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RECONNAISSANCE OF THE QUALITY OF SURFACE WATER IN THE SAN RAFAEL RIVER BASIN, UTAH

by

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the United States Geological Survey
in cooperation with
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CONTENTS

ILLUSTRATIONS

[Plates are in pocket]

TABLES

CONVERSION FACTORS

Most numbers are given in this report in inch-pound units followed by metric units. The conversion factors are shown to four significant figures. In the text, however, the metric equivalents are shown only to the number of significant figures consistent with the accuracy of the number in inch-pound units.

Inch-pound			Metric	
Units (Multiply)	Abbreviation	(by)	Units (to obtain)	Abbreviation
Acre		0.4047	Square hectometer	hm^2
Acre-foot	acre-ft	0.001233	Cubic hectometer	hm^3
		1233	Cubic meter	m^3
Cubic foot per second	ft^3/s	0.02832	Cubic meter per second	m^3/s
Foot	ft	0.3048	Meter	m
Inch	in.	25.4	Millimeter	mm
		2.54	Centimeter	cm
Mile	mi	1.609	Kilometer	km
Square mile	mi^2	2.590	Square kilometer	km^2
Ton		0.9072	Metric ton	t

Chemical concentration and water temperature are given only in metric units. Chemical concentration is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For concentrations less than 7,000 mg/L, the numerical value is about the same as for concentrations in the inch-pound unit, parts per million.

Water temperature is given in degrees Celsius (°C), which can be converted to degrees Fahrenheit by the following equation: $^{o}F=1.8(^{o}C)+32$.

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ABSTRACT

The water-quality reconnaissance of the San Rafael River basin, Utah, encompassed an area of about 2,300 square miles (5,960 square kilometers). Data were obtained by the U.S. Geological Survey one or more times at 116 sites from June 1977 to September 1978. At 19 other sites visited during the same period, the streams were dry. Precipitation and stream discharge were significantly less than normal during 1977 and ranged from less than to more than normal during 1978.

Exposed rocks in the San Rafael River basin range in age from Permian to Holocene. The Carmel Formation of Jurassic age and various members of the Mancos Shale of Cretaceous age are major contributors of dissolved solids to streams in the basin.

There are eight major reservoirs having a total usable capacity of 115,000 acre-feet (142 cubic hectometers); seven are mainly for irrigation supply; one, having a usable capacity of 30,530 acre-feet (38 cubic hectometers), is for powerplant water supply. From about April to November, major diversions from Huntington, Cottonwood, and Ferron Creeks nearly deplete the flow downstream; during such periods, downstream flow in these streams and in the San Rafael River is mainly irrigation-return flow and some ground-water seepage.

The water at the points of major diversion on Huntington, Cottonwood, and Ferron Creeks is of excellent quality for irrigation; salinity hazard is low to medium, and sodium hazard is low. Dissolved-solids concentrations are less than 500 milligrams per liter.

The water at the mouths of Huntington, Cottonwood, and Ferron Creeks has markedly larger dissolved-solids concentrations than does the water upstream from major diversions. The changes in the chemical quality occur in stream reaches that cross a belt of land 10 to 15 miles (16 to 24 kilometers) wide where the Mancos Shale is widely exposed. This also is the area where nearly all the intensive irrigation in the San Rafael River basin is practiced.

There are no perennial tributaries to the San Rafael River downstream from Ferron Creek. Except during infrequent short periods of runoff from cloudbursts or snowmelt, the flow in the San Rafael River is composed of the flow that reaches the mouths of Huntington, Cottonwood, and Ferron Creeks. The quality of water in the mainstem of the San Rafael River is largely determined by the major consumptive use of water for irrigation in upstream areas and by the poor quality of irrigation-return flow. During the data-collection periods for this study, dissolved-solids concentrations in the San Rafael River were more than 2,000 milligrams per liter except during snowmelt runoff in June 1978 and during a major flood in August 1977.

The concentrations of trace elements, with the exception of strontium, were relatively small; strontium concentrations exceeded 1,500 micrograms per liter at seven sites. Most of the suspended-sediment discharge of the San Rafael River probably occurs during a few days each year and results mainly from cloudburst runoff.

INTRODUCTION

Purpose and scope

This report on the quality of surface water in the San Rafael River basin, Utah, was prepared by the U.S. Geological Survey in cooperation with the Utah Department of Natural Resources and Energy, Division of Water Rights. The purpose of the water-quality reconnaissance on which this report is based was (1) to obtain general information about the inorganic chemical characteristics of surface water in the basin (including some effects of the natural environment and present water use on the chemical characteristics), and (2) to obtain general information about the characteristics of fluvial sediment in the basin. The reconnaissance was limited in scope; it did not include intensive study of the effects of municipal sewage, irrigation, or mining on water quality. The principal objective of the study was a general definition of water-quality characteristics of streams in the basin; a secondary objective was the definition of specific problem areas or stream reaches.

Methods of investigation

Water-quality data were obtained one or more times by the U.S. Geological Survey at 116 sites in the study area (pl. 1) during June 1977 to September 1978. At 19 other sites visited during the same period, the streams were dry. Concentrations of dissolved solids and of major ions were determined for most water samples collected. Concentrations of trace elements were determined semiquantitatively once at 20 sites and quantitatively once at 9 sites. Chemical analyses of samples obtained during this investigation were made by standard methods of the U.S. Geological Survey.

Water-quality data were obtained specifically for this investigation along with data obtained at Geological Survey gaging stations during the period January 1977 to September 1978; those data are presented in tables 5 and 7. Data obtained by the Bureau of Reclamation at several sites, and by Utah Power and Light Co. at two sites, and published data obtained by the Geological Survey before January 1977 were considered in the reconnaissance but are not given in this report. The availability of those data is shown in table 6.

The reconnaissance of the San Rafael River basin was designed primarily to define the seasonal chemical quality of water. The periods of spring runoff, summer irrigation, and fall low flow were chosen for water sampling because the extremes in chemical quality of water were expected to occur at these times. Seasonal collection of chemical quality of water data during a short period of relatively stable flow conditions is not compatible with the collection of sediment data (that are useful for the computation of the quantity and characteristics of fluvial sediment transported within and from the basin); consequently, there were insufficient sediment data from which to make reliable estimates of sediment characteristics of the basin.

Most of the water-discharge data were obtained by nonstandard methods. Current meters were used for velocity determinations, but in a greatly reduced number of sections. The method provided fairly reliable approximations of discharge which were regarded as adequate for this reconnaissance.

Previous studies and acknowledgments

The geology of all or parts of the San Rafael River basin has been mapped by many workers. The geologic map used for this study was compiled by Stokes (1964). Iorns, Hembree, and Oakland (1965), described the water resources of the Upper Colorado River Basin, including that part drained by the San Rafael River. Price (1978, p. 15-23) described the relation of geology to water quality in the Upper Colorado River Basin, including that part drained by the San Rafael River. Waddell, Contratto, Sumsion, and Butler (1979) described the hydrology of the Wasatch Plateau-Book Cliffs coal-fields area, which includes part of the San Rafael River basin.

Elmer Gerhart, U.S. Geological Survey, gave valuable assistance in the collection of the field data on water quality and streamflow during the course of this study.

Numbering system for selected data sites

Most data sites visited during this reconnaissance are numbered sequentially in downstream order as shown in table 5. Some of the data sites also are assigned a site-location number along with the stream name, such as "Buckhorn Wash at mouth at (D-20-11)14cab," to specifically locate sites in areas remote from towns, roads, or other easily identifiable features. The system of numbering these sites in Utah is based on the cadastral land-survey system of the U.S. Government. The number describes the position of the site in the land net. By the land-survey system, the State is divided into four quadrants by the Salt Lake base line and meridian, and these quadrants are designated by the uppercase letters A, B, C, and D, indicating the northeast, northwest, southwest, and southeast quadrants, respectively. Numbers designating the township and range (in that order) follow the quadrant letter, and all three are enclosed in parentheses. The number after the parentheses indicates the section and is followed by one, two, or three letters indicating the quarter section, the quarter-quarter section, or the quarter-quarter-quarter section. The letters a, b, c, and d indicate, respectively, the northeast, northwest, southwest, and southeast quarters of each subdivision. Thus, Buckhorn Wash at mouth at site (D-20-11)14cab is in the NW1/4NE1/4SW1/4 sec. 14, T. 20 S., R. 11 E. The numbering system is illustrated in figure 1.

HYDROLOGIC SETTING

General features and climatic conditions

The San Rafael River basin encompasses about 2,300 square miles (5,960 km^2), of which about 2,035 square miles (5,270 km^2) are in Emery County, 230

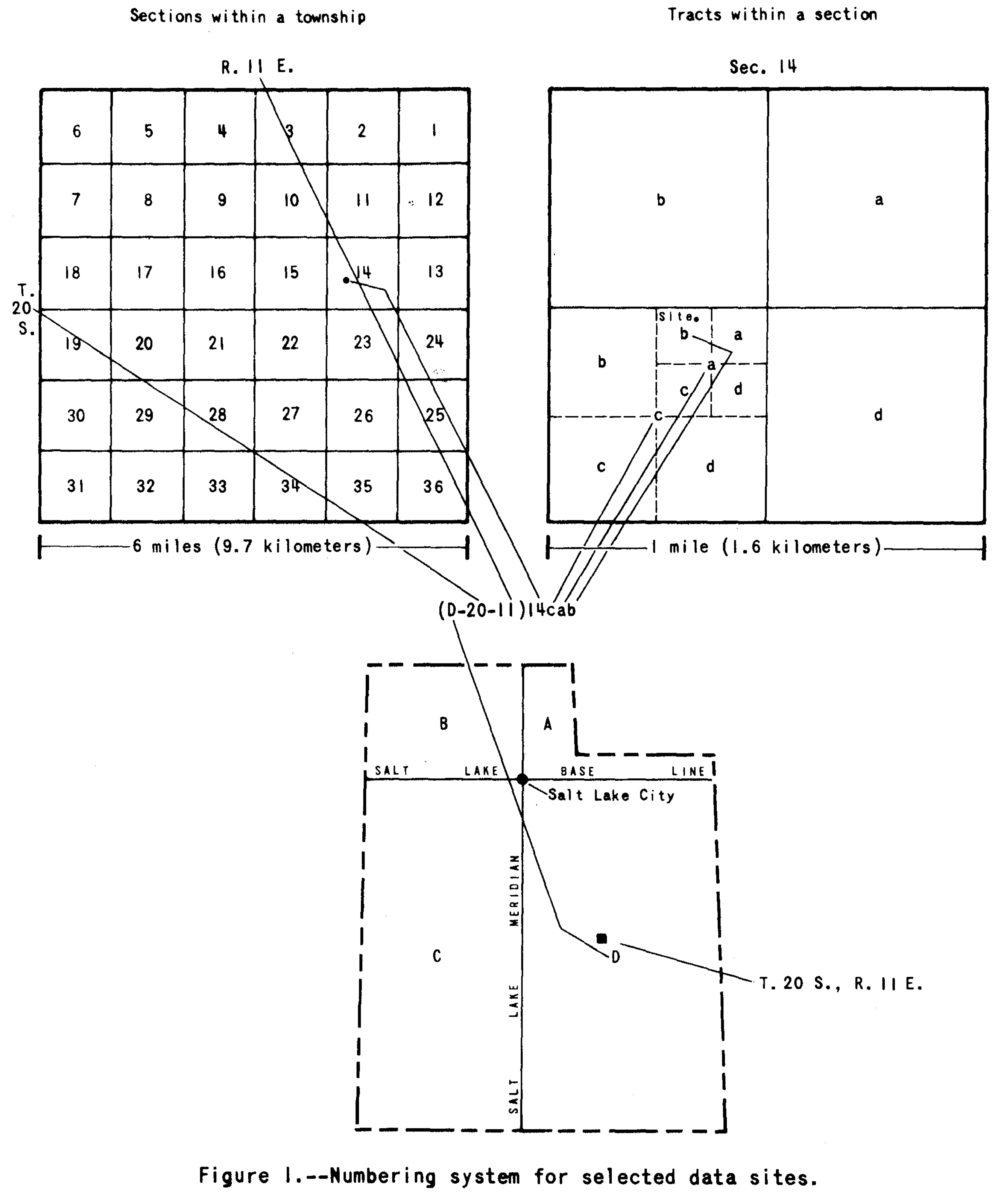

Figure 1.--Numbering system for selected data sites.

square miles (595 km^2) are in Sanpete County, and about 35 square miles (90 km^2) are in Wayne County. Principal streams in the basin are Huntington and Cottonwood Creeks, which converge to form the San Rafael River, and Ferron Creek, which joins the river about one-third of a mile (0.5 km) downstream from that convergence.

Altitudes in the basin range from about 4,000 feet (1,220 m) at the mouth of the San Rafael River to 11,285 feet (3,440 m) at South Tent Mountain in the headwaters of Cottonwood Creek. Altitudes in the headwaters of Huntington, Cottonwood, and Ferron Creeks commonly range from 9,000 to 11,000 feet (2,740 to 3,350 m).

Normal annual (1931-60) precipitation ranged from less than 6 inches (152 mm) in the eastern part of the basin to more than 40 inches (1,016 mm) in mountainous headwaters in the western part (fig.2). In these headwaters, 70 percent or more of the total annual precipitation generally falls as snow during October-April.

Drought prevailed throughout Utah during 1977. Precipitation at Emery during that year was 6.28 inches (160 mm) or 83 percent of the 1931-60 normal annual amount. The source of most of the runoff and most of the water used for irrigation in the San Rafael River basin is the mountainous headwaters. At three precipitation stations at altitudes ranging from 7,950 to 9,400 feet (2,420 to 2,865 m), precipitation during October 1976 to May 1977 ranged from only 52 to 62 percent of normal. Mean discharges during the 1977 water year at four streamflow-gaging stations in the basin ranged from 14 to 31 percent of the long-term average discharge at these stations.

The drought ended in 1978. Precipitation at Ferron during that year was 10.47 inches (266 mm) or 129 percent of normal. Precipitation at the three previously mentioned high-altitude precipitation stations during October 1977 to May 1978 ranged from 128 to 143 percent of normal. Mean discharges during the 1978 water year at the four streamflow-gaging stations ranged from 40 to 96 percent of the long-term average.

Geology

Rocks exposed in the San Rafael River basin range in age from Permian to Quaternary (pl. 1). Some units shown on plate 1 consist of several geologic formations. Others consist of only single formations that are of areal significance. The Carmel Formation of Jurassic age and various members of the Mancos Shale of Cretaceous age are major contributors of dissolved solids to streams in the basin. These rocks crop out extensively in the central part of the basin, including most areas of irrigation agriculture.

Water development and irrigation

Major water-storage facilities in the San Rafael River basin are mainly for irrigation supply; Electric Lake, a reservoir built and operated by Utah Power and Light Co., is for electric-power generation. The following table lists the major reservoirs in the San Rafael River basin:

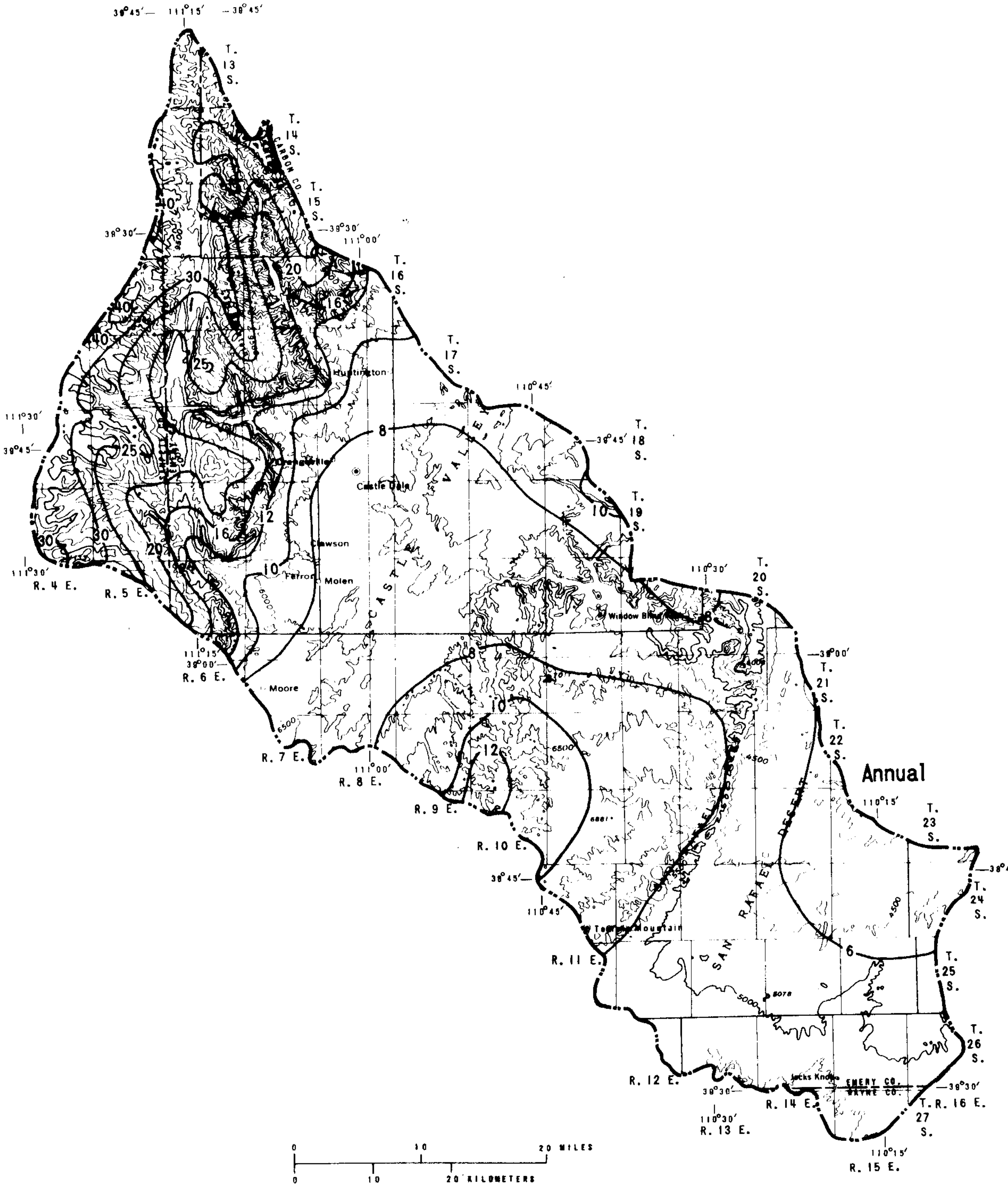

Figure 2.—Maps showing normal annual precipitation (1931-60) and normal October-April precipitation (1931-60) in the San Rafael River basin.

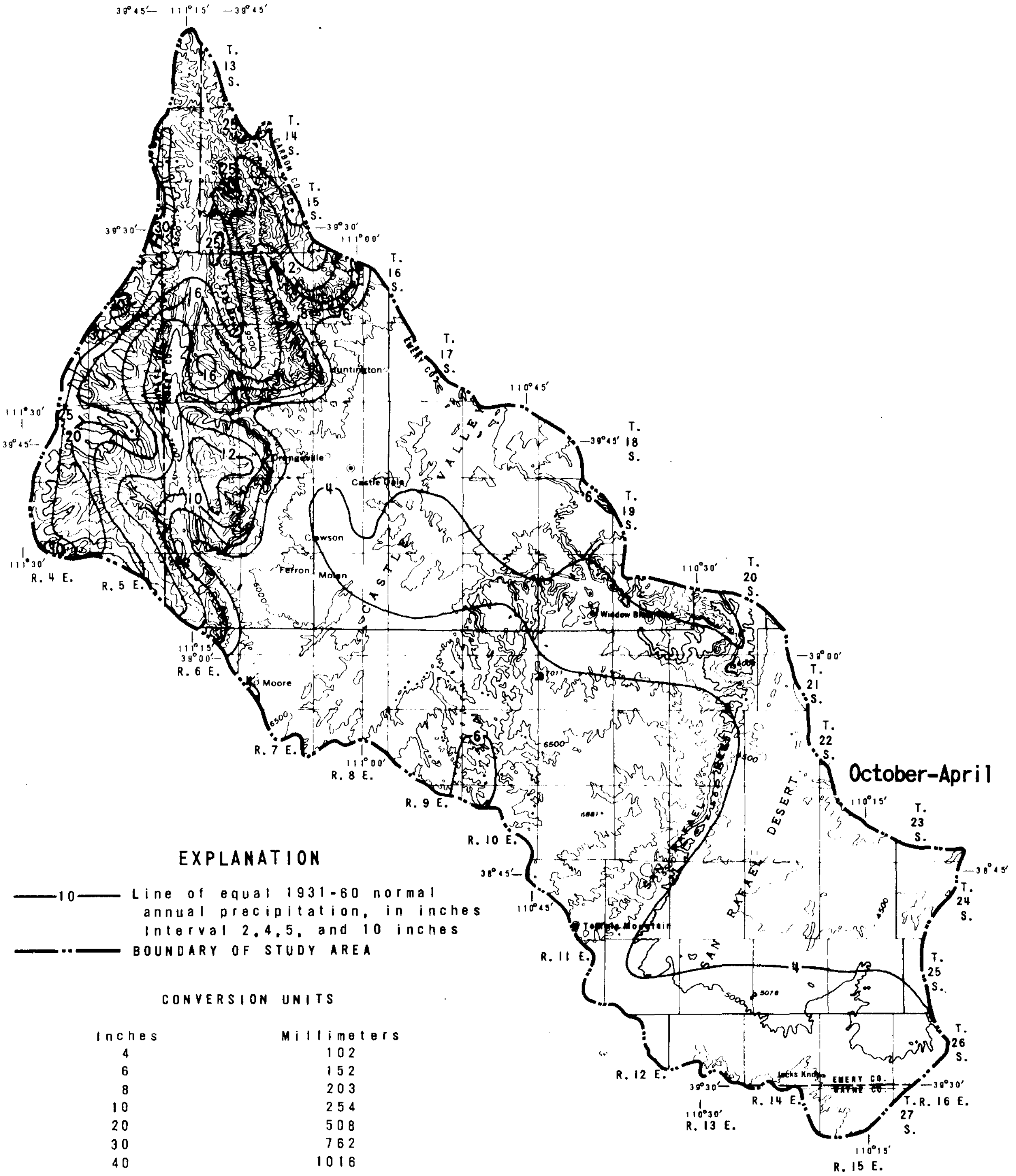

Figure 2.— Continued

Reservoir	Drainage basin	Usable capacity (acre-feet)
Millsite	Ferron Creek	16,700
Joes Valley	Cottonwood Creek	54,610
Miller Flat	Huntington Creek	2,450
Rolfson	do.	900
Cleveland	do.	4,000
Huntington	do.	2,460
Huntington North	do.	3,880
Electric Lake	do.	30,530
Total		115,530

During the main part of the irrigation season, from about April to November, major diversions from Huntington, Cottonwood, and Ferron Creeks nearly deplete the flow downstream from sites 92, 110, and 124 (pl. 1); exceptions are during peak snowmelt-runoff periods in May or early June. The diversions are not only for irrigation within the San Rafael River basin, but also for irrigation of about 13,000 acres (5,260 hm^2) in the southern part of the Price River basin, and transmountain diversions to the Sevier River basin. During the periods of major diversions, downstream flow in Huntington, Cottonwood, and Ferron Creeks and in the mainstem of the San Rafael River is mainly irrigation-return flow and some ground-water seepage.

CLASSIFICATION OF WATER FOR PUBLIC SUPPLY AND IRRIGATION

"The National Interim Primary Drinking Water Regulations***were promulgated on December 24, 1975, in accordance with the provisions of the Safe Drinking Water Act (Public Law 930523)***These regulations become effective on June 24, 1977, and become in essence the standards by which all public drinking water supplies are judged" (U.S. Environmental Protection Agency, 1976, Preface). The term "maximum contaminant level" is defined as "***the maximum permissible level of a contaminant in water which is delivered to the free-flowing outlet of the ultimate user of a public water system" (U.S. Environmental Protection Agency, 1976, p. 1). The following table lists maximum contaminant levels for inorganic chemicals other than fluoride:

Contaminant	Maximum contaminant level (mg/L)
Arsenic	0.05
Barium	1.0
Cadmium	.010
Chromium	.05
Lead	.05
Mercury	.002
Nitrate (as N)	10.0
Selenium	.01
Silver	.05

When the annual average of the maximum daily air temperatures for the location in which the community water system is situated is the following, the maximum contaminant levels (approval limits) and recommended control limits for fluoride (U.S. Environmental Protection Agency, 1976, p. 5) are:

Temperature		Recommended control limits for fluoride concentrations in milligrams per liter			Approval limit (mg/L)
°F	°C	Lower	Optimum	Upper	
53.7 and below	12.0 and below	1.1	1.2	1.3	2.4
53.8 to 58.3	12.1 to 14.6	1.0	1.1	1.2	2.2
58.4 to 63.8	14.7 to 17.6	.9	1.0	1.1	2.0
63.9 to 70.6	17.7 to 21.4	.8	.9	1.0	1.8
70.7 to 79.2	21.5 to 26.2	.7	.8	.9	1.6
79.3 to 90.5	26.3 to 32.5	.6	.7	.8	1.4

To provide a basis for evaluating a water source for a specific water use, the U.S. Environmental Protection Agency (1972, p. 50-94) recommended that water used for public supplies not exceed the listed concentrations of the following constituents:

Constituent	Concentration (mg/L)
Chloride	250
Copper	1
Iron	.3
Manganese	.05
Sulfate	250
Zinc	5

The property of hardness has been associated with effects observed in the use of soap; hardness may be said to represent the soap-consuming capacity of a water. Because hardness is not attributable to a single constituent but to the presence of alkaline earths--mainly calcium and magnesium--it is usually reported in terms of an equivalent concentration of calcium carbonate. Hardness, as calcium carbonate, is usually computed by multiplying the sum of milliequivalents per liter of calcium and magnesium by 50. Durfor and Becker (1964, p. 27) use the following classification of hardness ranges:

Classification	Hardness range (mg/L of $CaCO_3$)
Soft	0- 60
Moderately hard	61-120
Hard	121-180
Very hard	More than 180

A diagram for the classification of irrigation waters was devised by the U.S. Salinity Laboratory Staff (1954, p. 80). The U.S. Salinity Laboratory Staff emphasizes that in the classification of irrigation waters, the assumption is made that the water will be used under average conditions with respect to soil texture, infiltration rate, drainage, quantity of water used, and salt tolerance of the crops. Large deviations from the average for one or more of these variables may make the use of the water unsuitable for irrigation, which under average conditions would be suitable for irrigation. For example, if the water is applied to heavy-textured poorly drained soils in an area of extremely large evaporation rates, the salinity and sodium hazards (table 6) would increase.

A number of plants and crops adaptable to the San Rafael River basin are sensitive to boron. These include various types of beans, grapes, bell peppers, pumpkins, oats, as well as apricot, peach, cherry, apple, and pear trees (U.S. Salinity Laboratory Staff, 1954, table 9). The occurrence of boron in toxic concentrations in irrigation waters makes it necessary to consider this element in assessing water quality. The permissible limits of boron for several classes of irrigation waters (U.S. Salinity Laboratory Staff, 1954, table 14) are given below:

	Permissible limits, in micrograms per liter[1]		
Boron class	Sensitive crops	Semitolerant crops	Tolerant crops
1	Less than 330	Less than 670	Less than 1,000
2	330 to 670	670 to 1,330	1,000 to 2,000
3	670 to 1,000	1,330 to 2,000	2,000 to 3,000
4	1,000 to 1,250	2,000 to 2,500	3,000 to 3,750
5	More than 1,250	More than 2,500	More than 3,750

[1]Many tables in the literature on irrigation practices express the limits in milligrams per liter (mg/L) or in parts per million (ppm); 1 mg/L or 1 ppm is equivalent to 1,000 µg/L (micrograms per liter) for the concentration range in the above table. To convert the above concentrations in µg/L to mg/L (or to ppm) when the density of the water is near unity, move the decimal place three places to the left. For example, 0.67 milligrams per liter equals 670 micrograms per liter.

CHEMICAL QUALITY OF THE SURFACE WATER

General statement

The chemical composition of natural water is derived from many different sources of solutes, including gases and aerosols from the atmosphere, weathering and erosion of rocks and soil, solution or precipitation reactions occuring below the land surface, and effects resulting from activities of man (Hem, 1970, p. 1). The streams in the San Rafael River basin drain diverse terrane having markedly different geology, land use, vegetation, altitude, and climate.

Some general chemical characteristics of the water at 116 sites in the San Rafael River basin are given in table 6. In this table, the columns "Dominant cations" and "Dominant anions" list the ions that, if expressed as milliequivalents per liter, are usually dominant during either low flow or high flow. If more than one cation or anion is shown as dominant, they are listed in the relative order of dominance. Because some of the streams have water of highly variable composition, the relative order of dominance is not always the same under a given flow condition. The classification of the water relative to salinity hazard and sodium hazard under "Water-supply problems" is according to U.S. Salinity Laboratory Staff (1954, p. 80); the classification for hardness is according to Durfor and Becker (1964, p.27).

Approximate ranges of dissolved-solids concentrations in the water in streams in the San Rafael River basin are shown on plates 2-5 during seven periods in 1977 and 1978. For some of the streams during some periods, ranges are shown for reaches that extend for appreciable distances upstream from the most upstream sampling site. For such reaches, the ranges are estimates based on data collected during other periods, on geology, and on land use. For some of the streams, flow was observed at upstream sites but the stream was dry at a downstream site; in such cases, the point at which flow ceased was estimated. Plates 2 and 4 show graphically the major cations and anions, expressed in milliequivalents per liter, in the water at selected sites in the basin during August 1977 and June 1978.

Variations in the general chemistry of the water

Huntington, Cottonwood, and Ferron Creek basins upstream from major diversions

The San Rafael River basin upstream from major diversions includes the Huntington Creek basin upstream from site 92, the Cottonwood Creek basin upstream from site 110, and the Ferron Creek basin upstream from site 124 (pl. 1). Data collected at sites 92-99, 110-116, and 124-127 (tables 5-7) are representative of the general chemical quality of surface water in these headwater areas. At all these sites, except site 112, the dissolved-solids concentrations of the waters sampled were less than 500 milligrams per liter. The dissolved-solids concentration on water sampled at site 112 exceeded 500 milligrams per liter. Water sampled at all sites generally was of the calcium bicarbonate or calcium magnesium bicarbonate type.

Rocks in the Huntington, Cottonwood, and Ferron Creek basins upstream from sites 92, 110, and 124 are of Tertiary and Cretaceous age (pl. 1) and contain small amounts of readily soluble minerals such as gypsum. Altitudes generally are between 6,000 and 11,000 feet (1,830 and 3,350 m). Most of the area is forested, and grazing is the principal land use.

Water available for diversion immediately downstream from sites 92, 110, and 124 is of excellent quality for irrigation. Generally, the salinity hazard is low to medium, and the sodium hazard is low. Nearly all the flow of the streams is diverted for irrigation during April-November, except for a few days in May or June during maximum snowmelt discharge of the streams. Because the flow having low dissolved-solids concentrations is diverted, it is not available for downstream dilution of the more mineralized natural inflow or irrigation-return flow to the streams.

Huntington, Cottonwood, and Ferron Creek basins downstream from major diversions

The mouths of Huntington, Cottonwood, and Ferron Creeks are all within the same section of land (sec. 21, T. 19 S., R. 9 E.). The San Rafael River is formed by the confluence of Huntington and Cottonwood Creeks; Ferron Creek joins the San Rafael River about one-third of a mile (0.5 km) downstream from this confluence.

The water at the mouths of Huntington, Cottonwood, and Ferron Creeks has markedly larger dissolved-solids concentrations than the water at sites 92, 110, and 124. Sites 31 and 33 are regarded as representative of water at or near the mouth of Huntington Creek, sites 35, 36, and 38 as representative of water of the mouth of Cottonwood Creek, and sites 29, 39, and 39.5 as representative of water of the mouth of Ferron Creek. The very large increases in dissolved-solids, sodium, and sulfate concentrations between the major diversions and the mouths of these three streams, are shown in table 1.

Table 1.--Ranges in concentration of dissolved solids, sodium, and sulfate at selected sites

Stream and site numbers	Range, in milligrams per liter		
	Dissolved solids[1]	Sodium (Na)	Sulfate (SO_4)
Huntington Creek			
92	155-305	2.1-13	14-67
31,33	761-6,250	83-1,100	390-4,200
Cottonwood Creek			
110	208-407	11-42	21-110
35, 36, 38	305-5,720	320-1,100	1,500-3,800
Ferron Creek			
124, 125	217-499	5.8-47	29-210
29, 39, 39.5	473-9,630	240-1,400	1,100-5,300

[1]Data obtained by Bureau of Reclamation (sites 36, 39, 39.5, and 125) and by Utah Power and Light Co. (site 92) are included.

The consistently large increases in dissolved-solids concentrations and the major changes in the chemical quality of the water are shown on plates 2-5. The changes occur in stream reaches that cross a belt of land 10 to 15 miles (16 to 24 km) wide where rocks of the Mancos Shale are widely exposed, and where nearly all the intensive irrigation in the San Rafael River basin is practiced. The pronounced degradation in the quality of the water in the streams results from the following:

1. Most, and at times all, of the excellent quality runoff from areas upstream from sites 92, 110, and 124 is diverted for irrigation downstream from these sites.

2. Downstream from sites 92, 110, and 124, small amounts of natural runoff having relatively large dissolved-solids concentrations may enter the flow-depleted streams.

3. Downstream from sites 92, 110, and 124, relatively large amounts of irrigation-return flow having relatively large dissolved-solids concentrations probably enters the flow-depleted streams. The soils that are irrigated and from which return flow enters the streams are commonly developed on gypsum-bearing Mancos Shale.

During an appreciable part of each year, only part of the water that reaches the mouths of Huntington, Cottonwood, and Ferron Creeks is undiverted flow from the headwaters; some of the flow is an accretion of different water that enters the stream downstream from diversions and that has markedly different chemical characteristics than those of the diverted water. As is evident from plates 2-5, degradation of water quality of the streams begins immediately downstream from the major diversions, whether during extremely low flow in drought periods (pl. 2) or during peak snowmelt periods (pl. 4).

San Rafael River basin downstream from Ferron Creek

No perennial tributaries enter the San Rafael River downstream from Ferron Creek. Except during infrequent short periods of runoff from cloudbursts or snowmelt, the flow in the San Rafael River is composed of the flow that reaches the mouths of Huntington, Cottonwood, and Ferron Creeks. On June 7, 1977, flow reached the mouths of all three creeks; on August 3, 1977, Ferron Creek at mouth (site 29) was dry; on August 16-17, 1977, Ferron Creek at mouth and Huntington Creek at mouth (site 31) were dry. Thus, the San Rafael River generally is a composite of variable proportions of water from the drainage areas of Huntington, Cottonwood, and Ferron Creeks. No significant diversions or other consumptive uses by man affect the flow in the mainstem of the San Rafael River. Evaporation, evapotranspiration, and seepage losses from the channel may result in flow depletion.

The quality of water in the mainstem of the San Rafael River is largely determined by the major consumptive use of water for irrigation in upstream areas and by the poor quality of the irrigation-return flow. Although evaporation from the channel and evapotranspiration along the channel probably result in some additional degradation of the quality of water in the San Rafael River, the general chemical characteristics of the water in the river are established in the downstream parts of Huntington, Cottonwood, and Ferron Creek basins.

Plates 2-5 show that dissolved-solids concentrations in the San Rafael River were more than 2,000 milligrams per liter, except during a period of snowmelt in June 1978 and at San Rafael River at mouth (site 1) during a major flood in August 1977. This flood apparently was caused by runoff from cloudbursts downstream from site 26 (pl. 1) on August 17-18, 1977. Dissolved-solids concentrations during the flood remained more than 2,000 milligrams per liter in the San Rafael River except at the mouth (site 1) where the concentration was 1,860 milligrams per liter at a water discharge of 1,220 cubic feet per second (34.55 m^3/s). The relatively large dissolved-solids concentrations during floodflow may be caused by the re-solution of salts deposited in the mainstem and some tributary channels during periods of low flow. Concentrations at tributary sites 6, 7.2, 8, and 9 during this same period of cloudburst runoff (pl. 2 and table 5) show that dissolved-solids concentrations ranged from only 234 to 440 milligrams per liter. Inflow from these tributaries into the downstream part of the San Rafael River resulted in dilution of the dissolved solids in the mainstem.

Trace elements

Substances that typically occur in concentrations of less than 1.0 milligram per liter (1,000 g/L) are commonly referred to as "minor" or "trace" elements or constituents (Hem, 1970, p. 188). Samples were obtained at 20 sites for determination of 25 trace elements by semiquantitative methods, which result in data that are only approximations of true values (table 7). These data were used to select 10 sites at which samples were obtained for determination of 12 trace elements by standard quantitative methods (table 7). Both quantitative and semiquantitative methods were used for 9 of these 12 trace elements; thus one or both methods were used for a total of 28 trace elements.

The concentrations of trace elements with the exception of strontium, were small. Strontium concentrations that exceed 1,500 micrograms per liter are considered large (Skougstad and Horr, 1963, p. 63). Strontium concentrations at sites 1, 12, 29, 31, 35, 68, and 73 exceeded 1,500 micrograms per liter.

Other characterisitcs of the water

Since 1880, total coliform bacteria have been used as indicators of sanitary quality of water. Fecal coliform and fecal streptococcus bacteria are a more specific indicator of warm-blooded animal contamination. During September 1977, all three bacteria types (total coliform, fecal coliform, and fecal streptococcus) were sampled at eight sites, generally upstream and downstream from populated areas. Data obtained during this single period are not adequate for a general evaluation of the sanitary quality of the water but may be used as a rough indicator of the quality. Results of the bacteriological analyses are reported in number of colonies per 100 milliliters of water sample (table 2).

Total coliform bacteria densities should not exceed 20,000 per 100 milliliters, and fecal coliform bacteria densities should not exceed 2,000 per 100 milliliters in raw surface waters intended for public-water supplies (U.S. Environmental Protection Agency, 1972, p. 58). A ratio has been developed to help clarify results of bacteriological analyses. If, for each sample, the fecal coliform bacteria count is divided by the fecal streptococcus bacteria count, a useful ratio is formed.

$$\frac{\text{Fecal coliform bacteria}}{\text{Fecal streptococcus bacteria}} = \text{Ratio}$$

The ratio can be interpreted as follows:

If the ratio is greater than or equal to 4, it indicates that pollution is derived from human wastes.

If the ratio is less than or equal to 0.7, it indicates that pollution is derived from livestock or poultry.

If the ratio is between 0.7 and 4, it indicates mixed pollution sources.

Table 2.--Bacteriological data for selected sites

Creek	Site No.	Colonies per 100 mL of water: Total coliform bacteria	Colonies per 100 mL of water: Fecal coliform bacteria	Colonies per 100 mL of water: Fecal streptococcus bacteria	Ratio FC/FS
Ferron	125	380	8	61	0.13
	29	3,900	120	220	.54
Cottonwood	104	600	24	39	.62
	35	4,100	80	180	.44
Huntington	92	47	8	27	.30
	60	3,000	88	96	.92
	46	1,000	400	420	.95
	31	3,700	120	24	5.0

A sample was obtained on April 18, 1978, at San Rafael River near Green River (site 12) which is downstream from all irrigated areas in the basin. The sample was analyzed to determine the presence of the following pesticides: 2,4-DP, 2,4-D, 2,4,5-T, Aldrin, Chlordane, Chlorpyrifos, DDD, DDE, DDT, Diazinon, Dieldrin, Endosulfan, Endrin, Parathion, Trithion, Ethion, Heptachlor epoxide, Heptachlor, Lindane, Malathion, Methyl parathion, Methyl trithion, PCB, PCN Perthane, Silvex, and Toxaphene. None of these pesticides were detected in the sample.

Oxygen dissolved in water is derived from the air and from the oxygen given off in the process of photosynthesis by aquatic plants. The solubility of oxygen in water is mainly dependent on three factors:

1. Temperature: As the water temperature increases, the ability of water to retain dissolved oxygen decreases.

2. Atmospheric pressure: As atmospheric pressure increases, the solubility of oxygen in water increases.

3. Dissolved solids: As the dissolved-solids concentration of a water increases, the water's ability to retain dissolved oxygen decreases.

Because the dissolved-oxygen concentration of a stream changes seasonally and may change very rapidly diurnally, a measurement of dissolved oxygen is representative only of a specific place and time of measurement. The few dissolved-oxygen data presented in table 3 are definitive of neither annual or diurnal conditions and were obtained only to locate possible problem areas for future studies. The data indicate that dissolved-oxygen concentrations are relatively large, even when water temperatures and dissolved-solids concentrations are relatively large.

Table 3.—Dissolved-oxygen concentrations at selected sites

Site No.	Site	Date	Dissolved solids (mg/L)	Water temperature (°C)	Dissolved oxygen (mg/L)
41	Ferron Creek at (D-20-7)13ddd, near Ferron	9-12-78	1,980	18.5	10.2
46	Huntington Creek at country road, at (D-18-9)8dba	9-12-78	3,800	10.0	8.0
60	Huntington Creek at Highway U-10, at (D-17-9)18ccb	9-11-78	1,810	20.0	8.3
68	Cottonwood Creek at (D-18-8)33bda, at Castledale	9-12-78	1,910	14.0	10.8
73	Rock Canyon Creek at Highway U-10, at (D-19-7)24adb	9-12-78	2,650	16.0	8.7
79	Ferron Creek at (D-20-7)15bcc, at Ferron	9-12-78	977	16.0	8.7
92	Huntington Creek above Fish Creek, near Huntington	9-11-78	181	12.0	8.6
104	Cottonwood Creek below diversion, at (D-18-7)24aad	9-13-78	309	12.5	8.8
110	Cottonwood Creek near Orangeville	9-12-78	226	9.0	9.2
124	Ferron Creek below reservoir, at (D-20-7)7bbb	9-12-78	295	16.0	8.0
125	Ferron Creek (upper station) near Ferron	9-13-78	304	6.5	9.7

FLUVIAL SEDIMENT

Most of the sediment discharge by streams in arid and semiarid regions is transported during short periods of time during normal years. The largest suspended-sediment concentrations and discharges are characteristic of high-intensity runoff and usually occur as a result of runoff from cloudbursts. Sediment concentration and discharge during snowmelt runoff may increase significantly from concentrations and discharges during base flow but are small relative to those during high-intensity runoff from cloudbursts.

In general, suspended-sediment concentrations increase with increasing discharge of a stream, but dissolved-solids concentrations decrease with increasing water discharge. Thus, the quality of water, relative to its sediment content, generally is best during periods of low flow; the quality of water, relative to its chemical content, generally is best during periods of high flow. Furthermore, the range in sediment concentrations generally is much greater than the range in dissolved-solids concentrations; sediment concentrations may range from a few hundred or less to more than 100,000 milligrams per liter during a few hours.

The reconnaissance of the quality of surface water in the San Rafael River basin was designed primarily to define the chemical quality at selected times during the year. The scope of this investigation was limited and did not include special efforts to obtain water-quality data--either chemical quality or sediment--during cloudburst runoff. During any given reconnaissance of a single-stream system, cloudburst runoff is not desirable once the data collection has started because comparability of data obtained during similar runoff conditions throughout the system is not avaiable. Occasionally, however, such runoff does occur during one of the data-collection periods and offers the opportunity to obtain sediment data during one of the relatively rare periods of high-intensity runoff. On August 17-18, 1977, intense cloudbursts and runoff in the San Rafael River basin downstream from site 26 resulted in a major flood on the San Rafael River. Data obtained during this flood are shown in table 4. Water discharge and suspended-sediment concentration and discharge at some time during the flood were probably much greater than the single values shown for each site. These data are indicative, however, of discharges and concentrations to be expected during major floods on the San Rafael River. The suspended-sediment discharges determined during this flood indicate that an annual suspended-sediment discharge ranging from 300,000 to 1,000,000 tons (272,000 to 907,000 t) might be expected during many years.

Table 4.—Suspended-sediment discharges at selected sites, August 17-18, 1977, and June 5-8, 1978

Site No.	Site	Date	Water discharge (ft^3/s)	Suspended-sediment concentration (mg/L)	Suspended-sediment discharge (tons/day)
1	San Rafael River at mouth	8-18-77	1,220	56,300	182,000
7	San Rafael River above Iron Wash	8-18-77	500	96,600	130,000
12	San Rafael River near Green River (09328500)	8-18-77	440	81,200	96,500
13	San Rafael River at Highway I-70	8-18-77	450	60,500	73,500
19	Buckhorn Wash below Furniture Draw	8-17-77	.1	22,300	6.0
35	Cottonwood Creek at mouth	6- 7-78	16	179	7.7
60	Huntington Creek at State Highway U-10	6- 5-78	85	404	93
69	Drain at State Highway U-10	6- 7-78	12	276	8.9
73	Rock Canyon Creek at State Highway U-10	6- 8-78	.5	49	.07
79	Ferron Creek at Ferron	6- 8-78	22	64	3.8
110	Cottonwood Creek near Orangeville	6- 7-78	119	110	35

Data shown in table 4 for selected sites during June 5-8, 1978, are indicative of the small suspended-sediment concentrations during most of each year. Although water discharges resulting from snowmelt were appreciably greater than base flow during much of the year, the suspended-sediment concentrations and discharges were small. A reasonable conclusion is that 90 percent or more of the annual suspended-sediment discharge of the San Rafael River commonly occurs in 10 percent or less of the time each year.

SUMMARY

1. The dissolved-solids concentrations of water in Huntington, Cottonwood, and Ferron Creeks upstream from major diversions are nearly always less than 500 milligrams per liter. The water is of excellent quality for irrigation; salinity hazard generally is low to medium, and the sodium hazard is low.

2. The dissolved-solids concentrations of the water in Huntington, Cottonwood, and Ferron Creeks increase markedly between the major diversions and the mouths of these streams. The increases in the concentrations of sodium and sulfate are especially large.

3. During an appreciable part of each year, the water that reaches the mouths of Huntington, Cottonwood, and Ferron Creeks is an accretion of water that enters the streams downstream from the major diversions and is a composite of ground-water seepage and significant amounts of irrigation-return flow.

4. The chemical quality of the water in the San Rafael River downstream from Ferron Creek is largely determined by the contributions from Huntington, Cottonwood, and Ferron Creeks. The general chemical characteristics of the San Rafael River remain relatively unchanged between Ferron Creek and the mouth of the San Rafael River.

5. The concentrations of trace elements, with the exception of strontium were small. Concentration of strontium exceeded 1,500 micrograms per liter at seven sites.

6. Most of the suspended-sediment discharge probably occurs during a few days each year and results mainly from cloudburst runoff.

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Site No.	Site and location	Date of collection	Temperature (°C)	Discharge (ft^3/s)	Dissolved silica (SiO_2)	Dissolved calcium (Ca)	Dissolved magnesium (Mg)	Dissolved sodium (Na)	Dissolved potassium (K)
1	San Rafael River at mouth at (D-24-16)3aab	8-18-77[1]	21.5	1,220	5.6	430	49	56	13
		4-20-78	13.0	21	5.1	290	210	520	12
		6- 6-78	19.0	70	6.0	190	130	340	11
		9-14-78	-	Dry	-	-	-	-	-
2	Moonshine Wash at mouth at (D-24-16)10abb	8-18-77	-	Dry	-	-	-	-	-
		6- 6-78	-	Dry	-	-	-	-	-
3	Dugout Wash at mouth at (D-24-15)17ccc	8-18-77	-	Dry	-	-	-	-	-
		6- 6-78	32.0	.01	.60	240	310	98	36
4	San Rafael River below Cottonwood Wash at (D-24-15)6bbc	8-18-77[1]	24.0	550	8.3	540	74	35	18
		6- 5-78	22.0	85	4.0	190	53	340	11
5	Cottonwood Wash at mouth at (D-24-15)1aba	8-18-77	-	Dry	-	-	-	-	-
		6- 5-78	-	Dry	-	-	-	-	-
6	Iron Wash at mouth at (D-23-14)26ada	8-18-77[1]	24.0	.50	9.2	67	13	14	12
		6- 5-78	-	Dry	-	-	-	-	-
7	San Rafael River above Iron Wash at (D-23-14)26aab	8-18-77[1]	23.0	500	6.2	540	71	37	14
		6- 5-78	22.0	85	4.1	160	110	300	9.8
		9-13-78	25.5	4.0	5.4	240	200	510	13
7.2	Unnamed tributary at mouth at (D-23-14)14c	8-18-77[1]	22.0	25	20	6.2	4.5	150	4.5
		6- 5-78	-	Dry	-	-	-	-	-
8	Greasewood Draw at mouth at (D-23-14)4adc	8-18-77[1]	25.0	10	9.6	21	6.0	41	23
		6- 5-78	-	Dry	-	-	-	-	-
9	Iron Wash at Highway U-24 at (D-23-13)36abc	8-18-77[1]	25.0	2.0	8.8	54	12	13	12
		6- 5-78	-	Dry	-	-	-	-	-
10	Old Woman Wash at (D-24-13)31acd	8-18-77	-	Dry	-	-	-	-	-
		6- 5-78	-	Dry	-	-	-	-	-
11	Temple Wash at Highway U-24 at (D-24-12)11adb	8-18-77	-	Dry	-	-	-	-	-
		6- 5-78	-	Dry	-	-	-	-	-
12	San Rafael River near Green River	1-19-77	.0	19	11	350	190	470	9.8
		3-11-77	4.0	32	6.9	270	180	450	9.2
	USGS gaging-station number 09328500	3-22-77	11.5	22	6.0	290	200	540	9.4
		5- 4-77	20.0	3.8	8.2	450	230	650	19
		5-16-77	18.0	13	5.7	400	280	800	16
		6-29-77	32.5	.40	3.8	350	380	1,100	13
		7-21-77	25.0	100	11	560	84	230	17
		8- 1-77	27.0	.30	7.1	420	220	980	17
		8-18-77	24.0	440	6.8	540	62	99	18
		8-24-77	26.0	11	11	550	63	330	16
		9-28-77	18.5	.70	9.2	460	170	380	17
		10-13-77	14.0	1.3	9.4	440	95	370	14
		10-21-77	9.0	.61	9.0	400	140	380	14
		11- 9-77	4.5	5.2	6.9	400	220	550	16
		11-17-77	3.0	5.2	7.2	390	210	550	15
		12- 8-77	1.5	11	6.6	370	220	550	13
		12-14-77	2.5	11	9.0	490	200	480	16
		1-18-78	1.5	17	8.7	290	160	400	9.8
		2-24-78	.0	27	8.3	280	160	430	9.5
		3-24-78	10.0	72	6.4	290	190	570	10
		4-18-78	8.5	22	4.4	280	200	540	11
		5-26-78	11.5	26	6.2	240	230	630	15
		6- 5-78	20.5	88	3.7	140	94	240	8.2
		7- 6-78[2]	25.0	256	7.9	110	75	150	5.3
		8- 9-78[3]	32.0	10	8.1	170	150	350	10
		9-13-78	20.5	10	5.0	240	190	480	12
13	San Rafael River at Highway I-70 at (D-22-14)5dcb	8-18-77[1]	23.0	450	6.7	560	64	80	14
		4-19-78	19.0	20	5.1	280	200	450	11
		6- 6-78	25.0	120	4.3	150	91	230	8.1
		9-13-78	16.5	13	4.2	230	170	440	12
14	Spotted Wolf Canyon at Highway I-70 at (D-22-14)5cac	8-18-77	-	Dry	-	-	-	-	-
		6- 6-78	-	Dry	-	-	-	-	-
15	Spring Canyon at mouth at (D-21-12)1d	8-18-77	-	Dry	-	-	-	-	-
		6- 6-78	-	Dry	-	-	-	-	-
16	San Rafael River above Spring Canyon at (D-21-12)1c	6- 8-77	25.5	1.0	3.5	370	340	1,100	17
		8- 2-77	34.0	.10	9.4	440	66	130	15
		6- 6-78	20.0	110	6.4	120	74	190	6.3
17	Buckhorn Wash at mouth at (D-20-11)14cab	8-17-77	-	Dry	-	-	-	-	-
		4-19-78	-	Dry	-	-	-	-	-
		6- 6-78	-	Dry	-	-	-	-	-

collected, January 1977 to September 1978

Milligrams per liter, unless otherwise noted															
Bicarbonate (HCO_3)	Carbonate (CO_3)	Dissolved sulfate (SO_4)	Dissolved chloride (Cl)	Dissolved nitrate (NO_3) + nitrite (NO_2) as N	Ammonia (NH_4) as N	Dissolved phosphate (PO_4)	Dissolved fluoride (F)	Dissolved solids (sum of constituents)	Specific conductance (μmho/cm at 25°C)	Hardness as CaCO3: Calcium, magnesium	Hardness as CaCO3: Noncarbonate	Sodium-adsorption ratio	pH	Dissolved boron (B) (μ/L)	Dissolved oxygen
180	0	1,200	16	0.53	-	0.00	0.20	1,860	2,180	1,300	1,100	0.70	7.1	160	-
280	0	2,400	85	-	-	-	.30	3,660	4,300	1,600	1,400	5.7	8.1	310	-
180	0	1,300	50	.15	-	.00	.40	2,120	2,900	1,000	860	4.7	7.7	270	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
290	0	1,700	63	-	-	-	1.2	2,590	2,950	1,900	1,600	1.0	7.6	290	-
160	0	1,500	9.3	-	-	-	.20	2,260	2,640	1,700	1,500	.40	7.3	190	-
330	0	1,100	48	-	-	-	.40	1,910	2,750	690	420	5.6	7.8	270	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	0	110	13	-	-	-	..20	342	585	220	49	.40	7.5	150	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	0	1,500	11	.20	-	.00	.20	2,240	2,545	1,600	1,500	.40	7.2	190	-
260	0	1,100	38	-	-	-	.40	1,850	2,400	850	640	4.5	7.7	250	-
280	0	2,200	93	.06	-	-	.30	3,400	4,200	1,400	1,200	5.9	8.1	380	-
340	7	72	6.5	-	-	-	1.1	440	630	34	0	11	9.3	220	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	0	60	3.6	-	-	-	.30	234	341	77	0	2.0	8.7	160	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
170	0	100	12	-	-	-	.20	296	498	180	45	.40	7.9	140	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
600	0	2,100	73	.72	0.28	-	.40	3,500	3,820	1,700	1,200	5.0	7.7	340	11.8
347	0	1,900	62	.43	.21	-	.30	3,050	3,690	1,400	1,100	5.2	8.6	250	11.4
380	0	2,200	73	.22	.05	-	.30	3,510	4,130	1,500	1,200	6.0	8.3	290	9.4
340	0	2,900	200	.24	.12	-	.40	4,630	4,340	2,100	1,800	6.2	7.9	470	-
460	0	3,200	130	.10	.05	-	.40	5,060	5,510	2,200	1,800	7.5	8.2	430	8.0
450	0	4,300	160	.01	.05	-	.10	6,530	7,230	2,400	2,100	9.7	7.9	520	8.1
170	0	1,900	65	.99	.07	-	.40	2,950	3,250	1,700	1,600	2.4	7.6	330	5.1
240	0	3,600	110	-	-	-	.40	5,470	5,870	2,000	1,800	9.6	7.8	440	-
170	0	1,600	23	-	-	.00	.20	2,430	2,720	1,600	1,500	1.1	7.2	200	-
190	0	2,000	42	2.3	-	-	.50	3,110	3,460	1,600	1,500	3.6	7.6	260	5.9
280	0	2,100	140	.03	.07	-	.30	3,420	3,930	1,800	1,600	3.8	8.1	400	8.8
250	0	1,900	88	-	-	-	.50	3,040	3,470	1,500	1,300	4.2	7.9	230	-
310	0	2,000	130	.05	.17	-	.30	3,230	3,760	1,600	1,300	4.2	8.0	350	8.6
330	0	2,500	110	-	-	-	.40	3,970	4,460	1,900	1,600	5.5	7.5	360	-
430	0	2,400	120	.05	.09	-	.30	3,900	4,330	1,800	1,500	5.6	8.3	380	10.8
350	0	2,500	92	-	-	-	.30	3,920	4,400	1,800	1,500	5.6	8.3	350	-
500	0	2,400	130	.15	.19	-	.40	3,970	4,240	2,000	1,600	4.6	8.2	370	11.8
420	0	1,800	78	.77	.24	-	.40	2,950	3,310	1,400	1,000	4.7	8.2	280	11.0
410	0	1,800	59	.89	.30	-	.40	2,950	3,460	1,400	1,000	5.1	8.3	260	12.4
370	0	2,200	82	.95	.05	-	.50	3,530	3,880	1,500	1,200	6.4	8.2	290	9.4
370	0	2,100	85	-	-	-	.30	3,400	4,200	1,500	1,200	6.0	8.3	330	10.4
370	0	2,400	92	-	-	-	.40	3,800	4,410	1,500	1,200	7.0	8.2	410	8.0
250	0	980	28	-	-	-	.30	1,620	2,050	740	530	3.8	7.6	210	8.0
260	0	620	23	.11	-	-	.30	1,120	1,540	580	370	2.7	8.1	170	-
230	0	1,500	62	-	-	-	.40	2,360	2,950	1,000	850	4.7	8.2	340	-
250	0	2,100	86	.05	.00	-	.30	3,240	4,100	1,400	1,200	5.6	8.2	380	-
170	0	1,600	27	.57	-	.00	.20	2,440	2,745	1,700	1,500	.90	7.3	230	-
310	0	2,100	79	-	-	-	.30	3,280	3,940	1,500	1,300	5.0	7.8	300	-
260	0	920	27	-	-	-	.30	1,560	2,000	750	540	3.7	7.5	190	-
260	0	1,900	73	.00	-	-	.40	2,960	3,800	1,300	1,100	5.4	8.3	360	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	0	4,100	100	-	-	-	.30	6,130	7,200	2,300	2,200	9.9	8.2	490	-
120	0	1,500	18	-	-	-	.30	2,240	2,430	1,400	1,300	1.5	8.0	180	-
240	0	730	18	-	-	-	.20	1,260	1,700	600	410	3.4	7.8	170	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site No.	Site and location	Date of collection	Tem-pera-ture (°C)	Discharge (ft^3/s)	Dissolved silica (SiO_2)	Dissolved calcium (Ca)	Dissolved magnesium (Mg)	Dissolved sodium (Na)	Dissolved potassium (K)
18	San Rafael River at San Rafael Bridge Campground near Castledale	1-19-77	0.0	19	11	300	190	450	7.3
		3- 1-77	3.0	18	8.0	290	200	560	9.0
		4- 7-77	9.0	17	2.7	290	250	730	10
	USGS gaging-station number 09328100	5-11-77	14.0	6.3	6.3	330	280	770	12
		6- 8-77	22.0	2.7	4.9	350	320	1,100	15
		6-13-77	26.0	2.2	4.4	370	320	1,100	16
		8- 2-77	30.5	1.7	7.9	550	240	620	29
		8-17-77	20.5	600	8.7	590	96	23	22
		9-15-77	24.0	1.7	8.5	420	85	320	14
		11-16-77	5.5	7.9	4.9	340	280	850	12
		12-14-77	1.0	17	6.0	340	250	690	12
		1-12-78	1.5	24	9.6	300	190	500	8.8
		2-22-78	1.0	20	9.6	300	210	550	9.3
		3-30-78	14.0	34	4.5	250	190	440	8.9
		4-19-78	18.0	16	3.5	270	240	620	11
		5-30-78	21.0	23	5.8	190	180	520	12
		6- 6-78	22.5	102	3.6	120	66	160	5.5
		6-26-78	19.0	500	4.8	74	35	56	2.5
		9-12-78	18.0	22	4.4	190	170	430	9.8
		9-13-78	12.5	28	3.8	180	170	450	9.2
19	Buckhorn Wash below Furniture Draw at (D-19-11)19abc	8-17-77	20.0	.10	12	200	10	76	7.0
		6- 6-78	-	Dry	-	-	-	-	-
20	Unnamed tributary to Buckhorn Wash at (D-19-10)10ccd	8-17-77	22.5	.05	11	14	2.2	41	3.1
		6- 6-78	-	Dry	-	-	-	-	-
21	Red Seep Wash below Red Seep at (D-19-9)1adc	6- 7-78	-	Dry	-	-	-	-	-
22	Buckhorn Wash below Buckhorn Reservoir at (D-18-10)20dad	6- 6-78	-	Dry	-	-	-	-	-
23	Buckhorn Wash above Buckhorn Reservoir at (D-18-10)16bbc	8-17-77	-	Dry	-	-	-	-	-
		6- 6-78	-	Dry	-	-	-	-	-
24	North Salt Wash below Horn Silver Gulch at (D-20-9)28cdb	8-17-77	22.5	.30	13	500	170	620	15
		4-17-78	7.5	.05	9.0	480	240	1,100	14
		6- 7-78	25.0	.02	7.0	340	280	1,200	17
24.5	North Salt Wash at mouth	4-17-78	-	Dry	-	-	-	-	-
25	Fuller Bottom Draw at mouth at (D-20-9)1aab	8-17-77	-	Dry	-	-	-	-	-
		6- 7-78	-	Dry	-	-	-	-	-
26	San Rafael River above Fuller Bottom Draw at (D-20-9)1abd	6- 7-77	24.0	5.0	6.4	350	320	1,000	12
		8-17-77	23.0	.05	10	440	290	860	12
		6- 7-78	19.0	110	3.6	110	59	130	4.9
27	San Rafael River at Harnbrick Bottom at (D-19-9)27bda	1-19-77	.0	20	-	-	-	-	-
		3- 1-77	.5	36	-	-	-	-	-
		4- 7-77	16.0	17	-	-	-	-	-
	USGS gaging-station number 09328000	5-11-77	19.5	6.8	-	-	-	-	-
		6-13-77	26.5	3.2	-	-	-	-	-
		7-12-77	29.0	.03	-	-	-	-	-
		8- 1-77	25.0	1.5	5.3	370	220	920	16
		8-17-77	24.0	.25	.8	460	310	1,600	22
		9-15-77	20.0	.70	5.5	370	100	460	11
		10- 5-77	14.0	.60	2.7	420	270	1,100	14
		11-16-77	7.0	8.8	-	-	-	-	-
		12-14-77	.0	16	-	-	-	-	-
		1-12-78	.0	19	-	-	-	-	-
		3-30-78	17.0	25	4.0	250	200	600	9.1
		4-26-78	15.5	17	-	-	-	-	-
		5-30-78	23.5	28	-	-	-	-	-
		6- 7-78	20.0	170	-	-	-	-	-
		6-26-78	20.5	465	-	-	-	-	-
		7-12-78	26.0	56	-	-	-	-	-
		8-22-78	25.0	38	-	-	-	-	-
		9-11-78	20.0	33	5.6	190	160	450	9.3
		9-12-78	25.0	22	-	-	-	-	-
28	San Rafael River below Ferron Creek at (D-19-9)21dcd	6- 7-77	25.0	6.0	5.8	340	300	1,000	11
		8- 3-77	25.5	.20	5.1	410	210	1,100	17
		8-17-77	25.0	.15	.30	340	210	1,000	13
		4- 4-78	14.5	25	6.0	260	240	710	11
		4-17-78	13.0	16	4.3	270	230	580	9.8
		6- 7-78	19.0	150	6.4	100	64	130	4.6
29	Ferron Creek at mouth at (D-19-9)21dcd	6- 7-77	24.0	.10	8.8	260	320	1,100	12
		8- 3-77	-	Dry	-	-	-	-	-
		8-17-77	-	Dry	-	-	-	-	-
		4- 4-78	14.5	5.0	7.5	250	290	770	10
		4-17-78	13.0	3.5	4.6	260	260	600	9.7
		6- 7-78	24.5	10	9.3	150	130	350	11
		9-12-78	12.5	14	7.9	180	140	310	7.7

Milligrams per liter, unless otherwise noted									Hardness as $CaCO_3$				
Bicarbonate (HCO_3)	Carbonate (CO_3)	Dissolved sulfate (SO_4)	Dissolved chloride (Cl)	Dissolved nitrate (NO_3) + nitrite (NO_2) as N	Dissolved phosphate (PO_4)	Dissolved fluoride (F)	Dissolved solids (sum of constituents)	Specific conductance (µmho/cm at 25°C)	Calcium, magnesium	Noncarbonate	Sodium-adsorption ratio	pH	Dissolved boron (B) (µg/L)
276	0	2,100	47	0.93	0.12	0.30	3,250	4,000	1,500	1,300	5.0	7.8	260
383	0	2,300	74	.45	.06	.20	3,630	4,100	1,500	1,200	6.2	8.2	280
300	0	2,900	61	.29	.00	.30	4,390	5,000	1,800	1,500	7.6	8.5	350
310	0	3,000	81	.01	.03	.30	4,630	5,400	2,000	1,700	7.5	8.3	410
230	0	3,900	88	-	-	.30	5,890	7,200	2,200	2,000	10	8.1	450
240	0	4,000	98	.09	.03	.30	6,030	6,900	2,200	2,000	10	7.9	490
200	0	3,400	76	-	-	.50	5,020	5,320	2,400	2,200	5.6	7.7	420
140	0	1,700	6.0	-	-	.40	2,520	2,680	1,900	1,800	.20	7.6	220
140	0	1,800	49	-	-	.50	2,770	3,600	1,400	1,300	3.7	8.0	220
310	0	3,200	75	-	-	.30	4,920	5,520	2,000	1,700	8.3	7.7	390
330	0	2,800	72	-	-	.40	4,330	5,300	1,900	1,600	6.9	7.5	380
370	0	2,200	53	-	-	.30	3,440	4,000	1,500	1,200	5.6	7.9	280
390	0	2,300	59	-	-	.40	3,630	4,000	1,600	1,300	6.0	8.2	320
260	0	2,000	69	-	-	.30	3,090	3,830	1,400	1,200	5.1	7.9	250
280	0	2,500	70	-	-	.20	3,850	4,600	1,700	1,400	6.6	8.2	310
290	0	1,900	58	-	-	.40	3,010	3,800	1,200	980	6.5	8.1	390
250	0	630	17	-	-	.20	1,130	1,500	570	370	2.9	7.8	140
240	0	220	15	.09	-	.20	526	822	330	130	1.3	8.1	90
270	0	1,800	54	.02	-	.50	2,790	3,500	1,200	950	5.5	8.0	370
250	4	1,800	48	.00	-	.40	2,790	3,650	1,200	940	5.8	8.4	330
110	0	560	6.3	-	-	.40	926	1,260	540	450	1.4	-	130
-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	0	30	3.0	-	-	.60	174	260	44	0	2.7	9.1	90
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	0	2,500	390	-	-	.50	4,310	4,980	1,900	1,800	6.1	-	890
280	0	3,200	660	-	-	.70	5,840	6,870	2,200	2,000	10	7.8	1,000
270	0	3,400	720	-	-	.80	6,100	8,000	2,000	1,800	12	7.7	1,100
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
260	0	3,800	88	-	-	.30	5,710	6,800	2,200	2,000	9.3	8.0	430
210	0	3,700	200	.04	.03	.30	5,620	6,330	2,300	2,100	7.8	8.1	460
240	0	540	17	-	-	.20	983	1,330	520	320	2.5	7.8	130
-	-	-	-	-	-	-	-	4,100	-	-	-	-	-
-	-	-	-	-	-	-	-	4,000	-	-	-	-	-
-	-	-	-	-	-	-	-	5,180	-	-	-	-	-
-	-	-	-	-	-	-	-	5,640	-	-	-	-	-
-	-	-	-	-	-	-	-	6,900	-	-	-	-	-
-	-	-	-	-	-	-	-	7,700	-	-	-	-	-
200	0	3,400	79	-	-	.50	5,110	5,840	1,800	1,700	9.4	7.7	500
160	0	5,300	120	.03	.03	.50	7,890	8,560	2,400	2,300	14	8.4	690
150	0	2,000	35	-	-	.40	3,060	3,610	1,300	1,200	5.5	7.6	240
240	0	4,000	81	-	-	.40	6,010	6,440	2,200	2,000	10	7.7	550
-	-	-	-	-	-	-	-	5,800	-	-	-	-	-
-	-	-	-	-	-	-	-	4,900	-	-	-	-	-
-	-	-	-	-	-	-	-	3,800	-	-	-	-	-
290	0	2,300	65	-	-	.40	3,570	4,260	1,400	1,200	6.9	7.9	280
-	-	-	-	-	-	-	-	4,700	-	-	-	8.1	-
-	-	-	-	-	-	-	-	3,800	-	-	-	-	-
-	-	-	-	-	-	-	-	1,390	-	-	-	7.8	-
-	-	-	-	-	-	-	-	850	-	-	-	-	-
-	-	-	-	-	-	-	-	2,800	-	-	-	-	-
-	-	-	-	-	-	-	-	2,880	-	-	-	-	-
290	4	1,800	48	.00	-	.40	2,810	3,600	1,100	890	5.8	8.4	330
-	-	-	-	-	-	-	-	3,470	-	-	-	-	-
250	0	3,600	71	-	-	.30	5,450	6,470	2,100	1,900	9.5	8.0	430
200	0	3,700	86	-	-	.40	5,630	6,540	1,900	1,700	11	7.9	510
190	0	3,500	76	-	-	.40	5,230	6,150	1,700	1,600	11	8.1	500
330	0	2,600	63	-	-	.30	4,050	4,830	1,600	1,400	7.6	8.1	320
300	0	2,400	59	-	-	.30	3,700	4,250	1,600	1,400	6.3	8.0	300
240	0	530	16	-	-	.20	970	1,320	510	320	2.5	8.0	130
340	0	3,740	96	-	-	.50	5,710	6,800	2,000	1,700	8.8	8.1	470
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
340	0	2,900	99	-	-	.40	4,490	5,200	1,800	1,500	7.9	8.1	360
310	0	2,600	91	-	-	.30	3,980	4,500	1,700	1,500	6.3	8.1	360
350	0	1,200	44	.02	.06	.40	2,070	2,600	910	620	5.1	8.1	300
320	5	1,300	82	.01	.03	.50	2,190	2,800	1,000	760	4.2	8.4	270

Site No.	Site and location	Date of collection	Temperature (°C)	Discharge (ft^3/s)	Dissolved silica (SiO_2)	Dissolved calcium (Ca)	Dissolved magnesium (Mg)	Dissolved sodium (Na)	Dissolved potassium (K)
30	San Rafael River above Ferron Creek at	6- 7-77	25.0	6.0	5.6	360	290	1,000	11
	(D-19-9)21dcd	8- 3-77	25.5	.20	5.5	400	210	1,000	15
		8-17-77	25.0	.15	1.7	320	200	1,000	11
	USGS gaging-station number 09325100	4-17-78	13.0	13	4.2	240	220	530	9.8
		6- 7-78	19.0	145	4.1	110	59	130	4.4
31	Huntington Creek at mouth at (D-19-9)21dab	6- 7-77	25.0	4.0	4.5	340	300	1,000	11
		8- 3-77	25.0	.01	2.9	410	180	570	19
		8-17-77	-	Dry	-	-	-	-	-
		4- 4-78	14.5	8.0	5.1	180	260	850	12
		4-17-78	13.0	6.5	2.2	270	270	690	11
		6- 7-78	18.5	130	5.1	100	50	83	4.4
		9-12-78	12.5	7.5	3.8	210	250	730	12
32	Cedar Hollow at mouth at Huntington Creek at	8-16-77	-	Dry	-	-	-	-	-
	(D-19-9)4aaa	6- 7-78	-	Dry	-	-	-	-	-
33	Huntington Creek at country road at	6- 8-77	20.5	4.0	5.2	360	330	1,100	11
	(D-18-9)33acb	8- 1-77	26.5	1.0	6.6	380	300	1,100	18
		8-16-77	-	Dry	-	-	-	-	-
		3-30-78	17.0	4.0	1.3	310	310	1,000	14
		4-18-78	15.0	6.5	3.8	260	260	700	11
		6- 7-78	13.5	130	4.4	100	52	110	4.0
		9-11-78	19.0	7.5	5.5	220	250	740	11
34	Unnamed canal at (D-18-9)17bca	8-16-77	21.5	1.4	3.6	40	25	15	1.2
		6- 9-78	12.0	2.5	1.9	46	11	3.1	.90
35	Cottonwood Creek at mouth at (D-19-9)21dbd	6- 7-77	25.0	2.0	8.1	380	260	1,100	12
		8- 3-77	26.0	.10	5.8	380	200	1,100	14
		8-16-77	25.0	.15	1.5	290	180	930	10
		4- 4-78	15.0	12	7.0	270	210	600	9.6
		4-17-78	13.0	6.0	6.2	240	180	430	7.8
		6- 7-78	25.0	16	7.2	200	140	390	8.8
		9-11-78	-	-	-	-	-	-	-
		9-12-78	12.0	6.0	5.3	220	140	480	8.9
36	Cottonwood Creek above Rock Canyon Creek at	6- 8-77	21.0	.20	10	260	280	590	9.6
	(D-19-9)17cda	8-19-77	-	Dry	-	-	-	-	-
	USGS gaging-station number 09325000	4-18-78	18.0	4.5	7.3	310	260	460	10
		6- 8-78	30.0	10	8.6	200	180	320	9.4
37	Rock Canyon Creek at mouth at (D-19-9)17cdd	6- 8-77	18.0	2.0	6.7	430	240	1,100	12
		8-19-77	19.5	1.5	2.1	340	180	1,000	11
		4-18-78	19.5	4.0	7.2	290	180	740	9.5
		6- 8-78	28.0	6.5	6.8	200	160	590	12
		9-11-78	19.5	5.5	6.6	220	130	530	8.7
37.5	Rock Canyon Creek at (D-19-8)14	6- 8-78	27.5	.50	2.3	200	140	790	11
38	Cottonwood Creek at (D-19-9)7abd	8-19-77	-	Dry	-	-	-	-	-
		6- 8-78	28.0	4.0	4.5	190	200	430	9.1
		9-11-78	16.0	.50	7.0	240	250	580	8.4
39	Ferron Creek below Paradise Ranch near Clawson	1-20-77	.0	6.3	11	220	140	240	5.3
		3- 2-77	.0	4.4	9.9	240	170	390	6.6
	USGS gaging-station number 09327550	4- 6-77	6.0	2.8	5.2	320	280	730	9.6
		5-12-77	11.0	1.4	6.2	280	260	720	9.1
		6- 9-77	24.0	.15	9.7	360	480	1,400	10
		6-14-77	16.0	.55	7.9	310	320	1,000	10
		8-19-77	20.0	.50	11	420	150	940	23
		9-14-77	21.5	.80	11	350	250	850	19
		10- 5-77	18.0	.24	5.4	340	380	910	13
		11-17-77	5.0	2.5	5.7	260	250	580	9.1
		12-15-77	.0	10	10	250	200	410	8.0
		1-11-78	.0	4.7	11	230	170	330	6.5
		3- 8-79	9.5	13	9.5	300	280	770	12
		4-18-78	13.5	3	6.4	260	240	470	9.5
		4-27-78	17.5	2.8	5.0	240	230	490	8.6
		5-31-78	20.0	11	12	160	130	270	8.7
		6- 8-78	17.5	10	14	170	120	290	8.3
		9-12-78	18.0	20	7.8	190	130	270	7.4
		9-13-78	14.0	14	7.3	200	140	280	7.3
39.5	Ferron Creek at (D-20-8)4d near Castledale	6- 8-78	24.0	9.0	.70	170	120	270	8.1
	USGS gaging-station number 09327500								
40	Unnamed drain at Paradise Ranch at (D-19-8)34dcd	8-16-77	-	Dry	-	-	-	-	-
		6- 8-78	-	Dry	-	-	-	-	-
41	Ferron Creek at (D-20-7)13ddd near Ferron	8-16-77	25.0	.30	10	310	250	580	7.1
		6- 8-78	22.0	6.0	11	190	140	250	7.7
		9-12-78	18.5	5.0	9.3	230	120	230	6.0
42	Unnamed drain at (D-20-7)24aab	8-16-77	23.0	.01	.60	350	380	2,100	17
		6- 8-78	22.5	.15	.0	150	140	750	9.9

Bicarbonate (HCO_3)	Carbonate (CO_3)	Dissolved sulfate (SO_4)	Dissolved chloride (Cl)	Dissolved nitrate (NO_3) + nitrite (NO_2) as N	Dissolved phosphate (PO_4)	Dissolved fluoride (F)	Dissolved solids (sum of constituents)	Specific conductance (μmho/cm at 25°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium-adsorption ratio	pH	Dissolved boron (B) (μg/L)
Milligrams per liter, unless otherwise noted													
190	0	3,700	75	-	-	0.30	5,540	6,580	2,100	1,900	9.5	8.0	430
210	0	3,400	86	-	-	.40	5,220	6,560	1,900	1,700	10	7.9	530
180	0	3,300	71	-	-	.40	4,990	5,745	1,600	1,500	11	8.1	460
300	0	2,300	54	-	-	.30	3,510	4,300	1,500	1,300	5.9	8.0	280
240	0	540	17	-	-	.20	983	1,290	520	320	2.5	8.0	120
220	0	3,700	71	-	-	.20	5,540	6,600	2,100	1,900	9.5	8.1	420
130	0	2,800	56	-	-	.50	4,100	4,600	1,800	1,700	5.9	8.0	360
-	-	-	-	-	-	-	-	-	-	-	-	-	-
320	0	2,800	63	-	-	.30	4,330	5,280	1,500	1,300	9.5	8.3	310
310	0	2,800	60	-	-	.20	4,260	5,000	1,800	1,500	7.1	8.0	320
240	0	390	9.2	.13	.03	.20	761	1,060	460	260	1.7	8.0	90
300	0	2,700	61	.05	.03	.50	4,120	5,500	1,600	1,300	8.1	8.3	400
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	0	3,900	75	-	-	.20	5,890	6,900	2,300	2,100	10	8.0	440
330	0	4,200	77	-	-	.40	6,250	6,770	2,200	1,900	10	7.9	530
-	-	-	-	-	-	-	-	-	-	-	-	-	-
350	0	3,500	80	-	-	.20	5,390	6,180	2,100	1,800	9.6	7.9	370
330	0	2,900	62	-	-	.20	4,360	5,120	1,700	1,500	7.3	8.2	300
240	0	450	12	-	-	.20	851	1,260	460	270	2.2	7.8	110
350	0	2,900	68	.13	-	.30	4,370	5,600	1,600	1,300	8.1	8.3	390
210	0	35	5.8	-	-	.10	229	385	200	31	.50	8.4	30
170	0	26	3.3	-	-	.10	176	315	160	21	.10	7.7	20
170	0	3,800	75	-	-	.40	5,720	6,890	2,000	1,900	11	8.0	460
190	0	3,700	84	-	-	.40	5,580	6,450	1,800	1,600	11	8.1	500
170	0	3,200	69	.02	.00	.40	4,770	5,540	1,500	1,300	11	8.2	440
330	0	2,300	61	-	-	.30	3,620	4,280	1,500	1,300	6.7	8.0	320
300	0	1,800	49	-	-	.20	2,860	3,450	1,300	1,100	5.1	8.0	250
310	0	1,500	50	.03	.03	.30	2,450	3,050	1,100	820	5.2	8.0	290
-	-	-	-	.00	-	-	-	3,700	-	-	-	8.3	-
270	0	1,800	46	.07	.03	.40	2,840	3,600	1,100	910	6.2	8.3	410
320	0	2,500	82	-	-	.20	3,890	4,730	1,800	1,500	6.0	8.1	380
-	-	-	-	-	-	-	-	-	-	-	-	-	-
380	0	2,400	65	-	-	.20	3,700	4,230	1,800	1,500	4.7	8.1	330
310	0	1,500	44	-	-	.30	2,420	3,000	1,200	990	4.0	8.0	320
300	0	3,400	75	-	-	.40	5,410	6,650	2,100	1,800	11	7.8	440
280	0	3,400	77	.09	.03	.50	5,150	5,810	1,600	1,400	11	7.9	450
340	0	2,500	59	-	-	.40	3,950	4,740	1,500	1,200	8.4	8.2	310
320	0	2,000	50	-	-	.50	3,180	3,950	1,200	900	7.5	7.8	400
250	0	1,900	45	.00	-	.40	2,960	3,700	1,100	880	7.0	8.3	470
300	0	2,300	75	-	-	.40	3,670	4,700	1,100	830	10	7.8	340
-	-	-	-	-	-	-	-	-	-	-	-	-	-
260	0	1,800	48	-	-	.30	2,810	3,500	1,300	1,100	5.2	7.7	370
430	0	2,400	64	.00	-	.30	3,760	4,800	1,600	1,300	6.3	8.2	430
413	0	1,200	38	1.1	.06	.50	2,060	2,600	1,100	790	3.1	7.9	200
429	0	1,700	58	1.1	.09	.40	2,790	3,200	1,300	950	4.7	8.2	250
450	0	3,100	70	.07	.03	.40	4,740	5,270	2,000	1,600	7.2	7.9	430
410	0	2,800	77	.03	.00	.50	4,360	5,340	1,800	1,400	7.4	8.2	470
320	0	5,300	220	-	-	.40	7,940	9,080	2,900	2,600	11	8.0	700
360	0	3,800	130	.00	.15	.50	5,760	6,000	2,100	1,800	9.5	7.8	590
180	0	3,400	73	4.6	.06	.70	5,130	6,030	1,700	1,500	10	7.7	390
300	0	3,300	80	-	-	.60	5,010	5,500	1,900	1,700	8.5	7.8	570
310	0	3,800	99	-	-	.40	5,700	6,000	2,400	2,200	8.1	8.3	710
390	0	2,400	62	-	-	.40	3,760	4,320	1,700	1,400	6.2	7.9	400
380	0	1,800	51	-	-	.40	2,920	3,400	1,400	1,100	4.7	7.8	320
400	0	1,500	52	-	-	.50	2,500	3,050	1,300	950	4.0	8.2	250
440	0	2,900	96	-	-	.50	4,590	5,000	1,900	1,500	7.7	8.0	320
340	0	2,100	81	-	-	.40	3,340	3,960	1,600	1,400	5.1	8.2	330
310	0	2,100	73	-	-	.40	3,300	4,030	1,500	1,300	5.4	8.1	310
380	0	1,100	37	-	-	.50	1,910	2,450	930	620	3.8	8.3	360
380	0	1,100	45	-	-	.50	1,940	2,500	920	610	4.2	7.8	340
350	0	1,200	39	.01	-	.50	2,020	2,630	1,000	720	3.7	8.4	240
360	0	1,300	42	.05	-	.50	2,160	2,830	1,100	780	3.7	8.1	270
370	0	1,100	38	-	-	.50	1,890	2,400	920	620	3.9	8.0	300
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
160	0	2,700	52	.02	.03	.60	3,990	4,550	1,800	1,700	5.9	8.2	600
390	0	1,000	31	-	-	.50	1,820	2,400	1,100	730	3.4	7.7	290
290	8	1,200	30	.00	-	.70	1,980	2,420	1,100	820	3.1	8.4	240
380	0	6,300	100	-	-	.30	9,440	10,400	2,400	2,100	19	8.1	1,200
360	0	2,100	44	-	-	.50	3,370	4,400	950	660	11	8.0	400

Site No.	Site and location	Date of collection	Temperature (°C)	Discharge (ft³/s)	Dissolved silica (SiO_2)	Dissolved calcium (Ca)	Dissolved magnesium (Mg)	Dissolved sodium (Na)	Dissolved potassium (K)
43	Canal at (D-20-8)18adb near Molen	8-16-77	22.5	16	11	110	76	77	4.4
		6- 8-78	16.0	7.5	2.4	88	48	40	2.6
44	Canal at (D-20-8)7ccc at Molen	6- 8-78	13.5	1.5	3.3	49	24	16	1.3
45	Canal at (D-20-7)11bbd near Ferron	6- 8-78	15.0	8.0	4.0	49	25	15	1.1
46	Huntington Creek at country road at (D-18-9)8dba	8-16-77	24.0	4.0	5.9	390	220	690	11
		4-19-78	15.0	13	6.3	320	260	640	12
		6- 9-78	12.5	170	4.1	72	27	39	2.3
		9-12-78	10.0	7.0	4.1	270	220	590	11
47	McElprang Wash at country road at (D-18-9)8baa	8-16-77	20.0	1.0	8.1	410	220	640	11
		4-19-78	17.5	1.0	9.5	420	270	710	15
		6- 9-78	18.0	12	11	190	90	240	7.5
48	Huntington Creek at (D-17-9)33bca	8-16-77	23.0	.60	.50	320	330	800	11
		6- 9-78	10.5	170	3.8	59	19	20	1.8
49	North Ditch at (D-17-9)34cdd near Lawrence	8-16-77	22.0	5.4	3.9	55	34	24	2.3
		6- 9-78	13.0	18	4.0	54	19	10	1.4
50	North Ditch below Buffalo Hollow at (D-18-9)2acb	8-16-77	22.5	4.5	4.3	55	34	25	2.3
		6- 9-78	14.5	8.0	4.0	55	19	10	1.4
51	North Ditch at (D-17-9)27dbc	8-16-77	22.0	5.4	4.1	53	34	23	2.2
		6- 9-78	13.0	25	4.0	53	19	11	1.4
52	Roper Wash at (D-17-9)33ccc at Lawrence	8-16-77	-	Dry	-	-	-	-	-
		6- 9-78	24.5	.80	16	100	53	210	7.5
53	Cedar Creek at Highway U-155 at (D-17-9)16bcc	8-16-77	17.0	.60	11	410	320	580	11
		6- 9-78	13.5	1.0	9.4	57	43	37	5.1
54	Canal at (D-19-8)28bca near Clawson	8-16-77	-	Dry	-	-	-	-	-
		6- 8-78	21.5	2.5	4.4	52	25	15	1.1
55	Cleveland Canal at Highway U-10 at (D-17-9)9bcc	8-15-77	20.0	25	3.7	40	26	14	1.2
		6- 5-78	7.5	100	3.8	52	14	7.7	2.1
56	North Ditch at Highway U-10 at (D-17-9)8dad	8-13-77	30.0	.08	3.6	33	24	14	2.0
		6- 5-78	8.5	60	4.1	53	13	3.5	.90
57	Cedar Creek at Highway U-10 at (D-17-9)8dad	8-15-77	28.5	.20	14	410	450	650	10
		4-19-78	15.5	.25	11	390	490	660	12
		6- 5-78	13.0	.60	5.3	190	82	190	7.7
58	Canal from Huntington North Reservoir at Highway U-10	8-15-77	25.0	6.5	4.2	57	33	23	2.3
		4-19-78	-	Dry	-	-	-	-	-
		6- 5-78	11.0	15	5.4	64	33	23	2.4
59	North Ditch from Huntington North Reservoir at (D-17-9)17bbb	8-15-77	26.5	.60	3.3	33	24	13	1.1
		4-19-78	10.0	6.0	5.3	68	34	19	2.0
		6- 5-78	9.0	45	4.1	50	12	3.4	.90
60	Huntington Creek at Highway U-10 at (D-17-9)18ccb	8-15-77	30.0	.15	13	300	160	180	8.0
		8-16-77	21.0	.25	12	260	130	190	8.0
		9-15-77	19.0	.30	13	350	170	220	10
		10- 5-77	17.0	.30	12	350	180	220	11
		11-16-77	6.0	1.0	-	-	-	-	-
		12-14-77	.0	1.0	-	-	-	-	-
		1-12-78	.0	.80	-	-	-	-	-
		2-23-78	0.5	1.0	-	-	-	-	-
		3-30-78	14.5	1.5	10	350	190	260	10
		4-19-78	10.5	8.0	6.4	120	49	60	3.9
		4-27-78	18.0	1.2	-	-	-	-	-
		6- 1-78	7.0	15	-	-	-	-	-
		6- 5-78	12.5	85	4.4	69	19	17	1.9
		6-27-78	25.0	2.0	-	-	-	-	-
		7-14-78	17.5	7.0	-	-	-	-	-
		8-22-78	26.0	2.5	-	-	-	-	-
		9-11-78	20.0	2.0	12	260	120	140	8.0
		9-14-78	14.0	3.0	-	-	-	-	-
61	Canal at (D-17-9)30bcb	8-16-77	18.0	16	3.6	48	28	20	1.4
		6- 6-78	12.5	20	3.0	50	14	4.9	.90
62	McElprang Wash at Highway U-10 at (D-17-8)25add	8-16-77	15.5	.10	9.3	430	300	1,100	15
		6- 6-78	27.5	3.0	15	140	70	140	7.5
63	Guymon Wash at Highway U-10 at (D-17-8)36dda	8-16-77	19.0	.25	12	310	150	360	11
		4-19-78	12.0	.40	12	390	250	650	13
		6- 6-78	27.0	.25	3.2	280	290	640	13
64	Canal at Highway U-10 at (D-18-8)1cda	8-16-77	20.0	3.0	3.4	40	24	13	1.1
		6- 6-78	13.5	17	4.1	53	13	5.0	1.0

Milligrams per liter, unless otherwise noted

Bicarbonate (HCO_3)	Carbonate (CO_3)	Dissolved sulfate (SO_4)	Dissolved chloride (Cl)	Dissolved nitrate (NO_3) + nitrite (NO_2) as N	Dissolved phosphate (PO_4)	Dissolved fluoride (F)	Dissolved solids (sum of constituents)	Specific conductance (μmho/cm at 25°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Sodium-adsorption ratio	pH	Dissolved boron (B) (μg/L)
140	0	580	31	-	-	0.40	959	1,290	590	470	1.4	8.0	150
260	0	240	22	-	-	.30	572	840	420	200	.90	7.7	60
230	0	54	5.7	-	-	.20	267	460	220	33	.50	7.6	30
230	0	59	5.9	-	-	.20	273	460	230	37	.40	7.9	30
250	0	3,100	59	.03	.03	.30	4,600	5,100	1,900	1,700	6.9	8.0	450
340	0	2,700	47	-	-	.20	4,150	4,470	1,900	1,600	6.4	7.8	320
210	0	160	5.1	-	-	.10	413	655	290	120	1.0	7.8	50
330	0	2,500	44	.45	-	.20	3,800	4,430	1,600	1,300	6.5	7.9	390
310	0	2,800	39	-	-	.20	4,280	4,680	1,900	1,700	6.3	7.9	430
420	0	3,200	52	-	-	.30	4,880	5,400	2,200	1,800	6.6	7.7	450
340	0	990	19	-	-	.30	1,720	2,230	850	570	3.6	8.0	260
86	3	3,600	89	-	-	.20	5,200	6,110	2,200	2,100	7.5	8.7	490
200	0	110	4.1	-	-	.10	316	510	230	62	.60	7.8	30
200	0	140	8.1	-	-	.10	366	583	280	110	.60	8.2	50
190	0	60	5.1	-	-	.10	247	380	210	57	.30	8.0	30
200	0	150	9.0	-	-	.20	378	590	280	110	.70	8.2	60
210	0	60	5.2	-	-	.10	258	390	220	43	.30	8.0	30
200	0	130	8.4	-	-	.10	353	583	270	110	.60	8.2	50
200	0	61	5.3	-	-	.10	253	390	210	47	.30	8.0	30
-	-	-	-	-	-	-	-	-	-	-	-	-	-
240	0	690	12	-	-	.20	1,210	1,610	470	270	4.2	8.0	210
350	0	2,900	110	-	-	.30	4,520	5,240	2,300	2,100	5.2	7.9	450
240	0	200	6.8	-	-	.10	477	762	320	120	.90	7.8	120
-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	0	54	5.4	-	-	.20	271	445	230	44	.40	8.0	30
230	0	41	6.7	-	-	.10	246	395	210	18	.40	8.2	30
180	0	44	3.2	.28	.00	.10	217	380	190	40	.20	7.6	5
170	2	43	6.3	-	-	.10	212	340	180	38	.50	8.7	40
190	0	22	3.2	.27	.00	.10	195	290	190	30	.10	7.6	20
340	0	3,500	170	-	-	.30	5,370	5,890	2,900	2,600	5.3	7.8	540
380	0	3,800	200	-	-	.30	5,750	6,400	3,000	2,700	5.3	8.1	520
180	0	1,000	43	-	-	.30	1,610	2,060	810	660	2.9	7.7	180
190	0	150	8.3	-	-	.10	372	564	280	120	.60	8.5	60
-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	0	140	9.7	.03	.00	.10	381	597	300	120	.60	8.0	40
190	2	32	5.9	-	-	.10	208	365	180	22	.40	8.6	30
250	0	130	9.2	-	-	.10	391	620	310	100	.50	8.3	30
190	0	21	3.2	-	-	.10	188	300	170	18	.10	8.0	20
320	0	1,400	15	.04	.03	.20	2,230	2,580	1,400	1,100	2.1	7.8	270
210	0	1,300	18	-	-	.20	2,020	2,420	1,200	1,000	2.4	7.8	270
310	0	1,700	16	-	-	.20	2,630	3,100	1,600	1,300	2.4	8.2	330
310	0	1,700	18	-	-	.20	2,640	2,980	1,600	1,400	2.4	8.1	330
-	-	-	-	-	-	-	-	2,800	-	-	-	-	-
-	-	-	-	-	-	-	-	2,900	-	-	-	-	-
-	-	-	-	-	-	-	-	2,650	-	-	-	-	-
-	-	-	-	-	-	-	-	2,250	-	-	-	-	-
370	0	1,700	29	-	-	.20	2,730	3,250	1,700	1,400	2.8	7.9	240
290	0	330	9.3	-	-	.20	722	1,070	500	260	1.2	8.0	70
-	-	-	-	-	-	-	-	3,300	-	-	-	8.1	-
-	-	-	-	-	-	-	-	600	-	-	-	-	-
200	0	110	4.4	.11	.00	.10	325	490	250	86	.50	7.8	30
-	-	-	-	-	-	-	-	2,050	-	-	-	-	-
-	-	-	-	-	-	-	-	2,000	-	-	-	-	-
-	-	-	-	-	-	-	-	2,230	-	-	-	-	-
310	0	1,100	17	.00	-	.20	1,810	2,220	1,100	890	1.8	8.0	230
-	-	-	-	-	-	-	-	2,260	-	-	-	-	-
210	0	120	6.6	-	-	.10	331	472	240	63	.60	8.3	50
190	0	30	3.6	-	-	.10	200	310	180	27	.20	7.8	20
560	0	3,900	63	-	-	.30	6,090	7,100	2,300	1,900	10	7.5	520
290	0	610	20	-	-	.40	1,150	1,520	640	400	2.4	7.7	290
350	0	1,800	36	-	-	.40	2,850	3,600	1,400	1,100	4.2	7.8	400
420	0	2,900	56	-	-	.30	4,480	5,220	2,000	1,700	6.3	7.8	450
260	0	2,900	80	-	-	.40	4,340	4,750	1,900	1,700	6.4	7.9	430
220	0	31	5.9	-	-	.10	227	376	200	18	.40	8.3	30
190	0	26	3.3	.25	.00	.10	200	328	190	30	.20	8.0	20

Site No.	Site and location	Date of collection	Temperature (°C)	Discharge (ft^3/s)	Dissolved silica (SiO_2)	Dissolved calcium (Ca)	Dissolved magnesium (Mg)	Dissolved sodium (Na)	Dissolved potassium (K)
65	Fivemile Wash at Highway U-10 at (D-18-8)12cca	8-16-77	25.0	0.01	16	470	260	790	19
		6- 6-78	25.0	.25	15	270	290	1,200	1.7
65.2	Fivemile Wash at (D-18-9)18cab	6- 9-78	16.0	.50	2.1	200	140	530	11
65.5	Fivemile Wash at mouth at (D-18-9)20	6- 9-78	21.5	1.5	2.3	170	130	590	11
66	Wilberg Wash at Highway U-10 at (D-18-8)14dad	4-18-78	9.5	.15	11	390	430	2,000	16
		6- 6-78	19.5	.70	8.7	160	160	550	12
66.5	Wilberg Wash at mouth at (D-18-9)20	6- 9-78	17.0	1.2	3.8	240	250	910	12
67.2	Canal at (D-18-8)26ccb	6- 6-78	18.5	2.0	4.0	140	59	150	3.1
68	Cottonwood Creek at (D-18-8)33bda at Castledale	8-16-77	30.5	11	9.9	83	74	100	4.9
		9-15-77	14.0	3.3	8.8	150	68	74	4.0
		10- 6-77	12.5	2.5	4.6	230	110	130	6.8
		11-17-77	5.0	5.0	-	-	-	-	-
		12-15-77	2.5	2.5	-	-	-	-	-
		1-11-78	3.0	1.8	11	270	130	160	6.6
		2-23-78	0.0	2.0	-	-	-	-	-
		3-30-78	19.0	1.5	7.5	270	160	130	8.7
		4-18-78	19.5	2.5	10	260	150	180	7.7
		4-27-78	15.0	3.0	-	-	-	-	-
		5-31-78	17.5	7.0	-	-	-	-	-
		6- 6-78	26.0	1.3	11	270	200	320	11
		6-27-78	17.5	100	-	-	-	-	-
		7-13-78	21.0	12	-	-	-	-	-
		8-23-78	18.0	8.0	-	-	-	-	-
		9-12-78	14.0	2.5	11	280	120	170	7.9
		9-13-78	17.5	4.0	-	-	-	-	-
69	Blue Cut Ditch at Highway U-10 at (D-19-8)4add	6- 7-78	20.0	12	3.3	49	30	21	1.7
70	South Wash at Highway U-10 at (D-19-8)9bcd	6- 7-78	24.0	.60	14	100	110	420	8.7
71	Wolf Hollow at Highway U-10 at (D-19-8)17bac	6- 7-78	21.0	.80	8.3	140	65	100	7.0
72	Canal at (D-19-8)18dbd	8-16-77	20.0	1.6	3.8	50	26	19	1.5
73	Rock Canyon Creek at Highway U-10 at (D-19-7)24adb	8-16-77	26.0	.20	12	440	160	600	9.8
		3-31-78	13.0	2.0	6.1	93	37	180	3.7
		4-18-78	18.0	.15	11	440	180	500	10
		6- 8-78	12.0	.50	12	340	170	700	11
		9-12-78	16.0	1.0	9.7	240	100	460	8.1
74	Canal at (D-19-7)26daa at Clawson	6- 8-78	10.5	10	5.3	56	26	27	1.3
75	Canal at (D-19-7)35bda at Clawson	6- 8-78	10.5	10	5.3	51	24	15	1.1
77	Canal at Highway U-10 at (D-20-7)3cba	6- 8-78	11.0	40	5.3	53	24	15	1.1
78	Canal at (D-20-7)15bbb at Ferron	6- 8-78	12.0	8	5.6	53	27	18	2.4
79	Ferron Creek at (D-20-7)15bcc at Ferron	8-16-77	20.0	4.0	12	150	70	68	3.6
		9-14-77	15.0	2.9	13	160	73	61	3.6
		10- 6-77	18.5	3.0	11	160	71	61	4.1
		11-17-77	10.0	3.0	-	-	-	-	-
		12-15-77	.50	7.0	-	-	-	-	-
		1-10-78	6.0	3.0	-	-	-	-	-
		2-22-78	7.0	1.5	-	-	-	-	-
		3-30-78	12.5	2.0	10	170	85	60	4.2
		4-18-78	13.5	1.5	12	160	86	57	3.9
		4-27-78	14.0	2.0	-	-	-	-	-
		5-31-78	16.5	8.0	-	-	-	-	-
		6- 8-78	16.0	22	4.2	68	33	25	2.1
		6-27-78	16.5	120	-	-	-	-	-
		7-13-78	20.5	25	-	-	-	-	-
		8-24-78	15.5	5.0	-	-	-	-	-
		9-12-78	16.0	11	8.3	150	67	83	3.7
		9-13-78	17.0	10	-	-	-	-	-
80	Drain at Highway U-10 at (D-20-7)22bcc	6- 8-78	25.0	.20	7.5	270	180	590	11
81	Drain at Highway U-10 at (D-20-7)22ccc	8-15-77	23.5	.01	8.0	400	260	810	8.8
84	Canal at Highway U-10 at (D-21-7)8adc	8-16-77	19.0	.70	3.0	52	25	22	1.8
86	Cedar Creek at (D-17-9)5bbd	8-15-77	28.5	.03	14	330	240	290	11
		6- 5-78	14.5	2.0	4.1	93	28	80	5.8
87	Huntington Creek at Highway U-31 at (D-17-8)14acb	8-15-77	26.5	.15	16	180	71	55	4.7
		6- 6-78	6.0	110	3.1	46	13	3.4	.80
88	North Ditch at Highway U-31 at (D-17-8)14bac	8-15-77	27.5	.40	8.1	95	41	29	4.2
		6- 6-78	6.0	92	3.9	52	12	3.0	.80

Milligrams per liter, unless otherwise noted													
									Hardness as $CaCO_3$				
Bicarbonate (HCO_3)	Carbonate (CO_3)	Dissolved sulfate (SO_4)	Dissolved chloride (Cl)	Dissolved nitrate (NO_3) + nitrite (NO_2) as N	Dissolved phosphate (PO_4)	Dissolved fluoride (F)	Dissolved solids (sum of constituents)	Specific conductance (μmho/cm at 25°C)	Calcium, magnesium	Noncarbonate	Sodium-adsorption ratio	pH	Dissolved boron (B) (μg/L)
410	0	3,500	52	-	-	0.40	5,310	6,240	2,200	1,900	7.3	7.8	530
410	0	3,800	67	-	-	.50	5,850	7,200	1,900	1,500	12	7.6	500
340	0	1,800	30	-	-	.30	2,880	3,600	1,100	800	7.0	7.6	280
290	0	1,800	35	-	-	.30	2,880	3,700	960	720	8.3	8.2	310
510	0	5,000	290	-	-	.40	8,390	8,910	2,700	2,300	17	7.5	280
370	0	1,500	92	-	-	.40	2,670	3,690	1,100	750	7.4	7.7	160
350	0	3,000	63	-	-	.40	4,650	6,000	1,600	1,300	9.8	8.0	450
310	0	580	20	-	-	.20	1,110	1,370	590	340	2.7	7.8	110
160	3	560	19	.04	.00	.30	933	1,260	510	380	1.9	8.4	210
320	0	470	17	-	-	.20	950	1,260	650	390	1.3	8.0	120
380	0	890	33	-	-	.30	1,590	3,060	1,000	720	1.8	8.0	210
-	-	-	-	-	-	-	-	960	-	-	-	-	-
-	-	-	-	-	-	-	-	2,400	-	-	-	-	-
390	0	1,100	73	-	-	.30	1,940	2,400	1,200	890	2.0	7.9	180
-	-	-	-	-	-	-	-	2,190	-	-	-	-	-
270	0	1,300	48	-	-	.20	2,060	2,540	1,300	1,100	1.6	7.7	200
320	0	1,300	41	-	-	.30	2,110	2,550	1,300	1,000	2.2	8.3	200
-	-	-	-	-	-	-	-	1,900	-	-	-	8.4	-
-	-	-	-	-	-	-	-	1,120	-	-	-	-	-
420	0	1,600	63	.10	.00	.30	2,680	3,190	1,500	1,200	3.6	7.7	280
-	-	-	-	-	-	-	-	600	-	-	-	-	-
-	-	-	-	-	-	-	-	1,850	-	-	-	-	-
-	-	-	-	-	-	-	-	1,710	-	-	-	-	-
390	0	1,100	30	.01	-	.30	1,910	2,290	1,200	880	2.1	7.8	250
-	-	-	-	-	-	-	-	1,910	-	-	-	-	-
220	0	85	9.2	.02	.00	.10	308	450	250	65	.60	7.9	40
380	0	1,200	44	-	-	.40	2,080	2,550	700	390	6.9	7.8	440
290	0	510	16	-	-	.30	990	1,320	620	380	1.8	8.0	150
170	0	120	7.1	-	-	.20	311	489	230	92	.50	8.3	50
290	0	2,600	61	-	-	.30	4,030	4,540	1,800	1,500	6.2	7.8	460
250	0	550	20	-	-	.30	1,010	1,420	380	180	4.0	8.0	120
350	0	2,500	62	-	-	.30	3,880	4,570	1,800	1,600	5.1	8.0	390
430	0	2,500	75	-	-	.40	4,020	4,590	1,600	1,200	7.7	7.5	440
380	0	1,600	39	.11	-	.40	2,650	3,250	1,000	700	6.3	8.0	260
240	0	64	5.6	-	-	.20	304	420	250	50	.70	8.1	30
240	0	50	5.3	-	-	.20	270	410	230	29	.40	8.1	30
240	0	48	5.4	-	-	.20	270	400	230	34	.40	8.1	30
240	0	67	6.5	.25	.03	.20	299	517	240	47	.50	8.1	30
280	0	500	29	.77	.03	.50	975	1,350	660	430	1.2	7.6	100
390	0	430	27	-	-	.50	960	1,310	700	380	1.0	8.3	100
390	0	450	30	-	-	.50	980	1,350	690	370	1.0	7.9	110
-	-	-	-	-	-	-	-	1,650	-	-	-	-	-
-	-	-	-	-	-	-	-	1,400	-	-	-	-	-
-	-	-	-	-	-	-	-	1,400	-	-	-	-	-
-	-	-	-	-	-	-	-	1,400	-	-	-	-	-
360	0	500	47	-	-	.40	1,050	1,530	770	480	.90	7.8	110
380	0	510	47	-	-	.50	1,060	1,490	750	440	.90	7.6	100
-	-	-	-	-	-	-	-	1,550	-	-	-	8.2	-
-	-	-	-	-	-	-	-	640	-	-	-	-	-
230	0	130	16	.12	.00	.20	392	580	310	120	.60	8.2	40
-	-	-	-	-	-	-	-	495	-	-	-	-	-
-	-	-	-	-	-	-	-	900	-	-	-	-	-
-	-	-	-	-	-	-	-	1,430	-	-	-	-	-
340	-	460	34	.69	-	.40	977	1,330	650	370	1.4	8.4	70
-	-	-	-	-	-	-	-	1,300	-	-	-	-	-
350	0	2,300	61	-	-	.60	3,590	4,300	1,400	1,100	6.8	7.9	470
310	0	3,300	110	-	-	.60	5,050	5,520	2,100	1,800	7.8	7.8	770
160	0	160	4.5	-	-	.40	348	483	230	100	.60	8.3	50
260	0	2,000	76	-	-	.30	3,090	3,480	1,800	1,600	3.0	7.9	420
160	0	400	17	-	-	.20	707	1,000	350	220	1.9	7.9	170
310	0	570	10	-	-	.30	1,060	1,410	740	490	.90	7.7	140
190	0	18	3.1	-	-	.10	181	290	170	13	.10	7.8	20
310	0	200	9.7	-	-	.10	540	827	410	150	.60	8.0	70
190	0	15	2.9	-	-	.10	183	290	180	23	.10	7.8	20

Site No.	Site and location	Date of collection	Temperature (°C)	Discharge (ft³/s)	Dissolved silica (SiO_2)	Dissolved calcium (Ca)	Dissolved magnesium (Mg)	Dissolved sodium (Na)	Dissolved potassium (K)
88.2	Huntington Canal at (D-17-8)26aca	8-16-77	16.0	16	3.5	42	24	13	1.0
		6- 6-78	11.0	30	3.9	50	11	4.3	.80
88.4	Cottonwood Creek Canal at (D-17-8)26abc	8-16-77	15.5	45	3.5	39	26	15	1.1
		6- 6-78	23.0	2.0	12	61	36	54	2.6
89	Cedar Creek at (D-16-8)10dca at Mohrland	8-16-77	16.0	.40	9.5	80	65	9.6	4.6
		6- 5-78	11.0	2.5	5.2	69	38	6.8	1.5
90	North Ditch at diversion at (D-17-8)9bbb	8-16-77	20.5	11	6.3	63	29	14	1.9
		6- 6-78	6.5	92	2.9	50	12	2.8	.60
91	Huntington Creek below North Ditch diversion at (D-17-8)9dbb	8-15-77	-	Dry	-	-	-	-	-
		6- 6-78	6.5	110	2.8	51	12	3.0	.70
92	Huntington Creek above Fish Creek near Huntington	6- 9-77	15.0	40	3.4	55	15	4.6	1.1
		8-15-77	19.0	13	5.8	57	25	13	1.9
		3-31-78	6.0	20	4.6	59	27	9.2	1.7
	USGS gaging-station number 09318000	4-19-78	9.0	39	4.7	61	27	7.4	1.4
		6- 6-78	6.5	360	4.0	51	12	2.9	.80
		9-11-78	12.0	84	3.5	48	14	3.2	.90
93	Huntington Creek at Bear Creek Ranger Station	8-15-77	17.0	25	4.3	43	18	4.1	1.7
		6- 6-78	6.0	360	3.0	50	12	2.1	.60
94	Huntington Creek above Left Fork at (D-15-7)20dcc	8-15-77	15.0	17	3.1	49	15	2.9	1.3
		6- 6-78	5.5	45	4.3	49	13	2.5	.90
95	Left Fork Huntington Creek at mouth at (D-15-7)20cdd	8-15-77	15.0	9.6	5.8	49	20	4.0	1.1
		6- 6-78	7.5	300	3.3	48	8.8	1.6	.60
96	Cleveland Reservoir outflow at (D-14-6)27bdd	8-15-77	19.5	1.8	22	50	5.8	2.8	1.2
		6- 6-78	-	Dry	-	-	-	-	-
97	Lake Canyon at Lake Guard Station	8-15-77	15.0	1.6	3.9	57	8.5	1.9	.60
98	Huntington Reservoir outflow at (D-14-6)21cbd	8-15-77	15.0	.25	2.7	38	5.5	2.0	.80
		6- 6-78	4.5	25	3.9	45	6.6	1.6	.70
99	Huntington Creek below Cox Canyon at (D-14-6)14acb	8-15-77	16.5	12	2.0	51	9.8	3.0	1.1
		6- 6-78	6.0	22	2.7	43	8.5	1.9	.90
100	Canal at Highway U-29 at (D-18-8)27abb	6- 7-78	11.0	2.5	4.3	45	26	15	1.2
101	Canal at Highway U-29 at (D-18-8)28ada	6- 7-78	9.5	18	4.5	43	26	15	1.1
102	Cottonwood Creek at Highway U-57 at Orangeville	8-25-77	24.5	.20	11	200	80	86	6.1
		4-19-78	8.5	.30	8.3	250	120	140	6.1
		6- 7-78	16.0	.60	6.3	160	64	60	4.4
103	Blue Cut Ditch at (D-18-8)29cba at Orangeville	8-25-77	20.0	6.0	5.0	63	32	23	1.7
		6- 7-78	13.5	22	2.6	56	29	20	1.5
104	Cottonwood Creek below diversion at (D-18-7)24aad	8-25-77	21.5	4.0	5.0	61	31	21	1.5
		6- 7-78	14.5	19	3.1	50	28	16	1.2
		9-13-78	12.5	15	5.5	61	26	15	1.3
105.6	Canal at (D-18-8)30bdc at Orangeville	8-25-77	20.0	3.0	3.6	39	24	13	1.2
		6- 7-78	11.5	16	3.0	46	25	13	1.0
106.1	Canal at (D-18-8)30cbc	8-25-77	26.5	.30	3.1	31	23	12	1.1
		6- 7-78	11.5	9.0	3.9	41	25	13	1.0
107	Canal at (D-18-8)32cbb	8-25-77	18.5	6.0	3.2	41	25	14	1.2
		6- 7-78	18.5	8.0	3.0	42	24	13	1.0
108	Canal at (D-18-7)13cbc	8-25-77	20.0	4.0	4.0	40	26	14	1.2
		6- 7-78	14.5	37	4.0	42	24	14	1.1
109	Grimes Wash at mouth at Highway U-29	8-25-77	-	.05	13	160	80	160	9.5
		6- 7-78	-	Dry	-	-	-	-	-
109.5	Canal at diversion at Swasey Ranch at (D-18-7)14cab	8-25-77	19.0	20	3.9	39	23	13	1.1
109.6	Cottonwood Creek below diversion at Swasey Ranch	8-25-77	19.0	6.0	4.0	40	24	13	1.1
110	Cottonwood Creek near Orangeville	3- 2-77	0.0	3.6	4.9	64	39	27	1.9
		4- 6-77	14.5	5.9	3.8	52	32	21	1.6
	USGS gaging-station number 09324500	5-12-77	13.0	95	2.9	42	26	15	1.2
		6- 9-77	15.5	68	3.8	45	25	13	1.1
		6-14-77	16.0	66	3.5	44	26	16	1.1
		7-13-77	11.5	73	3.6	42	24	12	1.0
		8-10-77	11.0	71	3.8	44	26	13	1.0
		8-25-77	18.5	49	4.0	39	22	13	1.2
		9-15-77	9.0	62	4.4	40	25	14	1.2
		10- 6-77	9.0	34	4.3	43	27	13	1.2

Milligrams per liter, unless otherwise noted													
									Hardness as $CaCO_3$				
Bicarbonate (HCO_3)	Carbonate (CO_3)	Dissolved sulfate (SO_4)	Dissolved chloride (Cl)	Dissolved nitrate (NO_3) + nitrite (NO_2) as N	Dissolved phosphate (PO_4)	Dissolved fluoride (F)	Dissolved solids (sum of constituents)	Specific conductance (µmho/cm at 25°C)	Calcium, magnesium	Noncarbonate	Sodium-adsorption ratio	pH	Dissolved boron (B) (µg/L)
220	0	30	5.8	-	-	0.10	228	396	200	23	0.40	8.3	30
190	0	15	3.0	-	-	.10	182	300	170	14	.10	7.9	20
170	0	79	6.9	-	-	.10	254	387	200	65	.50	8.3	40
230	0	180	16	-	-	.20	475	710	300	110	1.4	8.1	50
155	0	300	7.8	-	-	.20	552	837	-	-	.20	8.1	110
260	0	85	5.4	-	-	.10	339	540	330	120	.20	7.9	30
230	0	80	11	-	-	.10	319	525	280	88	.40	8.1	50
190	0	16	3.2	-	-	.10	181	290	170	18	.10	7.8	10
190	0	12	3.0	-	-	.10	178	290	180	21	.10	7.8	20
190	0	23	3.9	-	-	.10	200	390	200	43	.10	8.3	30
210	0	67	15	.15	.00	.20	289	478	250	73	.40	8.1	40
230	0	55	9.1	-	-	.10	279	430	260	70	.30	8.2	40
240	0	45	7.1	-	-	.20	272	457	260	67	.20	8.3	80
190	0	14	3.1	.24	.00	.10	183	290	180	21	.10	7.8	20
170	9	15	3.0	.01	.03	.10	181	310	180	23	.10	8.6	20
200	0	22	3.8	-	-	.10	196	332	180	17	.10	8.3	30
180	0	14	2.7	-	-	.10	173	280	170	27	.10	7.8	10
200	0	20	2.9	-	-	.10	193	330	180	20	.10	8.2	20
190	0	11	3.0	-	-	.10	177	300	180	20	.10	7.8	20
210	0	32	2.9	-	-	.10	218	345	200	32	.10	8.3	20
170	0	5.7	2.5	-	-	.10	154	240	160	17	.10	7.7	10
130	0	41	3.5	-	-	.10	191	326	150	42	.10	7.3	40
-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	0	6.6	2.1	-	-	.10	179	290	180	13	.10	8.0	20
140	0	8.9	2.9	-	-	.10	130	220	120	3	.10	7.5	20
160	0	7.5	2.9	-	-	.10	147	266	140	8	.10	7.5	10
160	0	71	5.0	-	-	.10	222	286	170	36	.10	8.2	40
150	0	13	2.6	-	-	.10	147	250	140	19	.10	7.6	20
240	0	36	6.9	.09	.00	.10	253	390	220	23	.40	7.8	30
240	0	36	7.0	-	-	.10	251	390	210	18	.40	7.9	30
410	0	650	21	-	-	.30	1,260	1,670	830	490	1.3	7.8	180
360	0	950	30	-	-	.20	1,680	2,090	1,100	820	1.8	7.8	140
330	0	440	18	-	-	.20	916	1,270	660	390	1.0	7.5	90
250	0	110	8.0	-	-	.10	366	585	290	84	.60	8.1	50
230	0	80	7.9	-	-	.10	311	480	260	71	.50	8.0	40
250	0	120	7.6	-	-	.10	371	610	280	75	.50	8.1	50
230	0	50	7.2	-	-	.10	269	420	240	51	.50	7.7	30
240	0	73	6.9	.20	.03	.10	309	510	260	63	.40	8.3	40
200	0	44	5.8	-	-	.10	229	400	200	32	.40	8.4	30
220	0	34	20	-	-	.10	251	405	220	37	.40	7.7	30
210	4	28	5.8	-	-	.10	230	372	170	0	.40	8.5	50
230	0	24	6.0	-	-	.10	227	370	210	17	.40	7.7	30
200	2	51	7.3	-	-	.10	243	420	210	38	.40	8.5	30
220	0	31	6.4	-	-	.10	229	370	200	23	.40	7.9	30
230	0	34	6.0	-	-	.10	239	410	210	18	.40	8.3	30
230	0	30	6.6	-	-	.10	235	409	200	15	.40	7.7	30
180	0	800	42	-	-	.40	1,350	1,850	730	580	2.6	8.1	180
-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	0	31	7.6	-	-	.10	227	397	190	12	.40	8.4	30
220	0	34	6.0	-	-	.10	231	400	200	18	.40	8.4	30
316	0	99	15	.12	.03	.10	407	660	320	61	.70	8.1	40
250	0	75	9.5	.04	.00	.20	318	505	260	57	.60	8.1	40
220	0	43	6.1	.08	.03	.20	245	370	210	31	.40	8.2	30
210	0	34	5.6	-	-	.10	231	380	220	43	.40	8.2	30
220	0	46	6.8	.06	.03	.20	252	380	220	36	.50	8.3	30
230	0	27	5.7	-	-	.10	229	415	200	15	.40	7.8	30
230	0	25	5.8	-	-	.20	232	370	220	28	.40	7.5	30
200	3	32	6.0	.01	.00	.20	219	390	190	19	.40	8.4	30
240	0	35	6.2	-	-	.10	244	380	200	6	.40	8.2	30
230	0	38	6.6	-	-	.10	247	370	220	30	.40	8.1	30

Site No.	Site and location	Date of collection	Temperature (°C)	Discharge (ft^3/s)	Dissolved silica (SiO_2)	Dissolved calcium (Ca)	Dissolved magnesium (Mg)	Dissolved sodium (Na)	Dissolved potassium (K)
110	Cottonwood Creek near Orangeville--Continued	11-17-77	2.0	8.0	3.9	46	33	23	1.3
		12-15-77	.0	11	3.8	42	30	19	1.3
		1-11-78	.0	5.7	4.5	45	31	22	1.7
		2-23-78	.0	4.5	5.2	57	36	28	1.6
		3-31-78	9.0	10	4.6	44	32	42	1.8
		3-31-78	9.0	9.7	4.6	46	33	38	1.6
		4-19-78	6.0	17	4.1	43	31	19	1.3
		4-27-78	7.0	41	4.1	38	28	17	1.0
		5-31-78	9.5	98	4.3	42	25	14	1.0
		6- 7-78	14.5	119	4.3	41	26	13	1.1
		8-23-78	10.0	128	4.3	43	22	11	.50
		9-12-78	9.0	133	4.6	48	22	16	1.1
		9-13-78	-	-	-	-	-	-	-
111	Straight Canyon below Joes Valley Reservoir	8-25-77	12.0	26	3.9	41	23	12	1.0
		6- 7-78	10.0	119	3.0	41	25	13	.90
112	North Dragon Creek at Joes Valley Reservoir at (D-18-6)8ccc	6- 7-78	22.0	.30	14	36	70	75	3.5
113	Swasey Creek at Joes Valley Reservoir at (D-18-6)7aab	8-25-77	25.0	.01	6.5	27	15	90	5.2
		6- 7-78	11.0	5.0	5.8	40	21	20	.50
114	Seely Creek at Joes Valley Reservoir at (D-18-6)[illegible]	8-25-77	18.5	5.0	5.1	43	28	20	1.2
		6- 7-78	10.5	240	3.1	47	18	4.3	.50
115	Littles Creek at Joes Valley Reservoir at (D-17-6)31bd	8-25-77	22.5	.30	5.4	30	22	16	1.0
		6- 7-78	11.5	30	3.6	58	14	4.4	.50
116	Lowry Water at Joes Valley Reservoir at (D-17-6)30aaa	8-25-77	19.5	7.0	5.5	46	24	5.3	1.0
		6- 7-78	12.5	160	3.0	53	16	3.0	.70
117	Canal at diversion from Rock Canyon Creek at (D-19-7)22add	8-19-77	-	Dry	-	-	-	-	-
		6- 8-78	-	Dry	-	-	-	-	-
118	Canal at diversion from Rock Canyon Creek at (D-19-7)22dab	8-19-77	-	Dry	-	-	-	-	-
		6- 7-78	-	Dry	-	-	-	-	-
119	Rock Canyon Creek above diversions at (D-19-7)22acc	8-19-77	-	Dry	-	-	-	-	-
		6- 7-78	-	Dry	-	-	-	-	-
120	Canal at diversion from Ferron Creek at (D-20-7)7bba	8-19-77	24.0	.30	4.0	66	34	50	2.6
		6- 8-78	9.0	96	5.2	49	25	14	1.1
121	Ferron Creek below diversions at (D-20-7)7bba	8-19-77	-	Dry	-	-	-	-	-
		6- 8-78	9.0	37	5.2	49	24	14	1.1
122	Canal at diversion from Ferron Creek at (D-20-7)7bdc	8-19-77	-	Dry	-	-	-	-	-
		6- 8-78	9.0	53	5.2	50	24	14	1.1
123	Dry Wash at mouth at (D-20-6)12aad	8-19-77	-	Dry	-	-	-	-	-
		6- 8-78	-	Dry	-	-	-	-	-
124	Ferron Creek below reservoir at (D-20-7)7bbb	6- 9-77	12.0	35	4.6	58	28	24	1.3
		8-19-77	20.0	.50	4.8	67	35	47	2.6
		4-18-78	-	Dry	-	-	-	-	-
		6- 8-78	9.0	186	4.1	50	24	14	1.0
		9-12-78	16.0	80	4.9	52	29	14	1.2
125	Ferron Creek (upper station) near Ferron	1-21-77	.0	7.2	-	-	-	-	-
		2-10-77	.0	7.4	-	-	-	-	-
	USGS gaging-station number 09326500	3- 3-77	.0	3.2	-	-	-	-	-
		4- 5-77	13.5	5.8	-	-	-	-	-
		5-12-77	8.0	44	-	-	-	-	-
		6- 9-77	17.0	51	4.6	49	25	8.3	.90
		6-14-77	14.0	41	-	-	-	-	-
		7-12-77	23.5	14	-	-	-	-	-
		8- 9-77	22.5	8.1	-	-	-	-	-
		8-19-77	20.5	15	6.2	50	30	23	1.6
		9-14-77	14.0	7.6	-	-	-	-	-
		10- 5-77	14.0	6.9	-	-	-	-	-
		11-17-77	5.5	6.3	-	-	-	-	-
		12-15-77	.0	9.2	-	-	-	-	-
		1-11-78	.0	5.8	-	-	-	-	-
		3-30-78	12.5	19	5.7	44	25	45	1.9
		4-18-78	4.8	21	5.1	55	35	38	1.0
		4-27-78	10.0	41	-	-	-	-	-
		5-31-78	10.5	298	-	-	-	-	-
		6- 8-78	11.0	315	5.6	46	22	5.8	.90
		6-27-78	14.0	320	-	-	-	-	-
		7-13-78	19.5	107	-	-	-	-	-
		8-23-78	19.0	29	-	-	-	-	-
		9-13-78	6.5	21	5.8	50	33	14	1.0
126	Stevens Creek at mouth at (D-19-6)29dca	8-19-77	-	Dry	-	-	-	-	-
		6- 8-78	21.0	1.0	3.7	44	28	21	1.3
127	Ferron Creek above Stevens Creek at (D-19-6)29dac	8-19-77	19.0	5.0	6.0	43	31	19	3.2
		6- 8-78	11.0	315	5.4	46	21	5.3	.80

[1]Cloudburst runoff. [2]Analysis includes 50 μg/L iron (Fe). [3]Analysis includes 20 μg/L iron (Fe).

Milligrams per liter, unless otherwise noted													
									Hardness as $CaCO_3$				
Bicarbonate (HCO_3)	Carbonate (CO_3)	Dissolved sulfate (SO_4)	Dissolved chloride (Cl)	Dissolved nitrate (NO_3) + nitrite (NO_2) as N	Dissolved phosphate (PO_4)	Dissolved fluoride (F)	Dissolved solids (sum of constituents)	Specific conductance (μmho/cm at 25°C)	Calcium, magnesium	Noncarbonate	Sodium-adsorption ratio	pH	Dissolved boron (B) (u/L)
250	0	55	8.6	-	-	.10	294	440	250	46	0.60	7.5	40
230	0	58	8.4	-	-	.20	276	480	230	40	.50	7.4	30
240	0	53	21	-	-	.30	297	550	240	43	.60	8.1	40
280	0	93	10	-	-	.20	369	550	290	61	.70	7.5	50
250	0	100	15	-	-	.20	363	599	240	37	1.2	8.3	50
250	0	110	15	-	-	.20	372	560	250	46	1.0	7.8	70
240	0	47	13	-	-	.20	277	449	240	38	.50	8.2	30
230	0	34	7.2	-	-	.20	243	400	210	22	.50	7.8	40
230	0	29	6.7	-	-	.10	236	400	210	19	.40	7.9	50
220	0	27	6.4	-	-	.10	228	370	210	29	.40	7.8	30
220	0	21	4.7	.17	-	.10	216	360	200	18	.30	7.7	30
200	7	23	5.0	.18	-	.10	226	360	210	35	.50	8.5	20
-	-	-	-	.18	-	-	-	380	-	-	-	8.4	-
230	0	24	5.6	-	-	.10	224	340	200	8	.40	8.3	30
230	0	23	6.1	-	-	.10	226	370	210	17	.40	7.6	20
410	0	140	28	-	-	.50	569	890	380	42	1.7	7.9	110
270	5	50	17	-	-	.40	349	543	130	0	3.4	8.5	100
240	0	16	4.8	-	-	.30	227	380	190	0	.60	7.7	40
210	0	63	4.1	-	-	.20	268	458	220	50	.60	8.2	30
220	0	12	2.6	-	-	.10	196	320	190	11	.10	7.6	20
220	0	11	5.3	-	-	.10	199	350	170	0	.50	8.4	30
220	0	6.0	2.6	-	-	.10	198	321	200	22	.10	7.7	20
240	0	13	3.8	-	-	.10	217	385	210	17	.20	8.2	20
220	0	5.6	2.8	-	-	.10	193	320	200	18	.10	7.8	20
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	0	210	22	-	-	.30	497	730	300	120	1.2	8.1	60
230	0	43	4.8	-	-	.20	256	400	230	37	.40	8.1	30
-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	0	44	4.9	-	-	.20	256	400	220	33	.40	8.1	30
-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	0	45	4.9	-	-	.20	258	400	220	35	.40	8.1	30
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	0	97	11	-	-	.20	338	581	260	71	.60	8.4	30
230	0	210	19	-	-	.30	499	760	310	120	1.2	8.1	60
-	-	-	-	-	-	-	-	-	-	-	-	-	-
230	0	43	5.2	-	-	.20	255	400	220	35	.40	8.1	30
220	8	72	5.4	.04	-	.20	295	450	250	55	.40	8.6	20
-	-	-	-	-	-	-	-	700	-	-	-	-	-
-	-	-	-	-	-	-	-	620	-	-	-	-	-
-	-	-	-	-	-	-	-	740	-	-	-	-	-
-	-	-	-	-	-	-	-	570	-	-	-	-	-
-	-	-	-	-	-	-	-	380	-	-	-	-	-
200	0	50	4.2	-	-	.20	241	530	230	61	.20	8.4	30
-	-	-	-	-	-	-	-	420	-	-	-	-	-
-	-	-	-	-	-	-	-	500	-	-	-	-	-
-	-	-	-	-	-	-	-	515	-	-	-	-	-
230	0	78	9.2	.01	.00	.30	312	500	250	60	.60	8.2	50
-	-	-	-	-	-	-	-	540	-	-	-	-	-
-	-	-	-	-	-	-	-	560	-	-	-	-	-
-	-	-	-	-	-	-	-	615	-	-	-	-	-
-	-	-	-	-	-	-	-	600	-	-	-	-	-
-	-	-	-	-	-	-	-	700	-	-	-	-	-
250	0	73	13	-	-	.30	331	585	210	8	1.3	8.3	50
280	0	89	16	-	-	.30	377	594	280	52	1.0	8.1	50
-	-	-	-	-	-	-	-	450	-	-	-	-	-
-	-	-	-	-	-	-	-	400	-	-	-	-	-
210	0	29	2.9	.28	.00	.20	217	340	210	33	.20	8.1	20
-	-	-	-	-	-	-	-	370	-	-	-	-	-
-	-	-	-	-	-	-	-	400	-	-	-	-	-
-	-	-	-	-	-	-	-	480	-	-	-	-	-
230	10	69	6.2	.08	.00	.20	304	470	260	57	.40	8.5	30
-	-	-	-	-	-	-	-	-	-	-	-	-	-
260	4	17	5.6	-	-	.30	253	420	230	5	.60	8.4	30
230	0	72	7.7	-	-	.30	296	478	240	46	.50	8.2	40
200	0	28	2.3	-	-	.20	208	340	200	37	.20	8.1	20

Table 6.--Summary of selected hydrologic data

Name and location: See data-site numbering system.
Dominant cations: Ca, calcium, Mg, magnesium; Na, sodium.
Dominant anions: HCO3, bicarbonate; SO4, sulfate.
Water-supply problems: Salinity and sodium hazards are from classification by U.S. Salinity Laboratory Staff (1954, p. 80).

Site No.	Name and location	Number of chemical analyses	Discharge range of observations (ft^3/s)	Dissolved-solids range (mg/L)	Specific-conductance range (μmhos/cm at 25°C)	Dominant cations	
						Low flow	High flow
1	San Rafael River at mouth at (D-24-16)3aab	3	21-1,220	1,860-3,660	2,180-4,300	Na	Ca
2	Moonshine Wash at mouth at (D-24-16)10abb	See remarks	-	-	-	-	-
3	Dugout Wash at mouth at (D-24-15)17ccc	1	.01	2,590	2,950	Mg,Ca	-
4	San Rafael River below Cottonwood Wash (D-24-15)6bbc	2	85-550	1,910-2,260	2,640-2,750	Na	Ca
5	Cottonwood Wash at mouth at (D-24-15)1aba	See remarks	-	-	-	-	-
6	Iron Wash at mouth at (D-23-14)26ada	1	.50	342	585	-	Ca
7	San Rafael River above Iron Wash at (D-23-14)26aab	3	4-500	1,850-3,400	2,400-4,200	Na	Ca
7.2	Unnamed tributary at mouth at (D-23-14)14c	1	25	440	630	-	Na
8	Greasewood Draw at mouth at (D-23-14)4adc	1	10	234	341	-	Na,Ca
9	Iron Wash at Highway U-24 at (D-23-13)36abc	1	2	296	498	-	Ca
10	Old Woman Wash at (D-24-13)31acd	See remarks	-	-	-	-	-
11	Temple Wash at Highway U-24 at (D-24-12)11adb	do.	-	-	-	-	-
12	San Rafael River near Green River	See remarks	See remarks	487-6,530	689-7,230	Na	Ca,Na
13	San Rafael River at Highway I-70 at (D-22-14)5dcb	4	13-450	1,560-3,280	2,000-3,940	Na	Ca,Na
14	Spotted Wolf Canyon at Highway I-70 at (D-22-14)5cac	See remarks	-	-	-	-	-
15	Spring Canyon at mouth at (D-21-12)1d	do.	-	-	-	-	-
16	San Rafael River above Spring Canyon at (D-21-12)1c	3	.1-110	1,260-6,130	1,700-7,200	Na,Ca	Na,Ca
17	Buckhorn Wash at mouth at (D-20-11)14cab	See remarks	-	-	-	-	-
18	San Rafael River at San Rafael Bridge Campground	do.	.1-1,250	526-6,030	822-7,200	Na,Ca	Ca,Na
19	Buckhorn Wash below Furniture Draw at (D-19-11)19abc	1	.1	926	1,260	-	Ca
20	Unnamed tributary to Buckhorn Wash at (D-18-10)10ccd	1	.05	174	260	-	Na
21	Red Seep Wash below Red Seep at (D-19-9)1adc	See remarks	-	-	-	-	-
22	Buckhorn Wash below Buckhorn Reservoir at (D-18-10)20dad	do.	-	-	-	-	-
23	Buckhorn Wash above Buckhorn Reservoir at (D-18-10)16bbc	do.	-	-	-	-	-
24	North Salt Wash below Horn Silver Gulch at (D-20-9)28cdc	3	.02-0.3	4,310-6,100	4,980-8,000	Na	Na,Ca
24.5	North Salt Wash at mouth	See remarks	-	-	-	-	-
25	Fuller Bottom Draw at mouth at (D-20-9)1aab	do.	-	-	-	-	-
26	San Rafael River above Fuller Bottom Draw at (D-20-9)1abd	3	.05-110	983-5,710	1,330-6,800	Na,Ca	Ca,Na
27	San Rafael River at Hambrick Bottom at (D-19-9)27bda	6	.03-465	2,810-7,890	850-8,560	Na	Na
28	San Rafael River below Ferron Creek at (D-19-9)21dcd	6	.15-150	970-5,630	1,320-6,540	Na	Na,Ca
29	Ferron Creek at mouth at (D-19-9)21dcd	5	.10-14	2,070-5,710	2,600-6,800	Na	Na,Ca
30	San Rafael River above Ferron Creek at (D-19-9)21dca	5	.15-145	983-5,540	1,290-6,580	Na	Na,Ca

Dominant anions		Significant upstream diversions	Significant upstream irrigation	Water-supply problems			Remarks
Low flow	High flow			Salinity hazard	Sodium hazard	Hardness	
SO4	SO4	Yes	Yes	High to very high	Low to medium	Very hard	Discharge of 1220 ft^3/s was thunderstorm runoff.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
SO4	-	No	No	Very high	Low	Very hard	Stream dry during visit in August 1977.
SO4	SO4	Yes	Yes	do.	Low to medium	do.	Discharge of 550 ft^3/s was thunderstorm runoff.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
-	HCO3, SO4	No	No	Medium	Low	Very hard	Stream dry during visit in June 1978. Single analyses represents thunderstorm runoff.
SO4	SO4	Yes	Yes	Very high	Low to medium	do.	Discharge of 500 ft^3/s was thunderstorm runoff.
-	HCO3	No	No	Medium	Medium	Soft	Stream dry during visit in June 1978. Single analyses represents thunderstorm runoff.
-	HCO3	No	No	do.	Low	Moderately hard	Do.
-	HCO3, SO4	No	No	do.	do.	Hard	Do.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
-	-	-	-	-	-	-	Do.
SO4	SO4	Yes	Yes	Medium to very high	Low to very high	Very hard	U.S. Geological Survey water-quality station November 1946 to September 1949, October 1950 to present (1978). Ranges of discharge, dissolved solids, and specific conductance are based on this long-term record.
SO4	SO4	Yes	Yes	High to very high	Low to medium	do.	Discharge of 450 ft^3/s was thunderstorm runoff.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
-	-	-	-	-	-	-	Do.
SO4	SO4	Yes	Yes	High to very high	Low to high	Very hard	-
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and April and June 1978.
SO4	SO4	Yes	Yes	High to very high	Low to very high	Very hard	U.S. Geological Survey water-quality station October 1975 to present (1978). 39 analyses were made by U.S. Bureau of Reclamation during 1967-68 and 1976-77.
-	SO4	No	No	High	Low	do.	Discharge of 0.1 ft^3/s was thunderstorm runoff. Stream dry during visit in June 1978.
-	HCO3	-	-	Medium	do.	Soft	Discharge of 0.05 ft^3/s was thunderstorm runoff. Stream dry during visit in June 1978.
-	-	-	-	-	-	-	Stream dry during visit in June 1978.
-	-	-	-	-	-	-	Do.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
SO4	SO4	No	No	Very high	Medium to very high	Very hard	Boron ranges from 1,000 to 1,100 μ/L.
-	-	-	-	-	-	-	Stream dry during visit in April 1978.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
SO4	SO4	Yes	Yes	High to very high	Low to high	Very hard	-
SO4	SO4	Yes	Yes	do.	Medium to very high	do.	21 measurements of specific conductance only.
SO4	SO4	Yes	Yes	do.	Low to very high	do.	-
SO4	SO4	Yes	Yes	Very high	Medium to high	do.	Stream dry during two visits in August 1977.
SO4	SO4	Yes	Yes	High to very high	Low to very high	do.	-

Site No.	Name and location	Number of chemical analyses	Discharge range of observations (ft^3/s)	Dissolved-solids range (mg/L)	Specific-conductance range (µmhos/cm at 25°C)	Dominant cations	
						Low flow	High flow
31	Huntington Creek at mouth at (D-19-9)21dab	6	0.01-130	761-5,540	1,060-6,600	Na,Ca	Ca,Na
32	Cedar Hollow at mouth at Huntington Creek at (D-19-9)4aaa	See remarks	-	-	-	-	-
33	Huntington Creek at country road at (D-18-9)33acb	6	1-130	851-6,250	1,260-6,900	Na	Ca,Na
34	Unnamed canal at (D-18-9)17bcd	2	1.4-2.5	176-229	315-385	Ca	Ca
35	Cottonwood Creek at mouth at (D-19-9)21dbd	8	.1-16	2,450-5,720	3,050-6,890	Na	-
36	Cottonwood Creek above Rock Canyon Creek at (D-19-9)17cda	125 (See remarks)	.2-897	305-4,650	512-4,690	Na	Mg,Ca,Na
37	Rock Canyon Creek at mouth at (D-19-9)17cdd	111 (See remarks)	1-31	1,960-6,700	2,400-6,900	Na	Na,Mg,Ca
37.5	Rock Canyon Creek at (D-19-8)14	28 (See remarks)	.5-20	1,610-8,240	2,020-8,500	Na	Na
38	Cottonwood Creek at (D-19-9)7abd	2	.5-4.0	2,810-3,760	3,500-4,800	Na	-
39	Ferron Creek below Paradise Ranch near Clawson	See remarks	.05-60	574-9,630	817-9,030	Na	Mg,Ca,Na
39.5	Ferron Creek at (D-20-8)4d near Castledale	90 (See remarks)	1-390	473-6,030	722-5,860	Na,Mg,Ca	Mg,Na,Ca
40	Unnamed drain at Paradise Ranch at (D-19-8)34dcd	See remarks	-	-	-	-	-
41	Ferron Creek at (D-20-7)13ddd near Ferron	3	.3-6.0	1,840-3,990	2,400-4,550	Na	-
42	Unnamed drain at (D-20-7)24aab	2	.01-0.15	3,370-9,440	4,400-10,400	Na	-
43	Canal at (D-20-8)18adb near Molen	2	7.5-16	572-959	840-1,290	-	Ca,Mg,Na
44	Canal at (D-20-8)7ccc at Molen	1	1.5	267	460	Ca	-
45	Canal at (D-20-7)11bba near Ferron	1	8	273	460	-	Ca
46	Huntington Creek at country road at (D-18-9)8dba	14 (See remarks)	1-170	413-6,300	655-6,190	Na,Mg,Ca	Ca
47	McElprang Wash at country road at (D-18-9)8bad	3	1-12	1,720-4,880	2,230-5,400	Na,Ca	Na,Ca
48	Huntington Creek at (D-17-9)33bca	2	.6-170	316-5,200	510-6,110	Na,Mg,Ca	Ca
49	North Ditch at (D-17-9)34cdd near Lawrence	2	5.4-18	247-366	380-583	-	Ca
50	North Ditch below Buffalo Hollow at (D-18-9)2acb	2	4.5-8.0	258-378	390-590	-	Ca
51	North Ditch at (D-17-9)27dbc	2	5.4-25	253-353	390-583	-	Ca
52	Roper Wash at (D-17-9)33ccc at Lawrence	1	.8	1,210	1,670	Na,Ca	-
53	Cedar Creek at Highway U-155 at (D-17-9)16bcc	2	.6-1.0	477-4,520	762-5,240	Mg,Na,Ca	Ca,Mg,Na
54	Canal at (D-19-8)28bca near Clawson	1	2.5	271	445	-	Ca
55	Cleveland Canal at Highway U-10 at (D-17-9)9bcc	2	25-100	217-246	380-395	-	Ca
56	North Ditch at Highway U-10 at (D-17-9)8dad	2	.08-60	195-212	290-340	Ca,Mg	Ca
57	Cedar Creek at Highway U-10 at (D-17-9)8dad	3	.2-0.6	1,610-5,750	2,060-6,400	Na,Mg,Ca	-
58	Canal from Huntington North Reservoir at Highway U-10	2	6.5-15	372-381	564-597	-	Ca
59	North Ditch from Huntington North Reservoir at (D-17-9)17bbb	3	.6-45	188-391	300-620	-	Ca
60	Huntington Creek at Highway U-10 at (D-17-9)18ccb	8	.15-85	325-2,730	490-3,250	Ca	Ca
61	Canal at (D-17-9)30bcb	2	16-20	200-331	310-472	-	Ca
62	McElprang Wash at Highway U-10 at (D-17-8)25add	2	.1-3.0	1,150-6,090	1,520-7,100	Na	Ca,Na
63	Guymon Wash at Highway U-10 at (D-17-8)36dda	3	.25-0.40	2,850-4,480	3,600-5,200	Na,Ca,Mg	-
64	Canal at Highway U-10 at (D-18-8)1cda	2	3-17	200-227	328-376	Ca	Ca

Dominant anions Low flow	Dominant anions High flow	Significant upstream diversions	Significant upstream irrigation	Water-supply problems Salinity hazard	Water-supply problems Sodium hazard	Water-supply problems Hardness	Remarks
SO4	SO4	Yes	Yes	High to very high	Low to high	Very hard	Stream dry during one of two visits in August 1977.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
SO4	SO4	Yes	Yes	High to very high	Low to very high	Very hard	Stream dry during one of two visits in August 1977.
HCO3	HCO3	-	-	Medium	Low	Hard to very hard	-
SO4	-	Yes	Yes	Very high	High	Very hard	-
SO4	SO4	Yes	Yes	Medium to very high	Low to high	do.	122 analyses were made by U.S. Bureau of Reclamation during 1958-62 and 1975-77. Stream dry during visit in August 1977.
SO4	SO4	Yes	Yes	Very high	Medium to high	do.	107 analyses were made by U.S. Bureau of Reclamation during 1975-77.
SO4	SO4	Yes	Yes	High to very high	Medium to very high	do.	27 analyses were made by U.S. Bureau of Reclamation during 1958-61.
SO4	-	Yes	Yes	Very high	Medium	do.	Stream dry during visit in August 1977.
SO4	SO4	Yes	Yes	do.	Medium to very high	do.	U.S. Geological Survey water quality station October 1975 to present (1978). 89 analyses were made by U.S. Bureau of Reclamation during 1975-77.
SO4	SO4	Yes	Yes	Medium to very high	Low to high	do.	89 analyses were made by U.S. Bureau of Reclamation 1960-65 and 1974-75.
-	-	-	-	-	-	-	Stream dry during visits in August 1977 and June 1978.
SO4	-	Yes	Yes	Very high	Medium	Very hard	-
SO4	-	-	Yes	do.	High to very high	do.	-
-	HCO3, SO4	-	-	Medium to high	Low	do.	-
HCO3	-	-	-	Medium	do.	do.	-
-	HCO3	-	-	do.	do.	do.	-
SO4	HCO3, SO4	Yes	Yes	Medium to very high	Low to high	do.	10 analyses were made by U.S. Bureau of Reclamation during 1959-60.
SO4	SO4	No	Yes	High to very high	do.	do.	-
SO4	HCO3	Yes	Yes	Medium to very high	Low to high	do.	-
-	HCO3	-	-	Medium	Low	do.	-
-	HCO3	-	-	do.	do.	do.	-
-	HCO3	-	-	do.	do.	do.	-
SO4	-	No	Yes	High	do.	do.	Stream dry during visit in August 1977.
SO4	HCO3, SO4	Yes	Yes	Medium to very high	Low to medium	do.	-
-	HCO3	-	-	Medium	Low	do.	Dry during visit in August 1977.
-	HCO3	-	-	do.	do.	do.	-
HCO3	HCO3	-	-	do.	do.	do.	-
SO4	-	Yes	Yes	High to very high	Low to medium	do.	-
-	HCO3	-	-	Medium	Low	do.	Canal dry during visit in April 1978.
-	HCO3	-	-	do.	do.	Hard to very hard	-
SO4	HCO3, SO4	Yes	Yes	Medium to very high	Low to medium	Very hard	10 measurements of specific conductance only.
-	HCO3	-	-	Medium	Low	Hard to very hard	-
SO4	SO4	No	Yes	High to very high	Low to very high	Very hard	-
SO4	-	No	Yes	Very high	Medium	do.	-
HCO3	HCO3	-	-	Medium	Low	do.	-

Site No.	Name and location	Number of chemical analyses	Discharge range of observations (ft^3/s)	Dissolved-solids range (mg/L)	Specific conductance range (µmhos/cm at 25°C)	Dominant cations	
						Low flow	High flow
65	Fivemile Wash at Highway U-10 at (D-18-8)12cca	2	0.01-0.25	5,310-5,850	6,240-7,200	Na	-
65.2	Fivemile Wash at (D-18-9)18cab	1	.5	2,880	3,600	Na	-
65.5	Fivemile Wash at mouth at (D-18-9)20	9 (See remarks)	.1-4.0	2,480-11,100	2,960-10,570	Na	-
66	Wilberg Wash at Highway U-10 at (D-18-8)14aad	2	.15-0.7	2,670-8,390	3,690-8,910	Na	-
66.5	Wilberg Wash at mouth at (D-18-9)20	7 (See remarks)	.1-4.0	1,780-9,830	2,220-9,520	Na	-
67.2	Canal at (D-18-8)26ccb	1	2	1,110	1,370	Ca,Na	-
68	Cottonwood Creek at (D-18-8)33bda at Castledale	8	1.3-100	933-2,680	600-3,190	Ca,Na,Mg	Ca,Na,Mg
69	Blue Cut Ditch at Highway U-10 at (D-19-8)4add	1	12	308	450	-	Ca,Mg
70	South Wash at Highway U-10 at (D-19-8)9bcd	1	.6	2,080	2,550	Na	-
71	Wolf Hollow at Highway U-10 at (D-19-8)17bac	1	.8	990	1,320	Ca,Na	-
72	Canal at (D-19-8)18dbd	1	1.6	311	489	Ca	Ca
73	Rock Canyon Creek at Highway U-10 at (D-19-7)24adb	5	.15-2.0	1,010-4,030	1,420-4,590	Na,Ca	Na,Ca
74	Canal at (D-19-7)26daa at Clawson	1	10	304	420	-	Ca
75	Canal at (D-19-7)35bda at Clawson	1	10	270	410	-	Ca
77	Canal at Highway U-10 at (D-20-7)3cba	1	40	270	400	-	Ca
78	Canal at (D-20-7)15bbb at Ferron	1	8	299	517	-	Ca
79	Ferron Creek at (D-20-7)15bcc at Ferron	7	1.5-120	392-1,060	495-2,400	Ca	Ca
80	Drain at Highway U-10 at (D-20-7)22bcc	1	.2	3,590	4,300	Na	-
81	Drain at Highway U-10 at (D-20-7)22ccc	1	.01	5,050	5,520	Na,Ca	-
84	Canal at Highway U-10 at (D-21-7)8adc	1	.7	348	483	Ca,Mg	-
86	Cedar Creek at (D-17-9)5bbd	2	.03-2.0	707-3,090	1,000-3,450	Ca,Na,Mg	Ca,Na
87	Huntington Creek at Highway U-31 at (D-17-8)14acb	2	.15-110	181-1,060	290-1,410	Ca	Ca
88	North Ditch at Highway U-31 at (D-17-8)14bac	2	.4-92	183-540	290-827	Ca	Ca
88.2	Huntington Canal at (D-17-8)26aba	2	16-30	182-228	300-396	-	Ca
88.4	Cottonwood Creek Canal at (D-17-8)26abc	2	2-45	254-475	387-710	Ca,Na,Mg	Ca,Mg
89	Cedar Creek at (D-16-8)10dcd at Mohrland	2	.4-2.5	339-552	540-837	Ca,Mg	Ca,Mg
90	North Ditch at diversion at (D-17-8)9bbb	2	11-92	181-319	290-525	Ca,Mg	Ca
91	Huntington Creek below North Ditch diversion at (D-17-8)9dbb	1 (See remarks)	110	178	290	-	Ca
92	Huntington Creek above Fish Creek near Huntington	18 (See remarks)	13-603	155-305	290-502	Ca	Ca
93	Huntington Creek at Bear Creek Ranger Station	12 (See remarks)	20-600	150-274	280-477	Ca	Ca
94	Huntington Creek above Left Fork at (D-15-7)20dcc	2	17-45	177-193	300-330	Ca	Ca
95	Left Fork Huntington Creek at mouth at (D-15-7) 20cdd	2	9.6-300	154-218	240-345	Ca	Ca
96	Cleveland Reservoir outflow at (D-14-6)27bdd	1 (See remarks)	1.8	191	326	Ca	Ca
97	Lake Canyon at Lake Guard Station	1	1.6	179	290	Ca	Ca
98	Huntington Reservoir outflow at (D-14-6)21cbd	2	.25-25	130-147	220-266	Ca	Ca
99	Huntington Creek below Cox Canyon at (D-14-6)14acb	2	12-22	147-222	250-286	Ca	Ca
100	Canal at Highway U-29 at (D-18-8)27abb	1	2.5	253	390	Ca,Mg	Ca,Mg

Dominant anions		Significant upstream diversions	Significant upstream irrigation	Water-supply problems			Remarks
Low flow	High flow			Salinity hazard	Sodium hazard	Hardness	
SO4	-	No	Yes	Very high	High to very high	Very hard	-
SO4	-	No	Yes	do.	Medium	do.	-
SO4	-	No	Yes	do.	Medium to very high	do.	8 analyses were made by U.S. Bureau of Reclamation in 1960.
SO4	-	No	Yes	do.	High to very high	do.	-
SO4	-	No	Yes	High to very high	Medium to very high	do.	6 analyses were made by U.S. Bureau of Reclamation in 1960.
SO4	-	-	-	High	Low	Very hard	-
SO4	SO4	Yes	Yes	Medium to very high	do.	do.	-
	HCO3	-	-	Medium	do.	do.	-
SO4	-	Yes	Yes	Very high	Medium	do.	-
SO4	-	Yes	Yes	High	Low	do.	-
HCO3	HCO3	-	-	Medium	do.	do.	-
SO4	SO4	Yes	Yes	High to very high	Low to high	do.	-
-	HCO3	-	-	Medium	Low	do.	-
-	HCO3	-	-	do.	do.	do.	-
-	HCO3	-	-	do.	do.	do.	-
-	HCO3	-	-	do.	do.	do.	-
SO4,HCO3	SO4,HCO3	Yes	Yes	Medium to very high	do.	do.	10 measurements of specific conductance only.
SO4	-	-	Yes	Very high	High	do.	-
SO4	-	-	Yes	do.	do.	do.	-
SO4,HCO3	-	-	-	Medium	Low	do.	-
SO4	SO4	No	No	High to very high	do.	do.	-
SO4	HCO3	Yes	No	Medium to high	do.	Hard to very hard	-
HCO3,SO4	HCO3	-	-	do.	do.	do.	-
-	HCO3	-	-	Medium	do.	do.	-
HCO3,SO4	HCO3	-	-	do.	do.	Very hard	-
SO4	HCO3	No	No	Medium to high	do.	do.	-
HCO3	HCO3	-	-	Medium	do.	Hard to very hard	-
HCO3	-	Yes	No	do.	do.	Hard	Stream was dry during visit in August 1977.
HCO3	HCO3	No	No	do.	do.	Hard to very hard	12 analyses were made by Utah Power and Light Co. during 1972-75.
HCO3	HCO3	No	No	do.	do.	do.	10 analyses were made by Utah Power and Light Co. during 1972-75.
HCO3	HCO3	No	No	do.	do.	Hard	-
HCO3	HCO3	No	No	Low to medium	do.	Hard to very hard	-
HCO3	HCO3	No	No	Medium	do.	Hard	No reservoir outflow during visit in June 1978.
HCO3	HCO3	No	No	do.	do.	do.	-
HCO3	HCO3	No	No	Low to medium	do.	Moderately hard to hard	-
HCO3	HCO3	No	No	do.	do.	Hard	-
HCO3	HCO3	-	-	Medium	do.	Very hard	-

Site No.	Name and location	Number of chemical analyses	Discharge range of observations (ft^3/s)	Dissolved-solids range (mg/L)	Specific conductance range (µmhos/cm at 25°C)	Dominant cations	
						Low flow	High flow
101	Canal at Highway U-29 at (D-18-8)28ada	1	18	251	390	Ca,Mg	Ca,Mg
102	Cottonwood Creek at Highway U-57 at Orangeville	3	.2-0.6	916-1,680	1,270-2,090	Ca	-
103	Blue Cut Ditch at (D-18-8)29cba at Orangeville	2	6-22	311-366	480-585	Ca	Ca
104	Cottonwood Creek below diversion at (D-18-7)24aad	3	4-19	269-371	420-610	Ca	Ca
105.6	Canal at (D-18-8)30bdc at Orangeville	2	3-16	229-251	400-405	Ca,Mg	Ca,Mg
106.1	Canal at (D-18-8)30cbc	2	.3-9	213-227	370-372	Ca,Mg	Ca,Mg
107	Canal at (D-18-8)32cbb	2	6-8	229-243	370-420	Ca,Mg	Ca,Mg
108	Canal at (D-18-7)13cbc	2	4-37	235-239	409-410	Ca,Mg	Ca,Mg
109	Grimes Wash at mouth at Highway U-29	1 (See remarks)	.05	1,350	1,850	Ca,Na,Mg	-
109.5	Canal at diversion at Swasey Ranch at (D-18-7)14cab	1	20	227	397	Ca,Mg	-
109.6	Cottonwood Creek below diversion at Swasey Ranch	1	6	231	400	Ca,Mg	-
110	Cottonwood Creek near Orangeville	40	3.6-200	208-1,170	360-1,700	Ca,Mg	Ca,Mg
111	Straight Canyon below Joes Valley Reservoir	2	26-119	224-226	340-370	Ca,Mg	Ca,Mg
112	North Dragon Creek at Joes Valley Reservoir	1	.3	569	890	Mg,Na,Ca	-
113	Swasey Creek at Joes Valley Reservoir at (D-18-6)7aab	2	.01-5.0	227-349	380-543	Na,Ca	Ca,Mg
114	Seely Creek at Joes Valley Reservoir at (D-18-6)6bbb	2	5-240	196-268	320-458	Ca	Ca
115	Littles Creek at Joes Valley Reservoir at (D-17-6)31bd	2	.3-30	198-199	321-350	Ca,Mg	Ca
116	Lowry Water at Joes Valley Reservoir at (D-17-6)30aaa	2	7-160	193-217	320-385	Ca,Mg	Ca
117	Canal at diversion from Rock Canyon Creek at (D-19-7)22add	See remarks	-	-	-	-	-
118	Canal at diversion from Rock Canyon Creek at (D-19-7)22dab	do.	-	-	-	-	-
119	Rock Canyon Creek above diversion at (D-19-7)22acc	do.	-	-	-	-	-
120	Canal at diversion from Ferron Creek at (D-20-7)7bbd	2	.3-96	256-497	400-730	Ca,Na,Mg	Ca,Mg
121	Ferron Creek below diversions at (D-20-7)7bba	1 (See remarks)	37	256	400	-	Ca,Mg
122	Canal at diversion from Ferron Creek at (D-20-7)7bdc	1 (See remarks)	53	258	400	-	Ca,Mg
123	Dry Wash at mouth at (D-20-6)12aad	See remarks	-	-	-	-	-
124	Ferron Creek below reservoir at (D-20-7)7bbb	4 (See remarks)	.5-186	255-499	400-760	Ca,Na,Mg	Ca,Mg
125	Ferron Creek (upper station) near Ferron	59 (See remarks)	-	186-422	340-693	Ca,Mg	Ca
126	Stevens Creek at mouth at (D-19-6)29dcd	1 (See remarks)	1	253	420	Ca,Mg	-
127	Ferron Creek above Stevens Creek at (D-19-6)29dac	2	.5-315	208-296	340-478	Ca,Mg	Ca

Dominant anions		Significant upstream diversions	Significant upstream irrigation	Water-supply problems			Remarks
Low flow	High flow			Salinity hazard	Sodium hazard	Hardness	
HCO3	HCO3	-	-	Medium	Low	Very hard	-
SO4,HCO3	-	Yes	Yes	High	do.	do.	-
HCO3	HCO3	-	-	Medium	do.	do.	-
HCO3	HCO3	Yes	No	do.	do.	do.	-
HCO3	HCO3	-	-	do.	do.	do.	-
HCO3	HCO3	-	-	do.	do.	Hard to very hard	-
HCO3	HCO3	-	-	do.	do.	Very hard	-
HCO3	HCO3	-	-	do.	do.	do.	-
SO4	-	No	No	High	do.	do.	Stream dry during visit in June 1978.
HCO3	-	-	-	Medium	do.	do.	-
HCO3	-	Yes	No	do.	do.	do.	-
HCO3	HCO3	No	No	Medium to high	do.	do.	U.S. Geological Survey water-quality station October 1975 to present (1972).
HCO3	HCO3	No	No	do.	do.	do.	-
HCO3	-	No	No	High	do.	do.	-
HCO3	HCO3	No	No	Medium	do.	Hard to very hard	-
HCO3	HCO3	No	No	do.	do.	Very hard	-
HCO3	HCO3	No	No	do.	do.	Hard to very hard	-
HCO3	HCO3	No	No	do.	do.	Very hard	-
-	-	-	-	-	-	-	Canal dry during visits in August 1977 and June 1978.
-	-	-	-	-	-	-	Do.
-	-	-	-	-	-	-	Do.
SO4,HCO3	HCO3	-	-	Medium	Low	Very hard	-
-	HCO3	Yes	Yes	do.	do.	do.	Stream dry during visit in August 1977.
-	HCO3	-	-	do.	do.	do.	Canal dry during visit in August 1977.
-	-	-	-	-	-	-	Stream dry during visit in August 1977 and June 1978.
HCO3,SO4	HCO3	Yes	No	Medium to high	Low	Very hard	Stream dry during visit in April 1978.
HCO3	HCO3	No	No	Medium	do.	do.	53 analyses were made by U.S. Bureau of Reclamation during 1962-64. 18 measurements of specific conductance only.
HCO3	-	No	No	do.	do.	do.	Stream dry during visit in August 1977.
HCO3	HCO3	No	No	do.	do.	do.	-

Table 7.--Concentrations of trace elements in

Site No.	Name	Semiquantative method	Date of collection	Discharge (ft^3/s)	Dissolved aluminum (Al)	Dissolved antimony (Sb)	Dissolved arsenic (As)	Dissolved barium (Ba)	Dissolved beryllium (Be)	Dissolved bismuth (Bi)	Dissolved boron (B)
1	San Rafael River at mouth at (D-24-16)3aab	X	6- 6-78	70	1,000	50	-	30	<1	<1,000	100
			9-14-78	Dry	-	-	-	-	-	-	-
12	San Rafael River near Green River 09328500	-	9-13-78	10	20	-	1	0	-	-	380
27	San Rafael River at Hambrick Bottom at (D-19-9)27bda	X	6- 7-78	170	300	<30	-	50	<1	<1,000	70
29	Ferron Creek at mouth at (D-19-9)21dcd	X	6- 7-78	10	700	30	-	50	<1	<1,000	100
			9-12-78	20	20	-	2	100	-	-	270
31	Huntington Creek at mouth at (D-19-9)21dab	X	6- 7-78	130	300	<30	-	50	<1	<1,000	50
			9-12-78	7.5	20	-	-	0	-	-	400
35	Cottonwood Creek at mouth at (D-19-9)21dbd	X	6- 7-78	116	500	30	-	30	<1	<1,000	300
			9-12-78	6.0	20	-	1	100	-	-	410
55	Cleveland Canal at State Highway U-10 at (D-17-9)9bcc	X	6- 5-78	100	100	<30	-	30	<1	<1,000	7
56	North Ditch at State Highway U-10 at (D-17-9)8daa	X	6- 5-78	60	70	30	-	50	<1	<1,000	7
58	Canal from Huntington North Reservoir at State Highway U-10	X	6- 5-78	15	100	<30	-	70	<1	<1,000	30
60	Huntington Creek at State Highway U-10 at (D-17-9)18ccb	X	6- 5-78	85	100	<30	-	50	<1	<1,000	10
64	Canal at State Highway U-10 at (D-18-8)1cda	X	6- 6-78	17	100	<30	-	50	<1	<1,000	10
68	Cottonwood Creek at Castledale at (D-18-8)33bda	X	6- 6-78	1.3	1,000	50	-	50	<1	<1,000	100
			9-12-78	2.5	10	-	1	100	-	-	250
69	Blue Cut Ditch at State Highway U-10 at (D-19-8)4add	X	6- 7-78	12	100	<30	-	70	<1	<1,000	30
73	Rock Canyon Creek at State Highway U-10 at (D-19-7)24adb	X	6- 8-78	0.5	700	70	-	30	<1	<1,000	500
			9-12-78	1.0	10	-	1	100	-	-	260
78	Canal at (D-20-7)15bbb at Ferron	X	6- 8-78	8.0	100	30	-	100	<1	<1,000	10
79	Ferron Creek at Ferron at (D-20-7)15bcc	X	6- 8-78	22	100	<30	-	100	<1	<1,000	10
92	Huntington Creek above Fish Creek, near Huntington 09318000	X	6- 6-78	360	100	<30	-	50	<1	<1,000	7
			9-11-78	84	10	-	1	-	-	-	20
100	Canal at State Highway U-29 at (D-18-8)27abb	X	6- 7-78	2.5	100	30	-	100	<1	<1,000	10
104	Cottonwood Creek below diversion, at (D-18-7)24aad	-	9-13-78	15	20	-	2	100	-	-	40
110	Cottonwood Creek near Orangeville 09324500	X	6- 7-78	119	100	30	-	100	<1	<1,000	10
119	Rock Canyon Creek above diversions, at (D-19-7)22acc	X	6- 7-78	Dry	-	-	-	-	-	-	-
125	Ferron Creek (upper station) near Ferron 09326500	X	6- 8-78	315	100	<30	-	100	<1	<1,000	10
			9-13-78	21	20	-	2	300	-	-	30

water samples collected at selected sites.

Micrograms per liter																				
Dissolved cadium (Cd)	Dissolved chromium (Cr)	Dissolved cobalt (Co)	Dissolved copper (Cu)	Dissolved gallium (Ga)	Dissolved germanium (Ge)	Dissolved iron (Fe)	Dissolved lead (Pb)	Dissolved lithium (Li)	Dissolved manganese (Mn)	Dissolved mercury (Hg)	Dissolved molybdenum (Mo	Dissolved nickel (Ni)	Dissolved selenium (Se)	Dissolved silver (Ag)	Dissolved strontium (Sr)	Dissolved tin (SN)	Dissolved titanium (Ti)	Dissolved vanadium (V)	Dissolved zirconium (Zr)	Dissolved zinc (Zn)
<1	<50	<5	<10	<30	700	300	<30	100	10	-	<10	<50	-	<10	3,000	500	10	<10	<5	10
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	0	-	-	-	-	69	350	-	0.0	3	-	0	-	3,100	-	-	-	-	20
<1	<50	<5	<10	<30	300	10	<30	70	10	-	<10	<50	-	<10	1,000	300	<5	<10	<5	5
<1	<50	<5	<10	<30	700	30	<30	100	7	-	10	<50	-	<10	3,000	500	<5	<10	<5	10
-	-	0	-	-	-	-	20	240	-	0.0	2	-	2	-	2,600	-	-	-	-	10
<1	<50	<5	<10	<30	300	10	<30	70	10	-	<10	<50	-	<10	700	100	<5	<10	<5	<5
-	-	0	-	-	-	-	64	470	-	0.0	5	-	0	-	2,800	-	-	-	-	20
<1	<50	<5	<10	<30	700	10	<30	100	10	-	<10	<50	-	<10	3,000	700	<5	<10	<5	10
-	-	0	-	-	-	-	24	290	-	0.0	5	-	0	-	2,500	-	-	-	-	20
3	<50	<5	<10	<30	70	100	30	7	7	-	<10	<50	-	<10	100	<50	<5	<10	<5	10
1	<50	<5	<10	<30	70	10	<30	7	5	-	<10	<50	-	<10	100	<50	<5	<10	<5	10
5	<50	<5	<10	<30	300	<5	<30	10	5	-	<10	<50	-	<10	300	100	<5	<10	<5	10
<1	<50	<5	<10	<30	100	10	<30	10	30	-	<10	<50	-	<10	300	100	<5	<10	<5	10
<1	<50	<5	<10	<30	100	30	<30	10	5	-	<10	<50	-	<10	100	50	<5	<10	<5	7
<1	<50	<5	<10	<30	1,000	50	<30	100	30	-	10	<50	-	<10	3,000	700	<5	<10	<5	30
-	-	0	-	-	-	-	2	180	-	0.0	1	-	0	-	2,300	-	-	-	-	20
<1	<50	<5	<10	<30	100	10	<30	10	1	-	<10	<50	-	<10	300	100	<5	<10	<5	7
1	<50	7	<10	70	700	30	30	300	300	-	10	<50	-	<10	3,000	700	5	10	<5	30
-	-	0	-	-	-	-	2	210	-	0.0	2	-	0	-	2,300	-	-	-	-	10
<1	<50	<5	<10	<30	100	10	<30	10	1	-	<10	<50	-	<10	500	100	<5	<10	<5	<5
<1	<50	<5	<10	<30	100	10	<30	30	3	-	<10	<50	-	<10	700	100	<5	<10	<5	<5
<1	<50	<5	<10	<30	50	30	<30	<5	10	-	<10	<50	-	<10	100	<50	<5	<10	<5	7
-	-	0	-	-	-	-	3	7	-	0.0	-	-	0	-	140	-	-	-	-	10
<1	<50	<5	<10	<30	100	10	<30	10	3	-	<10	<50	-	<10	300	100	<5	<10	<5	5
-	-	0	-	-	-	-	12	20	-	0.0	1	-	0	-	380	-	-	-	-	10
<1	<50	<5	<10	<30	100	<5	<30	10	1	-	<10	<50	-	<10	300	100	<5	<10	<5	5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<1	<50	<5	<10	<30	100	10	<30	10	3	-	<10	<50	-	<10	500	100	<5	<10	<5	<5
-	-	0	-	-	-	-	21	30	-	0.0	2	-	0	-	820	-	-	-	-	10

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*No. 12. Test drilling in the upper Sevier River drainage basin, Garfield and Piute Counties, Utah, by R. D. Feltis and G. B. Robinson, Jr., U.S. Geological Survey, 1963.

*No. 13. Water requirements of lower Jordan River, Utah, by Karl Harris, Irrigation Engineer, Agricultural Research Service, Phoenix, Arizona, prepared under informal cooperation approved by Mr. W. W. Donnan, Chief, Southwest Branch (Riverside, California) Soil and Water Conservation Research Division, Agricultural Research Service, U.S.D.A., and by W. D. Criddle, State Engineer, State of Utah, Salt Lake City, Utah, 1964.

*No. 14. Consumptive use of water by native vegetation and irrigated crops in the Virgin River area of Utah, by W. D. Criddle, J. M. Bagley, R. K. Higginson, and D. W. Hendricks, through cooperation of Utah Agricultural Experiment Station, Agricultural Research Service, Soil and Water Conservation Branch, Western Soil and Water Management Section, Utah Water and Power Board, and Utah State Engineer, Salt Lake City, Utah, 1964.

*No. 15. Ground-water conditions and related water-administration problems in Cedar City Valley, Iron County, Utah, February, 1966, by J. A. Barnett and F. T. Mayo, Utah State Engineer's Office.

*No. 16. Summary of water well drilling activities in Utah, 1960 through 1965, compiled by Utah State Engineer's Office, 1966.

*No. 17. Bibliography of U.S. Geological Survey water-resources reports for Utah, compiled by O. A. Keller, U.S. Geological Survey, 1966.

*No. 18. The effect of pumping large-discharge wells on the ground-water reservoir in southern Utah Valley, Utah County, Utah, by R. M. Cordova and R. W. Mower, U.S. Geological Survey, 1967.

No. 19. Ground-water hydrology of southern Cache Valley, Utah, by L. P. Beer, Utah State Engineer's Office, 1967.

*No. 20. Fluvial sediment in Utah, 1905-65, A data compilation by J. C. Mundorff, U.S. Geological Survey, 1968.

*No. 21. Hydrogeology of the eastern portion of the south slopes of the Uinta Mountains, Utah, by L. G. Moore and D. A. Barker, U.S. Bureau of Reclamation, and J. D. Maxwell and B. L. Bridges, Soil Conservation Service, 1971.

*No. 22. Bibliography of U.S. Geological Survey water-resources reports for Utah, compiled by B. A. LaPray, U.S. Geological Survey, 1972.

*No. 23. Bibliography of U.S. Geological Survey water-resources reports for Utah, compiled by B. A. LaPray, U.S. Geological Survey, 1975.

No. 24. A water-land use management model for the Sevier River Basin, Phase I and II, by V. A. Narasimham and Eugene K. Israelsen, Utah Water Research Laboratory, College of Engineering, Utah State University, 1975.

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No. 27. Bibliography of U.S. Geological Survey Water-Resources Reports for Utah, compiled by Barbara A. LaPray and Linda S. Hamblin, U.S. Geological Survey, 1980.

UNITED STATES DEPARTMENT OF THE INTERIOR
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Prepared in cooperation with the
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TECHNICAL PUBLICATION NO. 72
1982 PLATE 2

EXPLANATION

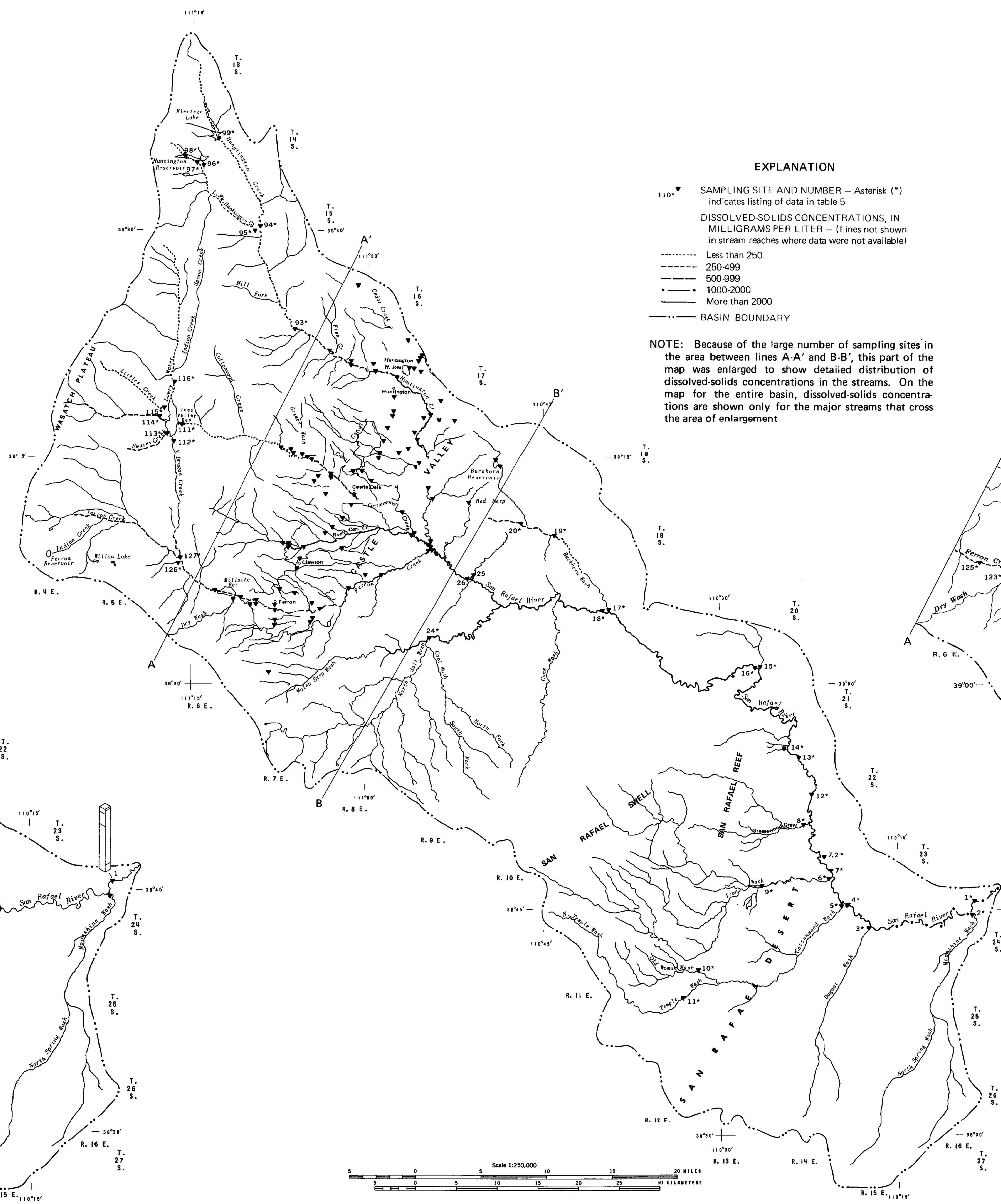
123▼ SAMPLING SITE AND NUMBER

Sodium plus Potassium | Chloride
Magnesium | Sulfate
Calcium | Bicarbonate plus Carbonate

MILLIEQUIVALENTS, PER LITER: 100, 75, 50, 25, 0

If total milliequivalents (cations or anions) per liter is less than 2 for analysis, the individual ions are not shown. Due to scale some cations or anions may appear to be missing. Refer to table 5 for actual analytical determinations

—— · · —— BASIN BOUNDARY



EXPLANATION

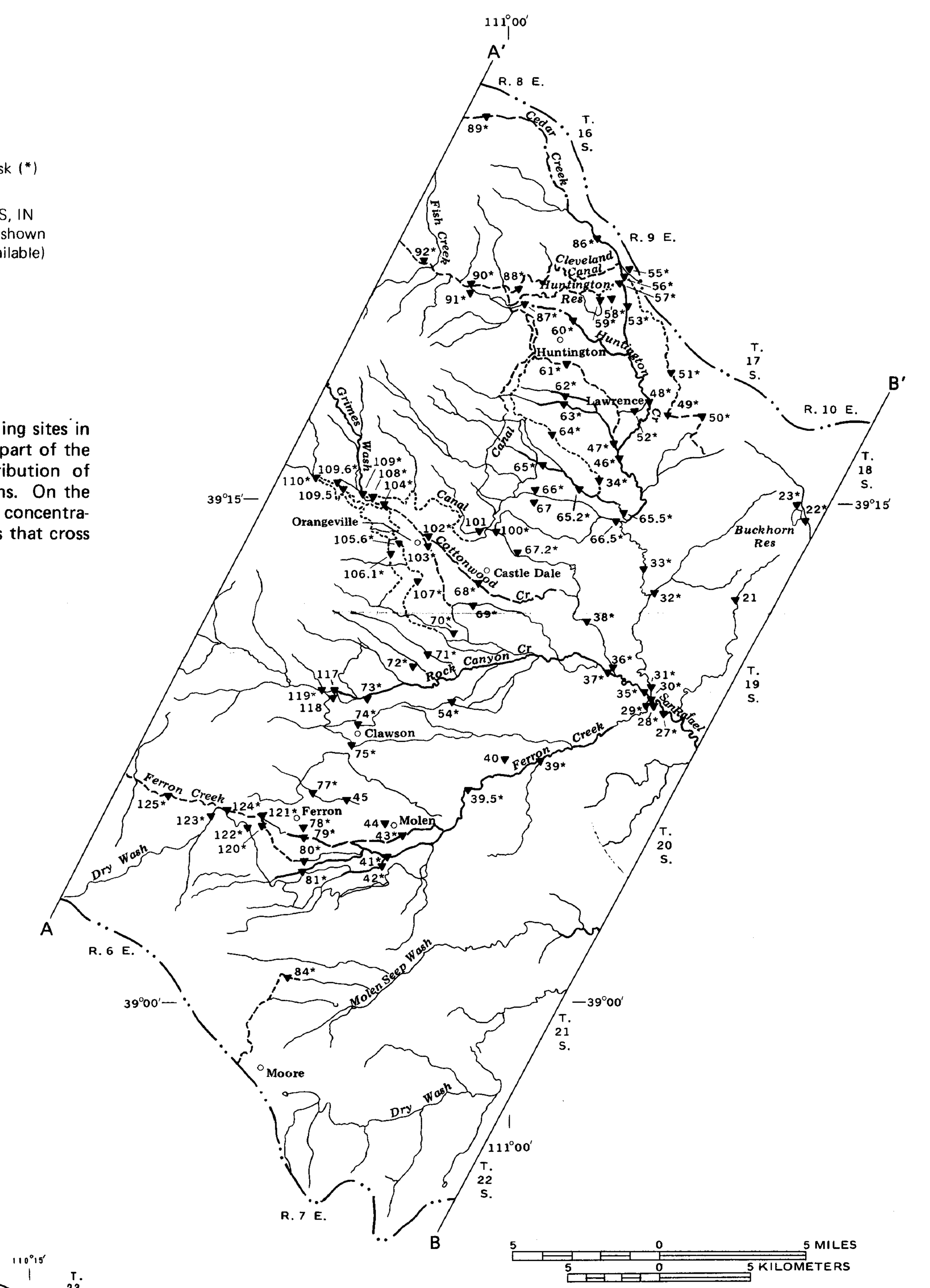
110*▼ SAMPLING SITE AND NUMBER – Asterisk (*) indicates listing of data in table 5

DISSOLVED-SOLIDS CONCENTRATIONS, IN MILLIGRAMS PER LITER – (Lines not shown in stream reaches where data were not available)

- Less than 250
- 250-499
- 500-999
- 1000-2000
- More than 2000

—— · · —— BASIN BOUNDARY

NOTE: Because of the large number of sampling sites in the area between lines A-A′ and B-B′, this part of the map was enlarged to show detailed distribution of dissolved-solids concentrations in the streams. On the map for the entire basin, dissolved-solids concentrations are shown only for the major streams that cross the area of enlargement



Base from U.S. Geological Survey 1:250,000 quadrangles: Price, 1956 (revised 1970), and Salina, 1956 (revised 1970)

MAPS SHOWING APPROXIMATE RANGES OF DISSOLVED-SOLIDS CONCENTRATIONS IN STREAMS AND CHEMICAL CHARACTERISTICS OF THE WATER AT SELECTED SITES DURING AUGUST 15-25, 1977 IN THE SAN RAFAEL RIVER BASIN

Hydrology by J.C. Mundorff and K.R. Thompson, 1978

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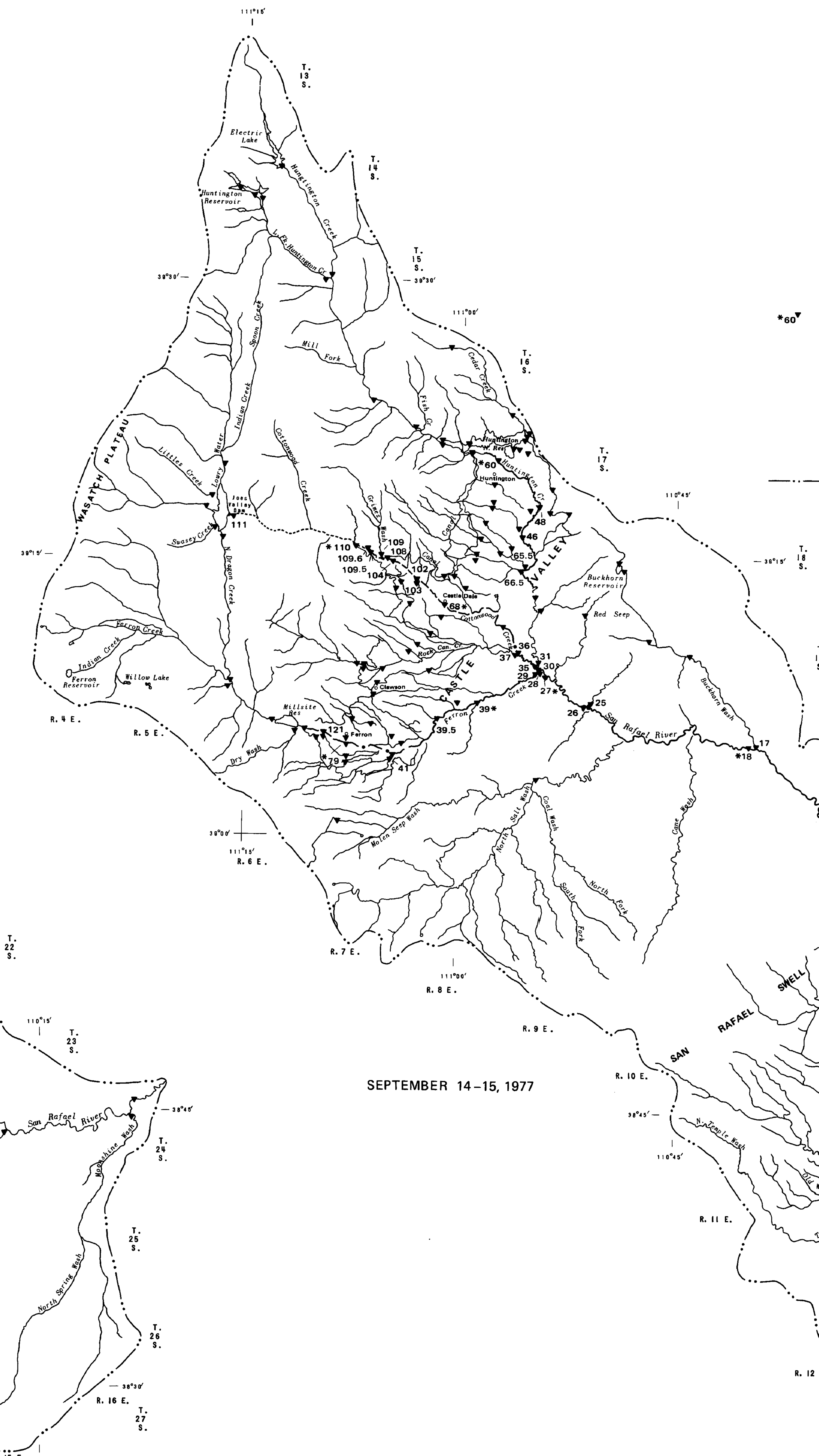
TECHNICAL PUBLICATION NO. 72
1982
PLATE 3

JUNE 6-9, 1977



SEPTEMBER 14-15, 1977

EXPLANATION

*60▼ SAMPLING SITE AND NUMBER – Asterisk (*) indicates listing of data in table 5

DISSOLVED-SOLIDS CONCENTRATIONS, IN MILLIGRAMS PER LITER – (Lines not shown in stream reaches where data were not available)

- Less than 250
- 250-499
- 500-999
- 1000-2000
- More than 2000

BASIN BOUNDARY

Scale 1:250,000

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETERS

Base from U.S. Geological Survey 1:250,000 quadrangles: Price, 1956 (revised 1970), and Salina, 1956 (revised 1970)

MAPS SHOWING APPROXIMATE RANGES OF DISSOLVED-SOLIDS CONCENTRATIONS IN STREAMS, JUNE 6-9 AND SEPTEMBER 14-15, 1977 IN THE SAN RAFAEL RIVER BASIN

Hydrology by J. C. Mundorff, 1978

Prepared in cooperation with the
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DEPARTMENT OF NATURAL RESOURCES

Base from U.S. Geological Survey 1:250,000 quadrangles:
Price, 1956 (revised 1970), and Salina, 1956 (revised 1970)

MAPS SHOWING APPROXIMATE RANGES OF DISSOLVED-SOLIDS CONCENTRATIONS IN STREAMS AND CHEMICAL CHARACTERISTICS OF THE WATER AT SELECTED SITES DURING JUNE 5-9, 1978 IN THE SAN RAFAEL RIVER BASIN

Hydrology by J.C. Mundorff and K.R. Thompson, 1978

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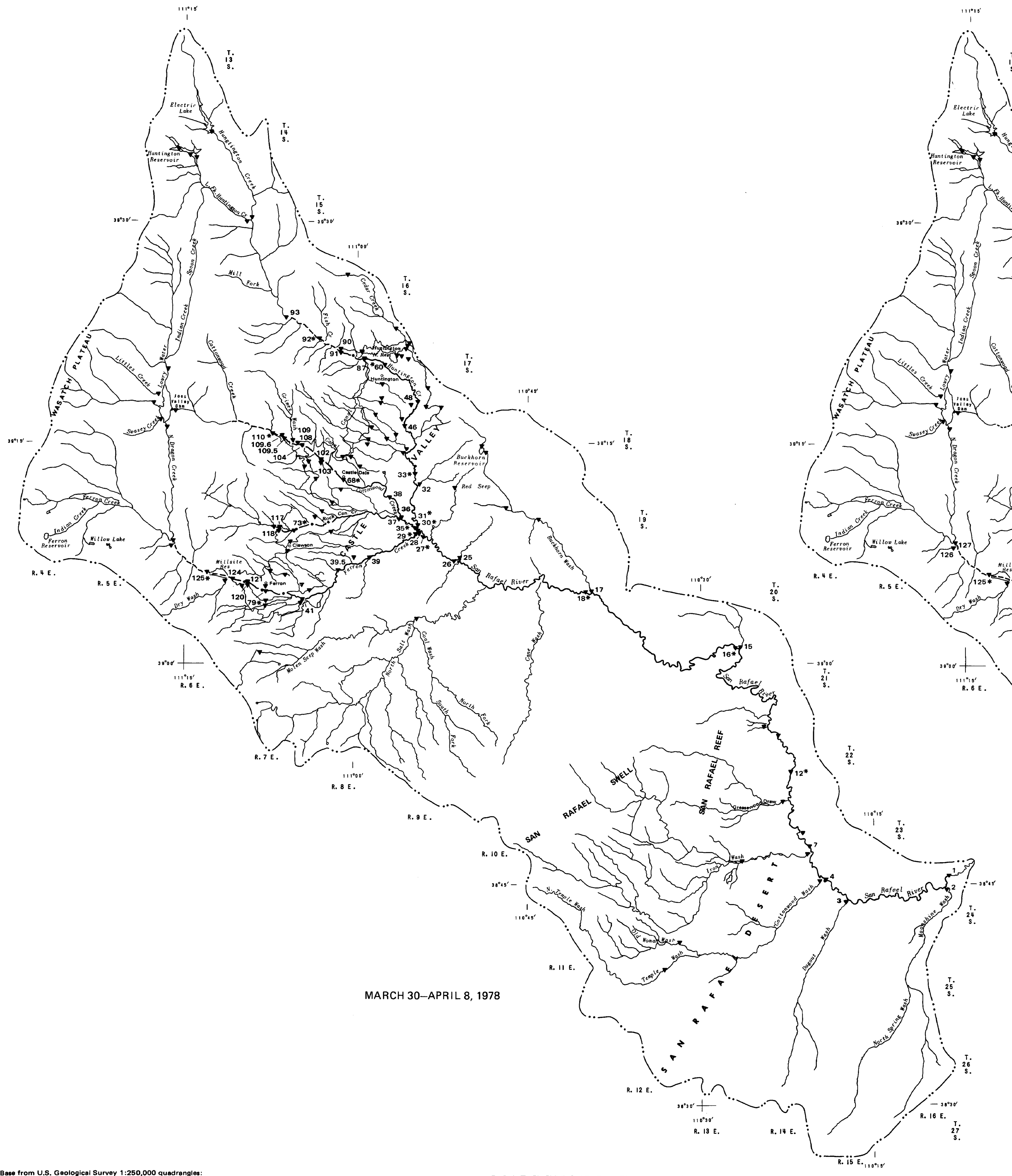
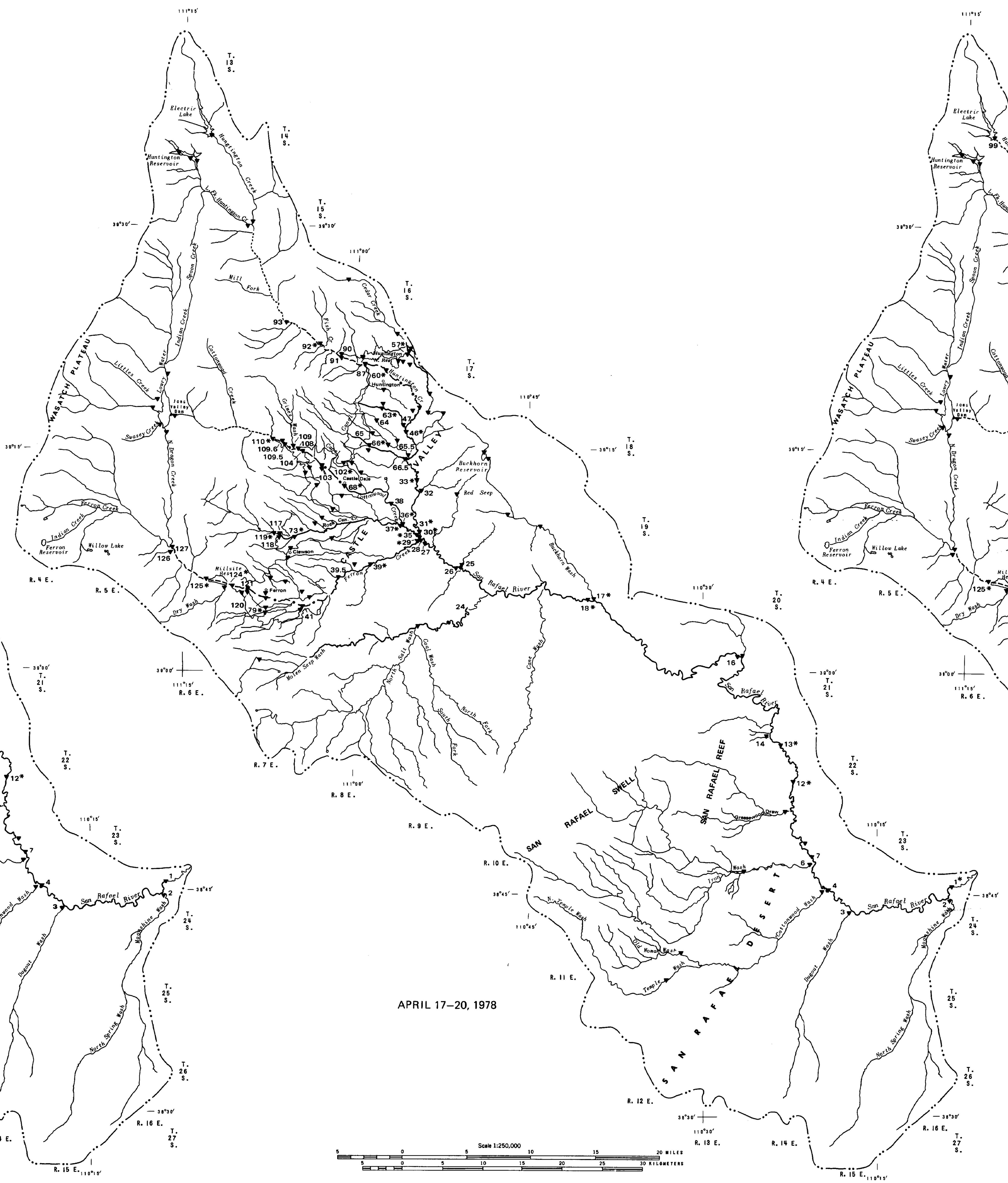
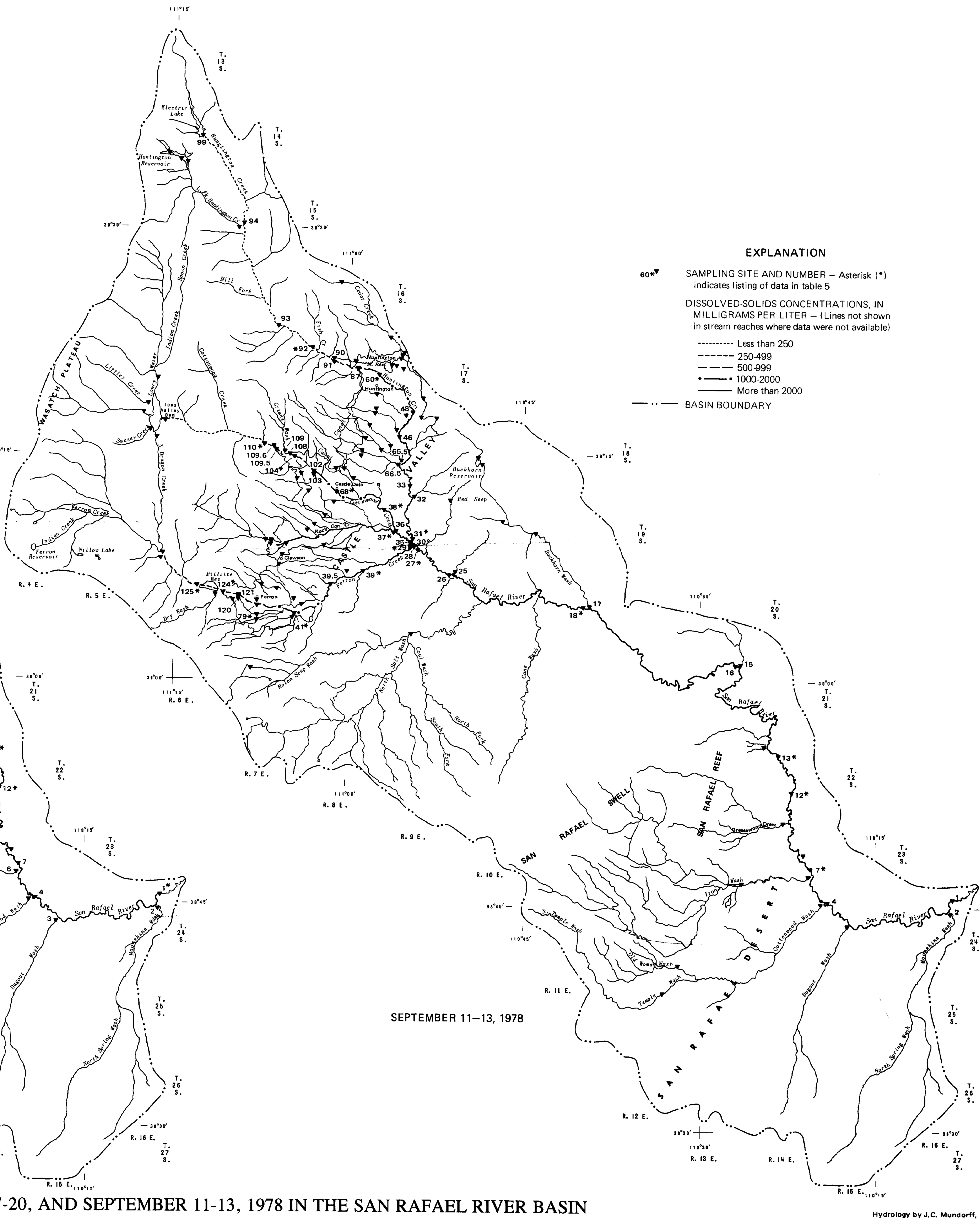


MARCH 30–APRIL 8, 1978



APRIL 17–20, 1978



SEPTEMBER 11–13, 1978

EXPLANATION

60*▼ SAMPLING SITE AND NUMBER – Asterisk (*) indicates listing of data in table 5

DISSOLVED-SOLIDS CONCENTRATIONS, IN MILLIGRAMS PER LITER – (Lines not shown in stream reaches where data were not available)

- Less than 250
- 250-499
- 500-999
- 1000-2000
- More than 2000

BASIN BOUNDARY

Scale 1:250,000
5 0 5 10 15 20 MILES
5 0 5 10 15 20 25 30 KILOMETERS

Base from U.S. Geological Survey 1:250,000 quadrangles:
Price, 1956 (revised 1970), and Salina, 1956, (revised 1970)

MAPS SHOWING APPROXIMATE RANGES OF DISSOLVED-SOLIDS CONCENTRATIONS IN STREAMS, MARCH 30-APRIL 8, APRIL 17-20, AND SEPTEMBER 11-13, 1978 IN THE SAN RAFAEL RIVER BASIN

Hydrology by J.C. Mundorff,