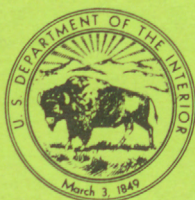
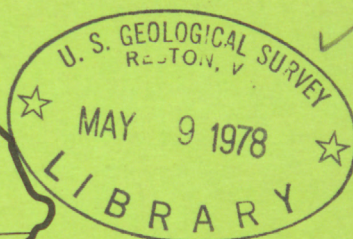
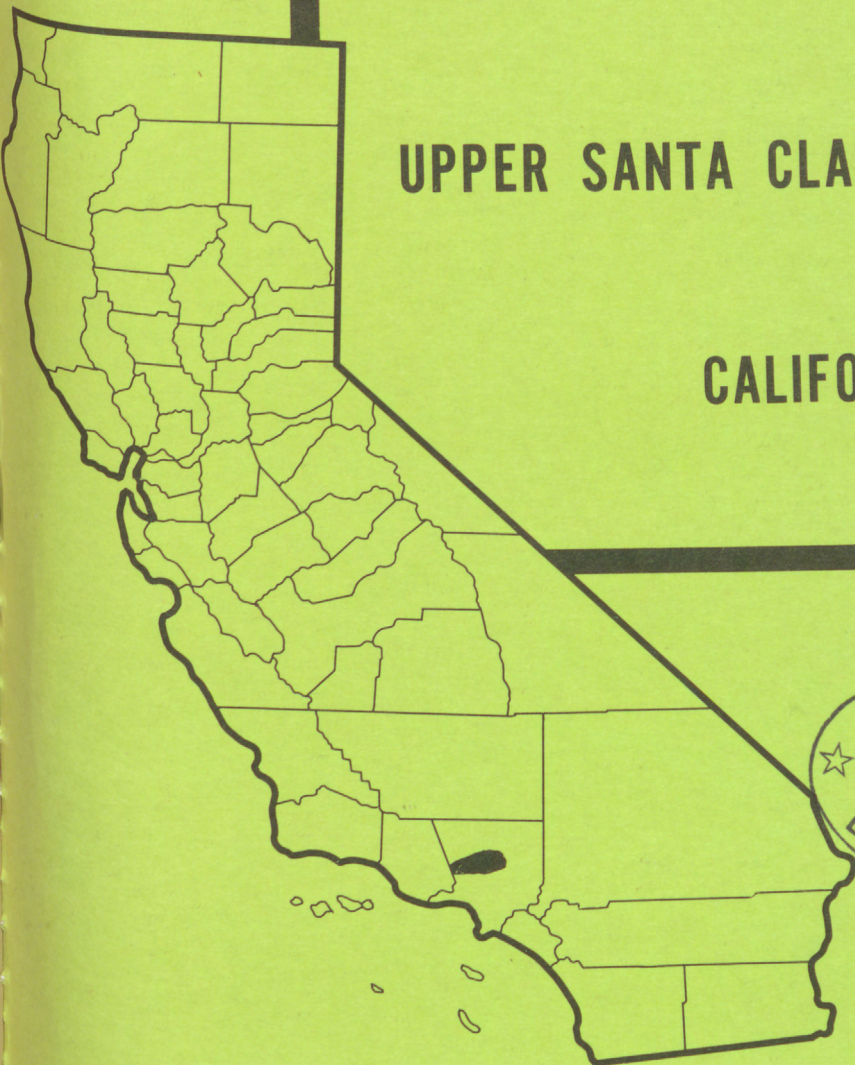


77-99

**WATER-QUALITY INVESTIGATION,
UPPER SANTA CLARA RIVER BASIN,
CALIFORNIA**



U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 77-99

Prepared in cooperation with the
CALIFORNIA DEPARTMENT OF WATER RESOURCES

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UPPER SANTA CLARA RIVER BASIN, CALIFORNIA

By James C. Bowers and George A. Irwin

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CONVERSION FACTORS

For readers who prefer metric units rather than U.S. customary units, the conversion factors for the terms used in this report are listed below:

| <i>Multiply U.S. customary unit</i> | <i>By</i> | <i>To obtain metric unit</i> |
|--|------------------------|------------------------------|
| acre-ft (acre-feet) | 1.233×10^{-3} | cubic hectometers |
| acres | 4.047×10^{-3} | square kilometers |
| ft (feet) | 3.048×10^{-1} | meters |
| ft ³ /s (cubic feet per second) | 2.832×10^{-2} | cubic meters per second |
| mi (miles) | 1.609 | kilometers |
| mi ² (square miles) | 2.590 | square kilometers |

WATER-QUALITY INVESTIGATION, UPPER SANTA CLARA RIVER BASIN, CALIFORNIA

By James C. Bowers and George A. Irwin

ABSTRACT

This report summarizes water-quality data collected in the upper Santa Clara River basin, California, during a reconnaissance study from August 1974 through June 1976 and during past monitoring programs. Data were collected for nitrogen, phosphorus, total organic carbon, trace elements, detergents, and pesticide compounds.

Because of the limited number of samples, the data are only an estimate of conditions that existed in the basin. Sampling was designed so that samples from each site would represent seasonal variations in discharge. Results indicate that most constituents were fairly low in concentration near the headwaters at Ravenna and higher below the urban and agricultural area near Saugus. Mean specific conductance in the river ranged from 745 micromhos per centimeter at 25°C below the headwaters near Lang to 2,640 micromhos at the Los Angeles-Ventura County line. Results also indicate that discharge was not the single factor controlling the concentration variance for most constituents.

Results of regression analyses indicate a high correlation between specific conductance and most major inorganic chemical constituents, and between specific conductance and discharge.

INTRODUCTION

The purpose of this study was to determine the concentration and distribution of nitrogen, phosphorus, total organic carbon, trace elements, detergents, and pesticides in the upper Santa Clara River basin. These variables were selected because they are important indexes of water quality and few data existed on their concentrations in the surface water of the area.

In addition to the results of the special reconnaissance, this report also summarizes historical major inorganic chemical data. Most of these historical data for the Santa Clara River near Saugus and for the Los Angeles-Ventura County line sites were collected by the California Department of Water Resources and local agencies.

From August 1974 through June 1976, the U.S. Geological Survey made a special reconnaissance of the water quality of the upper Santa Clara River basin. The sites were at Ravenna (A in fig. 1), near Lang (11107745), at Bouquet Junction (B in fig. 1), near Saugus (11108000), and at Los Angeles-Ventura County line (11108500). The major tributary systems were also sampled and included Bouquet Creek near Saugus (11107860), the South Fork of the Santa Clara River near Saugus (F-135 in fig. 1), and Castaic Creek below Castaic Reservoir (C in fig. 1).

This study is one of several water-quality investigations of rivers that have been started as a result of a letter (November 1971) of understanding between the California Department of Water Resources and the U.S. Geological Survey.

Acknowledgment is made to the many organizations that furnished hydrologic and water-quality data for use in this study. These include California Department of Water Resources, Southern District Office; Los Angeles County Flood Control District, Hydrology Division; and United Water Conservation District in Santa Paula, Calif.

AREA DESCRIPTION

The upper Santa Clara River basin lies northwest of Los Angeles near the center of the Transverse Ranges of southern California. It is bounded by the Santa Susanna and San Gabriel Mountains on the south and the Sawtooth Mountains on the north (fig. 1). The outlet of the upper basin is in the southwest corner at the Santa Clara River at Los Angeles-Ventura County line gaging station (11108500), where the Pico Formation forms a natural constriction. The basin has an area of 644 mi² and ranges in altitude from 795 ft to about 6,500 ft. From its source on the north-facing slopes of the San Gabriel Mountains in Los Angeles County, the Santa Clara River flows westward for about 35 mi to the Los Angeles-Ventura County line, and then predominantly west-southwestward for about 37 mi to the Pacific Ocean near

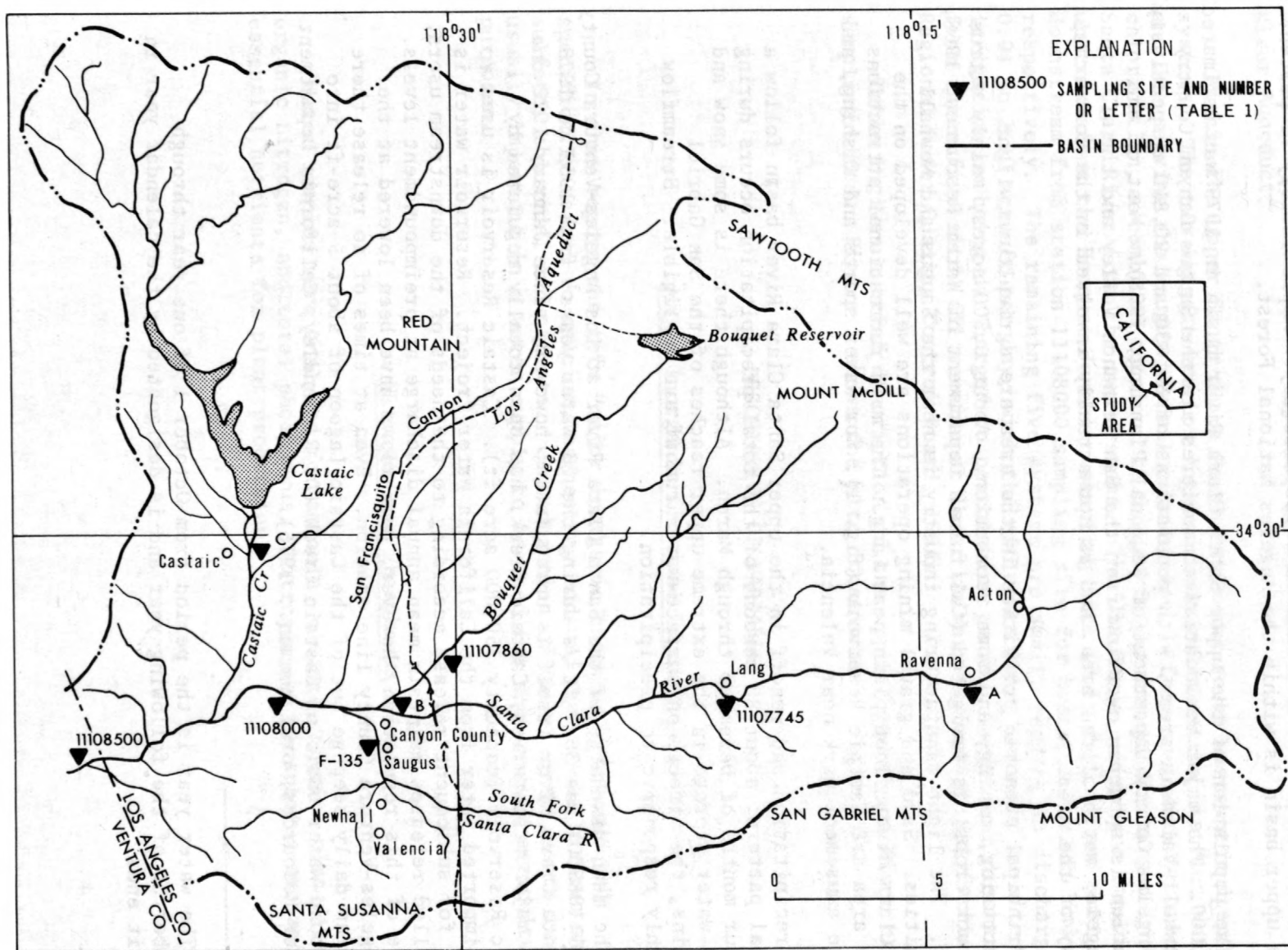


FIGURE 1.--Sampling sites.

Oxnard. Principal tributaries to the Santa Clara River in the upper basin are Castaic Creek, Bouquet Creek, and the South Fork of the Santa Clara River, draining 127 mi², 51.6 mi², 40.9 mi², respectively. Approximately 75 percent of the upper basin is within the Angeles National Forest.

The population of the upper Santa Clara River basin in 1975 was estimated at 66,000. The major residential communities are the Saugus-Canyon Country and Newhall-Valencia areas, with populations of 36,830 and 20,810 respectively (Los Angeles County Department of Regional Planning, 1975). Most of the population is suburban overflow from the San Fernando Valley and the Los Angeles metropolitan area, and is not actually involved in the commercial economy of the area.

Principal economic activities in the area are agriculture, light manufacturing, mining, and some recreation. About 6,500 acres, mainly citrus and truck crops, is irrigated (California Department of Water Resources, 1968, p. 13). The light manufacturing industry is near the Saugus and Newhall communities. Sand and gravel mining operations are well developed on the Santa Clara River flood plain near Lang. The main recreational attractions of the area are Castaic Reservoir (fig. 1), for water sports and fishing, and a large amusement park near Valencia.

Precipitation and runoff in the upper Santa Clara River basin follow a seasonal pattern; about 80 percent of the total precipitation occurs during the four months of December through March. Although there is some snow and ground-water storage in the extreme upper reaches of the San Gabriel Mountains, the effects on surface-water runoff are negligible. Streamflow is highly responsive to precipitation.

The mean discharge of the Santa Clara River at Los Angeles-Ventura County line (11108500) was 36.7 ft³/s during the 23 water years¹ from 1952 to 1975. The Santa Clara River itself is unregulated; however, since January 1972 one of the major tributaries, Castaic Creek, has been totally regulated by Castaic Reservoir (capacity 350,000 acre-ft). Castaic Reservoir is used to store imported water from the California Water Project. Reservoir water is stored for subsequent release according to the needs of the downstream users. Controlled releases maintain mean annual discharge at preimpoundment levels. Because of this regulation, however, peak flows have been lowered at the Los Angeles-Ventura County line station. Even at times of no release there is a mean daily seepage out of the Castaic Lagoon of about 5 acre-ft into the ground-water basin of Castaic Creek (D. R. Hendley, California Department of Water Resources, oral commun., 1976).

¹The water year is the period from October 1 of one year through September 30 of the following year and is designated by the calendar year in which it ends.

The only other major reservoir in the basin is Bouquet Reservoir (capacity 36,000 acre-ft). There is also imported water in Bouquet Reservoir which serves primarily as an equalizing reservoir to the Los Angeles-Owens River Aqueduct.

Within the upper Santa Clara River basin are seven wastewater disposal systems. The two largest are Los Angeles County Sanitation District Nos. 26 and 32, serving the Saugus-Newhall communities. After secondary treatment and chlorination, a combined total of 16.9 acre-ft per day is discharged into the Santa Clara River from the two systems. The discharge points are immediately upstream from the Bouquet Junction sampling site (B in fig. 1) and just downstream from station 11108000 sampling site for District Nos. 26 and 32, respectively. The remaining five systems are small, ranging in discharge from 0.04 to 2.10 acre-ft per day, with the effluents being used for on-site irrigation or being discharged to percolation ponds. Wastewater discharges from these five sites all receive at least primary treatment (California Regional Water Quality Control Board, 1971).

Table 1 gives a brief description of the upper Santa Clara River basin sampling sites. Figure 1 shows the site locations.

DESCRIPTION OF VARIABLES

Major Inorganic Chemical Constituents

In this report the term "major inorganic chemical constituents" specifically refers to calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, and nitrate. Consideration of these constituents is usually important in a water supply to be used for domestic or agricultural purposes.

Nitrogen and Phosphorus

Water samples were analyzed for ammonia, nitrate, nitrite plus nitrate, organic nitrogen, and total phosphorus. Nitrogen and phosphorus are among the essential nutrients for plant production.

TABLE 1.--Description of sampling sites

| Sampling site | | Drainage area (mi ²) | Period of recorded stream- flow | Mean dis- charge (ft ³ /s) | Description of flow |
|---|--|--|---|--|---|
| No. and letter (See fig. 1) | Name | | | | |
| A | Santa Clara River at Ravenna | 85.4 | -- | ¹ 1.4 | Flow is affected by small diversions for irrigation upstream. No regulation above site. |
| 11107745 | Santa Clara River above Railroad Station near Lang | 157 | 1949-75 | 4.99 | There is no regulation above station. Flow can be slightly affected by small diversions upstream for irrigation and recreation. |
| B | Santa Clara River at Bouquet Junction | 235 | -- | ¹ 6.4 | Flow is affected by ground- water pumping for irrigation. At times water is released into river above site from city of Los Angeles-Owens River Aqueduct blowoff at river crossing. Base flow is sustained by treated sewage discharge immediately above site. |
| 11107860 | Bouquet Creek near Saugus | 51.6 | 1970-75 | .61 | Flow is partly regulated by Bouquet Reservoir, 12 miles upstream, and by ground- water pumping for irrigation. |
| F-135 (Los Angeles County number) | South Fork Santa Clara River (at Saugus- Ventura Road) | 40.9 | 1947-75 | 4.0 | Flow is partly affected by ground-water pumping for irrigation. At times water is released into river above station from city of Los Angeles-Owens River Aqueduct blowoff. |
| 11108000 | Santa Clara River near Saugus | 407 | 1929-75 | 11.4 | Flow is affected by ground- water pumping for irrigation. At times water is released into river above station from city of Los Angeles-Owens River Aqueduct blowoff at river crossing. |

¹See footnote at end of table.

TABLE 1.--Description of sampling sites--Continued

| Sampling site | | Drainage area (mi ²) | Period of recorded stream- flow | Mean dis- charge (ft ³ /s) | Description of flow |
|--------------------------------|---|--|---|--|---|
| No. and letter (See fig. 1) | Name | | | | |
| C | Castaic Creek below Castaic Reservoir | 127 | -- | (²) | Flow is completely regulated by Castaic Reservoir. Imported water from California Water Project stored and released at Castaic Dam. |
| 11108500 | Santa Clara River at Los Angeles- Ventura County line | 644 | 1952-75 | 36.7 | Flow is partly regulated since January 1972 by Castaic Reservoir. (Imported water from California Water Project stored and released at Castaic Dam.) Base flow is affected by ground-water pumping for irrigation and seepage out of the Castaic Dam lagoon. |

¹Mean of discharges at time of sampling.

²Most samples were taken from lagoon below dam.

Total Organic Carbon

Total organic carbon is an index to the concentration of dissolved and suspended carbonaceous matter. High concentrations of organic matter in an aquatic environment can be a prime factor in influencing the dissolved-oxygen balance. If decomposable organic matter occurs in sufficient concentrations, intensive bacterial activity can result in complete oxygen depletion.

Trace Elements

Concentrations of arsenic, cadmium, chromium, lead, manganese, mercury, and selenium are considered to be a potential hazard to an aquatic environment. Few data are available on their concentrations in most California rivers. Determinations for boron and iron were also made because of their significance in public and agricultural water supplies.

Pesticide Compounds

Insecticides and herbicides are used for insect and plant control, but many of these compounds are lethal to higher organisms. Even low concentrations of pesticides in the aquatic environment are hazardous because of their sorptive properties. Because they have an affinity for particulate material, they may be concentrated within food chains as the material to which they are sorbed are consumed by organisms.

Samples were analyzed for insecticide and herbicide compounds from the chlorinated hydrocarbon, chlorophenoxy acids, and organic phosphorus groups. Chlorinated hydrocarbons included aldrin, chlordane, DDD, DDE, DDT, dieldrin, endrin, heptachlor epoxide, and lindane. Chlorophenoxy acids included 2,4-D, 2,4,5-T, and silvex. Organic phosphorus compounds included diazinon, malathion, methylparathion, and parathion.

Detergents (MBAS)

Detergents (methylene blue active substances) are a common component of sewage and industrial effluents, and thus they are an indicator of pollution from urban areas. These surfactant compounds may contaminate a stream system by acting as a catalyst dispersing normally insoluble organic compounds, some of which may be detrimental to aquatic life.

METHODS AND PROCEDURES

Frequency and Sources of Samples

During the period 1951-72, the California Department of Water Resources (DWR) collected samples monthly for the determination of major inorganic chemical constituents in the Santa Clara River near Saugus and at the Los Angeles-Ventura County line. An analysis usually comprised the determination of concentrations of calcium, magnesium, sodium, bicarbonate, sulfate, chloride, and nitrate and the measurement or calculation of dissolved-solids residue, total hardness, and specific conductance. During some months, however, only a partial analysis for bicarbonate, chloride, hardness, and specific conductance was made. During this period, a few samples for determination of major inorganic chemical constituents were also collected by the Los Angeles County Flood Control District (LACFCD) and by the United Water Conservation District (UWCD) near Saugus and at the Los Angeles-Ventura County line.

From 1972 to 1974, samples for determination of major inorganic chemical constituents were collected quarterly by DWR near Saugus and at the Los Angeles-Ventura County line, and also a few samples were collected at these sites by LACFCD.

During the period August 1974 through June 1976, the Geological Survey collected monthly water samples for determination of concentrations of nitrogen, phosphorus, total organic carbon, and selected trace elements at all sites except near Ravenna which was sampled only during the winter months December-March. Two samples at low flow and one at high flow were taken each year for pesticide analysis at all sites except Ravenna during this period. (No pesticide samples were taken on Castaic Creek from August 1975 through June 1976.)

Samples for determination of major inorganic chemical constituents were collected monthly by the Survey from January 1975 through June 1976 at sites on the Santa Clara River near Lang, at Bouquet Junction, near Saugus, and at the Los Angeles-Ventura County line.

Methods of Collection and Analysis

Samples collected by the Geological Survey during the study period August 1974-June 1976 were obtained using depth integration methods described by Guy and Norman (1970), except at extreme low flows when such methods were not practical. The most common method used was the equal discharge increment (EDI) or three-section method.

All water samples collected by the Survey were processed in the field as prescribed by Brown, Skougstad, and Fishman (1970) and Goerlitz and Brown (1972). Initially, the samples that were collected for nitrite and nitrate, ammonia nitrogen, organic nitrogen, total phosphorus, and total organic carbon were not filtered but were preserved with 0.75 mL (milliliter) of concentrated sulfuric acid per 250 mL of sample. The use of sulfuric acid as a preservative in these samples was discontinued in January 1975, and subsequently samples were unfiltered and chilled to 4°C (degrees Celsius).

Water and bottom-material samples for pesticide analysis were collected in pretreated glass bottles. Initially, these samples were shipped airmail without preservation to the laboratory within 24 hours after collection. After July 1975 the samples for pesticide analysis were chilled to 4°C before shipment.

Samples collected by the Survey for determination of major inorganic chemical constituents, nitrogen, phosphorus, total organic carbon, and trace elements were analyzed in the Salt Lake City, Utah, Central Laboratory, using the methods described by Brown, Skougstad, and Fishman (1970). Water and bottom-material samples were analyzed for pesticides by the Denver, Colo., and Doraville, Ga., Central Laboratories, using the methods described by Goerlitz and Brown (1972).

Methods of sample collection for the major constituents for most of the historical data are not precisely known; however, probably few samples were depth integrated using the methods suggested by Guy and Norman (1970). Preservation procedures for samples collected during this period are also not known; however, probably most were transported to the laboratories untreated and not preserved.

Analytical methods used by DWR were from the appropriate publication of the American Public Health Association and others. Analytical methods used by LACFCD and UWCD are presumed to be consistent with American Public Health Association specifications (1971).

RESULTS

Major Inorganic Chemical Constituents

Tables 2, 3, 4, and 5 summarize major chemical-constituent data for the upper Santa Clara River basin sampling sites on the Santa Clara River near Lang, at Bouquet Junction, near Saugus, and at the Los Angeles-Ventura County line.

TABLE 2.--Summary of dissolved major inorganic chemical-constituent data for the Santa Clara River above Railroad Station near Lang (11107745), August 1974 through March 1976 (Source of data: U.S. Geological Survey)

[Specific-conductance summary: 13 samples; mean = 745 μ mho/cm (micromhos per centimeter); standard deviation = 43 μ mho/cm; range = 680-820 μ mho/cm]

| No. of samples | Dissolved chemical constituents | | | | Regression summary | | | No. of samples in regression | Specific conductance [Ec] (µmho/cm at 25°C) | |
|------------------|---|----------------------|--------------------|---------|-------------------------------------|-------------------------|-----------------------------------|------------------------------|--|---------|
| | Constituent | Concentration (mg/L) | | | Regression equation | Correlation coefficient | Standard error of estimate (mg/L) | | Mean | Range |
| | | Mean | Standard deviation | Range | | | | | | |
| 8 | Calcium (Ca) | 77 | 3 | 72-82 | Ca = 37.46 + 0.053 Ec | 0.86 | 1.9 | 8 | 742 | 680-820 |
| 8 | Magnesium (Mg) | 22 | 1 | 21-24 | Mg = 21.11 + 0.001 Ec | .06 | 1.1 | 8 | 742 | 680-820 |
| 8 | Sodium (Na) | 55 | 4 | 49-59 | Na = 10.46 + 0.060 Ec | .87 | 2.1 | 8 | 742 | 680-820 |
| 8 | Potassium (K) | 2.8 | .5 | 2.4-3.8 | K = 2.19 + 0.001 Ec | .11 | .5 | 8 | 742 | 680-820 |
| 8 | Bicarbonate (HCO ₃) | 303 | 7 | 293-311 | HCO ₃ = 227.7 + 0.102 Ec | .84 | 4.0 | 8 | 742 | 680-820 |
| 8 | Sulfate (SO ₄) | 91 | 8 | 78-100 | SO ₄ = 6.11 + 0.114 Ec | .83 | 4.6 | 8 | 742 | 680-820 |
| 8 | Chloride (Cl) | 39 | 4 | 33-45 | Cl = -11.48 + 0.068 Ec | .85 | 2.6 | 8 | 742 | 680-820 |
| 2 | Nitrate (NO ₃) | 3.6 | .2 | 3.5-3.8 | -- | -- | -- | 2 | -- | -- |
| Dissolved solids | | | | | | | | | | |
| 8 | Residue at 180°C | 465 | 28 | 424-503 | DS = 127.8 + 0.454 Ec | .91 | 13 | 8 | 742 | 680-820 |
| 5 | Calculated (sum of determined constituents) | 482 | 12 | 470-495 | DS = 7.20 + 0.633 Ec | .67 | 9.8 | 5 | 750 | 740-770 |
| 8 | Hardness as CaCO ₃ (Ca, Mg) | 284 | 11 | 270-300 | H = 169.3 + 0.154 Ec | .81 | 6.7 | 8 | 742 | 680-820 |

TABLE 3.--Summary of dissolved major inorganic chemical-constituent data for the Santa Clara River at Bouquet Junction (342526118322101), August 1974 through June 1976 (Source of data: U.S. Geological Survey)

[Specific-conductance summary: 22 samples; mean = 1,340 $\mu\text{mho/cm}$ (micromhos per centimeter); standard deviation = 92 $\mu\text{mho/cm}$; range = 1,110-1,500 $\mu\text{mho/cm}$]

| No. of samples | Dissolved chemical constituents | | | Regression summary | | | No. of samples in regression | Specific conductance [Ec] (μmho/cm at 25°C) | | |
|----------------|---|----------------------|--------------------|---------------------|-------------------------------------|-----------------------------------|------------------------------|--|-------|-------------|
| | Constituent | Concentration (mg/L) | | Regression equation | Correlation coefficient | Standard error of estimate (mg/L) | | Mean | Range | |
| | | Mean | Standard deviation | | | | | | | Range |
| 17 | Calcium (Ca) | 82 | 8 | 69-100 | Ca = 81.08 + 0.001 Ec | 0.01 | 8.0 | 17 | 1,340 | 1,110-1,500 |
| 17 | Magnesium (Mg) | 27 | 2 | 22-31 | Mg = 7.06 + 0.015 Ec | .52 | 2.1 | 17 | 1,340 | 1,110-1,500 |
| 17 | Sodium (Na) | 166 | 14 | 120-180 | Na = -3.71 + 0.126 Ec | .73 | 9.7 | 17 | 1,340 | 1,110-1,500 |
| 17 | Potassium (K) | 14 | 2 | 9.9-17 | K = -3.09 + 0.013 Ec | .63 | 1.3 | 17 | 1,340 | 1,110-1,500 |
| 17 | Bicarbonate (HCO ₃) | 394 | 33 | 348-460 | HCO ₃ = 177.1 + 0.162 Ec | .39 | 32 | 17 | 1,340 | 1,110-1,500 |
| 17 | Sulfate (SO ₄) | 189 | 19 | 160-240 | SO ₄ = 46.79 + 0.106 Ec | .45 | 17 | 17 | 1,340 | 1,110-1,500 |
| 17 | Chloride (Cl) | 116 | 12 | 92-140 | Cl = -24.62 + 0.105 Ec | .67 | 9.4 | 17 | 1,340 | 1,110-1,500 |
| 10 | Nitrate (NO ₃) | 69 | 32 | 42-130 | NO ₃ = -127.0 + 0.147 Ec | .44 | 31 | 10 | 1,340 | 1,110-1,500 |
| 22 | Dissolved solids | | | | | | | | | |
| 0 | Residue at 180°C | 846 | 34 | 767-928 | DS = 501.7 + 0.257 Ec | .70 | 25 | 22 | 1,340 | 1,110-1,500 |
| | Calculated (sum of determined constituents) | -- | -- | -- | -- | -- | -- | 0 | -- | -- |
| 17 | Hardness as CaCO ₃ (Ca, Mg) | 318 | 24 | 280-360 | H = 220.3 + 0.073 Ec | .24 | 24 | 17 | 1,340 | 1,110-1,500 |

TABLE 4.--Summary of dissolved major inorganic chemical-constituent data for the Santa Clara River near Saugus (11108000), May 1951 through June 1976 (Source of data: California Department of Water Resources and U.S. Geological Survey)

[Specific-conductance summary: 99 samples; mean = 1,560 μ mho/cm (micromhos per centimeter); standard deviation = 426 μ mho/cm; range = 439-2,685 μ mho/cm]

| No. of samples | Dissolved chemical constituents | | | | Regression summary | | | No. of samples in regression | Specific conductance [Ec] (μmho/cm at 25°C) | |
|----------------|---|----------------------|--------------------|-----------|--|-------------------------|-----------------------------------|------------------------------|--|-----------|
| | Constituent | Concentration (mg/L) | | | Regression equation | Correlation coefficient | Standard error of estimate (mg/L) | | Mean | Range |
| | | Mean | Standard deviation | Range | | | | | | |
| 97 | Calcium (Ca) | 166 | 56 | 46-321 | Ca = -23.82 + 0.121 Ec | 0.93 | 21 | 97 | 1,560 | 439-2,685 |
| 96 | Magnesium (Mg) | 57 | 24 | 13-137 | Mg = -20.34 + 0.049 Ec | .90 | 10 | 96 | 1,570 | 439-2,685 |
| 96 | Sodium (Na) | 116 | 37 | 21-217 | Na = -7.14 + 0.078 Ec | .90 | 16 | 96 | 1,570 | 439-2,685 |
| 94 | Potassium (K) | 6.0 | 2.0 | 2.6-14.4 | K = 4.33 + 0.001 Ec | .24 | 1.9 | 94 | 1,550 | 439-2,685 |
| 97 | Bicarbonate (HCO ₃) | 371 | 95 | 62-600 | HCO ₃ = 98.88 + 0.174 Ec | .79 | 59 | 97 | 1,560 | 439-2,685 |
| 96 | Sulfate (SO ₄) | 453 | 211 | 104-1,027 | SO ₄ = -243.9 + 0.445 Ec | .91 | 88 | 96 | 1,570 | 439-2,685 |
| 97 | Chloride (Cl) | 77 | 27 | 5-170 | Cl = -8.17 + 0.055 Ec | .85 | 14 | 97 | 1,560 | 439-2,685 |
| 93 | Nitrate (NO ₃) | 26 | 16 | 0-96 | NO ₃ = -34.15 + (-0.005) Ec | -.13 | 16 | 90 | 1,550 | 439-2,685 |
| 77 | Dissolved solids Residue at 180°C | 1,148 | 427 | 310-2,165 | DS = -249.5 + 0.908 Ec | .98 | 93 | 77 | 1,540 | 439-2,685 |
| 36 | Calculated (sum of determined constituents) | 1,030 | 274 | 278-2,110 | DS = -188.2 + (-0.803) Ec | .95 | 87 | 36 | 1,520 | 439-2,425 |
| 85 | Hardness as CaCO ₃ (Ca, Mg) | 650 | 222 | 169-1,424 | H = -186.4 + 0.533 Ec | .92 | 87 | 85 | 1,570 | 439-2,577 |

TABLE 5.--Summary of dissolved major inorganic chemical-constituent data for the Santa Clara River at Los Angeles-Ventura County line (11108500), April 1951 through June 1976 (Source of data: California Department of Water Resources and U.S. Geological Survey)

[Specific-conductance summary: 334 samples; mean = 2,640 $\mu\text{mho/cm}$ (micromhos per centimeter); standard deviation = 1,200 $\mu\text{mho/cm}$; range = 668-7,620 $\mu\text{mho/cm}$]

| No. of samples | Dissolved chemical constituents | | | | Regression summary | | | No. of samples in regression | Specific conductance [Ec] (µmho/cm at 25°C) | |
|------------------|---|----------------------|--------------------|-----------|-------------------------------------|-------------------------|-----------------------------------|------------------------------|--|-----------|
| | Constituent | Concentration (mg/L) | | | Regression equation | Correlation coefficient | Standard error of estimate (mg/L) | | Mean | Range |
| | | Mean | Standard deviation | Range | | | | | | |
| 197 | Calcium (Ca) | 205 | 66 | 53-419 | Ca = 77.04 + 0.050 Ec | 0.91 | 28 | 197 | 2,560 | 677-6,680 |
| 197 | Magnesium (Mg) | 108 | 65 | 21-352 | Mg = -25.01 + 0.052 Ec | .97 | 15 | 197 | 2,560 | 677-6,680 |
| 242 | Sodium (Na) | 315 | 210 | 38-1,081 | Na = -123.0 + 0.157 Ec | .98 | 40 | 242 | 2,780 | 677-7,620 |
| 156 | Potassium (K) | 7.2 | 2.5 | 0-18 | K = 6.103 + 0.0005 Ec | .28 | 2.1 | 152 | 2,550 | 740-6,680 |
| 319 | Bicarbonate (HCO ₃) | 348 | 68 | 109-534 | HCO ₃ = 258.3 + 0.033 Ec | .59 | 55 | 319 | 2,687 | 668-7,620 |
| 215 | Sulfate (SO ₄) | 1,010 | 633 | 128-3,368 | SO ₄ = -297.8 + 0.525 Ec | .99 | 90 | 214 | 2,480 | 740-6,680 |
| 334 | Chloride (Cl) | 145 | 96 | 17-585 | Cl = -59.40 + 0.078 Ec | .97 | 23 | 334 | 2,640 | 668-7,620 |
| 174 | Nitrate (NO ₃) | 5.9 | 8.3 | 0-67 | NO ₃ = 8.159 + 0.0005 Ec | -.07 | 8.6 | 146 | 2,400 | 677-6,680 |
| Dissolved solids | | | | | | | | | | |
| 188 | Residue at 180°C | 2,050 | 1,150 | 387-5,986 | DS = -240.9 + 0.915 Ec | .99 | 190 | 187 | 2,510 | 677-6,680 |
| 148 | Calculated (sum of determined constituents) | 2,005 | 1,100 | 491-5,982 | DS = -270.2 + 0.876 Ec | .99 | 190 | 148 | 2,600 | 740-6,680 |
| 211 | Hardness as CaCO ₃ (Ca, Mg) | 921 | 421 | 42-2,412 | H = 75.96 + 0.341 Ec | .97 | 100 | 210 | 2,490 | 677-6,680 |

The water type of the Santa Clara River in the upper basin varies. Moving downstream, the water is affected by urban-area wastes, irrigated-agriculture runoff, and rising ground-water levels introducing water with high concentrations of dissolved solids. Above the area of urban influence, the water type of the Santa Clara River near Lang (11107745) is calcium bicarbonate. At Bouquet Junction (B in fig. 1) (located below a sewage outfall), the water type becomes sodium bicarbonate. Below the major agricultural region near Saugus, at the Santa Clara River near Saugus gaging station (11108000), the water type is calcium sulfate. At the Santa Clara River at the Los Angeles-Ventura County line gaging station (11108500), the water type is sodium sulfate. At this farthest downstream site the surface flow is strongly influenced by rising ground-water levels between the site and the confluence with Castaic Creek and by irrigated-agriculture runoff.

The mean concentration of dissolved solids (residue at 180°C) ranges from 465 mg/L (milligrams per liter) near Lang to 2,050 mg/L at the Los Angeles-Ventura County line. The concentrations exhibit a downstream increase.

The results of regression analyses of the relation between concentrations of individual constituents and specific conductance are also given in tables 2-5. Correlation coefficients indicate significance at the 1-percent probability level for only some of the element relations tested by regression for samples collected at the two upstream sites, near Lang and at Bouquet Junction. The lack of definition was perhaps due to the limited number of samples.

Correlation coefficients indicate significance at the 1-percent probability level for all relations at the two downstream sites, except coefficients for potassium and nitrate at the site near Saugus and for nitrate at the Los Angeles-Ventura County line site.

Specific Conductance-Water Discharge Relations

Table 6 summarizes the results of regression analyses using specific conductance and water discharge. The regression results for the sites near Lang and at Bouquet Junction are based on data collected by the Survey. Results for the sites near Saugus and at the Los Angeles-Ventura County line are based on data collected by the Survey and on historical data collected by DWR and LACFCD.

Coefficients of correlation exhibit the same degree of definition at each site as they did for the major inorganic chemical constituents, not having significance at the 1- or 5-percent probability level for the upstream sites near Lang and at Bouquet Junction. Coefficients of correlation at the downstream sites near Saugus and at the Los Angeles-Ventura County line were again both significant at the 1-percent probability level.

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TABLE 6.--Results of regression analyses of the relation between specific conductance and water discharge for selected sites

| Discharge [Q] (ft ³ /s) | | No. of sam- ples | Specific conductance [Ec] (μmho/cm at 25°C) | | Regression summary | | |
|--|------------|---------------------------|--|-------------|--------------------------------|--------------------------------------|--|
| Mean | Range | | Mean | Range | Regression equation | Corre- lation coeffi- cient | Standard error of estimate (log units) |
| 11107745 Santa Clara River above Railroad Station near Lang, August 1974 through March 1976 | | | | | | | |
| 1.9 | 0.01-8.5 | 13 | 745 | 680-820 | Ec = 724/Q ^{0.0912} | -0.33 | 0.84 |
| 342526118322101 Santa Clara River at Bouquet Junction, August 1974 through June 1976 | | | | | | | |
| 6.4 | 3.0-12.0 | 22 | 1,340 | 1,110-1,500 | Ec = 6,310/Q ^{0.8726} | -.21 | .17 |
| 11108000 Santa Clara River near Saugus, May 1951 through June 1976 | | | | | | | |
| 39 | 0.03-2,000 | 70 | 1,570 | 439-2,685 | Ec = 1,820/Q ^{0.2470} | -.70 | .59 |
| 11108500 Santa Clara River at Los Angeles-Ventura County line, April 1951 through June 1976 | | | | | | | |
| 66 | 0.4-1,907 | 201 | 2,110 | 668-5,155 | Ec = 3,311/Q ^{0.2262} | -.88 | .38 |

NOTE: The regression summaries for the sites near Lang and at Bouquet Junction probably are not meaningful because of the limited discharge range sampled.

Differences in the intercepts and slopes of the regression lines were greatest for the sites near Lang and at Bouquet Junction. This is inferred to be the result of a limited number of samples at these sites and the limited range in discharge represented by those samples.

Regression results for the sites near Saugus and at the Los Angeles-Ventura County line, based on a larger set of samples, show much more similarity of the intercepts and slopes of the regression lines, with the slopes differing less than 10 percent.

Nitrogen, Phosphorus, and Total Organic Carbon

Table 7 summarizes nitrogen, phosphorus, and total organic carbon data collected at the selected sites in the upper Santa Clara River basin from August 1974 through June 1976.

Mean concentrations of total ammonia nitrogen and total organic nitrogen exhibited an overall downstream increase in the Santa Clara River from the station at Ravenna to the station near Saugus. The highest mean concentrations were found below the sewage outfall at Bouquet Junction (B in fig. 1), as the water quality at this site is influenced by the sewage effluent, particularly during periods of low flow. The mean concentrations of total ammonia nitrogen and total organic nitrogen were 0.04 and 0.27 mg/L at Ravenna, increasing to 1.2 and 1.6 mg/L near Saugus. Median concentrations also indicated the same general downstream increase.

Mean concentrations of ammonia nitrogen and organic nitrogen decreased from near Saugus downstream to the Los Angeles-Ventura County line. This decrease was probably because of dilution by the imported water released from Castaic Reservoir into Castaic Creek. The imported water enters the Santa Clara River between Saugus and the Los Angeles-Ventura County line. Mean concentrations of ammonia nitrogen and organic nitrogen were 0.19 and 1.0 mg/L at the Los Angeles-Ventura County line.

Mean concentrations of nitrite and nitrate nitrogen in the Santa Clara River ranged from 0.13 mg/L near Lang to 4.4 mg/L near Saugus.

Mean concentrations of total phosphorus and total organic carbon exhibited the same downstream increase and decrease patterns as did those for ammonia nitrogen and organic nitrogen, with the maximum concentrations again found at Bouquet Junction. Mean concentrations of total phosphorus and total organic carbon were 0.06 and 1.8 mg/L at Ravenna, increasing to 9.4 and 17 mg/L at Bouquet Junction, and then decreasing to 2.6 and 9.6 mg/L near Saugus. Mean concentrations then decreased further to 1.1 and 7.3 mg/L at the Los Angeles-Ventura County line. Median concentrations exhibited the same general pattern as did the mean concentrations.

TABLE 7.--*Summary of nitrogen, phosphorus, and total organic carbon data for selected sites, August 1974 through June 1976*

| Constituent | No. of samples | Concentration, in milligrams per liter | | | |
|---|----------------|--|--------------------|-----------|--------|
| | | Mean | Standard deviation | Range | Median |
| 342613118131601 Santa Clara River at Ravenna | | | | | |
| Nitrite and nitrate, total as N | 9 | 1.56 | 1.17 | 0.00-2.6 | 2.3 |
| Nitrogen, ammonia, total as N | 9 | .04 | .02 | 0.00-0.09 | .04 |
| Nitrogen, total organic as N | 9 | .27 | .13 | 0.07-0.43 | .32 |
| Phosphorus, total as P | 9 | .06 | .016 | 0.04-0.09 | .06 |
| Carbon, total organic | 9 | 1.8 | .65 | 1.3-2.9 | 1.5 |
| 11107745 Santa Clara River above Railroad Station near Lang | | | | | |
| Nitrite and nitrate, total as N | 13 | .13 | .18 | 0-0.61 | .05 |
| Nitrogen, ammonia, total as N | 13 | .48 | 1.54 | 0-5.6 | .05 |
| Nitrogen, total organic as N | 13 | .33 | .49 | 0.02-1.9 | .16 |
| Phosphorus, total as P | 13 | .80 | 2.55 | 0.01-9.3 | .09 |
| Carbon, total organic | 13 | 3.1 | 3.0 | 0.8-12 | 2.1 |
| 342526118122101 Santa Clara River at Bouquet Junction | | | | | |
| Nitrite and nitrate, total as N | 22 | 2.7 | 3.1 | 0-10 | 1.4 |
| Nitrogen, ammonia, total as N | 21 | 6.4 | 4.9 | 0.08-16 | 6.0 |
| Nitrogen, total organic as N | 21 | 3.1 | 3.5 | 0.24-11.3 | 1.5 |
| Phosphorus, total as P | 22 | 9.4 | 4.1 | 0.31-15 | 9.8 |
| Carbon, total organic | 22 | 17 | 13 | 2.0-49 | 13 |

TABLE 7.--Summary of nitrogen, phosphorus, and total organic carbon data for selected sites, August 1974 through 1976--Continued

| Constituent | No. of samples | Concentration, in milligrams per liter | | | |
|---|----------------|--|--------------------|-----------|--------|
| | | Mean | Standard deviation | Range | Median |
| 11107860 Bouquet Creek near Saugus | | | | | |
| Nitrite and nitrate, total as N | 1 | 0 | -- | -- | -- |
| Nitrogen, ammonia, total as N | 1 | .09 | -- | -- | -- |
| Nitrogen, total organic as N | 1 | 1.1 | -- | -- | -- |
| Phosphorus, total as P | 1 | .92 | -- | -- | -- |
| Carbon, total organic | 1 | 18 | -- | -- | -- |
| F-135 South Fork Santa Clara River (at Saugus-Ventura Road) | | | | | |
| Nitrite and nitrate, total as N | 2 | 0 | 0 | 0 | 0 |
| Nitrogen, ammonia, total as N | 2 | -- | -- | 0.12-0.37 | -- |
| Nitrogen, total organic as N | 2 | -- | -- | 0.24-2.9 | -- |
| Phosphorus, total as P | 2 | -- | -- | 1.2-1.3 | -- |
| Carbon, total organic | 2 | -- | -- | 26-210 | -- |
| 11108000 Santa Clara River near Saugus | | | | | |
| Nitrite and nitrate, total as N | 15 | 4.4 | 2.8 | 0-7.5 | 5.9 |
| Nitrogen, ammonia, total as N | 15 | 1.2 | 2.4 | 0.02-8.9 | .1 |
| Nitrogen, total organic as N | 15 | 1.6 | 2.0 | 0.25-8.1 | .95 |
| Phosphorus, total as P | 15 | 2.6 | 3.0 | 0.31-9.4 | .77 |
| Carbon, total organic | 15 | 9.6 | 5.5 | 1.8-22 | 9.6 |

TABLE 7.--*Summary of nitrogen, phosphorus, and total organic carbon data for selected sites, August 1974 through 1976--Continued*

| Constituent | No. of samples | Concentration, in milligrams per liter | | | |
|---|----------------|--|--------------------|-----------|--------|
| | | Mean | Standard deviation | Range | Median |
| 343040118361801 Castaic Creek below Castaic Reservoir | | | | | |
| Nitrite and nitrate, total as N | 11 | 0.05 | 0.09 | 0-0.27 | 0 |
| Nitrogen, ammonia, total as N | 11 | .09 | .07 | 0-0.24 | .08 |
| Nitrogen, total organic as N | 11 | .43 | .19 | 0.18-78 | .34 |
| Phosphorus, total as P | 11 | .04 | .07 | 0.01-0.25 | .02 |
| Carbon, total organic | 11 | 5.6 | 1.3 | 4.00-8.4 | 5.5 |
| 11108500 Santa Clara River at Los Angeles-Ventura County line | | | | | |
| Nitrite and nitrate, total as N | 22 | 2.3 | 2.2 | 0-8.0 | 2.6 |
| Nitrogen, ammonia, total as N | 22 | .19 | .19 | 0.02-1.3 | .06 |
| Nitrogen, total organic as N | 22 | 1.0 | 1.5 | 0-7.1 | .59 |
| Phosphorus, total as P | 22 | 1.1 | 1.1 | 0.23-5.9 | .87 |
| Carbon, total organic | 22 | 7.3 | 5.5 | 1.9-23 | 5.8 |

Selected Trace Elements

Table 8 summarizes trace-element data collected at selected sites in the upper Santa Clara River basin. The period of record for the total-trace-element samples was August 1974-June 1976.

For some trace elements the mean and the standard deviation are not given because some concentrations were below the analytical detection limit.

TABLE 8.--*Summary of trace-element data for selected sites,
August 1974 through June 1976*

| Constituent | No. of samples | Concentration, in micrograms per liter | | | |
|---|-------------------|---|-----------------------|-----------|--------|
| | | Mean | Standard deviation | Range | Median |
| 342613118131601 Santa Clara River at Ravenna | | | | | |
| Total arsenic (As) | 8 | 0.6 | 0.74 | 0-2 | 0.5 |
| Total boron (B) | 0 | -- | -- | -- | -- |
| Total cadmium (Cd) | 9 | <10 | -- | 0-10 | <10 |
| Total chromium (Cr) | 9 | (1) | -- | 0-10 | 0 |
| Total iron (Fe) | 9 | 79 | 80 | 0-260 | 50 |
| Total lead (Pb) | 9 | <100 | -- | <100 | <100 |
| Total manganese (Mn) | 9 | 9 | 11 | 0-30 | 10 |
| Total mercury (Hg) | 9 | (1) | -- | 0-0.1 | 0 |
| Total selenium (Se) | 9 | .2 | .4 | 0-1 | 0 |
| 11107745 Santa Clara River above Railroad Station near Lang | | | | | |
| Total arsenic (As) | 13 | 1 | 1.3 | 0-4 | 1 |
| Total boron (B) | 8 | 300 | 52 | 220-360 | 8 |
| Total cadmium (Cd) | 13 | (1) | -- | <10-20 | 13 |
| Total chromium (Cr) | 13 | (1) | -- | 0-10 | 0 |
| Total iron (Fe) | 13 | 235 | 296 | 30-1,000 | 120 |
| Total lead (Pb) | 13 | (1) | -- | <100-100 | <100 |
| Total manganese (Mn) | 13 | (1) | -- | 0-40 | <10 |
| Total mercury (Hg) | 13 | (1) | -- | 0-3.4 | 0 |
| Total selenium (Se) | 13 | .1 | .3 | 0-1 | 0 |
| 342526118122101 Santa Clara River at Bouquet Junction | | | | | |
| Total arsenic (As) | 22 | 3.2 | 1.9 | 1-8 | 3 |
| Total boron (B) | 17 | 1,800 | 600 | 930-3,500 | 1,700 |
| Total cadmium (Cd) | 22 | (1) | -- | 0-20 | <10 |
| Total chromium (Cr) | 22 | (1) | -- | 0-40 | <10 |
| Total iron (Fe) | 22 | 500 | 1,200 | 30-4,700 | 100 |
| Total lead (Pb) | 22 | (1) | -- | 0-100 | <100 |
| Total manganese (Mn) | 22 | 20 | 30 | 0-100 | 20 |
| Total mercury (Hg) | 22 | .2 | .2 | 0-0.6 | .1 |
| Total selenium (Se) | 21 | 1 | 1 | 0-2 | 1 |

¹See footnote at end of table.

TABLE 8.--*Summary of trace-element data for selected sites,
August 1974 through June 1976--Continued*

| Constituent | No. of samples | Concentration, in micrograms per liter | | | |
|---|-------------------|---|-----------------------|---------------|--------|
| | | Mean | Standard deviation | Range | Median |
| 11107860 Bouquet Creek near Saugus | | | | | |
| Total arsenic (As) | 1 | 14 | -- | -- | -- |
| Total boron (B) | 0 | -- | -- | -- | -- |
| Total cadmium (Cd) | 1 | 30 | -- | -- | -- |
| Total chromium (Cr) | 1 | 70 | -- | -- | -- |
| Total iron (Fe) | 1 | 58,000 | -- | -- | -- |
| Total lead (Pb) | 1 | 200 | -- | -- | -- |
| Total manganese (Mn) | 1 | 1,000 | -- | -- | -- |
| Total mercury (Hg) | 1 | 0 | -- | -- | -- |
| Total selenium (Se) | 1 | 1 | -- | -- | -- |
| F-135 South Fork Santa Clara River (at Saugus-Ventura Road) | | | | | |
| Total arsenic (As) | 2 | -- | -- | 6-16 | -- |
| Total boron (B) | 0 | -- | -- | -- | -- |
| Total cadmium (Cd) | 2 | -- | -- | <10-20 | -- |
| Total chromium (Cr) | 2 | -- | -- | 0-80 | -- |
| Total iron (Fe) | 2 | -- | -- | 23,000-62,000 | -- |
| Total lead (Pb) | 2 | -- | -- | <100-100 | -- |
| Total manganese (Mn) | 2 | -- | -- | 380-840 | -- |
| Total mercury (Hg) | 2 | -- | -- | 0-0.1 | -- |
| Total selenium (Se) | 2 | -- | -- | 5-6 | -- |
| 11108000 Santa Clara River near Saugus | | | | | |
| Total arsenic (As) | 15 | 5 | 5 | 1-16 | 3 |
| Total boron (B) | 13 | 1,100 | 380 | 610-1,700 | 13 |
| Total cadmium (Cd) | 15 | (1) | -- | 0-10 | <10 |
| Total chromium (Cr) | 15 | 10 | 20 | 0-80 | 0 |
| Total iron (Fe) | 15 | 9,400 | 19,000 | 300-72,000 | 1,400 |
| Total lead (Pb) | 15 | (1) | -- | 0-100 | <100 |
| Total manganese (Mn) | 15 | 220 | 190 | 100-750 | 150 |
| Total mercury (Hg) | 15 | (1) | -- | 0-1.3 | .1 |
| Total selenium (Se) | 14 | 6 | 2 | 3-10 | 6 |

¹See footnote at end of table.

TABLE 8.--Summary of trace-element data for selected sites,
August 1974 through June 1976--Continued

| Constituent | No. of samples | Concentration, in micrograms per liter | | | |
|---|----------------|--|--------------------|------------|--------|
| | | Mean | Standard deviation | Range | Median |
| 343040118363801 Castaic Creek below Castaic Reservoir | | | | | |
| Total arsenic (As) | 11 | 2.5 | 2.9 | 0-10 | 1 |
| Total boron (B) | 0 | -- | -- | -- | -- |
| Total cadmium (Cd) | 11 | (1) | -- | <10-10 | <10 |
| Total chromium (Cr) | 11 | (1) | -- | 0-10 | 0 |
| Total iron (Fe) | 11 | 190 | 150 | 60-420 | 100 |
| Total lead (Pb) | 11 | (1) | -- | <100-100 | <100 |
| Total manganese (Mn) | 11 | 10 | 12 | 0-30 | 10 |
| Total mercury (Hg) | 10 | .06 | .13 | 0-0.4 | 0 |
| Total selenium (Se) | 11 | 0 | 0 | 0 | 0 |
| 11108500 Santa Clara River at Los Angeles-Ventura County line | | | | | |
| Total arsenic (As) | 22 | 3 | 2 | 1-10 | 3 |
| Total boron (B) | 17 | 730 | 220 | 570-1,500 | 660 |
| Total cadmium (Cd) | 22 | (1) | -- | 0-20 | <10 |
| Total chromium (Cr) | 22 | (1) | -- | 0-70 | <10 |
| Total iron (Fe) | 22 | 4,200 | 5,500 | 240-25,000 | 1,600 |
| Total lead (Pb) | 22 | (1) | -- | 0-100 | <100 |
| Total manganese (Mn) | 22 | 160 | 93 | 70-470 | 140 |
| Total mercury (Hg) | 22 | .1 | <.1 | 0-0.7 | 0 |
| Total selenium (Se) | 21 | 3 | 1 | 0-5 | 3 |

¹Some concentrations below analytical detection.

Total-trace-element concentrations varied among the sites but generally increased downstream. The range in concentration for total arsenic, chromium, iron, and manganese was greater at the Los Angeles-Ventura County line and near Saugus than at the upstream sites at Ravenna and near Lang. For example, at Ravenna the concentration ranges were: Total arsenic, 0-2 µg/L (micrograms per liter); total chromium, 0-10 µg/L; total iron, 0-260 µg/L; and total manganese, 0-30 µg/L. Near Saugus the ranges were: Total arsenic, 1-16 µg/L; total chromium, 0-80 µg/L; total iron, 300-72,000 µg/L; and total manganese, 100-750 µg/L.

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Most samples were collected at relatively low flow conditions, and the results show a wide variance in concentrations. A wider range in discharge should be sampled in order to develop a more definite concentration-discharge relation.

In August 1974, bottom-material samples were collected for selected trace-element analysis at four of the sites. Table 9 gives the results of those analyses.

TABLE 9.--Selected trace elements in bottom-material samples

[Concentration, in micrograms per gram]

| Date | Total arsenic | Total cadmium | Total cyanide | Total lead | Total mercury | Total selenium |
|---|------------------|------------------|------------------|---------------|------------------|-------------------|
| 11107745 Santa Clara River above Railroad Station near Lang | | | | | | |
| 8-26-74 | 1 | <1 | 0 | 10 | 0.00 | 0.0 |
| 342526118122101 Santa Clara River at Bouquet Junction | | | | | | |
| 8-27-74 | 2 | <1 | 0 | <10 | .00 | .0 |
| 342040118363801 Castaic Creek below Castaic Reservoir | | | | | | |
| 8-27-74 | 1 | <1 | 0 | <10 | .01 | .0 |
| 11108500 Santa Clara River at Los Angeles-Ventura County line | | | | | | |
| 8-27-74 | 2 | <1 | 0 | <10 | .01 | .0 |

Detergents (MBAS)

Samples were collected for detergent (MBAS) analysis from August 1974 through June 1976 at all sites. Table 10 summarizes results. Median concentrations were zero at all sites except at Bouquet Junction and near Saugus where the concentrations were 0.2 and 0.1 mg/L, respectively. The greatest variation in MBAS was found near Saugus, with concentrations ranging from 0 to 2.0 mg/L.

TABLE 10.--Summary of detergent (MBAS) concentration data for selected sites, August 1974 through June 1976

| Sampling site | No. of samples | Concentration, in milligrams per liter | | | |
|--|----------------|--|--------------------|----------|--------|
| | | Mean | Standard deviation | Range | Median |
| 342613118131601 Santa Clara River at Ravenna | 8 | 0.04 | 0.05 | 0-0.1 | 0 |
| 11107745 Santa Clara River near Lang | 13 | .03 | .05 | 0-0.16 | 0 |
| 342526118322101 Santa Clara River at Bouquet Junction | 20 | .2 | .2 | 0.01-0.7 | .2 |
| 11107860 Bouquet Creek near Saugus | 1 | .0 | -- | -- | -- |
| F-135 South Fork Santa Clara River (at Saugus-Ventura Road) | 2 | .025 | -- | 0-0.05 | -- |
| 11108000 Santa Clara River near Saugus | 13 | .3 | .3 | 0-2.0 | .1 |
| 343040118363801 Castaic Creek below Castaic Reservoir | 9 | .08 | .03 | 0-0.5 | 0 |
| 11108500 Santa Clara River at Los Angeles-Ventura County line | 19 | .03 | .17 | 0-0.6 | 0 |

Selected Pesticide Compounds

Water samples were collected for pesticide determination at all sites except Ravenna from August 1974 through June 1976 during low-flow and high-flow periods. The analyses included determinations for several of the compounds, commonly used in the area, from the chlorinated hydrocarbon, chlorophenoxy acids, and organic phosphorus pesticide groups.

Samples of bottom material were collected for pesticide analysis in August 1974 at four of the sites. Table 11 gives the results of pesticide analyses for whole-water and bottom-material samples.

SUMMARY

Results of the special sampling reconnaissance for nitrogen, phosphorus, total organic carbon, trace elements, detergents, and pesticide compounds indicate a wide variability among sites and among individual samples at each site. Because of the high concentrations of some elements, continued analysis for selected constituents is warranted.

The results of regression analysis indicate high correlations between specific conductance and all major chemical constituents, except nitrate and potassium, at the sites near Saugus and at the Los Angeles-Ventura County line, which had the largest data sets. Correlations were not as high for the sites near Lang and at Bouquet Junction, perhaps owing to the small data sets used. Results of regression analysis relating specific conductance to water discharge indicate the same degrees of definition, varying with the size of the data sets. Based on the significance of the results obtained at the downstream sites and with more data covering a wider range in discharge, good correlations might be developed at all sites to estimate concentrations of major inorganic chemical constituents, except those for potassium and nitrate.

If a more thorough understanding of the factors controlling concentration variability in the upper Santa Clara River basin is to be developed, a more specialized and comprehensive sampling program will be required.

TABLE 11.--Selected pesticide compounds in bottom-material and whole-water samples, August 1974 through June 1976

[NOTE: No entry means compound not detected in analysis]

| Date | Aldrin | Chlordane | DDD | DDE | DDT | Diazinon | Dieldrin | Lindane | Malathion | PCB |
|---|--------|-----------|-----|-------|------|----------|----------|---------|-----------|-----|
| 11107745 Santa Clara River above Railroad Station near Lang | | | | | | | | | | |
| No compounds detected in one bottom-material sample, August 26, 1974, and five whole-water samples, August 26, 1974, December 19, 1974, January 16, February 10, March 7, 1975. | | | | | | | | | | |
| 342526118122101 Santa Clara River at Bouquet Junction | | | | | | | | | | |
| Bottom Material (micrograms per kilogram) | | | | | | | | | | |
| 8-27-74 | | 2 | | 2.9 | 3.2 | | 0.1 | | | 4 |
| Whole Water (micrograms per liter) | | | | | | | | | | |
| 8-27-74 | | | | | | 0.08 | | | | |
| 12- 9-74 | | | | | | .01 | | 0.01 | | |
| 1-16-75 | | | | <0.01 | | .13 | | | | |
| 2-10-75 | <0.01 | | | <.01 | | | | .02 | | |
| 3-07-75 | | | | | | | | .03 | | |
| 9-16-75 | | | | .02 | | .04 | | | | |
| 3-23-76 | | | | | 0.01 | .01 | | | | |
| 6-22-76 | | | | | | | | | | |
| 11107860 Bouquet Creek near Saugus | | | | | | | | | | |
| Whole Water (micrograms per liter) | | | | | | | | | | |
| 2-10-75 | | <0.1 | | | 0.01 | 0.01 | 0.01 | 0.02 | 0.05 | |
| F-135 South Fork Santa Clara River (at Saugus-Ventura Road) | | | | | | | | | | |
| Whole Water (micrograms per liter) | | | | | | | | | | |
| 8-27-74 | | | | | | | | | | |
| 2-10-75 | | | | | | 0.02 | | | | 0.3 |

TABLE 11.--Selected pesticide compounds in bottom-material and whole-water samples, August 1974 through June 1976--Continued

[illegible]

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NITROGEN, PHOSPHORUS, AND TOTAL ORGANIC CARBON DATA

| Date | Instantaneous discharge (ft ³ /s) | Total nitrite and nitrate (N) (mg/L) | Total ammonia nitrogen (N) (mg/L) | Total organic nitrogen (N) (mg/L) | Total phosphorus (P) (mg/L) | Total organic carbon (C) (mg/L) |
|------|--|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|
|------|--|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|

342613118131601 Santa Clara River at Ravenna

| | | | | | | |
|-------------|------|------|------|------|------|-----|
| <u>1974</u> | | | | | | |
| Aug. 26 | 0.30 | 0.00 | 0.02 | 0.32 | 0.05 | 2.9 |
| Dec. 19 | 1.0 | .05 | .05 | .08 | .04 | 2.9 |
| <u>1975</u> | | | | | | |
| Jan. 16 | .30 | 2.3 | .05 | .36 | .07 | 1.5 |
| Feb. 10 | 3.5 | .00 | .09 | .07 | .06 | 1.8 |
| Mar. 7 | 4.0 | 2.4 | .03 | .32 | .08 | 1.3 |
| Dec. 10 | .90 | 2.1 | .00 | .38 | .06 | 1.3 |
| <u>1976</u> | | | | | | |
| Jan. 27 | 2.4 | 2.6 | .04 | .43 | .09 | 1.4 |
| Feb. 26 | 1.5 | 2.3 | .04 | .25 | .06 | 2.1 |
| Mar. 23 | 1.5 | 2.3 | .03 | .19 | .05 | 1.4 |

11107745 Santa Clara River above Railroad Station near Lang

| | | | | | | |
|-------------|-----|-----|-----|-----|-----|-----|
| <u>1974</u> | | | | | | |
| Aug. 26 | .02 | .05 | .09 | .32 | .09 | 3.6 |
| Sept. 25 | .01 | .00 | 5.6 | 1.9 | 9.3 | 12 |
| Oct. 16 | .30 | .00 | .11 | .13 | .07 | 3.8 |
| Nov. 18 | .50 | .00 | .05 | .11 | .11 | 3.0 |
| Dec. 19 | 1.0 | .03 | .09 | .02 | .11 | 1.5 |
| <u>1975</u> | | | | | | |
| Jan. 16 | .70 | .26 | .09 | .53 | .08 | 1.5 |
| Feb. 10 | 4.0 | .00 | .01 | .16 | .08 | 2.0 |
| Mar. 7 | 4.0 | .09 | .06 | .20 | .12 | 5.5 |
| Apr. 16 | 8.5 | .00 | .05 | .04 | .07 | 2.1 |
| May 22 | 3.0 | .06 | .00 | .09 | .01 | .8 |
| June 26 | 1.2 | .18 | .00 | .16 | .11 | .8 |
| <u>1976</u> | | | | | | |
| Feb. 26 | 1.0 | .61 | .04 | .20 | .14 | 3.0 |
| Mar. 23 | .80 | .36 | .03 | .39 | .09 | .8 |

NITROGEN, PHOSPHORUS, AND TOTAL ORGANIC CARBON DATA

| Date | Instantaneous dis- charge (ft ³ /s) | Total nitrite and nitrate (N) (mg/L) | Total ammonia nitro- gen (N) (mg/L) | Total organic nitro- gen (N) (mg/L) | Total phos- phorus (P) (mg/L) | Total organic carbon (C) (mg/L) |
|------|---|---|--|--|---|---|
|------|---|---|--|--|---|---|

342526118322101 Santa Clara River at Bouquet Junction

| | | | | | | |
|----------|-----|------|------|------|-----|-----|
| 1974 | | | | | | |
| Aug. 27 | 3.0 | 0.02 | -- | -- | 17 | 16 |
| Sept. 25 | 4.5 | .28 | 0.13 | 0.24 | .31 | 6.4 |
| Oct. 16 | 3.0 | .00 | 1.1 | .9 | 9.8 | 13 |
| Nov. 18 | 3.5 | .00 | 11 | 1.0 | 4.2 | 15 |
| Dec. 19 | 6.5 | .03 | 11 | 1.0 | 3.7 | 8.6 |

| | | | | | | |
|----------|-----|-----|-----|-----|-----|-----|
| 1975 | | | | | | |
| Jan. 16 | 4.5 | .00 | 6.0 | .7 | 9.7 | 9.7 |
| Feb. 10 | 4.0 | .00 | .43 | 1.4 | 12 | 9.8 |
| Mar. 7 | 10 | 5.8 | 6.4 | .3 | 12 | 9.3 |
| Apr. 16 | 9.0 | .00 | 6.0 | .3 | 12 | 9.0 |
| May 22 | 9.5 | 1.9 | 11 | 3.0 | 1.8 | 13 |
| June 26 | 7.2 | 9.4 | 3.4 | 3.0 | 13 | 13 |
| Aug. 28 | 3.0 | 1.2 | 12 | 1.0 | 9.3 | 13 |
| Sept. 16 | 8.0 | 1.4 | 4.5 | 2.0 | 8.9 | 2.0 |
| Oct. 20 | 7.0 | 5.2 | 4.8 | .3 | 11 | 17 |
| Nov. 19 | 7.0 | 4.9 | 16 | .2 | 11 | 19 |
| Dec. 10 | 9.0 | 7.0 | 7.7 | 11 | 10 | 49 |

| | | | | | | |
|---------|-----|-----|-----|------|-----|----|
| 1976 | | | | | | |
| Jan. 27 | 6.0 | 3.2 | 16 | 10 | 12 | 14 |
| Feb. 26 | 6.0 | 10 | 1.1 | 2.8 | 8.9 | 14 |
| Mar. 23 | 12 | 2.8 | .08 | 10.9 | 5.1 | 47 |
| Apr. 21 | 5.0 | 3.4 | 2.5 | 6.3 | 9.6 | 43 |
| May 28 | 6.0 | 1.4 | 6.5 | 1.6 | 15 | 12 |
| June 26 | 4.5 | 1.6 | 6.8 | 4.2 | 11 | 12 |

11107860 Bouquet Creek near Saugus

| | | | | | | |
|---------|----|-----|-----|-----|-----|----|
| 1975 | | | | | | |
| Feb. 10 | .5 | .00 | .09 | 1.6 | .92 | 18 |

NITROGEN, PHOSPHORUS, AND TOTAL ORGANIC CARBON DATA

| Date | Instantaneous discharge (ft ³ /s) | Total nitrite and nitrate (N) (mg/L) | Total ammonia nitrogen (N) (mg/L) | Total organic nitrogen (N) (mg/L) | Total phosphorus (P) (mg/L) | Total organic carbon (C) (mg/L) |
|------|--|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|
|------|--|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|

F-135 South Fork Santa Clara River (at Saugus-Ventura Road)

| | | | | | | |
|-------------|------|------|------|------|-----|-----|
| <u>1974</u> | | | | | | |
| Aug. 27 | 0.25 | 0.00 | 0.37 | 0.24 | 1.2 | 26 |
| <u>1975</u> | | | | | | |
| Feb. 10 | .50 | .00 | .12 | 2.9 | 1.3 | 210 |

11108000 Santa Clara River near Saugus

| | | | | | | |
|-------------|-----|-----|-----|------|-----|-----|
| <u>1974</u> | | | | | | |
| Sept. 25 | 7.5 | .00 | .60 | 1.2 | 4.1 | 7.8 |
| Dec. 19 | 3.0 | .05 | .04 | .62 | .47 | 4.6 |
| <u>1975</u> | | | | | | |
| Jan. 16 | 1.5 | .00 | .09 | .64 | .38 | 3.4 |
| Feb. 10 | 8.0 | .00 | .06 | .92 | .62 | 9.6 |
| Mar. 7 | 20 | 7.5 | .25 | .95 | .77 | 10 |
| Sept. 16 | 6.0 | 6.4 | 2.0 | 1.1 | 4.8 | 22 |
| Oct. 20 | 6.0 | 6.0 | 3.0 | 1.6 | 6.9 | 10 |
| Nov. 19 | 4.5 | 6.8 | 2.7 | 1.9 | 6.6 | 13 |
| Dec. 11 | 5.0 | 3.9 | .02 | 1.28 | 1.7 | 8.1 |
| <u>1976</u> | | | | | | |
| Jan. 27 | 7.0 | 4.7 | 8.9 | 8.1 | 9.4 | 12 |
| Feb. 27 | 3.0 | 6.9 | .1 | .66 | .59 | 13 |
| Mar. 24 | 3.0 | 5.9 | .03 | .25 | .46 | 6.0 |
| Apr. 21 | 2.0 | 5.7 | .03 | .89 | .34 | 4.4 |
| May 28 | 1.5 | 5.9 | .03 | .25 | .31 | 1.8 |
| June 22 | 2.5 | 6.4 | .05 | 3.0 | 1.4 | 18 |

NITROGEN, PHOSPHORUS, AND TOTAL ORGANIC CARBON DATA

| Date | Instantaneous discharge (ft ³ /s) | Total nitrite and nitrate (N) (mg/L) | Total ammonia nitrogen (N) (mg/L) | Total organic nitrogen (N) (mg/L) | Total phosphorus (P) (mg/L) | Total organic carbon (C) (mg/L) |
|------|--|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|
|------|--|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|

343040118361801 Castaic Creek below Castaic Reservoir

1974

| | | | | | | |
|----------|----|------|------|-------|------|-----|
| Aug. 27 | 10 | 0.00 | 0.24 | 0.218 | 0.25 | 7.0 |
| Sept. 25 | 10 | .00 | .10 | .69 | .01 | 6.1 |
| Oct. 16 | 10 | .00 | .09 | .33 | .02 | 5.9 |
| Nov. 18 | 10 | .00 | .21 | .33 | .04 | 4.8 |
| Dec. 19 | 10 | .02 | .06 | .32 | .01 | 4.5 |

1975

| | | | | | | |
|---------|----|-----|-----|-----|-----|-----|
| Jan. 16 | 10 | .27 | .08 | .78 | .05 | 8.4 |
| Feb. 10 | 10 | .00 | .06 | .34 | .02 | 5.1 |
| Mar. 7 | 10 | .11 | .10 | .28 | .01 | 6.1 |
| Apr. 16 | 10 | .00 | .03 | .18 | .01 | 4.0 |
| May 22 | 25 | .01 | .02 | .59 | .02 | 5.5 |
| June 26 | 13 | .14 | .00 | .38 | .02 | 4.6 |

11108500 Santa Clara River at Los Angeles-Ventura County line

1974

| | | | | | | |
|----------|----|-----|-----|------|-----|-----|
| Aug. 17 | 12 | .00 | .46 | .05 | 1.8 | 13 |
| Sept. 25 | 12 | .00 | .12 | 1.08 | 1.5 | 9.8 |
| Oct. 16 | 18 | .00 | .22 | .58 | 1.0 | 6.0 |
| Nov. 18 | 16 | .00 | .06 | .50 | .79 | 3.8 |
| Dec. 19 | 30 | .02 | .12 | .52 | .80 | 3.8 |

See footnote at end of table.

NITROGEN, PHOSPHORUS, AND TOTAL ORGANIC CARBON DATA

| Date | Instantaneous discharge (ft ³ /s) | Total nitrite and nitrate (N) (mg/L) | Total ammonia nitrogen (N) (mg/L) | Total organic nitrogen (N) (mg/L) | Total phosphorus (P) (mg/L) | Total organic carbon (C) (mg/L) |
|---|--|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|
| 11108500 Santa Clara River at Los Angeles-Ventura County line (Continued) | | | | | | |
| <u>1975</u> | | | | | | |
| Jan. 17 | 15 | 3.7 | 0.72 | 0.58 | 0.86 | 3.9 |
| Feb. 10 | 50 | .00 | .06 | 2.14 | 1.6 | 21 |
| Mar. 7 | 120 | 2.7 | .24 | .59 | .63 | 7.7 |
| Apr. 16 | 25 | .00 | .08 | .52 | .81 | 3.7 |
| May 22 | 21 | 2.5 | .04 | .96 | .23 | 7.8 |
| June 25 | 15 | 2.7 | .03 | .97 | .88 | 8.7 |
| Aug. 28 | 8.5 | 3.2 | .03 | .78 | .90 | 4.8 |
| Sept. 16 | 7.0 | 2.8 | .06 | .74 | 1.1 | 4.6 |
| Oct. 20 | 10 | 2.9 | .07 | .84 | 1.2 | 5.7 |
| Nov. 19 | 17 | 3.0 | .04 | 1.96 | .97 | 6.9 |
| Dec. 11 | 17 | 6.8 | 1.3 | 7.1 | 5.9 | 23 |
| <u>1976</u> | | | | | | |
| Jan. 28 | 20 | 4.0 | .41 | 1.59 | 1.7 | 5.9 |
| Feb. 27 | 25 | 2.9 | .02 | .46 | .75 | 8.5 |
| Mar. 24 | 20 | 2.4 | .04 | .45 | .60 | 4.4 |
| Apr. 21 | 17 | 8.0 | .02 | .00 | .45 | 3.0 |
| May 28 | 9.6 | 1.3 | .05 | .19 | .42 | 1.9 |
| June 22 | 6.6 | 1.2 | .04 | .09 | .30 | 2.2 |

¹Sampled in reservoir.

TRACE-ELEMENT DATA

| Date | Instantaneous discharge (ft ³ /s) | Total arsenic (As) (μg/L) | Total boron (B) (μg/L) | Total cadmium (Cd) (μg/L) | Total chromium (Cr) (μg/L) |
|------|--|---------------------------|------------------------|---------------------------|----------------------------|
|------|--|---------------------------|------------------------|---------------------------|----------------------------|

342613118131601 Santa Clara River at Ravenna

1974

| | | | | | |
|---------|------|---|---|-----|---|
| Aug. 26 | 0.30 | 1 | - | <10 | 0 |
| Dec. 19 | 1.0 | 2 | - | <10 | 0 |

1975

| | | | | | |
|---------|-----|---|---|-----|----|
| Jan. 16 | .30 | 1 | - | 0 | 10 |
| Feb. 10 | 3.5 | 0 | - | 10 | 10 |
| Mar. 7 | 4.0 | 0 | - | <10 | 0 |
| Dec. 10 | .90 | 0 | - | <10 | 0 |

1976

| | | | | | |
|---------|-----|---|---|-----|----|
| Jan. 27 | 2.4 | 1 | - | <10 | 0 |
| Feb. 26 | 1.5 | 0 | - | <10 | 0 |
| Mar. 23 | 1.5 | - | - | <10 | 10 |

11107745 Santa Clara River above Railroad Station near Lang

1974

| | | | | | |
|----------|-----|---|---|-----|-----|
| Aug. 26 | .02 | 0 | - | <10 | 0 |
| Sept. 25 | .01 | 4 | - | <10 | 0 |
| Oct. 16 | .30 | 2 | - | <10 | 0 |
| Nov. 18 | .50 | 1 | - | <10 | <10 |
| Dec. 19 | 1.0 | 2 | - | <10 | 0 |

1975

| | | | | | |
|---------|-----|---|-----|-----|----|
| Jan. 16 | .70 | 1 | 330 | 20 | 0 |
| Feb. 10 | 4.0 | 0 | 270 | <10 | 0 |
| Mar. 7 | 4.0 | 2 | 220 | 10 | 10 |
| Apr. 16 | 8.5 | 1 | 240 | <10 | 0 |
| May 22 | 3.0 | 1 | 300 | 10 | 0 |
| June 26 | 1.2 | 3 | 330 | <10 | 0 |

1976

| | | | | | |
|---------|-----|---|-----|-----|----|
| Feb. 26 | 1.0 | 1 | 360 | <10 | 0 |
| Mar. 23 | .80 | 0 | 350 | <10 | 10 |

TRACE-ELEMENT DATA

| Total iron (Fe) ($\mu\text{g/L}$) | Total lead (Pb) ($\mu\text{g/L}$) | Total manga- nese (Mn) ($\mu\text{g/L}$) | Total mercury (Hg) ($\mu\text{g/L}$) | Total selen- ium (Se) ($\mu\text{g/L}$) |
|--|--|--|---|---|
|--|--|--|---|---|

342613118131601 Santa Clara River at Ravenna

| | | | | |
|-----|------|----|-----|---|
| 50 | <100 | 0 | 0.0 | 0 |
| 40 | <100 | 0 | <.1 | 1 |
| 80 | <100 | 20 | .0 | 0 |
| 260 | <100 | 0 | .0 | 1 |
| 50 | <100 | 10 | .0 | 0 |
| 60 | <100 | 10 | .1 | 0 |
| 20 | <100 | 0 | .0 | 0 |
| 0 | <100 | 30 | .0 | 0 |
| 150 | <100 | 10 | .0 | 0 |

11107745 Santa Clara River above Railroad Station near Lang

| | | | | |
|-------|------|-----|-----|---|
| 120 | <100 | 0 | .0 | 0 |
| 130 | <100 | 0 | .0 | 1 |
| 70 | <100 | 0 | .0 | 0 |
| 70 | <100 | <10 | .0 | 0 |
| 60 | 100 | 0 | <.1 | 0 |
| 500 | <100 | 30 | .0 | 0 |
| 210 | <100 | 0 | .0 | 0 |
| 1,000 | <100 | 40 | 3.4 | 0 |
| 640 | 20 | 20 | .2 | 0 |
| 120 | <100 | 10 | .0 | 0 |
| 50 | <100 | 0 | .0 | 0 |
| 30 | <100 | 40 | .0 | 0 |
| 60 | <100 | 10 | .0 | 0 |

TRACE-ELEMENT DATA

| Date | Instantaneous discharge (ft ³ /s) | Total arsenic (As) (μg/L) | Total boron (B) (μg/L) | Total cadmium (Cd) (μg/L) | Total chromium (Cr) (μg/L) |
|------|--|---------------------------|------------------------|---------------------------|----------------------------|
|------|--|---------------------------|------------------------|---------------------------|----------------------------|

342526118322101 Santa Clara River at Bouquet Junction

1974

| | | | | | |
|----------|-----|---|---|-----|-----|
| Aug. 27 | 3.0 | 2 | - | <10 | 0 |
| Sept. 25 | 4.5 | 1 | - | <10 | 0 |
| Oct. 16 | 3.0 | 3 | - | <10 | 0 |
| Nov. 18 | 3.5 | 2 | - | <10 | <10 |
| Dec. 19 | 6.5 | 3 | - | <10 | 0 |

1975

| | | | | | |
|----------|-----|---|-------|-----|----|
| Jan. 16 | 4.5 | 2 | 1,700 | 0 | 0 |
| Feb. 10 | 4.0 | 1 | 1,800 | <10 | 10 |
| Mar. 7 | 10 | 3 | 1,600 | <10 | 0 |
| Apr. 16 | 9.0 | 2 | 1,800 | <10 | 0 |
| May 22 | 9.5 | 4 | 1,500 | 10 | 0 |
| June 26 | 7.2 | 8 | 2,000 | <10 | 0 |
| Aug. 28 | 3.0 | 4 | 1,600 | <10 | 10 |
| Sept. 16 | 8.0 | 7 | 2,100 | 0 | 0 |
| Oct. 20 | 7.0 | 5 | 930 | 0 | 40 |
| Nov. 19 | 7.0 | 6 | 1,900 | 20 | 10 |
| Dec. 10 | 9.0 | 4 | 1,700 | <10 | 10 |

1976

| | | | | | |
|---------|-----|---|-------|-----|----|
| Jan. 27 | 6.0 | 2 | 1,900 | <10 | 0 |
| Feb. 26 | 6.0 | 3 | 1,800 | <10 | 10 |
| Mar. 23 | 12 | 1 | 1,500 | <10 | 10 |
| Apr. 21 | 5.0 | 3 | 3,500 | <10 | 10 |
| May 28 | 6.0 | 2 | 1,500 | 0 | 10 |
| June 22 | 4.5 | 3 | 1,000 | 0 | 10 |

11107860 Bouquet Creek near Saugus

1975

| | | | | | |
|---------|----|----|---|----|----|
| Feb. 10 | .5 | 14 | - | 30 | 70 |
|---------|----|----|---|----|----|

F-135 South Fork Santa Clara River (at Saugus-Ventura Road)

1974

| | | | | | |
|---------|-----|---|---|-----|---|
| Aug. 27 | .25 | 6 | - | <10 | 0 |
|---------|-----|---|---|-----|---|

1975

| | | | | | |
|---------|----|----|---|----|----|
| Feb. 10 | .5 | 16 | - | 20 | 80 |
|---------|----|----|---|----|----|

TRACE-ELEMENT DATA

| Total iron (Fe) ($\mu\text{g/L}$) | Total lead (Pb) ($\mu\text{g/L}$) | Total manga- nese (Mn) ($\mu\text{g/L}$) | Total mercury (Hg) ($\mu\text{g/L}$) | Total selen- ium (Se) ($\mu\text{g/L}$) |
|--|--|--|---|---|
|--|--|--|---|---|

342526118322101 Santa Clara River at Bouquet Junction

| | | | | |
|-------|------|-----|-----|---|
| 70 | <100 | 0 | 0.0 | 2 |
| 50 | <100 | 0 | .3 | 0 |
| 70 | <100 | 0 | .0 | 1 |
| 120 | <100 | 10 | .1 | 0 |
| 100 | <100 | 0 | <.1 | 1 |
| 100 | <100 | 20 | .6 | 1 |
| 80 | <100 | 0 | .0 | 1 |
| 250 | <100 | 10 | .0 | 0 |
| 170 | <100 | 10 | .6 | 1 |
| 100 | <100 | 30 | .0 | 1 |
| 90 | <100 | 20 | .0 | 1 |
| 150 | <100 | 20 | .1 | 0 |
| 3,900 | 100 | 100 | .1 | 0 |
| 30 | 100 | 30 | .0 | 1 |
| 150 | <100 | 5 | .0 | 1 |
| 450 | <100 | 20 | .4 | 1 |
| 40 | <100 | 10 | .1 | 0 |
| 80 | 100 | 30 | .0 | 1 |
| 4,700 | <100 | 100 | .1 | 0 |
| 100 | 100 | 30 | .2 | 1 |
| 100 | 0 | 20 | .4 | - |
| 150 | 14 | 20 | .4 | 1 |

11107860 Bouquet Creek near Saugus

| | | | | |
|--------|-----|-------|----|---|
| 58,000 | 200 | 1,000 | .0 | 1 |
|--------|-----|-------|----|---|

F-135 South Fork Santa Clara River (at Saugus-Ventura Road)

| | | | | |
|--------|------|-----|----|---|
| 23,000 | <100 | 380 | .0 | 6 |
| 62,000 | 100 | 840 | .1 | 5 |

TRACE-ELEMENT DATA

| Date | Instantaneous discharge (ft ³ /s) | Total arsenic (As) (μg/L) | Total boron (B) (μg/L) | Total cadmium (Cd) (μg/L) | Total chromium (Cr) (μg/L) |
|------|--|---------------------------|------------------------|---------------------------|----------------------------|
|------|--|---------------------------|------------------------|---------------------------|----------------------------|

11108000 Santa Clara River near Saugus

| | | | | | |
|-------------|------|----|-------|-----|----|
| <u>1974</u> | | | | | |
| Sept. 25 | 7.5 | 6 | - | <10 | 0 |
| Dec. 19 | 3.0 | 2 | - | <10 | 0 |
| <u>1975</u> | | | | | |
| Jan. 16 | 1.5 | 1 | 960 | 10 | 0 |
| Feb. 10 | 8.0 | 5 | 890 | 10 | 20 |
| Mar. 7 | 20.0 | 5 | 850 | <10 | 0 |
| Sept. 16 | 6.0 | 14 | 1,600 | 0 | 40 |
| Oct. 20 | 6.0 | 3 | 830 | 0 | 40 |
| Nov. 19 | 4.5 | 4 | 1,700 | 10 | 0 |
| Dec. 11 | 5.0 | 1 | 740 | <10 | 0 |
| <u>1976</u> | | | | | |
| Jan. 27 | 7.0 | 4 | 1,700 | <10 | 0 |
| Feb. 27 | 3.0 | 3 | 1,100 | 10 | 0 |
| Mar. 24 | 3.0 | 1 | 1,000 | <10 | 20 |
| Apr. 21 | 2.0 | 2 | 1,400 | <10 | 10 |
| May 28 | 1.5 | 1 | 740 | 0 | 10 |
| June 22 | 2.5 | 16 | 610 | 0 | 80 |

343040118361801 Castaic Creek below Castaic Reservoir

| | | | | | |
|-------------|----|----|---|-----|-----|
| <u>1974</u> | | | | | |
| Aug. 27 | 10 | 1 | - | <10 | 0 |
| Sept. 25 | 10 | 10 | - | <10 | 0 |
| Oct. 16 | 10 | 2 | - | <10 | 0 |
| Nov. 18 | 10 | 3 | - | <10 | <10 |
| Dec. 19 | 10 | 1 | - | <10 | 0 |
| <u>1975</u> | | | | | |
| Jan. 16 | 10 | 1 | - | 10 | 0 |
| Feb. 10 | 10 | 0 | - | <10 | 10 |
| Mar. 7 | 10 | 2 | - | <10 | 0 |
| Apr. 7 | 10 | 1 | - | <10 | 0 |
| May 22 | 25 | 1 | - | 10 | 10 |
| June 26 | 13 | 6 | - | <10 | 0 |

See footnote on page 42.

TRACE-ELEMENT DATA

| Total iron (Fe) (µg/L) | Total lead (Pb) (µg/L) | Total manga- nese (Mn) (µg/L) | Total mercury (Hg) (µg/L) | Total selen- ium (Se) (µg/L) |
|---------------------------------|---------------------------------|---|------------------------------------|--|
|---------------------------------|---------------------------------|---|------------------------------------|--|

11108000 Santa Clara River near Saugus

| | | | | |
|--------|------|-----|-----|----|
| 7,900 | <100 | 200 | 0.0 | 5 |
| 1,400 | 100 | 160 | <.1 | 6 |
| 500 | <100 | 110 | .0 | 6 |
| 11,000 | 100 | 200 | .0 | 10 |
| 7,200 | <100 | 150 | .9 | 7 |
| 33,000 | 100 | 600 | .2 | 7 |
| 1,700 | <100 | 140 | .0 | 4 |
| 1,400 | <100 | 100 | .1 | 4 |
| 1,600 | <100 | 150 | .1 | 4 |
| 950 | <100 | 100 | .1 | 3 |
| 300 | <100 | 220 | .2 | 10 |
| 500 | <100 | 140 | .0 | 8 |
| 920 | 100 | 170 | .1 | 6 |
| 1,200 | 0 | 130 | .3 | - |
| 72,000 | 32 | 750 | 1.3 | 8 |

343040118361801 Castaic Creek below Castaic Reservoir

| | | | | |
|-----|------|----|----|---|
| 60 | <100 | 0 | .0 | 0 |
| 60 | <100 | 0 | - | 0 |
| 420 | <100 | 0 | .0 | 0 |
| 80 | <100 | 10 | .0 | 0 |
| 100 | 100 | 0 | .1 | 0 |
| 100 | <100 | 30 | .0 | 0 |
| 490 | 100 | 30 | .0 | 0 |
| 340 | <100 | 20 | .1 | 0 |
| 240 | <100 | 10 | .4 | 0 |
| 130 | <100 | 10 | .0 | 0 |
| 80 | <100 | 0 | .0 | 0 |

TRACE-ELEMENT DATA

| Date | Instantaneous discharge (ft ³ /s) | Total arsenic (As) (μg/L) | Total boron (B) (μg/L) | Total cadmium (Cd) (μg/L) | Total chromium (Cr) (μg/L) |
|---|--|---------------------------|------------------------|---------------------------|----------------------------|
| 11108500 Santa Clara River at Los Angeles-Ventura County line | | | | | |
| <u>1974</u> | | | | | |
| Aug. 27 | 12 | 2 | - | <10 | 0 |
| Sept. 25 | 12 | 3 | - | <10 | 0 |
| Oct. 16 | 18 | 3 | - | <10 | 0 |
| Nov. 18 | 16 | 4 | - | <10 | <10 |
| Dec. 19 | 30 | 3 | - | <10 | 0 |
| <u>1975</u> | | | | | |
| Jan. 17 | 15 | 1 | 650 | 10 | 10 |
| Feb. 10 | 50 | 10 | 610 | 10 | 40 |
| Mar. 7 | 120 | 3 | 620 | <10 | 10 |
| Apr. 16 | 25 | 3 | 570 | <10 | 0 |
| May 22 | 21 | 3 | 620 | <10 | 20 |
| June 25 | 15 | 5 | 670 | <10 | 0 |
| Aug. 28 | 8.5 | 4 | 770 | <10 | 10 |
| Sept. 16 | 7.0 | 3 | 830 | 0 | 10 |
| Oct. 20 | 10 | 2 | 580 | 0 | 70 |
| Nov. 19 | 17 | 2 | 770 | 20 | 10 |
| Dec. 11 | 17 | 2 | 1,500 | <10 | 0 |
| <u>1976</u> | | | | | |
| Jan. 28 | 20 | 2 | 830 | <10 | 0 |
| Feb. 27 | 25 | 2 | 680 | <10 | 0 |
| Mar. 24 | 20 | 2 | 660 | <10 | 0 |
| Apr. 21 | 17 | 1 | 750 | <10 | 10 |
| May 28 | 9.6 | 1 | 770 | 0 | 10 |
| June 22 | 6.6 | 2 | 580 | 0 | 20 |

¹Sampled in reservoir.

TRACE-ELEMENT DATA

| Total iron (Fe) ($\mu\text{g/L}$) | Total lead (Pb) ($\mu\text{g/L}$) | Total manga - nese (Mn) ($\mu\text{g/L}$) | Total mercury (Hg) ($\mu\text{g/L}$) | Total selen- ium (Se) ($\mu\text{g/L}$) |
|---|--|---|---|---|
| 11108500 Santa Clara River at Los Angeles-Ventura County line | | | | |
| 5,400 | <100 | 220 | 0.0 | 3 |
| 6,500 | 100 | 140 | .0 | 3 |
| 1,600 | <100 | 120 | .0 | 2 |
| 1,700 | 100 | 130 | .0 | 2 |
| 1,500 | <100 | 120 | .0 | 4 |
| 950 | <100 | 140 | .0 | 3 |
| 25,000 | <100 | 470 | .6 | 3 |
| 4,600 | <100 | 140 | .2 | 5 |
| 2,900 | <100 | 130 | .1 | 5 |
| 12,000 | <100 | 280 | .0 | 3 |
| 16,000 | <100 | 310 | .1 | 3 |
| 930 | <100 | 90 | .0 | 3 |
| 2,500 | <100 | 180 | .1 | 4 |
| 280 | 100 | 70 | .0 | 2 |
| 2,600 | <100 | 100 | .0 | 3 |
| 970 | <100 | 180 | .4 | 5 |
| 1,600 | <100 | 210 | .0 | 3 |
| 630 | <100 | 150 | .2 | 4 |
| 2,400 | <100 | 130 | .0 | 2 |
| 240 | <100 | 90 | .0 | 3 |
| 1,400 | 0 | 100 | .7 | - |
| 960 | 10 | 70 | .1 | 3 |

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