- | .62 | | .40 | 1.18 | .01 | .01 | | 143 | .19 | 14,257 | 64 | 2.26 | 248 | 7.0 |
| Dec. 1-10..... | 29,593 | 15.0 | .44 | .30 | 1.44 | -- | .56 | | .40 | 1.18 | .01 | .01 | | 139 | .19 | 5,594 | 66 | 2.37 | 232 | 6.6 |
| Dec. 11-22..... | 62,598 | 15.0 | .44 | .30 | 1.35 | -- | .49 | | .42 | 1.18 | -- | .00 | | 145 | .20 | 12,344 | 65 | 2.22 | 229 | 6.7 |
| Dec. 23-31..... | 46,574 | 14.0 | .39 | .25 | 1.00 | -- | .36 | | .37 | .93 | -- | .00 | | 121 | .16 | 7,664 | 61 | 1.77 | 189 | 6.1 |
| Jan. 1-2, 1963.. | 44,231 | 10.0 | .38 | .22 | 1.09 | -- | .28 | | .46 | .93 | -- | .00 | | 108 | .15 | 6,497 | 64 | 1.98 | 190 | 6.4 |
| Jan. 3-13..... | 174,873 | 7.7 | .32 | .17 | .70 | -- | .20 | | .40 | .56 | .01 | .00 | | 78 | .11 | 18,550 | 58 | 1.40 | 135 | 6.0 |
| Jan. 14-31..... | 89,792 | 12.0 | .45 | .26 | .96 | -- | .26 | | .56 | .82 | .01 | .01 | | 111 | .15 | 13,555 | 58 | 1.61 | 189 | 6.2 |
| Feb. 1-10..... | 49,488 | 16.0 | .49 | .35 | 1.26 | -- | .43 | | .60 | 1.07 | .01 | .01 | | 150 | .20 | 10,095 | 60 | 1.95 | 226 | 7.6 |
| Feb. 11-19..... | 41,647 | 16.0 | .50 | .36 | 1.35 | -- | .46 | | .62 | 1.13 | -- | .01 | | 151 | .21 | 8,553 | 61 | 2.06 | 244 | 6.9 |
| Feb. 20-28..... | 130,618 | 14.0 | .44 | .29 | 1.13 | -- | .34 | | .60 | .93 | -- | .01 | | 125 | .17 | 22,205 | 61 | 1.88 | 201 | 6.5 |
| Mar. 1-15..... | 177,977 | 12.0 | .45 | .31 | .87 | -- | .28 | | .62 | .73 | .01 | .00 | | 109 | .15 | 26,383 | 53 | 1.41 | 183 | 6.4 |
| Mar. 16-31..... | 78,069 | 13.0 | .50 | .40 | 1.17 | -- | .34 | | .69 | 1.04 | -- | .01 | | 136 | .18 | 14,440 | 57 | 1.75 | 226 | 6.4 |
| Apr. 1-10..... | 49,349 | 13.0 | .60 | .41 | 1.44 | -- | .46 | | .71 | 1.24 | .01 | .01 | | 156 | .21 | 10,470 | 59 | 2.02 | 262 | 6.6 |
| Apr. 11-19..... | 94,040 | 11.0 | .60 | .37 | 1.31 | -- | .44 | | .65 | 1.16 | -- | .01 | | 143 | .19 | 18,289 | 57 | 1.87 | 246 | 6.5 |
| Apr. 20-30..... | 49,135 | 12.0 | .49 | .34 | 1.17 | -- | .49 | | .60 | .90 | -- | .01 | | 129 | .18 | 8,620 | 59 | 1.83 | 211 | 6.4 |
| May 1-13..... | 28,725 | 14.0 | .55 | .33 | 1.13 | -- | .49 | | .58 | .93 | .01 | .01 | | 132 | .18 | 5,157 | 56 | 1.71 | 221 | 6.7 |

NECHES RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (calculated) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| May 14-31, 1963. | 50,198 | 11.0 | 0.60 | 0.36 | 1.39 | -- | 0.56 | | 0.58 | 1.18 | -- | 0.01 | | 147 | 0.20 | 10,036 | 59 | 2.01 | 253 | 6.5 |
| June 1-20..... | 51,174 | 14.0 | .60 | .36 | 1.57 | -- | .72 | | .52 | 1.27 | 0.01 | .01 | | 159 | .22 | 11,066 | 62 | 2.26 | 264 | 6.7 |
| June 21-30..... | 14,955 | 13.0 | .50 | .34 | 1.22 | -- | .62 | | .40 | 1.02 | -- | .01 | | 130 | .18 | 2,644 | 59 | 1.88 | 217 | 6.4 |
| July 1-15..... | 28,889 | 14.0 | .55 | .29 | 1.22 | 0.07 | .62 | | .40 | 1.13 | .01 | .01 | | 138 | .19 | 5,422 | 57 | 1.88 | 239 | 6.1 |
| July 16-31..... | 30,054 | 14.0 | .50 | .30 | 1.39 | -- | .64 | | .37 | 1.18 | -- | .01 | | 139 | .19 | 5,681 | 64 | 2.21 | 242 | 6.2 |
| Aug. 1-31..... | 44,886 | 16.0 | .55 | .29 | 1.44 | -- | .69 | | .35 | 1.21 | .01 | .01 | | 146 | .20 | 8,913 | 63 | 2.22 | 253 | 6.3 |
| Sept. 1-16..... | 16,407 | 13.0 | .55 | .35 | 1.57 | -- | .85 | | .33 | 1.27 | .01 | .01 | | 152 | .21 | 3,392 | 63 | 2.33 | 276 | 6.4 |
| Sept. 17-21..... | 51,203 | .0 | .12 | .00 | .10 | .02 | .10 | | .06 | .06 | .00 | .01 | | 14 | .02 | 975 | 40 | .40 | 29 | 5.7 |
| Sept. 22-24..... | 8,283 | 2.6 | .22 | .08 | .27 | .03 | .21 | | .14 | .21 | .01 | .02 | | 37 | .05 | 417 | 45 | .70 | 68 | 6.2 |
| Sept. 25-30..... | 4,332 | 13.0 | .50 | .26 | .83 | -- | .62 | | .21 | .71 | .01 | .02 | | 100 | .14 | 589 | 52 | 1.34 | 178 | 6.2 |
| Total or weighted average | 1,558,000 | 12.0 | 0.46 | 0.29 | 1.11 | -- | 0.41 | | 0.51 | 0.94 | -- | 0.01 | | 122 | 0.17 | 259,200 | 47 | 1.78 | 205 | 6.3 |

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

LOCATION.--At gaging station near right bank on downstream side of pier of 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 (revised).--17,186 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to November 1949, February 1950 to September 1951, April 1953 to September 1963.
Water temperatures: February 1950 to September 1951, April 1953 to January 1959, March 1961 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,330 micromhos Sept. 3; minimum daily, 211 micromhos Dec. 30.
Percent sodium: Maximum, 67 Sept. 16-30, June 11-12; minimum, 32 May 5-14.
Sodium-adsorption-ratio: Maximum, 5.25 Sept. 1-15; minimum, 1.06 May 5-14.
EXTREMES, 1945-50, 1953-63.--Specific conductance: Maximum daily, 3,800 micromhos Oct. 30, 1956; minimum daily, 103 micromhoe Nov. 9, 1946.
Percent sodium: Maximum, 86 Nov. 7, 1953; minimum, 23 June 11-20, 1946.
Sodium-adsorption-ratio (1961-63): Maximum, 5.25 Sept. 1-15, 1963; minimum, 1.06 May 5-14, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 267,523 | 9.9 | 2.20 | 0.39 | 1.74 | | 2.20 | | 0.60 | 1.47 | 0.02 | 0.03 | | 253 | 0.34 | 92,049 | 40 | 1.53 | 433 | 7.5 |
| Oct. 15-31..... | 234,583 | 9.3 | 2.20 | .36 | 1.65 | | 2.08 | | .69 | 1.41 | -- | .05 | | 249 | .34 | 79,439 | 39 | 1.46 | 432 | 7.2 |
| Nov. 1-15..... | 77,891 | 11.0 | 2.54 | .39 | 2.65 | | 2.43 | | .92 | 2.14 | .02 | .07 | | 326 | .44 | 34,534 | 47 | 2.19 | 576 | 7.6 |
| Nov. 16-30..... | 60,040 | 12.0 | 2.59 | .40 | 3.26 | | 2.51 | | .92 | 2.74 | -- | .06 | | 364 | .50 | 29,722 | 52 | 2.66 | 647 | 7.3 |
| Dec. 1-3..... | 26,360 | 20.0 | 2.35 | .44 | 5.13 | | 2.00 | | 1.23 | 4.51 | .03 | .14 | | 478 | .65 | 17,136 | 65 | 4.35 | 848 | 7.5 |
| Dec. 4-16..... | 219,045 | 13.0 | 2.35 | .36 | 1.48 | | 2.20 | | .77 | 1.16 | -- | .07 | | 250 | .34 | 74,475 | 35 | 1.27 | 431 | 7.6 |
| Dec. 17-21..... | 55,674 | 9.7 | 2.40 | .39 | 1.96 | | 2.20 | | .71 | 1.78 | -- | .06 | | 294 | .40 | 22,341 | 41 | 1.66 | 497 | 7.4 |
| Dec. 22-31..... | 184,403 | 11.0 | 1.70 | .22 | 1.26 | | 1.52 | | .52 | 1.13 | -- | .03 | | 190 | .26 | 47,650 | 40 | 1.29 | 336 | 7.0 |
| Jan. 1-9, 1963.. | 94,130 | 14.0 | 1.40 | .24 | 1.35 | | 1.18 | | .60 | 1.16 | .02 | .04 | | 184 | .25 | 23,555 | 45 | 1.49 | 323 | 7.0 |
| Jan. 10-20..... | 55,855 | 15.0 | 2.64 | .49 | 3.52 | | 2.26 | | 1.21 | 3.10 | -- | .10 | | 417 | .57 | 31,676 | 53 | 2.81 | 716 | 7.2 |
| Jan. 21-31..... | 43,200 | 16.0 | 2.74 | .52 | 3.26 | | 2.26 | | 1.35 | 2.82 | -- | .08 | | 404 | .55 | 23,736 | 50 | 2.55 | 695 | 7.2 |
| Feb. 1-16..... | 55,553 | 14.0 | 2.79 | .52 | 3.74 | | 2.41 | | 1.35 | 3.19 | .02 | .10 | | 436 | .60 | 33,092 | 53 | 2.91 | 745 | 7.1 |
| Feb. 19-26..... | 124,324 | 10.0 | 1.35 | .26 | 1.74 | | 1.05 | | .77 | 1.47 | -- | .06 | | 204 | .28 | 34,492 | 52 | 1.94 | 362 | 6.7 |
| Mar. 1-5..... | 31,974 | 13.0 | 1.65 | .35 | 2.39 | | 1.21 | | 1.04 | 2.06 | .02 | .05 | | 300 | .41 | 13,045 | 54 | 2.39 | 469 | 7.1 |
| Mar. 6-16..... | 39,491 | 13.0 | 2.50 | .59 | 4.74 | | 2.00 | | 1.54 | 4.23 | -- | .08 | | 492 | .67 | 26,424 | 61 | 3.82 | 846 | 7.0 |

TRINITY RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--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. 17-31, 1963 | 39,511 | 14.0 | 2.59 | 0.61 | 5.00 | | 0.33 | | 1.56 | 4.23 | -- | 0.06 | | 516 | 0.70 | 27,727 | 61 | 3.95 | 882 | 7.3 |
| Apr. 1-6 | 16,007 | 14.0 | 2.74 | .62 | 4.70 | | 2.56 | | 1.46 | 3.95 | 0.02 | .05 | | 476 | .65 | 10,362 | 58 | 3.62 | 827 | 7.4 |
| Apr. 7 | 22,810 | 11.0 | 1.25 | .25 | 1.52 | | 1.03 | | .77 | 1.18 | -- | .06 | | 188 | .26 | 5,832 | 50 | 1.76 | 328 | 6.6 |
| Apr. 8-10 | 66,704 | 8.5 | .85 | .23 | 1.09 | | .77 | | .56 | .79 | -- | .04 | | 134 | .18 | 12,156 | 50 | 1.48 | 224 | 6.6 |
| Apr. 11-13 | 20,868 | 12.0 | 1.00 | .30 | 1.22 | | .87 | | .60 | 1.02 | -- | .03 | | 157 | .21 | 4,456 | 48 | 1.51 | 268 | 6.7 |
| Apr. 14-20 | 21,299 | 12.0 | 2.15 | .55 | 3.39 | | 1.85 | | 1.17 | 3.05 | -- | .03 | | 394 | .54 | 11,413 | 56 | 2.92 | 634 | 7.0 |
| Apr. 21-30 | 19,240 | 10.0 | 2.84 | .69 | 5.87 | | 2.80 | | 1.60 | 4.94 | -- | .04 | | 584 | .79 | 15,281 | 62 | 4.42 | 960 | 7.4 |
| May 1-3 | 16,465 | 22.0 | 3.09 | .69 | 6.44 | | 3.05 | | 1.83 | 5.22 | .02 | .11 | | 612 | .83 | 13,704 | 63 | 4.68 | 1,040 | 7.7 |
| May 4 | 16,780 | 16.0 | 2.30 | .38 | 2.78 | | 2.44 | | 1.37 | 1.47 | -- | .18 | | 333 | .45 | 7,599 | 51 | 2.41 | 537 | 7.4 |
| May 5-14 | 285,620 | 15.0 | 2.30 | .16 | 1.17 | | 2.16 | | .71 | .71 | -- | .05 | | 217 | .30 | 84,292 | 32 | 1.06 | 364 | 7.6 |
| May 15-29 | 144,208 | 11.0 | 2.79 | .33 | 1.67 | | 2.62 | | .87 | 1.47 | -- | .05 | | 290 | .39 | 56,876 | 37 | 1.50 | 501 | 7.4 |
| May 30-31 | 9,977 | 17.0 | 3.29 | .41 | 4.13 | | 3.03 | | .96 | 3.81 | -- | .04 | | 458 | .62 | 6,214 | 53 | 3.04 | 808 | 7.6 |
| June 1-30 | 158,102 | 12.0 | 2.69 | .35 | 2.52 | | 2.64 | | .98 | 1.86 | .03 | .06 | | 325 | .44 | 69,881 | 45 | 2.04 | 559 | 7.2 |
| July 1-11 | 27,404 | 15.0 | 2.64 | .38 | 2.26 | 0.12 | 2.62 | | .87 | 1.95 | .02 | .03 | | 322 | .44 | 12,001 | 42 | 1.84 | 563 | 7.5 |
| July 12-21 | 15,154 | 16.0 | 2.89 | .43 | 3.78 | | 2.95 | | .92 | 3.24 | -- | .01 | | 415 | .56 | 8,553 | 53 | 2.94 | 735 | 7.3 |
| July 22-31 | 15,471 | 16.0 | 2.99 | .47 | 5.70 | | 3.28 | | 1.39 | 4.46 | -- | .03 | | 538 | .73 | 11,320 | 62 | 4.33 | 940 | 7.7 |
| Aug. 1-17 | 18,815 | 15.0 | 2.59 | .45 | 4.61 | | 2.88 | | 1.15 | 3.53 | .03 | .04 | | 448 | .61 | 11,464 | 60 | 3.74 | 822 | 6.8 |
| Aug. 18-31 | 13,940 | 7.7 | 3.24 | .52 | 6.57 | | 3.61 | | 1.75 | 4.94 | -- | .01 | | 598 | .81 | 11,337 | 64 | 4.79 | 1,090 | 6.8 |
| Sept. 1-15 | 14,132 | 9.1 | 2.99 | .53 | 6.96 | | 3.52 | | 1.61 | 5.08 | .04 | .03 | | 611 | .83 | 11,743 | 66 | 5.25 | 1,100 | 7.3 |
| Sept. 16-30 | 17,256 | 15.0 | 2.64 | .48 | 6.22 | | 3.13 | | 1.39 | 4.80 | -- | .02 | | 549 | .75 | 12,884 | 67 | 4.98 | 1,000 | 7.3 |
| Total or weighted average | 2,530,000 | 12.0 | 2.24 | 0.35 | 2.21 | -- | 2.09 | | 0.85 | 1.80 | -- | 0.05 | | 287 | 0.39 | 988,500 | 42 | 1.91 | 496 | 7.2 |

## BRAZOS RIVER BASIN

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

LOCATION.--At gaging station near right bank on downstream side of pier of bridge on U.S. Highway 59 in Richmond, Fort Bend County, 925 feet downstream from Texas and New Orleans Railroad Co. bridge, and at mile 93.
DRAINAGE AREA.--44,020 square miles, approximately, of which 9,240 square miles is probably noncontributing.
RECORDS AVAILABLE.--Chemical analyses: October 1945 to September 1963.
Water temperatures: November 1950 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,690 micromhos Sept. 9; minimum daily, 257 micromhos Dec. 26.
Percent sodium: Maximum, 59 Sept. 1-15; minimum, 29 Dec. 26.
Sodium-adsorption-ratio: Maximum, 5.12 Sept. 1-15; minimum, 0.79 Dec. 26.
EXTREMES, 1945-63.--Specific conductance: Maximum daily, 2,540 micromhos Sept. 4, 1951; minimum daily, 187 micromhos Aug. 31, 1947.
Percent sodium: Maximum, 76 Dec. 3-4, 1945; minimum, 18 Aug. 27-31, 1947.
Sodium-adsorption-ratio (1961-63): Maximum, 5.48 Aug. 1-10, 1962; minimum, 0.79 Dec. 26, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 95,778 | 13.0 | 3.99 | 1.32 | 6.74 | | 2.13 | | 3.25 | 6.63 | 0.02 | 0.02 | | 783 | 1.06 | 101,992 | 58 | 4.14 | 1,280 | 7.8 |
| Oct. 13-31..... | 204,710 | 12.0 | 3.84 | 1.23 | 5.74 | | 2.31 | | 2.83 | 5.64 | -- | .01 | | 695 | .95 | 193,492 | 53 | 3.60 | 1,120 | 7.8 |
| Nov. 1-15..... | 64,532 | 11.0 | 3.99 | 1.23 | 5.31 | | 2.90 | | 2.56 | 5.02 | .02 | .01 | | 643 | .87 | 56,432 | 50 | 3.28 | 1,060 | 7.2 |
| Nov. 16-28..... | 39,632 | 12.0 | 4.79 | 1.40 | 6.09 | | 3.72 | | 2.87 | 5.70 | -- | .00 | | 743 | 1.01 | 40,047 | 50 | 3.46 | 1,220 | 7.4 |
| Nov. 29-30..... | 42,208 | 11.0 | 2.59 | .75 | 3.31 | | 1.97 | | 1.56 | 3.10 | -- | .02 | | 394 | .54 | 22,617 | 50 | 2.56 | 691 | 7.7 |
| Dec. 1-4..... | 88,066 | 10.0 | 1.75 | .38 | 1.00 | | 1.64 | | .67 | .76 | .02 | .05 | | 184 | .25 | 22,038 | 32 | .97 | 321 | 7.0 |
| Dec. 5-12..... | 78,165 | 12.0 | 2.59 | .62 | 2.74 | | 1.74 | | 1.52 | 2.65 | -- | .03 | | 355 | .48 | 37,738 | 46 | 2.16 | 626 | 7.0 |
| Dec. 13-25..... | 80,475 | 11.0 | 3.79 | .99 | 4.52 | | 2.52 | | 2.31 | 4.46 | -- | .02 | | 553 | .75 | 60,524 | 49 | 2.93 | 957 | 7.2 |
| Dec. 26..... | 18,089 | 10.0 | 1.60 | .35 | .78 | | 1.61 | | .44 | .68 | -- | .01 | | 159 | .22 | 3,912 | 29 | .79 | 257 | 7.0 |
| Dec. 27-29..... | 56,767 | 11.0 | 2.10 | .58 | 1.91 | | 1.69 | | 1.12 | 1.75 | -- | .02 | | 272 | .37 | 20,999 | 42 | 1.66 | 480 | 7.3 |
| Dec. 30-31..... | 58,711 | 10.0 | 1.65 | .37 | .96 | | 1.59 | | .52 | .85 | -- | .01 | | 173 | .24 | 13,813 | 32 | .95 | 285 | 7.1 |
| Jan. 1-4, 1963.. | 66,946 | 11.0 | 1.60 | .35 | .87 | | 1.43 | | .56 | .79 | .02 | .01 | | 166 | .23 | 15,114 | 31 | .88 | 290 | 7.1 |
| Jan. 5-9..... | 36,377 | 11.0 | 2.10 | .53 | 1.57 | | 1.70 | | .94 | 1.52 | -- | .02 | | 247 | .34 | 12,220 | 37 | 1.37 | 434 | 7.1 |
| Jan. 10-17..... | 41,336 | 11.0 | 3.69 | .99 | 3.61 | | 2.85 | | 1.96 | 3.47 | -- | .02 | | 500 | .68 | 28,108 | 44 | 2.36 | 841 | 7.4 |
| Jan. 18-31..... | 80,168 | 9.2 | 3.49 | 1.07 | 3.48 | | 2.62 | | 1.92 | 3.47 | -- | .02 | | 478 | .65 | 51,898 | 43 | 2.30 | 818 | 7.1 |
| Feb. 1-18..... | 54,946 | 8.7 | 4.29 | 1.40 | 4.70 | | 3.41 | | 2.44 | 4.51 | .02 | .01 | | 622 | .85 | 46,480 | 45 | 2.79 | 1,040 | 7.2 |
| Feb. 19-21..... | 44,491 | 7.9 | 2.89 | .82 | 2.87 | | 2.36 | | 1.46 | 2.71 | -- | .03 | | 381 | .52 | 23,054 | 44 | 2.11 | 878 | 7.2 |
| Feb. 22-28..... | 118,850 | 11.0 | 1.85 | .42 | 1.39 | | 1.51 | | .98 | 1.16 | -- | .04 | | 220 | .30 | 35,580 | 38 | 1.31 | 378 | 7.0 |

BRAZOS RIVER BASIN---Continued

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

Chemical analyses, water year October 1962 to September 1963---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. 1-4, 1963.. | 24,238 | 13.0 | 2.30 | 0.60 | 2.18 | | 1.57 | | 1.33 | 2.14 | 0.02 | 0.03 | | 305 | 0.41 | 10,054 | 43 | 1.81 | 537 | 6.9 |
| Mar. 5-12..... | 28,959 | 12.0 | 3.29 | .90 | 3.13 | | 2.56 | | 1.75 | 2.99 | -- | .02 | | 429 | .58 | 16,896 | 43 | 2.16 | 747 | 7.1 |
| Mar. 13-31..... | 56,981 | 9.2 | 4.24 | 1.32 | 4.52 | | 3.34 | | 2.37 | 4.37 | -- | .00 | | 583 | .79 | 45,179 | 45 | 2.71 | 1,020 | 7.1 |
| Apr. 1-6..... | 15,197 | 7.5 | 4.19 | 1.40 | 5.18 | | 3.36 | | 2.50 | 4.85 | .03 | .01 | | 632 | .86 | 13,062 | 48 | 3.10 | 1,060 | 7.5 |
| Apr. 7-16..... | 115,359 | 12.0 | 2.05 | .49 | 1.39 | | 1.69 | | .96 | 1.24 | -- | .05 | | 235 | .32 | 36,869 | 35 | 1.24 | 405 | 7.1 |
| Apr. 17-20..... | 15,852 | 10.0 | 2.84 | .80 | 3.13 | | 2.00 | | 1.85 | 2.91 | -- | .02 | | 411 | .56 | 8,861 | 46 | 2.32 | 691 | 7.0 |
| Apr. 21-30..... | 17,256 | 11.0 | 4.09 | 1.32 | 4.79 | | 3.11 | | 2.35 | 4.74 | -- | .00 | | 626 | .85 | 14,691 | 47 | 2.91 | 1,020 | 7.4 |
| May 1-28..... | 69,255 | 9.6 | 4.09 | 1.40 | 6.09 | | 3.05 | | 2.85 | 5.64 | .02 | .02 | | 678 | .92 | 63,859 | 53 | 3.68 | 1,140 | 7.4 |
| May 29-31..... | 10,931 | 12.0 | 2.84 | .99 | 3.87 | | 2.36 | | 1.77 | 3.64 | -- | .02 | | 458 | .62 | 6,809 | 50 | 2.76 | 791 | 7.6 |
| June 1-9..... | 29,562 | 11.0 | 4.04 | 1.40 | 6.09 | | 2.62 | | 2.81 | 6.07 | .02 | .01 | | 679 | .92 | 27,298 | 53 | 3.69 | 1,170 | 7.1 |
| June 10-30..... | 156,240 | 10.0 | 4.44 | 1.40 | 7.05 | | 2.41 | | 3.25 | 7.19 | -- | .02 | | 762 | 1.04 | 161,915 | 55 | 4.12 | 1,320 | 7.2 |
| July 1-31..... | 119,901 | 12.0 | 4.19 | 1.56 | 6.83 | 0.14 | 2.59 | | 3.06 | 6.91 | .02 | .02 | | 749 | 1.02 | 122,136 | 54 | 4.03 | 1,280 | 6.8 |
| Aug. 1-19..... | 26,380 | 14.0 | 4.69 | 1.81 | 8.74 | | 2.80 | | 3.71 | 8.69 | .02 | .02 | | 903 | 1.23 | 32,397 | 57 | 4.85 | 1,580 | 7.0 |
| Aug. 20-31..... | 7,426 | 15.0 | 4.49 | 1.89 | 8.13 | | 3.13 | | 3.37 | 7.96 | -- | .04 | | 855 | 1.16 | 8,635 | 56 | 4.55 | 1,490 | 7.0 |
| Sept. 1-15..... | 14,370 | 14.0 | 4.29 | 1.89 | 9.00 | | 2.66 | | 3.73 | 8.75 | .02 | .01 | | 900 | 1.22 | 17,589 | 59 | 5.12 | 1,580 | 7.1 |
| Sept. 16-30..... | 19,666 | 13.0 | 4.29 | 1.81 | 8.31 | | 2.88 | | 3.46 | 8.04 | -- | .03 | | 852 | 1.16 | 22,788 | 58 | 4.76 | 1,500 | 7.0 |
| Total or weighted average | 1,997,800 | 11.0 | 3.29 | 1.01 | 4.21 | -- | 2.29 | | 2.09 | 4.09 | -- | 0.02 | | 513 | 0.70 | 1,395,000 | 54 | 2.72 | 871 | 7.2 |

## 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 1963.
Water temperatures: October 1947 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 640 micromhos Sept. 9; minimum daily, 512 micromhos Dec. 3.
Percent sodium: Maximum, 36 Aug. 1 to Sept. 30; minimum, 19 Mar. 1-31.
Sodium-adsorption-ratio: Maximum, 1.60 Sept. 1-30; minimum, 0.75 Mar. 1-31.
EXTREMES, 1947-63.--Specific conductance: Maximum daily, 640 micromhos Sept. 9, 1963; 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 (1961-63): Maximum, 1.60 Sept. 1-30, 1963; minimum, 0.75 Mar. 1-31, 1963.
REMARKS.--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 1962 to September 1963

| 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, 1962. | 17,401 | 13.0 | 2.45 | 1.65 | 1.61 | | 3.33 | | 0.73 | 1.61 | 0.02 | 0.02 | | 313 | 0.43 | 7,407 | 26 | 1.13 | 561 | 7.6 |
| Nov. 1-30..... | 24,635 | 12.0 | 2.35 | 1.65 | 1.65 | | 3.13 | | .77 | 1.72 | .02 | .01 | | A 320 | .44 | 10,721 | 29 | 1.17 | 554 | 7.5 |
| Dec. 1-31..... | 38,307 | 9.3 | 2.30 | 1.56 | 1.87 | | 2.97 | | .81 | 1.92 | .02 | .02 | | A 318 | .43 | 16,567 | 33 | 1.35 | 565 | 7.4 |
| Jan. 1-31, 1963. | 35,232 | 8.2 | 2.54 | 1.81 | 1.61 | | 3.20 | | .81 | 1.92 | .02 | .02 | | A 338 | .46 | 16,196 | 27 | 1.09 | 583 | 7.5 |
| Feb. 1-28..... | 42,597 | 11.0 | 2.40 | 1.81 | 1.65 | | 3.06 | | .83 | 1.95 | .02 | .02 | | 322 | .44 | 18,654 | 28 | 1.14 | 585 | 7.4 |
| Mar. 1-31..... | 15,003 | 11.0 | 2.99 | 1.89 | 1.17 | | 3.64 | | .77 | 1.58 | .02 | .04 | | 326 | .44 | 6,652 | 19 | .75 | 589 | 7.2 |
| Apr. 1-30..... | 66,169 | 10.0 | 2.50 | 1.73 | 1.87 | | 3.20 | | .85 | 2.00 | .02 | .01 | | 333 | .45 | 29,966 | 31 | 1.29 | 596 | 7.4 |
| May 1-31..... | 100,348 | 11.0 | 2.20 | 1.81 | 2.09 | | 2.98 | | .87 | 2.23 | .02 | .01 | | 336 | .46 | 45,855 | 34 | 1.48 | 588 | 7.7 |
| June 1-30..... | 118,830 | 11.0 | 2.30 | 1.73 | 2.09 | | 2.75 | | .90 | 2.34 | .02 | .12 | | 343 | .47 | 55,432 | 34 | 1.47 | 609 | 6.9 |
| July 1-31..... | 111,661 | 9.6 | 2.40 | 1.73 | 2.00 | 0.11 | 2.98 | | .92 | 2.34 | .02 | .01 | | 346 | .47 | 52,543 | 32 | 1.39 | 608 | 7.0 |
| Aug. 1-31..... | 107,111 | 11.0 | 2.20 | 1.81 | 2.22 | | 2.90 | | .94 | 2.37 | .02 | .01 | | 345 | .47 | 50,257 | 36 | 1.57 | 625 | 7.4 |
| Sept. 1-30..... | 86,995 | 11.0 | 2.20 | 1.81 | 2.26 | | 2.87 | | .94 | 2.45 | .02 | .00 | | 348 | .47 | 41,173 | 36 | 1.60 | 636 | 7.6 |
| Total or weighted average | 764,300 | 11.0 | 2.33 | 1.76 | 1.99 | -- | 2.98 | | 0.88 | 2.20 | 0.02 | 0.03 | | 336 | 0.46 | 351,400 | 32 | 1.40 | 603 | 7.2 |

A Residue at 180°C.

COLORADO RIVER BASIN--Continued

## 8-1620. COLORADO RIVER AT WHARTON, TEX.

LOCATION.--At gaging station near center span, at downstream side of 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 1963.
Water temperatures: October 1945 to September 1948, March 1950 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 868 micromhos July 29; minimum daily, 293 micromhos Dec. 31.
Percent sodium: Maximum, 36 June 1-30, Aug. 1-31; minimum, 24 Feb. 20-25.
Sodium-adsorption-ratio: Maximum, 1.60 Aug. 1-31; minimum, 0.72 Feb. 20-25.
EXTREMES, 1944-63.--Specific conductance: Maximum daily, 765 micromhos Feb. 5, 1957; minimum daily, 146 micromhos Sept. 27, 1957.
Percent sodium: Maximum, 43 Nov. 1-30, 1951; minimum, 7 Jan. 19-24, 1945.
Sodium-adsorption-ratio (1961-63): Maximum, 37 Aug. 1-31, 1962; minimum, 0.72 Feb. 20-25, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 55,462 | 14.0 | 2.69 | 1.15 | 1.35 | | 3.05 | | 0.92 | 1.16 | 0.02 | 0.03 | | 292 | 0.40 | 22,025 | 26 | 0.97 | 496 | 7.4 |
| Nov. 1-30..... | 40,225 | 14.0 | 2.69 | 1.32 | 1.44 | | 3.28 | | .87 | 1.27 | .02 | .02 | | 305 | .41 | 16,685 | 26 | 1.01 | 521 | 7.5 |
| Dec. 1-31..... | 86,083 | 14.0 | 2.74 | 1.15 | 1.44 | | 2.95 | | .98 | 1.33 | .02 | .06 | | 309 | .42 | 36,175 | 27 | 1.03 | 525 | 7.6 |
| Jan. 1-31, 1963. | 60,073 | 13.0 | 2.94 | 1.23 | 1.57 | | 3.29 | | .87 | 1.50 | .02 | .05 | | 336 | .46 | 27,451 | 27 | 1.08 | 559 | 7.4 |
| Feb. 1-19..... | 29,169 | 7.8 | 2.99 | 1.56 | 1.74 | | 3.51 | | .92 | 1.83 | .02 | .02 | | 352 | .48 | 13,964 | 28 | 1.15 | 617 | 7.3 |
| Feb. 20-25..... | 54,863 | 10.0 | 2.10 | .58 | .83 | | 1.77 | | .87 | .79 | -- | .09 | | 206 | .28 | 15,370 | 24 | .72 | 365 | 7.1 |
| Feb. 26-28..... | 11,127 | 11.0 | 2.64 | .90 | 1.35 | | 2.43 | | 1.04 | 1.35 | -- | .07 | | 282 | .38 | 4,268 | 28 | 1.01 | 493 | 7.3 |
| Mar. 1-31..... | 37,815 | 13.0 | 3.24 | 1.56 | 1.61 | | 3.67 | | 1.00 | 1.72 | .02 | .02 | | 354 | .48 | 18,206 | 25 | 1.04 | 624 | 7.3 |
| Apr. 1-30..... | 54,684 | 11.0 | 2.64 | 1.32 | 1.87 | | 2.90 | | 1.17 | 1.72 | .02 | .03 | | 329 | .45 | 24,468 | 32 | 1.33 | 567 | 7.6 |
| May 1-31..... | 56,938 | 8.9 | 2.50 | 1.65 | 2.22 | | 3.13 | | .96 | 2.23 | .02 | .01 | | 350 | .48 | 27,102 | 35 | 1.54 | 601 | 7.8 |
| June 1-30..... | 61,408 | 10.0 | 2.30 | 1.65 | 2.18 | | 2.90 | | .92 | 2.26 | .02 | .01 | | 338 | .46 | 28,228 | 36 | 1.55 | 599 | 7.1 |
| July 1-31..... | 65,976 | 11.0 | 2.40 | 1.65 | 2.00 | 0.12 | 2.95 | | .90 | 2.26 | .02 | .02 | | 343 | .47 | 30,777 | 33 | 1.41 | 607 | 7.3 |
| Aug. 1-31..... | 51,711 | 12.0 | 2.45 | 1.73 | 2.31 | | 3.00 | | .94 | 2.51 | .02 | .01 | | 360 | .49 | 25,318 | 36 | 1.60 | 645 | 7.0 |
| Sept. 1-30..... | 55,993 | 11.0 | 2.35 | 1.81 | 2.26 | | 3.02 | | .94 | 2.43 | .02 | .02 | | 354 | .48 | 26,957 | 35 | 1.57 | 648 | 7.2 |
| Total or weighted average | 721,500 | 12.0 | 2.59 | 1.39 | 1.75 | -- | 2.98 | | 0.95 | 1.76 | 0.02 | 0.03 | | 323 | 0.44 | 317,000 | 32 | 1.24 | 563 | 7.3 |

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

LOCATION (revised).--At gaging station on left bank, just upstream from pier of upstream bridge, of two bridges on U.S. Highway 59 in Victoria, Victoria County, 1,300 feet upstream from Southern Pacific 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 1963.
Water temperatures: November 1950 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 720 micromhos Sept. 12; minimum daily, 346 micromhos July 4.
Percent sodium: Maximum, 35 Sept. 10-15; minimum, 21 Dec. 16 to Jan. 31.
Sodium-adsorption-ratio: Maximum, 1.56 Sept. 10-15; minimum, 0.82 Jan. 1-31.
EXTREMES, 1945-46, 1948-63.-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, 21 Dec. 16-31, 1962, Jan. 1-31, 1963.
Sodium-adsorption-ratio (1961-63): Maximum, 1.56 Sept. 10-15, 1962; minimum, 0.82 Jan. 1-31, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 18,893 | 18.0 | 2.89 | 1.07 | 1.26 | | 3.31 | | 0.75 | 1.07 | 0.02 | 0.05 | | 314 | 0.43 | 8,088 | 24 | 0.90 | 494 | 7.8 |
| Oct. 16-31..... | 21,168 | 18.0 | 3.19 | 1.23 | 1.31 | | 3.98 | | .62 | 1.07 | -- | .05 | | 317 | .43 | 9,126 | 23 | .88 | 537 | 7.7 |
| Nov. 1-30..... | 40,879 | 16.0 | 3.29 | 1.15 | 1.35 | | 3.98 | | .62 | 1.10 | .02 | .05 | | 324 | .44 | 18,013 | 23 | .90 | 548 | 7.6 |
| Dec. 1-15..... | 24,010 | 15.0 | 3.29 | 1.15 | 1.39 | | 3.98 | | .65 | 1.10 | .02 | .06 | | 324 | .44 | 10,580 | 24 | .93 | 552 | 7.7 |
| Dec. 16-31..... | 25,452 | 14.0 | 3.64 | 1.32 | 1.31 | | 4.39 | | .67 | 1.13 | -- | .06 | | 343 | .47 | 11,873 | 21 | .83 | 589 | 7.9 |
| Jan. 1-31, 1963. | 42,857 | 13.0 | 3.39 | 1.40 | 1.26 | | 4.10 | | .65 | 1.21 | .02 | .05 | | 333 | .45 | 19,409 | 21 | .82 | 573 | 7.4 |
| Feb. 1-19..... | 26,908 | 11.0 | 3.19 | 1.48 | 1.35 | | 4.06 | | .62 | 1.24 | .02 | .06 | | 324 | .44 | 11,857 | 22 | .88 | 569 | 7.4 |
| Feb. 20-26..... | 31,043 | 12.0 | 2.35 | .72 | 1.17 | | 2.49 | | .75 | .93 | -- | .08 | | 244 | .33 | 10,301 | 28 | .95 | 421 | 7.0 |
| Mar. 1-31..... | 40,766 | 13.0 | 3.09 | 1.48 | 1.31 | | 3.70 | | .71 | 1.35 | .02 | .08 | | 334 | .45 | 18,518 | 22 | .86 | 565 | 7.3 |
| Apr. 1-30..... | 43,914 | 15.0 | 3.09 | 1.32 | 1.44 | | 3.88 | | .69 | 1.18 | .02 | .07 | | 323 | .44 | 19,291 | 25 | .97 | 549 | 7.7 |
| May 1-15..... | 17,256 | 17.0 | 2.79 | 1.32 | 1.39 | | 3.72 | | .56 | 1.13 | .02 | .05 | | 304 | .41 | 7,134 | 25 | .97 | 500 | 7.8 |
| May 16-31..... | 12,853 | 15.0 | 3.19 | 1.23 | 1.48 | | 4.00 | | .58 | 1.30 | -- | .04 | | 324 | .44 | 5,663 | 25 | .99 | 541 | 7.7 |
| June 1-17..... | 12,173 | 14.0 | 2.84 | 1.32 | 1.48 | | 3.77 | | .56 | 1.24 | .02 | .03 | | 307 | .42 | 5,082 | 26 | 1.03 | 526 | 7.4 |
| June 18..... | 1,091 | 15.0 | 2.20 | .61 | 1.17 | | 2.57 | | .40 | .96 | -- | .03 | | 225 | .31 | 334 | 30 | .99 | 375 | 7.5 |
| June 19-30..... | 8,640 | 16.0 | 2.89 | 1.32 | 1.39 | | 3.77 | | .58 | 1.21 | -- | .03 | | 308 | .42 | 3,619 | 25 | .96 | 518 | 7.4 |
| July 1-12..... | 10,663 | 18.0 | 2.40 | .99 | 1.09 | 0.07 | 3.06 | | .46 | 1.04 | .02 | .03 | | 259 | .35 | 3,756 | 24 | .84 | 439 | 7.6 |
| July 13-31..... | 8,027 | 8.5 | 2.69 | 1.40 | 1.70 | | 3.72 | | .60 | 1.44 | -- | .01 | | 311 | .42 | 3,395 | 29 | 1.19 | 533 | 7.5 |
| Aug. 1-31..... | 10,576 | 20.0 | 2.40 | 1.40 | 1.61 | | 3.38 | | .60 | 1.41 | .02 | .01 | | 303 | .41 | 4,358 | 30 | 1.17 | 532 | 7.2 |
| Sept. 1-9..... | 2,963 | 19.0 | 2.20 | 1.48 | 1.91 | | 3.28 | | .65 | 1.61 | .02 | .02 | | 312 | .42 | 1,257 | 34 | 1.41 | 542 | 7.3 |
| Sept. 10-15..... | 1,964 | 18.0 | 2.89 | 1.48 | 2.31 | | 3.74 | | .71 | 2.20 | -- | .02 | | 372 | .51 | 993 | 35 | 1.56 | 663 | 7.4 |
| Sept. 16-30..... | 7,021 | 19.0 | 2.94 | 1.48 | 1.87 | | 4.10 | | .62 | 1.52 | -- | .03 | | 348 | .47 | 3,323 | 30 | 1.26 | 599 | 7.6 |
| Total or weighted average | 409,200 | 15.0 | 3.06 | 1.26 | 1.36 | -- | 3.77 | | 0.65 | 1.16 | -- | 0.05 | | 316 | 0.43 | 176,000 | 24 | 1.95 | 538 | 7.5 |

## NUECES RIVER BASIN

### 8-2110. NUECES RIVER NEAR MATHIS, TEX.

LOCATION.--At intake tower at Westley 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.--16,600 square miles.
RECORDS AVAILABLE.--Chemical analyses: October 1947 to September 1963.
Water temperatures: October 1947 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 904 micromhos June 17; minimum daily, 576 micromhos Oct. 1.
Percent sodium: Maximum, 60 June 1-30; minimum, 48 Jan. 1-31.
Sodium-adsorption-ratio: Maximum, 3.62 June 1-30; minimum, 2.42 Jan. 1-31.
EXTREMES, 1947-63.--Specific conductance: Maximum, daily, 1,040 micromhos July 1, 1946; minimum daily, 233 micromhos July 30, 1949.
Percent sodium: Maximum, 63 May 1-20, 1953; minimum, 23 June 1-30, 1957.
Sodium-adsorption-ratio (1961-63): Maximum, 3.62 June 1-30, 1963; minimum, 1.46 Nov. 1-30, 1961.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 6,579 | 17.0 | 2.30 | 0.62 | 2.96 | | 2.93 | | 0.79 | 2.14 | 0.02 | 0.01 | | 344 | 0.47 | 3,078 | 50 | 2.45 | 599 | 7.7 |
| Nov. 1-30..... | 4,975 | 16.0 | 2.40 | .65 | 3.09 | | 3.03 | | .83 | 2.23 | .02 | .01 | | 357 | .49 | 2,415 | 50 | 2.50 | 621 | 7.7 |
| Dec. 1-31..... | 4,034 | 15.0 | 2.59 | .64 | 3.09 | | 3.20 | | .83 | 2.26 | .02 | .01 | | 372 | .51 | 2,041 | 49 | 2.43 | 638 | 7.5 |
| Jan. 1-31, 1963. | 5,429 | 12.0 | 2.69 | .65 | 3.13 | | 3.28 | | .83 | 2.34 | .02 | .00 | | 374 | .51 | 2,762 | 46 | 2.42 | 651 | 7.7 |
| Feb. 1-28..... | 4,632 | 12.0 | 2.69 | .67 | 3.31 | | 3.38 | | .83 | 2.43 | .02 | .00 | | 395 | .54 | 2,486 | 50 | 2.55 | 666 | 7.6 |
| Mar. 1-31..... | 5,540 | 13.0 | 2.69 | .65 | 3.39 | | 3.38 | | .85 | 2.48 | .02 | .01 | | 384 | .52 | 2,893 | 50 | 2.62 | 677 | 7.6 |
| Apr. 1-30..... | 6,545 | 15.0 | 2.50 | .69 | 3.65 | | 3.31 | | .87 | 2.65 | .02 | .01 | | 393 | .53 | 3,498 | 53 | 2.90 | 682 | 7.8 |
| May 1-31..... | 6,977 | 16.0 | 2.30 | .62 | 4.00 | | 3.13 | | .92 | 2.85 | .02 | .02 | | 402 | .55 | 4,908 | 58 | 3.32 | 688 | 7.6 |
| June 1-30..... | 7,617 | 19.0 | 2.30 | .66 | 4.39 | | 3.21 | | .96 | 3.13 | .02 | .02 | | 428 | .58 | 4,433 | 60 | 3.62 | 730 | 7.5 |
| July 1-31..... | 8,793 | 17.0 | 2.20 | .62 | 3.48 | 0.25 | 3.21 | | .85 | 2.45 | .02 | .02 | | 384 | .52 | 4,592 | 53 | 2.93 | 656 | 7.1 |
| Aug. 1-31..... | 9,654 | 20.0 | 2.40 | .52 | 3.35 | | 3.34 | | .77 | 2.14 | .02 | .01 | | 366 | .50 | 4,805 | 53 | 2.78 | 626 | 7.6 |
| Sept. 1-30..... | 6,426 | 19.0 | 2.50 | .54 | 3.31 | | 3.54 | | .75 | 2.03 | .02 | .01 | | 366 | .50 | 3,199 | 52 | 2.68 | 626 | 7.5 |
| Total or weighted average | 79,200 | 16.0 | 2.43 | 0.62 | 3.48 | -- | 3.24 | | 0.84 | 2.45 | 0.02 | 0.01 | | 382 | 0.52 | 41,110 | 53 | 2.83 | 657 | 7.5 |

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

LOCATION.--Half a mile southeast of Lasauces, 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 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 690 micromhos Apr. 27; minimum daily, 139 micromhos Nov. 7, 8.
Percent sodium: Maximum, 54 July 30-31; minimum, 27, Nov. 6-12.
Sodium-adsorption-ratio: Maximum, 2.78 July 30-31; minimum, 0.55 Nov. 6-12.
EXTREMES, 1946-63.--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 (1961-63): Maximum, 2.87 July 30-31, 1963; minimum, 0.55 Nov. 6-12, 1962.
REMARKS.--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 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-3, 1962.. | 357 | -- | 2.64 | 0.82 | 2.00 | -- | 2.92 | 0.00 | -- | -- | -- | -- | -- | 372 | 0.51 | 181 | 37 | 1.52 | 533 | 8.0 |
| Oct. 4-6..... | 418 | -- | 2.20 | .76 | 1.57 | -- | 2.64 | .00 | -- | -- | -- | -- | -- | 314 | .43 | 179 | 35 | 1.29 | 452 | 7.5 |
| Oct. 7-10..... | 530 | -- | 1.65 | .53 | 1.04 | -- | 2.23 | .00 | -- | -- | -- | -- | -- | 234 | .32 | 169 | 32 | 1.00 | 323 | 7.4 |
| Oct. 11-14..... | 424 | -- | 2.30 | .80 | 1.91 | -- | 2.97 | .00 | -- | -- | -- | -- | -- | 356 | .48 | 206 | 38 | 1.54 | 495 | 8.2 |
| Oct. 15..... | 97 | -- | 1.95 | .59 | 1.22 | -- | 2.39 | .00 | -- | -- | -- | -- | -- | 273 | .37 | 36 | 32 | 1.08 | 371 | 7.4 |
| Oct. 16-18..... | 412 | -- | 1.65 | .57 | 1.00 | -- | 2.18 | .00 | -- | -- | -- | -- | -- | 232 | .32 | 130 | 31 | .95 | 326 | 7.5 |
| Oct. 19-22..... | 682 | -- | 2.10 | .70 | 1.44 | -- | 2.52 | .00 | -- | -- | -- | -- | -- | 295 | .40 | 274 | 34 | 1.21 | 423 | 7.6 |
| Oct. 23-24..... | 397 | -- | 1.75 | .41 | .91 | -- | 2.20 | .00 | -- | -- | -- | -- | -- | 233 | .32 | 126 | 30 | .88 | 311 | 7.4 |
| Oct. 25-31..... | 1,250 | -- | 2.30 | .76 | 1.65 | -- | 2.62 | .00 | -- | -- | -- | -- | -- | 333 | .45 | 566 | 35 | 1.34 | 472 | 7.6 |
| Nov. 1..... | 175 | -- | 2.64 | .82 | 1.78 | -- | 3.51 | .00 | -- | -- | -- | -- | -- | 362 | .49 | 86 | 34 | 1.35 | 515 | 7.1 |
| Nov. 2..... | 202 | -- | 1.10 | .38 | .74 | -- | 1.25 | .00 | -- | -- | -- | -- | -- | 159 | .22 | 44 | 33 | .86 | 225 | 7.6 |
| Nov. 3-4..... | 1,535 | -- | 1.05 | .15 | .57 | -- | 1.07 | .00 | -- | -- | -- | -- | -- | 125 | .17 | 261 | 32 | .73 | 174 | 7.4 |
| Nov. 5..... | 1,188 | -- | 2.30 | .72 | 1.78 | -- | 2.69 | .00 | -- | -- | -- | -- | -- | 333 | .45 | 538 | 37 | 1.45 | 472 | 7.6 |
| Nov. 6-12..... | 9,455 | 20.0 | .75 | .21 | .38 | 0.07 | .92 | .00 | 0.42 | 0.07 | 0.01 | 0.01 | 0.09 | 106 | .14 | 1,363 | 27 | .55 | 148 | 7.3 |
| Nov. 13-17..... | 2,202 | -- | 1.90 | .64 | 1.17 | -- | 2.07 | .00 | -- | -- | -- | -- | -- | 264 | .36 | 790 | 32 | 1.04 | 378 | 7.7 |
| Nov. 18-19..... | 615 | -- | 2.15 | .61 | 1.31 | -- | 2.21 | .00 | -- | -- | -- | -- | -- | 282 | .38 | 236 | 32 | 1.11 | 410 | 7.9 |
| Nov. 20-29..... | 5,355 | -- | 1.70 | .52 | 1.00 | -- | 1.92 | .00 | -- | -- | -- | -- | -- | 239 | .33 | 1,741 | 31 | .95 | 328 | 7.5 |
| Nov. 30..... | 506 | -- | 2.10 | .70 | 1.17 | -- | 2.16 | .00 | -- | -- | -- | -- | -- | 291 | .40 | 200 | 30 | .99 | 404 | 7.8 |
| Dec. 1-22..... | 10,735 | -- | 2.05 | .59 | 1.09 | -- | 2.16 | .00 | -- | -- | -- | -- | -- | 255 | .35 | 3,723 | 29 | .95 | 368 | 7.8 |
| Dec. 23-25..... | 851 | -- | 2.20 | .62 | 1.26 | -- | 2.47 | .00 | -- | -- | -- | -- | -- | 300 | .41 | 347 | 31 | 1.06 | 404 | 7.9 |
| Dec. 26-31..... | 1,749 | -- | 2.64 | .78 | 1.44 | -- | 3.02 | .00 | -- | -- | -- | -- | -- | 344 | .47 | 818 | 30 | 1.10 | 479 | 7.5 |

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Jan. 1-2, 1963.. | 567 | -- | 2.50 | 0.58 | 1.22 | -- | 2.39 | 0.00 | -- | -- | -- | -- | -- | 297 | 0.40 | 229 | 28 | 0.98 | 419 | 7.5 |
| Jan. 3-21..... | 5,389 | -- | 2.00 | .48 | .96 | -- | 2.11 | .00 | -- | -- | -- | -- | -- | 243 | .33 | 1,781 | 28 | .86 | 345 | 7.5 |
| Jan. 22-29..... | 2,269 | -- | 1.55 | .43 | .78 | -- | 1.67 | .00 | -- | -- | -- | -- | -- | 207 | .28 | 639 | 28 | .79 | 286 | 7.3 |
| Jan. 30-31..... | 567 | -- | 1.70 | .66 | 1.22 | -- | 2.79 | .00 | -- | -- | -- | -- | -- | 236 | .32 | 182 | 34 | 1.12 | 349 | 7.7 |
| Feb. 1-3..... | 1,874 | -- | 1.45 | .51 | 1.00 | -- | 2.31 | .00 | -- | -- | -- | -- | -- | 198 | .27 | 505 | 34 | 1.01 | 297 | 7.5 |
| Feb. 4-12..... | 5,623 | -- | 1.40 | .40 | .74 | -- | 1.69 | .00 | -- | -- | -- | -- | -- | 186 | .25 | 1,422 | 29 | .78 | 265 | 7.5 |
| Feb. 13-18..... | 3,749 | -- | 1.60 | .48 | .91 | -- | 2.16 | .00 | -- | -- | -- | -- | -- | 207 | .28 | 1,055 | 31 | .90 | 299 | 7.5 |
| Feb. 19-28..... | 6,248 | -- | 1.50 | .44 | .74 | -- | 1.74 | .00 | -- | -- | -- | -- | -- | 196 | .27 | 1,665 | 28 | .75 | 275 | 7.4 |
| Mar. 1-6..... | 4,213 | -- | 1.65 | .47 | .83 | -- | 1.74 | .00 | -- | -- | -- | -- | -- | 217 | .30 | 1,243 | 28 | .80 | 306 | 7.5 |
| Mar. 7-20..... | 9,386 | -- | 1.95 | .53 | 1.09 | -- | 2.07 | .00 | -- | -- | -- | -- | -- | 265 | .36 | 3,383 | 31 | .98 | 365 | 7.6 |
| Mar. 21-23..... | 1,470 | -- | 2.20 | .64 | 1.35 | -- | 2.26 | .00 | -- | -- | -- | -- | -- | 303 | .41 | 606 | 32 | 1.13 | 422 | 7.7 |
| Mar. 24-26..... | 2,906 | -- | 1.95 | .61 | 1.17 | -- | 1.97 | .00 | -- | -- | -- | -- | -- | 266 | .36 | 1,051 | 31 | 1.04 | 378 | 7.6 |
| Mar. 29..... | 555 | -- | 1.60 | .52 | .96 | -- | 1.77 | .00 | -- | -- | -- | -- | -- | 240 | .33 | 181 | 31 | .93 | 314 | 7.7 |
| Mar. 30-31..... | 1,214 | -- | 1.95 | .61 | 1.13 | -- | 1.92 | .00 | -- | -- | -- | -- | -- | 276 | .38 | 456 | 31 | 1.00 | 360 | 7.7 |
| Apr. 1-2..... | 1,127 | -- | 2.20 | .64 | 1.26 | -- | 2.15 | .00 | -- | -- | -- | -- | -- | 285 | .39 | 437 | 31 | 1.06 | 410 | 7.5 |
| Apr. 3-7..... | 1,993 | -- | 2.89 | .75 | 1.65 | -- | 2.44 | .00 | -- | -- | -- | -- | -- | 363 | .49 | 984 | 31 | 1.22 | 527 | 7.6 |
| Apr. 6-9..... | 778 | -- | 2.25 | .79 | 1.44 | -- | 2.20 | .00 | -- | -- | -- | -- | -- | 308 | .42 | 326 | 32 | 1.17 | 448 | 7.5 |
| Apr. 10..... | 450 | -- | 1.65 | .31 | .87 | -- | 1.67 | .00 | -- | -- | -- | -- | -- | 189 | .26 | 116 | 31 | .88 | 289 | 7.1 |
| Apr. 11..... | 540 | -- | 2.10 | .58 | 1.22 | -- | 1.97 | .00 | -- | -- | -- | -- | -- | 265 | .36 | 194 | 31 | 1.05 | 395 | 7.2 |
| Apr. 12..... | 540 | -- | 2.84 | .82 | 2.04 | -- | 2.62 | .00 | -- | -- | -- | -- | -- | 424 | .58 | 311 | 36 | 1.51 | 567 | 7.6 |
| Apr. 13..... | 389 | -- | 2.45 | .51 | 1.39 | -- | 2.10 | .00 | -- | -- | -- | -- | -- | 302 | .41 | 160 | 32 | 1.15 | 434 | 7.2 |
| Apr. 14..... | 351 | -- | 2.79 | .77 | 2.04 | -- | 2.62 | .00 | -- | -- | -- | -- | -- | 378 | .51 | 180 | 36 | 1.53 | 546 | 8.0 |
| Apr. 15-18..... | 1,500 | -- | 2.45 | .51 | 1.44 | -- | 2.10 | .00 | -- | -- | -- | -- | -- | 308 | .42 | 628 | 33 | 1.18 | 439 | 7.2 |
| Apr. 19..... | 278 | -- | 2.89 | .71 | 2.04 | -- | 2.59 | .00 | -- | -- | -- | -- | -- | 365 | .50 | 138 | 36 | 1.52 | 546 | 7.6 |
| Apr. 20-21..... | 428 | -- | 2.10 | .48 | 1.17 | -- | 1.93 | .00 | -- | -- | -- | -- | -- | 262 | .36 | 153 | 31 | 1.04 | 382 | 7.5 |
| Apr. 22-25..... | 524 | -- | 2.74 | .74 | 2.04 | -- | 2.66 | .00 | -- | -- | -- | -- | -- | 370 | .50 | 263 | 37 | 1.55 | 539 | 7.9 |
| Apr. 26-28..... | 254 | 29.0 | 3.19 | .90 | 2.61 | 0.19 | 2.72 | .00 | 3.48 | 0.59 | 0.04 | 0.01 | 0.12 | 462 | .63 | 160 | 38 | 1.82 | 658 | 7.5 |
| Apr. 29..... | 67 | -- | 2.74 | .80 | 2.18 | -- | 2.69 | .00 | -- | -- | -- | -- | -- | 379 | .52 | 35 | 38 | 1.63 | 556 | 8.0 |
| Apr. 30..... | 60 | -- | 3.29 | .99 | 2.78 | -- | 2.88 | .00 | -- | -- | -- | -- | -- | 464 | .63 | 38 | 39 | 1.90 | 680 | 8.2 |
| May 1-3..... | 162 | -- | 2.59 | .82 | 2.26 | -- | 2.77 | .00 | -- | -- | -- | -- | -- | 392 | .53 | 87 | 40 | 1.73 | 569 | 7.7 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May 4-6, 1963... | 115 | -- | 2.89 | 1.07 | 2.57 | -- | 3.13 | .00 | -- | -- | -- | -- | -- | 429 | .58 | 67 | 39 | 1.82 | 627 | 7.7 |
| May 7-10..... | 149 | -- | 2.79 | .57 | 2.35 | -- | 3.18 | .00 | -- | -- | -- | -- | -- | 388 | .53 | 79 | 41 | 1.81 | 569 | 7.5 |
| May 11..... | 48 | -- | 1.80 | .52 | 1.52 | -- | 2.79 | .00 | -- | -- | -- | -- | -- | 250 | .34 | 16 | 40 | 1.42 | 371 | 7.5 |
| May 12..... | 60 | -- | 1.20 | .38 | .83 | -- | 1.93 | .00 | -- | -- | -- | -- | -- | 170 | .23 | 14 | 34 | .93 | 239 | 7.4 |
| May 13..... | 87 | -- | 2.35 | .73 | 2.35 | -- | 3.41 | .00 | -- | -- | -- | -- | -- | 362 | .49 | 43 | 43 | 1.89 | 536 | 7.6 |
| May 14-21..... | 1,008 | -- | 1.30 | .30 | .78 | -- | 1.93 | .00 | -- | -- | -- | -- | -- | 172 | .23 | 236 | 33 | .88 | 233 | 8.0 |
| May 22-30..... | 923 | -- | 1.50 | .42 | .91 | -- | 2.31 | .00 | -- | -- | -- | -- | -- | 204 | .28 | 256 | 32 | .93 | 279 | 7.3 |
| May 31..... | 89 | -- | 2.15 | .73 | 1.87 | -- | 3.11 | .00 | -- | -- | -- | -- | -- | 320 | .44 | 39 | 39 | 1.56 | 470 | 7.7 |
| June 1-2..... | 155 | -- | 1.95 | .61 | 1.83 | -- | 3.06 | .00 | -- | -- | -- | -- | -- | 323 | .44 | 68 | 42 | 1.62 | 441 | 7.6 |
| June 3-4..... | 159 | -- | 1.65 | .63 | 1.26 | -- | 2.84 | .00 | -- | -- | -- | -- | -- | 258 | .35 | 56 | 36 | 1.18 | 353 | 7.3 |
| June 5..... | 77 | -- | 2.64 | 1.07 | 2.26 | -- | 3.15 | .00 | -- | -- | -- | -- | -- | 410 | .56 | 43 | 38 | 1.66 | 565 | 8.2 |
| June 6-11..... | 399 | -- | 1.95 | .69 | 1.39 | -- | 3.13 | .00 | -- | -- | -- | -- | -- | 288 | .39 | 156 | 35 | 1.21 | 404 | 7.6 |
| June 12-20..... | 405 | -- | 2.30 | .74 | 1.74 | -- | 3.49 | .00 | -- | -- | -- | -- | -- | 339 | .46 | 187 | 36 | 1.41 | 472 | 7.8 |
| June 21-23..... | 107 | -- | 1.85 | .71 | 1.31 | -- | 3.41 | .00 | -- | -- | -- | -- | -- | 270 | .37 | 39 | 34 | 1.15 | 370 | 7.8 |
| June 24-28..... | 109 | -- | 2.20 | .56 | 1.57 | -- | 3.34 | .00 | -- | -- | -- | -- | -- | 298 | .41 | 44 | 36 | 1.33 | 425 | 7.8 |
| June 29-30..... | 36 | -- | 2.25 | .71 | 2.04 | -- | 3.31 | .00 | -- | -- | -- | -- | -- | 354 | .48 | 17 | 41 | 1.68 | 490 | 7.8 |
| July 1-11..... | 196 | 42.0 | 2.10 | .74 | 2.26 | .18 | 3.28 | .07 | 1.50 | .34 | .06 | .01 | .18 | 342 | .47 | 91 | 43 | 1.90 | 495 | 8.3 |
| July 12-13..... | 105 | -- | 2.00 | .48 | 1.44 | -- | 4.26 | .00 | -- | -- | -- | -- | -- | 260 | .35 | 37 | 37 | 1.29 | 382 | 8.0 |
| July 14-29..... | 308 | -- | 2.05 | .63 | 2.61 | -- | 3.38 | .00 | -- | -- | -- | -- | -- | 356 | .48 | 149 | 49 | 2.25 | 512 | 8.2 |
| July 30-31..... | 12 | -- | 2.15 | .69 | 3.31 | -- | 3.57 | .00 | -- | -- | -- | -- | -- | 404 | .55 | 7 | 54 | 2.78 | 602 | 8.1 |
| Aug. 1-3..... | 64 | -- | 1.80 | .68 | 2.70 | -- | 3.28 | .13 | -- | -- | -- | -- | -- | 343 | .47 | 30 | 52 | 2.42 | 505 | 8.3 |
| Aug. 4-7..... | 147 | -- | 2.50 | .82 | 2.74 | -- | 3.31 | .00 | -- | -- | -- | -- | -- | 408 | .55 | 81 | 45 | 2.13 | 601 | 7.6 |
| Aug. 8-21..... | 380 | -- | 2.10 | .70 | 2.52 | -- | 3.18 | .00 | -- | -- | -- | -- | -- | 349 | .47 | 181 | 47 | 2.13 | 521 | 8.0 |
| Aug. 22-31..... | 688 | -- | 1.60 | .52 | 1.74 | -- | 2.82 | .00 | -- | -- | -- | -- | -- | 248 | .34 | 232 | 45 | 1.69 | 377 | 7.9 |
| Sept. 1-30..... | 1,244 | 33.0 | 1.70 | .58 | 1.65 | .18 | 2.95 | .00 | .83 | .25 | .05 | .01 | .08 | 262 | .36 | 443 | 40 | 1.55 | 389 | 7.7 |
| Total or weighted average | 101,700 | -- | 1.79 | 0.52 | 1.06 | -- | 2.03 | 0.00 | -- | -- | -- | -- | -- | 240 | 0.33 | 33,230 | 29 | 0.97 | 340 | 7.5 |

RIO GRANDE BASIN--Continued

6-3130. 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 1963.
Water temperatures: October 1948 to September 1963.
Sediment records: October 1947 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,310 micromhos Aug. 5; minimum daily, 224 micromhos Apr. 30.
Percent sodium: Maximum, 36 Oct. 22-24; minimum, 10 Aug. 5.
Sodium-adsorption-ratio: Maximum, 1.38 Oct. 22-24; minimum, 0.49 Apr. 12-22.
EXTREMES, 1946-63.--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 (1961-63): Maximum, 1.56 July 5-13, 1962; minimum, 0.40 Apr. 19-30, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-21,1964.. | 14,953 | 28.0 | 2.25 | 0.59 | 1.31 | | 2.74 | 0.00 | 1.23 | 0.27 | | 0.01 | | 261 | 0.35 | 5,308 | 32 | 1.10 | 401 | 8.2 |
| Oct. 22-24..... | 2,446 | 27.0 | 2.50 | .54 | 1.70 | | 2.93 | .00 | 1.60 | .31 | | .02 | | 300 | .41 | 998 | 36 | 1.38 | 462 | 7.8 |
| Oct. 25-31..... | 6,095 | 27.0 | 2.20 | .58 | 1.26 | | 2.59 | .00 | 1.27 | .28 | | .01 | | 256 | .35 | 2,122 | 31 | 1.07 | 396 | 7.9 |
| Nov. 1-6..... | 11,151 | 25.0 | 2.30 | .52 | 1.00 | | 2.59 | .00 | 1.06 | .23 | | .03 | | 239 | .33 | 3,625 | 26 | .84 | 369 | 7.7 |
| Nov. 7-15..... | 32,900 | 21.0 | 1.65 | .39 | .52 | | 1.84 | .00 | .69 | .10 | | .02 | | 163 | .22 | 7,293 | 20 | .52 | 251 | 7.9 |
| Nov. 16..... | 3,352 | 21.0 | 2.30 | .18 | 1.09 | | 2.13 | .00 | 1.21 | .28 | | .02 | | 227 | .31 | 1,035 | 31 | .98 | 332 | 8.1 |
| Nov. 17-30..... | 43,486 | 20.0 | 1.75 | .45 | .70 | | 1.93 | .00 | .87 | .14 | | .01 | | 182 | .25 | 10,764 | 24 | .66 | 285 | 8.0 |
| Dec. 1-31..... | 90,264 | 21.0 | 1.80 | .60 | .70 | | 1.93 | .00 | 1.06 | .16 | | .01 | | 196 | .27 | 24,061 | 23 | .64 | 302 | 7.9 |
| Jan. 1-6, 1963.. | 15,197 | 22.0 | 2.20 | .68 | .83 | | 2.23 | .00 | 1.42 | .13 | | .01 | | 234 | .32 | 4,836 | 22 | .69 | 365 | 7.7 |
| Jan. 7-12..... | 7,367 | 30.0 | 2.30 | .70 | 1.09 | | 2.64 | .00 | 1.29 | .19 | | .02 | | 258 | .35 | 2,585 | 27 | .89 | 397 | 7.9 |
| Jan. 13-21..... | 8,140 | 33.0 | 2.59 | .69 | 1.26 | | 2.90 | .00 | 1.52 | .24 | | .03 | | 293 | .40 | 3,244 | 28 | .98 | 446 | 7.9 |
| Jan. 22-31..... | 10,155 | 31.0 | 2.30 | .64 | 1.17 | | 2.62 | .00 | 1.31 | .22 | | .02 | | 263 | .36 | 3,632 | 29 | .97 | 399 | 7.8 |
| Feb. 1-2..... | 2,658 | 27.0 | 2.25 | .67 | 1.13 | | 2.52 | .00 | 1.37 | .22 | | .01 | | 257 | .35 | 929 | 28 | .94 | 398 | 7.7 |
| Feb. 3-4..... | 3,340 | 25.0 | 2.50 | .68 | 1.31 | | 2.52 | .00 | 1.83 | .27 | | .02 | | 288 | .39 | 1,308 | 29 | 1.04 | 441 | 7.6 |
| Feb. 5-7..... | 5,915 | 24.0 | 2.74 | .90 | 1.31 | | 2.36 | .00 | 2.52 | .18 | | .03 | | 320 | .44 | 2,574 | 26 | .97 | 488 | 7.6 |
| Feb. 8-13..... | 10,175 | 24.0 | 2.20 | .70 | 1.09 | | 2.20 | .00 | 1.62 | .20 | | .03 | | 254 | .35 | 3,515 | 27 | .90 | 393 | 7.6 |
| Feb. 14..... | 976 | 25.0 | 2.59 | .77 | 1.26 | | 2.66 | .00 | 1.81 | .21 | | .03 | | 292 | .40 | 388 | 27 | .97 | 447 | 7.6 |
| Feb. 15-28..... | 21,743 | 27.0 | 2.25 | .71 | 1.17 | | 2.46 | .00 | 1.50 | .23 | | .00 | | 262 | .36 | 7,747 | 28 | .97 | 405 | 7.6 |
| Mar. 1-21..... | 34,822 | 26.0 | 2.30 | .74 | 1.22 | | 2.33 | .00 | 1.71 | .24 | | .02 | | 271 | .37 | 12,834 | 29 | .99 | 421 | 7.4 |
| Mar. 22-23..... | 5,831 | 21.0 | 3.14 | 1.23 | 1.57 | | 2.36 | .00 | 3.31 | .20 | | .03 | | 374 | .51 | 2,966 | 26 | 1.06 | 569 | 7.6 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mar. 24, 1963... | 3,967 | 17.0 | 2.69 | .99 | 1.09 | | 2.16 | .00 | 2.42 | .13 | | .02 | | 295 | .40 | 1,592 | 23 | .80 | 458 | 7.7 |
| Mar. 25-28..... | 15,217 | 18.0 | 2.10 | .70 | .76 | | 1.87 | .00 | 1.56 | .14 | | .02 | | 224 | .30 | 4,636 | 22 | .66 | 357 | 7.7 |
| Mar. 29-31..... | 13,728 | 17.0 | 1.90 | .56 | .61 | | 1.60 | .00 | 1.12 | .12 | | .02 | | 190 | .26 | 3,547 | 20 | .55 | 307 | 7.7 |
| Apr. 1-2..... | 9,243 | 18.0 | 1.95 | .45 | .57 | | 1.67 | .00 | .96 | .11 | | .03 | | 183 | .25 | 2,300 | 19 | .52 | 293 | 7.7 |
| Apr. 3-4..... | 7,416 | 20.0 | 1.80 | .38 | .61 | | 1.80 | .00 | .85 | .11 | | .02 | | 175 | .24 | 1,766 | 22 | .58 | 276 | 7.8 |
| Apr. 5-7..... | 9,003 | 21.0 | 1.80 | .42 | .70 | | 1.87 | .00 | .92 | .15 | | .01 | | 184 | .25 | 2,253 | 24 | .66 | 289 | 7.8 |
| Apr. 8-11..... | 15,011 | 19.0 | 1.80 | .36 | .57 | | 1.77 | .00 | .87 | .11 | | .00 | | 172 | .23 | 3,511 | 21 | .54 | 271 | 7.8 |
| Apr. 12-22..... | 39,862 | 17.0 | 1.60 | .30 | .46 | | 1.57 | .00 | .75 | .10 | | .01 | | 151 | .21 | 8,186 | 20 | .49 | 239 | 7.8 |
| Apr. 23-27..... | 11,008 | 18.0 | 1.60 | .36 | .57 | | 1.67 | .00 | .75 | .11 | | .00 | | 158 | .21 | 2,365 | 22 | .57 | 249 | 7.7 |
| Apr. 28-30..... | 7,736 | 18.0 | 1.50 | .30 | .52 | | 1.54 | .00 | .71 | .10 | | .00 | | 147 | .20 | 1,546 | 23 | .55 | 231 | 7.8 |
| May 1-2..... | 3,166 | 21.0 | 1.75 | .47 | .78 | | 2.07 | .00 | .87 | .16 | | .01 | | 190 | .26 | 818 | 26 | .74 | 300 | 7.6 |
| May 3-15..... | 11,913 | 20.0 | 2.15 | .57 | 1.04 | | 2.36 | .00 | 1.17 | .23 | | .00 | | 229 | .31 | 3,710 | 28 | .90 | 369 | 7.6 |
| May 16-27..... | 17,018 | 20.0 | 1.95 | .39 | .74 | | 2.07 | .00 | .85 | .17 | | .00 | | 190 | .26 | 4,397 | 24 | .68 | 307 | 7.4 |
| May 28-31..... | 3,459 | 22.0 | 2.10 | .48 | .91 | | 2.36 | .00 | .96 | .20 | | .01 | | 216 | .29 | 1,016 | 26 | .81 | 344 | 7.1 |
| June 1-26..... | 13,254 | 24.0 | 2.20 | .60 | 1.22 | | 2.66 | .00 | 1.08 | .26 | | .00 | | 245 | .33 | 4,416 | 30 | 1.03 | 391 | 7.7 |
| June 27-30..... | 3,872 | 22.0 | 1.85 | .43 | .78 | | 2.00 | .00 | .94 | .12 | | .00 | | 192 | .26 | 1,011 | 26 | .73 | 302 | 7.5 |
| July 1-16..... | 5,522 | 26.0 | 2.10 | .62 | 1.22 | | 2.79 | .00 | .96 | .20 | | .00 | | 243 | .33 | 1,825 | 31 | 1.05 | 378 | 8.2 |
| July 17..... | 853 | 34.0 | 3.99 | 1.23 | 2.18 | | 4.33 | .00 | 2.73 | .39 | | .00 | | 454 | .62 | 527 | 29 | 1.35 | 689 | 7.8 |
| July 18-31..... | 7,053 | 26.0 | 2.20 | .44 | 1.13 | | 2.59 | .00 | 1.02 | .21 | | .00 | | 236 | .32 | 2,264 | 30 | .98 | 365 | 7.9 |
| Aug. 1-4..... | 2,959 | 23.0 | 2.10 | .46 | .87 | | 2.20 | .00 | 1.10 | .14 | | .00 | | 214 | .29 | 861 | 25 | .77 | 335 | 7.7 |
| Aug. 5..... | 563 | 22.0 | 12.87 | 1.15 | 1.61 | | 3.15 | .00 | 12.53 | .08 | | .00 | | 1,030 | 1.40 | 789 | 10 | .61 | 1,310 | 7.6 |
| Aug. 6..... | 333 | 32.0 | 4.04 | .56 | 1.31 | | 2.56 | .27 | 2.96 | .14 | | .00 | | 383 | .52 | 174 | 22 | .86 | 551 | 8.4 |
| Aug. 7-13..... | 2,249 | 30.0 | 2.20 | .54 | 1.26 | | 2.62 | .13 | 1.08 | .19 | | .00 | | 252 | .34 | 771 | 32 | 1.08 | 387 | 8.3 |
| Aug. 14-21..... | 3,491 | 30.0 | 2.54 | .74 | 1.39 | | 2.82 | .00 | 1.64 | .25 | | .00 | | 295 | .40 | 1,401 | 30 | 1.09 | 454 | 7.9 |
| Aug. 22..... | 662 | 28.0 | 6.19 | 1.23 | 1.96 | | 2.95 | .00 | 6.41 | .14 | | .00 | | 614 | .84 | 553 | 21 | 1.02 | 859 | 7.6 |
| Aug. 23-24..... | 1,075 | 24.0 | 3.39 | .77 | 1.65 | | 2.85 | .00 | 2.79 | .16 | | .00 | | 366 | .50 | 535 | 28 | 1.15 | 557 | 7.7 |
| Aug. 25-27..... | 1,690 | 27.0 | 2.50 | .54 | 1.22 | | 2.92 | .00 | 1.17 | .23 | | .00 | | 264 | .36 | 607 | 29 | .99 | 413 | 8.0 |
| Aug. 28-30..... | 2,118 | 24.0 | 3.24 | .76 | 1.44 | | 2.79 | .00 | 2.50 | .19 | | .01 | | 342 | .47 | 985 | 26 | 1.02 | 525 | 7.8 |
| Aug. 31..... | 837 | 34.0 | 2.69 | .47 | .91 | | 3.93 | .00 | .05 | .08 | | .01 | | 238 | .32 | 271 | 22 | .73 | 387 | 7.6 |
| Sept. 1-30..... | 15,055 | 28.0 | 2.40 | .60 | 1.22 | | 2.86 | .00 | 1.17 | .21 | | .00 | | 262 | .36 | 5,364 | 29 | 1.00 | 408 | 7.9 |
| Total or weighted average | 560,300 | 22.0 | 2.03 | 0.55 | 0.87 | | 2.14 | 0.00 | 1.18 | 0.17 | | 0.01 | | 218 | 0.30 | 166,000 | | 0.76 | 338 | 7.2 |

RIO GRANDE BASIN--Continued

## 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 1963.
Water temperatures: March 1954 to September 1963.
Sediment records: March 1954 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,400 micromhos Aug. 6; minimum daily, 353 micromhos Jan. 8.
Percent sodium: Maximum, 58 June 1-30; minimum, 32 Nov. 11-30, Apr. 1-5.
Sodium-adsorption-ratio: Maximum, 5.28 Aug. 6; minimum, 1.23 Apr. 1-5.
EXTREMES, 1954-63.--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 (1961-62): Maximum, 5.38 Sept. 1-24, 1962; minimum, 1.10 Jan. 8-9, 1962.
REMARKS.--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. No flow July 24 to Aug. 5.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962.. | 1,198 | -- | 7.19 | 2.14 | 5.39 | -- | 4.02 | -- | -- | -- | -- | -- | -- | 1,000 | 1.36 | 1,629 | 37 | 2.50 | 1,320 | 7.3 |
| Oct. 3-5..... | 988 | -- | 4.79 | 1.40 | 4.22 | -- | 3.80 | -- | -- | -- | -- | -- | -- | 705 | .96 | 947 | 41 | 2.40 | 991 | 7.5 |
| Oct. 6-19..... | 3,193 | -- | 4.04 | 1.23 | 4.26 | -- | 3.85 | -- | -- | -- | -- | -- | -- | 635 | .86 | 2,758 | 45 | 2.62 | 929 | 7.8 |
| Oct. 20-21..... | 1,575 | -- | 10.08 | 3.13 | 6.70 | -- | 4.06 | -- | -- | -- | -- | -- | -- | 1,350 | 1.84 | 2,891 | 34 | 2.61 | 1,720 | 7.1 |
| Oct. 22..... | 373 | -- | 8.28 | 2.30 | 6.09 | -- | 4.06 | -- | -- | -- | -- | -- | -- | 1,130 | 1.54 | 573 | 37 | 2.65 | 1,500 | 7.2 |
| Oct. 23-24..... | 651 | -- | 5.44 | 1.56 | 5.48 | -- | 3.93 | -- | -- | -- | -- | -- | -- | 837 | 1.14 | 741 | 44 | 2.93 | 1,190 | 7.4 |
| Oct. 25-31..... | 3,207 | -- | 4.39 | 1.23 | 4.74 | -- | 3.98 | -- | -- | -- | -- | -- | -- | 690 | .94 | 3,010 | 46 | 2.83 | 997 | 7.6 |
| Nov. 1-7..... | 3,665 | -- | 4.09 | 1.15 | 4.31 | -- | 3.97 | -- | -- | -- | -- | -- | -- | 635 | .86 | 3,165 | 45 | 2.66 | 929 | 7.6 |
| Nov. 8-10..... | 6,040 | -- | 3.04 | .99 | 2.22 | -- | 3.52 | -- | -- | -- | -- | -- | -- | 415 | .56 | 3,409 | 35 | 1.56 | 609 | 7.3 |
| Nov. 11-30..... | 58,393 | -- | 2.84 | .70 | 1.65 | -- | 2.95 | -- | -- | -- | -- | -- | -- | 334 | .45 | 26,525 | 32 | 1.24 | 511 | 7.6 |
| Dec. 1-31..... | 90,633 | 25.0 | 2.69 | .71 | 1.74 | 0.10 | 2.74 | -- | 1.85 | 0.62 | 0.03 | 0.03 | 0.08 | 330 | .45 | 40,676 | 33 | 1.33 | 507 | 7.7 |
| Jan. 1-7, 1963.. | 18,341 | -- | 3.14 | .48 | 1.83 | -- | 2.82 | -- | -- | -- | -- | -- | -- | 344 | .47 | 8,581 | 34 | 1.36 | 531 | 7.6 |
| Jan. 8-13..... | 10,758 | 17.0 | 1.90 | .26 | 1.39 | .06 | 1.67 | -- | 1.33 | .59 | .03 | .02 | .10 | 240 | .33 | 3,512 | 39 | 1.34 | 366 | 7.9 |
| Jan. 14-22..... | 7,890 | -- | 3.59 | .90 | 3.44 | -- | 3.47 | -- | -- | -- | -- | -- | -- | 507 | .69 | 5,440 | 43 | 2.29 | 762 | 7.7 |
| Jan. 23-31..... | 11,139 | -- | 3.29 | .73 | 2.78 | -- | 3.21 | -- | -- | -- | -- | -- | -- | 437 | .59 | 6,620 | 41 | 1.96 | 669 | 7.6 |
| Feb. 1-28..... | 50,372 | -- | 3.34 | .62 | 2.65 | -- | 3.11 | -- | -- | -- | -- | -- | -- | 438 | .60 | 30,006 | 40 | 1.89 | 655 | 7.7 |
| Mar. 1-25..... | 29,802 | -- | 3.09 | .90 | 2.65 | -- | 3.18 | -- | -- | -- | -- | -- | -- | 438 | .60 | 17,752 | 40 | 1.88 | 660 | 7.7 |
| Mar. 26-31..... | 14,257 | -- | 2.99 | .90 | 2.04 | --- | 2.98 | -- | -- | -- | -- | -- | -- | 392 | .53 | 7,601 | 34 | 1.46 | 585 | 7.4 |
| Apr. 1-5..... | 14,936 | -- | 2.64 | .76 | 1.61 | -- | 2.62 | -- | -- | -- | -- | -- | -- | 330 | .45 | 6,703 | 32 | 1.23 | 490 | 7.5 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apr. 6-7,.1963.. | 4,225 | -- | 2.45 | .71 | 1.74 | -- | 2.49 | -- | -- | -- | -- | -- | -- | 328 | .45 | 1,885 | 36 | 1.39 | 484 | 7.7 |
| Apr. 8-11..... | 6,522 | -- | 2.69 | .90 | 2.26 | -- | 2.75 | -- | -- | -- | -- | -- | -- | 385 | .52 | 3,415 | 39 | 1.69 | 537 | 7.8 |
| Apr. 12-24..... | 29,395 | -- | 2.45 | .79 | 1.87 | -- | 2.49 | -- | -- | -- | -- | -- | -- | 341 | .46 | 13,632 | 37 | 1.47 | 516 | 7.8 |
| Apr. 25-28, 30.. | 4,721 | -- | 2.99 | .99 | 2.78 | -- | 2.98 | --- | -- | -- | -- | -- | -- | 445 | .61 | 2,857 | 41 | 1.97 | 660 | 7.9 |
| Apr. 29..... | 774 | -- | 3.99 | 1.32 | 3.22 | -- | 3.29 | -- | -- | -- | -- | -- | -- | 482 | .66 | 507 | 38 | 1.98 | 736 | 7.9 |
| May 1-4..... | 3,404 | -- | 3.19 | .90 | 2.63 | -- | 3.15 | -- | -- | -- | -- | -- | -- | 454 | .62 | 2,102 | 41 | 1.98 | 681 | 7.6 |
| May 5-11..... | 3,416 | -- | 3.49 | 1.15 | 4.00 | -- | 3.44 | -- | -- | -- | -- | -- | -- | 556 | .76 | 2,583 | 46 | 2.63 | 841 | 7.7 |
| May 12-17..... | 1,928 | -- | 3.79 | 1.32 | 4.83 | -- | 3.67 | -- | -- | -- | -- | -- | -- | 643 | .67 | 1,686 | 49 | 3.02 | 968 | 7.9 |
| May 18-31..... | 2,080 | -- | 4.09 | 1.48 | 6.53 | -- | 4.10 | -- | -- | -- | -- | -- | -- | 773 | 1.05 | 2,187 | 54 | 3.91 | 1,190 | 7.9 |
| June 1-30..... | 1,148 | -- | 4.09 | 1.65 | 7.87 | -- | 3.97 | -- | -- | -- | -- | -- | -- | 882 | 1.20 | 1,378 | 58 | 4.65 | 1,340 | 8.0 |
| July 1-23 a..... | 146 | -- | 3.99 | 1.65 | 7.31 | -- | 3.70 | -- | -- | -- | -- | -- | -- | 843 | 1.15 | 167 | 56 | 4.35 | 1,290 | 7.7 |
| Aug. 6..... | 643 | 21.0 | 10.18 | 4.20 | 14.14 | .16 | 6.52 | -- | 20.40 | 1.52 | .04 | .01 | .22 | 1,690 | 2.57 | 1,652 | 49 | 5.27 | 2,400 | 7.6 |
| Aug. 7..... | 575 | -- | 8.08 | 3.13 | 10.96 | -- | 5.74 | -- | -- | -- | -- | -- | -- | 1,460 | 1.99 | 1,142 | 49 | 4.63 | 1,910 | 7.5 |
| Aug. 8-12..... | 664 | -- | 7.19 | 2.80 | 9.22 | -- | 6.13 | -- | -- | -- | -- | -- | -- | 1,220 | 1.66 | 1,102 | 48 | 4.13 | 1,670 | 7.6 |
| Aug. 13-26..... | 2,024 | -- | 5.69 | 1.89 | 6.31 | -- | 4.98 | -- | -- | -- | -- | -- | -- | 868 | 1.21 | 2,445 | 45 | 3.24 | 1,290 | 7.6 |
| Aug. 27-29..... | 1,410 | -- | 9.93 | 3.29 | 9.14 | -- | 6.75 | -- | -- | -- | -- | -- | -- | 1,460 | 1.99 | 2,800 | 41 | 3.55 | 1,940 | 7.5 |
| Aug. 30-31..... | 2,400 | -- | 5.84 | 2.14 | 5.35 | -- | 6.46 | -- | -- | -- | -- | -- | -- | 820 | 1.12 | 2,676 | 40 | 2.68 | 1,190 | 7.6 |
| Sept. 1-5..... | 4,056 | -- | 7.39 | 2.30 | 6.79 | -- | 4.33 | -- | -- | -- | -- | -- | -- | 1,060 | 1.47 | 5,958 | 41 | 3.08 | 1,490 | 7.5 |
| Sept. 6-7..... | 770 | -- | 5.99 | 1.65 | 3.70 | -- | 5.70 | -- | -- | -- | -- | -- | -- | 668 | .91 | 699 | 33 | 1.89 | 1,030 | 7.6 |
| Sept. 8..... | 819 | -- | 12.36 | 3.95 | 10.61 | -- | 6.03 | -- | -- | -- | -- | -- | -- | 1,710 | 2.33 | 1,905 | 39 | 3.72 | 2,240 | 7.5 |
| Sept. 9-23..... | 3,273 | 27.0 | 6.09 | 1.89 | 7.00 | .19 | 4.26 | -- | 8.16 | 2.82 | .03 | .01 | .25 | 976 | 1.33 | 4,353 | 46 | 3.51 | 1,420 | 7.7 |
| Sept. 24-25..... | 1,753 | -- | 9.58 | 3.21 | 9.18 | -- | 5.08 | -- | -- | -- | -- | -- | -- | 1,450 | 1.97 | 3,458 | 42 | 3.63 | 1,910 | 7.5 |
| Sept. 26-27..... | 341 | -- | 6.39 | 1.81 | 7.92 | -- | 4.10 | -- | -- | -- | -- | -- | -- | 1,070 | 1.46 | 496 | 49 | 3.91 | 1,520 | 7.7 |
| Sept. 28-30..... | 155 | -- | 4.94 | 1.23 | 3.87 | -- | 3.41 | -- | -- | -- | -- | -- | -- | 630 | .66 | 133 | 39 | 2.20 | 928 | 8.0 |
| Total or weighted average | 404,100 | -- | 3.20 | 0.85 | 2.48 | -- | 3.03 | -- | -- | -- | -- | -- | -- | 425 | 0.58 | 233,800 | 34 | 1.69 | 634 | 7.6 |

RIO GRANDE BASIN--Continued

6-3584. 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 1963.
Water temperatures: January 1949 to September 1963.
Sediment records: July 1946 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,540 micromhos Sept. 4; minimum daily, 480 micromhos Apr. 5.
Percent sodium: Maximum, 42 Sept. 1-12; minimum, 32 Oct. 28-29, Apr. 2-3, 5.
Sodium-adsorption-ratio: Maximum, 3.06 Sept. 1-12; minimum, 1.23 Apr. 2-3, 5.
EXTREMES, 1946-63.--Specific conductance: Maximum daily, 2,730 micromhos Apr. 8, 1953; minimum daily, 311 micromhos June 14, 1952.
Percent sodium: Maximum, 65 May 1-10, 1951; minimum 18 July 22-23, 1962.
Sodium-adsorption-ratio (1961-63): Maximum, 3.09 July 24-28, 1962; minimum, 0.87 May 1-23, 1962.
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 84 . No flow Oct. 1-27, Oct. 30 to Apr. 1, 4, Apr. 6 to Aug. 22, 24-30, Sept. 13-22.

Chemical analyses, water year October 1962 to September 1963

| 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. 26-29, 1962 | 36 | 27.0 | 7.98 | 2.47 | 4.83 | -- | 9.51 | | 4.41 | 4.94 | 0.04 | 0.00 | 0.16 | 928 | 1.26 | 45 | 32 | 2.11 | 1,390 | 7.2 |
| Apr. 2-3, 5, 1963 A..... | 2 | -- | 2.64 | .76 | 1.61 | -- | 2.62 | | -- | -- | -- | -- | -- | 330 | .45 | 1 | 32 | 1.23 | 490 | 7.5 |
| Aug. 23, 31..... | 424 | 23.0 | 5.89 | 2.14 | 5.18 | 0.15 | 4.62 | | 7.08 | 1.44 | 0.04 | 0.00 | 0.14 | 822 | 1.12 | 475 | 39 | 2.58 | 1,180 | 7.7 |
| Sept. 1-12..... | 778 | 19.0 | 6.74 | 1.97 | 6.39 | .18 | 2.85 | | 11.12 | 1.47 | .04 | .05 | .21 | 1,010 | 1.37 | 1,069 | 42 | 3.06 | 1,400 | 7.8 |
| Sept. 23-30..... | 236 | 27.0 | 6.09 | 2.14 | 4.74 | .15 | 3.84 | | 7.81 | 1.52 | .04 | .00 | .13 | 844 | 1.15 | 271 | 38 | 2.34 | 1,190 | 7.7 |
| Total or weighted average | 1,476 | 22.0 | 6.42 | 2.06 | 5.73 | 0.17 | 3.68 | | 9.26 | 1.55 | 0.04 | 0.03 | 0.18 | 927 | 1.26 | 1,860 | 40 | 2.78 | 1,300 | 7.7 |

A Estimated analysis from Rio Grande conveyance channel at San Marcial, N. Mex.

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

LOCATION.--At gaging station, in Pedro Armendaris Grant, 1.0 mile downstream from dam, and 1.5 miles upstream from Cuchillo Negro River.
DRAINAGE AREA.--28,900 square miles, approximately (includes 2,940 square miles in closed basin in San Luis Valley, Colorado).
RECORDS AVAILABLE.--Chemical analyses, 1933 to 1963.
REMARKS.--Chemical analyses by the U.S. Department of Agriculture, Agricultural Research Service, U.S. Salinity Laboratory, Riverside, Calif.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1962 | 25 | 504 | --- | 2.68 | 1.02 | 2.70 | --- | 2.95 | 0.00 | 2.46 | 1.00 | --- | 0.01 | | 0.13 | 384 | 0.52 | 262 | 42 | 2.0 | 622 | 7.7 |
| November..... | 20 | 403 | --- | 2.79 | .85 | 2.99 | --- | 2.90 | .00 | 2.82 | 1.06 | --- | .01 | | .12 | 422 | .57 | 230 | 45 | 2.2 | 664 | 7.7 |
| December..... | 20 | 200 | --- | 2.67 | .87 | 2.81 | --- | 2.87 | .00 | 2.67 | .99 | --- | .01 | | .11 | 408 | .55 | 110 | 44 | 2.1 | 627 | 8.0 |
| January, 1963 | 25 | 382 | 16 | 2.96 | .78 | 2.93 | 0.11 | 3.05 | .00 | 2.77 | 1.05 | 0.03 | .01 | | .11 | 428 | .58 | 222 | 43 | 2.1 | 656 | 7.8 |
| February..... | 20 | 60,154 | --- | 2.77 | .89 | 2.49 | --- | 2.68 | .00 | 2.50 | .91 | --- | .01 | | .07 | 376 | .51 | 679 | 40 | 1.8 | 624 | 7.9 |
| March..... | 20 | 64,849 | --- | 2.69 | .81 | 2.39 | --- | 2.66 | .00 | 2.39 | .92 | --- | .01 | | .12 | 386 | .52 | 33,720 | 41 | 1.8 | 619 | |
| April..... | 20 | 106,335 | --- | 2.78 | .89 | 2.42 | --- | 2.74 | .00 | 2.55 | .96 | --- | .01 | | .05 | 398 | .54 | 57,420 | 40 | 1.8 | 620 | 8.2 |
| May..... | 25 | 71,525 | --- | 2.68 | .81 | 2.42 | --- | 2.55 | .00 | 2.48 | .90 | --- | .01 | | .14 | 387 | .53 | 37,910 | 41 | 1.8 | 609 | 8.1 |
| June..... | 20 | 45,067 | --- | 3.03 | .84 | 2.52 | --- | 2.95 | .00 | 2.54 | .92 | --- | .01 | | .13 | 387 | .53 | 23,890 | 39 | 1.8 | 643 | 7.9 |
| July..... | 25 | 85,786 | 4 | 2.24 | .92 | 2.62 | .12 | 2.10 | .00 | 2.59 | 1.20 | .03 | .01 | | .14 | 360 | .49 | 42,040 | 44 | 2.1 | 590 | 7.8 |
| August..... | 20 | 71,709 | --- | 3.06 | 1.14 | 2.91 | --- | 2.94 | .00 | 2.76 | 1.42 | --- | .01 | | .15 | 441 | .60 | 43,030 | 41 | 2.0 | 706 | 7.8 |
| September.... | 20 | 2,977 | --- | 3.46 | 1.14 | 4.19 | --- | 3.30 | .00 | 3.75 | 1.85 | --- | .01 | | .13 | 557 | .76 | 2,260 | 48 | 2.8 | 857 | 7.9 |
| Total or weighted average | --- | 509,890 | --- | 2.73 | 0.91 | 2.55 | --- | 2.64 | 0.00 | 2.56 | 1.05 | --- | 0.01 | | 0.11 | 392 | 0.47 | 241,800 | 44 | 1.89 | 629 | 7.9 |

RIO GRANDE BASIN--Continued

8-3640. RIO GRANDE NEAR EL PASO, TEX.

LOCATION.--At gaging station, 5 miles northwest of El Paso, Tex., 6 miles northwest of Juarez, Chihuahua, and 1.9 river miles above the American Dam.
DRAINAGE AREA.--29,267 square miles (from International Boundary and Water Commission Water Bulletin Number 31).
RECORDS AVAILABLE.--Chemical analyses, 1933 to 1963.
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 1962 to September 1963 given in International Boundary and Water Commission Water Bulletin Numbers 32 and 33. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1962 | 31 | 13,311 | --- | 5.35 | 2.34 | 12.40 | --- | 3.57 | 0.00 | 9.57 | 6.95 | --- | 0.01 | 0.35 | 1,342 | 1.83 | 24,400 | 62 | 6.3 | 1,900 | 8.0 |
| November..... | 30 | 8,850 | --- | 5.52 | 2.46 | 14.15 | --- | 3.40 | .00 | 11.29 | 7.70 | --- | .01 | .32 | 1,470 | 2.00 | 17,700 | 64 | 7.1 | 2,170 | 8.0 |
| December..... | 31 | 8,092 | --- | 6.83 | 2.38 | 13.44 | --- | 4.46 | .00 | 11.23 | 7.66 | --- | .01 | .38 | 1,494 | 2.03 | 16,400 | 59 | 6.3 | 2,200 | 8.0 |
| January, 1963 | 31 | 6,070 | 27 | 6.53 | 2.53 | 15.10 | 0.31 | 4.50 | .00 | 11.47 | 8.48 | 0.05 | .01 | .38 | 1,621 | 2.20 | 13,400 | 62 | 7.1 | 2,360 | 8.0 |
| February..... | 28 | 4,262 | --- | 6.67 | 2.21 | 15.73 | --- | 4.65 | .00 | 11.94 | 8.95 | --- | .01 | .44 | 1,629 | 2.22 | 9,460 | 63 | 7.4 | 2,450 | 8.1 |
| March..... | 31 | 48,425 | --- | 4.17 | 1.21 | 5.22 | --- | 3.30 | .00 | 4.42 | 3.18 | --- | .01 | .20 | 713 | .97 | 47,000 | 49 | 3.2 | 1,080 | 7.7 |
| April..... | 30 | 32,722 | --- | 4.59 | 1.37 | 6.64 | --- | 3.52 | .00 | 5.53 | 3.62 | --- | .01 | .20 | 839 | 1.14 | 37,300 | 53 | 3.8 | 1,270 | 7.9 |
| May..... | 31 | 22,191 | --- | 5.10 | 1.72 | 7.75 | --- | 3.95 | .00 | 6.61 | 4.25 | --- | .01 | .23 | 938 | 1.28 | 28,400 | 53 | 4.2 | 1,440 | 8.0 |
| June..... | 30 | 41,187 | --- | 4.16 | 1.40 | 5.34 | --- | 3.52 | .00 | 4.63 | 2.95 | --- | .01 | .23 | 699 | .95 | 39,100 | 49 | 3.2 | 1,070 | 8.0 |
| July..... | 31 | 48,060 | 16 | 4.03 | 1.31 | 5.38 | .23 | 3.36 | .00 | 4.56 | 3.02 | .04 | .01 | .16 | 689 | .94 | 45,200 | 49 | 3.3 | 1,070 | 8.1 |
| August..... | 31 | 29,427 | --- | 4.73 | 1.44 | 7.37 | --- | 3.90 | .00 | 5.90 | 3.90 | --- | .02 | .27 | 912 | 1.24 | 36,500 | 54 | 4.2 | 1,350 | 7.8 |
| September.... | 30 | 16,529 | --- | 5.42 | 1.98 | 9.47 | --- | 4.20 | .00 | 7.69 | 5.35 | --- | .02 | .30 | 1,107 | 1.51 | 25,000 | 56 | 4.9 | 1,660 | 8.2 |
| Total or weighted average | --- | 279,100 | --- | 4.67 | 1.56 | 7.35 | --- | 36.63 | 0.00 | 6.06 | 4.12 | --- | 0.01 | 0.24 | 894 | 1.22 | 339,900 | 51 | 4.1 | 1,350 | 7.9 |

## 8-3705. RIO GRANDE AT FORT QUITMAN, TEX.
(Formerly published as Rio Grande below Old Fort Quitman, Tex.)

LOCATION.--At gaging station at the rectified channel of the Rio Grande, 1.5 miles below Old Fort Quitman, and 81.1 river miles below the American Dam at El Paso, Tex.
DRAINAGE AREA.--32,035 square miles (United States and Mexico; from International Boundary and Water Commission Water Bulletin Number 31).
RECORDS AVAILABLE.--Chemical analyses: 1933 to 1963.
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 1962 to September 1963 given in International Boundary and Water Commission Water Bulletin Numbers 32 and 33. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1962 | 5 | 13,438 | -- | 13.07 | 4.87 | 27.53 | -- | 5.29 | 0.00 | 15.53 | 25.58 | -- | 0.05 | 0.42 | | 2,954 | 4.02 | 54,000 | 61 | 9.2 | 4,180 | 7.9 |
| November..... | 4 | 8,146 | -- | 12.94 | 4.96 | 27.75 | -- | 5.70 | .00 | 16.21 | 23.92 | -- | .07 | .48 | | 2,969 | 4.04 | 32,900 | 61 | 9.3 | 4,360 | 7.8 |
| December..... | 4 | 7,707 | -- | 12.79 | 4.44 | 27.40 | -- | 5.34 | .00 | 16.06 | 24.32 | -- | .02 | .50 | | 2,882 | 3.92 | 30,200 | 61 | 9.3 | 4,320 | 7.8 |
| January, 1963 | 5 | 3,663 | 30.0 | 15.05 | 5.86 | 33.78 | 0.33 | 5.38 | .00 | 18.38 | 31.73 | 0.04 | .05 | .58 | | 3,505 | 4.77 | 17,500 | 61 | 10.0 | 5,220 | 7.9 |
| February..... | 2 | 1,107 | -- | 20.80 | 9.04 | 54.19 | -- | 5.20 | .00 | 26.10 | 53.80 | -- | .01 | .80 | | 5,324 | 7.24 | 8,010 | 64 | 14.0 | 7,780 | 7.9 |
| March..... | 4 | 570 | -- | 31.52 | 16.86 | 89.80 | -- | 4.62 | .00 | 36.98 | 98.10 | -- | .02 | 1.10 | | 8,826 | 12.00 | 6,840 | 65 | 18.0 | 12,200 | 7.8 |
| April..... | 3 | 2,060 | -- | 20.61 | 9.12 | 52.61 | -- | 5.10 | .00 | 25.08 | 53.40 | -- | .01 | .80 | | 5,310 | 7.22 | 14,900 | 64 | 14.0 | 7,690 | 7.9 |
| May..... | 5 | 1,510 | -- | 24.08 | 12.52 | 67.33 | -- | 4.25 | .00 | 30.16 | 69.75 | -- | .01 | .88 | | 6,516 | 8.86 | 13,400 | 65 | 16.0 | 9,360 | 7.8 |
| June..... | 4 | 460 | -- | 31.12 | 19.84 | 98.80 | -- | 4.05 | .00 | 39.31 | 107.00 | -- | .01 | 1.06 | | 9,344 | 12.70 | 5,840 | 66 | 20.0 | 13,000 | 7.9 |
| July..... | 9 | 975 | 19.0 | 11.12 | 4.90 | 26.95 | .26 | 3.52 | .00 | 12.04 | 27.75 | .05 | .02 | .42 | | 2,736 | 3.72 | 3,630 | 62 | 9.5 | 4,160 | 7.8 |
| August..... | 7 | 2,343 | -- | 6.78 | 1.20 | 8.54 | -- | 4.97 | .00 | 4.22 | 7.55 | -- | .02 | .27 | | 1,054 | 1.43 | 3,350 | 52 | 4.3 | 1,650 | 7.9 |
| September.... | 4 | 2,091 | -- | 15.84 | 7.92 | 46.45 | -- | 3.96 | .00 | 12.96 | 53.50 | -- | .03 | .83 | | 4,477 | 6.09 | 12,700 | 66 | 13.0 | 6,570 | 7.9 |
| Total or weighted average | -- | 44,070 | -- | 14.27 | 5.72 | 32.70 | -- | 5.19 | 0.00 | 16.92 | 31.29 | -- | 0.04 | 0.53 | | 3,391 | 4.61 | 203,300 | 62 | 10.1 | 4,930 | 7.8 |

RIO GRANDE BASIN---Continued

8-3715. RIO GRANDE ABOVE PRESIDIO, TEX.
(Formerly published as Rio Grande at upper Presidio, Tex.)

LOCATION.---At gaging station, 7.8 river miles above the junction of the Rio Conchos, about 10 miles northwest of the towns of Presidio, Tex. and Ojinaga, Chihuahua, and 265.7 river miles below the American Dam at El Paso, Texas.
DRAINAGE AREA.---34,966 square miles (United States and Mexico; from International Boundary and Water Commission Water Bulletin Number 31).
RECORDS AVAILABLE.---Chemical analyses: 1935 to 1963.
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 1962 to September 1963 published as Rio Grande above Rio Conchos, near Presidio, Tex. in International Boundary and Water Commission Water Bulletin Numbers 32 and 33. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1962 | 9 | 8,599 | | 14.36 | | 23.94 | | 4.02 | 0.00 | | 20.45 | | | | 2,525 | 3.43 | 29,500 | 63 | 8.9 | 3,570 | |
| November..... | 9 | 4,159 | | 14.48 | | 24.74 | | 4.51 | .00 | | 20.75 | | | | 2,481 | 3.37 | 14,000 | 63 | 9.2 | 3,800 | |
| December..... | 8 | 4,485 | | 14.61 | | 25.30 | | 4.16 | .00 | | 21.55 | | | | 2,557 | 3.48 | 15,600 | 63 | 9.4 | 3,880 | |
| January, 1963 | 7 | 1,756 | 12 | 11.13 | 4.67 | 28.63 | 0.33 | 3.90 | .00 | 16.61 | 24.50 | 0.05 | 0.01 | 0.54 | 2,937 | 3.99 | 7,010 | 64 | 10 | 4,300 | 7.8 |
| February..... | 5 | 107 | | 20.95 | | 37.30 | | 4.48 | .00 | | 34.20 | | | | 3,681 | 5.01 | 536 | 64 | 12 | 5,480 | |
| May..... | 4 | 322 | | 4.58 | | 2.86 | | 2.75 | .00 | | 1.48 | | | | 490 | .67 | 216 | 38 | 1.9 | 757 | |
| August..... | 9 | 6,091 | | 5.56 | | 2.79 | | 2.30 | .00 | | .78 | | | | 627 | .85 | 5,180 | 33 | 1.7 | 818 | |
| September.... | 9 | 8,525 | | 4.36 | | 3.48 | | 2.60 | .00 | | 1.90 | | | | 547 | .74 | 6,310 | 44 | 2.3 | 804 | |

## 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 1963.
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 chemioal analyses for water year October 1982 to September 1963 given in International Boundary and Water Commission Water Bulletin Numbers 32 and 33. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1982 | 8 | 137,893 | -- | 4.85 | 0.73 | 3.93 | -- | 3.14 | 0.00 | 4.94 | 1.54 | -- | 0.05 | 0.17 | 654 | 0.89 | 123,000 | 41 | 2.4 | 904 | 7.7 |
| November..... | 9 | 59,319 | -- | 5.08 | 1.58 | 6.51 | -- | 3.30 | .00 | 6.75 | 3.35 | -- | .05 | .31 | 884 | 1.20 | 71,200 | 49 | 3.8 | 1,290 | 7.8 |
| December..... | 5 | 57,230 | -- | 4.71 | 1.62 | 6.00 | -- | 3.22 | .00 | 8.37 | 2.76 | -- | .03 | .24 | 804 | 1.09 | 62,400 | 49 | 3.4 | 1,210 | 7.7 |
| January, 1983 | 8 | 50,452 | 26.0 | 4.99 | 1.70 | 8.54 | 0.16 | 3.37 | .00 | 6.82 | 3.25 | 0.08 | .08 | .24 | 897 | 1.22 | 61,800 | 49 | 3.8 | 1,310 | 7.9 |
| February..... | 9 | 38,734 | -- | 4.59 | 1.49 | 5.51 | -- | 3.10 | .00 | 8.14 | 2.38 | -- | .01 | .24 | 769 | 1.05 | 40,700 | 48 | 3.2 | 1,130 | 8.2 |
| March..... | 8 | 34,057 | -- | 4.07 | 1.60 | 5.42 | -- | 2.70 | .00 | 8.29 | 2.24 | -- | .02 | .32 | 759 | 1.03 | 35,100 | 49 | 3.2 | 1,100 | 7.7 |
| April..... | 8 | 30,955 | -- | 4.77 | 1.00 | 4.42 | -- | 2.62 | .00 | 5.91 | 1.89 | -- | .02 | .24 | 695 | .95 | 29,400 | 43 | 2.6 | 1,000 | 7.8 |
| May..... | 8 | 58,240 | -- | 5.00 | 1.02 | 4.09 | -- | 3.40 | .00 | 5.03 | 1.70 | -- | .03 | .20 | 649 | .88 | 51,300 | 40 | 2.4 | 962 | 7.9 |
| June..... | 7 | 74,623 | -- | 4.54 | .80 | 1.81 | -- | 3.14 | .00 | 3.28 | .80 | -- | .01 | .10 | 449 | .61 | 45,500 | 25 | 1.1 | 676 | 8.1 |
| July..... | 9 | 81,107 | 20.0 | 5.94 | .94 | 3.78 | .16 | 3.86 | .00 | 6.04 | 1.03 | .06 | .04 | .17 | 708 | .96 | 77,900 | 35 | 2.0 | 987 | 7.9 |
| August..... | 7 | 107,264 | -- | 4.73 | .70 | 4.04 | -- | 3.35 | .00 | 4.90 | 1.18 | -- | .01 | .20 | 686 | .91 | 97,800 | 43 | 2.5 | 906 | 8.0 |
| September.... | 8 | 128,587 | -- | 4.78 | .68 | 3.11 | -- | 3.50 | .00 | 4.16 | .97 | -- | .06 | .20 | 583 | .79 | 101,800 | 38 | 1.9 | 818 | 7.8 |
| Total or weighted average | -- | 858,400 | -- | 4.86 | 1.02 | 4.25 | -- | 3.28 | 0.00 | 5.25 | 1.69 | -- | 0.04 | 0.20 | 783 | 0.93 | 797,300 | 40 | 2.48 | 976 | 7.8 |

RIO GRANDE BASIN--Continued

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 No. 31).
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1963.
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 1962 to September 1963 are given in International Boundary and Water Commission Water Bulletin Numbers 32 and 33. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1962 | 31 | 267,440 | -- | 4.36 | | 3.34 | -- | 2.58 | 0.00 | -- | 1.87 | -- | -- | -- | 515 | 0.70 | 187,000 | 43 | 2.30 | 758 | -- |
| November | 30 | 129,584 | -- | 5.74 | | 4.88 | -- | 2.80 | .00 | -- | 3.45 | -- | -- | -- | 672 | .91 | 118,000 | 46 | 2.90 | 1,050 | -- |
| December | 31 | 111,358 | -- | 7.13 | | 8.26 | -- | 2.65 | .00 | -- | 6.85 | -- | -- | -- | 978 | 1.33 | 148,000 | 54 | 4.40 | 1,560 | -- |
| January, 1963 | 31 | 99,682 | 27.0 | 4.02 | 1.96 | 6.51 | 0.12 | 2.48 | .00 | 5.19 | 4.95 | 0.05 | 0.09 | 0.23 | 833 | 1.13 | 113,000 | 52 | 3.80 | 1,310 | 7.9 |
| February | 28 | 82,667 | -- | 6.03 | | 5.92 | -- | 2.55 | .00 | -- | 4.52 | -- | -- | -- | 784 | 1.07 | 88,500 | 50 | 3.40 | 1,220 | -- |
| March | 31 | 61,696 | -- | 6.01 | | 6.37 | -- | 2.39 | .00 | -- | 4.86 | -- | -- | -- | 820 | 1.12 | 69,100 | 51 | 3.70 | 1,260 | -- |
| April | 30 | 89,014 | -- | 5.22 | | 4.85 | -- | 2.36 | .00 | -- | 3.77 | -- | -- | -- | 665 | .90 | 80,100 | 48 | 3.00 | 1,040 | -- |
| May | 31 | 135,440 | -- | 4.84 | | 3.70 | -- | 2.39 | .00 | -- | 3.05 | -- | -- | -- | 529 | .72 | 97,500 | 43 | 2.40 | 871 | -- |
| June | 30 | 142,486 | -- | 4.82 | | 3.58 | -- | 2.35 | .00 | -- | 2.80 | -- | -- | -- | 497 | .68 | 96,900 | 43 | 2.30 | 834 | -- |
| July | 31 | 99,051 | 24.0 | 4.04 | 1.16 | 3.70 | .14 | 2.50 | .00 | 4.27 | 2.12 | .05 | .09 | .14 | 593 | .81 | 80,200 | 41 | 2.30 | 878 | 8.0 |
| August | 30 | 112,142 | -- | 5.06 | | 3.96 | -- | 2.66 | .00 | -- | 1.96 | -- | -- | -- | 634 | .86 | 96,400 | 44 | 2.50 | 895 | -- |
| September | 31 | 168,950 | -- | 4.92 | | 3.20 | -- | 2.63 | .00 | -- | 1.65 | -- | -- | -- | 552 | .75 | 127,000 | 39 | 2.0 | 813 | -- |
| Total or weighted average | -- | 1,499,500 | -- | 5.26 | | 4.52 | -- | 2.54 | 0.00 | -- | 3.16 | -- | -- | -- | 638 | 0.87 | 1,302,000 | 46 | 2.75 | 984 | -- |

## 8-4613. RIO GRANDE AT FALCON, DAM-U. S. TAILRACE

LOCATION.--U.S. Tailrace at Falcon Dam.
DRAINAGE AREA.--164,482 square miles (from International Boundary and Water Commission Water Bulletin Number 31).
RECORDS AVAILABLE.--Chemical analyses: July 1955 to September 1963.
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 1962 to September 1963 given in International Boundary and Water Commission Bulletin Numbers 32 and 33. Records for previous years are given in earlier Bulletins.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1962 | 13 | 88,889 | -- | 3.25 | 1.36 | 4.31 | -- | 2.13 | 0.00 | 4.05 | 2.80 | -- | 0.01 | 0.20 | 582 | 0.79 | 70,200 | 48 | 2.8 | 882 | 7.7 |
| November..... | 8 | 49,903 | -- | 3.44 | 1.36 | 4.23 | -- | 2.20 | .00 | 4.13 | 2.90 | -- | .01 | .19 | 578 | .79 | 39,400 | 47 | 2.7 | 925 | 7.8 |
| December..... | 6 | 62,911 | -- | 3.64 | 1.13 | 4.24 | -- | 2.20 | .00 | 4.14 | 2.75 | -- | .01 | .16 | 580 | .79 | 49,700 | 47 | 2.7 | 933 | 7.8 |
| January, 1963 | 7 | 133,222 | 9.0 | 3.60 | 1.43 | 4.31 | 0.14 | 2.30 | .00 | 4.34 | 2.80 | 0.04 | .01 | .14 | 604 | .82 | 109,000 | 45 | 2.7 | 963 | 7.8 |
| February..... | 10 | 203,095 | -- | 3.72 | 1.33 | 4.48 | -- | 2.33 | .00 | 4.30 | 2.95 | -- | .01 | .17 | 616 | .84 | 171,000 | 47 | 2.8 | 969 | 7.8 |
| March..... | 11 | 159,830 | -- | 3.99 | 1.26 | 4.62 | -- | 2.40 | .00 | 4.40 | 3.20 | -- | .01 | .20 | 645 | .88 | 141,000 | 47 | 2.9 | 1,020 | 7.5 |
| April..... | 13 | 417,209 | -- | 4.27 | 1.11 | 4.90 | -- | 2.45 | .00 | 4.48 | 3.40 | -- | .01 | .22 | 674 | .92 | 384,000 | 48 | 3.0 | 1,040 | 7.6 |
| May..... | 2 | 58,483 | -- | 4.28 | 1.44 | 5.35 | -- | 2.38 | .00 | 4.86 | 4.13 | -- | .10 | .25 | 706 | .96 | 56,100 | 48 | 3.2 | 1,110 | 7.9 |
| June..... | 6 | 265,432 | -- | 3.84 | 1.56 | 5.04 | -- | 2.26 | .00 | 4.46 | 3.70 | -- | .01 | .14 | 663 | .90 | 239,000 | 48 | 3.1 | 1,040 | 7.8 |
| July..... | 9 | 66,168 | 12.0 | 3.42 | 1.44 | 4.53 | .15 | 2.10 | .00 | 4.08 | 3.30 | .04 | .01 | .20 | 609 | .83 | 54,900 | 47 | 2.9 | 963 | 7.8 |
| August..... | 9 | 122,140 | -- | 3.39 | 1.35 | 4.75 | -- | 2.08 | .00 | 4.06 | 3.30 | -- | .01 | .17 | 642 | .87 | 106,000 | 50 | 3.1 | 968 | 7.7 |
| September.... | 5 | 38,087 | -- | 3.36 | 1.40 | 4.73 | -- | 2.03 | .00 | 4.28 | 3.30 | -- | .02 | .20 | 823 | .85 | 32,400 | 50 | 3.1 | 974 | 7.8 |
| Total or weighted average | -- | 1,665,000 | -- | 3.83 | 1.32 | 4.70 | -- | 2.30 | 0.00 | 4.34 | 3.27 | -- | 0.01 | 0.18 | 640 | 0.87 | 1,453,000 | 46 | 2.9 | 1,000 | 7.7 |

RIO GRANDE BASIN--Continued

## 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 1963.
Water temperatures: June 1959 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,320 micromhos on several days in June; minimum daily, 936 micromhos Aug. 27.
Percent sodium: Maximum, 12 Nov. 1-30; minimum, 8 Aug. 27.
Sodium-adsorption-ratio: Maximum, 0.90 Apr. 1-30; minimum, 0.40 Aug. 27.
EXTREMES, 1937-63.--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 (1961-63): Maximum, 0.90 Apr. 1-30, 1963; 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 1962 to September 1963

| 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, 1962. | 3,714 | 16.0 | 16.57 | 3.45 | 2.57 | | 2.05 | | 18.90 | 1.92 | | 0.00 | | 1,490 | 2.03 | 7,526 | 11 | 0.81 | 1,820 | 7.6 |
| Nov. 1-30..... | 333 | 16.0 | 17.47 | 3.54 | 2.74 | | 2.16 | | 19.49 | 2.12 | | .00 | | 1,550 | 2.11 | 702 | 12 | .85 | 1,900 | 7.6 |
| Dec. 1-31..... | 473 | 16.0 | 18.41 | 4.03 | 2.87 | | 2.26 | | 20.74 | 2.26 | | .01 | | 1,640 | 2.23 | 1,056 | 11 | .86 | 1,980 | 7.7 |
| Jan. 1-31, 1963. | 627 | 16.0 | 19.06 | 4.11 | 2.91 | | 2.26 | | 21.65 | 2.40 | | .01 | | 1,710 | 2.33 | 1,459 | 11 | .86 | 2,050 | 7.8 |
| Feb. 1-28..... | 683 | 15.0 | 19.56 | 4.03 | 3.05 | | 2.29 | | 22.07 | 2.48 | | .00 | | 1,740 | 2.37 | 1,617 | 11 | .89 | 2,100 | 7.7 |
| Mar. 1-31..... | 29,268 | 15.0 | 20.96 | 3.62 | 3.13 | | 2.16 | | 23.32 | 2.54 | | .00 | | 1,830 | 2.49 | 72,842 | 11 | .89 | 2,170 | 7.4 |
| Apr. 1-30..... | 5,730 | 14.0 | 21.26 | 4.36 | 3.22 | | 2.11 | | 23.94 | 2.82 | | .00 | | 1,880 | 2.56 | 14,651 | 11 | .90 | 2,220 | 7.6 |
| May 1-31..... | 5,134 | 16.0 | 21.51 | 4.52 | 3.22 | | 2.10 | | 24.57 | 2.82 | | .00 | | 1,920 | 2.61 | 13,406 | 11 | .89 | 2,270 | 7.4 |
| June 1-30..... | 3,660 | 16.0 | 20.46 | 4.36 | 3.00 | | 1.90 | | 23.53 | 2.65 | | .00 | | 1,830 | 2.49 | 9,108 | 11 | .85 | 2,180 | 7.7 |
| July 1-31..... | 46,423 | 15.0 | 18.68 | 3.70 | 2.78 | | 1.77 | | 21.24 | 2.43 | | .00 | | 1,660 | 2.26 | 104,805 | 11 | .83 | 2,010 | 7.4 |
| Aug. 1-13..... | 24,728 | 16.0 | 20.01 | 4.20 | 3.00 | | 1.97 | | 23.11 | 2.60 | | .00 | | 1,800 | 2.45 | 60,534 | 11 | .86 | 2,140 | 7.7 |
| Aug. 14-16..... | 522 | 14.0 | 13.37 | 2.55 | 1.96 | | 2.00 | | 14.16 | 1.52 | | .03 | | 1,150 | 1.56 | 816 | 11 | .69 | 1,500 | 7.7 |
| Aug. 17-26..... | 1,700 | 13.0 | 10.53 | 2.06 | 1.48 | | 2.23 | | 10.58 | 1.50 | | .02 | | 912 | 1.24 | 2,108 | 11 | .59 | 1,200 | 7.5 |
| Aug. 27..... | 149 | 26.0 | 7.88 | 1.81 | .87 | | 6.36 | | 3.71 | .68 | | .00 | | 619 | .84 | 125 | 08 | .40 | 936 | 7.6 |
| Aug. 28-31..... | 605 | 12.0 | 10.13 | 2.06 | 1.44 | | 2.23 | | 10.45 | 1.16 | | .01 | | 884 | 1.20 | 727 | 11 | .58 | 1,190 | 7.6 |
| Sept. 1-13..... | 993 | 12.0 | 9.73 | 2.14 | 1.52 | | 2.23 | | 10.16 | 1.13 | | .01 | | 864 | 1.18 | 1,166 | 11 | .82 | 1,170 | 7.3 |
| Sept. 14..... | 177 | 15.0 | 13.12 | 2.47 | 2.00 | | 2.23 | | 14.03 | 1.64 | | .00 | | 1,150 | 1.56 | 276 | 11 | .72 | 1,500 | 7.4 |
| Sept. 15-30..... | 3,043 | 14.0 | 10.03 | 2.06 | 1.48 | | 2.16 | | 10.49 | 1.13 | | .00 | | 883 | 1.20 | 3,655 | 11 | .60 | 1,190 | 7.6 |
| Total or weighted average | 127,960 | 15.0 | 19.21 | 3.77 | 2.87 | | 1.97 | | 21.74 | 2.45 | | 0.00 | | 1,700 | 2.32 | 296,800 | 11 | 0.84 | 2,050 | 7.5 |

## 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 1963.
Water temperatures: April 1949 to September 1963.
Sediment records: January 1949 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 19,300 micromhos May 29; minimum daily, 793 micromhos May 31.
Percent sodium: Maximum, 67 May 29; minimum, 14 July 20 to Aug. 17.
Sodium-adsorption-ratio: Maximum, 24.48 May 29; minimum, 1.21 July 20-31.
EXTREMES, 1937-63.--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 (1961-63): Maximum, 24.48 May 29, 1963; minimum, 0.98 Aug. 1-2, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-2, 1962.. | 436 | 15.0 | 20.16 | 9.05 | 20.45 | -- | 2.02 | | 26.65 | 21.02 | | 0.04 | | 3,090 | 4.20 | 1,834 | 41 | 5.35 | 4,280 | 7.2 |
| Oct. 3-6..... | 702 | 14.0 | 21.86 | 10.94 | 28.23 | -- | 1.59 | | 30.81 | 29.06 | | .05 | | 3,790 | 5.15 | 3,619 | 46 | 6.97 | 5,310 | 6.9 |
| Oct. 7-11..... | 553 | 17.0 | 25.55 | 14.07 | 37.67 | -- | 2.20 | | 35.61 | 39.49 | | .04 | | 4,750 | 6.46 | 3,575 | 49 | 8.46 | 6,700 | 7.2 |
| Oct. 12-25..... | 1,513 | 16.0 | 27.64 | 16.37 | 47.85 | -- | 2.62 | | 37.89 | 51.91 | | .04 | | 5,610 | 7.63 | 11,547 | 52 | 10.20 | 7,930 | 7.6 |
| Oct. 26-31..... | 788 | 16.0 | 25.65 | 14.56 | 38.11 | -- | 2.21 | | 35.39 | 41.19 | | .05 | | 4,810 | 6.54 | 5,154 | 49 | 8.50 | 6,830 | 7.3 |
| Nov. 1-30..... | 3,582 | 14.0 | 28.09 | 16.29 | 45.24 | -- | 3.05 | | 38.31 | 48.52 | | .04 | | 5,470 | 7.44 | 26,648 | 50 | 9.60 | 7,690 | 7.4 |
| Dec. 1-31..... | 4,132 | 13.0 | 27.84 | 15.96 | 43.94 | -- | 3.44 | | 38.31 | 46.26 | | .06 | | 5,360 | 7.29 | 30,120 | 50 | 9.39 | 7,500 | 7.8 |
| Jan. 1-13, 1963. | 1,818 | 15.0 | 28.34 | 15.05 | 44.81 | -- | 3.67 | | 37.48 | 47.39 | | .03 | | 5,390 | 7.33 | 13,326 | 51 | 9.62 | 7,610 | 7.7 |
| Jan. 14-16..... | 357 | 19.0 | 30.74 | 18.10 | 50.90 | -- | 4.10 | | 41.22 | 54.16 | | .11 | | 6,050 | 8.23 | 2,938 | 51 | 10.30 | 8,380 | 7.4 |
| Jan. 17-25..... | 1,262 | 20.0 | 27.79 | 16.45 | 45.68 | -- | 4.16 | | 36.23 | 49.65 | | .18 | | 5,460 | 7.43 | 9,372 | 51 | 9.71 | 7,740 | 7.5 |
| Jan. 26-31..... | 752 | 17.0 | 29.44 | 17.19 | 53.07 | -- | 3.95 | | 40.81 | 55.86 | | .11 | | 6,100 | 8.30 | 6,240 | 53 | 10.99 | 8,470 | 7.5 |
| Feb. 1-25..... | 3,417 | 13.0 | 27.79 | 15.63 | 44.81 | -- | 2.80 | | 39.56 | 46.83 | | .00 | | 5,430 | 7.38 | 25,230 | 51 | 9.62 | 7,540 | 7.6 |
| Feb. 26-28..... | 351 | 8.9 | 29.54 | 16.70 | 55.25 | -- | 2.46 | | 42.47 | 56.98 | | .04 | | 6,210 | 8.45 | 2,965 | 54 | 11.49 | 8,760 | 7.3 |
| Mar. 1-10..... | 956 | 11.0 | 30.49 | 17.93 | 56.12 | -- | 2.49 | | 44.14 | 58.68 | | .03 | | 6,410 | 8.72 | 8,334 | 54 | 11.40 | 9,030 | 7.3 |
| Mar. 11..... | 1,095 | 29.0 | 25.75 | 10.45 | 19.14 | -- | 3.34 | | 34.98 | 17.49 | | .00 | | 3,510 | 4.77 | 5,226 | 35 | 4.50 | 4,580 | 7.3 |
| Mar. 12-13..... | 3,094 | 19.0 | 23.95 | 8.42 | 6.70 | -- | 2.66 | | 28.73 | 7.62 | | .03 | | 2,510 | 3.41 | 10,562 | 22 | 2.23 | 3,110 | 7.3 |
| Mar. 14-23..... | 15,907 | 16.0 | 23.30 | 5.51 | 5.83 | -- | 2.23 | | 27.27 | 5.22 | | .04 | | 2,250 | 3.06 | 48,677 | 17 | 1.54 | 2,710 | 7.4 |
| Mar. 24-25..... | 524 | 16.0 | 24.50 | 6.91 | 10.79 | -- | 2.23 | | 29.15 | 10.72 | | .02 | | 2,690 | 3.66 | 1,916 | 26 | 2.72 | 3,410 | 7.6 |
| Mar. 26-28..... | 357 | 16.0 | 26.60 | 8.23 | 17.75 | -- | 2.16 | | 33.52 | 17.49 | | .09 | | 3,360 | 4.57 | 1,631 | 34 | 4.25 | 4,320 | 7.4 |
| Mar. 29-31..... | 222 | 13.0 | 27.69 | 10.53 | 26.93 | -- | 2.00 | | 36.44 | 26.94 | | .08 | | 4,080 | 5.55 | 1,232 | 41 | 6.16 | 5,450 | 7.3 |

RIO GRANDE BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (calculated) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Apr. 1-2, 1963.. | 109 | 9.5 | 28.94 | 12.26 | 38.80 | -- | 1.38 | | 39.35 | 39.49 | | 0.01 | | 4,960 | 6.75 | 736 | 49 | 8.55 | 6,930 | 7.0 |
| Apr. 3-11..... | 584 | 12.0 | 31.04 | 15.38 | 50.03 | -- | 1.88 | | 43.31 | 51.34 | | .01 | | 5,930 | 8.06 | 4,708 | 52 | 10.38 | 8,720 | 6.9 |
| Apr. 12-21..... | 464 | 12.0 | 34.33 | 19.50 | 66.56 | -- | 2.36 | | 48.93 | 66.27 | | .02 | | 7,310 | 9.94 | 4,614 | 55 | 12.83 | 10,300 | 7.1 |
| Apr. 22-24..... | 143 | 13.0 | 38.67 | 24.51 | 95.70 | -- | 2.77 | | 56.01 | 100.99 | | .01 | | 9,640 | 13.11 | 1,872 | 60 | 17.03 | 13,700 | 7.3 |
| Apr. 25-30..... | 298 | 14.0 | 34.33 | 22.29 | 69.60 | -- | 2.33 | | 52.05 | 72.22 | | .01 | | 7,700 | 10.47 | 3,116 | 55 | 13.08 | 10,800 | 7.3 |
| May 1-12..... | 512 | 14.0 | 34.03 | 22.21 | 71.34 | -- | 2.61 | | 50.59 | 73.35 | | .04 | | 7,720 | 10.50 | 5,373 | 56 | 13.45 | 10,800 | 7.2 |
| May 13-15..... | 61 | 15.0 | 36.68 | 22.70 | 82.22 | -- | 3.02 | | 52.67 | 87.73 | | .06 | | 8,650 | 11.76 | 721 | 58 | 15.09 | 12,300 | 7.1 |
| May 16..... | 22 | 17.0 | 24.55 | 15.22 | 58.73 | -- | 2.33 | | 35.19 | 60.65 | | .07 | | 5,960 | 8.11 | 177 | 60 | 13.17 | 8,860 | 7.6 |
| May 17-21..... | 67 | 20.0 | 39.12 | 25.91 | 109.19 | -- | 3.03 | | 56.42 | 114.25 | | .03 | | 10,500 | 14.28 | 963 | 63 | 19.15 | 15,000 | 7.0 |
| May 22..... | 105 | 13.0 | 10.78 | 2.14 | 6.61 | -- | 2.00 | | 10.70 | 8.97 | | .10 | | 1,350 | 1.84 | 193 | 40 | 3.39 | 2,070 | 7.6 |
| May 23..... | 24 | 19.0 | 38.47 | 25.91 | 103.10 | -- | 2.84 | | 57.67 | 108.61 | | .07 | | 10,200 | 13.87 | 330 | 62 | 18.17 | 14,600 | 7.2 |
| May 24..... | 24 | 18.0 | 26.94 | 16.29 | 68.73 | -- | 2.43 | | 40.81 | 72.76 | | .11 | | 7,000 | 9.52 | 227 | 60 | 14.45 | 10,300 | 7.2 |
| May 25-26..... | 34 | 13.0 | 25.65 | 13.98 | 54.81 | 0.49 | 2.26 | | 35.81 | 55.86 | | .08 | | 5,750 | 7.82 | 264 | 58 | 12.31 | 8,410 | 7.1 |
| May 27-28..... | 28 | 16.0 | 35.98 | 25.67 | 117.45 | .82 | 2.38 | | 53.72 | 121.87 | | .01 | | 10,800 | 14.69 | 408 | 65 | 21.16 | 15,500 | 7.3 |
| May 29..... | 18 | 13.0 | 40.12 | 32.90 | 147.90 | -- | 2.31 | | 64.13 | 157.41 | | .06 | | 13,300 | 18.09 | 323 | 67 | 24.48 | 19,300 | 7.4 |
| May 30..... | 1,367 | 38.0 | 28.29 | 15.88 | 66.56 | -- | 5.52 | | 35.39 | 70.81 | | .01 | | 6,700 | 9.11 | 12,453 | 60 | 14.16 | 10,000 | 7.4 |
| May 31..... | 452 | 18.0 | 3.69 | .99 | 2.96 | .13 | 3.11 | | 1.98 | 2.71 | | .01 | | 461 | .63 | 284 | 38 | 1.93 | 793 | 7.5 |
| June 1..... | 214 | 11.0 | 5.34 | 1.48 | 4.39 | -- | 2.29 | | 4.79 | 4.37 | | .07 | | 695 | .95 | 202 | 39 | 2.38 | 1,150 | 7.6 |
| June 2..... | 1,549 | 11.0 | 9.78 | 2.80 | 6.26 | -- | 2.03 | | 10.49 | 6.21 | | .05 | | 1,170 | 1.59 | 2,465 | 33 | 2.50 | 1,770 | 7.5 |
| June 3..... | 6,883 | 25.0 | 23.45 | 7.57 | 18.49 | -- | 3.05 | | 26.73 | 17.91 | | .00 | | 3,120 | 4.24 | 29,204 | 37 | 4.69 | 4,190 | 7.4 |
| June 4-7..... | 6,276 | 14.0 | 17.51 | 3.70 | 9.92 | -- | 2.18 | | 20.74 | 8.18 | | .02 | | 1,990 | 2.71 | 16,985 | 32 | 3.05 | 2,680 | 7.3 |
| June 8-10..... | 774 | 15.0 | 16.46 | 5.51 | 16.18 | -- | 1.93 | | 23.53 | 14.67 | | .01 | | 2,530 | 3.44 | 2,662 | 40 | 4.67 | 3,510 | 7.5 |
| June 11-13..... | 462 | 17.0 | 23.05 | 8.56 | 22.14 | -- | 2.26 | | 29.98 | 21.58 | | .00 | | 3,370 | 4.58 | 2,119 | 41 | 5.57 | 4,630 | 7.4 |
| June 14-17..... | 611 | 15.0 | 23.85 | 9.79 | 28.28 | -- | 1.85 | | 31.44 | 28.49 | | .03 | | 3,840 | 5.22 | 3,190 | 46 | 6.89 | 5,370 | 7.2 |
| June 18..... | 522 | 17.0 | 27.15 | 11.68 | 33.89 | -- | 1.97 | | 36.44 | 34.98 | | .04 | | 4,530 | 6.16 | 3,214 | 47 | 7.69 | 6,270 | 7.4 |
| June 19..... | 1,002 | 21.0 | 21.56 | 6.00 | 13.09 | -- | 2.75 | | 27.48 | 10.58 | | .00 | | 2,610 | 3.55 | 3,555 | 32 | 3.53 | 3,360 | 7.4 |
| June 20-23..... | 1,722 | 15.0 | 14.87 | 4.03 | 9.66 | -- | 1.90 | | 18.24 | 8.60 | | .04 | | 1,820 | 2.48 | 4,261 | 34 | 3.14 | 2,540 | 7.4 |
| June 24-25..... | 500 | 15.0 | 16.07 | 5.35 | 12.09 | -- | 1.77 | | 20.07 | 11.71 | | .00 | | 2,110 | 2.87 | 1,434 | 36 | 3.70 | 2,960 | 7.4 |
| June 26-27..... | 202 | 17.0 | 19.96 | 7.07 | 17.66 | -- | 2.00 | | 25.19 | 17.35 | | .04 | | 2,800 | 3.81 | 770 | 40 | 4.80 | 3,880 | 7.3 |
| June 28-29..... | 93 | 18.0 | 24.55 | 9.87 | 27.27 | -- | 1.90 | | 32.69 | 27.50 | | .00 | | 3,860 | 5.25 | 489 | 44 | 6.57 | 5,340 | 7.4 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 30, 1963... | 24 | 22.0 | 27.35 | 11.02 | 35.28 | -- | 2.10 | | 36.23 | 35.54 | .02 | | 4,580 | 6.23 | 148 | 48 | 8.05 | 6,290 | 7.5 |
| July 1-3..... | 48 | 20.0 | 28.64 | 13.57 | 42.98 | -- | 2.29 | | 39.35 | 44.57 | .00 | | 5,290 | 7.19 | 342 | 50 | 9.35 | 7,400 | 7.5 |
| July 4-8..... | 79 | 19.0 | 30.94 | 15.46 | 54.81 | -- | 2.46 | | 42.89 | 55.86 | .00 | | 6,200 | 8.43 | 669 | 54 | 11.38 | 8,720 | 7.4 |
| July 9-13..... | 103 | 12.0 | 31.59 | 18.18 | 80.04 | -- | 2.03 | | 44.55 | 85.19 | .02 | | 7,930 | 10.78 | 1,112 | 62 | 16.05 | 11,700 | 7.3 |
| July 14-15..... | 1,226 | 18.0 | 24.95 | 7.07 | 11.75 | -- | 2.82 | | 31.02 | 10.49 | .01 | | 2,820 | 3.84 | 4,701 | 27 | 2.94 | 3,530 | 7.6 |
| July 16-19..... | 4,879 | 16.0 | 22.41 | 5.43 | 6.00 | -- | 2.13 | | 26.44 | 5.22 | .01 | | 2,190 | 2.96 | 14,533 | 18 | 1.61 | 2,690 | 7.4 |
| July 20-31..... | 15,447 | 16.0 | 21.76 | 4.61 | 4.39 | -- | 1.93 | | 25.19 | 3.89 | .00 | | 2,020 | 2.75 | 42,437 | 14 | 1.21 | 2,440 | 7.5 |
| Aug. 1-17..... | 21,209 | 17.0 | 22.26 | 4.94 | 4.48 | -- | 1.84 | | 26.23 | 4.01 | .00 | | 2,080 | 2.83 | 59,997 | 14 | 1.22 | 2,490 | 7.6 |
| Aug. 18-20..... | 726 | 18.0 | 24.35 | 6.25 | 8.35 | -- | 1.97 | | 28.94 | 8.69 | .00 | | 2,530 | 3.44 | 2,498 | 21 | 2.14 | 3,170 | 7.5 |
| Aug. 21-23..... | 518 | 16.0 | 24.60 | 7.24 | 12.48 | -- | 1.61 | | 30.61 | 12.69 | .00 | | 2,850 | 3.88 | 2,007 | 28 | 3.13 | 3,640 | 7.4 |
| Aug. 24-25..... | 173 | 16.0 | 25.80 | 8.64 | 19.97 | -- | 1.48 | | 33.10 | 19.66 | .05 | | 3,430 | 4.66 | 805 | 37 | 4.81 | 4,520 | 7.2 |
| Aug. 26-30..... | 202 | 18.0 | 23.65 | 9.13 | 28.06 | -- | 2.03 | | 30.81 | 28.49 | .03 | | 3,800 | 5.17 | 1,046 | 46 | 6.93 | 5,350 | 7.3 |
| Aug. 31..... | 113 | 20.0 | 25.60 | 9.79 | 33.76 | -- | 2.36 | | 32.90 | 35.26 | .05 | | 4,330 | 5.89 | 666 | 49 | 8.02 | 6,210 | 7.4 |
| Sept. 1..... | 1,827 | 18.0 | 20.46 | 5.76 | 13.31 | -- | 2.23 | | 24.15 | 12.98 | .01 | | 2,500 | 3.40 | 6,211 | 34 | 3.68 | 3,370 | 7.6 |
| Sept. 2..... | 2,638 | 17.0 | 21.36 | 3.04 | 5.39 | -- | 2.16 | | 23.73 | 4.09 | .00 | | 1,960 | 2.67 | 7,032 | 18 | 1.54 | 2,390 | 7.6 |
| Sept. 3-7..... | 3,273 | 14.0 | 15.22 | 2.96 | 6.00 | -- | 1.84 | | 17.24 | 5.22 | .00 | | 1,560 | 2.12 | 6,943 | 25 | 1.99 | 2,080 | 7.6 |
| Sept. 8-10..... | 726 | 14.0 | 15.02 | 3.37 | 9.44 | -- | 1.64 | | 17.24 | 9.31 | .00 | | 1,780 | 2.42 | 1,757 | 34 | 3.11 | 2,460 | 7.5 |
| Sept. 11-12..... | 196 | 14.0 | 17.27 | 5.51 | 17.31 | -- | 1.74 | | 21.24 | 17.63 | .00 | | 2,520 | 3.43 | 673 | 43 | 5.13 | 3,620 | 7.3 |
| Sept. 13-14..... | 125 | 14.0 | 21.36 | 8.23 | 25.23 | -- | 1.61 | | 27.48 | 25.81 | .00 | | 3,410 | 4.64 | 580 | 46 | 6.56 | 4,840 | 7.3 |
| Sept. 15-16..... | 131 | 15.0 | 26.25 | 11.35 | 37.58 | -- | 1.84 | | 35.19 | 38.08 | .00 | | 4,640 | 6.31 | 826 | 50 | 8.67 | 6,490 | 7.4 |
| Sept. 17-19..... | 125 | 16.0 | 28.84 | 13.16 | 46.11 | -- | 2.07 | | 39.97 | 47.11 | .00 | | 5,470 | 7.44 | 930 | 52 | 10.06 | 7,610 | 7.5 |
| Sept. 20-22..... | 60 | 18.0 | 31.24 | 15.14 | 53.94 | -- | 2.10 | | 44.35 | 55.29 | .00 | | 6,220 | 8.46 | 503 | 54 | 11.20 | 8,660 | 7.4 |
| Sept. 23-24..... | 131 | 19.0 | 36.38 | 20.65 | 92.22 | -- | 2.28 | | 50.59 | 98.45 | .01 | | 9,110 | 12.39 | 1,622 | 62 | 17.27 | 13,000 | 7.4 |
| Sept. 25-27..... | 111 | 18.0 | 32.24 | 16.95 | 53.94 | -- | 2.26 | | 46.85 | 54.73 | .00 | | 6,370 | 8.66 | 964 | 52 | 10.88 | 8,790 | 7.6 |
| Sept. 28-30..... | 99 | 19.0 | 33.83 | 18.34 | 67.86 | -- | 2.49 | | 48.09 | 70.81 | .00 | | 7,380 | 10.04 | 997 | 57 | 13.29 | 10,300 | 7.7 |
| Total or weighted average | 121,100 | 17.0 | 22.91 | 7.52 | 16.42 | -- | 2.34 | | 28.30 | 16.45 | 0.02 | | 2,960 | 4.02 | 487,500 | 41 | 3.85 | 3,910 | 7.4 |

RIO GRANDE BASIN--Continued

## 6-4101. 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 1963.
Water temperatures: March 1953 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 15,700 micromhos Apr. 9; minimum daily, 10,700 micromhos Aug. 30.
Percent sodium: Maximum, 69 Apr. 1-30; minimum, 62 July 1-31.
Sodium-adsorption-ratio: Maximum, 22.94 Apr. 1-30; minimum, 16.82 July 1-31.
EXTREMES, 1937-63.--Specific conductance: Maximum daily, 24,200 micromhos Sept. 28, 30, 1953; minimum daily, 1,610 micromhos June 2, 1946.
Percent sodium: Maximum, 76 Oct. 4-8, 1954; minimum, 9 Aug. 17-19, 1944.
Sodium-adsorption-ratio (1961-63): Maximum, 22.94 Apr. 1-30, 1963; minimum, 15.15 Feb. 1-28, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Austin, Tex. Records of discharge are given for gaging station near Orla. Mean discharge values reported below have been adjusted to exclude inflow from Salt (Screwbean) Draw which enters Pecos River between sampling point and gaging station.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-31, 1962. | 6,210 | 12.0 | 34.18 | 21.63 | 116.56 | | 1.93 | | 52.88 | 117.64 | | | | 10,400 | 14.14 | 87,838 | 68 | 22.07 | 14,000 | 7.2 |
| Nov. 1-30..... | 12,615 | 12.0 | 34.66 | 22.54 | 115.28 | | 2.18 | | 52.47 | 117.64 | | | | 10,400 | 14.14 | 178,425 | 67 | 21.55 | 14,300 | 7.0 |
| Dec. 1-31..... | 400 | 10.0 | 31.74 | 19.91 | 102.23 | | 2.56 | | 48.09 | 102.97 | | | | 9,280 | 12.62 | 5,044 | 66 | 20.12 | 12,900 | 7.6 |
| Jan. 1-31, 1963. | 350 | 6.7 | 30.29 | 21.96 | 95.27 | | 2.26 | | 46.85 | 98.17 | | | | 8,870 | 12.06 | 4,228 | 65 | 18.64 | 12,400 | 7.4 |
| Feb. 1-28..... | 350 | 6.0 | 29.84 | 21.55 | 95.70 | | 1.93 | | 46.85 | 98.45 | | | | 8,860 | 12.05 | 4,216 | 65 | 18.88 | 12,500 | 6.7 |
| Mar. 1-31..... | 301 | 4.5 | 29.74 | 21.72 | 100.05 | | 1.62 | | 47.47 | 102.40 | | | | 9,120 | 12.40 | 3,737 | 66 | 19.72 | 12,600 | 7.1 |
| Apr. 1-30..... | 274 | 7.4 | 29.99 | 23.20 | 118.32 | | 1.87 | | 49.14 | 120.46 | | | | 10,300 | 14.01 | 3,834 | 69 | 22.94 | 14,100 | 7.0 |
| May 1-31..... | 3,966 | 4.6 | 32.19 | 23.44 | 113.54 | | 1.87 | | 51.43 | 115.66 | | | | 10,200 | 13.87 | 55,016 | 67 | 21.53 | 13,400 | 7.3 |
| June 1-30..... | 3,725 | 6.8 | 32.73 | 21.63 | 106.58 | | 1.87 | | 49.76 | 109.45 | | | | 9,700 | 13.19 | 49,140 | 66 | 20.44 | 13,100 | 6.9 |
| July 1-31..... | 4,366 | 8.1 | 32.53 | 17.27 | 83.96 | 1.46 | 1.56 | | 47.05 | 87.73 | | | | 8,270 | 11.25 | 49,101 | 62 | 16.62 | 11,400 | 6.5 |
| Aug. 1-31..... | 5,097 | 9.5 | 33.98 | 18.18 | 98.75 | | 1.59 | | 46.30 | 100.99 | | | | 9,130 | 12.42 | 63,292 | 65 | 19.34 | 12,800 | 6.6 |
| Sept. 1-30..... | 1,131 | 11.0 | 32.76 | 17.44 | 87.00 | | 1.46 | | 46.01 | 89.71 | | | | 8,310 | 11.30 | 12,777 | 63 | 17.36 | 11,900 | 6.3 |
| Total or weighted average | 36,790 | 9.7 | 33.56 | 21.04 | 107.36 | -- | 1.91 | | 50.61 | 109.66 | | | | 9,790 | 13.32 | 516,600 | 62 | 20.51 | 13,400 | 6.6 |

## 8-4474. PECOS RIVER NEAR SHUMLA, TEX.

LOCATION.--At gaging station, 13.0 river miles upstream from the Pecos High Bridge, and 18.5 river miles above the confluence with the Rio Grande. This confluence is 638.2 river miles below the American Dam at El Paso, Tex.
DRAINAGE AREA.--35,308 square miles (from International Boundary and Water Commission Water Bulletin No. 31).
RECORDS AVAILABLE.--Chemical analyses: January 1955 to September 1963. 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 1962 to September 1963 given in International Boundary and Water Commission Bulletin Numbers 32 and 33. Records of previous years are given in earlier Bulletins for a station near the mouth and for a station 4.7 river miles upstream at the Pecos High Bridge.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | 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, 1962 | 5 | 30,483 | -- | 4.82 | 2.05 | 7.74 | -- | 2.94 | 0.00 | 3.32 | 8.33 | -- | 0.09 | 0.11 | 950 | 1.29 | 39,300 | 53 | 4.2 | 1,450 | 7.7 |
| November..... | 4 | 15,446 | -- | 11.68 | 7.50 | 30.67 | -- | 2.95 | .00 | 14.29 | 33.00 | -- | .04 | .29 | 3,203 | 4.36 | 67,300 | 62 | 9.9 | 4,850 | 7.7 |
| December..... | 4 | 11,560 | -- | 12.87 | 8.42 | 34.82 | -- | 2.88 | .00 | 15.99 | 37.56 | -- | .12 | .29 | 3,572 | 4.86 | 56,200 | 62 | 11.0 | 5,370 | 7.7 |
| January, 1963 | 5 | 10,350 | 15.0 | 10.79 | 7.37 | 27.63 | 0.29 | 3.10 | .00 | 12.93 | 30.23 | 0.05 | .05 | .24 | 2,972 | 4.04 | 41,800 | 60 | 9.2 | 4,530 | 7.7 |
| February..... | 4 | 8,616 | -- | 10.07 | 7.31 | 27.29 | -- | 2.80 | .00 | 12.65 | 30.00 | -- | .02 | .28 | 2,947 | 4.01 | 34,600 | 61 | 9.3 | 4,410 | 7.6 |
| March..... | 2 | 8,174 | -- | 10.13 | 7.25 | 27.70 | -- | 2.60 | .00 | 12.49 | 30.38 | -- | .02 | .28 | 2,838 | 3.86 | 31,600 | 61 | 9.4 | 4,420 | 7.6 |
| April..... | 5 | 11,299 | -- | 8.38 | 5.48 | 21.41 | -- | 2.60 | .00 | 9.54 | 23.20 | -- | .05 | .26 | 2,196 | 2.99 | 33,800 | 61 | 8.1 | 3,510 | 7.9 |
| May..... | 4 | 17,865 | -- | 6.60 | 4.56 | 16.36 | -- | 2.68 | .00 | 7.30 | 17.88 | -- | .03 | .21 | 1,743 | 2.37 | 42,300 | 59 | 6.9 | 2,810 | 7.8 |
| June..... | 3 | 12,248 | -- | 6.32 | 4.68 | 16.42 | -- | 2.68 | .00 | 7.34 | 17.45 | -- | .02 | .14 | 1,703 | 2.32 | 28,400 | 60 | 7.0 | 2,740 | 8.0 |
| July..... | 5 | 6,977 | 16.0 | 6.24 | 4.68 | 16.12 | .21 | 2.46 | .00 | 7.13 | 17.70 | .05 | .03 | .22 | 1,693 | 2.30 | 16,000 | 59 | 6.9 | 2,750 | 7.7 |
| August..... | 3 | 5,999 | -- | 5.90 | 4.21 | 15.37 | -- | 2.46 | .00 | 6.65 | 16.54 | -- | .02 | .21 | 1,685 | 2.29 | 13,700 | 60 | 6.8 | 2,570 | 7.7 |
| September.... | 5 | 6,239 | -- | 6.16 | 4.52 | 16.23 | -- | 2.48 | .00 | 6.99 | 17.80 | -- | .01 | .27 | 1,705 | 2.32 | 14,500 | 60 | 7.0 | 2,750 | 7.7 |
| Total or weighted average | -- | 145,300 | -- | 8.02 | 5.24 | 19.97 | -- | 2.78 | 0.00 | 9.04 | 21.66 | -- | 0.05 | 0.22 | 2,123 | 2.89 | 419,500 | 59 | 7.5 | 3,286 | 7.7 |

## 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 1963.
Water temperatures: May 1949 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,080 micromhos Aug. 11; minimum daily, 316 micromhos May 19.
Percent sodium: Maximum, 47 Jan. 11-31; minimum, 26 Aug. 11.
Sodium-adsorption-ratio: Maximum, 2.77 Jan. 11-31; minimum, 1.04 May 7-26.
EXTREMES, 1941-63.--Specific conductance: Maximum daily, 2,260 micromhos Aug. 10, 1947; minimum daily, 153 micromhos May 24, 1946.
Percent sodium: Maximum, 53 Dec. 11-20, 1954; minimum 7 Apr. 8, 1962.
Sodium-adsorption-ratio (1961-63): Maximum, 2.77 Jan. 11-31, 1963; 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 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-9, 1962.. | 30,847 | | 3.56 | | 2.31 | | 2.00 | | 1.63 | 2.06 | | | | 353 | 0.48 | 14,609 | 39 | 1.72 | 607 | 7.6 |
| Oct. 10-22..... | 58,223 | | 3.18 | | 1.70 | | 1.65 | | 1.56 | 1.47 | | | | 291 | .40 | 23,042 | 35 | 1.35 | 506 | 7.6 |
| Oct. 23-24..... | 7,200 | | 3.92 | | 2.35 | | 2.10 | | 2.06 | 2.09 | | | | 375 | .51 | 3,672 | 37 | 1.66 | 639 | 7.6 |
| Oct. 25-31..... | 17,534 | | 3.16 | | 1.74 | | 1.92 | | 1.56 | 1.38 | | | | 267 | .39 | 6,844 | 36 | 1.38 | 495 | 7.5 |
| Nov. 1-17..... | 67,539 | | 3.36 | | 1.96 | | 1.92 | | 1.69 | 1.69 | | | | 316 | .43 | 29,026 | 37 | 1.51 | 548 | 7.4 |
| Nov. 16-30..... | 34,861 | | 3.96 | | 2.74 | | 2.21 | | 2.02 | 2.48 | | | | 407 | .55 | 19,297 | 41 | 1.95 | 695 | 7.6 |
| Dec. 1-31..... | 72,248 | | 3.96 | | 3.00 | | 2.23 | | 2.00 | 2.71 | | | | 419 | .57 | 41,170 | 43 | 2.13 | 718 | 7.7 |
| Jan. 1-10, 1963. | 22,711 | | 3.74 | | 2.61 | | 2.20 | | 1.63 | 2.31 | | | | 366 | .53 | 11,964 | 41 | 1.91 | 657 | 7.7 |
| Jan. 11-31..... | 32,656 | | 4.74 | | 4.26 | | 2.51 | | 2.48 | 4.01 | | | | 554 | .75 | 24,604 | 47 | 2.77 | 936 | 7.5 |
| Feb. 1-28..... | 52,871 | | 3.86 | | 3.35 | | 2.20 | | 2.14 | 2.68 | | | | 460 | .63 | 33,076 | 46 | 2.41 | 740 | 7.3 |
| Mar. 1-31..... | 61,734 | | 3.90 | | 3.22 | | 2.26 | | 2.06 | 2.79 | | | | 430 | .56 | 36,102 | 45 | 2.31 | 728 | 7.6 |
| Apr. 1-30..... | 80,569 | | 3.44 | | 2.44 | | 2.16 | | 1.64 | 2.09 | | | | 354 | .48 | 38,769 | 41 | 1.66 | 608 | 7.5 |
| May 1-6..... | 17,756 | | 3.26 | | 2.31 | | 2.02 | | 1.50 | 2.03 | | | | 335 | .46 | 8,090 | 41 | 1.61 | 578 | 7.4 |
| May 7-26..... | 132,179 | | 2.38 | | 1.13 | | 1.67 | | .67 | .96 | | | | 207 | .26 | 37,211 | 32 | 1.04 | 361 | 7.5 |
| May 27-31..... | 25,170 | | 2.76 | | 1.57 | | 1.69 | | 1.31 | 1.35 | | | | 266 | .36 | 9,106 | 36 | 1.33 | 453 | 7.8 |
| June 1-24..... | 105,441 | | 3.32 | | 1.96 | | 1.97 | | 1.75 | 1.55 | | | | 319 | .43 | 45,745 | 37 | 1.52 | 537 | 7.5 |
| June 25-30..... | 16,447 | | 4.12 | | 2.96 | | 2.29 | | 2.23 | 2.54 | | | | 427 | .56 | 9,551 | 42 | 2.06 | 718 | 7.7 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July 1-31, 1963. | 66,038 | | 4.78 | 3.74 | | 2.52 | | 2.75 | 3.24 | | | | 487 | .66 | 43,738 | 44 | 2.42 | 826 | 7.5 |
| Aug. 1-10..... | 27,233 | | 4.32 | 2.83 | | 2.43 | | 2.50 | 2.20 | | | | 421 | .57 | 15,593 | 40 | 1.92 | 691 | 7.5 |
| Aug. 11..... | 2,916 | | 9.24 | 3.18 | | 3.41 | | 7.04 | 1.97 | | | | 768 | 1.04 | 3,045 | 26 | 1.48 | 1,080 | 7.2 |
| Aug. 12-31..... | 47,167 | | 4.24 | 2.65 | | 2.46 | | 2.33 | 2.09 | | | | 417 | .57 | 26,749 | 38 | 1.82 | 699 | 7.4 |
| Sept. 1-30..... | 75,987 | | 4.10 | 2.78 | | 2.26 | | 2.25 | 2.37 | | | | 417 | .57 | 43,094 | 40 | 1.94 | 688 | 7.5 |
| Total or weighted average | 1,055,000 | | 3.62 | 2.45 | | 2.11 | | 1.86 | 2.11 | | | | 365 | 0.50 | 524,300 | 40 | 1.79 | 618 | 7.5 |

COLORADO RIVER MAIN STEM--Continued

9-1805. COLORADO RIVER NEAR CISCO, UTAH

LOCATION.--At gaging station on left bank, 1 mile downstream from Dolores River, 11 miles south of Cisco, Grand County, 36 miles downstream from Colorado-Utah State 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 1963.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,630 micromhos Aug. 5; minimum daily, 570 micromhos May 22.
Percent sodium: Maximum, 49 Mar. 1-25; minimum, 31 Aug. 16-31.
Sodium-adsorption-ratio: Maximum, 4.07 Aug. 1-25; minimum, 1.45 May 10-26.
EXTREMES, 1941-52, 1953-63.--Specific conductance: Maximum daily, 4,820 micromhos Dec. 13, 1957; minimum daily, 291 micromhos May 31, 1958.
Percent sodium: Maximum, 60 Oct. 29, 1960; minimum, 18 June 1-10, 1957.
Sodium-adsorption-ratio (1961-63): Maximum, 4.24 Sept. 1-30, 1962; 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 1962 to September 1963

| 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, 1962. | 262,429 | | 6.54 | 3.78 | 6.09 | | 3.29 | | 9.60 | 3.39 | | 0.15 | | 1,050 | 1.43 | 374,749 | 37 | 2.68 | 1,530 | 7.8 |
| Nov. 1-30..... | 242,896 | | 8.80 | | 6.57 | | 2.95 | | 8.22 | 4.12 | | .09 | | 964 | 1.31 | 318,446 | 43 | 3.13 | 1,460 | 7.8 |
| Dec. 1-31..... | 180,159 | | 11.44 | | 9.09 | | 3.54 | | 11.08 | 5.75 | | .16 | | 1,300 | 1.77 | 318,521 | 44 | 3.80 | 1,880 | 7.6 |
| Jan. 1-31, 1963. | 163,434 | | 9.92 | | 8.00 | | 3.36 | | 9.35 | 5.08 | | .14 | | 1,120 | 1.52 | 248,943 | 45 | 3.59 | 1,700 | 7.3 |
| Feb. 1-28..... | 193,269 | | 9.32 | | 8.31 | | 3.16 | | 8.85 | 5.42 | | .19 | | 1,110 | 1.51 | 291,760 | 47 | 3.85 | 1,680 | 7.2 |
| Mar. 1-25..... | 137,455 | | 9.04 | | 8.66 | | 2.95 | | 8.68 | 5.87 | | .18 | | 1,130 | 1.54 | 211,240 | 49 | 4.07 | 1,720 | 7.6 |
| Mar. 26-31..... | 81,913 | | 6.48 | | 3.96 | | 3.11 | | 4.89 | 2.34 | | .11 | | 664 | .90 | 73,971 | 38 | 2.20 | 1,010 | 7.3 |
| Apr. 1-22..... | 207,011 | | 5.68 | | 3.83 | | 2.43 | | 4.62 | 2.37 | | .10 | | 610 | .83 | 171,736 | 40 | 2.27 | 940 | 7.5 |
| Apr. 23-30..... | 37,591 | | 8.72 | | 6.74 | | 2.52 | | 8.85 | 3.95 | | .12 | | 998 | 1.36 | 51,021 | 44 | 3.23 | 1,470 | 7.4 |
| May 1-9..... | 78,581 | | 6.80 | | 4.79 | | 2.61 | | 5.93 | 2.96 | | .10 | | 726 | .99 | 77,588 | 41 | 2.60 | 1,120 | 7.7 |
| May 10-26..... | 356,073 | | 4.32 | | 2.13 | | 2.25 | | 2.96 | 1.16 | | .07 | | 397 | .54 | 192,251 | 33 | 1.45 | 631 | 7.8 |
| May 27-31..... | 81,997 | | 5.12 | | 2.83 | | 2.31 | | 3.98 | 1.61 | | .06 | | 493 | .67 | 54,977 | 36 | 1.77 | 773 | 7.3 |
| June 1-6..... | 90,351 | | 5.68 | | 3.13 | | 2.31 | | 4.50 | 1.95 | | .06 | | 549 | .75 | 67,460 | 36 | 1.86 | 848 | 7.3 |
| June 7-23..... | 196,278 | | 7.04 | | 4.13 | | 2.66 | | 6.00 | 2.45 | | .07 | | 701 | .95 | 187,124 | 37 | 2.20 | 1,060 | 7.5 |
| June 24-30..... | 45,318 | | 8.64 | | 5.31 | | 2.56 | | 8.08 | 3.24 | | .08 | | 889 | 1.21 | 54,792 | 38 | 2.55 | 1,310 | 7.2 |
| July 1-10..... | 37,666 | | 11.70 | | 6.96 | | 2.69 | | 11.76 | 4.09 | | .12 | | 1,220 | 1.66 | 62,496 | 37 | 2.88 | 1,730 | 7.6 |
| July 11-20..... | 43,379 | | 12.70 | | 8.83 | | 3.41 | | 12.99 | 5.02 | | .12 | | 1,390 | 1.89 | 82,003 | 41 | 3.50 | 1,950 | 7.5 |
| July 21-29, 31.. | 31,041 | | 17.00 | | 9.83 | | 3.39 | | 18.61 | 4.65 | | .18 | | 1,710 | 2.33 | 72,190 | 37 | 3.37 | 2,180 | 7.9 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July 30, 1963... | 2,460 | | 16.10 | 9.00 | | 3.61 | | 17.07 | 4.29 | | .14 | | 1,660 | 2.26 | 5,553 | 36 | 3.17 | 2,150 | 8.1 |
| Aug. 1-7..... | 26,005 | | 19.20 | 9.31 | | 3.41 | | 20.30 | 4.65 | | .13 | | 1,800 | 2.45 | 63,681 | 33 | 3.00 | 2,300 | 8.1 |
| Aug. 8-15..... | 50,221 | | 13.28 | 7.26 | | 3.70 | | 13.30 | 3.44 | | .09 | | 1,300 | 1.77 | 88,792 | 35 | 2.82 | 1,740 | 8.1 |
| Aug. 16-31..... | 91,462 | | 15.20 | 6.92 | | 3.44 | | 14.41 | 4.18 | | .10 | | 1,400 | 1.90 | 174,143 | 31 | 2.51 | 1,890 | 7.5 |
| Sept. 1-30..... | 182,618 | | 12.76 | 7.79 | | 3.41 | | 12.97 | 3.95 | | .21 | | 1,320 | 1.80 | 327,836 | 38 | 3.08 | 1,780 | 7.4 |
| Total or weighted average | 2,820,000 | | 8.81 | 5.90 | | 2.93 | | 8.14 | 3.53 | | 0.12 | | 931 | 1.27 | 3,571,000 | 40 | 2.76 | 1,370 | 7.5 |

COLORADO RIVER MAIN STEM--Continued

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

LOCATION.--At gaging station at head of Marble Gorge at Lees Ferry, Coconino County, just upstream from Paria River, 16 miles downstream from 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 1963.
Water temperatures: July 1949 to September 1963.
Sediment records: October 1928 to December 1933, November 1942 to September 1944, October 1947 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,320 micromhos Oct. 2; minimum daily, 968 micromhos Sept. 20.
Percent sodium: Maximum, 45 May 1-31; minimum, 34 Oct. 1, 2.
Sodium-adsorption-ratio: Maximum, 3.62 Feb. 1-5; minimum, 2.33 Sept. 1-30.
EXTREMES, 1942-45, 1947-63.--Specific conductance: Maximum daily, 2,430 micromhos Oct. 15, 1960; minimum daily, 318 micromhos June 9, 1948.
Percent sodium (1942-45, 1947-63): Maximum, 46 Mar. 2, 4, 7, 10, 1944; minimum, 17 June 1-11, 1958.
Sodium-adsorption-ratio (1961-63): Maximum, 3.62 Feb. 1-5, minimum, 0.70 May 13-17, 1962.
REMARKS.--Records of specific conduotance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962.... | 20,430 | -- | 10.38 | 4.44 | 7.66 | -- | 4.52 | | -- | -- | -- | -- | -- | 1,450 | 1.97 | 40,287 | 34 | 2.61 | 1,960 | 7.7 |
| Oct. 2..... | 21,620 | -- | 13.22 | 4.85 | 9.22 | -- | 4.26 | | -- | -- | -- | -- | -- | 1,750 | 2.38 | 51,455 | 34 | 3.07 | 2,320 | 7.8 |
| Oct. 3..... | 18,387 | -- | 9.68 | 3.70 | 7.22 | -- | 4.79 | | -- | -- | -- | -- | -- | 1,260 | 1.71 | 31,508 | 35 | 2.79 | 1,810 | 7.2 |
| Oct. 4-5..... | 27,749 | -- | 7.53 | 3.04 | 6.18 | -- | 3.33 | | -- | -- | -- | -- | -- | 1,060 | 1.44 | 40,003 | 37 | 2.69 | 1,510 | 8.0 |
| Oct. 6-19..... | 195,574 | -- | 8.48 | 3.62 | 6.61 | -- | 3.25 | | -- | -- | -- | -- | -- | 1,240 | 1.69 | 329,816 | 35 | 2.69 | 1,660 | 7.7 |
| Oct. 20-31..... | 255,630 | -- | 6.19 | 2.63 | 6.16 | -- | 3.56 | | -- | -- | -- | -- | -- | 940 | 1.28 | 326,797 | 41 | 2.94 | 1,390 | 7.5 |
| Nov. 1-20..... | 291,570 | -- | 5.69 | 3.21 | 5.70 | -- | 3.21 | | -- | -- | -- | -- | -- | 922 | 1.25 | 365,606 | 39 | 2.70 | 1,360 | 7.8 |
| Nov. 21-30..... | 136,502 | -- | 5.74 | 3.37 | 6.44 | -- | 3.41 | | -- | -- | -- | -- | -- | 988 | 1.34 | 163,416 | 41 | 3.02 | 1,450 | 7.6 |
| Dec. 1-28..... | 310,953 | -- | 5.99 | 3.54 | 6.92 | -- | 3.62 | | -- | -- | -- | -- | -- | 1,040 | 1.41 | 439,812 | 42 | 3.17 | 1,530 | 7.4 |
| Dec. 29-31..... | 21,660 | -- | 6.79 | 3.70 | 7.92 | -- | 3.85 | | -- | -- | -- | -- | -- | 1,160 | 1.60 | 34,759 | 43 | 3.46 | 1,720 | 7.3 |
| Jan. 1-31, 1963. | 168,906 | 16.0 | 6.84 | 4.20 | 8.18 | 0.18 | 4.38 | | 9.99 | 4.57 | 0.02 | 0.13 | 0.19 | 1,240 | 1.69 | 284,844 | 42 | 3.48 | 1,760 | 7.7 |
| Feb. 1-5..... | 50,202 | -- | 6.69 | 3.95 | 6.35 | -- | 4.00 | | -- | -- | -- | -- | -- | 1,220 | 1.66 | 83,295 | 44 | 3.62 | 1,770 | 7.6 |
| Feb. 6-12..... | 100,370 | -- | 5.69 | 3.37 | 6.87 | -- | 3.49 | | -- | -- | -- | -- | -- | 1,040 | 1.41 | 141,963 | 43 | 3.23 | 1,510 | 7.6 |
| Feb. 13-28..... | 218,277 | -- | 5.09 | 3.13 | 5.66 | -- | 3.20 | | -- | -- | -- | -- | -- | 918 | 1.25 | 272,514 | 41 | 2.79 | 1,330 | 7.5 |
| Mar. 1-31..... | 167,783 | 13.0 | 5.04 | 3.45 | 6.61 | .16 | 3.38 | | 8.14 | 3.61 | .02 | .09 | .15 | 992 | 1.35 | 253,342 | 43 | 3.21 | 1,430 | 7.9 |
| Apr. 1-30..... | 60,516 | -- | 5.29 | 3.70 | 7.13 | -- | 3.15 | | -- | -- | -- | -- | -- | 1,060 | 1.44 | 87,239 | 44 | 3.36 | 1,530 | 7.9 |
| May 1-31..... | 62,102 | -- | 4.59 | 3.37 | 6.61 | -- | 2.95 | | -- | -- | -- | -- | -- | 956 | 1.30 | 80,743 | 45 | 3.31 | 1,390 | 7.5 |
| June 1-30..... | 140,430 | -- | 4.24 | 2.88 | 5.57 | -- | 2.85 | | -- | -- | -- | -- | -- | 830 | 1.13 | 158,517 | 44 | 2.95 | 1,200 | 7.5 |
| July 1-31..... | 89,649 | 12.0 | 4.19 | 2.22 | 4.65 | .12 | 2.75 | | 5.87 | 2.37 | .02 | .07 | .15 | 697 | .95 | 84,980 | 42 | 2.60 | 1,050 | 7.9 |
| Aug. 1-31..... | 61,795 | -- | 4.19 | 2.22 | 4.61 | -- | 2.75 | | -- | -- | -- | -- | -- | 707 | .96 | 59,417 | 42 | 2.58 | 1,050 | 7.6 |
| Sept. 1-30..... | 59,861 | 13.0 | 4.29 | 1.89 | 4.09 | .13 | 2.66 | | 5.66 | 1.97 | .02 | .07 | .17 | 661 | .90 | 53,813 | 39 | 2.33 | 989 | 7.9 |
| Total or weighted average | 2,500,000 | -- | 5.92 | 3.27 | 6.37 | -- | 3.40 | | -- | -- | -- | -- | -- | 1,000 | 1.36 | 3,404,000 | 42 | 2.98 | 1,450 | 7.6 |

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

LOCATION.--At gaging station on left bank at Kaibab Bridge, 0.2 mile upstream from Bright Angel Creek, 11 miles by trail northeast of Grand Canyon, Coconino County, 26 miles downstream from Little Colorado River, and 267 miles upstream from Hoover Dam.
DRAINAGE AREA.--137,800 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: August 1925 to November 1942, September 1943 to September 1963.
Water temperatures: October 1936 to October 1942, September 1943 to September 1963.
Sediment records: October 1925 to November 1942, September 1943 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,370 micromhos Jan. 27; minimum daily, 1,110 micromhos Feb. 10, 16.
Percent sodium: Maximum, 58 Sept. 3-6; minimum, 33 Oct. 10-12.
Sodium-adsorption-ratio: Maximum, 5.45 Jan. 26-27; minimum, 2.48 Feb. 9-10.
EXTREMES, 1937-42, 1943-63.--Specific conductance: Maximum daily, 2,900 micromhos Sept. 6, 1940; minimum daily, 341 micromhos June 15, 1942.
Percent sodium (1941-42, 1943-63): Maximum, 58 Sept. 3-6, 1963; minimum, 16 June 11-20, 1952.
Sodium-adsorption-ratio (1961-63): Maximum, 5.45 Jan. 26-27, 1963; minimum, 0.87 July 1-6, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1962 to September 1963

| 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 | | | | |
| Oct. 1-4, 1962.. | 77,736 | -- | 10.38 | 4.03 | 7.31 | -- | 4.54 | | -- | -- | -- | -- | -- | 1,450 | 1.97 | 153,296 | 34 | 2.72 | 1,930 | 7.5 |
| Oct. 5-9..... | 68,410 | -- | 7.49 | 3.13 | 7.05 | -- | 3.31 | | -- | -- | -- | -- | -- | 1,170 | 1.59 | 108,854 | 40 | 3.06 | 1,640 | 8.1 |
| Oct. 10-12..... | 44,271 | -- | 10.73 | 4.03 | 7.22 | -- | 4.18 | | -- | -- | -- | -- | -- | 1,470 | 2.00 | 88,507 | 33 | 2.66 | 1,930 | 7.8 |
| Oct. 13-18..... | 82,675 | -- | 7.88 | 3.29 | 7.40 | -- | 3.74 | | -- | -- | -- | -- | -- | 1,240 | 1.69 | 139,423 | 40 | 3.13 | 1,720 | 7.6 |
| Oct. 19-31..... | 284,152 | -- | 6.24 | 2.55 | 6.70 | -- | 3.92 | | -- | -- | -- | -- | -- | 998 | 1.36 | 385,674 | 43 | 3.20 | 1,460 | 7.7 |
| Nov. 1-16..... | 241,761 | -- | 5.89 | 3.13 | 6.39 | -- | 3.44 | | -- | -- | -- | -- | -- | 998 | 1.36 | 328,138 | 41 | 3.01 | 1,460 | 8.0 |
| Nov. 17..... | 14,083 | -- | 4.79 | 2.88 | 4.87 | -- | 3.54 | | -- | -- | -- | -- | -- | 792 | 1.08 | 15,169 | 39 | 2.49 | 1,210 | 8.0 |
| Nov. 18-25..... | 120,579 | -- | 6.09 | 3.04 | 6.66 | -- | 3.90 | | -- | -- | -- | -- | -- | 1,010 | 1.37 | 165,628 | 42 | 3.11 | 1,500 | 7.6 |
| Nov. 26-28..... | 40,879 | 11.0 | 4.94 | 2.80 | 5.22 | 0.13 | 3.39 | | 6.45 | 3.27 | 0.02 | 0.09 | 0.10 | 814 | 1.11 | 45,255 | 40 | 2.65 | 1,260 | 7.4 |
| Nov. 29-30..... | 25,646 | -- | 6.24 | 3.45 | 7.05 | -- | 4.11 | | -- | -- | -- | -- | -- | 1,070 | 1.46 | 37,320 | 42 | 3.20 | 1,580 | 7.4 |
| Dec. 1-31..... | 344,085 | -- | 5.99 | 3.62 | 7.79 | -- | 3.75 | | -- | -- | -- | -- | -- | 1,100 | 1.50 | 514,751 | 45 | 3.55 | 1,640 | 7.9 |
| Jan. 1-10, 1963. | 64,086 | -- | 6.49 | 3.95 | 9.70 | -- | 3.97 | | -- | -- | -- | -- | -- | 1,270 | 1.73 | 110,689 | 48 | 4.25 | 1,910 | 7.9 |
| Jan. 11-25..... | 84,050 | -- | 7.09 | 4.44 | 10.92 | -- | 4.57 | | -- | -- | -- | -- | -- | 1,410 | 1.92 | 161,173 | 49 | 4.55 | 2,100 | 7.8 |
| Jan. 26-27..... | 6,466 | -- | 7.29 | 4.03 | 12.96 | -- | 5.18 | | -- | -- | -- | -- | -- | 1,510 | 2.05 | 13,279 | 53 | 5.45 | 2,310 | 7.8 |
| Jan. 28-31..... | 27,134 | -- | 7.34 | 4.03 | 9.40 | -- | 4.56 | | -- | -- | -- | -- | -- | 1,310 | 1.78 | 48,342 | 45 | 3.94 | 1,940 | 7.8 |
| Feb. 1-8..... | 65,829 | -- | 6.84 | 3.95 | 9.22 | -- | 4.33 | | -- | -- | -- | -- | -- | 1,270 | 1.73 | 148,243 | 46 | 3.97 | 1,880 | 7.5 |
| Feb. 9-10..... | 29,633 | -- | 4.39 | 2.63 | 4.65 | -- | 3.41 | | -- | -- | -- | -- | -- | 708 | .96 | 28,533 | 40 | 2.48 | 1,120 | 7.4 |
| Feb. 11-12..... | 30,367 | -- | 5.99 | 3.21 | 7.61 | -- | 3.74 | | -- | -- | -- | -- | -- | 1,070 | 1.46 | 44,190 | 45 | 3.55 | 1,570 | 7.9 |



235-755 O - 66 - 8

COLORADO RIVER MAIN STEM--Continued

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

Chemical analyses, water year October 1962 to September 1963--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. 13, 1963... | 15,253 | -- | 4.39 | 2.55 | 4.65 | -- | 3.47 | | -- | -- | -- | -- | -- | 710 | 0.97 | 14,728 | 40 | 2.50 | 1,120 | 7.4 |
| Feb. 14-15..... | 31,260 | -- | 5.79 | 3.21 | 7.74 | -- | 3.31 | | -- | -- | -- | -- | -- | 1,060 | 1.44 | 45,064 | 46 | 3.65 | 1,600 | 7.3 |
| Feb. 16-17..... | 30,902 | -- | 4.34 | 2.47 | 4.70 | -- | 3.34 | | -- | -- | -- | -- | -- | 718 | .98 | 30,176 | 41 | 2.55 | 1,120 | 7.2 |
| Feb. 18-23..... | 65,603 | -- | 5.34 | 2.80 | 6.39 | -- | 3.25 | | -- | -- | -- | -- | -- | 940 | 1.28 | 109,434 | 44 | 3.17 | 1,390 | 7.8 |
| Feb. 24-27..... | 52,324 | -- | 4.59 | 2.71 | 5.44 | -- | 3.61 | | -- | -- | -- | -- | -- | 814 | 1.11 | 57,925 | 43 | 2.85 | 1,230 | 7.7 |
| Feb. 28..... | 12,734 | -- | 5.29 | 3.29 | 6.96 | -- | 3.57 | | -- | -- | -- | -- | -- | 1,000 | 1.36 | 17,318 | 45 | 3.36 | 1,490 | 7.4 |
| Mar. 1-15..... | 164,529 | -- | 5.09 | 3.29 | 6.96 | -- | 3.62 | | -- | -- | -- | -- | -- | 988 | 1.34 | 221,074 | 45 | 3.40 | 1,490 | 7.8 |
| Mar. 16-31..... | 38,527 | -- | 5.39 | 2.88 | 9.92 | -- | 4.03 | | -- | -- | -- | -- | -- | 1,110 | 1.51 | 58,160 | 55 | 4.88 | 1,760 | 7.9 |
| Apr. 1-7..... | 16,758 | -- | 5.14 | 3.13 | 9.70 | -- | 4.00 | | -- | -- | -- | -- | -- | 1,070 | 1.46 | 24,387 | 54 | 4.77 | 1,740 | 7.7 |
| Apr. 8-30..... | 54,744 | 12.0 | 5.59 | 3.04 | 10.27 | 0.17 | 3.93 | | 6.58 | 8.52 | 0.02 | 0.05 | 0.17 | 1,170 | 1.59 | 87,108 | 54 | 4.94 | 1,870 | 7.9 |
| May 1-31..... | 78,704 | 14.0 | 4.69 | 3.29 | 9.96 | .17 | 3.87 | | 6.35 | 7.84 | .02 | .14 | .18 | 1,100 | 1.50 | 117,741 | 55 | 4.99 | 1,750 | 7.7 |
| June 1-4..... | 10,060 | -- | 3.49 | 3.37 | 9.31 | -- | 3.21 | | -- | -- | -- | -- | -- | 1,000 | 1.36 | 13,682 | 58 | 5.02 | 1,820 | 8.2 |
| June 5-30..... | 137,744 | -- | 4.14 | 2.39 | 6.26 | -- | 3.44 | | -- | -- | -- | -- | -- | 794 | 1.08 | 148,742 | 49 | 3.47 | 1,270 | 7.8 |
| July 1-12..... | 59,837 | 13.0 | 3.79 | 2.55 | 6.00 | .13 | 3.44 | | 4.64 | 4.34 | .02 | .14 | .14 | 766 | 1.04 | 62,336 | 48 | 3.37 | 1,210 | 8.0 |
| July 13-31..... | 48,050 | -- | 4.19 | 2.55 | 8.35 | -- | 3.77 | | -- | -- | -- | -- | -- | 926 | 1.26 | 60,512 | 55 | 4.55 | 1,510 | 7.9 |
| Aug. 1-3..... | 7,914 | -- | 4.44 | 2.80 | 9.57 | -- | 3.80 | | -- | -- | -- | -- | -- | 1,050 | 1.43 | 11,301 | 57 | 5.03 | 1,680 | 7.8 |
| Aug. 4-7..... | 13,075 | -- | 3.39 | 2.63 | 6.35 | -- | 3.74 | | -- | -- | -- | -- | -- | 748 | 1.02 | 13,301 | 51 | 3.66 | 1,220 | 7.8 |
| Aug. 8-14..... | 30,809 | -- | 6.69 | 2.22 | 9.22 | -- | 4.95 | | -- | -- | -- | -- | -- | 1,150 | 1.56 | 48,186 | 51 | 4.37 | 1,720 | 7.8 |
| Aug. 15-21..... | 21,798 | -- | 5.59 | 1.73 | 6.79 | -- | 3.87 | | -- | -- | -- | -- | -- | 914 | 1.24 | 27,096 | 48 | 3.55 | 1,390 | 7.9 |
| Aug. 22-28..... | 25,603 | -- | 4.64 | 1.40 | 6.57 | -- | 4.75 | | -- | -- | -- | -- | -- | 804 | 1.09 | 27,995 | 52 | 3.78 | 1,220 | 7.8 |
| Aug. 29-31..... | 12,811 | -- | 6.29 | 2.14 | 7.05 | -- | 4.46 | | -- | -- | -- | -- | -- | 988 | 1.34 | 17,214 | 46 | 3.43 | 1,460 | 7.7 |
| Sept. 1-2..... | 25,131 | -- | 8.03 | 2.30 | 6.26 | -- | 4.46 | | -- | -- | -- | -- | -- | 1,090 | 1.48 | 37,254 | 38 | 2.76 | 1,510 | 8.0 |
| Sept. 3-6..... | 25,587 | -- | 4.29 | 1.32 | 7.66 | -- | 4.65 | | -- | -- | -- | -- | -- | 856 | 1.16 | 29,787 | 58 | 4.57 | 1,290 | 7.7 |
| Sept. 7-24..... | 56,731 | -- | 6.19 | 1.97 | 8.70 | -- | 4.46 | | -- | -- | -- | -- | -- | 1,100 | 1.50 | 84,870 | 52 | 4.31 | 1,650 | 7.6 |
| Sept. 25-30..... | 14,198 | -- | 6.44 | 2.63 | 9.63 | -- | 4.13 | | -- | -- | -- | -- | -- | 1,220 | 1.66 | 23,557 | 52 | 4.62 | 1,850 | 7.6 |
| Total or weighted average | 2,743,000 | -- | 5.97 | 3.09 | 7.43 | -- | 3.83 | | -- | -- | -- | -- | -- | 1,050 | 1.43 | 3,925,000 | 50 | 3.52 | 1,570 | 7.7 |

COLORADO RIVER MAIN STEM--Continued

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

LOCATION.--At Hoover Dam, 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 1963.
Water temperatures: October 1941 to September 1963.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962 | 673,904 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,100 | -- |
| Nov. 1, 15..... | 647,405 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,100 | -- |
| Dec. 3, 17..... | 722,479 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,090 | -- |
| Jan. 1, 15, 1963 | 362,777 | 10.0 | 5.29 | 1.89 | 4.44 | 0.11 | 2.61 | | 6.50 | 2.45 | 0.02 | 0.06 | 0.12 | 730 | 0.99 | 360,165 | 38 | 2.34 | 1,090 | 7.5 |
| Feb. 1, 15..... | 612,575 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,050 | -- |
| Mar. 1, 15..... | 894,645 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,070 | -- |
| Apr. 1, 15..... | 960,992 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,040 | -- |
| May 1, 15..... | 1,011,471 | 10.0 | 4.49 | 2.06 | 4.09 | .11 | 2.61 | | 5.66 | 2.37 | .01 | .04 | .12 | 686 | .93 | 943,662 | 38 | 2.26 | 1,040 | 7.7 |
| June 1, 17..... | 800,331 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,020 | -- |
| July 5, 15..... | 959,207 | --- | --- | --- | --- | --- | --- | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1,010 | -- |
| Aug. 1, 20..... | 986,876 | 1.1 | 4.89 | 1.73 | 3.83 | .11 | 2.62 | | 5.70 | 2.31 | .02 | .05 | .10 | 863 | .90 | 889,846 | 36 | 2.10 | 991 | 7.5 |
| Aug. 28, Sept. 18..... | 865,785 | 9.8 | 4.89 | 1.81 | 3.70 | .10 | 2.57 | | 5.73 | 2.31 | .02 | .04 | .10 | 658 | .89 | 774,774 | 35 | 2.02 | 988 | 7.6 |
| Total or weighted average A | 8,810,000 | 10.0 | 4.89 | 1.97 | 4.18 | 0.11 | 2.62 | | 6.04 | 2.43 | 0.02 | 0.04 | 0.11 | 700 | 0.95 | 8,370,000 | 37 | 2.20 | 1,050 | 7.6 |

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

## 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 1963.
Water temperatures: May 1960 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,470 micromhos Dec. 28; minimum daily, 1,030 micromhos Sept. 19.
Percent sodium: Maximum, 46 Jan. 1-31; minimum, 43 Mar. 1 to Aug. 31.
Sodium-adsorption-ratio: Maximum, 3.25 Jan. 1-31; minimum, 2.80 July 1-31.
EXTREMES, 1943-63.--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; minimum, 32 several periods in 1945, 1946, 1948, 1949, and 1957.
Sodium-adsorption-ratio (1961-63): 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 1962 to September 1963

| 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, 1962. | 31,297 | 6.0 | 4.99 | 2.47 | 6.09 | | 2.79 | | 7.14 | 3.70 | | 0.03 | | 846 | 1.15 | 36,009 | 45 | 3.15 | 1,320 | 7.9 |
| Nov. 1-30..... | 21,421 | 15.0 | 4.99 | 2.55 | 6.18 | | 2.80 | | 7.22 | 3.81 | | .03 | | 856 | 1.16 | 24,938 | 45 | 3.18 | 1,330 | 7.9 |
| Dec. 1-31..... | 12,052 | 14.0 | 5.24 | 2.39 | 6.31 | | 2.85 | | 7.31 | 3.86 | | .03 | | 869 | 1.18 | 14,243 | 45 | 3.23 | 1,350 | 8.1 |
| Jan. 1-31, 1963. | 18,569 | 16.0 | 5.14 | 2.30 | 6.26 | | 2.72 | | 7.10 | 3.53 | | .04 | | 841 | 1.14 | 21,239 | 46 | 3.25 | 1,300 | 8.0 |
| Feb. 1-28..... | 27,991 | 14.0 | 4.99 | 2.39 | 5.74 | | 2.72 | | 6.93 | 3.50 | | .04 | | 816 | 1.11 | 31,063 | 44 | 2.99 | 1,260 | 8.0 |
| Mar. 1-31..... | 29,576 | 13.0 | 4.99 | 2.39 | 5.48 | | 2.75 | | 6.91 | 3.44 | | .04 | | 807 | 1.10 | 32,460 | 43 | 2.85 | 1,250 | 8.0 |
| Apr. 1-30..... | 27,907 | 13.0 | 5.24 | 2.06 | 5.52 | | 2.75 | | 6.91 | 3.24 | | .02 | | 801 | 1.09 | 30,401 | 43 | 2.89 | 1,240 | 8.0 |
| May 1-31..... | 37,815 | 13.0 | 5.39 | 1.97 | 5.57 | | 2.79 | | 6.85 | 3.27 | | .01 | | 803 | 1.09 | 41,297 | 43 | 2.90 | 1,240 | 8.1 |
| June 1-30..... | 32,311 | 16.0 | 4.94 | 2.22 | 5.35 | | 2.72 | | 6.68 | 3.13 | | .02 | | 780 | 1.06 | 34,275 | 43 | 2.83 | 1,200 | 7.9 |
| July 1-31..... | 40,643 | 16.0 | 4.79 | 2.14 | 5.22 | | 2.75 | | 6.48 | 3.10 | | .01 | | 763 | 1.04 | 42,175 | 43 | 2.80 | 1,190 | 8.1 |
| Aug. 1-31..... | 34,863 | 16.0 | 4.89 | 1.89 | 5.22 | | 2.66 | | 6.41 | 3.05 | | .00 | | 753 | 1.02 | 35,703 | 43 | 2.83 | 1,170 | 8.1 |
| Sept. 1-30..... | 31,418 | 15.0 | 4.54 | 2.22 | 5.48 | 0.13 | 2.66 | | 6.41 | 3.24 | 0.03 | .00 | 0.17 | 768 | 1.04 | 32,816 | 44 | 2.98 | 1,190 | 8.1 |
| Total or weighted average | 345,900 | 15.0 | 4.99 | 2.22 | 5.61 | -- | 2.74 | | 6.80 | 3.35 | -- | 0.02 | -- | 801 | 1.09 | 376,600 | 44 | 2.98 | 1,240 | 8.0 |

## 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 1963.
Water temperatures: April 1949 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,330 micromhos Sept. 30; minimum daily, 461 micromhos May 10.
Percent sodium: Maximum, 34 Mar. 1-22; minimum, 23 May 25-31.
Sodium-adsorption-ratio: Maximum, 2.64 Sept. 14-30; minimum, 0.95 May 6-24.
EXTREMES, 1941-63.--Specific conductance: Maximum daily, 2,730 micromhos Sept. 10, 1956; minimum daily, 280 micromhos May 23, 1946.
Percent sodium (1950-63): 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 1962 to September 1963

| 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, 1962. | 70,219 | | 14.32 | | 5.79 | | 3.92 | | 15.74 | 0.45 | | | | 1,350 | 1.64 | 126,922 | 29 | 2.16 | 1,660 | 7.8 |
| Nov. 1-30..... | 67,656 | | 12.72 | | 5.31 | | 4.00 | | 13.57 | .45 | | | | 1,190 | 1.62 | 109,495 | 29 | 2.10 | 1,490 | 7.8 |
| Dec. 1-31..... | 53,740 | | 12.92 | | 5.96 | | 4.10 | | 14.26 | .51 | | | | 1,250 | 1.70 | 91,358 | 32 | 2.34 | 1,550 | 7.8 |
| Jan. 1-31, 1963. | 46,145 | | 12.96 | | 5.70 | | 4.38 | | 13.76 | .51 | | | | 1,220 | 1.66 | 79,682 | 31 | 2.24 | 1,530 | 7.8 |
| Feb. 1-26..... | 70,421 | | 11.12 | | 5.46 | | 3.74 | | 12.39 | .46 | | | | 1,110 | 1.51 | 106,306 | 33 | 2.32 | 1,420 | 7.3 |
| Mar. 1-22..... | 35,258 | | 10.96 | | 5.66 | | 3.34 | | 12.76 | .51 | | | | 1,130 | 1.54 | 54,185 | 34 | 2.42 | 1,430 | 7.3 |
| Mar. 23-24..... | 7,379 | | 8.46 | | 3.87 | | 3.34 | | 6.66 | .37 | | | | 830 | 1.13 | 8,329 | 31 | 1.88 | 1,080 | 7.3 |
| Mar. 25-31..... | 38,959 | | 5.92 | | 2.09 | | 3.10 | | 4.71 | .21 | | | | 530 | .72 | 26,082 | 26 | 1.21 | 737 | 7.2 |
| Apr. 1-5..... | 24,397 | | 4.80 | | 1.87 | | 2.34 | | 4.16 | .16 | | | | 464 | .63 | 15,395 | 26 | 1.21 | 627 | 7.2 |
| Apr. 6-8..... | 10,752 | | 6.20 | | 2.74 | | 2.62 | | 6.06 | .26 | | | | 604 | .82 | 8,832 | 31 | 1.56 | 821 | 7.2 |
| Apr. 9-19..... | 42,218 | | 5.08 | | 2.00 | | 2.29 | | 4.60 | .20 | | | | 486 | .66 | 27,905 | 28 | 1.26 | 666 | 7.2 |
| Apr. 20-27..... | 15,963 | | 7.36 | | 3.18 | | 2.56 | | 7.60 | .37 | | | | 712 | .97 | 15,457 | 30 | 1.66 | 953 | 7.4 |
| Apr. 28-30..... | 8,967 | | 5.48 | | 2.04 | | 2.13 | | 5.16 | .25 | | | | 514 | .70 | 6,266 | 27 | 1.24 | 712 | 7.2 |
| May 1-5..... | 15,511 | | 6.52 | | 2.26 | | 2.41 | | 6.02 | .37 | | | | 550 | .75 | 11,602 | 26 | 1.25 | 785 | 7.5 |
| May 6-24..... | 133,860 | | 4.30 | | 1.39 | | 1.97 | | 3.54 | .20 | | | | 348 | .47 | 63,353 | 24 | .95 | 526 | 7.4 |
| May 25-31..... | 38,723 | | 6.00 | | 1.83 | | 2.16 | | 5.43 | .25 | | | | 466 | .66 | 25,595 | 23 | 1.05 | 700 | 7.6 |
| June 1-9..... | 39,844 | | 7.12 | | 2.74 | | 2.72 | | 6.85 | .27 | | | | 629 | .86 | 34,084 | 26 | 1.45 | 686 | 7.6 |
| June 10-25..... | 47,635 | | 9.16 | | 3.70 | | 3.02 | | 9.56 | .28 | | | | 820 | 1.12 | 53,123 | 29 | 1.73 | 1,110 | 7.5 |
| June 26-30..... | 4,760 | | 14.00 | | 6.00 | | 3.16 | | 16.30 | .54 | | | | 1,330 | 1.81 | 8,610 | 30 | 2.27 | 1,640 | 7.6 |
| July 1-31..... | 37,016 | | 16.00 | | 6.26 | | 3.82 | | 17.82 | .62 | | | | 1,550 | 2.11 | 78,029 | 28 | 2.21 | 1,840 | 7.6 |

GUNNISON RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Aug. 1-5, 1963.. | 5,276 | | 18.80 | | 7.96 | | 3.80 | | 22.26 | 0.68 | | | | 1,850 | 2.52 | 13,274 | 30 | 2.60 | 2,130 | 7.3 |
| Aug. 6-16..... | 19,047 | | 14.00 | | 5.18 | | 3.80 | | 14.91 | .48 | | | | 1,300 | 1.77 | 33,676 | 27 | 1.96 | 1,610 | 7.7 |
| Aug. 17-27..... | 16,560 | | 16.40 | | 6.92 | | 3.80 | | 18.88 | .62 | | | | 1,600 | 2.18 | 36,035 | 30 | 2.42 | 1,890 | 7.5 |
| Aug. 28-31..... | 10,909 | | 14.20 | | 5.52 | | 3.75 | | 15.45 | .54 | | | | 1,340 | 1.82 | 19,881 | 28 | 2.07 | 1,640 | 7.4 |
| Sept. 1-13..... | 26,095 | | 15.80 | | 6.18 | | 3.97 | | 17.51 | .48 | | | | 1,480 | 2.01 | 52,523 | 28 | 2.20 | 1,770 | 7.5 |
| Sept. 14-30..... | 24,446 | | 19.20 | | 8.18 | | 3.87 | | 22.90 | .59 | | | | 1,880 | 2.56 | 62,504 | 30 | 2.64 | 2,150 | 7.6 |
| Total or weighted average | 913,800 | | 10.04 | | 4.16 | | 3.21 | | 10.61 | 0.38 | | | | 974 | 1.28 | 1,173,000 | 29 | 1.78 | 1,200 | 7.5 |

## 9-2345. GREEN RIVER NEAR GREENDALE, UTAH

LOCATION.--At gaging station on right bank, 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 1963.
Water temperatures: October 1956 to September 1959.
Sediment records: October 1956 to September 1959.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,090 micromhos Dec. 26; minimum daily, 797 micromhos Nov. 29.
Percent sodium: Maximum, 38 Nov. 1-7; minimum, 33 Jan. 1-31.
Sodium-adsorption-ratio: Maximum, 2.11 Mar. 1 to Apr. 30; minimum, 1.88 Oct. 1-31, Nov. 8-30.
EXTREMES, 1956-58, 1959-63.--Specific conductance: Maximum daily, 1,340 micromhos Aug. 30, 1961; minimum daily, 325 micromhos June 2, 1961.
Percent sodium: Maximum, 53 Mar. 29-31, 1962; minimum, 16 May 8, 1962.
Sodium-adsorption-ratio (1961-63): 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. Flow regulated by Flaming Gorge Reservoir since Nov. 1, 1962.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 47,776 | 6.0 | 3.79 | 2.22 | 3.26 | 0.06 | 3.06 | 0.00 | 5.70 | 0.68 | 0.02 | 0.01 | 0.09 | 585 | 0.80 | 38,010 | 35 | 1.88 | 867 | 7.9 |
| Nov. 1-7..... | 1,972 | 19.0 | 3.59 | 1.73 | 3.35 | .16 | 2.38 | .10 | 5.68 | .73 | .02 | .02 | .12 | 575 | .78 | 1,542 | 38 | 2.05 | 868 | 8.3 |
| Nov. 8-30..... | 3,390 | 11.0 | 3.74 | 2.14 | 3.22 | .06 | 3.46 | .00 | 5.16 | .82 | .02 | .02 | .09 | 564 | .77 | 2,600 | 35 | 1.88 | 834 | 7.9 |
| Dec. 1-31..... | 16,479 | 6.8 | 4.79 | 2.55 | 3.67 | .06 | 4.00 | .00 | 6.60 | .79 | .02 | .02 | .01 | 700 | .95 | 15,688 | 34 | 2.02 | 1,010 | 7.8 |
| Jan. 1-31, 1963. | 22,566 | --- | 7.20 | | 3.61 | --- | 3.77 | .00 | 6.29 | .73 | --- | --- | --- | 682 | .93 | 20,930 | 33 | 1.90 | 979 | 7.7 |
| Feb. 1-28..... | 25,936 | --- | 7.28 | | 3.78 | --- | 3.87 | .00 | 6.45 | .73 | --- | --- | --- | 693 | .94 | 24,444 | 34 | 1.98 | 994 | 7.9 |
| Mar. 1-31..... | 6,518 | --- | 6.72 | | 3.87 | --- | 3.47 | .00 | 6.33 | .79 | --- | --- | --- | 646 | .88 | 5,726 | 37 | 2.11 | 962 | 7.6 |
| Apr. 1-30..... | 7,974 | --- | 7.04 | | 3.96 | --- | 3.70 | .00 | 6.50 | .79 | --- | --- | --- | 672 | .91 | 7,287 | 36 | 2.11 | 994 | 7.4 |
| May 1-31..... | 7,993 | --- | 7.00 | | 3.92 | --- | 3.65 | .00 | 6.45 | .82 | --- | --- | --- | 690 | .94 | 7,501 | 36 | 2.09 | 994 | 7.8 |
| June 1-30..... | 7,438 | --- | | | 3.87 | --- | 3.69 | .00 | 6.29 | .85 | --- | --- | --- | | | | | | | |
| July 1-31..... | 7,438 | --- | 6.96 | | 3.87 | --- | 3.69 | .00 | 6.29 | .85 | --- | --- | --- | 680 | .92 | 6,879 | 36 | 2.08 | 984 | 7.7 |
| Aug. 1-31..... | 6,395 | --- | 6.68 | | 3.78 | --- | 3.59 | .00 | 6.00 | .87 | --- | --- | --- | 672 | .91 | 5,844 | 36 | 2.07 | 975 | 7.7 |
| Sept. 1-30..... | 6,272 | --- | 6.84 | | 3.78 | --- | 3.62 | .00 | 6.16 | .85 | --- | --- | --- | 668 | .91 | 5,698 | 36 | 2.05 | 943 | 7.6 |
| Total or weighted average | 167,400 | --- | 6.74 | | 3.61 | --- | 3.54 | 0.00 | 6.13 | 0.76 | --- | --- | --- | 650 | 0.88 | 148,110 | 35 | 1.97 | 948 | 7.8 |

GREEN RIVER BASIN--Continued

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 1963.
Water temperatures: May 1949 to September 1959.
Sediment records: May 1930 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,620 micromhos Aug. 6; minimum daily, 363 micromhos May 26.
Percent sodium: Maximum, 53 Aug. 1-4; minimum, 26 Aug. 18.
Sodium-adsorption-ratio: Maximum, 3.92 Oct. 1-6; minimum, 1.11 May 11-31.
EXTREMES, 1941-63.--Specific conductance: Maximum daily, 2,620 micromhos Aug. 6, 1963; minimum daily, 272 micromhos May 13, 1956.
Percent sodium: Maximum, 53 Aug. 1-4, 1963; minimum, 19 Aug. 7, 1957.
Sodium-adsorption-ratio (1961-63): Maximum, 3.92 Oct. 1-6, 1963; minimum, 0.84 May 1-31, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City Utah.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-6, 1962.. | 23,540 | -- | 16.88 | | 11.40 | -- | 4.46 | | 22.49 | 1.30 | -- | -- | -- | 1,880 | 2.56 | 60,187 | 40 | 3.92 | 2,320 | 7.6 |
| Oct. 7-20..... | 55,981 | -- | 7.08 | | 5.96 | -- | 3.77 | | 7.70 | 1.58 | -- | -- | -- | 820 | 1.12 | 62,431 | 46 | 3.17 | 1,210 | 7.7 |
| Oct. 21-31..... | 46,167 | -- | 7.32 | | 5.00 | -- | 3.93 | | 7.06 | 1.33 | -- | -- | -- | 777 | 1.06 | 48,786 | 41 | 2.61 | 1,140 | 7.5 |
| Nov. 1-20..... | 64,423 | 12.0 | 4.34 | 3.54 | 5.48 | 0.06 | 4.39 | | 7.39 | 1.64 | 0.02 | 0.02 | 0.30 | 838 | 1.14 | 73,422 | 41 | 2.76 | 1,220 | 7.6 |
| Nov. 21-26,28-30 | 27,027 | -- | 8.12 | | 5.96 | -- | 4.46 | | 7.91 | 1.72 | -- | -- | -- | 873 | 1.19 | 32,088 | 42 | 2.96 | 1,280 | 7.9 |
| Nov. 27..... | 2,975 | 11.0 | 4.34 | 3.54 | 5.57 | .06 | 4.43 | | 7.60 | 1.69 | .02 | .01 | .12 | 856 | 1.16 | 3,464 | 41 | 2.81 | 1,240 | 8.1 |
| Dec. 1-15..... | 41,980 | 12.0 | 4.19 | 3.70 | 5.66 | .06 | 4.33 | | 7.50 | 1.61 | .02 | .01 | .28 | 828 | 1.13 | 47,273 | 42 | 2.85 | 1,220 | 8.1 |
| Dec. 16-Jan. 15, 1963..... | 66,407 | 13.0 | 3.14 | 3.62 | 5.48 | .06 | 3.18 | | 7.58 | 1.61 | .02 | .03 | .13 | 784 | 1.07 | 70,805 | 45 | 2.98 | 1,160 | 8.2 |
| Jan. 16-Feb. 10. | 73,127 | -- | 6.96 | | 5.39 | -- | 4.06 | | 6.83 | 1.44 | -- | -- | -- | 742 | 1.01 | 73,794 | 44 | 2.89 | 1,120 | 8.1 |
| Feb. 11-28..... | 81,616 | -- | 6.28 | | 4.44 | -- | 3.57 | | 5.95 | 1.18 | -- | -- | -- | 664 | .90 | 73,702 | 41 | 2.50 | 988 | 7.9 |
| Mar. 1-10..... | 37,646 | -- | 6.40 | | 4.83 | -- | 3.56 | | 6.41 | 1.27 | -- | -- | -- | 684 | .93 | 35,020 | 43 | 2.70 | 1,030 | 7.7 |
| Mar. 11-31..... | 61,813 | -- | 6.88 | | 5.83 | -- | 4.00 | | 7.06 | 1.64 | -- | -- | -- | 774 | 1.05 | 65,067 | 46 | 3.14 | 1,170 | 7.5 |
| Apr. 1-5..... | 25,448 | -- | 5.52 | | 4.65 | -- | 3.61 | | 5.33 | 1.24 | -- | -- | -- | 620 | .84 | 21,458 | 46 | 2.80 | 950 | 7.5 |
| Apr. 6-30..... | 128,727 | -- | 4.52 | | 3.26 | -- | 2.88 | | 3.96 | .93 | -- | -- | -- | 476 | .65 | 83,333 | 42 | 2.17 | 750 | 7.4 |
| May 1-10..... | 65,534 | -- | 4.74 | | 3.65 | -- | 3.11 | | 4.12 | 1.16 | -- | -- | -- | 515 | .70 | 45,900 | 44 | 2.37 | 795 | 7.9 |
| May 11-31..... | 333,223 | -- | 2.76 | | 1.31 | -- | 2.23 | | 1.46 | .39 | -- | -- | -- | 250 | .34 | 113,296 | 32 | 1.11 | 398 | 7.9 |
| June 1-30..... | 309,719 | -- | 3.10 | | 1.91 | -- | 2.26 | | 2.19 | .56 | -- | -- | -- | 311 | .42 | 130,999 | 38 | 1.54 | 490 | 7.6 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July 1-10, 1963. | 24,060 | -- | 3.90 | 3.05 | -- | 2.69 | | 3.23 | 1.02 | -- | -- | -- | 429 | .58 | 14,037 | 44 | 2.16 | 679 | 7.5 |
| July 11-31..... | 26,658 | -- | 5.96 | 5.22 | -- | 3.28 | | 6.08 | 1.83 | -- | -- | -- | 695 | .95 | 25,197 | 47 | 3.02 | 1,060 | 7.7 |
| Aug. 1-4..... | 3,499 | -- | 6.08 | 6.79 | -- | 3.54 | | 7.08 | 2.23 | -- | -- | -- | 792 | 1.08 | 3,769 | 53 | 3.89 | 1,200 | 7.9 |
| Aug. 5-6..... | 3,396 | -- | 18.20 | 13.09 | -- | 4.26 | | 24.98 | 2.06 | -- | -- | -- | 2,110 | 2.87 | 9,744 | 42 | 4.34 | 2,520 | 7.6 |
| Aug. 7-17..... | 19,876 | -- | 8.68 | 7.61 | -- | 3.88 | | 10.12 | 2.29 | -- | -- | -- | 1,040 | 1.41 | 28,113 | 47 | 3.65 | 1,460 | 7.5 |
| Aug. 18..... | 4,502 | -- | 24.80 | 8.87 | -- | 5.70 | | 26.65 | 1.33 | -- | -- | -- | 2,330 | 3.17 | 14,267 | 26 | 2.52 | 2,460 | 7.4 |
| Aug. 19-28..... | 30,724 | -- | 10.86 | 7.44 | -- | 3.70 | | 12.20 | 2.40 | -- | -- | -- | 1,190 | 1.62 | 49,724 | 41 | 3.19 | 1,620 | 7.6 |
| Aug. 29-31..... | 9,979 | -- | 16.00 | 8.40 | -- | 3.87 | | 18.45 | 2.09 | -- | -- | -- | 1,610 | 2.19 | 21,850 | 34 | 2.97 | 2,010 | 7.6 |
| Sept. 1-6..... | 24,789 | -- | 8.64 | 6.83 | -- | 4.20 | | 9.60 | 1.66 | -- | -- | -- | 999 | 1.36 | 33,680 | 44 | 3.29 | 1,380 | 7.9 |
| Sept. 7-15..... | 34,506 | -- | 13.20 | 7.83 | -- | 4.00 | | 15.66 | 1.35 | -- | -- | -- | 1,410 | 1.92 | 66,170 | 37 | 3.05 | 1,760 | 7.5 |
| Sept. 16-22..... | 16,161 | -- | 10.56 | 6.92 | -- | 3.87 | | 11.93 | 1.69 | -- | -- | -- | 1,150 | 1.56 | 25,276 | 40 | 3.01 | 1,550 | 7.5 |
| Sept. 23-30..... | 19,375 | -- | 7.60 | 6.74 | -- | 3.97 | | 8.58 | 1.81 | -- | -- | -- | 897 | 1.22 | 23,635 | 47 | 3.46 | 1,280 | 7.5 |
| Total or weighted average | 1,663,000 | -- | 5.63 | 3.93 | -- | 3.13 | | 5.37 | 1.07 | -- | -- | -- | 600 | 0.82 | 1,356,000 | 42 | 2.23 | 880 | 7.7 |

## SAN JUAN RIVER BASIN

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

LOCATION.--At gaging station on right bank, 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 1963.
Water temperatures: December 1954 to September 1963.
Sediment records: December 1954 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 527 micromhos Jan. 19; minimum daily, 180 micromhos June 12.
Percent sodium: Maximum, 36, Jan. 19; minimum, 19 Sept. 20.
Sodium-adsorption-ratio: Maximum, 1.48 Jan. 19; minimum, 0.51 June 23-30.
EXTREMES, 1954-63.--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 (1961-63): Maximum, 1.53 Mar. 20, 1962; minimum, 0.30 Apr. 17-23, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-18, 1962. | 10,318 | -- | 1.90 | 0.50 | 1.00 | -- | 2.11 | | -- | -- | -- | -- | -- | 216 | 0.29 | 3,031 | 29 | 0.91 | 338 | 7.8 |
| Oct. 19..... | 704 | -- | 2.35 | .45 | 1.26 | -- | 2.36 | | -- | -- | -- | -- | -- | 270 | .37 | 259 | 31 | 1.07 | 396 | 7.8 |
| Oct. 20-31..... | 7,283 | -- | 2.05 | .45 | 1.26 | -- | 2.10 | | -- | -- | -- | -- | -- | 239 | .33 | 2,367 | 34 | 1.13 | 373 | 7.4 |
| Nov. 1-30..... | 14,281 | 13.0 | 2.15 | .45 | 1.22 | 0.07 | 2.10 | | 1.60 | 0.18 | 0.02 | 0.01 | 0.11 | 244 | .33 | 4,739 | 31 | 1.07 | 378 | 7.6 |
| Dec. 1-31..... | 9,961 | -- | 2.25 | .59 | 1.35 | -- | 2.21 | | -- | -- | -- | -- | -- | 271 | .37 | 3,671 | 32 | 1.13 | 414 | 7.7 |
| Jan. 1-18, 20-31, 1963. | 6,843 | -- | 2.40 | .44 | 1.39 | -- | 2.21 | | -- | -- | -- | -- | -- | 290 | .39 | 2,699 | 33 | 1.17 | 418 | 7.8 |
| Jan. 19..... | 218 | -- | 2.89 | .59 | 1.96 | -- | 2.88 | | -- | -- | -- | -- | -- | 378 | .51 | 112 | 36 | 1.48 | 527 | 7.6 |
| Feb. 1-28..... | 8,275 | 13.0 | 2.40 | .56 | 1.48 | .08 | 2.23 | | 2.02 | .25 | .02 | .00 | .03 | 314 | .43 | 3,534 | 33 | 1.22 | 439 | 7.6 |
| Mar. 1-31..... | 14,634 | -- | 2.45 | .63 | 1.44 | -- | 2.29 | | -- | -- | -- | -- | -- | 290 | .39 | 5,772 | 32 | 1.16 | 436 | 7.6 |
| Apr. 1-30..... | 30,764 | -- | 2.40 | .60 | 1.35 | -- | 2.16 | | -- | -- | -- | -- | -- | 280 | .38 | 11,715 | 31 | 1.10 | 428 | 8.0 |
| May 1-10..... | 5,871 | -- | 2.15 | .73 | 1.22 | -- | 2.10 | | -- | -- | -- | -- | -- | 270 | .37 | 2,156 | 30 | 1.02 | 406 | 7.8 |
| May 11-13..... | 1,839 | -- | 1.25 | .31 | .48 | -- | 1.28 | | -- | -- | -- | -- | -- | 142 | .19 | 355 | 23 | .54 | 206 | 7.5 |
| May 14-19..... | 3,642 | -- | 1.40 | .52 | .65 | -- | 1.51 | | -- | -- | -- | -- | -- | 170 | .23 | 842 | 25 | .67 | 250 | 7.5 |
| May 20-31..... | 7,379 | -- | 1.30 | .18 | .48 | -- | 1.25 | | -- | -- | -- | -- | -- | 137 | .19 | 1,375 | 24 | .56 | 194 | 7.5 |
| June 1-20..... | 12,337 | -- | 1.10 | .30 | .48 | -- | 1.21 | | -- | -- | -- | -- | -- | 136 | .18 | 2,282 | 26 | .57 | 193 | 7.6 |
| June 21-22..... | 1,515 | -- | 1.75 | .73 | .96 | -- | 1.69 | | -- | -- | -- | -- | -- | 224 | .30 | 462 | 28 | .86 | 330 | 7.7 |
| June 23-30..... | 4,982 | -- | 1.20 | .28 | .44 | -- | 1.23 | | -- | -- | -- | -- | -- | 134 | .18 | 908 | 23 | .51 | 192 | 7.7 |
| July 1-31..... | 20,229 | 16.0 | 1.20 | .24 | .48 | .04 | 1.21 | | .69 | .07 | .01 | .00 | .04 | 136 | .18 | 3,742 | 24 | .56 | 194 | 7.7 |
| Aug. 1-31..... | 21,705 | 15.0 | 1.25 | .27 | .48 | .05 | 1.25 | | .75 | .06 | .01 | .01 | .05 | 142 | .19 | 4,192 | 23 | .55 | 205 | 7.4 |
| Sept. 1-19..... | 12,549 | -- | 1.25 | .31 | .52 | -- | 1.38 | | -- | -- | -- | -- | -- | 146 | .20 | 2,492 | 25 | .59 | 216 | 7.3 |
| Sept. 20..... | 694 | -- | 2.35 | .45 | .65 | -- | 2.29 | | -- | -- | -- | -- | -- | 238 | .32 | 225 | 19 | .55 | 350 | 7.8 |
| Sept. 21-30..... | 6,823 | -- | 1.35 | .37 | .57 | -- | 1.48 | | -- | -- | -- | -- | -- | 150 | .20 | 1,392 | 25 | .61 | 227 | 7.5 |
| Total or weighted average | 202,800 | -- | 1.80 | 0.43 | 0.94 | -- | 1.77 | | -- | -- | -- | -- | -- | 211 | 0.29 | 58,320 | 27 | 0.86 | 315 | 7.6 |

## 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 1963.
Water temperatures: May 1944 to September 1961.
Sediment records: August to September 1928, July 1929 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 2,260 micromhos July 29; minimum daily, 546 micromhos May 12.
Percent sodium: Maximum, 47 Aug. 3-5; minimum, 27 Apr. 1-6.
Sodium-adsorption-ratio: Maximum, 4.03 July 26-31; minimum, 1.16 June 1-30.
EXTREMES, 1929-63.--Specific conductance (1941-63): Maximum daily, 2,790 micromhos Sept. 19, 1959; minimum daily, 206 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 (1961-63): Maximum, 5.03 Sept. 26-30, 1962; minimum, 0.3 June 5-18, 1962.
REMARKS.--Records of specific conductance of daily samples available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 103,914 | | 8.92 | | 5.96 | | 3.51 | | 10.31 | 1.04 | | | | 972 | 1.32 | 137,366 | 40 | 2.82 | 1,350 | 7.6 |
| Nov. 1-30..... | 45,461 | | 9.40 | | 5.48 | | 3.36 | | 10.33 | 1.18 | | | | 982 | 1.34 | 60,714 | 37 | 2.53 | 1,360 | 7.8 |
| Dec. 1-31..... | 33,142 | | 10.16 | | 5.61 | | 3.25 | | 11.24 | 1.30 | | | | 1,030 | 1.40 | 46,425 | 36 | 2.49 | 1,410 | 7.9 |
| Jan. 1-31, 1963. | 25,210 | | 11.92 | | 6.61 | | 3.77 | | 13.22 | 1.52 | | | | 1,220 | 1.66 | 41,828 | 36 | 2.71 | 1,620 | 7.3 |
| Feb. 1-28..... | 39,098 | | 10.20 | | 5.79 | | 3.38 | | 11.43 | 1.18 | | | | 1,060 | 1.44 | 56,364 | 36 | 2.56 | 1,430 | 7.5 |
| Mar. 1-15..... | 16,423 | | 10.00 | | 5.61 | | 3.31 | | 11.01 | 1.30 | | | | 1,040 | 1.41 | 23,229 | 36 | 2.51 | 1,400 | 7.8 |
| Mar. 16-31..... | 23,357 | | 8.44 | | 4.00 | | 3.05 | | 8.62 | .79 | | | | 636 | 1.14 | 26,556 | 32 | 1.95 | 1,140 | 7.5 |
| Apr. 1-6..... | 13,412 | | 6.04 | | 2.26 | | 2.72 | | 5.08 | .48 | | | | 546 | .74 | 9,959 | 27 | 1.30 | 789 | 7.7 |
| Apr. 7-24..... | 44,985 | | 5.68 | | 2.26 | | 2.80 | | 4.64 | .45 | | | | 526 | .72 | 32,181 | 28 | 1.34 | 767 | 7.5 |
| Apr. 25-30..... | 5,974 | | 9.04 | | 5.05 | | 3.11 | | 9.95 | 1.02 | | | | 950 | 1.29 | 7,719 | 36 | 2.37 | 1,270 | 7.6 |
| May 1-10..... | 17,455 | | 9.88 | | 6.53 | | 2.52 | | 12.58 | 1.30 | | | | 1,120 | 1.52 | 26,587 | 40 | 2.94 | 1,470 | 7.3 |
| May 11-31..... | 77,808 | | 4.50 | | 1.74 | | 2.29 | | 3.58 | .39 | | | | 397 | .54 | 42,010 | 28 | 1.16 | 606 | 7.4 |
| June 1-30..... | 46,711 | | 6.00 | | 3.05 | | 2.28 | | 6.06 | .71 | | | | 600 | .82 | 38,116 | 34 | 1.76 | 868 | 7.2 |
| July 1-2..... | 932 | | 8.00 | | 6.09 | | 2.25 | | 10.56 | 1.27 | | | | 945 | 1.29 | 1,198 | 43 | 3.05 | 1,300 | 7.1 |
| July 3-12..... | 4,026 | | 13.10 | | 8.22 | | 2.93 | | 16.14 | 2.26 | | | | 1,410 | 1.92 | 7,721 | 39 | 3.21 | 1,850 | 7.5 |
| July 13-21..... | 7,533 | | 9.32 | | 5.87 | | 2.80 | | 11.28 | 1.13 | | | | 986 | 1.34 | 10,102 | 39 | 2.72 | 1,360 | 7.5 |
| July 22-25..... | 873 | | 9.06 | | 7.44 | | 1.61 | | 13.39 | 1.52 | | | | 1,130 | 1.54 | 1,341 | 45 | 3.49 | 1,520 | 7.1 |
| July 26-31..... | 1,145 | | 15.50 | | 11.22 | | 2.16 | | 21.86 | 2.68 | | | | 1,800 | 2.45 | 2,803 | 42 | 4.03 | 2,260 | 7.6 |

SAN JUAN RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 160°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Aug. 1-2, 1963.. | 484 | | 13.10 | | 6.66 | | 2.95 | | 15.26 | 1.55 | | | | 1,280 | 1.74 | 842 | 34 | 2.60 | 1,700 | 7.2 |
| Aug. 3-5..... | 3,076 | | 6.88 | | 6.13 | | 6.00 | | 5.95 | 1.07 | | | | 768 | 1.04 | 3,213 | 47 | 3.31 | 1,160 | 7.2 |
| Aug. 6-8..... | 6,313 | | 14.00 | | 7.96 | | 4.82 | | 15.72 | 1.41 | | | | 1,390 | 1.89 | 11,935 | 36 | 3.01 | 1,760 | 7.6 |
| Aug. 9-31..... | 38,594 | | 11.56 | | 6.44 | | 3.46 | | 13.39 | 1.13 | | | | 1,150 | 1.56 | 60,362 | 36 | 2.68 | 1,510 | 7.5 |
| Sept. 1-20..... | 48,397 | | 7.60 | | 4.39 | | 3.51 | | 7.75 | .73 | | | | 771 | 1.05 | 50,747 | 37 | 2.25 | 1,080 | 7.6 |
| Sept. 21-30..... | 21,203 | | 8.40 | | 4.92 | | 3.26 | | 9.18 | .85 | | | | 877 | 1.19 | 25,290 | 37 | 2.40 | 1,210 | 7.6 |
| Total or weighted average | 625,530 | | 6.33 | | 4.68 | | 3.12 | | 8.95 | 0.93 | | | | 652 | 1.16 | 724,600 | 36 | 2.24 | 1,180 | 7.5 |

## VIRGIN RIVER BASIN

### 9-4150. VIRGIN RIVER AT LITTLEFIELD, ARIZ.

LOCATION.--At gaging station on right bank, 0.4 mile downstream from Beaver Dam Wash, 0.4 mile upstream from Littlefield, Mohave County, and 36 miles upstream from waterline of Lake Mead at elevation 1,221 feet above mean sea level.
DRAINAGE AREA.--5,090 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: July 1949 to September 1963.
Water temperatures: October 1947 to September 1963.
Sediment records: October 1947 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 4,010 micromhos Mar. 29; minimum daily, 1,380 micromhos Jan. 6.
Percent sodium: Maximum, 43 Dec. 28, Jan. 1, 3; minimum, 18 Aug. 30-31.
Sodium-adsorption-ratio: Maximum, 5.23 Mar. 29; minimum, 1.62 Aug. 30-31.
EXTREMES, 1949-63.--Specific conductance: Maximum daily, 4,090 micromhos Oct. 5, 1955; 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 (1961-63): 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 1962 to September 1963

| 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, 1962. | 6,456 | | 24.60 | | 12.92 | | 4.43 | | 22.49 | 10.58 | | | | 2,440 | 3.32 | 21,424 | 34 | 3.68 | 3,250 | 7.8 |
| Nov. 1-30..... | 6,188 | | 23.40 | | 13.22 | | 5.24 | | 19.95 | 11.43 | | | | 2,340 | 3.18 | 19,694 | 36 | 3.87 | 3,250 | 7.8 |
| Dec. 1-26..... | 6,343 | | 19.60 | | 12.96 | | 3.57 | | 18.13 | 10.86 | | | | 2,120 | 2.88 | 18,289 | 40 | 4.14 | 2,930 | 7.8 |
| Dec. 27..... | 220 | | 10.40 | | 4.44 | | 1.44 | | 9.83 | 3.55 | | | | 982 | 1.34 | 294 | 30 | 1.95 | 1,420 | 7.7 |
| Dec. 28..... | 220 | | 18.30 | | 13.57 | | 3.11 | | 18.03 | 10.72 | | | | 2,070 | 2.82 | 620 | 43 | 4.49 | 2,810 | 7.7 |
| Dec. 29-31..... | 690 | | 13.70 | | 8.74 | | 2.33 | | 12.76 | 7.33 | | | | 1,460 | 1.99 | 1,371 | 39 | 3.34 | 2,080 | 7.8 |
| Jan. 1, 1963.... | 248 | | 17.30 | | 13.01 | | 4.39 | | 15.99 | 9.93 | | | | 1,930 | 2.62 | 651 | 43 | 4.42 | 2,690 | 7.9 |
| Jan. 2..... | 266 | | 10.30 | | 6.09 | | 1.97 | | 9.29 | 5.13 | | | | 1,040 | 1.41 | 376 | 37 | 2.68 | 1,590 | 8.0 |
| Jan. 3..... | 305 | | 17.90 | | 13.40 | | 5.44 | | 15.93 | 9.93 | | | | 1,980 | 2.69 | 823 | 43 | 4.48 | 2,720 | 7.8 |
| Jan. 4-5..... | 635 | | 12.70 | | 8.27 | | 2.33 | | 11.60 | 7.05 | | | | 1,350 | 1.84 | 1,165 | 39 | 3.28 | 1,960 | 7.7 |
| Jan. 6..... | 300 | | 9.24 | | 4.74 | | 1.90 | | 7.89 | 4.18 | | | | 926 | 1.26 | 377 | 34 | 2.21 | 1,380 | 7.8 |
| Jan. 7-10..... | 1,246 | | 18.00 | | 11.27 | | 3.72 | | 16.22 | 9.31 | | | | 1,890 | 2.57 | 3,202 | 38 | 3.76 | 2,610 | 7.7 |
| Jan. 11-12..... | 682 | | 15.00 | | 5.61 | | 2.66 | | 13.64 | 4.29 | | | | 1,350 | 1.84 | 1,253 | 27 | 2.05 | 1,810 | 7.5 |
| Jan. 13-31..... | 5,314 | | 20.60 | | 12.14 | | 5.31 | | 17.34 | 10.10 | | | | 2,080 | 2.83 | 15,031 | 37 | 3.78 | 2,850 | 7.8 |
| Feb. 1-12..... | 4,760 | | 17.90 | | 9.87 | | 4.97 | | 14.34 | 8.46 | | | | 1,760 | 2.39 | 11,394 | 36 | 3.30 | 2,470 | 8.0 |
| Feb. 13-28..... | 4,189 | | 20.20 | | 11.70 | | 5.28 | | 16.78 | 9.82 | | | | 2,030 | 2.76 | 11,565 | 37 | 3.68 | 2,790 | 7.6 |

VIRGIN RIVER BASIN--Continued

9-4150. VIRGIN RIVER AT LITTLEFIELD, ARIZ.--Continued

Chemical analyses, water year October 1962 to September 1963--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. 1-28, 1963. | 5,370 | | 23.20 | | 12.79 | | 4.98 | | 20.47 | 10.44 | | | | 2,300 | 3.13 | 16,799 | 36 | 3.75 | 3,130 | 7.5 |
| Mar. 29..... | 246 | | 27.20 | | 19.27 | | 5.31 | | 25.19 | 15.94 | | | | 2,940 | 4.00 | 983 | 41 | 5.23 | 4,010 | 7.3 |
| Mar. 30-31..... | 460 | | 21.40 | | 11.61 | | 5.28 | | 18.55 | 9.17 | | | | 2,100 | 2.86 | 1,314 | 35 | 3.55 | 2,880 | 7.5 |
| Apr. 1-30..... | 4,255 | | 25.60 | | 12.62 | | 4.95 | | 22.90 | 10.44 | | | | 2,520 | 3.43 | 14,581 | 33 | 3.53 | 3,300 | 7.6 |
| May 1-31..... | 3,886 | | 26.00 | | 13.35 | | 5.16 | | 23.32 | 10.86 | | | | 2,510 | 3.41 | 13,265 | 34 | 3.70 | 3,290 | 7.6 |
| June 1-30..... | 3,112 | | 25.60 | | 12.62 | | 4.15 | | 23.73 | 10.44 | | | | 2,530 | 3.44 | 10,708 | 33 | 3.53 | 3,240 | 7.5 |
| July 1-31..... | 3,357 | | 26.20 | | 12.66 | | 4.25 | | 24.15 | 10.44 | | | | 2,560 | 3.48 | 11,689 | 33 | 3.50 | 3,280 | 7.5 |
| Aug. 1-29..... | 7,420 | | 29.40 | | 10.22 | | 4.65 | | 26.23 | 8.75 | | | | 2,600 | 3.54 | 26,238 | 26 | 2.67 | 3,200 | 7.6 |
| Aug. 30-31..... | 3,515 | | 26.20 | | 5.87 | | 5.57 | | 22.28 | 4.23 | | | | 2,120 | 2.88 | 10,134 | 18 | 1.62 | 2,480 | 7.5 |
| Sept. 1-30..... | 13,626 | | 29.40 | | 9.27 | | 4.49 | | 25.40 | 8.75 | | | | 2,600 | 3.54 | 48,183 | 24 | 2.42 | 3,110 | 7.4 |
| Total or weighted average | 83,310 | | 24.11 | | 11.29 | | 4.63 | | 21.20 | 9.55 | | | | 2,310 | 3.14 | 261,400 | 32 | 3.30 | 3,010 | 7.6 |

## 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 below Coolidge Dam.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1963.
Water temperatures: December 1950 to September 1963.
Sediment records: January 1958 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 3,720 micromhos Nov. 4; minimum daily, 426 micromhos Feb. 12.
Percent sodium: Maximum, 57 July 1-29; minimum, 18 Jan. 11.
Sodium-adsorption-ratio: Maximum, 4.96 July 1-29; minimum, 0.74 Feb. 12.
EXTREMES, 1950-63.--Specific conductance: Maximum daily, 5,120 micromhos May 22, 1981; 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 (1961-63): Maximum, 4.96 July 1-29, 1963; minimum, 0.72 Jan. 25-28, 1962.
REMARKS.--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 1962 to September 1963

| 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, 1962.. | 93 | -- | 9.23 | 2.80 | 7.66 | -- | 4.49 | | -- | -- | -- | -- | -- | 1,270 | 1.73 | 161 | 39 | 3.12 | 1,810 | 7.8 |
| Oct. 3-6..... | 226 | -- | 18.86 | 4.77 | 8.44 | -- | 1.49 | | -- | -- | -- | -- | -- | 2,220 | 3.02 | 683 | 26 | 2.45 | 2,660 | 7.2 |
| Oct. 7-8..... | 105 | -- | 13.57 | 3.21 | 8.31 | -- | 2.21 | | -- | -- | -- | -- | -- | 1,730 | 2.35 | 247 | 33 | 2.87 | 2,250 | 7.1 |
| Oct. 9-14..... | 226 | -- | 20.56 | 5.26 | 9.05 | -- | 1.26 | | -- | -- | -- | -- | -- | 2,420 | 3.29 | 744 | 26 | 2.52 | 2,850 | 7.0 |
| Oct. 15-16..... | 54 | -- | 10.98 | 3.95 | 9.22 | -- | 3.57 | | -- | -- | -- | -- | -- | 1,620 | 2.20 | 118 | 38 | 3.38 | 2,190 | 7.8 |
| Oct. 17..... | 52 | -- | 19.71 | 8.66 | 8.66 | -- | 2.36 | | -- | -- | -- | -- | -- | 2,400 | 3.26 | 168 | 25 | 2.38 | 2,850 | 7.4 |
| Oct. 18..... | 87 | -- | 9.88 | 2.55 | 6.18 | -- | 3.28 | | -- | -- | -- | -- | -- | 1,220 | 1.66 | 145 | 33 | 2.48 | 17,200 | 7.6 |
| Oct. 19-20..... | 129 | -- | 14.47 | 3.45 | 7.13 | -- | 2.98 | | -- | -- | -- | -- | -- | 1,740 | 2.37 | 305 | 28 | 2.38 | 2,190 | 7.7 |
| Oct. 21-25..... | 234 | -- | 17.47 | 4.52 | 8.87 | -- | 2.15 | | -- | -- | -- | -- | -- | 2,130 | 2.90 | 678 | 29 | 2.68 | 2,620 | 7.3 |
| Oct. 26-28..... | 113 | -- | 20.71 | 5.26 | 9.22 | -- | 1.52 | | -- | -- | -- | -- | -- | 2,440 | 3.32 | 375 | 26 | 2.56 | 2,880 | 7.2 |
| Oct. 29-30..... | 52 | -- | 12.48 | 4.11 | 9.86 | -- | 3.84 | | -- | -- | -- | -- | -- | 1,750 | 2.38 | 123 | 37 | 3.35 | 2,360 | 7.5 |
| Oct. 31..... | 30 | -- | 20.21 | 6.00 | 9.86 | -- | 1.80 | | -- | -- | -- | -- | -- | 2,500 | 3.40 | 101 | 27 | 2.67 | 2,930 | 8.0 |
| Nov. 1-4..... | 127 | 32.0 | 25.05 | 6.33 | 9.31 | 0.72 | .00 | | 35.81 | 5.98 | 0.05 | 0.02 | 0.26 | A 2,940 | 4.00 | 508 | 22 | 2.35 | 3,380 | 3.5 |
| Nov. 5-8..... | 127 | -- | 21.36 | 5.88 | 9.35 | -- | 1.31 | | -- | -- | -- | -- | -- | 2,580 | 3.48 | 442 | 26 | 2.54 | 2,960 | 7.2 |
| Nov. 9-14..... | 149 | -- | 15.47 | 4.03 | 9.44 | -- | 3.11 | | -- | -- | -- | -- | -- | 1,980 | 2.67 | 397 | 33 | 3.02 | 2,530 | 7.3 |
| Nov. 15..... | 52 | -- | 24.85 | 6.17 | 8.40 | -- | .00 | | -- | -- | -- | -- | -- | B 2,870 | 3.90 | 201 | 21 | 2.13 | 3,200 | 3.6 |
| Nov. 16..... | 42 | -- | 17.37 | 5.02 | 8.18 | -- | .98 | | -- | -- | -- | -- | -- | 2,130 | 2.90 | 121 | 27 | 2.44 | 2,550 | 7.1 |
| Nov. 17-21..... | 216 | -- | 22.46 | 5.76 | 8.79 | -- | .89 | | -- | -- | -- | -- | -- | 2,600 | 3.54 | 764 | 24 | 2.34 | 2,970 | 7.5 |
| Nov. 22-30..... | 237 | -- | 11.88 | 4.36 | 9.22 | -- | 3.67 | | -- | -- | -- | -- | -- | 1,700 | 2.31 | 549 | 36 | 3.24 | 2,290 | 7.8 |
| Dec. 1-24..... | 809 | -- | 15.37 | 3.95 | 8.79 | -- | 2.26 | | -- | -- | -- | -- | -- | 1,930 | 2.62 | 2,124 | 31 | 2.83 | 2,440 | 7.7 |

A Includes 0.3 parts per million total acidity ($H^{+1}$).
B Includes 0.2 parts per million total acidity ($H^{+1}$).

GILA RIVER BASIN--Continued

9-4740. GILA RIVER AT KELVIN, ARIZ.--Continued

Chemical analyses, water year October 1962 to September 1963--Continued

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Dec. 25, 1962... | 119 | -- | 8.38 | 3.62 | 8.44 | -- | 3.21 | | -- | -- | -- | -- | -- | 1,320 | 1.80 | 214 | 41 | 3.44 | 1,920 | 6.0 |
| Dec. 26..... | 60 | -- | 5.29 | 1.40 | 3.48 | -- | 3.34 | | -- | -- | -- | -- | -- | 634 | .86 | 51 | 34 | 1.90 | 980 | 7.5 |
| Dec. 27..... | 50 | -- | 8.48 | 3.13 | 6.48 | -- | 4.52 | | -- | -- | -- | -- | -- | 1,170 | 1.59 | 79 | 36 | 2.69 | 1,670 | 7.6 |
| Dec. 28-29..... | 357 | -- | 7.19 | 1.81 | 3.57 | -- | 3.93 | | -- | -- | -- | -- | -- | 808 | 1.10 | 392 | 28 | 1.68 | 1,180 | 7.4 |
| Dec. 30-31..... | 109 | -- | 12.87 | 3.62 | 7.09 | -- | 1.48 | | -- | -- | -- | -- | -- | 1,630 | 2.22 | 242 | 30 | 2.47 | 2,100 | 7.6 |
| Jan. 1-3, 1963.. | 149 | -- | 12.97 | 4.03 | 8.35 | -- | 2.66 | | -- | -- | -- | -- | -- | 1,700 | 2.31 | 344 | 33 | 2.86 | 2,240 | 7.6 |
| Jan. 4..... | 123 | -- | 7.93 | 2.22 | 5.22 | -- | 3.61 | | -- | -- | -- | -- | -- | 996 | 1.35 | 167 | 34 | 2.32 | 1,440 | 7.4 |
| Jan. 5-8..... | 290 | -- | 10.78 | 3.45 | 8.00 | -- | 3.79 | | -- | -- | -- | -- | -- | 1,450 | 1.97 | 571 | 36 | 3.00 | 2,030 | 7.7 |
| Jan. 9-10..... | 131 | -- | 16.37 | 4.44 | 8.61 | -- | 2.39 | | -- | -- | -- | -- | -- | 2,030 | 2.76 | 361 | 29 | 2.67 | 2,520 | 7.6 |
| Jan. 11..... | 1,289 | -- | 8.03 | 1.65 | 2.18 | -- | 3.31 | | -- | -- | -- | -- | -- | 758 | 1.03 | 1,329 | 18 | .99 | 1,080 | 7.5 |
| Jan. 12-13..... | 218 | -- | 9.58 | 2.55 | 5.57 | 0.23 | 2.20 | | -- | -- | -- | -- | -- | 1,170 | 1.59 | 347 | 31 | 2.26 | 1,630 | 7.9 |
| Jan. 14-15..... | 129 | -- | 13.37 | 3.54 | 6.66 | -- | 1.74 | | -- | -- | -- | -- | -- | 1,630 | 2.22 | 286 | 28 | 2.29 | 2,070 | 7.3 |
| Jan. 16-20..... | 292 | -- | 18.21 | 5.59 | 6.00 | -- | 2.66 | | -- | -- | -- | -- | -- | 2,080 | 2.83 | 825 | 20 | 1.74 | 2,430 | 7.4 |
| Jan. 21-31..... | 3,251 | 20.0 | 6.84 | 2.47 | 8.48 | .24 | 2.97 | | 6.75 | 8.12 | 0.06 | 0.02 | 0.21 | 1,120 | 1.52 | 4,952 | 47 | 3.93 | 1,770 | 7.7 |
| Feb. 1-9..... | 3,088 | -- | 5.74 | 2.22 | 8.44 | -- | 3.44 | | -- | -- | -- | -- | -- | 1,030 | 1.40 | 4,326 | 51 | 4.23 | 1,650 | 7.9 |
| Feb. 10..... | 1,400 | -- | 5.64 | 1.89 | 7.00 | -- | 3.05 | | -- | -- | -- | -- | -- | 926 | 1.26 | 1,764 | 48 | 3.61 | 1,470 | 7.4 |
| Feb. 11..... | 5,038 | -- | 3.69 | .90 | 2.78 | -- | 2.95 | | -- | -- | -- | -- | -- | 488 | .66 | 3,344 | 38 | 1.84 | 750 | 7.4 |
| Feb. 12..... | 8,767 | -- | 2.74 | .58 | .96 | -- | 2.39 | | -- | -- | -- | -- | -- | 294 | .40 | 3,505 | 22 | .74 | 426 | 7.4 |
| Feb. 13..... | 1,478 | -- | 3.64 | 1.07 | 1.91 | -- | 2.36 | | -- | -- | -- | -- | -- | 452 | .61 | 908 | 29 | 1.25 | 655 | 7.6 |
| Feb. 14..... | 629 | -- | 5.64 | 1.89 | 3.48 | -- | 3.15 | | -- | -- | -- | -- | -- | 722 | .98 | 617 | 32 | 1.79 | 1,060 | 7.7 |
| Feb. 15-17..... | 922 | -- | 8.66 | 2.71 | 5.74 | -- | 4.10 | | -- | -- | -- | -- | -- | 1,120 | 1.52 | 1,405 | 34 | 2.41 | 1,610 | 7.7 |
| Feb. 18-21..... | 726 | -- | 9.98 | 3.62 | 7.22 | -- | 4.47 | | -- | -- | -- | -- | -- | 1,350 | 1.84 | 1,333 | 35 | 2.77 | 1,900 | 7.7 |
| Feb. 22-28..... | 7,109 | -- | 5.09 | 1.61 | 7.35 | -- | 3.06 | | -- | -- | -- | -- | -- | 900 | 1.22 | 6,701 | 52 | 3.96 | 1,460 | 7.6 |
| Mar. 1-29..... | 21,800 | 26.0 | 4.69 | 1.73 | 6.53 | .16 | 2.68 | | 4.08 | 5.92 | .06 | .00 | .14 | 790 | 1.07 | 23,422 | 50 | 3.64 | 1,300 | 8.0 |
| Mar. 30-31..... | 738 | -- | 5.64 | 2.22 | 6.96 | -- | 3.47 | | -- | -- | -- | -- | -- | 914 | 1.24 | 917 | 47 | 3.51 | 1,470 | 8.0 |
| Apr. 1-2..... | 666 | -- | 6.49 | 2.14 | 8.18 | -- | 3.39 | | -- | -- | -- | -- | -- | 1,040 | 1.41 | 943 | 49 | 3.94 | 1,630 | 8.2 |
| Apr. 3-30..... | 15,384 | -- | 5.69 | 1.56 | 7.13 | -- | 2.95 | | -- | -- | -- | -- | -- | 908 | 1.23 | 18,997 | 50 | 3.75 | 1,430 | 8.1 |
| May 1-31..... | 16,602 | -- | 5.94 | 1.73 | 7.87 | -- | 2.68 | | -- | -- | -- | -- | -- | 1,020 | 1.39 | 23,030 | 51 | 4.02 | 1,530 | 7.9 |
| June 1-30..... | 19,755 | -- | 4.99 | 2.22 | 8.61 | -- | 3.11 | | -- | -- | -- | -- | -- | 964 | 1.31 | 25,900 | 54 | 4.54 | 1,610 | 7.9 |
| July 1-29..... | 28,588 | -- | 4.74 | 2.06 | 9.14 | -- | 3.47 | | -- | -- | -- | -- | -- | 968 | 1.32 | 37,635 | 57 | 4.96 | 1,630 | 7.9 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July 30, 1963... | 2,003 | -- | 5.24 | 1.48 | 5.39 | -- | 4.59 | | -- | -- | -- | -- | -- | 718 | .98 | 1,956 | 45 | 2.94 | 1,210 | 8.0 |
| July 31..... | 2,817 | -- | 4.29 | 1.65 | 2.70 | -- | 6.23 | | -- | -- | -- | -- | -- | 484 | .66 | 1,854 | 31 | 1.57 | 798 | 7.8 |
| Aug. 1-3..... | 3,713 | -- | 5.84 | 1.89 | 3.31 | -- | 7.80 | | -- | -- | -- | -- | -- | 648 | .88 | 3,272 | 30 | 1.68 | 1,020 | 7.7 |
| Aug. 4-6..... | 3,166 | -- | 5.14 | 1.81 | 7.40 | -- | 4.36 | | -- | -- | -- | -- | -- | 804 | 1.20 | 3,806 | 52 | 3.97 | 1,460 | 7.6 |
| Aug. 7-16..... | 9,779 | -- | 5.74 | 2.14 | 8.00 | -- | 4.39 | | -- | -- | -- | -- | -- | 988 | 1.34 | 13,139 | 50 | 4.03 | 1,610 | 7.5 |
| Aug. 17-18..... | 5,443 | -- | 5.59 | 1.32 | 3.05 | -- | 5.97 | | -- | -- | -- | -- | -- | 600 | .82 | 4,441 | 31 | 1.64 | 974 | 7.5 |
| Aug. 19..... | 250 | -- | 7.09 | 1.97 | 5.48 | -- | 4.39 | | -- | -- | -- | -- | -- | 904 | 1.23 | 307 | 38 | 2.58 | 1,410 | 7.7 |
| Aug. 20-24..... | 5,931 | -- | 5.39 | 1.81 | 2.44 | -- | 6.56 | | -- | -- | -- | -- | -- | 556 | .76 | 4,484 | 25 | 1.28 | 889 | 7.5 |
| Aug. 25..... | 736 | -- | 10.43 | 2.71 | 5.31 | -- | 3.67 | | -- | -- | -- | -- | -- | 1,160 | 1.58 | 1,161 | 29 | 2.07 | 1,670 | 7.6 |
| Aug. 26-28..... | 5,004 | -- | 4.54 | 1.23 | 2.18 | -- | 5.74 | | -- | -- | -- | -- | -- | 474 | .64 | 3,226 | 27 | 1.28 | 743 | 7.7 |
| Aug. 29-31..... | 3,564 | -- | 7.83 | 1.81 | 2.31 | -- | 5.41 | | -- | -- | -- | -- | -- | 744 | 1.01 | 3,606 | 19 | 1.05 | 1,070 | 7.7 |
| Sept. 1..... | 1,597 | -- | 4.04 | .72 | 1.39 | -- | 3.74 | | -- | -- | -- | -- | -- | 366 | .50 | 795 | 23 | .90 | 583 | 8.0 |
| Sept. 2-3..... | 873 | -- | 5.79 | 1.81 | 3.18 | -- | 5.05 | | -- | -- | -- | -- | -- | 678 | .92 | 805 | 29 | 1.63 | 1,010 | 7.6 |
| Sept. 4-5..... | 3,427 | 26.0 | 3.94 | .90 | 1.74 | .12 | 4.43 | | 1.98 | .28 | .02 | .00 | .14 | 404 | .55 | 1,883 | 26 | 1.12 | 613 | 7.8 |
| Sept. 6-7..... | 1,087 | -- | 5.34 | 1.65 | 2.78 | -- | 3.97 | | -- | -- | -- | -- | -- | 639 | .87 | 945 | 28 | 1.49 | 911 | 7.5 |
| Sept. 8..... | 204 | -- | 10.08 | 2.71 | 5.39 | -- | 4.00 | | -- | -- | -- | -- | -- | 1,170 | 1.59 | 325 | 30 | 2.13 | 1,650 | 7.9 |
| Sept. 9..... | 613 | -- | 5.19 | 1.97 | 2.70 | -- | 4.92 | | -- | -- | -- | -- | -- | 604 | .82 | 503 | 27 | 1.43 | 893 | 7.6 |
| Sept. 10-11..... | 359 | -- | 7.68 | 2.14 | 5.92 | -- | 3.64 | | -- | -- | -- | -- | -- | 1,020 | 1.39 | 498 | 38 | 2.67 | 1,500 | 7.7 |
| Sept. 12-30..... | 7,085 | -- | 4.34 | 1.40 | 4.74 | -- | 3.11 | | -- | -- | -- | -- | -- | 669 | .91 | 6,446 | 45 | 2.80 | 1,060 | 7.7 |
| Total or weighted average | 200,100 | -- | 5.39 | 1.81 | 6.31 | -- | 3.63 | | -- | -- | -- | -- | -- | 843 | 1.15 | 229,300 | 46 | 3.32 | 1,340 | 6.6 |

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 1963.
Water temperatures: December 1950 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 11,000 micromhos Nov. 10, 12-15; minimum daily, 707 micromhos Aug. 24.
Percent sodium: Maximum, 84 Oct. 1-5; minimum, 38 Aug. 28-29.
Sodium-adsorption-ratio: Maximum, 18.08 Dec. 1-31; minimum, 2.07 Aug. 28-29.
EXTREMES, 1950-63.--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, 36 Jan. 23-24, 1952.
Sodium-adsorption-ratio (1961-63): Maximum, 18.37 Aug. 1-31, 1962: minimum, 2.07 Aug. 28-29, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex. Samples from canal are believed to be representative of total flow passing Gillespie Dam including spill and amounts diverted into Gila Bend and Enterprise Canals.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-5, 1962.. | 728 | -- | 1.30 | 0.44 | 9.22 | -- | 4.98 | | 3.16 | 2.82 | -- | -- | -- | 692 | 0.94 | 685 | 84 | 9.88 | 1,090 | 7.9 |
| Oct. 6-31..... | 469 | -- | 21.66 | 15.96 | 77.00 | -- | 5.26 | | -- | -- | -- | -- | -- | 7,110 | 9.67 | 4,538 | 67 | 17.75 | 10,400 | 7.8 |
| Nov. 1-30..... | 464 | 32.0 | 21.41 | 16.21 | 76.56 | 0.33 | 5.51 | | 36.64 | 69.68 | 0.20 | 1.02 | 0.37 | 7,030 | 9.56 | 4,437 | 67 | 17.65 | 10,300 | 7.8 |
| Dec. 1-31..... | 566 | 33.0 | 23.40 | 16.21 | 80.48 | .31 | 5.59 | | 38.93 | 74.19 | .15 | .97 | .37 | 7,720 | 10.50 | 5,939 | 67 | 18.08 | 10,700 | 7.5 |
| Jan. 1-31, 1963. | 781 | -- | 22.21 | 15.38 | 73.08 | -- | 5.87 | | -- | -- | -- | -- | -- | 6,940 | 9.44 | 7,370 | 66 | 16.86 | 9,830 | 7.8 |
| Feb. 1-11..... | 218 | -- | 20.31 | 14.72 | 68.73 | -- | 5.28 | | -- | -- | -- | -- | -- | 6,680 | 9.08 | 1,982 | 66 | 16.42 | 9,390 | 7.8 |
| Feb. 12-15..... | 115 | -- | 16.32 | 11.68 | 54.38 | -- | 5.13 | | -- | -- | -- | -- | -- | 5,330 | 7.25 | 834 | 66 | 14.53 | 7,700 | 7.7 |
| Feb. 16..... | 238 | -- | 5.04 | 1.97 | 8.27 | .17 | 2.75 | | -- | -- | -- | -- | -- | 1,020 | 1.39 | 330 | 53 | 4.41 | 1,560 | 7.5 |
| Feb. 17..... | 226 | -- | 17.47 | 11.76 | 54.81 | -- | 5.77 | | -- | -- | -- | -- | -- | 5,480 | 7.45 | 1,685 | 65 | 14.34 | 7,730 | 7.8 |
| Feb. 18-28..... | 482 | -- | 19.86 | 14.97 | 66.12 | -- | 4.87 | | -- | -- | -- | -- | -- | 6,620 | 9.00 | 4,341 | 65 | 15.84 | 9,270 | 7.8 |
| Mar. 1-20..... | 524 | -- | 20.06 | 14.97 | 67.86 | -- | 5.29 | | -- | -- | -- | -- | -- | 6,700 | 9.11 | 4,771 | 66 | 16.21 | 9,440 | 7.7 |
| Mar. 21-31..... | 336 | -- | 18.36 | 13.41 | 62.64 | -- | 5.11 | | -- | -- | -- | -- | -- | 6,050 | 8.23 | 2,765 | 66 | 15.72 | 8,570 | 7.6 |
| Apr. 1-16..... | 400 | -- | 20.06 | 14.97 | 69.17 | -- | 5.06 | | -- | -- | -- | -- | -- | 6,800 | 9.25 | 3,698 | 66 | 16.53 | 9,490 | 7.6 |
| Apr. 17-30..... | 344 | -- | 18.46 | 13.57 | 63.51 | -- | 4.90 | | -- | -- | -- | -- | -- | 6,180 | 8.40 | 2,894 | 66 | 15.87 | 8,720 | 7.8 |
| May 1-13..... | 263 | -- | 17.86 | 13.33 | 63.08 | -- | 4.87 | | -- | -- | -- | -- | -- | 5,970 | 8.12 | 2,135 | 67 | 15.97 | 8,540 | 7.6 |
| May 14-31..... | 236 | -- | 19.16 | 14.23 | 70.91 | -- | 4.05 | | -- | -- | -- | -- | -- | 6,670 | 9.07 | 2,138 | 68 | 17.35 | 9,500 | 7.6 |
| June 1-9..... | 98 | -- | 17.56 | 14.48 | 64.38 | -- | 3.26 | | -- | -- | -- | -- | -- | 6,430 | 8.74 | 859 | 67 | 16.08 | 8,890 | 7.6 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 10-11, 1963 | .17 | 24.0 | 13.57 | 9.82 | 31.28 | .31 | 3.05 | 18.57 | 32.72 | .06 | .48 | .20 | 3,730 | 5.07 | 85 | 57 | 9.18 | 5,100 | 7.5 |
| June 12..... | 16 | -- | 16.37 | 12.26 | 53.51 | -- | 3.18 | -- | -- | -- | -- | -- | 5,400 | 7.34 | 117 | 65 | 14.14 | 7,670 | 7.5 |
| June 13-15..... | 30 | -- | 14.47 | 10.53 | 37.67 | -- | 3.25 | -- | -- | -- | -- | -- | 4,110 | 5.59 | 166 | 60 | 10.65 | 5,900 | 7.4 |
| June 16-24..... | 75 | -- | 17.56 | 14.48 | 64.38 | -- | 3.26 | -- | -- | -- | -- | -- | 8,390 | 8.69 | 652 | 67 | 16.08 | 8,820 | 7.6 |
| June 25..... | 9 | -- | 14.37 | 10.86 | 36.89 | -- | 3.54 | -- | -- | -- | -- | -- | 4,060 | 5.52 | 50 | 59 | 10.39 | 5,850 | 7.5 |
| June 26-30..... | 31 | -- | 17.56 | 14.07 | 64.38 | -- | 3.25 | -- | -- | -- | -- | -- | 6,320 | 8.60 | 264 | 67 | 16.19 | 8,750 | 7.7 |
| July 1..... | 7 | -- | 15.12 | 12.09 | 57.86 | -- | 3.74 | -- | -- | -- | -- | -- | 5,360 | 7.29 | 49 | 68 | 15.68 | 7,710 | 7.8 |
| July 2-6..... | 43 | -- | 15.92 | 14.07 | 67.43 | -- | 2.51 | -- | -- | -- | -- | -- | 6,330 | 8.61 | 367 | 69 | 17.41 | 8,890 | 7.7 |
| July 7-8..... | 22 | -- | 15.07 | 12.34 | 56.55 | -- | 3.77 | -- | -- | -- | -- | -- | 5,440 | 7.40 | 164 | 67 | 15.28 | 7,740 | 7.7 |
| July 9-10..... | 12 | -- | 15.92 | 14.48 | 69.17 | -- | 2.46 | -- | -- | -- | -- | -- | 6,440 | 8.76 | 104 | 69 | 17.74 | 9,040 | 7.6 |
| July 11..... | 8 | -- | 13.02 | 8.80 | 34.54 | -- | 3.70 | -- | -- | -- | -- | -- | 3,720 | 5.06 | 41 | 61 | 10.46 | 5,390 | 7.8 |
| July 12-Aug. 6.. | 170 | -- | 14.12 | 11.68 | 54.38 | -- | 3.47 | -- | -- | -- | -- | -- | 5,150 | 7.00 | 1,192 | 68 | 15.14 | 7,320 | 7.8 |
| Aug. 7-16..... | 196 | -- | 3.69 | .79 | 3.61 | -- | 3.15 | -- | -- | -- | -- | -- | 503 | .68 | 134 | 45 | 2.41 | 816 | 7.7 |
| Aug. 17-20..... | 546 | -- | 3.99 | 1.15 | 4.18 | -- | 3.05 | -- | -- | -- | -- | -- | 594 | .81 | 441 | 45 | 2.60 | 933 | 7.7 |
| Aug. 21-24..... | 857 | 22.0 | 3.34 | .82 | 3.18 | .21 | 3.11 | 1.81 | 2.57 | .03 | .02 | .20 | 461 | .63 | 537 | 42 | 2.20 | 758 | 7.7 |
| Aug. 25-27..... | 833 | -- | 3.94 | 1.48 | 6.26 | -- | 2.82 | -- | -- | -- | -- | -- | 724 | .98 | 820 | 54 | 3.80 | 1,200 | 7.8 |
| Aug. 28-29..... | 337 | -- | 4.44 | 1.23 | 3.48 | -- | 2.72 | -- | -- | -- | -- | -- | 585 | .80 | 268 | 38 | 2.07 | 911 | 7.7 |
| Aug. 30-31..... | 536 | -- | 10.23 | 5.68 | 25.06 | -- | 4.26 | -- | -- | -- | -- | -- | 2,490 | 3.39 | 1,814 | 61 | 8.88 | 3,890 | 7.8 |
| Sept. 1-7..... | 367 | -- | 11.48 | 5.92 | 28.80 | -- | 2.89 | -- | -- | -- | -- | -- | 2,930 | 3.98 | 1,461 | 62 | 9.76 | 4,480 | 7.6 |
| Sept. 8-30..... | 315 | -- | 17.07 | 11.76 | 59.16 | -- | 4.49 | -- | -- | -- | -- | -- | 5,380 | 7.32 | 2,303 | 67 | 15.58 | 7,930 | 7.8 |
| Total or weighted average | 10,900 | -- | 13.47 | 9.18 | 43.38 | -- | 4.36 | -- | -- | -- | -- | -- | 4,210 | 5.72 | 62,430 | 55 | 11.68 | 6,039 | 7.7 |

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 (revised).--6,232 square miles, upstream from gaging station, of which 21 square miles is below Stewart Mountain Dam.
RECORDS AVAILABLE.--Chemical analyses: December 1950 to September 1963.
Water temperatures: December 1950 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,300 micromhos Apr. 25; minimum daily, 1,100 micromhos Aug. 25, Sept. 6, 16.
Percent sodium: Maximum, 68 July 1-31, Aug. 1-31; minimum, 63 Apr. 23-30.
Sodium-adsorption-ratio: Maximum, 5.51 June 1-30; minimum, 5.15 Sept. 1-30.
EXTREMES, 1950-63.--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 (1961-63): Maximum, 5.69 Sept. 1-30, 1962; 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. No flow Oct. 16-22, Nov. 26 to Feb. 8, 17-20.

Chemical analyses, water year October 1962 to September 1963

| 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, 23-Nov. 25, 1962 | 10,788 | 19.0 | 2.89 | 0.99 | 7.53 | 0.14 | 2.95 | | 1.00 | 7.62 | 0.03 | 0.00 | 0.12 | 695 | 0.95 | 10,197 | 65 | 5.40 | 1,230 | 7.6 |
| Feb. 9-16, 21-28, 1963 | 5,078 | 18.0 | 2.79 | .90 | 7.48 | .14 | 2.77 | | 1.04 | 7.45 | .03 | .01 | .12 | 677 | .92 | 4,675 | 66 | 5.50 | 1,200 | 8.1 |
| Mar. 1-31 | 90,079 | -- | 2.84 | 1.07 | 7.22 | -- | 2.75 | | -- | -- | -- | -- | -- | 659 | .90 | 80,733 | 66 | 5.30 | 1,180 | 7.7 |
| Apr. 1-22 | 50,313 | -- | 2.50 | 1.07 | 6.96 | -- | 2.66 | | -- | -- | -- | -- | -- | 648 | .88 | 44,340 | 66 | 5.21 | 1,160 | 7.8 |
| Apr. 23-30 | 12,186 | -- | 2.89 | 1.32 | 7.31 | -- | 2.95 | | -- | -- | -- | -- | -- | 706 | .96 | 11,701 | 63 | 5.04 | 1,250 | 7.4 |
| May 1-31 | 83,562 | -- | 2.50 | .99 | 7.13 | -- | 2.59 | | -- | -- | -- | -- | -- | 658 | .89 | 74,778 | 67 | 5.41 | 1,160 | 7.9 |
| June 1-30 | 108,417 | 18.0 | 2.50 | .90 | 7.18 | .13 | 2.52 | | 1.00 | 7.28 | .02 | .00 | .10 | 646 | .88 | 95,250 | 67 | 5.51 | 1,150 | 7.9 |
| July 1-31 | 121,069 | -- | 2.40 | .99 | 7.09 | -- | 2.47 | | -- | -- | -- | -- | -- | 647 | .88 | 106,531 | 68 | 5.45 | 1,140 | 7.8 |
| Aug. 1-31 | 69,727 | -- | 2.54 | .82 | 7.05 | -- | 2.52 | | -- | -- | -- | -- | -- | 634 | .86 | 60,121 | 68 | 5.43 | 1,120 | 7.8 |
| Sept. 1-30 | 81,765 | 18.0 | 2.40 | .99 | 6.70 | .13 | 2.56 | | .87 | 6.94 | .02 | .00 | .09 | 614 | .84 | 51,576 | 66 | 5.15 | 1,110 | 7.7 |
| Total or weighted average | 613,000 | -- | 2.51 | 0.98 | 7.09 | -- | 2.59 | | -- | -- | -- | -- | -- | 648 | 0.88 | 539,900 | 66 | 5.37 | 1,150 | 7.8 |

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

LOCATION.--At gaging station on right bank, 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 1983.
Water temperatures: December 1950 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 709 micromhos Aug. 1, 3; minimum daily, 303 micromhos Sept. 2.
Percent sodium: Maximum, 30 Aug. 1-17; minimum, 18 Aug. 27-31.
Sodium-adsorption-ratio: Maximum, 1.36 Aug. 1-17; minimum, 0.53 Aug. 27-31.
EXTREMES, 1950-63.--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 (1981-63): Maximum 1.36 Aug. 1-17, 1963; minimum, 0.32 Apr. 30, 1982.
REMARKS.--Records of specific conductance of daily samples available in district office at Albuquerque, N. Mex.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 23,488 | 25.0 | 2.64 | 2.39 | 1.91 | 0.10 | 4.46 | 0.00 | 1.73 | 0.79 | 0.04 | 0.02 | 0.21 | 385 | 0.52 | 12,298 | 27 | 1.21 | 642 | 8.1 |
| Nov. 1-30..... | 8,129 | -- | 2.69 | 2.80 | 1.91 | -- | 4.95 | .00 | -- | -- | -- | -- | -- | 411 | .56 | 3,426 | 26 | 1.18 | 677 | 8.2 |
| Dec. 1-31..... | 13,486 | -- | 2.79 | 2.71 | 1.78 | -- | 4.98 | .00 | -- | -- | -- | -- | -- | 402 | .55 | 7,382 | 24 | 1.07 | 863 | 8.2 |
| Jan. 1-31, 1963. | 11,252 | 23.0 | 3.54 | 1.97 | 1.78 | .08 | 5.00 | .00 | 1.52 | .73 | .02 | .01 | .19 | 423 | .58 | 8,473 | 24 | 1.07 | 853 | 8.2 |
| Feb. 1-28..... | 14,940 | -- | 3.34 | 1.89 | 1.65 | -- | 4.82 | .00 | -- | -- | -- | -- | -- | 387 | .53 | 7,863 | 24 | 1.02 | 623 | 8.2 |
| Mar. 1-31..... | 4,888 | -- | 2.50 | 2.39 | 1.57 | -- | 4.52 | .00 | -- | -- | -- | -- | -- | 351 | .48 | 2,333 | 24 | 1.00 | 587 | 8.2 |
| Apr. 1-30..... | 4,433 | -- | 2.50 | 2.47 | 1.81 | -- | 4.49 | .13 | -- | -- | -- | -- | -- | 362 | .49 | 2,182 | 24 | 1.02 | 599 | 8.3 |
| May 1-31..... | 3,283 | -- | 2.69 | 2.55 | 1.65 | -- | 4.57 | .13 | -- | -- | -- | -- | -- | 377 | .51 | 1,683 | 24 | 1.02 | 621 | 8.3 |
| June 1-30..... | 13,983 | -- | 2.45 | 2.80 | 1.74 | -- | 4.80 | .00 | -- | -- | -- | -- | -- | 387 | .53 | 7,360 | 25 | 1.07 | 835 | 8.2 |
| July 1-31..... | 19,061 | 26.0 | 2.15 | 3.13 | 2.18 | .10 | 4.67 | .00 | 1.89 | .90 | .03 | .00 | .20 | 406 | .55 | 10,525 | 29 | 1.34 | 682 | 8.1 |
| Aug. 1-17..... | 3,365 | -- | 3.29 | 1.81 | 2.18 | -- | 4.39 | .00 | -- | -- | -- | -- | -- | 417 | .57 | 1,908 | 30 | 1.36 | 682 | 8.0 |
| Aug. 18-26..... | 1,721 | -- | 2.35 | 1.65 | 1.39 | -- | 3.41 | .00 | -- | -- | -- | -- | -- | 308 | .42 | 721 | 26 | .99 | 510 | 7.8 |
| Aug. 27-31..... | 545 | 20.0 | 1.75 | .90 | .61 | .09 | 2.33 | .00 | .67 | .22 | .02 | .04 | .10 | 191 | .26 | 142 | 18 | .53 | 309 | 7.6 |
| Sept. 1-9..... | 4,338 | -- | 1.60 | .90 | .65 | -- | 2.33 | .00 | -- | -- | -- | -- | -- | 198 | .27 | 1,158 | 21 | .58 | 314 | 7.6 |
| Sept. 10-18..... | 14,317 | -- | 1.95 | 1.23 | .83 | -- | 2.88 | .00 | -- | -- | -- | -- | -- | 244 | .33 | 4,751 | 21 | .86 | 382 | 7.7 |
| Sept. 19-30..... | 12,805 | -- | 2.10 | 2.14 | 1.13 | -- | 3.90 | .00 | -- | -- | -- | -- | -- | 308 | .42 | 5,329 | 21 | .78 | 490 | 8.0 |
| Total or weighted average | 152,000 | -- | 2.57 | 2.29 | 1.65 | -- | 4.39 | 0.01 | -- | -- | -- | -- | -- | 365 | 0.50 | 75,510 | 27 | 1.05 | 597 | 8.0 |

## PART 10. THE GREAT BASIN

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

LOCATION.--At outlet below Piute Dam, 0.8 mile upstream from gaging station and about 9 miles south of Marysvale, Piute County.
DRAINAGE AREA.--2,440 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: March 1958 to September 1959, February 1961 to September 1963.
REMARKS.--Records of water temperatures of samples collected available in district office at Salt Lake City, Utah.

Chemical analyses, water year October 1962 to September 1963

| 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, 1963.... | 395 | 28.0 | 2.59 | 1.48 | 1.13 | 0.06 | 4.33 | | 0.56 | 0.34 | 0.01 | 0.03 | 0.09 | 296 | 0.40 | 159 | 21 | 0.79 | 486 | 8.0 |
| May 2..... | 742 | 21.0 | 1.90 | 1.73 | 1.26 | .08 | 3.90 | | .69 | .34 | .02 | .01 | .07 | 264 | .36 | 266 | 25 | .94 | 467 | 7.4 |
| July 30..... | 7,655 | 31.0 | 2.74 | 1.56 | 1.22 | .10 | 4.36 | | .79 | .51 | .03 | .02 | .10 | 319 | .43 | 3,408 | 22 | .83 | 517 | 7.8 |
| Aug. 15..... | 6,188 | 32.0 | 2.74 | 1.56 | 1.46 | -- | 4.39 | | .65 | .56 | -- | .02 | -- | 337 | .46 | 2,836 | 26 | 1.01 | 523 | 7.5 |
| Sept. 16..... | 984 | -- | 3.76 | | 1.61 | -- | 3.93 | | .92 | .56 | -- | -- | -- | 311 | .42 | 416 | 30 | 1.17 | 495 | 7.6 |
| Total or weighted average A | 81,310 | 29.0 | 2.74 | 1.64 | 1.13 | 0.07 | 4.43 | | 0.60 | 0.51 | 0.02 | 0.02 | -- | 320 | 0.43 | 34,960 | 20 | 1.80 | 496 | -- |

A 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 1963.
Water temperatures: March 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 8,300 micromhos Dec. 27; minimum daily, 949 micromhos Sept. 1.
Percent sodium: Maximum, 65 Aug. 20-23; minimum, 41 Sept. 1.
Sodium-adsorption-ratio: Maximum, 12.84 Dec. 25-27, minimum, 2.43 Sept. 1.
EXTREMES, 1951-63.--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 a deep well discharging to the river between the sampling station and the gaging station.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolvsd solids (residue at 180°C) | | | Per-cent so-dium | So-dium adsorp-tion ratio | Specific conduct-ance (micro-mhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cal-cium (Ca) | Magne-sium (Mg) | So-dium (Na) | Potas-sium (K) | Bicar-bonate ($HCO_3$) | Car-bonate ($CO_3$) | Sul-fate ($SO_4$) | Chlo-ride (Cl) | Fluo-ride (F) | Ni-trate ($NO_3$) | | Parts per mil-lion | Tons psr acre-foot | Total tons | | | | |
| Oct. 1-2, 1962.. | 40 | | 15.60 | | 19.88 | | 5.34 | | 12.22 | 17.91 | | | | 2,170 | 2.95 | 118 | 56 | 7.12 | 3,440 | 8.1 |
| Oct. 3-12..... | 724 | | 11.96 | | 15.40 | | 4.54 | | 9.39 | 13.40 | | | | 1,690 | 2.30 | 1,664 | 56 | 6.30 | 2,670 | 8.0 |
| Oct. 13-31..... | 1,398 | | 9.84 | | 8.31 | | 4.36 | | 5.41 | 8.18 | | | | 1,040 | 1.41 | 1,978 | 46 | 3.78 | 1,750 | 8.0 |
| Nov. 1-27..... | 2,094 | | 10.00 | | 8.05 | | 4.59 | | 5.43 | 8.04 | | | | 1,080 | 1.47 | 3,076 | 45 | 3.60 | 1,770 | 7.9 |
| Nov. 28-30..... | 234 | | 18.10 | | 22.19 | | 5.97 | | 13.99 | 20.31 | | | | 2,490 | 3.39 | 792 | 55 | 7.37 | 3,810 | 7.8 |
| Dec. 1-24..... | 533 | | 21.60 | | 29.36 | | 6.62 | | 18.09 | 26.24 | | | | 3,150 | 4.28 | 2,284 | 58 | 8.93 | 4,750 | 7.7 |
| Dec. 25-27..... | 42 | | 38.80 | | 56.55 | | 10.82 | | 34.56 | 49.93 | | | | 5,980 | 8.13 | 339 | 59 | 12.84 | 8,250 | 7.8 |
| Dec. 28..... | 14 | | 25.60 | | 35.63 | | 7.67 | | 21.65 | 31.88 | | | | 3,760 | 5.11 | 71 | 58 | 9.96 | 5,650 | 7.7 |
| Dec. 29-30..... | 28 | | 39.40 | | 55.68 | | 11.64 | | 34.14 | 49.37 | | | | 5,910 | 8.04 | 223 | 59 | 12.54 | 8,200 | 7.8 |
| Dec. 31, Jan. 1-13, 1963..... | 189 | | 26.20 | | 37.19 | | 8.21 | | 21.86 | 33.29 | | | | 3,900 | 5.30 | 1,002 | 59 | 10.28 | 5,770 | 7.6 |
| Jan. 14-30..... | 192 | | 17.60 | | 25.10 | | 5.15 | | 15.26 | 22.29 | | | | 2,630 | 3.58 | 687 | 59 | 8.46 | 4,070 | 7.9 |
| Jan. 31, Feb. 1-28..... | 2,433 | | 11.60 | | 9.14 | | 4.56 | | 6.85 | 9.31 | | | | 1,240 | 1.69 | 4,103 | 44 | 3.79 | 2,010 | 7.5 |
| Mar. 1-31..... | 1,383 | | 12.12 | | 12.31 | | 4.72 | | 7.99 | 11.71 | | | | 1,500 | 2.04 | 2,822 | 50 | 5.00 | 2,380 | 7.7 |
| Apr. 1-10..... | 311 | | 12.92 | | 14.22 | | 5.10 | | 8.77 | 13.26 | | | | 1,660 | 2.26 | 703 | 52 | 5.60 | 2,620 | 7.7 |
| Apr. 11-30..... | 5,078 | | 10.24 | | 11.09 | | 5.02 | | 6.70 | 9.59 | | | | 1,270 | 1.73 | 8,770 | 52 | 4.90 | 2,070 | 7.6 |

SEVIER LAKE BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--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 1-31, 1963.. | 33,265 | | 9.84 | | 13.05 | | 5.15 | | 7.16 | 10.58 | | | | 1,330 | 1.81 | 60,169 | 57 | 5.88 | 2,170 | 7.8 |
| June 1-30..... | 11,425 | | 9.88 | | 12.75 | | 4.67 | | 7.25 | 10.72 | | | | 1,370 | 1.86 | 21,287 | 56 | 5.73 | 2,210 | 7.9 |
| July 1-31..... | 14,573 | | 10.48 | | 17.44 | | 4.82 | | 8.70 | 14.39 | | | | 1,610 | 2.19 | 31,908 | 62 | 7.82 | 2,570 | 8.0 |
| Aug. 1-10..... | 3,491 | | 12.80 | | 20.36 | | 4.31 | | 11.20 | 17.63 | | | | 1,990 | 2.71 | 9,448 | 66 | 8.05 | 3,180 | 7.9 |
| Aug. 11-19..... | 482 | | 7.76 | | 8.96 | | 4.39 | | 3.83 | 8.49 | | | | 850 | 1.16 | 557 | 47 | 3.53 | 1,430 | 7.8 |
| Aug. 20-23..... | 1,825 | | 10.70 | | 20.01 | | 4.85 | | 9.84 | 18.22 | | | | 1,750 | 2.38 | 4,343 | 65 | 8.65 | 2,780 | 7.7 |
| Aug. 24-31..... | 1,587 | | 8.44 | | 9.61 | | 4.57 | | 5.00 | 8.46 | | | | 1,040 | 1.41 | 2,244 | 53 | 4.68 | 1,710 | 7.9 |
| Sept. 1..... | 236 | | 5.92 | | 4.18 | | 4.75 | | 2.17 | 3.16 | | | | 584 | .79 | 187 | 41 | 2.43 | 949 | 7.4 |
| Sept. 2-30..... | 1,208 | | 9.40 | | 10.53 | | 4.65 | | 5.95 | 9.31 | | | | 1,140 | 1.55 | 1,873 | 53 | 4.86 | 1,840 | 7.8 |
| Total or weighted average | 82,800 | | 10.38 | | 13.91 | | 4.92 | | 7.67 | 11.69 | | | | 1,430 | 1.94 | 160,600 | 57 | 6.08 | 2,300 | 7.8 |

## CARSON RIVER BASIN

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

LOCATION.--At Weeks bridge on U.S. Highway 95 alternate, 4.5 miles donwstream from gaging station near Fort Churchill, and approximately 8 miles south of Silver Springs, Lyon County.
DRAINAGE AREA.--1,450 square miles, approximately, upstream from gaging stations.
RECORDS AVAILABLE.--Chemical analyses: October 1962 to September 1963.
Water temperatures: October 1962 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 685 micromhos Aug. 17; minimum daily, 102 micromhos June 21.
Percent sodium: Maximum, 38 Jan. 1-30; minimum, 25 May 13-31.
Sodium-adsorption-ratio: Maximum, 1.74 Oct. 1-12; minimum, 0.46 May 13-24, June 16-22.
REMARKS.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Sacramento, Calif. Chemical quality samples collected from Burkland ditch diversion during irrigagion season. Records of discharge given for Carson River near Fort Churchill.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 2 | 37.0 | 2.99 | 1.23 | 2.52 | 0.14 | 3.44 | 0.00 | 3.27 | 0.45 | 0.02 | 0.01 | 0.30 | 451 | 0.61 | 1 | 37 | 1.74 | 667 | 7.9 |
| Oct. 13-20..... | 2,698 | 24.0 | 1.45 | .59 | 1.13 | .12 | 1.87 | .00 | 1.08 | .27 | .02 | .02 | .30 | 214 | .29 | 785 | 34 | 1.12 | 331 | 7.5 |
| Oct. 21-31..... | 2,465 | 25.0 | 1.90 | .70 | 1.52 | .10 | 2.34 | .00 | 1.56 | .31 | .02 | .02 | .20 | 276 | .38 | 925 | 36 | 1.34 | 423 | 7.7 |
| Nov. 1-30..... | 3,671 | 28.0 | 2.15 | .69 | 1.70 | .09 | 2.49 | .00 | 1.85 | .34 | .03 | .02 | .20 | 307 | .42 | 1,533 | 37 | 1.42 | 459 | 7.8 |
| Dec. 1-15..... | 2,960 | 26.0 | 1.65 | .48 | 1.22 | .09 | 1.98 | .00 | 1.27 | .27 | .03 | .03 | .20 | 230 | .31 | 926 | 35 | 1.18 | 348 | 8.2 |
| Dec. 16-31..... | 3,459 | 28.0 | 1.45 | .71 | 1.26 | .08 | 1.97 | .00 | 1.31 | .27 | .04 | .03 | .20 | 233 | .32 | 1,096 | 36 | 1.22 | 355 | 7.9 |
| Jan. 1-30, 1963. | 4,302 | 29.0 | 1.75 | .62 | 1.48 | .08 | 2.03 | .00 | 1.60 | .34 | .03 | .04 | .20 | 262 | .36 | 1,533 | 38 | 1.36 | 394 | 7.7 |
| Jan. 31..... | 1,410 | 24.0 | 1.25 | .52 | .83 | .08 | 1.57 | .00 | --- | .25 | .02 | .02 | .10 | A 184 | .25 | 353 | 31 | .88 | 275 | 7.4 |
| Feb. 1-14..... | 75,586 | 24.0 | 1.30 | .46 | .83 | .08 | 1.57 | .00 | .94 | .20 | .02 | .04 | .20 | 187 | .25 | 19,223 | 31 | .88 | 273 | 7.5 |
| Feb. 15..... | 1,353 | 27.0 | 2.40 | .90 | 1.31 | .08 | 2.79 | .00 | | .28 | .02 | .03 | .20 | A 307 | .42 | 565 | 28 | 1.02 | 458 | 7.2 |
| Feb. 18-28..... | 12,248 | 25.0 | 1.35 | .52 | .91 | .07 | 1.61 | .00 | 1.06 | .24 | .02 | .04 | .10 | 194 | .26 | 3,231 | 32 | .95 | 281 | 7.9 |
| Mar. 1-10..... | 7,478 | 26.0 | 1.35 | .47 | .91 | .07 | 1.66 | .00 | .98 | .23 | .02 | .01 | .10 | 201 | .27 | 2,044 | 33 | .96 | 285 | 7.6 |
| Mar. 11-31..... | 12,538 | 24.0 | 1.45 | .53 | 1.00 | .07 | 1.70 | .00 | 1.08 | .28 | .02 | .00 | .20 | 216 | .29 | 3,683 | 33 | 1.01 | 309 | 7.8 |
| Apr. 1-7..... | 4,554 | 23.0 | 1.50 | .54 | .96 | .07 | 1.70 | .00 | 1.06 | .28 | .03 | .01 | .20 | 199 | .27 | 1,233 | 31 | .95 | 299 | 7.7 |

A Estimated.

CARSON RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--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. 8-30, 1963. | 22,536 | 23.0 | 1.20 | 0.32 | 0.70 | 0.06 | 1.44 | 0.00 | 0.73 | 0.15 | 0.03 | 0.02 | 0.10 | 158 | 0.21 | 4,843 | 31 | 0.80 | 227 | 7.7 |
| May 1-12..... | 24,206 | 17.0 | .70 | .32 | .37 | .05 | 1.02 | .00 | .31 | .10 | .02 | .03 | .10 | 105 | .14 | 3,457 | 26 | .52 | 146 | 7.4 |
| May 13-24..... | 30,347 | 17.0 | .60 | .24 | .30 | .05 | .82 | .00 | .23 | .09 | .01 | .04 | .10 | 90 | .12 | 3,714 | 25 | .46 | 115 | 7.6 |
| May 25-31..... | 28,032 | 17.0 | .65 | .25 | .32 | .05 | .95 | .00 | .23 | .09 | .01 | .04 | .10 | 98 | .13 | 3,736 | 25 | .47 | 129 | 7.5 |
| June 1-15..... | 45,223 | 18.0 | .70 | .32 | .39 | .04 | .98 | .00 | .35 | .13 | .01 | .01 | .00 | 107 | .15 | 6,581 | 27 | .55 | 147 | 7.3 |
| June 16-22..... | 26,241 | 17.0 | .60 | .17 | .29 | .04 | .80 | .00 | .23 | .06 | .01 | .01 | .00 | 83 | .11 | 2,962 | 26 | .46 | 111 | 7.9 |
| June 23-30..... | 14,091 | 20.0 | .85 | .25 | .44 | .05 | 1.07 | .00 | .44 | .08 | .01 | .01 | .00 | 115 | .16 | 2,204 | 28 | .59 | 162 | 7.8 |
| July 1-10..... | 8,212 | 26.0 | 1.20 | .40 | .70 | .07 | 1.48 | .00 | .77 | .15 | .02 | .00 | .20 | 169 | .23 | 1,887 | 29 | .78 | 234 | 7.1 |
| July 11-18..... | 3,475 | 29.0 | 1.60 | .54 | 1.09 | .14 | 1.90 | .00 | 1.25 | .23 | .03 | .00 | .10 | 227 | .31 | 1,073 | 32 | 1.05 | 330 | 7.3 |
| July 19-24..... | 968 | 34.0 | 2.45 | .90 | 1.65 | .11 | 2.64 | .00 | 2.06 | .31 | .03 | .00 | .30 | 308 | .42 | 405 | 32 | 1.28 | 484 | 7.5 |
| July 25-31..... | 17 | 32.0 | 2.94 | 1.07 | 1.83 | .12 | 3.16 | .00 | 2.42 | .37 | .02 | .00 | .30 | 384 | .52 | 9 | 31 | 1.29 | 561 | 7.6 |
| Aug. 1-31..... | 6 | 35.0 | 3.09 | 1.40 | 2.48 | .13 | 3.41 | .13 | 3.14 | .45 | .01 | .02 | .20 | 468 | .64 | 4 | 35 | 1.65 | 680 | 8.4 |
| Sept. 1-30..... | 327 | 33.0 | 3.14 | 1.23 | 2.44 | .14 | 3.15 | .27 | 3.21 | .39 | .01 | .03 | .20 | 456 | .62 | 203 | 35 | 1.65 | 663 | 8.6 |
| Total or weighted average | 338,400 | 21.0 | 1.03 | 0.37 | 0.63 | 0.06 | 1.30 | 0.00 | 0.65 | 0.16 | 0.02 | 0.03 | 0.11 | 148 | 0.20 | 68,210 | 29 | 0.73 | 211 | 7.5 |

## HUMBOLDT RIVER BASIN

### 10-3225. HUMBOLDT RIVER AT PALISADE, NEV.

LOCATION.--At gaging station on right bank, 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 1963.
Water temperatures: May 1962 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 695 micromhos Jan. 13; minimum daily, 366 micromhos May 24.
Percent sodium: Maximum, 35 Nov. 21 to Dec. 31, Feb. 1-28, Sept. 1-20; minimum, 28 July 1-20.
Sodium-adsorption-ratio: Maximum, 1.63 Dec. 1-31; minimum, 1.04 July 1-20.
EXTREMES, May 1962 to September 1963.--Specific conductance: Maximum daily, 695 micromhos Jan. 13, 1963; minimum daily, 352 micromhos June 15, 1962.
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.--Daily samples for chemical analysis composited by discharge. Records of specific conductance of daily samples available in district office at Sacramento, Calif.

Chemical analyses, water year October 1962 to September 1963

| 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, 1962. | 1,888 | 38.0 | 2.74 | 1.07 | 2.13 | 0.25 | 4.56 | 0.00 | 0.85 | 0.62 | 0.04 | 0.01 | 0.30 | 351 | 0.48 | 901 | 34 | 1.54 | 553 | 8.1 |
| Nov. 1-20..... | 1,420 | 36.0 | 2.64 | 1.15 | 1.91 | .24 | 4.62 | .00 | .90 | .54 | .04 | .02 | .20 | 357 | .49 | 690 | 32 | 1.39 | 555 | 8.0 |
| Nov. 21-30..... | 916 | 36.0 | 2.74 | 1.15 | 2.18 | .23 | 4.87 | .00 | .90 | .59 | .04 | .02 | .20 | 365 | .50 | 455 | 35 | 1.56 | 580 | 8.2 |
| Dec. 1-31..... | 3,425 | 36.0 | 2.84 | 1.15 | 2.31 | .24 | 5.03 | .00 | .94 | .59 | .02 | .02 | .20 | 383 | .52 | 1,784 | 35 | 1.63 | 602 | 8.0 |
| Jan. 1-23, 1963. | 1,752 | 42.0 | 3.04 | 1.40 | 2.35 | .25 | 5.28 | .07 | 1.00 | .62 | .04 | .02 | .20 | 416 | .57 | 991 | 33 | 1.58 | 631 | 8.3 |
| Jan. 24-31..... | 616 | 44.0 | 2.69 | 1.23 | 2.18 | .24 | 3.90 | .93 | 1.00 | .65 | .03 | .02 | .10 | 389 | .53 | 326 | 34 | 1.55 | 574 | 8.7 |
| Feb. 1-26..... | 10,163 | 33.0 | 2.35 | .90 | 1.83 | .21 | 3.92 | .00 | .90 | .54 | .03 | .03 | .20 | 307 | .42 | 4,243 | 35 | 1.43 | 507 | 7.9 |
| Mar. 1-31..... | 8,424 | 36.0 | 2.59 | 1.07 | 1.91 | .20 | 4.65 | .00 | .77 | .51 | .04 | .01 | .20 | 357 | .49 | 4,090 | 33 | 1.41 | 543 | 8.1 |
| Apr. 1-20..... | 7,416 | 34.0 | 2.84 | 1.15 | 1.91 | .19 | 4.61 | .00 | .69 | .56 | .04 | .02 | .20 | 350 | .48 | 3,531 | 31 | 1.35 | 547 | 8.1 |
| Apr. 21-30..... | 4,582 | 33.0 | 2.59 | .82 | 1.83 | .21 | 4.25 | .00 | .81 | .54 | .04 | .02 | .20 | 335 | .46 | 2,087 | 34 | 1.40 | 513 | 8.0 |
| May 1-21..... | 23,492 | 35.0 | 2.35 | .76 | 1.65 | .17 | 3.33 | .37 | .77 | .42 | .03 | .02 | .00 | 300 | .41 | 9,585 | 34 | 1.33 | 446 | 8.6 |
| May 22-31..... | 20,866 | 33.0 | 2.05 | .69 | 1.31 | .14 | 3.29 | .00 | .52 | .28 | .03 | .02 | .00 | 258 | .35 | 7,322 | 31 | 1.12 | 384 | 8.1 |
| June 1-30..... | 134,539 | 33.0 | 2.25 | .82 | 1.65 | .17 | 3.84 | .00 | .58 | .34 | .03 | .01 | .00 | 300 | .41 | 54,892 | 34 | 1.33 | 453 | 8.0 |
| July 1-20..... | 24,079 | 34.0 | 2.25 | .90 | 1.31 | .13 | 3.87 | .00 | .44 | .28 | .02 | .02 | .20 | 278 | .38 | 9,104 | 28 | 1.04 | 422 | 7.9 |
| July 21-31..... | 2,924 | 32.0 | 2.40 | 1.15 | 1.57 | .18 | 4.13 | .00 | .60 | .39 | .03 | .02 | .20 | 305 | .41 | 1,213 | 30 | 1.18 | 476 | 7.9 |
| Aug. 1-31..... | 2,343 | 37.0 | 2.59 | 1.15 | 2.04 | .26 | 4.43 | .13 | .90 | .62 | .03 | .01 | .10 | 367 | .50 | 1,169 | 34 | 1.49 | 565 | 8.4 |
| Sept. 1-20..... | 976 | 42.0 | 2.50 | 1.32 | 2.18 | .28 | 4.46 | .13 | .83 | .73 | .03 | .01 | .10 | 387 | .53 | 514 | 35 | 1.58 | 595 | 8.4 |
| Sept. 21-30..... | 536 | 42.0 | 2.50 | 1.23 | 1.91 | .26 | 4.10 | .20 | 1.08 | .68 | .03 | .01 | .10 | 367 | .50 | 267 | 32 | 1.40 | 560 | 8.5 |
| Total or weighted average | 250,300 | 33.0 | 2.31 | 0.86 | 1.64 | 0.17 | 3.86 | 0.04 | 0.63 | 0.38 | 0.03 | 0.01 | 0.06 | 303 | 0.41 | 10,320 | 33 | 1.30 | 460 | 8.0 |

HUMBOLDT RIVER BASIN--Continued

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

LOCATION.--At gaging station on left bank, 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 1963.
Water temperatures: December 1951 to September 1958, October 1959 to September 1961, May 1962 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 971 micromhos Mar 8; minimum daily, 723 micromhos Nov. 14.
Percent sodium: Maximum, 56 June 1-30; minimum, 49 Dec. 1-31.
Sodium-adsorption-ratio: Maximum, 3.89 June 1-30; minimum, 3.04 Dec. 1-31.
EXTREMES, 1951-58, 1959-61, May 1962 to September 1963.--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 1962 to September 1963

| 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, 1962. | 5,355 | 42.0 | 3.09 | 1.07 | 4.83 | 0.33 | 5.69 | 0.00 | 1.42 | 2.03 | 0.05 | 0.02 | 0.50 | 543 | 0.74 | 3,955 | 52 | 3.35 | 846 | 8.2 |
| Oct. 16-31..... | 108 | 42.0 | 3.09 | .90 | 4.70 | .38 | 5.92 | .00 | 1.44 | 1.58 | .05 | .02 | .50 | 534 | .73 | 78 | 52 | 3.32 | 800 | 8.2 |
| Nov. 1-30..... | 173 | 43.0 | 2.64 | 1.48 | 4.61 | .31 | 5.56 | .13 | 1.44 | 2.09 | .03 | .02 | .50 | 550 | .75 | 129 | 51 | 3.21 | 862 | 8.3 |
| Dec. 1-31..... | 154 | 42.0 | 2.79 | 1.65 | 4.52 | .33 | 5.70 | .00 | 1.44 | 2.26 | .02 | .01 | .50 | 561 | .76 | 117 | 49 | 3.04 | 884 | 8.2 |
| Jan. 1-31, 1963. | 154 | 43.0 | 2.84 | 1.40 | 5.09 | .33 | 5.93 | .00 | 1.46 | 2.31 | .04 | .01 | .50 | 587 | .80 | 123 | 53 | 3.49 | 925 | 8.2 |
| Feb. 1-28..... | 150 | 41.0 | 2.74 | 1.56 | 5.05 | .33 | 5.62 | .07 | 1.50 | 2.60 | .05 | .01 | .50 | 583 | .79 | 119 | 52 | 3.44 | 930 | 8.3 |
| Mar. 1-15..... | 80 | 41.0 | 2.79 | 1.56 | 4.96 | .33 | 5.64 | .00 | 1.46 | 2.74 | .04 | .00 | .50 | 592 | .61 | 65 | 51 | 3.36 | 932 | 8.1 |
| Mar. 16-31..... | 156 | 39.0 | 2.69 | 1.65 | 4.92 | .33 | 5.64 | .00 | 1.46 | 2.65 | .05 | .00 | .60 | 586 | .80 | 124 | 51 | 3.34 | 924 | 8.1 |
| Apr. 1-30..... | 12,436 | 33.0 | 2.69 | 1.32 | 4.96 | .41 | 5.75 | .27 | 1.48 | 2.03 | .06 | .02 | .50 | 561 | .76 | 9,488 | 53 | 3.50 | 881 | 8.4 |
| May 1-31..... | 24,165 | 34.0 | 2.45 | 1.48 | 5.31 | .41 | 5.57 | .27 | 1.60 | 2.17 | .05 | .01 | .40 | 570 | .78 | 18,732 | 55 | 3.79 | 905 | 8.4 |
| June 1-30..... | 12,436 | 32.0 | 2.25 | 1.48 | 5.31 | .38 | 5.28 | .27 | 1.67 | 2.17 | .05 | .01 | .40 | 559 | .76 | 9,455 | 56 | 3.89 | 903 | 8.5 |
| July 1-31..... | 26,009 | 36.0 | 2.15 | 1.48 | 4.96 | .38 | 5.24 | .00 | 1.62 | 1.92 | .05 | .03 | .40 | 539 | .73 | 19,066 | 55 | 3.68 | 860 | 8.2 |
| Aug. 1-31..... | 10,453 | 40.0 | 2.20 | 1.48 | 4.87 | .38 | 5.26 | .07 | 1.58 | 1.69 | .05 | .03 | .40 | 537 | .73 | 7,634 | 55 | 3.59 | 842 | 8.3 |
| Sept. 1-30..... | 8,212 | 43.0 | 2.25 | 1.32 | 4.61 | .38 | 5.28 | .27 | 1.54 | 1.69 | .04 | .01 | .50 | 544 | .74 | 6,075 | 54 | 3.46 | 830 | 8.6 |
| Total or weighted average | 100,000 | 36.0 | 2.37 | 1.42 | 5.04 | 0.39 | 5.42 | 0.16 | 1.58 | 1.99 | 0.05 | 0.02 | 0.43 | 552 | 0.75 | 75,160 | 55 | 3.66 | 874 | 8.3 |

## PART 11. PACIFIC SLOPE BASINS IN CALIFORNIA

### SAN JOAQUIN RIVER BASIN

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

LOCATION.--At gaging station, at Durham Ferry highway bridge, 3 miles downstream from Stanislaus River, and 3.4 miles northeast of Vernalis, San Joaquin County.
DRAINAGE AREA.--14,010 square miles, approximately.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1963.
Water temperatures: March 1951 to September 1963.
Sediment records: November 1956 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 1,160 micromhos Mar. 22, 23; minimum daily, 90 micromhos May 17, 18.
Percent sodium: Maximum, 56 Jan. 22-31; minimum, 16 May 17-19.
Sodium-adsorption-ratio: Maximum, 3.64 Jan. 22-31; minimum, 0.24 May 17-19.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 2,350 micromhos Aug. 11, 1961; minimum daily, 60 micromhos June 21, 1953.
Percent sodium: Maximum, 56 on many days in 1954, 1961, 1962, and 1963; minimum, 16 May 17-19, 1963.
Sodium-adsorption-ratio (1961-63): Maximum, 4.34 Feb. 1-9, 1962; minimum, 0.24 May 17-19, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Sacramento, Calif.

Chemical analyses, water year October 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-13, 1962. | 31,999 | 32.0 | 2.30 | 1.73 | 4.44 | 0.11 | 2.88 | | 1.12 | 4.18 | 0.01 | 0.07 | 0.30 | 500 | 0.68 | 21,760 | 52 | 3.13 | 876 | 7.4 |
| Oct. 14-19..... | 22,754 | 25.0 | 1.50 | 1.15 | 3.00 | .08 | 1.90 | | .90 | 2.65 | .01 | .07 | .20 | 338 | .46 | 10,460 | 52 | 2.61 | 574 | 7.6 |
| Oct. 20-31..... | 34,631 | 25.0 | 2.05 | 1.40 | 4.09 | .08 | 2.23 | | 1.27 | 3.72 | .01 | .07 | .10 | 438 | .60 | 20,629 | 54 | 3.12 | 756 | 7.5 |
| Nov. 1-12..... | 35,726 | 24.0 | 1.85 | 1.23 | 3.57 | .08 | 2.20 | | .83 | 3.39 | .00 | .06 | .20 | 409 | .56 | 19,872 | 53 | 2.67 | 704 | 7.3 |
| Nov. 13-25..... | 40,740 | 24.0 | 1.70 | 1.23 | 3.35 | .07 | 2.03 | | 1.12 | 3.10 | .00 | .05 | .30 | 396 | .54 | 21,941 | 53 | 2.77 | 671 | 7.3 |
| Nov. 26-30..... | 21,322 | 20.0 | 1.25 | .61 | 2.18 | .06 | 1.34 | | .69 | 2.06 | .00 | .04 | .10 | 265 | .36 | 7,685 | 51 | 2.15 | 450 | 7.2 |
| Dec. 1-7..... | 31,934 | 16.0 | 1.20 | .56 | 1.83 | .06 | 1.21 | | .65 | 1.86 | .01 | .05 | .10 | 231 | .31 | 10,032 | 50 | 1.95 | 412 | 7.4 |
| Dec. 8-16..... | 42,629 | 16.0 | 1.00 | .70 | 1.65 | .05 | 1.11 | | .56 | 1.81 | .01 | .05 | .10 | 224 | .30 | 12,986 | 49 | 1.79 | 392 | 7.6 |
| Dec. 17-31..... | 75,154 | 19.0 | 1.05 | .90 | 2.13 | .06 | 1.41 | | .83 | 2.00 | .02 | .05 | .20 | 258 | .35 | 26,370 | 51 | 2.16 | 460 | 7.8 |
| Jan. 1-14, 1963. | 56,370 | 19.0 | 1.55 | 1.15 | 3.31 | .06 | 1.80 | | 1.27 | 2.76 | .01 | .05 | .30 | 366 | .50 | 28,059 | 54 | 2.85 | 637 | 7.3 |
| Jan. 15-21..... | 22,409 | 24.0 | 2.00 | 1.65 | 4.57 | .07 | 2.39 | | 1.96 | 3.84 | .01 | .05 | .50 | 512 | .70 | 15,604 | 55 | 3.39 | 868 | 7.6 |
| Jan. 22-31..... | 29,058 | 23.0 | 2.15 | 1.89 | 5.18 | .06 | 2.43 | | 2.33 | 4.32 | .01 | .08 | .50 | 563 | .77 | 22,249 | 56 | 3.64 | 954 | 7.7 |
| Feb. 1, 2..... | 11,405 | 17.0 | 1.65 | 1.23 | 2.70 | .10 | 1.98 | | 1.35 | 2.34 | .02 | .08 | .40 | 353 | .48 | 5,475 | 47 | 2.25 | 610 | 7.4 |
| Feb. 3-7..... | 111,074 | 9.3 | .44 | .32 | .61 | .06 | .64 | | .31 | .45 | .01 | .05 | .10 | 103 | .14 | 15,559 | 43 | .99 | 158 | 7.0 |
| Feb. 8-20..... | 239,518 | 12.0 | .60 | .46 | 1.09 | .07 | .93 | | .52 | .79 | .01 | .04 | .20 | 161 | .22 | 52,445 | 49 | 1.48 | 243 | 7.0 |
| Feb. 21-28..... | 92,541 | 14.0 | .95 | .82 | 1.83 | .07 | 1.26 | | .94 | 1.47 | .01 | .04 | .30 | 235 | .32 | 29,576 | 50 | 1.94 | 394 | 7.3 |
| Mar. 1-5..... | 35,663 | 23.0 | 1.60 | 1.07 | 2.91 | .06 | 1.90 | | 1.42 | 2.23 | -- | .03 | .30 | 351 | .48 | 17,024 | 52 | 2.52 | 595 | 7.3 |
| Mar. 6-19..... | 55,620 | 21.0 | 1.90 | 1.56 | 4.13 | .07 | 2.07 | | 2.06 | 3.53 | .01 | .04 | .40 | 485 | .66 | 36,687 | 54 | 3.14 | 815 | 7.0 |

SAN JOAQUIN RIVER BASIN--Continued

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

Chemical analyses, water year October 1962 to September 1963--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. 20-29, 1963 | 36,992 | 31.0 | 2.45 | 1.89 | 5.22 | 0.09 | 2.54 | | 2.54 | 4.46 | 0.00 | 0.06 | 0.40 | 598 | 0.81 | 30,085 | 54 | 3.54 | 1,050 | 7.0 |
| Mar. 30, 31..... | 32,053 | 13.0 | .65 | .41 | .96 | .04 | .80 | | .52 | .76 | .00 | .02 | .00 | 134 | .18 | 5,841 | 47 | 1.31 | 227 | 7.0 |
| Apr. 1-9..... | 111,035 | 14.0 | .85 | .59 | 1.22 | .05 | 1.08 | | .67 | 1.02 | .01 | .03 | .20 | 179 | .24 | 27,030 | 45 | 1.44 | 291 | 7.4 |
| Apr. 10-20..... | 212,596 | 14.0 | .65 | .45 | .83 | .04 | .90 | | .44 | .65 | .02 | .03 | .10 | 125 | .17 | 36,141 | 42 | 1.11 | 210 | 7.4 |
| Apr. 21-30..... | 189,045 | 15.0 | .70 | .42 | .74 | .04 | .90 | | .42 | .62 | .01 | .02 | .10 | 120 | .16 | 30,852 | 39 | .99 | 202 | 7.2 |
| May 1-11..... | 159,098 | 18.0 | .70 | .54 | .96 | .04 | 1.02 | | .48 | .76 | .02 | .03 | .10 | 148 | .20 | 32,023 | 43 | 1.21 | 241 | 7.6 |
| May 12-16..... | 104,231 | 16.0 | .60 | .36 | .57 | .04 | .80 | | .23 | .45 | .01 | .03 | .10 | 102 | .14 | 14,459 | 36 | .82 | 157 | 7.6 |
| May 17-19..... | 38,577 | 14.0 | .50 | .28 | .15 | .03 | .77 | | .06 | .08 | .01 | .03 | .00 | 71 | .10 | 3,725 | 16 | .24 | 95 | 7.9 |
| May 20-31..... | 272,291 | 13.0 | .55 | .27 | .48 | .04 | .69 | | .21 | .45 | .01 | .03 | .00 | 94 | .13 | 34,810 | 36 | .75 | 143 | 7.4 |
| June 1-5..... | 113,653 | 14.0 | .50 | .26 | .48 | .03 | .61 | | .23 | .42 | .01 | .04 | .00 | 86 | .12 | 13,293 | 38 | .78 | 136 | 7.5 |
| June 6-25..... | 250,711 | 15.0 | 1.00 | .09 | .87 | .04 | .85 | | .37 | .82 | .01 | .01 | .10 | 133 | .18 | 45,349 | 44 | 1.18 | 219 | 7.5 |
| June 26-30..... | 32,093 | 21.0 | 1.25 | .90 | 2.00 | .06 | 1.49 | | .77 | 1.86 | .01 | .05 | .10 | 273 | .37 | 11,915 | 47 | 1.93 | 452 | 7.5 |
| July 10..... | 4,383 | -- | 3.20 | | 3.22 | -- | 2.15 | | -- | 3.07 | -- | -- | .20 | -- | -- | -- | 50 | 2.54 | 681 | 7.7 |
| Aug. 7..... | 2,142 | -- | 4.16 | | 4.44 | -- | 2.82 | | -- | 4.71 | -- | -- | .20 | -- | -- | -- | 52 | 3.08 | 916 | 8.1 |
| Sept. 10..... | 25,587 | 24.0 | 2.45 | 1.32 | 3.96 | .10 | 2.70 | | 1.17 | 3.67 | .01 | .11 | .20 | 471 | .64 | 16,390 | 51 | 2.89 | 816 | 7.8 |
| Total or weighted average | A 2,815,000 | 16.0 | 0.93 | 0.59 | 1.45 | 0.05 | 1.13 | | 0.62 | 1.25 | 0.01 | 0.04 | 0.14 | 194 | 0.26 | 676,300 | 44 | 1.51 | 323 | 7.3 |

A Total runoff based on 365 days of flow; total average for 285 days of chemical analyses 2,575,000 acre-feet.

## COLUMBIA RIVER MAIN STEM

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

LOCATION.--At bridge on State Highway 22 at Northport, Stevens County, and 12 miles downstream from gaging station at international boundary.
DRAINAGE AREA.--59,700 square miles, approximately, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: February 1910 to January 1911, November 1951 to September 1963.
Water temperatures: November 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 257 micromhos Feb. 23; minimum daily, 123 micromhos Aug. 12.
Percent sodium: Maximum, 6 Nov. 1 to Dec. 27, Apr. 12-24; minimum, 3 July 13 to Aug. 11.
Sodium-adsorption-ratio: Maximum, 0.12 Apr. 12-24; minimum, 0.05 July 13 to Aug. 11.
EXTREMES, 1958-63.--Specific conductance: Maximum daily, 257 micromhos Feb. 23, 1963; minimum daily, 123 micromhos Aug. 2, 1960, Aug. 12, 1963.
Percent sodium (1961-63): Maximum, 6 on many days in 1962 and 1963; minimum, 3 July 13 to Aug. 11, 1963.
Sodium-adsorption-ratio (1961-63): Maximum, 0.12 Apr. 12-24, 1963; 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 1962 to September 1963

| 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, 1962. | 3,451,299 | 4.4 | 1.05 | 0.38 | 0.07 | 0.02 | 1.18 | | 0.29 | 0.03 | 0.01 | 0.01 | | 90 | 0.12 | 422,439 | 05 | 0.09 | 148 | 7.6 |
| Nov. 1-30..... | 3,361,388 | 5.0 | 1.10 | .38 | .09 | .03 | 1.21 | | .31 | .02 | .02 | .01 | | 95 | .13 | 434,291 | 06 | .11 | 155 | 7.6 |
| Dec. 1-27..... | 2,977,051 | 5.6 | 1.20 | .35 | .10 | .03 | 1.28 | | .33 | .01 | .02 | .01 | | 100 | .14 | 404,879 | 06 | .11 | 162 | 7.7 |
| Dec. 28-Jan. 27, 1963. | 2,943,411 | 5.9 | 1.20 | .43 | .09 | .01 | 1.34 | | .33 | .01 | .01 | .01 | | 99 | .13 | 396,301 | 05 | .10 | 168 | 7.7 |
| Jan. 28-Feb. 22. | 2,639,973 | 6.2 | 1.25 | .40 | .10 | .02 | 1.41 | | .35 | .03 | .01 | .01 | | 103 | .14 | 397,823 | 05 | .11 | 174 | 7.5 |
| Feb. 23..... | 114,645 | -- | 2.56 | | .12 | -- | 2.03 | | -- | -- | -- | -- | | 158 | .21 | 24,635 | 05 | .11 | 257 | 7.6 |
| Feb. 24-Mar. 13. | 1,908,297 | 5.7 | 1.25 | .39 | .09 | .02 | 1.39 | | .33 | .02 | .01 | .01 | | 99 | .13 | 256,933 | 05 | .10 | 172 | 7.6 |
| Mar. 14-Apr. 1.. | 2,109,659 | 5.4 | 1.20 | .49 | .10 | .03 | 1.43 | | .33 | .06 | .01 | .01 | | 107 | .15 | 306,998 | 05 | .10 | 175 | 7.9 |
| Apr. 2-7..... | 784,621 | 5.9 | 1.25 | .52 | .10 | .03 | 1.46 | | .35 | .02 | .01 | .01 | | 113 | .15 | 120,581 | 05 | .11 | 183 | 8.0 |
| Apr. 8-11..... | 510,149 | 6.6 | 1.40 | .61 | .11 | .04 | 1.66 | | .48 | .02 | .01 | .01 | | 127 | .17 | 68,113 | 05 | .11 | 206 | 7.9 |
| Apr. 12-24..... | 1,990,611 | 5.4 | 1.15 | .44 | .10 | .04 | 1.34 | | .31 | .02 | .01 | .01 | | 100 | .14 | 270,723 | 06 | .12 | 166 | 7.6 |
| Apr. 25-28..... | 668,430 | 5.9 | 1.35 | .54 | .10 | .04 | 1.54 | | .44 | .02 | .01 | .01 | | 117 | .16 | 106,361 | 05 | .10 | 194 | 7.7 |
| Apr. 29-May 17.. | 4,198,215 | 4.9 | 1.10 | .40 | .08 | .02 | 1.31 | | .29 | .02 | .01 | .01 | | 89 | .12 | 508,152 | 05 | .10 | 156 | 7.8 |
| May 18-June 12.. | 10,344,991 | 4.7 | 1.00 | .35 | .06 | .02 | 1.18 | | .25 | .01 | .01 | .01 | | 78 | .11 | 1,097,397 | 04 | .07 | 140 | 7.8 |
| June 13-July 12. | 15,030,743 | 4.6 | 1.00 | .38 | .05 | .02 | 1.16 | | .25 | .01 | .01 | .01 | | 81 | .11 | 1,655,787 | 04 | .08 | 137 | 7.8 |
| July 13-Aug. 11. | 9,306,446 | 3.1 | 1.00 | .31 | .04 | .02 | 1.08 | | .23 | .01 | .01 | .01 | | 77 | .10 | 974,571 | 03 | .05 | 131 | 7.7 |
| Aug. 12-Sept. 10 | 5,630,281 | 4.0 | 1.00 | .30 | .06 | .02 | 1.10 | | .25 | .02 | .01 | .01 | | 76 | .10 | 581,946 | 04 | .07 | 134 | 7.5 |
| Sept. 11-30..... | 2,680,066 | 3.7 | 1.00 | .32 | .06 | .02 | 1.10 | | .25 | .01 | .01 | .01 | | 77 | .10 | 280,657 | 04 | .07 | 136 | 7.6 |
| Total or weighted average | 70,850,000 | 4.6 | 1.07 | 0.37 | 0.07 | 0.02 | 1.21 | | 0.28 | 0.02 | 0.01 | 0.01 | | 86 | 0.12 | 8,329,000 | 04 | 0.06 | 147 | 7.7 |

## 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 1963.
Water temperatures: December 1952 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 384 micromhos Sept. 24; minimum daily, 114 micromhos May 23.
Percent sodium: Maximum, 28 Oct. 1-31; minimum, 23 Nov. 22-24, Apr. 8 to May 4, May 21-29.
Sodium-adsorption-ratio: Maximum, 0.89 Sept. 1-30; minimum, 0.44 May 21-29.
EXTREMES, 1952-63.--Specific conductance: Maximum daily, 409 micromhos Oct. 3, 10, 1961; minimum daily, 99 micromhos Dec. 17, 1959.
Percent sodium (1961-63): Maximum, 28 Oct. 1-31, 1962; minimum, 23 on several days in 1962 and 1963.
Sodium-adsorption-ratio (1961-63): Maximum, 0.89 on 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 1962 to September 1963

| 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, 1962. | 178,990 | 29.0 | 1.50 | 0.90 | 0.96 | 0.09 | 2.69 | | 0.46 | 0.20 | 0.02 | 0.04 | | 204 | 0.28 | 49,659 | 28 | 0.87 | 325 | 7.9 |
| Nov. 1-20..... | 97,666 | 29.0 | 1.50 | .90 | .91 | .08 | 2.67 | | .46 | .21 | .02 | .04 | | 200 | .27 | 26,565 | 27 | .83 | 321 | 7.9 |
| Nov. 21..... | 13,309 | -- | 2.38 | | .87 | -- | 2.57 | | -- | -- | -- | .07 | | 204 | .28 | 3,692 | 27 | .80 | 312 | 7.4 |
| Nov. 22-24..... | 49,049 | 22.0 | .70 | .43 | .35 | .04 | 1.20 | | .17 | .07 | .01 | .04 | | 107 | .15 | 7,138 | 23 | .47 | 147 | 8.1 |
| Nov. 25-Dec. 24. | 326,975 | 23.0 | .90 | .50 | .48 | .04 | 1.54 | | .21 | .11 | .01 | .03 | | 122 | .17 | 54,252 | 25 | .57 | 185 | 8.0 |
| Dec. 25-Jan. 12, 1963..... | 187,864 | 22.0 | .85 | .49 | .48 | .04 | 1.48 | | .20 | .09 | .01 | .03 | | 116 | .16 | 29,637 | 26 | .58 | 177 | 7.9 |
| Jan. 13-28..... | 101,681 | 23.0 | 1.00 | .83 | .57 | .05 | 1.79 | | .25 | .12 | .01 | .04 | | 139 | .19 | 19,222 | 25 | .63 | 213 | 7.9 |
| Jan. 29-Feb. 3.. | 24,301 | 26.0 | 1.30 | .72 | .74 | .06 | 2.20 | | .37 | .16 | .02 | .04 | | 172 | .23 | 5,685 | 26 | .74 | 264 | 8.0 |
| Feb. 4-9..... | 127,696 | 21.0 | .75 | .37 | .39 | .07 | 1.23 | | .20 | .09 | .01 | .05 | | 114 | .16 | 19,798 | 25 | .52 | 153 | 7.3 |
| Feb. 10-Mar. 7.. | 283,275 | 23.0 | .90 | .48 | .52 | .05 | 1.54 | | .23 | .11 | .01 | .03 | | 123 | .17 | 47,386 | 27 | .63 | 186 | 7.5 |
| Mar. 8-20..... | 83,802 | 23.0 | 1.05 | .58 | .57 | .05 | 1.85 | | .25 | .12 | .01 | .02 | | 140 | .19 | 15,956 | 25 | .63 | 216 | 7.7 |
| Mar. 21-Apr. 7.. | 106,643 | 23.0 | 1.05 | .65 | .61 | .06 | 1.90 | | .27 | .14 | .01 | .02 | | 146 | .20 | 21,175 | 26 | .66 | 221 | 7.7 |
| Apr. 8-May 4.... | 253,095 | 22.0 | .90 | .47 | .44 | .05 | 1.54 | | .20 | .10 | .01 | .01 | | 122 | .17 | 41,994 | 23 | .53 | 178 | 7.7 |
| May 5-20..... | 102,855 | 21.0 | 1.10 | .45 | .52 | .04 | 1.74 | | .23 | .11 | .01 | .02 | | 138 | .19 | 19,304 | 25 | .59 | 202 | 7.8 |
| May 21-29..... | 109,482 | 17.0 | .70 | .32 | .31 | .04 | 1.13 | | .14 | .06 | .01 | .02 | | 95 | .13 | 14,145 | 23 | .44 | 134 | 7.7 |
| May 30-June 3... | 37,904 | 19.0 | .90 | .46 | .44 | .05 | 1.51 | | .23 | .09 | .01 | .02 | | 123 | .17 | 6,341 | 24 | .53 | 179 | 7.8 |
| June 4-6..... | 17,494 | 21.0 | 1.00 | .58 | .52 | .06 | 1.67 | | .27 | .11 | .01 | .03 | | 133 | .18 | 3,164 | 24 | .59 | 197 | 8.0 |
| June 7-13..... | 21,160 | 24.0 | 1.40 | .90 | .78 | .08 | 2.44 | | .40 | .16 | .01 | .05 | | 184 | .25 | 5,295 | 25 | .73 | 288 | 8.0 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 14-July 4, 1963..... | 52,483 | 25.0 | 1.60 | .99 | .91 | .10 | 2.77 | | .50 | .21 | .02 | .04 | | 207 | .28 | 14,775 | 25 | .80 | 328 | 8.0 |
| July 5-9..... | 14,519 | 26.0 | 1.70 | .99 | .96 | .10 | 2.88 | | .50 | .20 | .02 | .05 | | 218 | .30 | 4,305 | 26 | .83 | 340 | 8.2 |
| July 10-13..... | 7,069 | 23.0 | 1.40 | .90 | .83 | .08 | 2.43 | | .40 | .16 | .02 | .05 | | 187 | .25 | 1,798 | 26 | .77 | 290 | 8.1 |
| July 14-Aug. 3.. | 59,564 | 24.0 | 1.70 | .90 | .96 | .10 | 2.85 | | .48 | .20 | .02 | .05 | | 211 | .29 | 17,092 | 26 | .84 | 336 | 7.8 |
| Aug. 4-31..... | 84,639 | 28.0 | 1.60 | .99 | .96 | .10 | 2.88 | | .46 | .19 | .02 | .04 | | 219 | .30 | 25,209 | 26 | .84 | 340 | 7.9 |
| Sept. 1-30..... | 100,324 | 29.0 | 1.75 | .99 | 1.04 | .11 | 3.05 | | .52 | .21 | .02 | .05 | | 229 | .31 | 31,245 | 27 | .89 | 354 | 8.0 |
| Total or weighted average | 2,442,000 | 23.0 | 1.08 | 0.60 | 0.60 | 0.06 | 1.87 | | 0.28 | 0.13 | 0.01 | 0.03 | | 146 | 0.20 | 484,800 | 25 | 0.65 | 222 | 7.7 |

## 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 21 miles upstream from Henrys Fork.
DRAINAGE AREA.--5,752 square miles upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: January 1953 to September 1963.
Water temperatures: January 1953 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 581 micromhos Apr. 15; minimum daily, 279 micromhos July 25-27.
Percent sodium: Maximum, 15 Jan. 1-17, Feb. 3 to Mar. 22, Apr. 15-25; minimum, 10 June 15-23.
Sodium-adsorption-ratio: Maximum, 0.55 Apr. 15-25; minimum, 0.29 June 15 to Aug. 13.
EXTREMES, 1953-63.--Specific conductance: Maximum daily, 791 micromhos Nov. 13, 1956; minimum daily, 240 micromhos June 27, 1954.
Percent sodium: Maximum, 19 Sept. 1-10, 1955; minimum, 7 June 11-20, 1953, May 1-10, June 1-10, 1955.
Sodium-adsorption-ratio (1961-63): Maximum, 0.65 Feb. 17-26, 1962; 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 1962 to September 1963

| 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, 1962. | 102,674 | 8.9 | 2.50 | 0.90 | 0.57 | 0.06 | 2.75 | | 0.92 | 0.34 | 0.02 | 0.01 | 0.05 | 230 | 0.31 | 32,117 | 14 | 0.43 | 388 | 8.0 |
| Oct. 16-Nov. 1.. | 95,324 | -- | 3.56 | | .57 | -- | 2.85 | | -- | -- | -- | -- | -- | 238 | .32 | 30,854 | 14 | .42 | 407 | 8.0 |
| Nov. 2-30..... | 145,470 | -- | 3.90 | | .61 | -- | 2.98 | | -- | -- | -- | -- | -- | 261 | .35 | 51,636 | 14 | .44 | 431 | 8.0 |
| Dec. 1-31..... | 149,538 | -- | 4.00 | | .61 | -- | 3.02 | | -- | -- | -- | -- | -- | 267 | .36 | 54,300 | 13 | .43 | 442 | 8.0 |
| Jan. 1-17, 1963. | 59,042 | 8.4 | 2.94 | 1.23 | .70 | .06 | 3.13 | | 1.21 | .51 | .02 | .01 | .05 | 283 | .38 | 22,724 | 14 | .48 | 457 | 8.2 |
| Jan. 18-30..... | 34,733 | -- | 4.44 | | .78 | -- | 3.29 | | -- | -- | -- | -- | -- | 307 | .42 | 14,502 | 15 | .53 | 487 | 8.2 |
| Jan. 31-Feb. 2.. | 10,372 | -- | 3.72 | | .61 | -- | 2.87 | | -- | -- | -- | -- | -- | 258 | .35 | 3,639 | 14 | .45 | 420 | 7.6 |
| Feb. 3-23..... | 54,065 | -- | 4.40 | | .78 | -- | 3.31 | | -- | -- | -- | -- | -- | 304 | .41 | 22,353 | 15 | .53 | 490 | 8.0 |
| Feb. 24-Mar. 16. | 53,649 | -- | 4.56 | | .78 | -- | 3.39 | | -- | -- | -- | -- | -- | 316 | .43 | 23,056 | 15 | .52 | 509 | 8.1 |
| Mar. 17-22..... | 15,685 | -- | 4.82 | | .83 | -- | 3.51 | | -- | -- | -- | -- | -- | 331 | .45 | 7,061 | 15 | .53 | 525 | 7.8 |
| Mar. 23-29..... | 19,993 | -- | 4.46 | | .74 | -- | 3.28 | | -- | -- | -- | -- | -- | 294 | .40 | 7,994 | 14 | .50 | 488 | 7.8 |
| Mar. 30-Apr. 14. | 42,494 | -- | 4.78 | | .78 | -- | 3.46 | | -- | -- | -- | -- | -- | 312 | .42 | 18,031 | 14 | .51 | 515 | 8.1 |
| Apr. 15-25..... | 25,985 | 6.9 | 3.39 | 1.56 | .87 | .08 | 3.61 | | 1.52 | .71 | .02 | .01 | .06 | 327 | .44 | 11,556 | 15 | .55 | 543 | 8.1 |
| Apr. 26-30..... | 19,815 | -- | 4.52 | | .70 | -- | 3.31 | | -- | -- | -- | -- | -- | 290 | .39 | 7,815 | 13 | .46 | 484 | 7.9 |
| May 1-4..... | 26,912 | -- | 4.04 | | .61 | -- | 3.03 | | -- | -- | -- | -- | -- | 264 | .36 | 9,662 | 13 | .43 | 437 | 7.9 |
| May 5-June 3.... | 783,074 | -- | 3.70 | | .44 | -- | 2.82 | | -- | -- | -- | -- | -- | 241 | .33 | 256,660 | 11 | .32 | 390 | 7.9 |
| June 4-14..... | 427,636 | -- | 3.46 | | .41 | -- | 2.72 | | -- | -- | -- | -- | -- | 220 | .30 | 127,949 | 11 | .31 | 360 | 8.2 |
| June 15-23..... | 395,048 | -- | 3.32 | | .37 | -- | 2.56 | | -- | -- | -- | -- | -- | 201 | .27 | 107,990 | 10 | .29 | 331 | 8.0 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 24-July 14, 1963..... | 614,380 | 7.8 | 2.05 | .82 | .35 | .04 | 2.33 | | .65 | .17 | .02 | .01 | .10 | 177 | .24 | 147,894 | 11 | .29 | 297 | 8.0 |
| July 15-Aug. 13. | 720,000 | -- | 2.74 | | .34 | -- | 2.23 | | -- | -- | -- | -- | -- | 176 | .24 | 172,339 | 11 | .29 | 284 | 7.9 |
| Aug. 14-Sept. 3. | 360,922 | -- | 2.80 | | .38 | -- | 2.31 | | -- | -- | -- | -- | -- | 182 | .25 | 89,335 | 12 | .32 | 310 | 7.9 |
| Sept. 4-12..... | 113,552 | -- | 3.00 | | .48 | -- | 2.43 | | -- | -- | -- | -- | -- | 197 | .27 | 30,423 | 14 | .39 | 332 | 7.9 |
| Sept. 13-21..... | 120,978 | -- | 2.68 | | .44 | -- | 2.41 | | -- | -- | -- | -- | -- | 198 | .27 | 32,577 | 14 | .38 | 329 | 7.8 |
| Sept. 22-30..... | 68,709 | -- | 3.40 | | .57 | -- | 2.66 | | -- | -- | -- | -- | -- | 223 | .30 | 20,838 | 14 | .43 | 369 | 7.8 |
| Total or weighted average | 4,460,000 | -- | 3.32 | | 0.44 | -- | 2.61 | | -- | -- | -- | -- | -- | 215 | 0.29 | 1,303,000 | 12 | 0.34 | 354 | 8.0 |

SNAKE RIVER MAIN STEM--Continued

## 13-1545. SNAKE RIVER AT KING HILL, IDAHO

LOCATION.--At county highway bridge, 400 yards downstream from gaging station at King Hill, Elmore County, and 20 miles downstream from Malad River.
DRAINAGE AREA.--35,800 square miles, approximately. Mean altitude 6,040 feet.
RECORDS AVAILABLE.--Chemical analyses: March 1951 to September 1963.
Water temperatures: March 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 580 micromhos Apr. 14; minimum daily, 367 micromhos Feb. 3.
Percent sodium: Maximum, 30 Apr. 14, 15; minimum, 21 June 17 to July 4.
Sodium-adsorption-ratio: Maximum, 1.26 Apr. 14, 15; minimum, 0.75 June 17 to July 4.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 594 micromhos Oct. 3, 1952; minimum daily, 355 micromhos Feb. 11, 1962.
Sodium-adsorption-ratio (1961-63): Maximum, 1.26 Apr. 14, 15, 1963; minimum, 0.75 June 17 to July 4, 1963.
REMARKS.--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 1962 to September 1963

| 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, 1962. | 307,454 | 34.0 | 2.59 | 1.65 | 1.61 | 0.12 | 3.84 | 0.00 | 1.21 | 0.76 | 0.04 | 0.07 | 0.07 | 353 | 0.48 | 147,802 | 27 | 1.11 | 558 | 8.2 |
| Oct. 17-Nov. 3.. | 363,094 | -- | 4.20 | | 1.57 | -- | 3.84 | .00 | -- | -- | -- | -- | -- | 348 | .47 | 171,845 | 27 | 1.08 | 554 | 8.2 |
| Nov. 4-Dec. 3... | 547,795 | -- | 4.28 | | 1.61 | -- | 3.74 | .07 | -- | -- | -- | -- | -- | 352 | .48 | 262,240 | 27 | 1.10 | 547 | 8.3 |
| Dec. 4-18..... | 236,888 | -- | 4.28 | | 1.52 | -- | 3.77 | .00 | -- | -- | -- | -- | -- | 349 | .47 | 112,436 | 26 | 1.04 | 555 | 8.1 |
| Dec. 17-Jan. 2, 1963..... | 296,390 | -- | 4.24 | | 1.52 | -- | 3.77 | .00 | -- | -- | -- | -- | -- | 348 | .47 | 140,275 | 26 | 1.05 | 552 | 8.2 |
| Jan. 3-31..... | 479,205 | 34.0 | 2.45 | 1.73 | 1.48 | .12 | 3.61 | .10 | 1.17 | .71 | .04 | .06 | .05 | 340 | .46 | 221,584 | 26 | 1.02 | 529 | 8.3 |
| Feb. 1-3..... | 92,231 | -- | 2.88 | | 1.04 | -- | 2.57 | .00 | -- | -- | -- | -- | -- | 250 | .34 | 31,359 | 27 | .87 | 386 | 7.9 |
| Feb. 4-8..... | 93,521 | -- | 3.72 | | 1.31 | -- | 3.28 | .00 | -- | -- | -- | -- | -- | 305 | .41 | 38,792 | 26 | .96 | 477 | 8.1 |
| Feb. 9-28..... | 307,676 | -- | 4.00 | | 1.44 | -- | 3.59 | .00 | -- | -- | -- | -- | -- | 331 | .45 | 138,503 | 26 | 1.02 | 516 | 8.2 |
| Mar. 1-18..... | 296,973 | -- | 4.04 | | 1.44 | -- | 3.59 | .00 | -- | -- | -- | -- | -- | 332 | .45 | 134,089 | 26 | 1.01 | 521 | 8.2 |
| Mar. 19-Apr. 13. | 373,575 | 31.0 | 2.20 | 1.65 | 1.39 | .13 | 3.38 | .07 | 1.04 | .68 | .03 | .07 | .08 | 319 | .43 | 162,072 | 26 | 1.00 | 491 | 8.3 |
| Apr. 14, 15..... | 39,868 | -- | 4.42 | | 1.87 | -- | 3.80 | .00 | -- | -- | -- | -- | -- | 370 | .50 | 20,061 | 30 | 1.26 | 575 | 8.1 |
| Apr. 16-May 2... | 273,326 | -- | 4.00 | | 1.39 | -- | 3.41 | .07 | -- | -- | -- | -- | -- | 320 | .44 | 118,952 | 26 | .98 | 504 | 8.3 |
| May 3-12..... | 147,868 | -- | 3.82 | | 1.26 | -- | 3.41 | .00 | -- | -- | -- | -- | -- | 325 | .44 | 65,358 | 25 | .91 | 483 | 8.2 |
| May 13, 14..... | 61,289 | -- | 4.20 | | 1.74 | -- | 3.47 | .30 | -- | -- | -- | -- | -- | 375 | .51 | 31,258 | 29 | 1.20 | 567 | 8.5 |
| May 15-June 1... | 350,598 | -- | 3.80 | | 1.22 | -- | 3.41 | .00 | -- | -- | -- | -- | -- | 310 | .42 | 147,812 | 24 | .88 | 480 | 8.2 |
| June 2-16..... | 479,901 | -- | 4.16 | | 1.26 | -- | 3.51 | .00 | -- | -- | -- | -- | -- | 316 | .43 | 206,242 | 23 | .87 | 491 | 8.1 |
| June 17-July 4.. | 623,722 | -- | 4.16 | | 1.09 | -- | 3.39 | .00 | -- | -- | -- | -- | -- | 299 | .41 | 253,630 | 21 | .75 | 470 | 8.0 |
| July 5-16..... | 167,730 | 29.0 | 1.90 | 1.56 | 1.35 | .11 | 3.11 | .00 | 1.08 | .62 | .03 | .04 | .05 | 290 | .39 | 66,153 | 27 | 1.03 | 463 | 7.9 |
| July 17-31..... | 219,362 | -- | 3.90 | | 1.44 | -- | 3.33 | .00 | -- | -- | -- | -- | -- | 318 | .43 | 94,870 | 27 | 1.03 | 493 | 7.9 |
| Aug. 1-15..... | 235,250 | -- | 4.08 | | 1.44 | -- | 3.54 | .00 | -- | -- | -- | -- | -- | 327 | .44 | 104,620 | 26 | 1.01 | 512 | 8.0 |
| Aug. 16-Sept. 8. | 382,493 | -- | 4.06 | | 1.48 | -- | 3.64 | .00 | -- | -- | -- | -- | -- | 334 | .45 | 173,743 | 27 | 1.04 | 522 | 8.1 |
| Sept. 9-30..... | 385,964 | -- | 4.20 | | 1.57 | -- | 3.77 | .00 | -- | -- | -- | -- | -- | 345 | .47 | 181,094 | 27 | 1.08 | 539 | 8.2 |
| Total or weighted average | 6,762,000 | -- | 4.07 | | 1.42 | -- | 3.56 | 0.02 | -- | -- | -- | -- | -- | 329 | 0.45 | 3,026,000 | 26 | 0.99 | 514 | 8.0 |

## 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, upstream from gaging station.
RECORDS AVAILABLE.--Chemical analyses: January 1939 to January 1940, November 1950 to September 1963.
Water temperatures: November 1950 to September 1963.
Sediment records: January 1939 to June 1940.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 776 micromhos Jan. 11; minimum daily, 132 micromhos June 18.
Percent sodium: Maximum, 55 May 16-19; minimum, 35 May 22 to June 18.
Sodium-adsorption-ratio: Maximum, 2.67 Apr. 30 to May 2; minimum, 0.75 June 14-18.
EXTREMES, 1939-40, 1950-63.--Specific conductance: Maximum daily, 1,470 micromhos July 30, Aug. 26, 1939; minimum daily, 82 micromhos Apr. 27, 1952.
Percent sodium (1961-63): Maximum, 55 June 27-28, 1962, May 16-19, 1963; minimum, 35 May 22 to June 18, 1963.
Sodium-adsorption-ratio (1961-63): 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 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_3$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 160°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, 1962. | 21,749 | 32.0 | 2.10 | 0.82 | 2.61 | 0.12 | 3.80 | 0.00 | 1.27 | 0.42 | 0.03 | 0.06 | 0.09 | 346 | 0.47 | 10,234 | 46 | 2.16 | 538 | 8.0 |
| Oct. 16-Nov. 6.. | 41,082 | -- | 3.74 | | 3.18 | -- | 4.65 | .00 | -- | -- | -- | -- | -- | 416 | .57 | 23,354 | 46 | 2.32 | 651 | 8.0 |
| Nov. 9-Dec. 8... | 42,010 | -- | 3.82 | | 3.22 | -- | 4.56 | .00 | -- | -- | -- | -- | -- | 428 | .58 | 24,453 | 46 | 2.33 | 650 | 7.9 |
| Dec. 9-Jan. 8, 1963..... | 41,750 | -- | 3.60 | | 2.87 | -- | 4.23 | .00 | -- | -- | -- | -- | -- | 404 | .55 | 22,939 | 44 | 2.14 | 606 | 7.9 |
| Jan. 9-29..... | 22,701 | 36.0 | 2.74 | 1.15 | 3.05 | .12 | 4.59 | .00 | 1.73 | .54 | .03 | .16 | .07 | 436 | .59 | 13,461 | 43 | 2.18 | 654 | 7.7 |
| Jan. 30-Feb. 1.. | 5,671 | -- | 3.68 | | 2.57 | -- | 4.20 | .00 | -- | -- | -- | -- | -- | 395 | .54 | 3,046 | 41 | 1.89 | 595 | 7.6 |
| Feb. 2, 3..... | 8,390 | -- | 2.44 | | 1.61 | -- | 2.88 | .00 | -- | -- | -- | -- | -- | 296 | .40 | 3,378 | 40 | 1.46 | 430 | 7.1 |
| Feb. 4-6..... | 5,010 | -- | 3.44 | | 2.83 | -- | 4.26 | .00 | -- | -- | -- | -- | -- | 391 | .53 | 2,664 | 45 | 2.16 | 595 | 7.5 |
| Feb. 7-28..... | 26,967 | -- | 3.56 | | 3.05 | -- | 4.26 | .00 | -- | -- | -- | -- | -- | 412 | .56 | 15,110 | 46 | 2.28 | 621 | 7.8 |
| Mar. 1-23..... | 24,635 | -- | 3.58 | | 3.22 | -- | 4.49 | .00 | -- | -- | -- | -- | -- | 419 | .57 | 14,038 | 47 | 2.41 | 643 | 7.8 |
| Mar. 24-Apr. 4.. | 9,021 | -- | 3.48 | | 3.05 | -- | 4.29 | .00 | -- | -- | -- | -- | -- | 421 | .57 | 5,165 | 47 | 2.31 | 626 | 7.9 |
| Apr. 5-8..... | 3,846 | -- | 2.28 | | 1.87 | -- | 2.77 | .00 | -- | -- | -- | -- | -- | 271 | .37 | 1,416 | 45 | 1.75 | 401 | 7.7 |
| Apr. 9-17..... | 4,552 | -- | 2.76 | | 2.52 | -- | 3.47 | .00 | -- | -- | -- | -- | -- | 286 | .39 | 1,771 | 48 | 2.15 | 497 | 8.0 |
| Apr. 18-23..... | 8,795 | 20.0 | 1.25 | .42 | 1.22 | .06 | 2.00 | .00 | .62 | .23 | .03 | .06 | .03 | 187 | .25 | 2,237 | 41 | 1.33 | 286 | 7.5 |
| Apr. 24-29..... | 2,404 | -- | 2.24 | | 1.96 | -- | 2.72 | .00 | -- | -- | -- | -- | -- | 256 | .35 | 844 | 47 | 1.65 | 404 | 7.8 |

BOISE RIVER BASIN--Continued

13-2125. BOISE RIVER AT NOTUS, IDAHO--Continued

Chemical analyses, water year October 1962 to September 1963--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. 30-May 2, 1963 | 353 | -- | 3.24 | | 3.39 | -- | 3.85 | 0.00 | -- | -- | -- | -- | -- | 420 | 0.57 | 202 | 51 | 2.67 | 631 | 8.1 |
| May 3-7 | 6,258 | -- | 1.76 | | 1.26 | -- | 2.10 | .00 | -- | -- | -- | -- | -- | 198 | .27 | 1,685 | 42 | 1.34 | 301 | 7.6 |
| May 8-13 | 6,664 | -- | 1.90 | | 1.48 | -- | 2.31 | .00 | -- | -- | -- | -- | -- | 223 | .30 | 2,021 | 44 | 1.52 | 333 | 7.8 |
| May 14, 15 | 619 | -- | 2.66 | | 2.48 | -- | 3.33 | .00 | -- | -- | -- | -- | -- | 295 | .40 | 248 | 48 | 2.15 | 507 | 8.0 |
| May 16-19 | 478 | -- | 3.48 | | 4.18 | -- | 4.16 | .20 | -- | -- | -- | -- | -- | 480 | .65 | 312 | 55 | 3.17 | 719 | 8.4 |
| May 20, 21 | 278 | -- | 3.14 | | 3.35 | -- | 3.92 | .00 | -- | -- | -- | -- | -- | 412 | .56 | 156 | 52 | 2.67 | 621 | 7.9 |
| May 22-June 6 | 129,100 | -- | 1.04 | | .57 | -- | 1.23 | .00 | -- | -- | -- | -- | -- | 112 | .15 | 19,665 | 35 | .78 | 161 | 7.6 |
| June 7-13 | 50,900 | -- | 1.12 | | .61 | -- | 1.31 | .00 | -- | -- | -- | -- | -- | 121 | .16 | 8,376 | 35 | .81 | 171 | 7.3 |
| June 14-18 | 36,595 | -- | .98 | | .52 | -- | 1.16 | .00 | -- | -- | -- | -- | -- | 108 | .15 | 5,375 | 35 | .75 | 150 | 7.7 |
| June 19-24 | 37,369 | -- | 1.12 | | .70 | -- | 1.34 | .00 | -- | -- | -- | -- | -- | 125 | .17 | 6,353 | 38 | .93 | 178 | 7.4 |
| June 25-July 1 | 7,845 | -- | 2.20 | | 1.78 | -- | 2.72 | .00 | -- | -- | -- | -- | -- | 261 | .35 | 2,785 | 45 | 1.70 | 375 | 7.9 |
| July 2-21 | 7,537 | 28.0 | 1.95 | .82 | 2.70 | 0.12 | 3.67 | .00 | 1.37 | 0.48 | 0.03 | 0.05 | 0.08 | 352 | .48 | 3,608 | 48 | 2.29 | 525 | 8.1 |
| July 22-Aug. 1 | 5,193 | -- | 2.74 | | 2.70 | -- | 3.57 | .00 | -- | -- | -- | -- | -- | 333 | .45 | 2,352 | 50 | 2.30 | 508 | 8.0 |
| Aug. 2-20 | 8,894 | -- | 2.94 | | 2.96 | -- | 3.87 | .00 | -- | -- | -- | -- | -- | 363 | .49 | 4,391 | 50 | 2.44 | 553 | 8.0 |
| Aug. 21-31 | 6,393 | -- | 3.08 | | 3.09 | -- | 4.02 | .00 | -- | -- | -- | -- | -- | 380 | .52 | 3,304 | 50 | 2.49 | 572 | 8.1 |
| Sept. 1-24 | 32,751 | -- | 2.72 | | 2.44 | -- | 3.56 | .00 | -- | -- | -- | -- | -- | 331 | .45 | 14,743 | 47 | 2.09 | 496 | 7.8 |
| Sept. 25-30 | 6,010 | -- | 3.10 | | 2.96 | -- | 4.08 | .00 | -- | -- | -- | -- | -- | 373 | .51 | 3,049 | 49 | 2.38 | 570 | 8.0 |
| Total or weighted average | 611,800 | -- | 2.35 | | 1.87 | -- | 2.86 | 0.00 | -- | -- | -- | -- | -- | 268 | 0.36 | 222,700 | 45 | 1.60 | 402 | 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 1963.
Water temperatures: December 1950 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 251 micromhos Oct. 22; minimum daily, 117 micromhos June 1.
Percent sodium: Maximum, 28 Oct. 20-25; minimum, 10 July 3 to Aug. 2.
Sodium-adsorption-ratio: Maximum, 0.71 Oct. 20-25; minimum, 0.19 July 3 to Aug. 2.
EXTREMES, 1950-63.--Specific conductance: Maximum daily, 324 micromhos Dec. 7, 1955; minimum daily, 102 micromhos May 27, 1956.
Percent sodium (1961-63): Maximum, 28 Oct. 20-25, 1962; minimum, 10 July 1-31, 1962, July 3 to Aug. 2, 1963.
Sodium-adsorption-ratio (1961-63): Maximum, 0.71 Oct. 20-25, 1963; minimum, 0.18 July 1-31, 1962.
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 1962 to September 1963

| Date of collection | Runoff (acre-feet) | Silica ($SiO_2$) ppm | Equivalents per million | | | | | | | | | | Boron (B) ppm | Dissolved solids (residue at 180°C) | | | Percent sodium | Sodium adsorption ratio | Specific conductance (micromhos at 25°C) | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | | Parts per million | Tons per acre-foot | Total tons | | | | |
| Oct. 1-19, 1962. | 3,968,330 | 9.3 | 1.10 | 0.48 | 0.44 | 0.04 | 1.51 | | 0.42 | 0.15 | 0.02 | 0.01 | 0.01 | 121 | 0.16 | 653,028 | 21 | 0.49 | 201 | 7.9 |
| Oct. 20-25..... | 1,344,793 | -- | 1.70 | | .65 | -- | 1.67 | | -- | -- | -- | -- | -- | 144 | .20 | 263,364 | 28 | .71 | 234 | 7.9 |
| Oct. 26-31..... | 1,362,645 | -- | 1.42 | | .40 | -- | 1.38 | | -- | -- | -- | -- | -- | 113 | .15 | 209,411 | 22 | .48 | 183 | 7.9 |
| Nov. 1-27..... | 5,992,661 | -- | 1.50 | | .43 | -- | 1.48 | | -- | -- | -- | -- | -- | 122 | .17 | 994,302 | 22 | .50 | 195 | 7.8 |
| Nov. 28-Dec. 1.. | 1,180,562 | -- | 1.56 | | .48 | -- | 1.54 | | -- | -- | -- | -- | -- | 132 | .18 | 211,934 | 23 | .54 | 209 | 7.8 |
| Dec. 2-19..... | 4,891,239 | -- | 1.38 | | .34 | -- | 1.31 | | -- | -- | -- | -- | -- | 111 | .15 | 738,382 | 20 | .41 | 174 | 7.8 |
| Dec. 20-28..... | 2,518,810 | -- | 1.48 | | .40 | -- | 1.41 | | -- | -- | -- | -- | -- | 119 | .16 | 407,644 | 21 | .47 | 189 | 7.7 |
| Dec. 29-Jan. 25, 1963..... | 7,192,066 | 12.0 | 1.00 | .50 | .34 | .03 | 1.38 | | .35 | .09 | .01 | .01 | .02 | 110 | .15 | 1,075,933 | 18 | .39 | 179 | 8.0 |
| Jan. 26-31..... | 1,368,595 | -- | 1.74 | | .44 | -- | 1.59 | | -- | -- | -- | -- | -- | 133 | .18 | 247,551 | 20 | .47 | 213 | 8.0 |
| Feb. 1-8..... | 2,621,355 | -- | 1.66 | | .44 | -- | 1.54 | | -- | -- | -- | -- | -- | 131 | .18 | 467,021 | 21 | .48 | 207 | 7.9 |
| Feb. 9-11..... | 1,114,512 | -- | 1.80 | | .61 | -- | 1.72 | | -- | -- | -- | -- | -- | 156 | .21 | 236,455 | 25 | .64 | 237 | 7.7 |
| Feb. 12-28..... | 5,351,206 | -- | 1.44 | | .35 | -- | 1.34 | | -- | -- | -- | -- | -- | 112 | .15 | 815,096 | 19 | .41 | 176 | 7.7 |
| Mar. 1-16..... | 4,446,149 | -- | 1.52 | | .35 | -- | 1.41 | | -- | -- | -- | -- | -- | 115 | .16 | 695,378 | 19 | .40 | 181 | 8.0 |
| Mar. 17-Apr. 6.. | 5,185,785 | -- | 1.56 | | .33 | -- | 1.41 | | -- | -- | -- | -- | -- | 112 | .15 | 789,899 | 18 | .38 | 183 | 8.0 |
| Apr. 7-May 2.... | 9,138,248 | 13.0 | .95 | .42 | .34 | .04 | 1.28 | | .29 | .09 | .01 | .02 | .01 | 103 | .14 | 1,280,086 | 20 | .42 | 167 | 7.9 |
| May 3-25..... | 10,725,223 | -- | -- | | .30 | -- | 1.26 | | -- | -- | -- | -- | -- | 101 | .14 | 1,473,217 | -- | -- | 158 | 7.9 |

COLUMBIA RIVER MAIN STEM--Continued

14-1057. COLUMBIA RIVER NEAR THE DALLES, OREG.--Continued

Chemical analyses, water year October 1962 to September 1963--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 26-June 25, 1963..... | 24,195,371 | -- | 1.12 | | 0.17 | -- | 1.05 | | -- | -- | -- | -- | -- | 80 | 0.11 | 2,632,456 | 13 | 0.23 | 129 | 7.7 |
| June 26-July 2.. | 4,874,777 | -- | 1.22 | | .17 | -- | 1.15 | | -- | -- | -- | -- | -- | 63 | .11 | 550,265 | 12 | .21 | 138 | 7.9 |
| July 3-Aug. 2... | 14,757,024 | 7.8 | 0.90 | 0.38 | .15 | 0.03 | 1.16 | | 0.25 | 0.04 | 0.01 | 0.01 | 0.00 | 60 | .11 | 1,605,564 | 10 | .19 | 140 | 7.8 |
| Aug. 3-27..... | 6,942,149 | -- | 1.38 | | .19 | -- | 1.26 | | -- | -- | -- | -- | -- | 87 | .12 | 821,395 | 12 | .23 | 154 | 7.9 |
| Aug. 28-Sept. 10 | 2,862,942 | -- | 1.44 | | .24 | -- | 1.28 | | -- | -- | -- | -- | -- | 97 | .13 | 377,679 | 14 | .28 | 167 | 7.7 |
| Sept. 11-30..... | 4,036,347 | -- | 1.52 | | .33 | -- | 1.41 | | -- | -- | -- | -- | -- | 106 | .14 | 582,168 | 18 | .37 | 183 | 7.5 |
| Total or weighted average | 126,100,000 | -- | 1.37 | | 0.26 | -- | 1.28 | | -- | -- | -- | -- | -- | 100 | 0.14 | 17,130,000 | 16 | 0.34 | 163 | 7.8 |

## 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 1963.
Water temperatures: February 1951 to September 1963.
EXTREMES, 1962-63.--Specific conductance: Maximum daily, 78 micromhos June 5; minimum daily, 37 micromhos Nov. 21.
Percent sodium: Maximum, 30 Oct. 9-17, Nov. 1-23; minimum, 24 May 3-24.
Sodium-adsorption-ratio: Maximum, 0.39 Aug. 1-30; minimum, 0.28 Feb. 19-23, May 3-24.
EXTREMES, 1951-63.--Specific conductance: Maximum daily, 133 micromhos Nov. 7, 1954; minimum daily, 35 micromhos Jan. 20, 1953, Feb. 12, 1961.
Percent sodium (1961-63): Maximum, 31 Oct. 11 to Nov. 2, 1961; minimum, 24 May 3-24, 1963.
Sodium-adsorption-ratio (1961-63): Maximum, 0.41 Oct. 1-10, 1961; minimum, 0.28 Feb. 19-23, May 3-24, 1963.
REMARKS.--Records of specific conductance of daily samples available in district office at Portland, Oreg.

Chemical analyses, water year October 1962 to September 1963

| 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. 1-8, 1962.. | 161,058 | 15.0 | 0.27 | 0.14 | 0.17 | 0.02 | 0.44 | | 0.07 | 0.08 | 0.01 | 0.01 | 0.02 | 57 | 0.08 | 12,485 | 28 | 0.37 | 62 | 6.8 |
| Oct. 9-17..... | 483,590 | --- | | .34 | .15 | --- | .38 | | --- | --- | --- | --- | --- | 50 | .07 | 32,884 | 30 | .36 | 50 | 6.8 |
| Oct. 18-31..... | 484,284 | --- | | .40 | .15 | --- | .31 | | --- | --- | --- | --- | --- | 73 | .10 | 48,080 | 27 | .33 | 60 | 6.6 |
| Nov. 1-20..... | 679,140 | --- | | .38 | .16 | --- | .36 | | --- | --- | --- | --- | --- | 63 | .09 | 58,189 | 30 | .37 | 59 | 6.7 |
| Nov. 21-23..... | 331,021 | --- | | .28 | .12 | --- | .28 | | --- | --- | --- | --- | --- | 52 | .07 | 23,410 | 30 | .31 | 43 | 7.1 |
| Nov. 24-Dec. 14. | 2,372,132 | --- | | .32 | .13 | --- | .34 | | --- | --- | --- | --- | --- | 50 | .07 | 161,305 | 29 | .33 | 48 | 6.9 |
| Dec. 15-28..... | 708,099 | --- | | .40 | .16 | --- | .36 | | --- | --- | --- | --- | --- | 67 | .09 | 64,522 | 28 | .35 | 60 | 6.6 |
| Dec. 29-Jan. 28, 1963. | 781,507 | 16.0 | .30 | .15 | .16 | .01 | .39 | | .12 | .08 | .01 | .02 | .01 | 67 | .09 | 71,211 | 26 | .34 | 65 | 6.7 |
| Jan. 29-Feb. 1.. | 94,017 | --- | | .46 | .17 | --- | .36 | | --- | --- | --- | --- | --- | 65 | .09 | 8,311 | 27 | .36 | 69 | 6.7 |
| Feb. 2-9..... | 1,191,511 | --- | | .32 | .12 | --- | .31 | | --- | --- | --- | --- | --- | 50 | .07 | 81,023 | 28 | .30 | 46 | 6.9 |
| Feb. 10-18..... | 393,977 | --- | | .42 | .16 | --- | .36 | | --- | --- | --- | --- | --- | 63 | .09 | 33,756 | 27 | .34 | 62 | 6.6 |
| Feb. 19-23..... | 434,380 | --- | | .32 | .11 | --- | .34 | | --- | --- | --- | --- | --- | 49 | .07 | 28,947 | 26 | .28 | 46 | 7.0 |
| Feb. 24-Mar. 18. | 912,853 | --- | | .40 | .14 | --- | .39 | | --- | --- | --- | --- | --- | 58 | .08 | 72,006 | 26 | .31 | 58 | 6.8 |
| Mar. 19-30..... | 528,159 | --- | | .44 | .16 | --- | .38 | | --- | --- | --- | --- | --- | 60 | .08 | 43,098 | 26 | .33 | 60 | 6.8 |
| Mar. 31-Apr. 22. | 2,372,688 | 13.0 | .22 | .15 | .13 | .02 | .39 | | .07 | .05 | .00 | .01 | .00 | 51 | .07 | 164,570 | 25 | .30 | 51 | 6.8 |
| Apr. 23-May 2... | 554,975 | --- | | .40 | .15 | --- | .41 | | --- | --- | --- | --- | --- | 54 | .07 | 40,757 | 27 | .33 | 56 | 6.8 |
| May 3-24..... | 2,061,818 | --- | | .38 | .12 | --- | .39 | | --- | --- | --- | --- | --- | 51 | .07 | 143,008 | 24 | .28 | 51 | 6.7 |
| May 25-June 22.. | 644,231 | --- | | .46 | .16 | --- | .46 | | --- | --- | --- | --- | --- | 61 | .08 | 53,445 | 26 | .34 | 65 | 6.7 |
| June 23-July 1.. | 172,479 | --- | | .44 | .16 | --- | .49 | | --- | --- | --- | --- | --- | 50 | .07 | 11,729 | 26 | .33 | 61 | 6.9 |
| July 2-31..... | 458,301 | 16.0 | .32 | .11 | .17 | .03 | .49 | | .06 | .08 | .01 | .02 | .02 | 49 | .07 | 30,541 | 28 | .37 | 63 | 6.9 |
| Aug. 1-30..... | 362,559 | --- | | .44 | .16 | --- | .49 | | --- | --- | --- | --- | --- | 51 | .07 | 25,147 | 29 | .39 | 66 | 6.9 |
| Aug. 31-Sept. 30 | 432,258 | --- | | .46 | .18 | --- | .48 | | --- | --- | --- | --- | --- | 58 | .08 | 34,096 | 26 | .38 | 67 | 6.8 |
| Total or weighted average | 16,200,000 | --- | 0.38 | | 0.14 | --- | 0.38 | | --- | --- | --- | --- | --- | 55 | 0.07 | 1,243,000 | 26 | 0.32 | 55 | 6.8 |

# INDEX