Water-Quality Characteristics and Nutrient and Suspended-Sediment Loads, Carson River and Truckee Canal, Western Nevada, Water Year 1980

By Kerry T. Garcia and Rita L. Carman

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CONVERSION FACTORS AND ABBREVIATIONS

"Inch-pound" units of measure used in this report may be converted to International System (metric) units by using the following factors:

Multiply	*By*	*To obtain*
Acres	0.4047	Square hectometers (hm^2)
Acre-feet (acre-ft)	0.001233	Cubic hectometers (hm^3)
Cubic feet per second (ft^3/s)	0.02832	Cubic meters per second (m^3/s)
Feet (ft)	0.3048	Meters (m)
Gallons (gal)	3.785	Liters (L)
Inches (in.)	25.40	Millimeters (mm)
Miles (mi)	1.609	Kilometers (km)
Square miles (mi^2)	2.590	Square kilometers (km^2)
Tons (short)	0.9072	Metric tons (t)

WATER-QUALITY CHARACTERISTICS AND NUTRIENT AND SUSPENDED-SEDIMENT LOADS, CARSON RIVER AND TRUCKEE CANAL, WESTERN NEVADA, WATER YEAR 1980

By Kerry T. Garcia and Rita L. Carman

ABSTRACT

Lahontan Reservoir, which stores water for irrigation in the nearby Fallon area, is a major recreational site in the Carson River basin of western Nevada. The reservoir is fed primarily by the Carson River and the Truckee Canal. The latter allows water from the adjacent Truckee River basin to flow into the reservoir. Water quality in both basins is strongly influenced by agriculture and urbanization.

In the Carson River during water year 1980, specific conductance tended to increase in a downstream direction, with the highest mean value occurring below the reservoir. Values of pH generally ranged from 7.0 to 8.8. Water temperature followed seasonal and diel cycles in response to meteorological conditions. Dissolved-oxygen concentrations were greater than 5 milligrams per liter. Among the major ions, calcium and sodium were the dominant cations and bicarbonate the dominant anion.

Inorganic nitrogen and phosphorus concentrations in the river increased in Carson Valley and between the sampling stations near Carson City and at Deer Run Road. The same nutrients, however, were reduced between Deer Run Road and the station near Fort Churchill. The inorganic nitrogen input to Lahontan Reservoir from the Truckee Canal was greater than that from the Carson River.

Measured suspended-sediment concentrations in the river ranged from 3 to 1,790 milligrams per liter during water year 1980. Excluding flow resulting from the January storm, about 95 percent of the concentrations were less than 500 milligrams per liter.

The maximum ultimate carbonaceous biochemical oxygen demand determined in the Carson River and Truckee Canal during water year 1980 occurred in January, with concentrations ranging from 10.4 to 19.6 milligrams per liter. All other values ranged from 1.2 to 10.8 milligrams per liter. Average carbonaceous deoxygenation rates ranged from 0.10 to 0.14. The carbonaceous biochemical oxygen-demand load decreased in the Carson River between Carson City and Lahontan Reservoir. The load entering the reservoir was approximately two times greater than the output from the reservoir.

The codominant algal groups in the river above the reservoir were diatoms and blue-green algae, whereas those in the Truckee Canal were diatoms and green algae. An algal bloom caused by *Aphanizomenon* occurred in the reservoir during the summer of 1980. This blue-green algae was also the dominant genera below the reservoir during that summer.

Background nutrient loads (those upstream from most agriculture and urbanization) in the river during 1980 were about 490 tons for total nitrogen and about 130 tons for total phosphorus. An increase to about 670 tons of total nitrogen and 230 tons of total phosphorus was observed between the background load and the Carson City station. The total nutrient loads remained nearly constant between the Carson City and Fort Churchill stations. The background suspended-sediment load for the river in 1980 was about 200,000 tons, increasing to about 210,000 tons at the Carson City station. The load decreased to 170,000 tons at the Deer Run Road station and then increased to about 230,000 tons at the Fort Churchill station.

During water year 1980, the total nitrogen load to Lahontan Reservoir was about 980 tons, the total phosphorus load was about 300 tons, and the suspended-sediment load was about 300,000 tons. The estimated long-term average loads of total nitrogen and total phosphorus were about 680 and 180 tons, respectively.

Loads to the lower Carson River from the reservoir during 1980 were about 820 tons for total nitrogen, 180 tons for total phosphorus, and 26,000 tons for suspended sediment.

INTRODUCTION

The Carson River and Truckee Canal provide nearly all of the inflow to Lahontan Reservoir. The Carson River and the Truckee River (which provides the flow for the Truckee Canal) receive point and nonpoint wastewater from urban areas and nonpoint discharges from agricultural areas (Nowlin and others, 1980, page 71). These contributions, therefore, directly influence the physical, chemical, and biological nature of the reservoir. Because the reservoir is used for a variety of recreational purposes, any serious impairment to its quality is of concern to the Nevada Division of Environmental Protection (NDEP).

As the State agency with primary responsibility for the coordination and control of water quality, the NDEP requested the U.S. Geological Survey to make a water-quality study of the Carson River and the Truckee Canal as they relate to Lahontan Reservoir. The study was initiated by cooperative agreement, and field work began in October 1979.

The objectives of this study were to determine (1) water-quality characteristics in the Carson River, and (2) regional contributions of seasonal nutrient and sediment loadings to Lahontan Reservoir from the river and Truckee Canal and to the river above and below the reservoir.[1] This information would provide a basis upon which decisions could be made concerning wastewater management in the Carson River basin.

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[1] In this report, the term "nutrient" is used principally with respect to nitrogen and phosphorus, which are essential to the growth of aquatic vegetation.

A sampling schedule was maintained to obtain as many data as possible from a range of flow conditions. Eighteen to twenty field surveys were made from October 1979 through September 1980. An attempt was made to sample the inflows to the reservoir from the Carson River and Truckee Canal, as well as the outflow from the reservoir at the same time that monthly samples were collected from Lahontan Reservoir by Desert Research Institute, University of Nevada.

For ease of data analysis, the Carson River basin was conceptually divided into three hydrologic subbasins for determining inputs and outputs of contaminants to and from each subbasin. No attempt was made to distinguish between urban (point) and agricultural (nonpoint) sources of pollution to Lahontan Reservoir. Basic data are presented at the end of this report.

A technical advisory committee was established to provide assistance and direction during the project. This committee consisted of Gilbert C. Bortleson, Edmund A. Prych, Roy A. Walters, U.S. Geological Survey; Gerald T. Orlob, University of California at Davis; and William F. Rush, University of California at Berkeley.

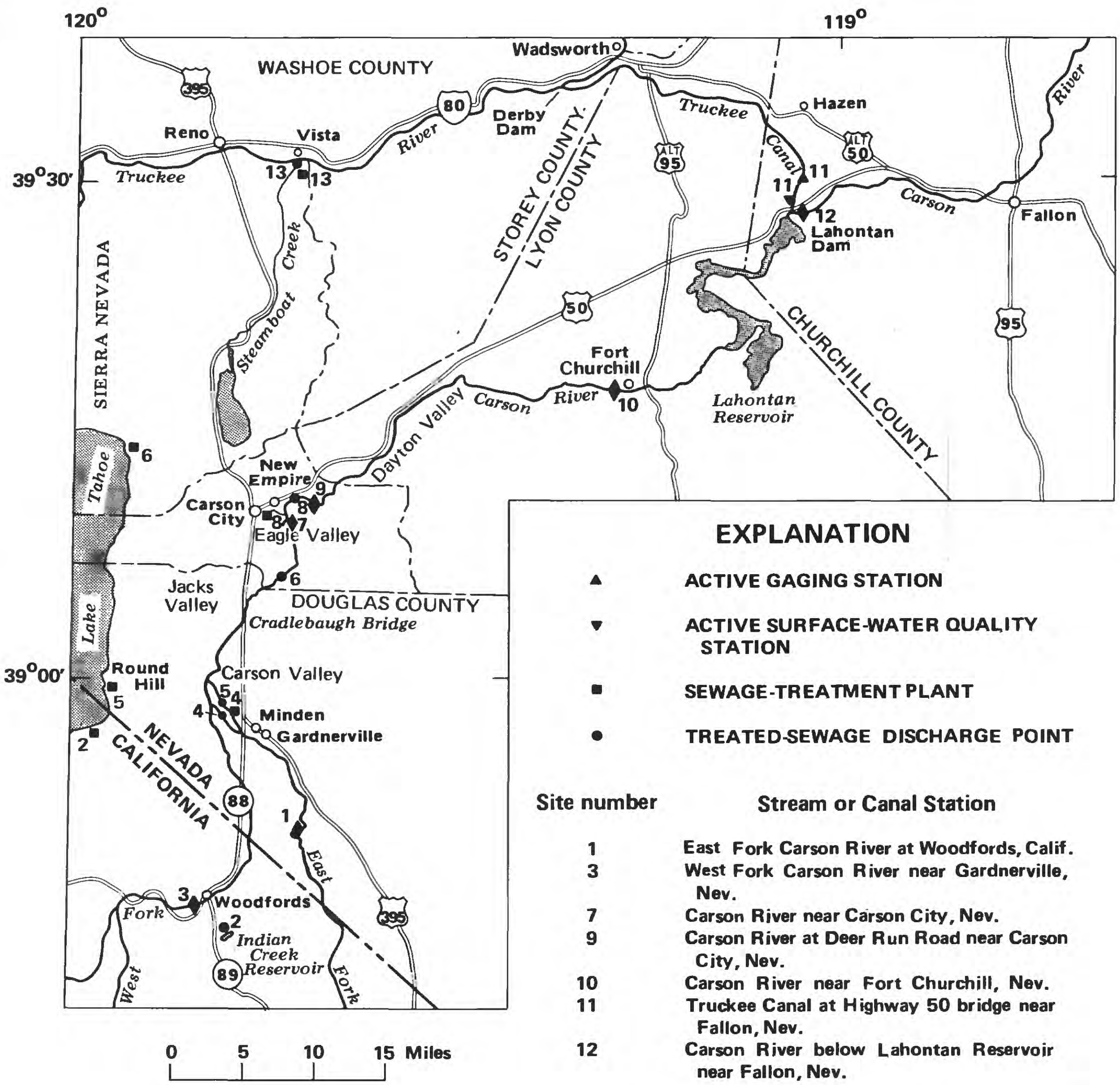
DESCRIPTION OF THE BASIN

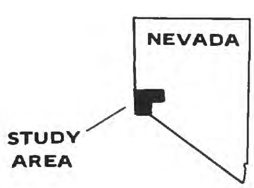
Physical Setting

Lahontan Reservoir is on the Carson River, about 18 miles west of Fallon in western Nevada (figure 1). The reservoir was completed in 1915 as part of the Newlands Reclamation Project, one of the first irrigation projects undertaken after the Reclamation Act of 1902 (U.S. Bureau of Reclamation, 1981, page 689). Recreational use of the reservoir (fishing, camping, and boating) was an added benefit after its construction. It has a maximum capacity of about 322,000 acre-ft and covers an area of approximately 15,000 acres (Katzer, 1972).

Lahontan Reservoir receives water from two major sources--Carson River and the Truckee Canal (figure 1). The Carson River, which has a drainage area upstream from Lahontan Reservoir of about 1,450 square miles, originates on the eastern slope of the Sierra Nevada. Runoff from the Sierra snowpack is the major contributor to streamflow. The East and West Forks are the principal tributaries of the Carson River, with the East Fork contributing most of the flow. The East Fork flows into Carson Valley past the cities of Minden and Gardnerville. The West Fork flows past the town of Woodfords, Calif., and into Carson Valley. The two forks flow in a northerly direction and join in the northwest part of Carson Valley. The river then veers northeastward past Carson City, continues past the community of Dayton, and then discharges into the southwest end of Lahontan Reservoir (figure 1).

The Carson River basin receives point discharges of treated sewage effluent from several treatment plants (figure 1). Some of this treated effluent is pumped from the Lake Tahoe basin over the Carson Range and discharges to the Carson River or onto agricultural lands for irrigation. The Carson City sewage-treatment plant effluent is also discharged to the Carson River or is used for irrigation.





EXPLANATION

- ▲ ACTIVE GAGING STATION
- ▼ ACTIVE SURFACE-WATER QUALITY STATION
- ■ SEWAGE-TREATMENT PLANT
- ● TREATED-SEWAGE DISCHARGE POINT

Site number	Stream or Canal Station
1	East Fork Carson River at Woodfords, Calif.
3	West Fork Carson River near Gardnerville, Nev.
7	Carson River near Carson City, Nev.
9	Carson River at Deer Run Road near Carson City, Nev.
10	Carson River near Fort Churchill, Nev.
11	Truckee Canal at Highway 50 bridge near Fallon, Nev.
12	Carson River below Lahontan Reservoir near Fallon, Nev.

Site number	Sewage-Treatment Plant and Discharge Point
2	South Lake Tahoe Public Utility District
4	Minden-Gardnerville
5	Douglas County Sewer Improvement District
6	Incline Village General Improvement District
8	Carson City
13	Reno-Sparks Joint Water Pollution Control Plant

Note: Stream and canal stations and sewage-discharge points are numbered in downstream order.

FIGURE 1.--Data-collection sites, sewage-treatment plants, and treated-sewage discharge points, Carson and Truckee River basins, Nevada and California.

The Truckee River, which has a drainage area of about 3,119 square miles, begins at the outlet of Lake Tahoe on the eastern slope of the Sierra Nevada. The altitudes of the mountains around the lake locally exceed 10,000 feet above sea level, and snowmelt is the primary contributor to streamflow (Nowlin and others, 1980, page 6). The river leaves the Sierra Nevada, flows through the cities of Reno and Sparks, and continues on to its terminus at Pyramid Lake. The Truckee River receives a point discharge of treated sewage effluent near Vista (figure 1), as well as nonpoint discharges along other sections of the river. Nutrients from the Truckee River that enter the Truckee Canal contribute to the nutrient loading of Lahontan Reservoir.

The Truckee Canal, completed in 1905, allows water from the Truckee River at Derby Dam to be diverted to Lahontan Reservoir at the northernmost end near Lahontan Dam (figure 1). The canal is 32.5 miles long and has a reported maximum capacity of about 1,500 ft^3/s (U.S. Bureau of Reclamation, 1981, page 690). However, the maximum recorded daily discharge of the Truckee Canal near Hazen, Nev., was 916 ft^3/s (February 3, 1967).

Water from the canal is used for irrigation between the town of Fernley and Lahontan Dam, and to supplement storage of water in Lahontan Reservoir. Water is diverted throughout the year, with the largest flows in the canal usually occurring from November to June. Observed phytoplankton blooms have directly or indirectly caused taste and odor problems, fish kills, and an occasional closure of the reservoir to recreational use.

Climate

The general climate of the Carson and Truckee River basins is classified as a mid-latitude steppe, with characteristic cold winters and hot summers. Prevailing westerly winds, large daily temperature ranges, infrequent severe storms, and great local variations in altitude are also characteristic of this area (Houghton and others, 1975, page 4). The average annual precipitation in the lowlands ranges from less than 4 inches to 15 inches with light to moderate snowfall (Houghton and others, 1975, page 40). The period during which this study was conducted (October 1, 1979 to September 30, 1980) was abnormally wet, and the amount of precipitation exceeded the long-term average at five selected sites where precipitation was measured (table 1). Snow accounts for the greatest percentage of precipitation in both basins over the long term. The amount of water that results from winter rains can be significant, however, especially in the eastern and lower parts of the basins where snowfall is usually light (Glancy and Katzer, 1976, page 17). The amount of precipitation greatly increases with altitude. Most of the annual precipitation in the Sierra Nevada is in the form of snow and accumulates between December and March (Houghton and others, 1975, pages 6, 53). The snowmelt provides most of the water used in the basins during the irrigation season.

TABLE 1.--*Annual precipitation at selected weather stations for the period of record and water year 1980*[1]

Station	Altitude (feet above sea level)	Period of record	Annual precipitation (inches)	
			Average for period of record	Total for water year 1980
Woodfords	5,625	1937-80	20.3	30.0
Minden	4,700	1930-38, 1940-80	8.5	10.6
Carson City	4,651	1930-80	11.0	16.1
Reno	4,404	1930-80	7.2	10.7
Lahontan Dam	4,158	1930-34, 1936-50, 1952-73, 1976-80	4.6	5.6

[1] From published records of National Climatic Center (1931-81).

Warm winter rains on the Sierra snowpack can cause flooding and premature snowmelt, similar to that which ocurred in January 1980, in the Carson and Truckee River basins (figure 2). Intense precipitation during spring and summer thunderstorms usually affects only small areas. These storms, however, cause major property damage due to flooding and debris movement because large volumes of runoff occur in a short time.

Streamflow

Discharge records from selected U.S. Geological Survey gaging stations located on the Carson River and Truckee Canal were used to determine annual discharge rates (table 2). These discharge rates are based on water year (October 1 of one year to September 30 of the following year), not calendar year. Thus, December 1979 is in water year 1980. The gaging stations in the Carson River basin where water-quality samples were collected were: at Woodfords; near Gardnerville; near Carson City; at Deer Run Road; at Fort Churchill; and below Lahontan Dam (figure 1).

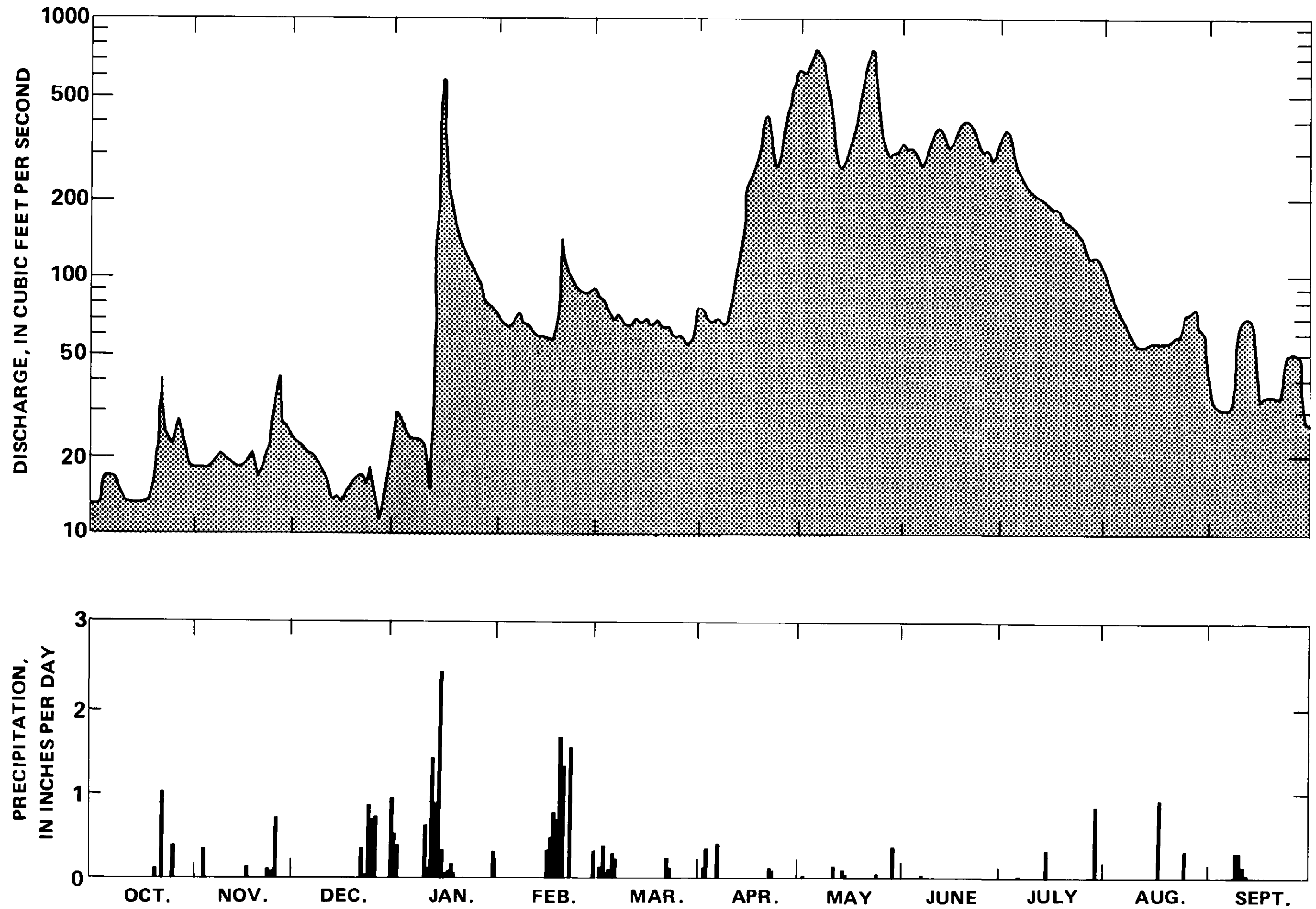


FIGURE 2.--Discharge of West Fork Carson River and precipitation at Woodfords, Calif., water year 1980.

TABLE 2.--*Discharge at sampling sites on the river and canal for the period of record and water year 1980*[1]

Site number (figure 1)	Station number	Station name	Drainage area (square miles)[2]	Period of record	Discharge for period of record: Cubic feet per second Average	Max.	Min.	Average acre-feet per year	Discharge for water year 1980: Cubic feet per second Average	Max.	Min.	Acre-feet per year
1	10309000	East Fork Carson River near Gardnerville, Nev.	341	1890-93 1900-03, [a]1904-06, 1908-10, [a]1917,1924 1925-28, [a]1929, 1935-37, 1939-80	384	17,600	7.8	278,000	525	3,390	52	381,000
3	10310000	West Fork Carson River near Woodfords, Calif.	65.6	1900-07 [a]1910-11 1938-80	111	4,890	5.0	80,400	138	746	11	10,000
7	10311000	Carson River near Carson City, Nev.	876	1939-80	396	30,000	1.6	287,000	648	6,800	20	471,000
9	10311400	Carson River at Deer Run Road near Carson City, Nev.	958	[b]1979-80	572	7,650	12	364,000	636	6,600	15	461,000
10	10312000	Carson River near Fort Churchill, Nev.	1,450	1911-80	362	15,300	(*c*)	262,000	595	5,630	0.5	432,000
11	10351400	Truckee Canal near Hazen, Nev.	—	1966-80	213	916	(*c*)	154,000	175	568	3.0	127,000
12	10312150	Carson River below Lahontan Reservoir near Fallon, Nev.	1,950	1966-80	522	2,300	1.6	378,000	658	1,770	4.5	478,000

[1] Data from U.S. Geological Survey (1981).
[2] From Glancy and Katzer (1976) except for Carson River at Deer Run Road near Carson City, Nev.
[a] Full-year data not available; incomplete records not included in computations of average discharge.
[b] New gaging station; period of record, April 1979 to September 1980.
[c] No flow during some months in most years.

The discharge records for the sampling site on the Truckee Canal were obtained using the Hazen gaging station, approximately 2.3 miles from Hazen, Nev. A diversion, the K-X Lateral, exists between this gage and Lahontan Reservoir but is operated only during the irrigation season. Records for this diversion were obtained from Robert Green (U.S. Bureau of Reclamation, written communication, 1982). The annual average flow to this diversion is about 7,100 acre-feet, or about 5 percent of the Truckee Canal annual flow (table 3); during the summer, however, the flow to this diversion is generally between 15 and 20 percent. Periodic discharge measurements were obtained on-site to provide accurate records of inflow to the reservoir at the time of sampling.

Except for floods, high flow in the Carson and Truckee Rivers usually begins in April when spring snowmelt occurs in the Sierra Nevada. Generally, peak flow is in May and June and discharge gradually decreases through July and August. In the months when snowmelt runoff is not the controlling factor, the peaks of river discharge follow closely those of precipitation. Figure 2 shows precipitation data at Woodfords, Calif., and discharge data for the West Fork Carson River at Woodfords, Calif., during water year 1980. The graph distinguishes rather clearly between snowmelt (April-June) and precipitation (January and February) as the major sources of discharge for the Carson River. Precipitation has an insignificant effect, however, on the overall discharge between April and August.

In January 1980, a tropical storm produced a large amount of rain in the basins. Within 48-72 hours the discharge at the West Fork Carson River at Woodfords gaging station increased 20-fold due to these rains, as shown by the peak on the graph for January in figure 2. This increase was typical of those at all unregulated sites. Minor flooding occurred in low-lying areas along the river due to these high discharges.

Many floods have occurred in the Carson River basin over the period of record (Glancy and Katzer, 1976, pages 43, 44). Almost all the known floods on the Carson River were caused by heavy rains on snowpacks in the Sierra Nevada, similar to the high flows that occurred during the winter of 1980.

The sum of the average flow in the Truckee River below Derby Dam and the average flow in the Truckee Canal near Wadsworth can be used to provide an estimate of the total flow in the Truckee River before diversion. Thus, the Truckee Canal diverted approximately 35 percent of the annual flow of the Truckee River at Derby Dam during the period 1967-80 (table 3), or an average of about 204,000 acre-feet per year (acre-ft/yr). About 25 percent of this amount was lost by seepage, return flows to the Truckee River, or irrigation diversions between Derby Dam and the Hazen gage on the canal. Nearly 155,000 acre-ft/yr passed the Hazen gage. Subtracting about 7,000 acre-ft of diverted water to the K-X Lateral, approximately 148,000 acre-ft/yr was discharged into Lahontan Reservoir through the Truckee Canal.[1]

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[1] The Hazen gage was relocated down-canal from the K-X Lateral in 1981. Thus, the canalflow record at the new site indicates the inflow to Lahontan Reservoir.

TABLE 3.--*Average discharge at selected sites on the Truckee River, Truckee Canal, and K-X Lateral, water years 1967-80*[1]

	Acre-feet per year
1. Truckee River at Derby Dam (rounded)[2]	580,000
2. Truckee Canal near Wadsworth	204,000
3. Truckee Canal near Hazen	155,000
Loss between Wadsworth and Hazen gages [(2)-(3)]	49,000
4. K-X Lateral diversion below Hazen gage[3]	7,100
Net canal flow into Lahontan Reservoir [(3)-(4), rounded]	148,000

[1] Data from U.S. Geological Survey (1968-81), except as indicated.

[2] Sum of gaged discharge of river below Derby Dam and canal near Wadsworth. The sum underestimates total flow due to ungaged canal diversions and spillbacks to the river between Derby Dam and the canal gage. Ungaged losses probably average 1-5 ft^3/s (700 to 4,000 acre-ft/yr). Information from Jon O. Nowlin (U.S. Geological Survey, written communication, 1984).

[3] Average for water years 1967-68 and 1973-80 (information not available for 1969-72). Data from Robert Green (U.S. Bureau of Reclamation, written communication, 1982).

Socioeconomic Setting

According to the 1980 census, Nevada had a population growth of 63.8 percent during the period 1970-80 (U.S. Bureau of the Census, 1981, page 8). Table 4 shows the populations of the counties that encompass the Carson and Truckee River basins according to the census.

The population of the Truckee River basin is expected to increase to approximately 467,000 and the Carson River basin to approximately 143,000 by the year 2000, assuming that no moratoriums or growth restrictions are imposed (Nevada Division of Water Planning, 1980, page 51). Both basins are changing from a once predominantly agrarian society to an urban and light-industrial society.

The service industries (for example--gaming, tourism, and medicine) are the leading employers in Nevada, accounting for 42 percent of the total employment in 1978. Trade and government were the second and third leading employers with 20 and 15 percent, respectively. In 1978 the service industries accounted for 37 percent of employment in Washoe County, 73 percent in Douglas County, and 21 percent in Carson City. In Carson City, Nevada's capital, government accounted for 40 percent of employment. In the less populated counties, government, trade, and mining were the dominant industries (Governor's Office of Planning Coordination, 1980, pages 40, 52, and 53).

Land and Water Use

Land use directly affects the level of water quality and the nutrient loadings to the Carson and Truckee River systems. Increasing urbanization and industrialization in the Carson and Truckee River basins have created and will continue to create a demand for water of high quality. A summary of estimated water use in Nevada shows that 72 percent is for agriculture, 22 percent for electric-power generation, 3.5 percent for public utilities, 1.9 percent for self-supplied industrial users, and 0.2 percent for non-agricultural rural use (Smales and Harrill, 1971, page 32). The amount of Nevada farmland in use and the amount irrigated in 1978 in the Carson and Truckee River basins are shown by county in table 4.

Table 5 shows projected water requirements for the Carson and Truckee River basins for the years 1990 and 2000. Overall, the Carson River basin's water requirements are projected to increase by about 8 percent from 1980 to the year 2000. However, the demand for water by the municipal and industrial users are projected to increase by approximately 135 percent by the year 2000. The total demand for water in the Truckee River basin could increase dramatically--81 percent overall--by the year 2000, and municipal and industrial requirements by about 127 percent (Nevada Division of Water Planning, 1980, pages 54, 56, and 57).

TABLE 4.--*Summary of population and land-area statistics for Nevada counties in and adjacent to the Carson and Truckee River basins*[1]

County	Approximate population[2]			Approximate acreage, 1978				Population density, 1980 (people per square mile)
					Farmland			
	1970	1980	Percent increase, 1970-80	Total for County[3]	Total	Percent of total county acreage	Irrigated[4]	
Carson City	15,000	32,000	107	98,000	19,500	20	2,670	209
Churchill	10,500	13,900	32	3,140,000	338,000	11	56,500	2.8
Douglas	6,880	19,400	182	481,000	107,000	22	46,900	25.8
Lyon	8,220	13,600	65	1,300,000	254,000	20	91,300	6.7
Storey	700	1,500	116	168,000	319	0.2	90	5.7
Washoe	121,000	194,000	60	4,230,000	935,000	22	61,800	29.3

[1] Data are for entire county.
[2] U.S. Bureau of the Census (1981, page 8).
[3] Governor's Office of Planning Coordination (1980, page 16).
[4] U.S. Bureau of the Census (1981, pages 104, 105). Includes large area of noncropland.

TABLE 5.--*Current and projected water requirements for the Carson and Truckee River basins*[1]

[Acre-feet per year]

Hydrographic region	1980	1990	2000
	Municipal and industrial		
Carson River basin	18,700	31,500	44,000
Truckee River basin	110,000	180,000	250,000
	Agricultural		
Carson River basin	290,000	290,000	290,000
Truckee River basin	60,000	59,000	58,000
	Livestock		
Carson River basin	2,100	2,300	2,400
Truckee River basin	770	830	880
	Total		
Carson River basin	310,800	323,800	336,400
Truckee River basin	170,800	239,800	308,900

[1] Nevada Division of Water Planning (1980, pages 54, 56, and 57).

Six sewage treatment facilities discharge sewage effluent into the Carson and Truckee River basins and have, or could have, significant effects on nutrient loading to Lahontan Reservoir. Each facility provides at least secondary treatment to the influent before it is discharged and all, except the Reno-Sparks facility, can incorporate a land application program for the treated effluent.

Tertiary treated sewage effluent is discharged from the STPUD (South Lake Tahoe Public Utility District) plant into Indian Creek Reservoir in Alpine County, Calif. (figure 1). During the irrigation season the water is released from the reservoir for agricultural purposes.

The MGSTP (Minden-Gardnerville Sewage Treatment Plant) discharges its treated sewage effluent to a small area of land (approximately 10 acres) between the plant and the East Fork Carson River (figure 1). Excess runoff from this acreage is discharged by way of Martin Slough into a pond that is used for irrigation. Most of this water is discharged through irrigation ditches to Settlemeyer Ranch land. The excess runoff from the irrigation is ultimately discharged to the Carson River.

Sewage effluent from the DCSID (Douglas County Sewer Improvement District) plant at Round Hill, Nev., is discharged into Williams Slough (figure 1) where it is directed through canals onto ranchland for irrigation. During periods of nonirrigation, the sewage effluent may be diverted directly into the East Fork Carson River; however, during the study period the diversion of effluent directly to the river was never observed by the authors.

According to Keith Mackey, Nevada Division of Environmental Protection (oral communication, 1981), analysis of water samples collected by that agency indicates that some sewage effluent from the MGSTP and DCSID plant destined for irrigation purposes is being returned almost directly to the Carson River. This sewage effluent generally has higher nutrient loadings than the excess irrigation water because of the nutrient uptake by the irrigated vegetation. In almost all instances of sewage-effluent land application, some excess irrigation water reaches the Carson River. According to Mackey, of all the water used for irrigation in the Carson River basin, approximately 20 percent will eventually return to the Carson River.

The IVGID (Incline Village General Improvement District) plant (figure 1) is allowed to discharge sewage effluent to Jacks Valley for land application during the irrigation period. During most of the study period, however, the effluent was discharged directly to the Carson River, approximately 2 miles downstream from Cradlebaugh Bridge.

The Carson City Sewage Treatment Plant discharges treated effluent to a ditch which eventually flows into the Carson River at site 8, about 0.5 mile upstream from the Deer Run Road station (figure 1). During the growing season, however, some of this treated effluent is applied to the golf course and agricultural lands around New Empire, Nev.

The major sewage treatment facility in the Truckee River basin contributing nutrient loading to the Truckee River is the Reno-Sparks Joint Water Pollution Control Plant (figure 1). It discharges its treated effluent directly into Steamboat Creek (site 13), which in turn discharges into the Truckee River. A major mechanical breakdown at the facility in June 1980 resulted in a discharge of approximately 1 million gallons of raw sewage into the Truckee River. No long- or short-term evaluations of the effects that this incident had on the reservoir have been made.

METHODS OF STUDY

Selection of Sampling Sites and Subunits

For the purpose of this study, the Carson River basin was conceptually divided into three subunits: Carson Valley, Eagle Valley, and Dayton-Churchill Valley. Inputs and outputs of constituents to and from each subunit were then determined from data obtained during this study. Inputs to the Carson Valley subunit were estimated from samples taken at established gaging stations on the East Fork Carson River near Gardnerville, Nev., and the West Fork Carson River at Woodfords, Calif. Outputs from the Carson Valley subunit were considered to be the inputs to the Eagle Valley subunit, and were estimated from sampling at the Carson River near the Carson City gage.

Outputs from the Eagle Valley subunit, which was also input to the Dayton-Churchill Valley subunit, were estimated from sampling the Carson River at the Deer Run Road gage. The outputs from the Dayton-Churchill Valleys subunit, which were used as the inputs to the Lahontan Reservoir through the Carson River, were estimated from samples taken at the Carson River near the Fort Churchill gage.

Input to Lahontan Reservoir from the Truckee River basin was estimated from data taken on the Truckee Canal at the station above Lahontan Reservoir (figure 1). Constituent loadings leaving Lahontan Reservoir were estimated from measurements and samples taken at the gage on the Carson River below Lahontan Dam.

Table 6 provides the downstream site number, the offical station name, and an abbreviated name for each sampling site used in this report. Figure 1 shows the physical locations of the sites on the Carson River and Truckee Canal.

Sampling Schedule and Constituents Measured

Water-quality samples were collected about the same time each month from October 1979 through September 1980. Sampling of the Carson River and Truckee Canal was coordinated with sampling done in Lahontan Reservoir by the Desert Research Institute. This sampling schedule was maintained except for times of high flow when a more frequent sampling schedule, generally weekly, was maintained.

TABLE 6.--*Sampling-site and station numbers, official names, and abbreviated names*

Site number (figure 1)	Station number	Official station name	Abbreviated station name used in this report
1	10309000	East Fork Carson River near Gardnerville, Nev.	Gardnerville
3	10310000	West Fork Carson River at Woodfords, Calif.	Woodfords
7	10311000	Carson River near Carson City, Nev.	Carson City
9	10311400	Carson River at Deer Run Road near Carson City, Nev.	Deer Run Road
10	10312000	Carson River near Fort Churchill, Nev.	Fort Churchill
11	10351590	Truckee Canal at U.S. Highway 50 above Lahontan Reservoir, Nev.	Truckee Canal
12	10312150	Carson River below Lahontan Reservoir near Fallon, Nev.	Below Lahontan Dam

Field measurements were made during the samplings. Specific conductance and pH were measured using standard meters. DO (dissolved oxygen) concentrations were determined using the modified Winkler titration method, and barometric pressure was measured using a calibrated hand-held pocket barometer. Percent saturation of dissolved oxygen was calculated by the following formula:

$$\text{Percent saturation} = \frac{DO_{measured}}{DO^{o}} \times 100 \ ,$$

where DO^{o} is the saturation DO in freshwater at the barometric pressure and the water temperature at time of measurement. Water temperature was measured using a hand-held mercury thermometer.

The U.S. Geological Survey Denver Central Laboratory analyzed water samples for dissolved and suspended organic carbon, dissolved solids, total and dissolved nutrient species, and some chlorophyll *a*. Total nitrite and nitrate were analyzed initially, but beginning in February 1980, upon recommendations of the technical advisory committee, only the dissolved portions were subsequently analyzed. This decision was based on the premise that most of the nitrite and nitrate in the water was in the dissolved state. In addition, major dissolved ions were analyzed from water samples taken at the Fort Churchill, Truckee Canal, and below Lahontan Dam stations to facilitate the study of Lahontan Reservoir by the Desert Research Institute. BOD (biochemical oxygen demand) was measured in the U.S. Geological Survey laboratory at Carson City, Nev. Phytoplankton, AGP (algal-growth potential) and some chlorophyll-*a* samples were analyzed by the U.S. Geological Survey Atlanta Laboratory. Water samples were collected to determine suspended-sediment concentrations, and for selected samples, particle-size distributions. Sediment concentrations and particle-size distribution were determined at the U.S. Geological Survey Sediment Laboratory in Sacramento. No bedload samples were collected.

In addition to individual samples collected by the U.S. Geological Survey and the Desert Research Institute, duplicate sets of samples were obtained on April 16, 1980, by both groups for the purpose of checking the consistency and accuracy of methodologies used by the two analyzing laboratories. Desert Research Institute collected samples from the reservoir at a 1-meter depth using an underwater sampler. The results of this comparison were good except for chlorophyll *a* (table 7). Because the chlorophyll-*a* analysis reflected significant differences, standard reference samples of known chlorophyll-*a* concentrations were obtained from the U.S. Environmental Protection Agency, Cincinnati, Ohio, and sent to both laboratories for analysis. The results obtained from both laboratories confirmed the known concentration of the reference sample. The differences in the chlorophyll-*a* results on April 16, 1980, were attributed to sample collection error.

TABLE 7.--*Comparison between U.S. Geological Survey and Desert Research Institute laboratory results for duplicate samples collected April 16, 1980*[1]

[Milligrams per liter, except as noted]

Constituent	Truckee Canal		Below Lahontan Dam		Lahontan Reservoir	
	USGS	DRI	USGS	DRI	USGS	DRI
Calcium	14	14	23	24	22	23
Magnesium	4.9	4.7	6.2	5.9	6.1	5.9
Sodium	14	14	25	24	24	24
Potassium	2.5	2.3	4.0	3.3	3.9	3.3
Bicarbonate	66	70	98	101	--	99
Carbonate	0	0	0	0	--	0
Sulfate	12	11	37	33	39	33
Chloride	10	12	10	12	11	12
Silica	19	19	18	18	18	18
Dissolved nitrate	.35	.37	.64	.66	.63	.66
Dissolved nitrite	.05	.04	.03	.02	.02	.02
Dissolved ammonia	.28	.20	.23	.15	.26	.18
Total Kjeldahl nitrogen	.64	.80	.86	.80	.97	.80
Dissolved Kjeldahl nitrogen	.64	.80	.76	.80	.74	.60
Dissolved orthophosphorus	.17	.15	.24	.24	.24	.23
Chlorophyll *a* (micrograms per liter)	2.5	6.1	.54	4.3	1.2	9.3

[1] Desert Research Institute data from James J. Cooper (written communication, 1980).

Samples were collected by standard U.S. Geological Survey techniques across the stream using the depth integrating DH-48, D-74, or D-74-AL samplers depending on the flow. The water was then composited in a churn splitter, and samples for nutrients, dissolved solids, phytoplankton, and AGP (algal growth potential) representing the entire river were drawn off. The field and laboratory techniques used during this study for sampling and preserving water-quality samples were described by Skougstad and others (1979), Guy and Norman (1976), and Greeson and others (1977).

Ultimate biochemical oxygen demand was determined using the methods described by Hines and others (1977, pages 144-146), except that nitrapyrin [2-chloro-6-(trichloromethyl) pyridine] was used instead of 1-allyl-2-thiourea, to inhibit nitrifying bacteria in the BOD bottles.

AGP was determined using the procedures described by Greeson and others (1977, pages 289-293). Approximately two-thirds of the water samples (October 1979-April 1980) were inadvertently filtered without a gage to insure that a pressure of 10 inches of mercury was not exceeded. Thus, these values may be suspect.

Load Calculations

All load estimates were calculated using the instantaneous concentrations and the continuous streamflow record. Simple linear regressions showing the relationship between the various nutrient concentrations and streamflow were developed. Correlation coefficients, which are numbers between negative one and one, were calculated from such equations. The regressions of the nonconservative constituents to streamflow showed that most relationships that existed were poor.

Based on the statistical analysis and poor correlations, four mathematical methods were used to estimate loads: The transport curve, the flow-weighted average, the mean concentration, and the time-weighted average. The four methods were then averaged on a seasonal basis to estimate total seasonal and annual loads.

For determining nutrient loads in the Truckee Canal, the flow records for the K-X Lateral were obtained from Robert Green (U.S. Bureau of Reclamation, written communications, January 1982) and subtracted from the streamflow at Hazen. Minor differences in load estimates were obtained by using the Hazen-gage flows directly rather than subtracting the amount of flow in K-X Lateral. For example, the difference using only the Hazen records for 1980, rather than Hazen minus K-X Lateral, was only 10 tons for nitrogen and 5 tons for phosphorus. These are believed to be within the error of the data themselves.

Transport-Curve Method

Instantaneous load versus instantaneous streamflow was plotted on a log-log scale, and a rating curve was drawn to best fit the data points. Points on the rating curve were entered into a computer program along with mean daily streamflow in cubic feet per second. For every mean daily discharge, a load was estimated from the rating curve. By adding the daily loads in each season, a seasonal load was determined.

Flow-Weighted Average Method

Average seasonal loads using the flow-weighted average method were estimated using this equation:

$$L = \frac{\Sigma Q_i C_i}{\Sigma Q_i} (0.0027 Q_m) ,$$

where L = the load for the period of interest, in tons per day;
Q_i = the instantaneous discharge at the time of sampling, in cubic feet per second;
C_i = the concentration at the time of sampling, in milligrams per liter;
Q_m = the mean daily discharge for the period, in cubic feet per second; and
0.0027 = the unit's conversion factor for tons per day.

Seasonal loads were estimated by multiplying the tons per day by the number of days in the season.

Mean-Concentration Method

Seasonal loads using the mean-concentration method were estimated by the following equation:

$$L = 0.0027 C_n Q_m ,$$

where L = the load for the period of interest, in tons per day;
C_n = the mean concentration for the period, in milligrams per liter;
Q_m = the mean daily discharge for the period, in cubic feet per second; and
0.0027 = the unit's conversion factor for tons per day.

Seasonal loads were estimated by multiplying the tons per day by the number of days in the season.

Time-Weighted Average Method

The time-weighted average method involves the following procedure. Each measured concentration is assumed to be the average value for a specific time interval. That interval is considered to be one-half of the total elapsed time between the previous and subsequent measurements. (Intervals for the first and last measurements of the water year begin and end, respectively, on October 1 and September 30.) The time-weighted load for a specific interval is calculated using the following equation:

$$L = 0.0027 C Q_m I ,$$

where L = the load for the period of interest, in tons;
C = the concentration for that interval, in milligrams per liter;
Q_m = the mean daily discharge during the interval, in cubic feet per second;
I = the duration of the interval, in days; and
0.0027 = the unit's conversion factor for tons per day.

Seasonal loads were estimated by summing the tonnages for all intervals, or parts thereof, within that season.

WATER-QUALITY CHARACTERISTICS OF THE RIVER AND CANAL

General Physical and Chemical Characteristics

Selected field determinations were obtained at the time of sampling. Dissolved oxygen, pH, and water temperature were determined on site. Specific conductance was determined at the Carson City laboratory usually within 24-48 hours. Because these measurements were taken at a specific time of day, they do not provide information on diel (24-hour) variations. Table 8 provides the maximum, mean, and minimum values for specific conductance, dissolved oxygen, and water temperature, and the maximum, median, and minimum pH values at all sampling sites. Figure 3 compares these characteristics seasonally and with respect to streamflow.

Specific Conductance and Dissolved-Solids Concentrations

Specific conductance is defined as the ability of a substance to conduct an electric current at 25°C (Hem, 1970, page 96). The specific conductance of water provides an indication of the concentration of ionized substances dissolved in the water (the more ions present, generally, the higher the specific conductance). The reporting units are micromhos per centimeter at 25°C, which are abbreviated as micromhos in this report.

TABLE 8.--*Specific conductance, dissolved oxygen, pH, and water temperature for stations on the river and canal, water year 1980*

Station	Specific conductance (micromhos)				Dissolved oxygen (milligrams per liter)				pH (units)				Water temperature (degrees Celsius)			
	Max.	Mean	Min.	No. of samples	Max.	Mean	Min.	No. of samples	Max.	Median	Min.	No. of samples	Max.	Mean	Min.	No. of samples
Gardnerville	226	116	50	18	12.6	10.1	7.8	18	8.7	7.7	7.3	15	19.5	8.3	2.0	18
Woodfords	79	55	38	18	12.0	10.4	8.5	17	7.8	7.6	7,0	15	12.5	4.6	0.0	18
Carson City	402	198	81	18	12.2	9.1	6.8	18	8.5	7.7	7.3	18	23.0	10.1	0.0	18
Deer Run Road	505	216	83	19	10.2	9.1	7.7	16	8.7	7.8	7.4	19	25.5	11.3	1.5	19
Fort Churchill	639	248	96	19	11.8	9.2	7.2	18	8.6	8.0	7.6	19	22.0	10.6	0.0	20
Truckee Canal	246	181	109	18	12.2	9.3	5.8	18	8.8	8.2	7.5	19	22.5	12.0	0.5	19
Below Lahontan Dam	374	273	204	18	15.9	9.3	6.3	17	9.3	8.0	7.7	18	20.0	12.3	4.5	18

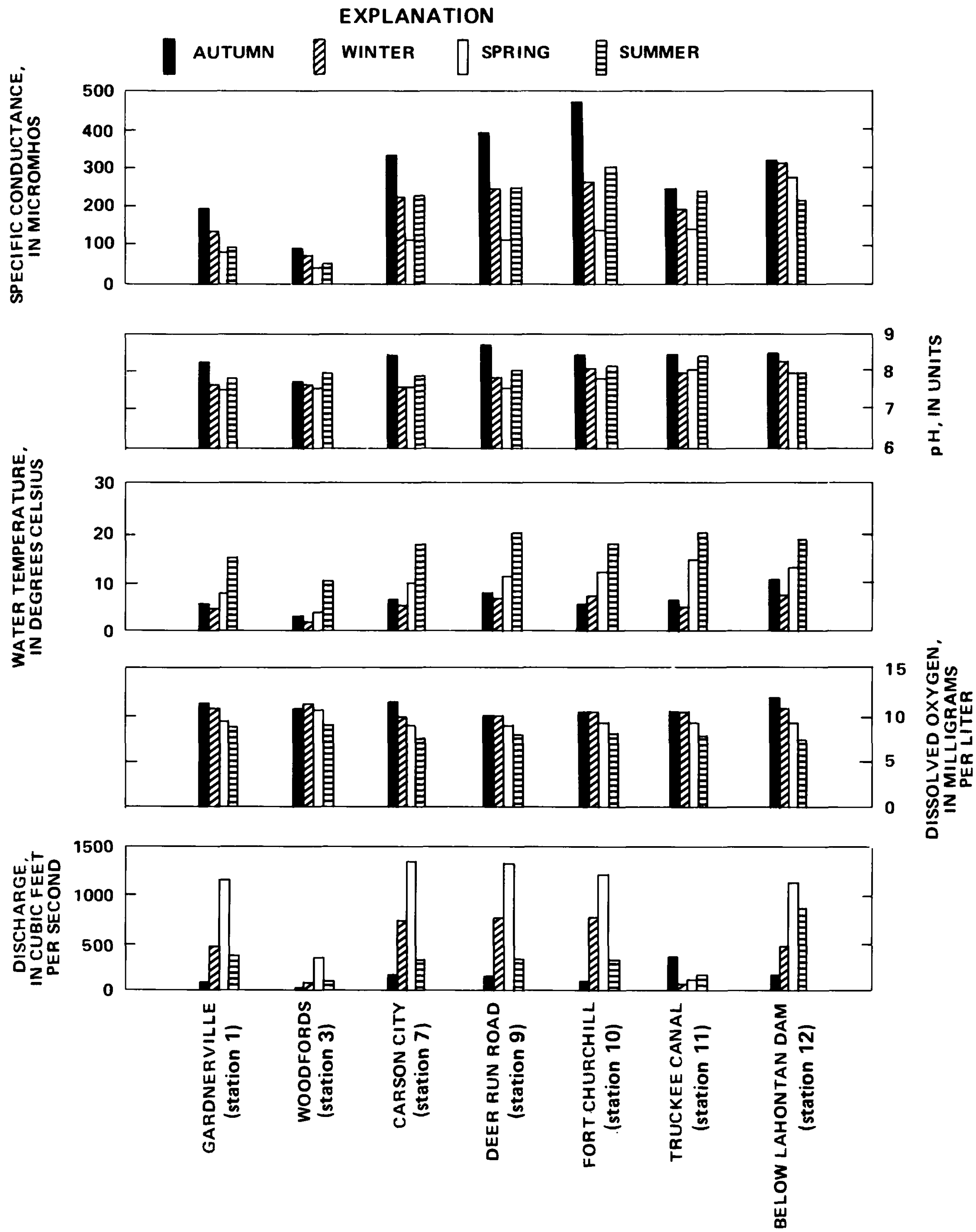

FIGURE 3.--Seasonal means of specific conductance, water temperature, dissolved oxygen, and discharge, and seasonal medians of pH, at sampling sites on the river and canal, water year 1980.

Specific conductance tends to vary inversely with discharge over a normal range of flows in most river systems because of dilution. As shown in figure 3, for example, the average streamflow was highest during the spring, whereas the average specific conductance was lowest during the same period at all stations above Lahontan Reservoir in the Carson River.

During water year 1980, the specific conductance increased downstream in the Carson River above Lahontan Reservoir. The Truckee Canal showed the same general seasonal trends, but the values were lower than for the Carson River near Fort Churchill. The station below Lahontan Dam had little variation in specific conductance because of the moderating effect of the reservoir.

A relationship exists between specific conductance and dissolved solids (residue on evaporation), because the ionized substances that contribute to conductance are components of the dissolved solids. This relationship permits the estimation of dissolved-solids concentrations in the Carson River and Truckee Canal by using the following equations:

$$\text{Carson River dissolved solids (mg/L)} = 10 + 0.623(SC)$$
$$\text{Truckee Canal dissolved solids (mg/L)} = 9 + 0.611(SC)$$

where SC is the specific conductance, in micromhos. The correlation coefficients for these two equations are 0.99 for the Carson River and 0.98 for the Truckee Canal.

pH

Median pH values, rather than mean values, are reported in table 8 and are shown on figure 3. Mean pH values can be misleading because pH is expressed in logarithmic units.

The U.S. Environmental Protection Agency (1976, page 180) reported that although a pH range of 6.5 to 9.0 is harmless to fish and seems to protect invertebrate fish-food organisms, the toxicity of other constituents may be affected by changes in pH within this range. The pH values shown in table 8 exceeded this range only once, at the site downstream from Lahontan Reservoir.

Seasonal variations in pH shown in figure 3 indicate that larger median values usually occur in the autumn and smaller median values in the spring, except at the two regulated stations on the Truckee Canal and below Lahontan Dam.

Water Temperature

Water temperatures followed seasonal and diel cycles in response to meteorological conditions. Table 8 indicates the range of temperature values, and figure 3 shows the seasonal variations during the study.

Dissolved Oxygen

Concentrations of dissolved oxygen in river systems are influenced by many factors including temperature, atmospheric pressure, reaeration of the water surface, photosynthetic production of oxygen, oxidation of constituents in water, and respiration of aquatic flora and fauna, but are mainly a function of the temperature and pressure (Hem, 1970, page 221). High water temperatures decrease the solubility of oxygen and results in low dissolved-oxygen concentrations, whereas high barometric pressures prevent degassing of the oxygen and result in high dissolved-oxygen concentrations. Figure 3 indicates that the average dissolved-oxygen concentrations are indeed lower during the warm summer months.

During water year 1980 more than 90 percent of the samples analyzed for dissolved-oxygen concentrations in the Carson River and Truckee Canal were near or at saturation, and at times supersaturated. Supersaturation occurs when the water has a greater dissolved-oxygen concentration than would normally be contained in the water at equilibrium with the air at the existing temperature and pressure: it is primarily a function of photosynthesis. All concentrations measured were above 5 mg/L, which is considered to be the minimum concentrations needed to support a varied fish population (U.S. Environmental Protection Agency, 1976, page 125), and 85 percent of the dissolved-oxygen concentrations at all stations were greater than or equal to 8.0 mg/L. The lowest value measured, 5.8 mg/L in the Truckee Canal, was determined early in the morning when dissolved-oxygen concentrations usually are low.

Dissolved-oxygen concentrations at all stations showed a decreasing trend from January through September, with the lowest concentrations occurring in the summer. The highest average concentrations occurred in the winter, probably as a result of cooler water temperatures and reduced biological oxygen demand.

Principal Dissolved Constituents

Figure 4 shows the chemical character of the water for water year 1980 at the stations on the Truckee Canal and below Lahontan Dam beginning in February 1980, and at the Fort Churchill station beginning in October 1979. The trilinear type of diagram represented by figure 4 can be used as an aid in determining whether a particular water (1) is chemically similar to some other water, (2) is a simple mixture of two chemically different water types, or (3) has been affected by cation exchange or by the dissolution or precipitation of a particular mineral (Hem, 1970, page 268). By projecting the points from the lower left and right triangles upward, along parallel lines into the diamond, the composition of the water can be depicted by the intersection of these projections.

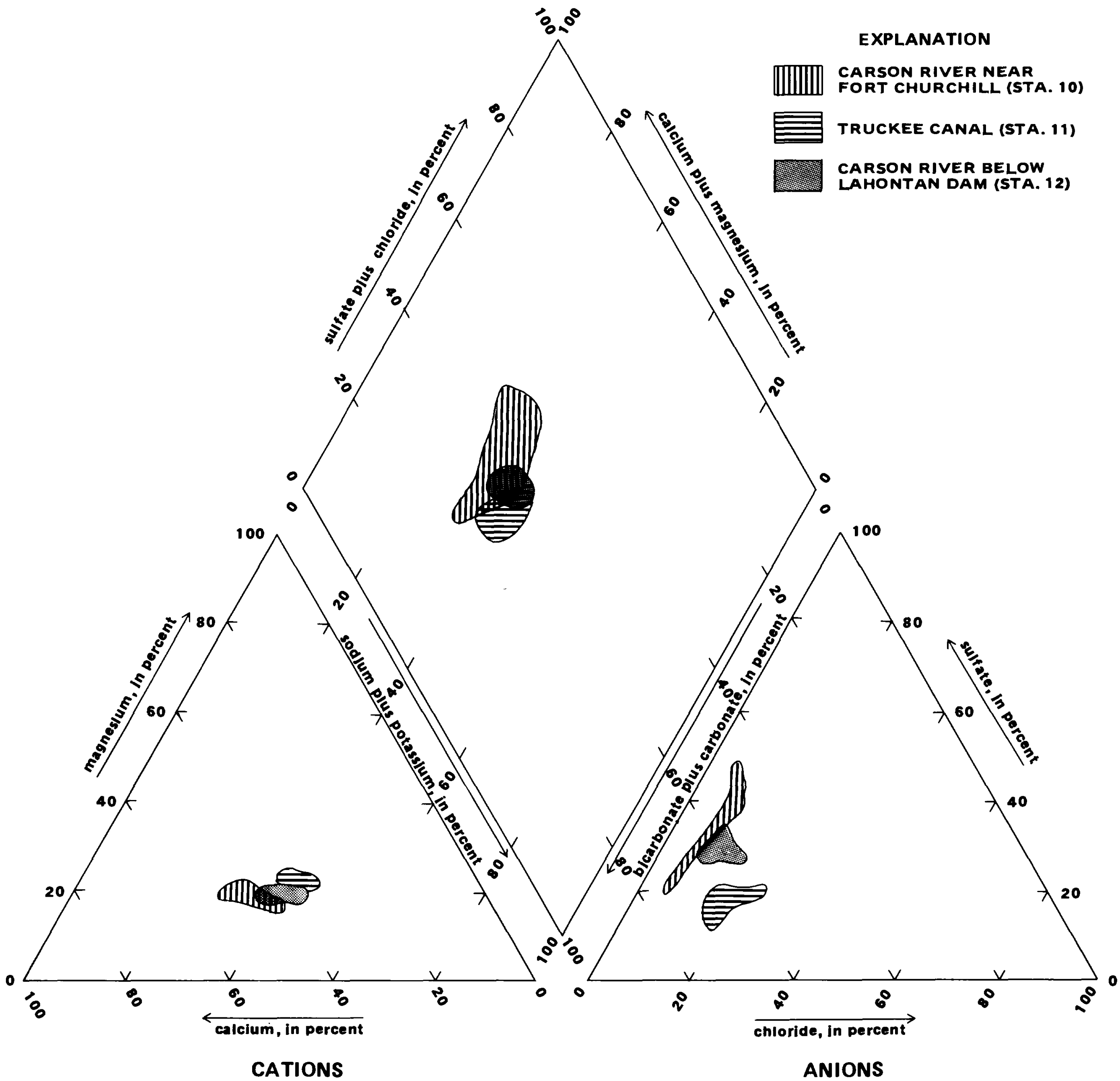

FIGURE 4.--Proportions of major dissolved constituents for inflow to and outflow from Lahontan Reservoir, water year 1980. Cation and anion percentages are based on milliequivalents per liter. By convention, potassium, normally a minor constituent, is included with sodium in calculating cation percentages. Similarly, carbonate, when present, is included with bicarbonate. See text for discussion of this type of diagram.

The codominant cations at the Fort Churchill, Truckee Canal, and below Lahontan Dam stations were sodium and calcium, which for the most part composed nearly 75 percent of the total cations. Magnesium accounted for between 15 and 25 percent at these three stations. The dominant anion at all three stations was bicarbonate, which composes about 50 percent or more of the anion concentration. Chloride, another anion, usually composed less than 30 percent of the anions at all three stations.

Figure 4 also shows the chemical mixing of the two input waters from the Fort Churchill and Truckee Canal stations, each of which has its own distinct chemical character. After these waters mix in Lahontan Reservoir, the outflow reflects the blend. In each trilinear diagram in figure 4, the chemical data grouping for the outflow from Lahontan Dam lies between the chemical data groupings for the Truckee Canal and Fort Churchill. The wide spread that appears in the percentage of bicarbonate can be attributed to the four additional samples collected from October through January at the Fort Churchill site. Samples were not collected at that time, however, at the Truckee Canal and below Lahontan Dam stations.

The Carson River has a higher concentration of cations and anions during the base-flow periods. This probably represents the effect of the greater number of irrigation return flows in the Carson River basin and some groundwater influence. Also, the Truckee River, which provides the flow to the Truckee Canal, is regulated, resulting in a greater base flow which causes dilution.

Organic Carbon

Total organic carbon is the sum of the concentrations of organic carbon in the dissolved and suspended phases of a sample taken from a water-sediment mixture. Concentrations at all stations, excluding the January and February storms, ranged from 1.7 to about 17 mg/L, with only 10 percent of the concentrations greater than 9 mg/L. Nelson and Lysyj (1968) found that the organic content in municipal waters of the southwest and Pacific Coast regions of the United States ranged from 1.1 to 7.7 mg/L, with the Pacific Coast waters having higher concentrations due to climate and vegetation. Figure 5 shows the mean concentration of total organic carbon at the seven sampling stations in the study area.

A rough estimate of the organic carbon load using only the mean method was calculated. The estimate showed that about 25 percent of the load input to the reservoir remained there during water year 1980.

Nutrients

Seasonal variations in mean nitrogen and phosphorus concentrations for water year 1980 are shown in figure 6. Illustrated are average concentrations of the total nitrogen species and phosphorus at the seven sampling sites.

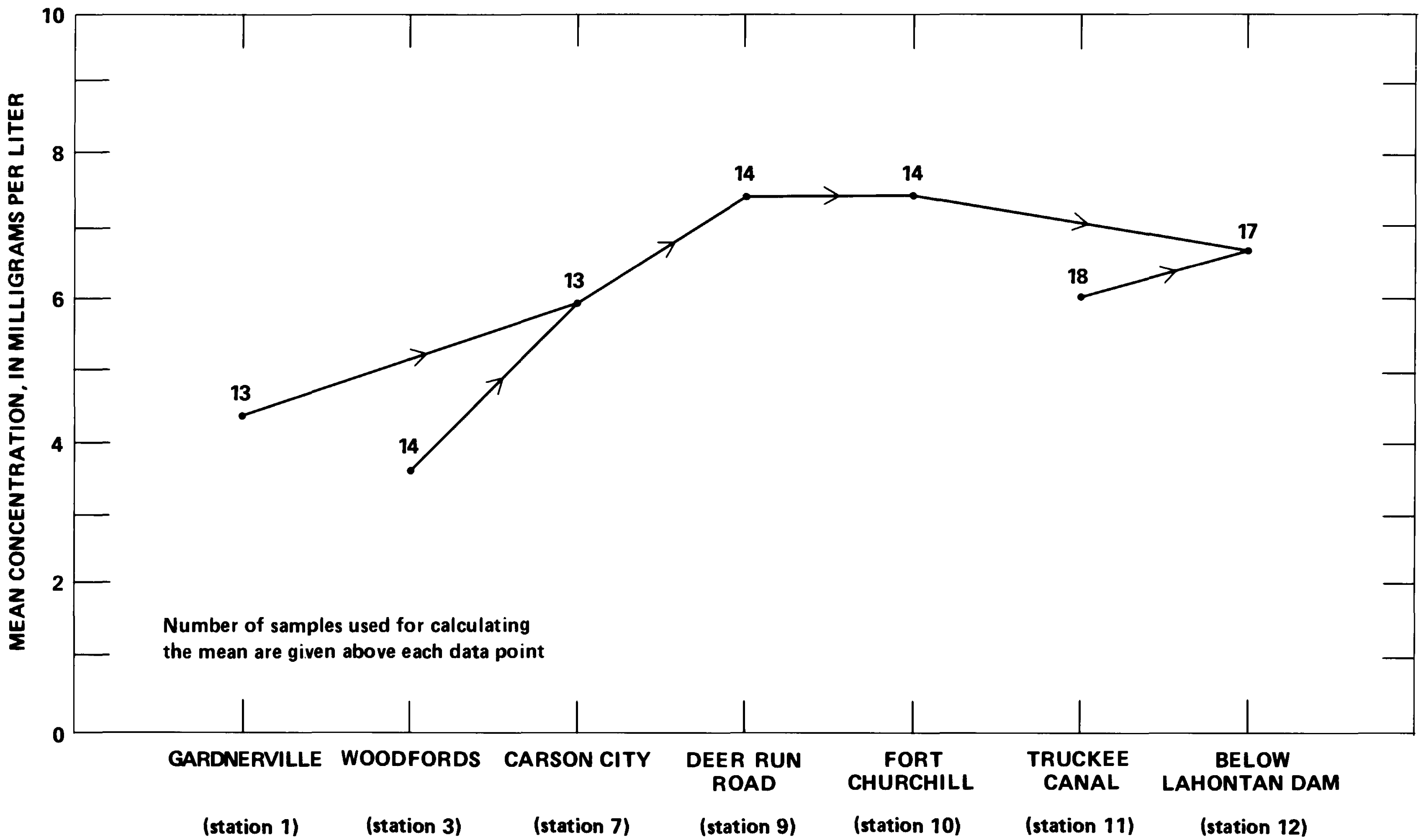

FIGURE 5.--Mean concentration of total organic carbon at sampling sites on the river and canal, water year 1980.

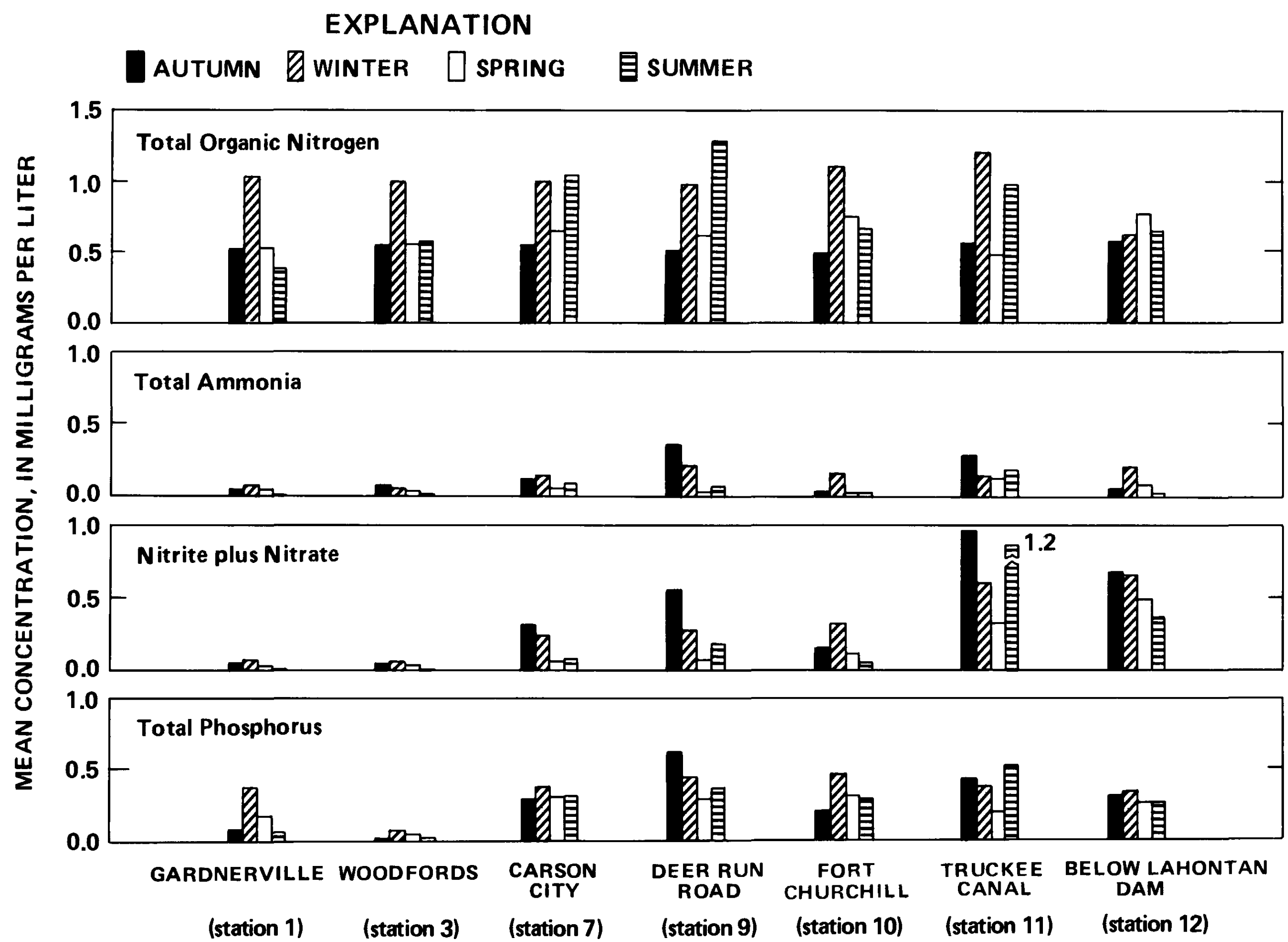

FIGURE 6.--Seasonal variation in the mean concentration of total nitrogen species and total phosphorus at sampling sites on the river and canal, water year 1980.

The input of nutrients to Carson Valley from the East and West Forks Carson River was considered background, or near natural, concentrations during the study. Figure 7 shows the mean annual concentrations of selected nutrients in water year 1980. The nutrient concentrations at Gardnerville and Woodfords were combined to provide a way of estimating total nutrient concentrations into Carson Valley.

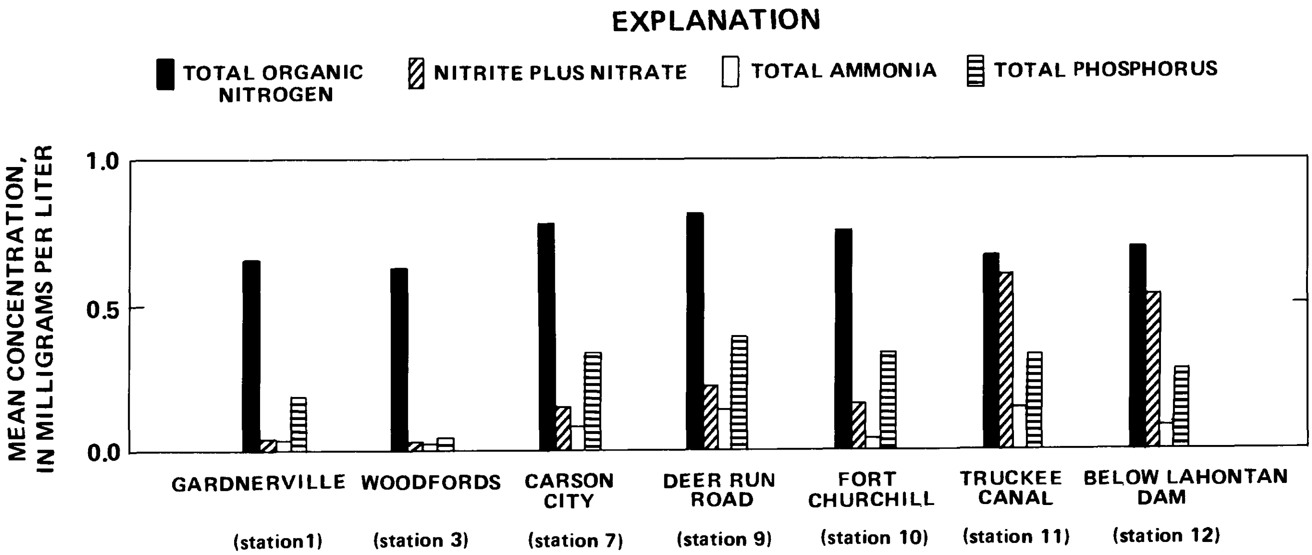

FIGURE 7.--Mean annual concentration of total nitrogen species and total phosphorus at sampling sites on the river and canal, water year 1980.

Comparing background concentrations to the concentrations after the Carson River had flowed through Carson Valley, the total inorganic nitrogen (nitrite, nitrate, and ammonia) had increased by 64 percent and phosphorus concentration by 43 percent.[1] The increase in the inorganic part of nitrogen is possibly due to irrigation return flows. Because most of the sewage treatment plants discharging in Carson Valley use land application for effluent disposal, and because there was little urban runoff, these sources for the increases in nutrient concentrations were believed to be minor.

Total organic nitrogen showed a decrease of about 40 percent between the background stations and Carson City. This decrease is probably the result of the slower stream velocities in Carson Valley allowing for deposition of the suspended portion of organic nitrogen. Suspended organic nitrogen was determined by subtracting the dissolved organic nitrogen from the total organic nitrogen. This calculation showed an approximate 50 percent reduction in suspended organic nitrogen.

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[1] Ammonia data are the result of an analytical procedure that determines the combined concentration of the ammonium ion ($NH4^{+}$) plus un-ionized ammonia (NH3). In most waters having a pH of less than about 8.5, the concentration of ammonium exceeds that of ammonia.

The nutrient concentrations for Eagle Valley increased slightly between the Carson City and Deer Run Road stations (figures 1 and 7). Because Eagle Valley is predominantly urban land with only about 14 percent of the land irrigated for agriculture, the increase in total nutrient concentrations is probably the result of inflow of treated sewage effluent and some urban runoff during storms. Nutrient input from irrigated agriculture in Eagle Valley is probably minor.

The data indicate that Dayton-Churchill Valley seems to have little effect on nutrient input to the river. Between the Deer Run Road and Fort Churchill stations a gradual reduction in total nutrient concentration was observed. This may be the direct result of nutrient uptake by plants (figure 7).

The total inorganic nitrogen input to Lahontan Reservoir from the Truckee Canal was greater than that from the Carson River in all seasons. Total phosphorus concentrations going into the reservoir were greater in the canal than in the Carson River during summer and autumn, whereas during winter and spring the Carson River had the higher concentrations (figure 6). The increase of phosphorus in the canal in summer and autumn was possibly due to the increase in tourism in the Reno area, resulting in discharging a larger volume of treated sewage effluent to the Truckee River, and eventually the Truckee Canal.

The output of nutrients from Lahontan Reservoir is significantly lower than the concentrations from the combined input of the Fort Churchill and Truckee Canal sites (figure 7). The imbalance suggests that Lahontan Reservoir acts as a sink by retaining nitrogen and phosphorus inputs.

Dissolved Nitrogen and Phosphorus Concentrations

The dissolved portion of the nutrient species was sampled along with the total portion. Dissolved constitutents are defined as those that pass through a 0.45-μm (micrometer) membrane filter (Skougstad and others, 1979, page 4). The total portion is the combination of the dissolved portion and that being transported by suspended sediment.

Table 9 lists the total and dissolved mean concentrations of the nutrients during the sampling period, by season. Dissolved phosphorus was not analyzed in the autumn except at the Fort Churchill station. Thus the values reported are estimates based on the dissolved orthophosphorus values. At times, the dissolved portion was reported to be slightly higher than the total portion, a condition which is theoretically impossible. Due to sampling error, rounding error, errors due to averaging, and to the limits of accuracy of the determinations, however, this type of error can happen.

TABLE 9.--*Average seasonal concentrations of total- and dissolved-nutrient species for stations on the river and canal, water year 1980*

[Milligrams per liter. Abbreviations: T, total; D, dissolved; N, nitrogen; ON, organic nitrogen as N; NO2+NO3, nitrite plus nitrate as N; P, phosphorus; OP, orthophosphorus as P]

Station	TON		DON		TNH3		DNH3		NO2+NO3		TP		DP		DOP	
	Mean concen-tration	No. of sam-ples	Mean concen-tration	No. of sam-ples	Mean concen-tration	No. of sam-ples	Mean concen-tration	No. of sam-ples	Mean concen-tration	No. of sam-ples	Mean concen-tration	No. of sam-ples	Mean concen-tration	No. of sam-ples	Mean concen-tration	No. of sam-ples
Gardnerville																
Autumn	0.52	3	0.30	3	0.04	3	0.03	3	0.05	3	0.07	3	[a]0.03	—	0.03	3
Winter	1.04	4	.44	4	.06	4	.03	4	.07	4	.38	4	.01	2	.04	3
Spring	.52	6	.35	7	.04	7	.04	7	.03	7	.17	7	.02	7	.02	7
Summer	.39	1	.22	2	.00	2	.02	2	.02	4	.07	4	.03	4	.002	4
Woodfords																
Autumn	0.53	3	0.37	3	0.05	3	0.03	3	0.05	3	0.02	2	[a]0.03	—	0.03	3
Winter	.99	3	.45	3	.04	4	.03	4	.06	4	.07	4	.01	2	.02	3
Spring	.50	6	.39	7	.03	7	.02	7	.03	7	.05	6	.02	6	.03	6
Summer	.57	3	.43	3	.00	4	.00	4	.00	4	.03	4	.02	4	.005	4
Carson City																
Autumn	0.54	2	0.36	2	0.11	3	0.09	3	0.31	3	0.30	3	[a]0.26	—	0.26	3
Winter	.98	4	.77	4	.12	4	.12	4	.23	4	.37	4	.10	2	.09	3
Spring	.64	6	.41	5	.05	7	.03	6	.07	7	.31	5	.06	6	.06	6
Summer	1.04	2	.74	4	.08	3	.07	4	.17	4	.32	4	.21	4	.14	4
Deer Run Road																
Autumn	0.50	3	0.40	3	0.35	3	0.23	3	0.55	3	0.61	3	[a]0.52	—	0.52	3
Winter	.97	5	.66	5	.21	5	.18	5	.27	5	.44	5	.21	2	.17	4
Spring	.64	7	.49	6	.07	7	.02	6	.07	7	.29	7	.07	7	.06	7
Summer	1.30	3	.62	4	.06	4	.07	4	.17	4	.35	4	.27	4	.14	4
Fort Churchill																
Autumn	0.48	3	0.30	3	0.02	3	0.01	3	0.15	3	0.22	3	0.26	2	0.19	3
Winter	1.20	4	.44	5	.15	4	.06	5	.33	5	.50	5	.14	4	.13	3
Spring	.71	7	.52	8	.02	7	.02	8	.12	7	.31	8	.08	8	.07	7
Summer	.66	4	.52	4	.00	4	.02	4	.05	4	.30	4	.17	4	.09	3
Truckee Canal																
Autumn	0.55	3	0.40	3	0.28	3	0.27	3	0.96	3	0.44	3	[a]0.43	—	0.43	3
Winter	1.20	3	.56	4	.13	3	.12	4	.60	4	.38	4	.21	2	.15	4
Spring	.45	7	.48	6	.12	8	.12	8	.33	9	.18	9	.15	9	.12	9
Summer	.97	1	.83	3	[b].19	1	.19	3	1.20	3	.54	3	.50	3	.43	3
Below Lahontan Dam																
Autumn	0.57	3	0.42	3	0.05	3	0.03	3	0.68	3	0.30	3	[a]0.25	—	0.25	3
Winter	.61	1	.59	3	.20	2	.21	3	.67	3	.33	3	.26	2	.26	3
Spring	.75	9	.50	7	.09	9	.10	7	.49	9	.25	9	.17	8	.14	8
Summer	.64	2	.51	2	.02	2	.05	2	.35	3	.26	3	.19	3	.15	3

[a] No samples; DP assumed to equal DOP.
[b] Estimated on basis of graphical relation between TNH3 and DNH3.

An average of more than 50 percent of the total nitrogen was in the dissolved state most of the time during all seasons at the five upstream stations on the Carson River. The average percentage of dissolved phosphorus was approximately 25 percent of the total at those same five stations during winter and spring when high concentrations of suspended sediment were observed. In summer and autumn, the dissolved phosphorus percentage was approximately 70 percent, with the highest percentage occurring in autumn when concentrations of suspended sediment were low. The average percentage of dissolved nutrients is high at the station below Lahontan Dam and the Truckee Canal station (figure 1) where the concentrations of suspended sediment are generally low.

Sources of Nitrogen and Phosphorus

The principal sources of nitrogen and phosphorus in the study area are irrigation return flows, effluent from sewage treatment plants, precipitation, and urban runoff. Irrigation return flow is the residual water that is unused by plant life and leaves the irrigated lands by surface or subsurface flow, returning to the river. The return flow, not sampled in this study, may contain nutrients from fertilizers or animal wastes. Sewage treatment plants discharge treated effluent into the Carson and Truckee River basins. For the most part, the treated effluent is used for land application in the Carson River basin, but at times it flows directly to the Carson River through either discharge pipes or irrigation ditches.

Although not analyzed in this study, precipitation is known to contain nitrogen and phosphorus, and thus is a potential source of nutrients to the watershed. The total input of nitrogen and phosphorus from precipitation is probably minor when compared to other sources. In January and February 1980, two major storms contributed an undetermined amount of nitrogen and phosphorus to the river system. The urban runoff resulting from these storms also may have contributed to the river's nutrient load.

Suspended Sediment

Concentrations

Sediment is fragmental material, ranging in size from boulders to clay, that originates from the weathering of rocks composing the Earth's crust (Langbein and Iseri, 1960, page 17). The term suspended sediment refers to any of this material in the water column but not in solution.

Fluvial sediment at times can be a major problem to plants and animals. Aquatic plant life can be disrupted due to the reduction of available light caused by excessive concentrations of suspended sediment. Domestic water supplies, fisheries, and the esthetic value of rivers and lakes can also be affected directly and indirectly by high suspended-sediment concentrations. Deposition of sediment in reservoirs can result in the loss of their storage capacity.

During January and February 1980, intense rainstorms occurred in the study area. The highest concentrations of suspended sediment occurred in January at all sampling stations except the one below Lahontan Dam. The February storm was sampled at only two stations, but high concentrations were measured again at these two stations. Table 10 shows the instantaneous maximum, minimum, and mean values during 1980 at all sampling stations. For the sake of comparability, the two samples collected during the February storm were not used in the calculation of the mean. Also, because measurements represent only instantaneous values, the extremes may not be a true representation.

TABLE 10.--*Suspended-sediment concentrations for stations on the river and canal, water year 1980*

[Milligrams per liter]

Station	Maximum	Minimum	Mean	Number of samples
Gardnerville	1,790	3	253	16
Woodfords	247	3	45	16
Carson City	971	9	255	16
Deer Run Road	734	14	239	16
Fort Churchill	1,160	5	343	19
Truckee Canal	602	8	60	17
Below Lahontan Dam	69	10	46	16

Particle Size

The U.S. Geological Survey has recommended standard size classifications (Lane, 1947, pages 936-938) for the classification of particle size of suspended sediment. Sizes are classified as gravel, sand, silt, and clay, as the size decreases. Within each major classification, more descriptive terminology is used, such as very fine, fine, medium, coarse, and very coarse (Cummings, 1978, page 23). The following table indicates the range of classes and sizes, in millimeters (rounded).

Sediment class and subclass	Size, in millimeters	Sediment class and subclass	Size, in millimeters
Gravel		Silt	
Very coarse	64 - 32	Coarse	0.062 - 0.031
Coarse	32 - 16	Medium	0.031 - 0.016
Medium	16 - 8	Fine	0.016 - 0.0080
Fine	8 - 4	Very fine	0.0080 - 0.0040
Very fine	4 - 2		
Sand		Clay	
Very coarse	2.0 - 1.0	Coarse	0.0040 - 0.0020
Coarse	1.0 - 0.50	Medium	0.0020 - 0.0010
Medium	0.50 - 0.25	Fine	0.0010 - 0.0005
Fine	0.25 - 0.12		
Very fine	0.12 - 0.062		

As streamflow increases, the ability of the water to transport both coarse and fine sediments increases because of the higher velocities and turbulence associated with the high flows. Coarse sediments are generally not in the suspended fraction of the water column, however, the finer sediment particles are more easily transported because of their lighter weight, and are commonly found suspended at low flows (Colby, 1963, page 11).

The dominant particle size in runoff above Lahontan Reservoir differed between the upstream and downstream stations. This was due at least in part to higher velocities at the upstream Gardnerville and Woodfords stations, in contrast with lower velocities at the downstream Carson City, Deer Run Road, and Fort Churchill stations. Seven samples at the Gardnerville station averaged about 56 percent sand. Only one sample at the Woodfords station had enough material for a particle-size analysis; it contained about 72 percent sand. In contrast, at the Carson City (10 samples), Deer Run Road (11) and Fort Churchill (10) stations, the sand content averaged 46, 40, and 50 percent, respectively.

The dominant sediment sizes at the stations on the Truckee Canal and below Lahontan Dam were in the silt and clay fractions. The high man-made banks and the slow velocities in the Truckee Canal do not allow for the coarser material to be in suspension. Because the incoming coarser material from the Carson River is deposited in Lahontan Reservoir, the material available to be discharged below the reservoir is limited to the silt and clay fractions.

Biological Characteristics

Biochemical Oxygen Demand

BOD_{ult} (ultimate biochemical oxygen demand) is the total amount of oxygen consumed by heterotrophic bacteria to oxidize carbonaceous matter ($CBOD_{ult}$) and (or) by chemoautotrophic bacteria to oxidize ammonium and nitrite ($NBOD_{ult}$). BOD_{ult} is an indicator of the decomposability of the organic matter and thereby gives a measure of the pollution characteristics of the material in terms of oxygen demand (Marske and Polkowski, 1972, page 1987).

When nitrifying bacteria oxidize ammonium and nitrite, the process consumes dissolved oxygen. By inhibiting the nitrification process, only $CBOD_{ult}$ is consumed and thus analyzed. If the effects of the nitrifying bacteria were not eliminated, the results would be a greater depletion of dissolved oxygen and therefore a higher BOD_{ult} in the bottle than might otherwise be detected in the river.

Two rate constants, K_1 and L_0, were estimated from graphs of BOD values, where K_1 is the carbonaceous deoxygenation rate ($\log_e$) as measured in a BOD bottle at 20°C and L_0 is the ultimate amount of oxygen needed to stabilize the carbonaceous organic matter. The K_1 and L_0 constants were generated from 20-day time-series BOD analyses at 20°C in the laboratory, using a computer program developed by James P. Bennett and Wayne E. Webb of the U.S. Geological Survey during the Potomac Estuary Water-Quality Assessment study, and modified by Jon O. Nowlin of the U.S. Geological Survey during the Truckee-Carson River Quality Assessment.

Concentrations and Rates

$CBOD_{ult}$ concentrations in the Carson River and Truckee Canal ranged from 1.2 to 19.6 mg/L. The January storm values resulted in typically large $CBOD_{ult}$ concentrations. The following table shows the mean $CBOD_{ult}$ concentrations for the winter, with and without the first January sample. The resulting values illustrate the significant difference these high $CBOD_{ult}$ concentrations had on the winter mean.

Site	Excluding first January sample: Milligrams per liter	Excluding first January sample: No. of samples	Including first January sample: Milligrams per liter	Including first January sample: No. of samples
Gardnerville	2.4	2	8.1	3
Woodfords	3.2	3	6.2	4
Carson City	3.3	3	5.3	4
Deer Run Road	4.2	2	6.6	3
Fort Churchill	3.7	3	5.7	4
Truckee Canal	3.7	3	5.4	4

Somewhat higher than average concentrations occurred in the November samples at most stations coincident with riparian leaf fall in autumn. Figure 8 shows the mean $CBOD_{ult}$ concentration for all stations during each sampling and indicates the high concentration during the January storm. Table 11 gives the seasonal mean concentrations and the yearly mean concentrations of $CBOD_{ult}$ at the seven sampling stations.

Laboratory determined deoxygenation rates (K_1) at 20° ± 1°C ranged from 0.04 to 0.25 for all samples and averaged from 0.10 to 0.14 between stations (table 11). As with most chemical reactions, K_1 is temperature dependent, and a river deoxygenation rate at the time of sampling can be calculated using the following equation:

$$K_r = K_{20°C}\ 1.047^{(T-20)}$$

where K_r = the temperature-corrected specific rate constant in the river;
$K_{20°C}$ = the specific-rate constant at 20°C; and
T = temperature in degrees Celsius (Velz, 1970, page 146).

$NBOD_{ult}$ concentrations in the Carson River and Truckee Canal ranged from 0.9 to 6.4 mg/L. This demand did not occur at all stations, and for the most part was negligible (tables 16-22).

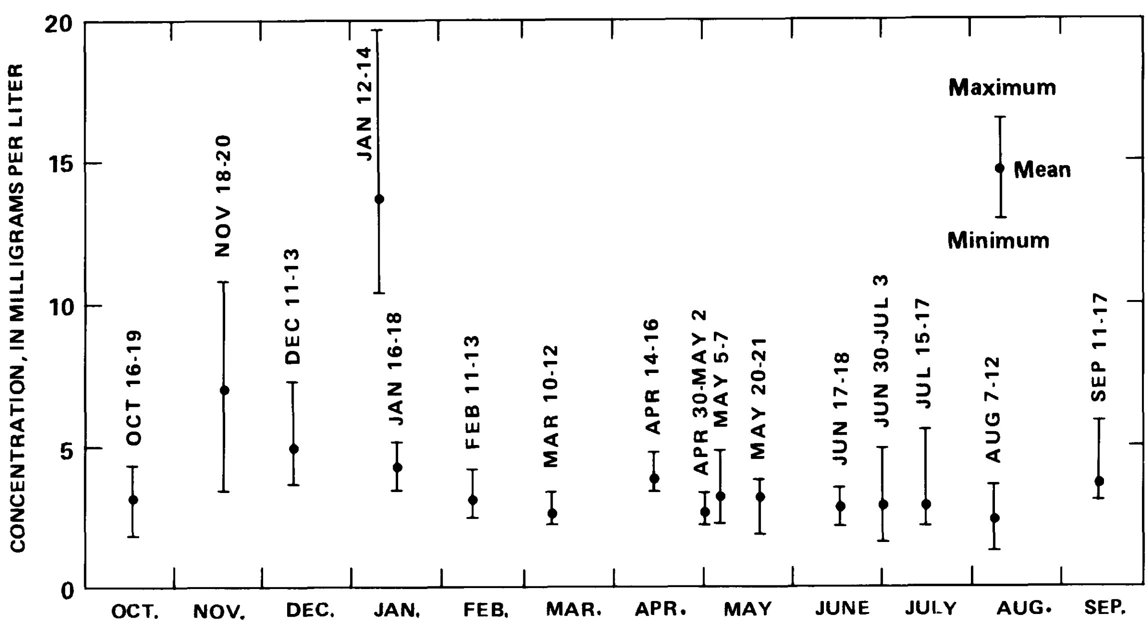

FIGURE 8.--Maximum, minimum, and mean ultimate carbonaceous biochemical oxygen demand for all river and canal stations, water year 1980.

TABLE 11.--*Mean annual and seasonal concentrations of ultimate carbonaceous biochemical oxygen demand for stations on the river and canal, water year 1980*

[Milligrams per liter]

Station	Average carbonaceous deoxygenation rate, K_1 (day^{-1})	Mean $CBOD_{ult}$ concentration				
		Autumn	Winter	Spring	Summer	Yearly mean
Gardnerville	0.10	3.6	8.1	3.0	1.7	4.2
Woodfords	.12	4.9	6.2	2.7	1.8	4.0
Carson City	.10	5.2	5.3	3.2	3.6	4.2
Deer Run Road	.11	6.7	6.6	2.8	3.0	4.5
Fort Churchill	.12	5.3	5.7	3.1	2.6	3.9
Truckee Canal	.13	4.3	5.4	3.2	4.8	4.2
Below Lahontan Dam	.14	5.8	2.6	2.6	2.6	3.3

Load Estimates

The $CBOD_{ult}$ load was calculated using the flow-weighted, transport-curve, and mean-concentration methods, and the values then averaged to obtain the load. The transport-curve method during the lower flow periods predicted a lesser load than the other two methods at the Carson City, Deer Run Road, and Fort Churchill stations, possibly due in part to the lack of data at these lower flows. At the station below Lahontan Dam, the autumn estimate using the mean-concentration method was substantially higher than the other two estimates because of the high mean flow.

Total $CBOD_{ult}$ load to Carson Valley from the Gardnerville and Woodfords stations was approximately 2,900 tons (table 12). The outflow $CBOD_{ult}$ load from Carson Valley showed a slight decrease of 100 tons from the combined load of the Gardnerville and Woodford stations. The decrease, if real and not due to mathematical rounding, shows that during water year 1980 no significant input of $CBOD_{ult}$ occurred in Carson Valley. This suggests that (1) the oxygen in the river was being replenished by aquatic plants, (2) diffusion of atmospheric oxygen into the river occurred faster than the demand for oxygen, or (3) that the available organic material was not oxidizable by the microorganisms.

TABLE 12.--*Annual and seasonal loads of ultimate carbonaceous biochemical oxygen demand for stations on the river and canal, water year 1980*

[Tons]

Station	Mean $CBOD_{ult}$ load				
	Autumn	Winter	Spring	Summer	Yearly mean
Gardnerville	74	1,300	920	190	2,500
Woodfords	24	110	230	47	400
Carson City	170	1,200	1,100	300	2,800
Deer Run Road	180	1,400	960	230	2,800
Fort Churchill	120	1,200	980	210	2,600
Truckee Canal	370	170	86	160	800
Below Lahontan Dam	150	260	760	560	1,700

No reduction in the estimated annual load was observed between the Carson City station and Deer Run Road station (the Eagle Valley subunit), although seasonal differences were evident (table 12). Between the Deer Run Road and Fort Churchill stations, a decrease in the $CBOD_{ult}$ load occurred in all seasons except in the spring when a slight increase was noted. The decrease suggests that no significant $CBOD_{ult}$ load was contributed by Dayton Valley or other intervening areas. Assuming that the total annual $CBOD_{ult}$ load of 2,600 tons at the Fort Churchill station undergoes little change between Fort Churchill and Lahontan Reservoir, this estimate is considered to have been the contribution to the reservoir from the Carson River during water year 1980. When this total was added to that from the Truckee Canal, about 800 tons, the total $CBOD_{ult}$ input to Lahontan Reservoir was approximately 3,400 tons. Because Lahontan Reservoir acts as a $CBOD_{ult}$ sink, the estimated $CBOD_{ult}$ load at the site below Lahontan Dam was only 1,700 tons.

Phytoplankton

The community of suspended, floating, or weakly swimming photosynthetic organisms, mostly algae, that live in the open water are known as phytoplankton. Extensive growths, or blooms, of these organisms often result when the right combination of temperature, light, and nutrient availability exists.

When blooms develop, they can impair water use, give off objectionable odors, and affect the esthetic quality of the water. The Carson River and Truckee Canal did not generally have these problems during the period of this study; during the late summer months of 1980, however, an algal bloom occurred in Lahontan Reservoir, forcing the temporary closure of the reservoir to recreational use. The plant causing the bloom was *Aphanizomenon*, a blue-green alga.

Phytoplankton can directly affect water composition, notably the dissolved oxygen, pH, concentrations of certain solutes, and optical properties (Greeson and others, 1977, page 91). At night, when photosynthetic activity ceases, the algae, along with the decomposition of detritus by other microorganisms, may cause a depletion of the available dissolved oxygen through respiration.

Seasonal variation in phytoplankton concentrations usually occur because of a change in water temperature, sunlight, and nutrient availability. The unusually high phytoplankton concentrations in the Carson River and Truckee Canal in January 1980 may have been the result of sloughing of benthic material by above average flows.

The two dominant algal groups (tables 16-22) during water-year 1980 were Bacillariophyceae (diatoms) and Cyanophyta (blue-green algae). The Chlorophyta (green algae) group also observed at all sites was most prevalent at the Fort Churchill and Truckee Canal stations. Usually, the green algae did not represent a large percentage of the total concentration of phytoplankton in the river systems.

The diatoms occurring most frequently were of the genera *Navicula*, *Cyclotella*, and *Nitzschia*. The blue-green algae occurring most frequently were *Anabaena*, *Anacystis*, and *Oscillatoria*. The exception was at the station below Lahontan Dam where the dominant blue-green alga was *Aphanizomenon*. This genus was discharged from the reservoir during the normal release of water during the summer of 1980.

The diatoms occurred throughout the year at all stations, but the blue-green and the green algae seemed to be restricted to the warm-weather months.

Algal-Growth Potential

AGP (algal-growth potential) is defined as the maximum algal mass (dry weight) that can be produced in a water sample under standardized laboratory conditions (Thomas Shoaf, U.S. Geological Survey, written communication, March 1975). To some extent, it provides an indication of the quantity of nutrients in water and the limiting nutrients needed for growth. Limiting nutrients are those that are needed for growth but are present in such limited quantity that growth is restricted.

An estimate of the limiting nutrient (nitrogen or phosphorus) can be determined by calculating N:P (nitrogen:phosphorus) atomic ratios. The calculation of this ratio during this study used total inorganic nitrogen and dissolved orthophosphorus. Ryther and Dunstan (1971) found that when the N:P atomic ratio was less than 15, nitrogen was the limiting nutrient. The average N:P atomic ratios at the Fort Churchill and the Truckee Canal stations were 3.5:1 and 9.2:1, respectively.

The potential for algal growth was lowest at the two most upstream stations (figure 9), probably due to the low concentrations of inorganic nitrogen and phosphorus. A slight increase occurred between these two stations and the Carson City station. Another increase, also slight, occurred in the mean AGP between the Carson City station and the Deer Run Road station, possibly due to the inflow of treated sewage effluent from Carson City that is discharged to the Carson River between the two stations. The reduction in the mean AGP that occurs between the Deer Run Road and Fort Churchill stations is believed to be the result of biological uptake of the available nutrients between these stations.

Figure 9 shows that a substantially greater AGP existed in the Truckee Canal than in the Carson River near Fort Churchill. The Truckee Canal contributed more than twice the mean AGP concentration to Lahontan Reservoir than did the Carson River. The higher mean AGP concentration in the Truckee Canal probably was the result of more available nitrogen.

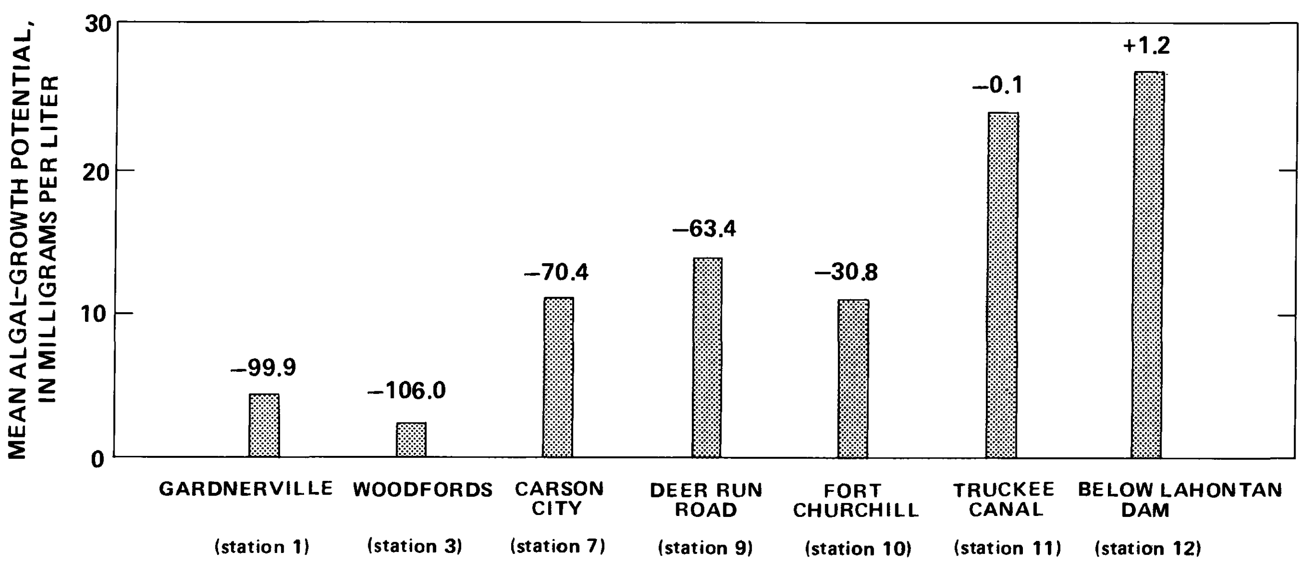

FIGURE 9.--Mean algal-growth potential at sampling sites on the river and canal, water year 1980. Numbers above bars indicate river miles upstream (–) or downstream (+) from Lahontan Dam.

Chlorophyll *a* of the Phytoplankton

All plants, such as the phytoplankton, contain chlorophyll *a*. Measurements of chlorophyll *a* are frequently used as an indicator of algal biomass, or standing crop. A measure of this pigment provides only an estimate because certain ecological factors may affect the chlorophyll concentration without affecting the total algal biomass.

Chlorophyll-*a* concentrations at the Woodfords and Gardnerville stations were less than 1 μg/L (microgram per liter) during water year 1980, except for the first sample in January when a chlorophyll-*a* peak occurred. A peak occurred not only at these two stations but at all stations during January. Chlorophyll *a* was generally less than 4 μg/L at all stations. Some high concentrations did occur at the Fort Churchill and Truckee Canal stations; and these concentrations correlate well with the high phytoplankton densities. The Carson City station experienced a high chlorophyll-*a* concentration in December 1979 (8.26 μg/L), which is unexplained and perhaps should be omitted from the data.

Figure 10 compares chlorophyll-*a* concentrations with phytoplankton densities at three sampling stations near Lahontan Reservoir. The histograms show an inverse relationship between the two for the first January samples. This unexpected relationship may have been caused by terrestrial plant material being washed into the river during the intense January rainfall (figure 2). A direct relationship between chlorophyll *a* and phytoplankton concentrations seems to have occurred throughout most of the year at the three stations. In June 1980, Cooper and others (1983, page 124) recorded a maximum chlorophyll-*a* concentration of about 52 μg/L during a bloom of *Aphanizomenon* in Lahontan Reservoir.

An attempt was made to mathematically relate chlorophyll-*a* concentrations to total phosphorus in hopes of providing a simple method for estimating the phytoplankton standing crop. The scatter of data, however, proved to be too great to provide a reliable estimate.

NUTRIENT AND SUSPENDED-SEDIMENT LOADS

Regional Contributions to the Carson River Above Lahontan Reservoir

Nutrients

It was hoped that the regression equations would provide a predictive method for estimating the concentration of a constituent on the basis of known corresponding streamflow values. The results from these simple regressions at the seven sites produced correlation coefficients of 0.6 or greater on 10 constituents out of 77, or about 13 percent. Further analysis of the standard deviation of the mean, standard deviation of residuals, and the correlation coefficients, indicated that only about 30 percent of the regression lines were better indicators of concentration than the mean concentration.

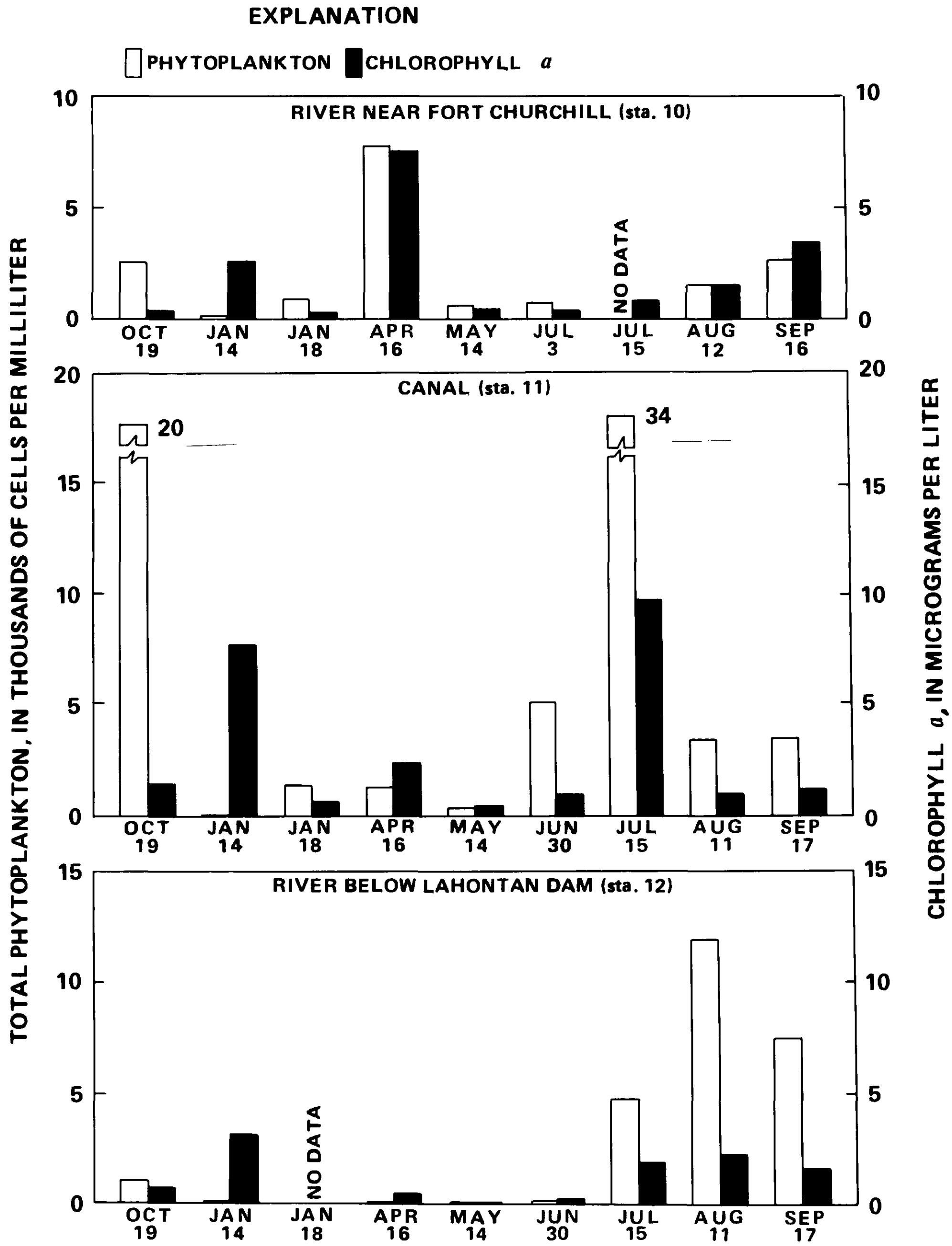

FIGURE 10.--Relationship between chlorophyll *a* and phytoplankton for inflow to and outflow from Lahontan Reservoir, water year 1980.

Table 13 shows the estimated seasonal loads in tons of nitrogen and phosphorus as determined for water year 1980 by the four methods previously described. The percentage difference between the mean of the four methods and the individual estimates was about 30 percent for the transport-curve method, 19 percent for the flow-weighted average method, 14 percent for the mean-concentration method, and 17 percent for the time-weighted average method. Table 14 indicates the average load for the four procedures used for each constituent on a seasonal basis and the total for the year.

TABLE 13.—*Estimated seasonal tonnages of total- and dissolved-nutrient species for stations on the river and canal, water year 1980, using four mathematical methods*

[Tons per season. Abbreviations: T, total; D, dissolved; N, nitrogen; ON, organic nitrogen as N; NH3, ammonia as N; NO2+NO3, nitrite plus nitrate as N; P, phosphorus; OP, orthophosphorus, as P]

Station	Constituent	Autumn				Winter			
		Transport-curve method	Flow-weighted method	Mean method	Time-weighted method	Transport-curve method	Flow-weighted method	Mean method	Time-weighted method
Gardnerville	TON	11	10	11	26	150	190	110	94
	DON	6.2	5.8	6.3	8.7	32	54	45	42
	TNH3	.9	.8	.8	1.2	8.1	6.0	6.1	6.3
	DNH3	.9	.6	.6	.7	3.5	1.9	3.1	3.2
	NO2+NO3	.7	1.0	1.0	1.8	9.4	11	7.1	6.0
	TP	.8	1.5	1.5	9.8	56	94	39	34
	DP	.0	E .7	E .6	E .9	3.3	1.0	1.0	2.2
	DOP	.9	.7	.6	.9	2.9	4.4	4.1	2.7
Woodfords	TON	1.6	2.2	2.5	3.9	8.3	25	21	16
	DON	.9	1.6	1.7	2.0	6.3	13	9.5	9.2
	TNH3	.0	.3	.2	.2	.4	.4	.8	.9
	DNH3	.0	.2	.1	.2	.7	.3	.6	.6
	NO2+NO3	.0	.2	.2	.3	.7	1.4	1.3	1.1
	TP	.0	.1	.1	.3	.3	1.8	1.5	1.1
	DP	.0	E .1	E .1	E .2	.2	.2	.2	.2
	DOP	.0	.1	.1	.2	.3	.3	.4	.4
Carson City	TON	18	16	20	33	290	270	180	170
	DON	16	9.4	13	22	120	190	140	140
	TNH3	3.4	4.6	4.0	5.2	14	20	22	23
	DNH3	1.8	3.7	3.3	4.2	12	17	22	22
	NO2+NO3	6.0	12	11	13	23	45	43	42
	TP	8.5	10	11	17	140	100	70	67
	DP	5.8	E 8.6	E 9.4	E 9.3	15	18	19	16
	DOP	6.6	8.6	9.4	9.3	14	17	17	16
Deer Run Road	TON	19	14	15	27	200	230	180	190
	DON	11	11	12	17	110	140	120	130
	TNH3	2.6	10	11	9.8	30	33	40	34
	DNH3	3.5	7.3	7.1	7.1	20	24	34	28
	NO2+NO3	4.8	17	17	19	44	48	51	45
	TP	13	18	19	22	150	110	83	85
	DP	9.4	E 15	E 16	E 14	19	35	40	24
	DOP	8.1	15	16	14	16	28	32	25
Fort Churchill	TON	12	12	12	21	180	310	230	230
	DON	7.4	5.6	7.3	10	88	97	83	86
	TNH3	.0	.4	.5	1.2	16	28	28	23
	DNH3	.2	.4	.2	.8	6.1	11	11	10
	NO2+NO3	1.8	4.6	3.6	6.9	31	78	62	57
	TP	6.2	6.5	5.3	10	76	140	94	110
	DP	4.1	6.1	6.3	6.3	23	28	26	26
	DOP	3.0	5.7	4.6	5.8	20	25	24	28
Truckee Canal	TON	75	41	42	46	29	41	29	38
	DON	46	29	31	31	15	17	14	16
	TNH3	20	22	22	22	8.6	2.6	3.1	3.1
	DNH3	14	22	21	21	6.8	2.7	2.9	3.1
	NO2+NO3	86	71	74	72	48	13	14	14
	TP	44	33	34	34	16	14	9.2	14
	DP	41	E 32	E 33	E 32	15	5.0	5.1	2.6
	DOP	32	32	33	32	13	2.2	3.6	2.7
Below Lahontan Dam	TON	24	33	26	32	64	67	67	68
	DON	11	28	19	26	32	64	65	64
	TNH3	2.1	1.4	2.3	1.7	5.8	35	22	28
	DNH3	1.6	.5	1.4	.8	5.3	33	23	28
	NO2+NO3	20	29	31	30	50	84	74	80
	TP	13	17	14	16	31	33	36	34
	DP	8.0	E 13	E 11	E 12	20	28	28	28
	DOP	6.8	13	11	12	17	31	28	30

E: Estimated to equal DOP load (DP not determined).

TABLE 13.--*Estimated seasonal tonnages of total- and dissolved-nutrient species for stations on the river and canal, water year 1980, using four mathematical methods*--Continued

[Tons per season. Abbreviations: T, total; D, dissolved; N, nitrogen; ON, organic nitrogen as N; NH3, ammonia as N; NO2+NO3, nitrite plus nitrate as N; P, phosphorus as P; OP, orthophosphorus as P]

		Spring				Summer			
Station	Constituent	Transport-curve method	Flow-weighted method	Mean method	Time-weighted method	Transport-curve method	Flow-weighted method	Mean method	Time-weighted method
Gardnerville	TON	200	140	160	140	43	36	38	58
	DON	100	100	100	99	28	22	21	30
	TNH3	13	11	12	11	2.5	.6	.5	2.2
	DNH3	12	12	12	12	3.0	2.5	1.9	1.9
	NO2+NO3	9.9	10	9.0	9.5	2.8	2.3	1.9	1.7
	TP	46	51	51	46	7.2	9.7	6.8	7.2
	DP	9.2	7.3	6.0	7.9	2.0	3.2	2.9	3.4
	DOP	7.0	6.4	6.0	6.3	2.0	.3	.2	.4
Woodfords	TON	62	43	43	39	8.8	20	14	14
	DON	43	35	34	33	7.1	15	10	11
	TNH3	1.7	2.2	2.6	2.2	.4	.1	.0	.1
	DNH3	1.1	1.7	1.7	1.6	.4	.0	.0	.0
	NO2+NO3	3.5	2.6	2.6	2.2	.6	.0	.0	.0
	TP	3.6	4.5	4.3	4.3	.4	.7	.7	.7
	DP	1.3	1.5	1.7	2.1	.3	.4	.5	.5
	DOP	2.8	2.1	2.6	1.8	.4	.0	.1	.1
Carson City	TON	240	220	220	210	48	84	83	73
	DON	180	130	140	140	40	53	59	54
	TNH3	22	16	17	15	5.7	5.2	6.4	5.2
	DNH3	23	10	10	13	4.8	4.6	5.6	4.7
	NO2+NO3	38	23	24	20	11	5.6	14	8.3
	TP	100	110	100	95	21	23	26	23
	DP	21	20	20	21	7.9	9.5	17	12
	DOP	21	18	20	18	8.8	5.7	11	7.8
Deer Run Road	TON	240	210	210	220	52	89	100	80
	DON	150	140	160	160	31	47	48	48
	TNH3	27	18	23	18	6.1	1.4	4.7	2.8
	DNH3	32	8.3	6.6	8.4	8.0	1.7	5.5	3.4
	NO2+NO3	69	22	23	20	14	4.0	13	7.3
	TP	91	102	96	95	24	18	27	21
	DP	27	23	23	24	13	10	21	15
	DOP	23	21	20	21	12	6.0	11	8.3
Fort Churchill	TON	260	210	220	230	49	51	46	48
	DON	150	150	160	160	28	34	36	34
	TNH3	11	8.1	6.1	7.9	1.4	.0	.0	.0
	DNH3	6.6	7.1	6.1	6.3	1.1	1.1	1.4	.9
	NO2+NO3	46	33	37	30	8.1	11	3.4	3.3
	TP	96	102	95	97	19	25	21	22
	DP	29	25	24	26	8.0	7.9	12	8.6
	DOP	25	22	21	22	6.6	4.5	6.2	6.4
Truckee Canal	TON	11	11	12	13	17	34	34	32
	DON	12	13	13	12	17	30	29	30
	TNH3	2.8	3.6	3.2	3.9	4.3	9.4	6.7	9.5
	DNH3	2.0	3.3	3.2	3.6	3.0	9.2	6.7	8.8
	NO2+NO3	9.6	9.8	8.8	9.1	15	45	41	42
	TP	6.6	5.1	4.8	4.8	11	21	19	21
	DP	5.7	4.3	4.0	4.0	9.4	20	18	19
	DOP	4.0	3.5	3.2	3.4	6.5	18	15	17
Below Lahontan Dam	TON	210	210	210	210	150	140	140	140
	DON	160	150	140	170	91	110	110	130
	TNH3	25	24	25	23	16	5.3	4.3	7.8
	DNH3	25	22	28	22	16	10	11	7.8
	NO2+NO3	140	130	140	130	110	71	76	74
	TP	79	68	70	67	61	56	56	57
	DP	56	47	47	47	42	39	41	39
	DOP	47	38	39	39	35	12	32	32

E: Estimated to equal DOP load (DP not determined).

The background, or natural, loads are assumed to be represented by the East and West Forks Carson River at Gardnerville and Woodfords, respectively. The total background loads for water year 1980 were about 490 tons of total nitrogen and about 130 tons of total phosphorus (table 14). Figure 11 shows the downstream increase above total background nitrogen and phosphorus loads. The increase in the nitrogen and phosphorus loads between Carson Valley and Carson City is due more to the greater streamflow rather than to increased concentration.

Only small increases in nutrient loadings were measured in the Carson River between Carson City and Lahontan Reservoir during water year 1980. Slight increases in the nitrogen and phosphorus loads were measured between the Carson City and Deer Run Road stations in the summer and autumn. These increases seem to be the result of the slightly high nitrogen and phosphorus concentrations during these two periods, and not increased streamflow. During the summer and autumn seasons, when streamflow is low, the treated sewage effluent from Carson City could play a major role in the measured increases in concentrations between these two sites.

A reduction in nutrient loading between the Fort Churchill station and the Deer Run Road station during summer and autumn is believed to be the result of aquatic plant uptake of the nutrients between the Deer Run Road and Fort Churchill stations. The nutrient loads calculated during winter and spring 1980 from Carson Valley, Eagle Valley, and Dayton-Churchill Valley are similar.

The estimated seasonal loads of total nitrogen and phosphorus at stations along the Carson River and the Truckee Canal are shown in table 14. The loads for total nitrogen were determined by summing the tons of organic nitrogen, total ammonia, and nitrite plus nitrate. All nitrite plus nitrate calculations were based on the total concentrations through January 1980 and dissolved concentrations thereafter.

Suspended Sediment

The transport-curve technique was believed to provide the best estimate of load because of the close relationship between suspended-sediment concentration and discharge; therefore, this was the method used for estimating sediment load. Daily sampling during the study would have provided a more reliable estimate of the annual load because sediment movement in streams is erratic and subject to changes with modifications in streamflow.

TABLE 14.--*Estimated seasonal and annual tonnages of total- and dissolved-nutrient species for stations on the river and canal, water year 1980*

[Tons per season. Abbreviations: T, total; D, dissolved; N, nitrogen; ON, organic nitrogen as N; NH3, ammonia as N; NO2+NO3, nitrite plus nitrate as N; P, phosphorus; OP, orthophosphorus as P]

Station	TN	DN	TON	DON	TNH3	DNH3	NO2+NO3	TP	DP	DOP
Gardnerville										
Autumn	16	8.6	14	6.8	0.9	0.7	1.1	3.4	0.6	0.8
Wintar	160	54	140	43	6.6	2.9	8.4	56	1.9	3.5
Spring	180	120	160	100	12	12	9.6	48	7.6	6.4
Summer	48	30	44	25	1.4	2.3	2.2	7.7	2.9	.7
Total	400	210	360	170	21	18	21	120	13	11
Woodfords										
Autumn	3.0	1.9	2.6	1.6	0.2	0.1	0.2	0.1	0.1	0.1
Winter	20	11	18	9.5	.6	.6	1.1	1.2	0.2	.4
Spring	52	40	47	36	2.2	1.5	2.7	4.2	1.6	2.3
Summer	14	11	14	11	.2	.1	.2	.6	.4	.2
Total	89	64	82	58	3.2	2.3	4.2	6.1	2.3	3.0
Carson City										
Autumn	36	28	22	15	4.3	3.2	10	12	8.3	8.4
Winter	290	210	230	150	20	18	38	94	17	16
Spring	260	190	220	150	18	14	26	100	20	19
Summer	87	66	72	52	5.6	4.9	9.7	23	12	8.3
Total	670	490	540	370	48	40	84	230	57	52
Dear Run Road										
Autumn	41	33	19	13	8.4	6.2	14	18	14	13
Winter	280	190	200	120	34	26	47	110	30	26
Spring	280	200	220	150	22	14	34	96	24	21
Summer	93	58	80	44	3.8	4.6	9.6	22	15	9.3
Total	690	480	520	330	68	51	100	250	83	69
Fort Churchill										
Autumn	19	12	14	7.6	0.5	0.4	4.2	7.0	5.7	4.8
Winter	320	150	240	88	24	9.5	57	110	26	24
Spring	280	200	230	160	8.3	6.5	36	97	26	22
Summer	55	40	48	33	.4	1.1	6.4	22	9.1	5.9
Total	670	400	530	290	33	18	100	230	67	57
Truckee Canal										
Autumn	150	130	51	34	22	20	76	36	34	32
Winter	60	42	34	16	4.4	3.9	22	13	6.9	5.4
Spring	25	24	12	12	3.4	3.0	9.3	5.3	4.5	3.5
Summer	72	69	29	26	7.5	6.9	36	18	17	14
Total	310	260	130	88	37	34	140	72	63	55
Below Lahontan Dam										
Autumn	59	50	29	21	1.9	1.1	28	15	11	11
Winter	160	150	66	56	23	22	72	34	26	26
Spring	370	320	210	160	24	24	140	71	49	41
Summer	230	200	140	110	8.4	11	83	58	40	28
Total	820	720	440	350	57	58	320	180	130	110

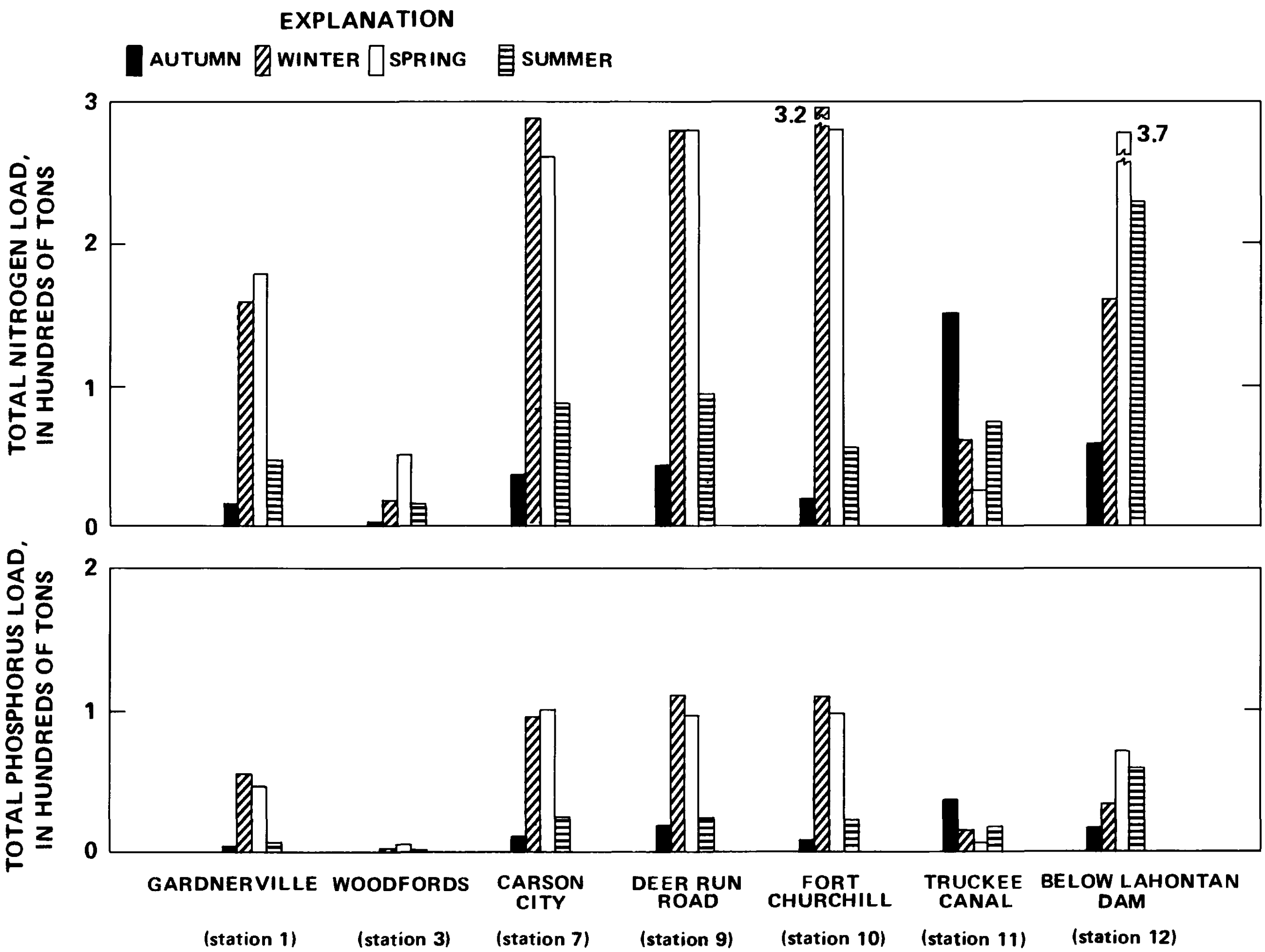

FIGURE 11.--Seasonal load of total nitrogen and phosphorus at sampling sites on the river and canal, water year 1980.

Most suspended-sediment load in natural river systems is transported during storms and spring runoff. This was true in this study. For example, at the Gardnerville station, the estimated load during 4 days in January, 2 days in February, and the 96 days of spring runoff accounted for approximately 99 percent of the suspended-sediment load. This estimate was based on the rating curve developed from the 16 instantaneous samples.

TABLE 15.--*Seasonal and total suspended-sediment loads for stations on the river and canal, water year 1980*

[Tons]

Station	Autumn	Winter	Spring	Summer	Total for year
Gardnerville	70	114,000	67,000	5,700	190,000
Woodfords	17	520	8,100	260	8,900
Carson City	700	107,000	95,000	11,000	210,000
Deer Run Road	620	89,000	73,000	8,600	170,000
Fort Churchill	340	81,000	130,000	15,000	230,000
Truckee Canal	24,000	45,000	520	1,100	71,000
Below Lahontan Dam	1,200	3,100	14,000	7,900	26,000

The background suspended-sediment load for water year 1980 was estimated at 200,000 tons (table 15). The suspended-sediment load increased to about 210,000 tons at the Carson City station, possibly due to sediment contributions by overland runoff in Carson Valley.

The load then decreased between the Carson City and Deer Run Road stations. This decrease was probably the result of the diversion of streamflow for irrigation and a slight decrease in the suspended-sediment concentrations.

The suspended-sediment load increased by about 60,000 tons between the Deer Run Road and Fort Churchill stations (table 15). The higher loads at Fort Churchill were probably the result of overland runoff between the two stations that contributed sediment to the river.

Contributions to Lahontan Reservoir from the Carson River and Truckee Canal

Nutrients

Water Year 1980

The estimated combined nutrient input to Lahontan Reservoir during water year 1980 was about 980 tons of total nitrogen and about 300 tons of total phosphorus. The total nitrogen load to Lahontan Reservoir from the Carson River during water year 1980 was estimated to be about 670 tons (table 14). Approximately 130 tons of this quantity was inorganic nitrogen. Approximately 230 tons of total phosphorus was discharged to Lahontan Reservoir from the river. In comparison, the Truckee Canal contributed approximately 310 tons of total nitrogen, of which 180 tons were inorganic nitrogen. About 72 tons of total phosphorus were discharged from the canal during the same period. Thus, during water year 1980, the Carson River contributed more than twice as much of the total nutrient load to Lahontan Reservoir as did the Truckee Canal. The higher loads at Fort Churchill are the direct result of the higher flow of the natural river system and not because of higher concentrations.

The dissolved-nitrogen load to Lahontan Reservoir from the Carson River was about 400 tons, of which about 120 tons was inorganic. The dissolved phosphorus load from the river was about 67 tons. The dissolved nitrogen from the canal was about 260 tons, of which about 170 tons was inorganic. Dissolved phosphorus from the canal totaled about 63 tons. Like the total nutrient load, the dissolved nutrient load was greater from the river than from the canal.

Comparison with Long-Term Estimates

Contributions to Lahontan Reservoir during water year 1980 can be compared with long-term estimates. Three procedures were used to calculate the long-term averages: the transport-curve, flow-weighted, and mean-concentration methods (the time-weighted average method used for the 1980 data was not used for the long-term records).

For Fort Churchill, streamflow and water-quality data for water years 1971-80 were used to calculate long-term nutrient loads. For the Truckee Canal, flow data for the same period, along with the only available water-quality data, for water years 1975 and 1980, were used. The canal-flow records were obtained directly from the Hazen gage, without consideration of the loss of streamflow to the K-X Lateral. The resulting difference is believed to be within the error of the data themselves (see "Methods of Study"), and the method is therefore considered acceptable for the long-term estimates. Because the Truckee Canal has only 2 years of nutrient data--from this study and data from the National Eutrophication Survey (1977)--the estimated long-term nutrient loads are much less reliable than those for the river.

Averaging the results for the three methods used, the estimated long-term contributions are listed below, along with the estimated values for water year 1980:

Contributions to Lahontan Reservoir, in tons per year

Source	Long term	1980
Carson River		
Total nitrogen	340	670
Total phosphorus	110	230
Truckee Canal		
Total nitrogen	340	310
Total phosphorus	75	72
Combined		
Total nitrogen	680	980
Total phosphorus	180	300

Suspended Sediment

The suspended-sediment contribution to Lahontan Reservoir from the Carson River during water year 1980 was estimated to be approximately 230,000 tons (table 15). In comparison, the Truckee Canal contributed approximately 71,000 tons. These estimates show that the Carson River discharged about three times the suspended-sediment load to Lahontan Reservoir as did the Truckee Canal. The large difference between the two loads was because flow and suspended-sediment concentrations were much greater in the river than in the canal.

Contributions to the Lower Carson River from Lahontan Reservoir

Nutrients

The estimated output from Lahontan Reservoir during water year 1980 was about 820 tons total nitrogen and about 180 tons total phosphorus (table 14). The estimated combined nutrient input to the reservoir during the same time was about 980 tons of total nitrogen and about 300 tons of total phosphorus. This imbalance between nutrient input and output indicates that nutrients are retained by the reservoir. During 1980, about 160 tons of total nitrogen and 120 tons of total phosphorus were retained in Lahontan Reservoir. Data for the dissolved nitrogen, however, show that there was a greater load leaving the reservoir (about 720 tons) than was entering it (about 660 tons). This difference suggests that nitrogen from the atmosphere was either being fixed by the blue-green algae in the reservoir, or that some of the suspended nitrogen (total minus dissolved) was being converted into dissolved nitrogen, or a combination of the two.

Suspended Sediment

The combined suspended-sediment load to Lahontan Reservoir during water year 1980 was estimated at about 300,000 tons (table 15). In contrast, the estimated output from the reservoir during the same year was only 26,000 tons. The large difference indicates that a large portion of the incoming suspended sediment (about 270,000 tons) was retained in the reservoir.

SUMMARY

Lahontan Reservoir is a major recreational site in Nevada that stores water for irrigation in the nearby Fallon area. The quality of inflow to the reservoir, from the Carson River and Truckee Canal, is being affected by upstream irrigation, urban runoff, and sewage treatment-plant discharges.

Specific conductance tended to increase downstream with the highest mean value being below the reservoir. Values of pH generally ranged from 7.0 to 8.8. Water temperature followed seasonal and diel cycles in response to meteorologic conditions. Dissolved-oxygen concentrations were greater than 5 mg/L, the minimum concentration required for a varied fish population, and fluctuated seasonally. Among the major ions, calcium and sodium were the dominant cations and bicarbonate the dominant anion.

Background (near-natural) nutrient concentrations were measured at the East Fork Carson River near Gardnerville, Nev., and the West Fork Carson River at Woodfords, Calif. Increases in inorganic nitrogen and phosphorus concentrations occurred between these two stations and the Carson River station near Carson City, Nev., the first station downstream from Carson Valley. The increase is probably due to the effects of agriculture and treated sewage-effluent discharges that occur in Carson Valley. Increases in nutrient concentrations were also observed between the Carson River sampling stations near Carson City and at Deer Run Road near Carson City probably due to the urban runoff and treated sewage effluent that is discharged to the river between these two stations.

Reductions in the nutrient concentrations between Deer Run Road and the station near Fort Churchill, indicate that discharges from Dayton Valley do not seem to affect nutrient concentrations in the Carson River.

The Truckee Canal had higher concentrations of inorganic nitrogen than the Carson River, possibly due to the larger volume of treated sewage effluent that was discharged to the Truckee River in the Reno area. The concentration of total phosphorus at the inflow stations to Lahontan Reservoir varied with season: The canal had the highest concentration during the summer and autumn, whereas the Carson River had the highest concentrations during winter and spring.

Measured suspended-sediment concentrations ranged from 3 to 1,790 mg/L, and the highest concentrations occurred during the January 1980 storm. If the storm data are excluded, about 95 percent of the suspended-sediment concentrations were less than 500 mg/L.

Biochemical oxygen-demand concentrations were highest during the January storm at all stations above the reservoir, but high values observed during November as well, are believed to have been caused by an increased oxygen demand as a result of the input of riparian leaf fall. The $CBOD_{ult}$ concentrations ranged from 1.2 to 19.6 mg/L.

The $CBOD_{ult}$ load decreased approximately 100 tons from background levels to the Carson City station. The loads remained constant between Carson City and Deer Run Road stations, although seasonal differences did occur. A decrease between the Deer Run Road and Fort Churchill station also occurred. The $CBOD_{ult}$ load from the Truckee Canal was substantially less than that from the Carson River. This difference in loads was attributed more to the reduced flow in the canal than to a lower $CBOD_{ult}$ concentration.

The codominant algal groups in the Carson River above Lahontan Reservoir were the diatoms and blue-green algae, whereas the codominant groups in the Truckee Canal were the diatoms and green algae.

An algal bloom occurred in Lahontan Reservoir during the summer of 1980. The genus causing the bloom was *Aphanizomenon*, a blue-green alga, which was also the dominant genus below the reservoir.

Background concentrations for algal-growth potential ranged from 0.3 to 9.2 mg/L, excluding the January 1980 storm. Slight increases in the algal-growth potential of the Carson River occurred at the Carson City and Deer Run Road stations, and a slight reduction occurred at the Fort Churchill stations. The potential for algal growth in the Truckee Canal, however, was approximately twice that of the Carson River.

Chlorophyll-*a* concentrations were generally less than 4 μg/L, and the highest concentrations occurred during the summer. The January storm resulted in a peak for chlorophyll *a*, when an inverse relationship occurred between chlorophyll *a* and phytoplankton at the two stations directly affecting Lahontan Reservoir.

Background, or near-natural, nutrient loads were estimated at approximately 490 tons of nitrogen and 130 tons of phosphorus. Increases above background loads seemed to occur in Carson Valley, probably due more to increased streamflow than to higher concentrations. The nutrient loads remained nearly constant between the Deer Run Road and Fort Churchill stations during the winter and spring but decreased in the summer and autumn.

The background suspended-sediment load was estimated at about 200,000 tons. The load increased to about 210,000 tons at the Carson City station, but decreased between the Carson City and Deer Run Road stations. The load increased by about 60,000 tons between the Deer Run Road and Fort Churchill stations. The increases were probably the result of overland runoff which contributed sediment to the river. The decrease between the Carson City and Deer Run Road stations was probably from the diversion of streamflow for irrigation and a slight decrease in suspended-sediment concentrations.

The combined total load of nutrients entering Lahontan Reservoir from the Carson River and Truckee Canal during water year 1980 was approximately 980 tons of total nitrogen and 300 tons of total phosphorus. The nutrient output from the reservoir was about 820 tons of nitrogen and 180 tons of phosphorus, a condition that tends to indicate that a nutrient sink existed in the reservoir. A greater dissolved nitrogen load, however, left the reservoir than entered. This difference suggests that either nitrogen from the atmosphere was being fixed by the blue-green algae in the reservoir, or that some of the suspended nitrogen was being converted into dissolved nitrogen, or a combination of the two.

Long-term estimates of the nutrient load to Lahontan Reservoir were based on 10 years of data for the Carson River near Fort Churchill and 2 years of data for the Truckee Canal. The lack of data for the Truckee Canal makes the estimate for that source less reliable than the 10 years of data for the Carson River. The long-term estimates indicate that, on the average, approximately 340 tons of nitrogen and 110 tons of phosphorus are transported annually to Lahontan Reservoir by the Carson River. The Truckee Canal contributes about the same amount of nitrogen, 340 tons, but only about 75 tons of phosphorus. These estimates are less than the 980 tons of nitrogen and 300 tons of phosphorus estimated for water year 1980. If these estimates accurately reflect the annual loads, the Carson River contributes, on the average, about 30 percent more phosphorus than the Truckee Canal.

The suspended-sediment load to Lahontan Reservoir during water year 1980 was approximately 300,000 tons, most of which accumulated during the January storm and spring runoff. About 26,000 tons of sediment were discharged from the reservoir. The large difference between the inflowing and outflowing suspended-sediment loads shows that a large amount of material was deposited in the reservoir during water year 1980.

Population increases expected in the future as a result of development in the Carson and Truckee River basins could create additional water-quality problems or intensify existing ones. Although long-term data are not available at most of the sampling sites, the data collected in the Carson River basin and Truckee Canal during water year 1980 should be valuable in any future studies.

Basic Water-Quality Data

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TABLE 16.--*Water-quality data for the East Fork Carson River near Gardnerville, Nev., water year 1980*

[Abbreviations: BIOCHEM, biochemical; CARBON., carbonaceous; CELLS/ML, cells per milliliter; CHROMO, chromatography; DEG C, degrees Celsius; DIAM., diameter; FET-FLD, fixed-endpoint titration in field; FLUOROM, fluormeter; FT^3/S, cubic feet per second; MG/L, milligrams per liter; MM of HG, millimeters of Mercury; SED, sediment; SUSP., suspended; T/D, tons per day; UG/L, micrograms per liter; ULT, ultimate; UMHOS, micromhos per centimeter at 25°C; UNIHIB, uninhibited; <, less than; --, data not available]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH, FIELD (UNITS)	BARO-METRIC PRES-SURE (MM OF HG)	TEMPER-ATURE, WATER (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	BICAR-BONATE FET-FLD (MG/L AS HCO3)	CAR-BONATE FET-FLD (MG/L AS CO3)	SOLIDS, RESIDUE At 180°C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (T/D)
OCT												
16...	0945	58	226	8.7	--	10.0	10.3	--	--	--	151	23.6
NOV												
18...	1000	90	195	8.2	635	4.0	11.6	106	74	0	121	28.7
DEC												
11...	1205	71	170	8.3	640	2.0	12.6	109	73	0	128	25.9
JAN												
12...	1405	2580	92	7.3	--	3.5	10.4	--	38	0	67	467
16...	1125	913	116	7.6	--	4.0	10.6	--	48	0	89	219
FEB												
11...	1005	202	157	--	--	2.0	11.4	--	--	--	111	60.5
MAR												
10...	1145	300	185	8.1	--	5.5	11.0	--	--	--	124	100
APR												
14...	1230	718	130	--	--	9.5	9.7	--	--	--	98	190
21...	1215	1270	97	--	--	5.5	10.4	--	--	--	72	247
30...	1245	1460	97	7.4	631	7.0	10.1	101	36	0	68	268
MAY												
06...	1150	1910	71	7.4	634	8.0	9.9	100	37	0	41	211
20...	1020	1830	62	7.5	635	7.0	9.9	98	32	0	48	237
JUN												
02...	1110	1170	74	7.8	629	7.0	9.6	96	34	0	63	199
17...	1405	1460	57	7.6	634	12.5	9.1	102	29	0	43	170
JUL												
01...	1315	1630	50	7.5	638	12.0	9.6	105	26	0	37	163
15...	1235	792	61	7.7	638	15.5	8.5	101	31	0	54	115
AUG												
07...	1325	260	103	8.0	635	19.5	7.8	101	48	0	73	51.2
SEP												
11...	1105	164	142	8.2	637	15.0	9.0	106	61	0	92	40.7

TABLE 16.--*Water-quality data for the East Fork Carson River near Gardnerville, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
16...	0945	58	.00	--	.02	--	.01	.01	.59
NOV									
18...	1000	90	.04	--	.01	--	.02	.03	.17
DEC									
11...	1205	71	.06	--	.02	--	.09	.05	.79
JAN									
12...	1405	2580	.04	--	.10	--	.07	.02	2.6
16...	1125	913	.07	--	.01	--	.02	.00	.82
FEB									
11...	1005	202	--	.03	--	.00	.13	.07	.44
MAR									
10...	1145	300	--	.01	--	.01	.03	.03	.30
APR									
14...	1230	718	--	.03	--	.00	.04	.06	.57
21...	1215	1270	--	.03	--	.01	.08	.06	.60
30...	1245	1460	--	.04	--	.00	.01	.00	.43
MAY									
06...	1150	1910	--	.06	--	.00	.06	.07	.72
20...	1020	1830	--	.02	--	.00	.01	.01	.53
JUN									
02...	1110	1170	--	.01	--	.01	.07	.07	.28
17...	1405	1460	--	.01	--	.01	.01	.03	--
JUL									
01...	1315	1630	--	.04	--	.00	--	--	--
15...	1235	792	--	.00	--	.01	.01	--	--
AUG									
07...	1325	260	--	.00	--	.01	.00	.03	.36
SEP									
11...	1105	164	--	.00	--	.00	.00	.02	.39

DATE	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	ALGAL GROWTH POTEN-TIAL, BOTTLE TEST (MG/L)
OCT									
16...	.39	.01	--	.02	2.1	.2	.351	<.064	--
NOV									
18...	.16	.03	--	.03	7.6	.1	.149	<.112	1.4
DEC									
11...	.34	.18	--	.05	1.7	--	.130	<.080	5.9
JAN									
12...	.50	1.40	--	.05	13	--	4.83	.463	16
16...	.73	.05	--	.03	5.0	--	.138	<.051	8.6
FEB									
11...	.22	.03	.01	--	4.2	.2	.089	.000	4.2
MAR									
10...	.32	.04	.01	.03	2.4	.1	.301	<.059	9.2
APR									
14...	.43	.21	.01	.00	2.9	.9	.261	<.126	5.4
21...	.34	.25	.03	.02	5.5	1.2	.220	<.105	8.8
30...	.43	.17	.02	.01	4.4	.6	.062	<.070	1.3
MAY									
06...	.50	.23	.02	.02	--	.5	.259	<.075	1.0
20...	.26	.20	.01	.03	2.4	1.1	.379	.043	.3
JUN									
02...	.22	.02	.03	.03	4.2	.1	.074	<.076	--
17...	.27	.09	.05	.03	6.5	.7	.218	<.101	1.7
JUL									
01...	--	.14	.03	.00	--	.7	.241	.059	1.4
15...	--	.05	.04	.01	3.2	.3	.116	<.102	2.8
AUG									
07...	.24	.04	.04	.00	2.5	.1	<.073	<.072	1.5
SEP									
11...	.20	.04	.02	.00	3.5	.5	.260	<.073	1.7

TABLE 16.--*Water-quality data for the East Fork Carson River near Gardnerville, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT³/S)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/D)	SED. SUSP. FALL DIAM. % FINER THAN .002 MM	SED. SUSP. FALL DIAM. % FINER THAN .004 MM	SED. SUSP. FALL DIAM. % FINER THAN .008 MM
OCT							
16...	0945	58	3	.47	--	--	--
JAN							
12...	1405	2580	1790	12500	--	27	34
16...	1125	913	135	333	--	--	--
FEB							
11...	1005	202	6	3.3	--	--	--
MAR							
10...	1145	300	8	6.5	--	--	--
APR							
14...	1230	718	191	370	--	--	--
21...	1215	1270	201	689	--	--	--
30...	1245	1460	446	1760	--	--	--
MAY							
06...	1150	1910	417	2150	13	16	22
20...	1020	1830	455	2250	--	--	--
JUN							
02...	1110	1170	60	190	--	--	--
17...	1405	1460	153	603	--	--	--
JUL							
01...	1315	1630	161	709	--	--	--
15...	1235	792	19	41	--	--	--
AUG							
07...	1325	260	4	2.8	--	--	--
SEP							
11...	1105	164	4	1.8	--	--	--

DATE	SED. SUSP. FALL DIAM. % FINER THAN .016 MM	SED. SUSP. FALL DIAM. % FINER THAN .031 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .125 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .250 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .500 MM	SED. SUSP. SIEVE DIAM. % FINER THAN 1.00 MM
OCT							
16...	--	--	--	--	--	--	--
JAN							
12...	44	55	64	73	85	95	100
16...	--	--	47	--	--	--	--
FEB							
11...	--	--	--	--	--	--	--
MAR							
10...	--	--	--	--	--	--	--
APR							
14...	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--
30...	--	--	34	--	--	--	--
MAY							
06...	29	37	43	49	61	95	100
20...	--	--	33	--	--	--	--
JUN							
02...	--	--	--	--	--	--	--
17...	--	--	36	--	--	--	--
JUL							
01...	--	--	53	--	--	--	--
15...	--	--	--	--	--	--	--
AUG							
07...	--	--	--	--	--	--	--
SEP							
11...	--	--	--	--	--	--	--

TABLE 16.--*Water-quality data for the East Fork Carson River near Gardnerville, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 16,79	JAN 12,80	JAN 16,80	APR 14,80	MAY 20,80	JUN 2,80
TIME	0945	1405	1125	1230	1020	1110
TOTAL CELLS/ML	160	15	76	2000	13	39
DIVERSITY: DIVISION	0.4	0.0	1.2	1.0	0.0	0.0
.CLASS	0.4	0.0	1.2	1.0	0.0	0.0
..ORDER	0.4	0.0	1.2	1.0	0.0	0.9
...FAMILY	1.3	1.6	2.6	2.1	0.0	1.6
....GENUS	1.3	1.6	2.6	2.4	0.0	1.6

ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)												
.CHLOROPHYCEAE												
..CHLOROCOCCALES												
...OOCYSTACEAE												
....ANKISTRODESMUS	--	-	--	-	5	7	14	1	--	-	--	-
...SCENEDESMACEAE												
....SCENEDESMUS	--	-	--	-	--	-	--	-	--	-	--	-
..VOLVOCALES												
...CHLAMYDOMONADACEAE												
....CHLAMYDOMONAS	13	8	--	-	--	-	--	-	--	-	--	-
CHRYSOPHYTA												
.BACILLARIOPHYCEAE												
..CENTRALES												
...COSCINODISCACEAE												
....CYCLOTELLA	--	-	--	-	--	-	--	-	13#	100	13#	33
....MELOSIRA	--	-	--	-	--	-	--	-	--	-	--	-
..PENNALES												
...ACHNANTHACEAE												
....ACHNANTHES	--	-	--	-	--	-	14	1	--	-	--	-
....COCCONEIS	--	-	--	-	10	13	--	-	--	-	--	-
...CYMBELLACEAE												
....CYMBELLA	--	-	5#	33	--	-	55	3	--	-	--	-
....EPITHEMIA	--	-	--	-	10	13	--	-	--	-	--	-
...DIATOMACEAE												
....DIATOMA	--	-	5#	33	--	-	--	-	--	-	--	-
....OPEPHORA	--	-	--	-	--	-	14	1	--	-	--	-
...FRAGILARIACEAE												
....FRAGILARIA	52#	33	--	-	--	-	41	2	--	-	13#	33
....HANNAEA	--	-	--	-	--	-	27	1	--	-	--	-
....SYNEDRA	--	-	--	-	10	13	180	9	--	-	--	-
...GOMPHONEMATACEAE												
....GOMPHONEMA	--	-	--	-	--	-	110	6	--	-	--	-
...MERIDIONACEAE												
....MERIDION	--	-	--	-	--	-	27	1	--	-	--	-
...NAVICULACEAE												
....NAVICULA	--	-	--	-	10	13	82	4	--	-	13#	33
...NITZSCHIACEAE												
....NITZSCHIA	91#	58	5#	33	5	7	220	11	--	-	--	-
...SURIRELLACEAE												
....SURIRELLA	--	-	--	-	--	-	27	1	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)												
.CYANOPHYCEAE												
..HORMOGONALES												
...NOSTOCACEAE												
....ANABAENA	--	-	--	-	25#	33	--	-	--	-	--	-
...OSCILLATORIACEAE												
....LYNGBYA	--	-	--	-	--	-	96	5	--	-	--	-
....OSCILLATORIA	--	-	--	-	--	-	1100#	54	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 16.--*Water-quality data for the East Fork Carson River near Gardnerville, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JULY 1,80		JULY 15,80		AUG 7,80		SEP 11,80	
TIME	1315		1235		1325		1105	
TOTAL CELLS/ML	26		13		64		220	
DIVERSITY: DIVISION	0.0		0.0		0.0		0.9	
.CLASS	0.0		0.0		0.0		0.9	
..ORDER	0.0		0.0		0.0		1.6	
...FAMILY	1.0		0.0		1.5		2.3	
....GENUS	1.0		0.0		1.5		2.6	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...OOCYSTACEAE								
....ANKISTRODESMUS	--	-	--	-	--	-	--	-
...SCENEDESMACEAE								
....SCENEDESMUS	--	-	--	-	--	-	64#	29
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	--	-	--	-	--	-	--	-
CHRYSOPHYTA								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....CYCLOTELLA	--	-	--	-	--	-	26	12
....MELOSIRA	--	-	--	-	--	-	52#	24
..PENNALES								
...ACHNANTHACEAE								
....ACHNANTHES	--	-	--	-	--	-	13	6
....COCCONEIS	--	-	--	-	--	-	--	-
...CYMBELLACEAE								
....CYMBELLA	--	-	--	-	--	-	--	-
....EPITHEMIA	--	-	--	-	--	-	26	12
...DIATOMACEAE								
....DIATOMA	--	-	--	-	--	-	--	-
....OPEPHORA	--	-	--	-	--	-	--	-
...FRAGILARIACEAE								
....FRAGILARIA	--	-	--	-	--	-	26	12
....HANNAEA	--	-	--	-	--	-	--	-
....SYNEDRA	--	-	--	-	26#	40	--	-
...GOMPHONEMATACEAE								
....GOMPHONEMA	--	-	13#	100	--	-	--	-
...MERIDIONACEAE								
....MERIDION	--	-	--	-	--	-	--	-
...NAVICULACEAE								
....NAVICULA	13#	50	--	-	26#	40	13	6
...NITZSCHIACEAE								
....NITZSCHIA	13#	50	--	-	13#	20	--	-
...SURIRELLACEAE								
....SURIRELLA	--	-	--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..HORMOGONALES								
...NOSTOCACEAE								
....ANABAENA	--	-	--	-	--	-	--	-
...OSCILLATORIACEAE								
....LYNGBYA	--	-	--	-	--	-	--	-
....OSCILLATORIA	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 16.--*Water-quality data for the East Fork Carson River near Gardnerville, Nev., water year 1980*--Continued

DATE	TIME	OXYGEN DEMAND, BIOCHEM CARBON. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM CARBON. 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. ULT. (MG/L)	DEOXYGE-NATION CARBON. (K1 TO BASE E PER DAY AT 20°C)	DEOXYGE-NATION CARBON. (K1 TO BASE 10 PER DAY AT 20°C)	OXYGEN DEMAND, BIOCHEM UNINHIB 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB ULT. (MG/L)
1979										
Nov 18	1000	.74	1.8	3.2	3.4	.15	.07	1.4	3.2	4.0
Dec 11	1205	1.2	1.8	3.5	3.7	.14	.06	1.8	3.3	3.6
1980										
Jan 12	1405	0.0	6.1	15.2	19.6	.07	.03	5.9	15.3	20.6
Feb 11	1005	1.2	1.0	2.2	2.5	.10	.04	1.4	2.7	2.9
Mar 10	1145	--	.7	1.7	2.2	.07	.03	.7	1.7	2.1
Apr 21	1215	--	1.6	2.8	3.0	.15	.07	1.6	3.2	3.5
May 20	1020	--	.8	2.3	3.8	.05	.02	1.1	2.7	3.4
June 17	1405	--	.7	1.7	2.3	.07	.03	--	--	--
July 01	1315	--	1.0	1.9	2.0	.15	.07	1.0	2.3	2.8
15	1235	.72	.7	1.6	2.0	.08	.03	.7	1.6	1.8
Aug 07	1325	.75	.5	1.1	1.2	.12	.05	1.0	2.1	2.4
Sept 11	1105	--	--	--	--	--	--	1.7	3.0	3.1

TABLE 17.--*Water-quality data for the West Fork Carson River at Woodfords, Calif., water year 1980*

[Abbreviations: BIOCHEM, biochemical; CARBON., carbonaceous; CELLS/ML, cells per milliliter; CHROMO, chromatography; DEG C, degrees Celsius; DIAM., diameter; FET-FLD, fixed-endpoint titration in field; FLUOROM, fluormeter; FT^3/S, cubic feet per second; MG/L, milligrams per liter; MM of HG, millimeters of Mercury; SED,sediment; SUSP., suspended; T/D, tons per day; UG/L, micrograms per liter; ULT, ultimate; UMHOS, micromhos per centimeter at 25°C; UNIHIB, uninhibited; <, less than; --, data not available]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH, FIELD (UNITS)	BARO-METRIC PRES-SURE (MM OF HG)	TEMPER-ATURE, WATER (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	BICAR-BONATE FET-FLD (MG/L AS HCO3)	CAR-BONATE FET-FLD (MG/L AS CO3)	SOLIDS, RESIDUE AT 180°C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (T/D)
OCT												
16...	0950	13	79	7.8	--	7.0	9.5	--	--	--	58	2.0
NOV												
18...	1030	20	73	7.7	--	1.5	11.0	--	44	0	59	3.1
DEC												
11...	0915	9.6	79	7.5	620	.0	12.0	101	47	0	53	1.3
JAN												
12...	1055	153	53	7.4	--	1.5	10.8	--	28	0	47	19.4
16...	0900	225	46	7.7	--	1.5	--	--	25	0	41	24.9
FEB												
11...	1315	57	71	--	--	1.5	11.6	--	--	--	58	8.9
MAR												
10...	0840	46	73	7.7	--	.0	11.5	--	--	--	57	7.0
APR												
14...	0900	205	53	--	--	3.0	11.0	--	--	--	47	26.0
21...	0920	364	47	--	--	1.5	11.4	--	--	--	42	41.3
30...	0925	529	44	7.6	616	2.0	11.3	101	23	0	29	41.4
MAY												
06...	0920	676	42	7.0	618	4.5	10.8	103	11	0	38	69.4
20...	0805	603	42	7.8	618	4.5	10.0	95	24	0	37	60.2
JUN												
02...	0930	315	46	7.6	612	4.5	9.8	94	37	0	47	40.0
17...	1110	352	42	7.6	618	7.5	9.4	96	24	0	34	32.3
JUL												
01...	1000	367	38	7.3	--	9.0	9.7	--	30	0	33	32.7
15...	1000	189	43	7.5	622	11.0	9.0	100	22	0	37	18.9
AUG												
07...	1040	61	56	7.7	619	12.5	8.5	98	34	0	45	7.4
SEP												
11...	0855	65	59	7.5	621	10.0	9.1	99	35	0	39	6.8

TABLE 17.--*Water-quality data for the West Fork Carson River at Woodfords, Calif., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
16...	0950	13	.00	--	.02	--	.00	.01	.64
NOV									
18...	1030	20	.06	--	.01	--	.08	.05	.21
DEC									
11...	0915	9.6	.05	--	.02	--	.07	.04	.74
JAN									
12...	1055	153	.04	--	.02	--	.01	.01	1.7
16...	0900	225	.08	--	.00	--	.00	.00	1.0
FEB									
11...	1315	57	--	.04	--	.00	.12	.06	--
MAR									
10...	0840	46	--	.03	--	.01	.04	.04	.27
APR									
14...	0900	205	--	.06	--	.00	.02	.02	.41
21...	0920	364	--	.03	--	.00	.06	.00	.50
30...	0925	529	--	.02	--	.00	.00	.00	.62
MAY									
06...	0920	676	--	.06	--	.00	.02	.03	--
20...	0805	603	--	.02	--	.00	.01	.03	.31
JUN									
02...	0930	315	--	.01	--	.01	.09	.04	.28
17...	1110	352	--	.00	--	.00	.01	.01	.86
JUL									
01...	1000	367	--	.00	--	.00	.00	.00	1.0
15...	1000	189	--	.00	--	.00	.01	.00	--
AUG									
07...	1040	61	--	.00	--	.01	.00	.00	.45
SEP									
11...	0855	65	--	.00	--	.00	.00	.00	.27

DATE	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	ALGAL GROWTH POTEN-TIAL, BOTTLE TEST (MG/L)
OCT									
16...	.55	.01	--	.01	1.5	.2	.066	<.095	--
NOV									
18...	.17	--	--	.04	3.9	.2	.149	<.112	.8
DEC									
11...	.39	.02	--	.03	1.7	.1	.130	<.080	6.7
JAN									
12...	.39	.23	--	.02	8.4	--	5.25	1.08	7.5
16...	.85	.02	--	.01	5.5	--	.184	<.103	.9
FEB									
11...	--	.01	.01	--	2.3	.3	.222	.000	2.0
MAR									
10...	.11	.02	.01	.03	2.0	.1	--	--	4.8
APR									
14...	.29	.05	.02	--	6.7	.7	.417	.050	2.7
21...	.34	.05	.02	.02	7.7	.7	.227	<.109	--
30...	.52	.05	.02	.01	3.4	.5	.073	<.081	.3
MAY									
06...	.42	.05	.01	--	3.2	.4	.259	<.056	2.1
20...	.34	.07	.01	.03	2.3	.2	.206	.065	.3
JUN									
02...	.30	--	--	.06	3.1	.2	.062	<.063	.6
17...	.52	.03	.04	.01	2.5	--	.165	<.077	1.7
JUL									
01...	.76	.03	.01	.00	3.6	.4	.279	.057	1.6
15...	--	.03	.02	.00	1.9	.5	.233	<.102	1.9
AUG									
07...	.43	.04	.03	.01	--	.1	.039	<.077	1.5
SEP									
11...	.11	.02	.03	.01	2.3	.6	.678	.057	3.6

TABLE 17.--*Water-quality data for the West Fork Carson River at Woodfords, Calif., water year 1980*—Continued

DATE	TIME	STREAM-FLOW INSTAN-TANEOUS (FT^3/S)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/D)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
16...	0950	13	3	.11	—
JAN					
12...	1055	153	247	102	—
16...	0900	225	22	13	—
FEB					
11...	1315	57	7	1.1	—
MAR					
10...	0840	46	7	.87	—
APR					
14...	0900	205	29	16	—
21...	0920	364	31	30	—
30...	0925	529	95	136	—
MAY					
06...	0920	676	54	99	—
20...	0805	603	140	228	28
JUN					
02...	0930	315	16	14	—
17...	1110	352	19	18	—
JUL					
01...	1000	367	29	29	—
15...	1000	189	7	3.6	—
AUG					
07...	1040	61	4	.66	—
SEP					
11...	0855	65	4	.70	—

TABLE 17.--*Water-quality data for the West Fork Carson River at Woodfords, Calif., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 16,79	JAN 12,80	JAN 16,80	APR 14,80	MAY 20,80
TIME	0950	1055	0900	0900	0805
TOTAL CELLS/ML	13	1900	220	1200	13
DIVERSITY: DIVISION	0.0	1.4	1.0	1.2	0.0
.CLASS	0.0	1.4	1.0	1.2	0.0
..ORDER	0.0	1.5	1.5	1.2	0.0
...FAMILY	0.0	2.2	2.7	2.3	0.0
....GENUS	0.0	2.8	2.8	2.7	0.0

ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)										
.CHLOROPHYCEAE										
..CHLOROCOCCALES										
...COELASTRACEAE										
....COELASTRUM	--	-	--	-	--	-	--	-	--	-
...HYDRODICTYACEAE										
....PEDIASTRUM	--	-	240	13	--	-	--	-	--	-
...OOCYSTACEAE										
....ANKISTRODESMUS	--	-	13	1	5	2	14	1	--	-
....OOCYSTIS	--	-	--	-	--	-	14	1	--	-
...SCENEDESMACEAE										
....SCENEDESMUS	--	-	--	-	--	-	--	-	--	-
..VOLVOCALES										
...CHLAMYDOMONADACEAE										
....CHLAMYDOMONAS	13#	100	--	-	--	-	--	-	--	-
CHRYSOPHYTA										
.BACILLARIOPHYCEAE										
..CENTRALES										
...COSCINODISCACEAE										
....CYCLOTELLA	--	-	65	3	--	-	--	-	--	-
....MELOSIRA	--	-	--	-	25	11	--	-	--	-
..PENNALES										
...ACHNANTHACEAE										
....COCCONEIS	--	-	26	1	5	2	--	-	--	-
....RHOICOSPHENIA	--	-	13	1	--	-	27	2	--	-
...CYMBELLACEAE										
....CYMBELLA	--	-	45	2	20	9	14	1	--	-
...FRAGILARIACEAE										
....FRAGILARIA	--	-	26	1	41#	18	160	13	--	-
....HANNAEA	--	-	32	2	--	-	27	2	--	-
....SYNEDRA	--	-	190	10	5	2	140	11	13#	100
...GOMPHONEMATACEAE										
....GOMPHONEMA	--	-	26	1	20	9	55	4	--	-
...NAVICULACEAE										
....NAVICULA	--	-	84	4	20	9	160	13	--	-
....PINNULARIA	--	-	--	-	--	-	14	1	--	-
...NITZSCHIACEAE										
....NITZSCHIA	--	-	84	4	10	5	69	5	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)										
.CYANOPHYCEAE										
..CHROOCOCCALES										
...CHROOCOCCACEAE										
....ANACYSTIS	--	-	--	-	--	-	--	-	--	-
..HORMOGONALES										
...NOSTOCACEAE										
....ANABAENA	--	-	--	-	--	-	--	-	--	-
...OSCILLATORIACEAE										
....OSCILLATORIA	--	-	240	13	71#	32	520#	42	--	-
....PHORMIDIUM	--	-	--	-	--	-	--	-	--	-
....SCHIZOTHRIX	--	-	790#	42	--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)										
.EUGLENOPHYCEAE										
..EUGLENALES										
...EUGLENACEAE										
....TRACHELOMONAS	--	-	--	-	--	-	27	2	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 17.--*Water-quality data for the West Fork Carson River at Woodfords, Calif., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JUNE 2,80		JULY 1,80		JULY 15,80		SEP 11,80	
TIME	0930		1000		1000		0855	
TOTAL CELLS/ML	3500		90		1400		500	
DIVERSITY: DIVISION	0.4		0.6		0.3		0.9	
.CLASS	0.4		0.6		0.3		0.9	
..ORDER	0.4		1.4		0.3		1.8	
...FAMILY	0.7		1.4		0.3		2.0	
....GENUS	1.0		1.4		0.3		2.0	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...COELASTRACEAE								
....COELASTRUM	160	4	--	-	--	-	--	-
...HYDRODICTYACEAE								
....PEDIASTRUM	--	-	--	-	--	-	--	-
...OOCYSTACEAE								
....ANKISTRODESMUS	*	0	--	-	--	-	--	-
....OOCYSTIS	*	0	--	-	--	-	--	-
...SCENEDESMACEAE								
....SCENEDESMUS	26	1	--	-	26	2	--	-
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	--	-	13	14	--	-	--	-
CHRYSOPHYTA								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....CYCLOTELLA	--	-	--	-	39	3	120#	23
....MELOSIRA	39	1	--	-	--	-	--	-
..PENNALES								
...ACHNANTHACEAE								
....COCCONEIS	--	-	--	-	--	-	--	-
....RHOICOSPHENIA	--	-	--	-	--	-	--	-
...CYMBELLACEAE								
....CYMBELLA	--	-	--	-	--	-	13	3
...FRAGILARIACEAE								
....FRAGILARIA	--	-	--	-	--	-	--	-
....HANNAEA	--	-	--	-	--	-	--	-
....SYNEDRA	--	-	--	-	--	-	--	-
...GOMPHONEMATACEAE								
....GOMPHONEMA	--	-	--	-	--	-	13	3
...NAVICULACEAE								
....NAVICULA	*	0	--	-	--	-	--	-
....PINNULARIA	--	-	--	-	--	-	--	-
...NITZSCHIACEAE								
....NITZSCHIA	--	-	--	-	--	-	26	5
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..CHROOCOCCALES								
...CHROOCOCCACEAE								
....ANACYSTIS	--	-	39#	43	--	-	230#	46
..HORMOGONALES								
...NOSTOCACEAE								
....ANABAENA	100	3	39#	43	--	-	--	-
...OSCILLATORIACEAE								
....OSCILLATORIA	190	6	--	-	1300#	95	--	-
....PHORMIDIUM	2900#	84	--	-	--	-	100#	21
....SCHIZOTHRIX	--	-	--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)								
.EUGLENOPHYCEAE								
..EUGLENALES								
...EUGLENACEAE								
....TRACHELOMONAS	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 17.--*Water-quality data for the West Fork Carson River at Woodfords, Calif., water year 1980*--Continued

DATE	TIME	OXYGEN DEMAND, OXYGEN BIOCHEM CARBON. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM CARBON. 5-DAY (MG/L)	OXYGEN-ATION DEMAND, BIOCHEM CARBON. 20-DAY (MG/L)	OXYGEN-ATION DEMAND, BIOCHEM CARBON. ULT. (MG/L)	DEOXYGE-NATION CARBON. (K1 TO BASE E PER DAY AT 20°C)	DEOXYGE-NATION CARBON. (K1 TO BASE 10 PER DAY AT 20°C)	OXYGEN DEMAND, BIOCHEM UNINHIB 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB ULT. (MG/L)
1979										
Nov										
18	1030	--	1.0	3.0	6.0	0.04	0.02	1.4	3.1	3.6
Dec										
11	0915	--	2.1	3.6	3.8	.16	.06	--	--	--
1980										
Jan										
12	1055	--	4.7	11.7	15.1	.07	.03	5.5	13.0	16.0
16	0900	.32	1.8	3.4	3.6	.14	.06	2.1	3.7	3.9
Feb										
11	1315	--	1.1	2.9	3.8	.07	.03	1.0	2.5	3.6
Mar										
10	0840	.15	1.3	2.2	2.3	.17	.07	1.1	2.4	2.8
Apr										
21	0920	.22	2.3	3.6	3.7	.20	.09	2.0	3.6	3.8
May										
20	0805	--	1.1	2.5	3.1	.09	.04	.9	2.4	3.4
June										
02	0930	.55	.8	1.6	1.8	.12	.05	.7	1.1	1.1
17	1110	--	.9	2.0	2.2	.10	.04	1.3	2.2	2.3
July										
01	1000	--	.6	1.3	1.5	.11	.05	1.3	2.3	2.4
15	1000	.72	.9	1.8	2.0	.11	.05	.9	1.9	2.2
Aug										
07	1040	--	--	--	--	--	--	.8	1.6	1.8

TABLE 18.--*Water-quality data for the Careon River near Carson City, Nev., water year 1980*

[Abbreviations: BIOCHEM, biochemical; CARBON., carbonaceous; CELLS/ML, cells per milliliter; CHROMO, chromatography; DEG C, degrees Celsius; DIAM., diameter; FET-FLD, fixed-endpoint titration in field; FLUOROM, fluormeter; FT^3/S, cubic feet per second; MG/L, milligrams per liter; MM of HG, millimeters of Mercury; NITROG, nitrogenous; SED, sediment; SUSP., suspended; T/D, tons per day; UG/L, micrograms per liter; ULT, ultimate; UMHOS, micromhos per centimeter at 25°C; UNIHIB, uninhibited; <, less than; --, dete not available]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH, FIELD (UNITS)	BARO-METRIC PRES-SURE (MM OF HG)	TEMPER-ATURE, WATER (DEG C)	OXYGEN, DIS SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	BICAR-BONATE FET-FLD (MG/L AS HCO3)	CAR-BONATE FET-FLD (MG/L) AS CO3)	SOLIDS, RESIDUE AT 180°C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (T/D)
OCT												
17...	1505	54	402	8.5	--	15.5	10.8	129	--	--	258	37.6
NOV												
19...	1555	157	282	8.4	--	3.0	12.2	109	--	--	163	69.1
DEC												
12...	0900	135	320	8.1	--	.0	11.0	90	110	0	200	72.9
JAN												
13...	1100	3160	163	7.8	643	5.0	9.4	87	65	0	122	1040
17...	0940	1510	177	7.6	--	5.0	9.2	87	72	0	126	514
FEB												
12...	0830	325	251	7.5	--	3.5	10.5	95	74	0	170	149
MAR												
11...	0830	482	275	7.8	--	6.5	9.6	94	95	0	173	225
APR												
15...	0925	874	151	7.3	650	9.5	9.0	92	44	0	102	241
22...	0930	1340	125	7.7	641	6.5	9.9	94	49	0	88	318
MAY												
01...	0850	1700	109	7.6	644	9.5	9.1	94	46	0	--	--
06...	1030	2630	88	7.6	644	10.0	8.8	92	43	0	64	454
21...	1025	2390	81	7.6	642	11.5	8.4	91	38	0	61	394
JUN												
02...	0920	1180	128	7.6	638	11.0	8.4	90	57	0	98	312
18...	1000	1700	91	7.5	645	14.5	7.9	92	42	0	65	298
JUL												
02...	1340	1980	86	7.7	648	14.5	8.1	93	46	0	65	347
16...	0910	493	140	7.7	650	18.0	7.0	85	63	0	103	137
AUG												
08...	1235	119	351	8.1	643	23.0	7.3	100	140	0	230	73.9
SEP												
12...	0920	147	338	7.9	645	16.0	6.8	81	150	0	212	84.1

TABLE 18.--*Water-quality data for the Carson River near Carson City, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
17...	1505	54	0.15	--	0.12	--	0.05	0.03	0.74
NOV									
19...	1555	157	.35	--	.01	--	.10	.05	.33
DEC									
12...	0900	135	.26	--	.04	--	.19	.19	--
JAN									
13...	1100	3160	.16	--	.05	--	.11	.09	1.5
17...	0940	1510	.20	--	.06	--	.07	.06	1.2
FEB									
12...	0830	325	--	.25	--	.01	.22	.22	.44
MAR									
11...	0830	482	--	.16	--	.01	.09	.09	.50
APR									
15...	0925	874	--	.05	--	.00	.04	--	.55
22...	0930	1340	--	.08	--	.00	.12	.00	.62
MAY									
01...	0850	1700	--	.15	--	.00	.06	.04	1.0
06...	1030	2630	--	.06	--	.00	.04	.04	.65
21...	1025	2390	--	.04	--	.00	.03	.01	--
JUN									
02...	0920	1180	--	.06	--	.01	.04	.06	.54
18...	1000	1700	--	.01	--	.01	.03	.01	.46
JUL									
02...	1340	1950	--	.05	--	.00	--	.06	--
16...	0910	493	--	.02	--	.01	.05	.02	--
AUG									
08...	1235	119	--	.36	--	.08	.11	.11	.99
SEP									
12...	0920	147	--	.15	--	.02	.08	.10	1.1

DATE	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	ALGAL GROWTH POTEN-TIAL, BOTTLE TEST (MG/L)
OCT									
17...	0.58	0.37	--	0.36	6.9	0.6	2.83	0.191	--
NOV									
19...	.15	.24	--	.26	--	.4	.595	<.112	15
DEC									
12...	--	.28	--	.16	5.0	.0	8.26	.299	24
JAN									
13...	1.2	.72	--	.10	15	.9	1.66	<.185	23
17...	.88	.42	--	.07	7.4	1.1	.241	<.079	18
FEB									
12...	.44	.16	.10	.09	5.7	.7	.399	.045	20
MAR									
11...	.57	.19	.09	--	3.3	2.5	1.00	<.119	15
APR									
15...	--	--	.07	--	4.0	1.4	.834	.040	--
22...	.44	.25	.05	.05	4.8	1.0	.461	<.147	5.9
MAY									
01...	.30	.28	.06	.08	4.5	1.1	.160	<.090	8.4
06...	.35	.36	.05	.04	4.2	--	.172	<.075	3.8
21...	--	.46	.05	.05	6.6	2.2	.370	.058	2.4
JUN									
02...	.55	--	--	.06	5.6	.5	.468	.060	6.7
18...	.42	.21	.09	.05	3.7	.8	.763	.101	2.7
JUL									
02...	.66	.30	.09	.05	4.7	--	.441	.269	1.8
16...	.55	.20	.13	.08	7.6	.3	.677	.059	6.6
AUG									
08...	.99	.44	.38	.20	--	.2	1.62	.229	13
SEP									
12...	.76	.34	.25	.22	12	1.0	2.02	.245	12

TABLE 18.--*Water-quality data for Carson River near Carson City, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/D)	SED. SUSP. FALL DIAM. % FINER THAN .002 MM	SED. SUSP. FALL DIAM. % FINER THAN .004 MM	SED. SUSP. FALL DIAM. % FINER THAN .008 MM	SED. SUSP. FALL DIAM. % FINER THAN .016 MM
OCT								
17...	1505	54	9	1.3	--	--	--	--
JAN								
13...	1100	3160	971	8290	--	15	19	23
17...	0940	1510	280	1140	22	28	35	44
FEB								
12...	0830	325	22	19	--	--	--	--
MAR								
11...	0830	482	72	94	--	--	--	--
APR								
15...	0925	874	271	640	--	--	--	--
22...	0930	1340	236	854	--	--	--	--
MAY								
01...	0850	1700	320	1470	--	--	--	--
06...	1030	2630	490	3480	17	23	30	39
21...	1025	2390	570	3680	--	--	--	--
JUN								
02...	0920	1180	146	465	--	--	--	--
18...	1000	1700	232	1070	--	--	--	--
JUL								
02...	1340	1980	342	1830	--	--	--	--
16...	0910	493	64	85	--	--	--	--
AUG								
08...	1235	119	16	5.1	--	--	--	--
SEP								
12...	0920	147	36	14	--	--	--	--

DATE	SED. SUSP. FALL DIAM. % FINER THAN .031 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .125 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .250 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .500 MM	SED. SUSP. SIEVE DIAM. % FINER THAN 1.00 MM	SED. SUSP. SIEVE DIAM. % FINER THAN 2.00 MM
OCT							
17...	--	--	--	--	--	--	--
JAN							
13...	27	31	38	53	73	90	99
17...	54	65	79	91	99	100	--
FEB							
12...	--	--	--	--	--	--	--
MAR							
11...	--	--	--	--	--	--	--
APR							
15...	--	67	--	--	--	--	--
22...	--	56	--	--	--	--	--
MAY							
01...	--	55	--	--	--	--	--
06...	48	55	65	81	98	100	--
21...	--	60	--	--	--	--	--
JUN							
02...	--	48	--	--	--	--	--
18...	--	47	--	--	--	--	--
JUL							
02...	--	52	--	--	--	--	--
16...	--	--	--	--	--	--	--
AUG							
08...	--	--	--	--	--	--	--
SEP							
12...	--	--	--	--	--	--	--

TABLE 18.--*Water-quality data for the Carson River near Carson City, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 17,79	JAN 13,80	JAN 17,80	APR 15,80	MAY 21,80	JUNE 2,80
TIME	1505	1100	0940	0925	1025	0920
TOTAL CELLS/ML	2700	480	1200	680	90	370
DIVERSITY: DIVISION	0.6	1.0	1.1	0.4	0.0	1.1
.CLASS	0.6	1.0	1.1	0.4	0.0	1.1
..ORDER	1.1	1.3	1.5	1.0	0.9	1.3
...FAMILY	1.2	2.0	3.0	2.8	0.9	1.6
....GENUS	1.2	2.2	3.4	3.0	0.9	1.6

ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)												
.CHLOROPHYCEAE												
..CHLOROCOCCALES												
...MICRACTINIACEAE												
....MICRACTINIUM	--	-	--	-	--	-	--	-	--	-	--	-
...OOCYSTACEAE												
....ANKISTRODESMUS	--	-	--	-	--	-	--	-	--	-	13	3
....SELENASTRUM	--	-	--	-	--	-	--	-	--	-	--	-
...SCENEDESMACEAE												
....SCENEDESMUS	200	8	--	-	24	2	53	8	--	-	--	-
..VOLVOCALES												
...CHLAMYDOMONADACEAE												
....CHLAMYDOMONAS	25	1	--	-	--	-	--	-	--	-	13	3
...PHACOTACEAE												
....PTEROMONAS	--	-	--	-	--	-	--	-	--	-	--	-
CHRYSOPHYTA												
.BACILLARIOPHYCEAE												
..CENTRALES												
...COSCINODISCACEAE												
....CYCLOTELLA	2100#	78	20	4	53	4	39	6	26#	29	13	3
....MELOSIRA	--	-	25	5	47	4	--	-	--	-	--	-
....STEPHANODISCUS	--	-	--	-	--	-	66	10	--	-	--	-
..PENNALES												
...ACHNANTHACEAE												
....ACHNANTHES	--	-	--	-	--	-	--	-	--	-	--	-
....COCCONEIS	--	-	--	-	30	2	26	4	--	-	--	-
....RHOICOSPHENIA	--	-	--	-	18	1	--	-	--	-	--	-
...CYMBELLACEAE												
....CYMBELLA	--	-	5	1	*	0	39	6	--	-	--	-
....EPITHEMIA	--	-	--	-	36	3	--	-	--	-	--	-
...DIATOMACEAE												
....DIATOMA	--	-	--	-	36	3	--	-	--	-	--	-
...EUNOTIACEAE												
....EUNOTIA	--	-	--	-	*	0	--	-	--	-	--	-
...FRAGILARIACEAE												
....FRAGILARIA	--	-	--	-	210#	17	140#	21	--	-	51	14
....SYNEDRA	--	-	40	8	110	9	13	2	--	-	--	-
...GOMPHONEMATACEAE												
....GOMPHONEMA	--	-	--	-	36	3	79	12	--	-	13	3
...NAVICULACEAE												
....NAVICULA	76	3	66	14	36	3	66	10	--	-	13	3
....PLEUROSIGMA	--	-	5	1	--	-	--	-	--	-	--	-
...NITZSCHIACEAE												
....NITZSCHIA	200	8	76#	16	140	11	160#	23	64#	71	--	-
CRYPTOPHYTA (CRYPTOMONADS)												
.CRYPTOPHYCEAE												
..CRYPTOMONADALES												
...CRYPTOCHRYSIDACEAE												
....CHROOMONAS	25	1	--	-	--	-	--	-	--	-	--	-
...CRYPTOMONADACEAE												
....CRYPTOMONAS	25	1	--	-	--	-	--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)												
.CYANOPHYCEAE												
..CHROOCOCCALES												
...CHROOCOCCACEAE												
....AGMENELLUM	--	-	--	-	--	-	--	-	--	-	--	-
....ANACYSTIS	--	-	--	-	--	-	--	-	--	-	--	-
..HORMOGONALES												
...NOSTOCACEAE												
....ANABAENA	--	-	240#	51	260#	21	--	-	--	-	--	-
...OSCILLATORIACEAE												
....LYNGBYA	--	-	--	-	--	-	--	-	--	-	--	-
....OSCILLATORIA	--	-	--	-	190#	15	--	-	--	-	260#	69
EUGLENOPHYTA (EUGLENOIDS)												
.EUGLENOPHYCEAE												
..EUGLENALES												
...EUGLENACEAE												
....EUGLENA	--	-	--	-	--	-	--	-	--	-	--	-
....TRACHELOMONAS	25	1	--	-	12	1	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 18.--*Water-quality data for the Carson River near Carson City, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JULY 2,80	JULY 16,80	AUG 8,80	SEP 12,80
TIME	1340	0910	1235	0920
TOTAL CELLS/ML	1400	90	1000	1300
DIVERSITY: DIVISION	0.5	0.6	1.6	1.2
.CLASS	0.5	0.6	1.6	1.2
..ORDER	1.2	1.1	2.3	2.0
...FAMILY	1.3	1.1	2.7	2.8
....GENUS	1.3	1.1	2.9	3.0

ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...MICRACTINIACEAE								
....MICRACTINIUM	--	-	--	-	26	3	--	-
...OOCYSTACEAE								
....ANKISTRODESMUS	--	-	13	14	13	1	13	1
....SELENASTRUM	--	-	--	-	13	1	13	1
...SCENEDESMACEAE								
....SCENEDESMUS	--	-	--	-	--	-	52	4
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	--	-	--	-	64	6	52	4
...PHACOTACEAE								
....PTEROMONAS	--	-	--	-	13	1	--	-
CHRYSOPHYTA								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....CYCLOTELLA	--	-	13	14	210#	20	140	11
....MELOSIRA	--	-	--	-	52	5	150	12
....STEPHANODISCUS	--	-	--	-	--	-	--	-
..PENNALES								
...ACHNANTHACEAE								
....ACHNANTHES	--	-	--	-	--	-	--	-
....COCCONEIS	--	-	--	-	--	-	--	-
....RHOICOSPHENIA	--	-	--	-	--	-	--	-
...CYMBELLACEAE								
....CYMBELLA	--	-	--	-	--	-	--	-
....EPITHEMIA	--	-	--	-	--	-	--	-
...DIATOMACEAE								
....DIATOMA	--	-	--	-	--	-	--	-
...EUNOTIACEAE								
....EUNOTIA	--	-	--	-	--	-	--	-
...FRAGILARIACEAE								
....FRAGILARIA	--	-	--	-	--	-	120	9
....SYNEDRA	--	-	--	-	--	-	--	-
...GOMPHONEMATACEAE								
....GOMPHONEMA	13	1	--	-	--	-	--	-
...NAVICULACEAE								
....NAVICULA	77	6	--	-	90	9	170	13
....PLEUROSIGMA	--	-	--	-	--	-	--	-
...NITZSCHIACEAE								
....NITZSCHIA	52	4	65#	71	150#	15	350#	26
CRYPTOPHYTA (CRYPTOMONADS)								
.CRYPTOPHYCEAE								
..CRYPTOMONADALES								
...CRYPTOCHRYSIDACEAE								
....CHROOMONAS	--	-	--	-	--	-	--	-
...CRYPTOMONADACEAE								
....CRYPTOMONAS	--	-	--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..CHROOCOCCALES								
...CHROOCOCCACEAE								
....AGMENELLUM	280#	20	--	-	--	-	52	4
....ANACYSTIS	--	-	--	-	26	3	--	-
..HORMOGONALES								
...NOSTOCACEAE								
....ANABAENA	--	-	--	-	--	-	--	-
...OSCILLATORIACEAE								
....LYNGBYA	970#	69	--	-	--	-	--	-
....OSCILLATORIA	--	-	--	-	320#	32	230#	17
EUGLENOPHYTA (EUGLENOIDS)								
.EUGLENOPHYCEAE								
..EUGLENALES								
...EUGLENACEAE								
....EUGLENA	--	-	--	-	26	3	--	-
....TRACHELOMONAS	--	-	--	-	13	1	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 18.--*Water-quality data for the Carson River near Carson City, Nev., water year 1980*--Continued

DATE	TIME	OXYGEN DEMAND, BIOCHEM CARBON. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM CARBON. 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. ULT. (MG/L)	DEOXYGE-NATION CARBON. (K1 TO BASE E PER DAY AT 20°C)	DEOXYGE-NATION CARBON. (K1 TO BASE 10 PER DAY AT 20°C)	OXYGEN DEMAND, BIOCHEM UNINHIB 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB ULT. (MG/L)	OXYGEN DEMAND, BIOCHEM NITROG. DAYS LAGTIME AT 20°C	OXYGEN DEMAND, BIOCHEM NITROG. ULT. (MG/L)
1979												
Oct 17	1505	--	1.8	3.4	3.6	0.13	0.06	1.8	4.8	6.6	--	--
Nov 19	1555	1.27	1.7	4.5	6.3	.06	.03	1.6	3.9	4.9	--	--
Dec 12	0900	.21	2.4	5.0	5.6	.11	.05	2.2	4.9	5.7	--	--
1980												
Jan 13	1100	--	3.8	9.1	11.3	0.08	0.03	4.5	10.8	13.5	--	--
17	0940	--	1.9	4.0	4.4	.11	.05	1.7	4.0	4.9	--	--
Feb 12	0830	.33	1.2	2.6	3.0	.10	.04	1.2	3.4	3.9	5.0	.9
Mar 11	0830	--	1.3	2.3	2.4	.16	.07	1.3	2.6	2.9	--	--
Apr 15	0925	.39	1.2	2.8	3.4	.09	.04	1.3	3.2	3.9	--	--
May 01	0850	--	1.4	2.9	3.3	.11	.05	1.8	3.0	3.1	--	--
06	1030	--	1.3	3.0	3.8	.08	.03	1.6	3.4	3.8	--	--
21	1025	.68	1.2	2.3	2.5	.13	.06	1.3	2.9	3.4	--	--
June 18	1000	--	.8	2.1	3.0	.06	.03	.9	3.0	3.7	7.9	.9
July 02	1340	--	1.8	4.1	4.9	.09	.04	1.3	3.6	5.4	--	--
16	0910	--	1.2	2.4	2.6	.12	.05	1.6	3.4	3.8	--	--
Aug 08	1235	--	1.2	2.9	3.6	.08	.03	1.8	5.2	9.6	8.1	6.4
Sept 12	0920	.38	1.7	3.2	3.4	.15	.07	2.1	4.3	4.8	--	--

TABLE 19.--*Water-quality data for Carson River at Deer Run Road near Carson City, Nev., water year 1980*

[Abbreviations: BIOCHEM, biochemical; CARBON., carbonaceous; CELLS/ML, cells per milliliter; CHROMO, chromatography; DEG C, degrees Celsius; DIAM., diameter; FET-FLD, fixed-endpoint titration in field; FLUOROM, fluormeter; FT^3/S, cubic feet per second; MG/L, milligrams per liter; MM of HG, millimeters of Mercury; SED, sediment; SUSP., suspended; T/D, tons per day; UG/L, micrograms per liter; ULT, ultimate; UMHOS, micromhos per centimeter at 25°C; UNIHIB, uninhibited; <, less than; --, data not available]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH, FIELD (UNITS)	BARO-METRIC PRES-SURE (MM OF HG)	TEMPER-ATURE, WATER (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	BICAR-BONATE FET-FLD (MG/L AS HCO3)	CAR-BONATE FET-FLD (MG/L AS CO3)	SOLIDS, RESIDUE AT 180°C DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (T/D)
OCT												
17...	1715	77	505	8.6	--	16.0	10.0	120	--	--	--	--
NOV												
19...	1225	132	316	8.7	--	5.0	--	--	--	--	193	68.8
DEC												
12...	1120	76	343	8.2	--	1.5	--	--	120	0	215	44.1
JAN												
13...	1330	3520	165	7.8	644	6.5	9.8	94	66	0	118	1120
17...	1130	1420	186	7.6	--	5.0	10.0	93	71	0	130	498
FEB												
12...	1350	325	273	7.8	641	7.0	10.2	100	95	0	182	160
19...	1455	2660	226	7.9	--	5.0	--	--	--	--	161	1160
MAR												
11...	1040	497	293	8.0	642	7.5	9.6	95	100	0	191	256
APR												
15...	1130	937	160	7.8	--	11.5	9.3	102	53	0	112	283
22...	1255	1250	132	7.6	640	7.0	10.0	98	50	0	91	307
MAY												
01...	1145	1700	111	7.4	643	11.0	9.2	99	49	0	97	445
06...	1235	2610	93	7.6	643	11.5	9.2	100	44	0	62	437
21...	1245	2440	83	7.6	641	12.5	8.4	93	33	0	63	415
JUN												
02...	1200	1160	135	7.7	638	11.0	9.0	97	57	0	100	313
18...	1205	1810	94	7.7	645	15.5	8.2	96	44	0	70	342
JUL												
02...	1020	1830	97	7.8	649	15.5	8.2	95	47	0	67	331
16...	1130	486	150	7.9	--	20.5	7.7	101	63	0	111	146
AUG												
08...	1520	104	387	8.5	644	25.5	8.6	125	140	4	247	69.4
SEP												
12...	1200	154	364	8.0	645	20.0	7.9	101	160	0	250	104

TABLE 19.--*Water-quality data for Careon River at Deer Run Road near Carson City, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
17...	1715	77	.12	--	.30	--	.64	.33	.76
NOV									
19...	1225	132	.42	--	.11	--	.29	.25	.35
DEC									
12...	1120	76	.41	--	.30	--	.12	.12	.39
JAN									
13...	1330	3520	.14	--	.12	--	.12	.10	1.5
17...	1130	1420	.21	--	.08	--	.07	.06	1.3
FEB									
12...	1350	325	--	.30	--	.05	.42	.43	.49
19...	1455	2660	--	.22	--	.01	.27	.15	1.0
MAR									
11...	1040	497	--	.20	--	.01	.18	.18	.58
APR									
15...	1130	937	--	.08	--	.00	.06	--	.64
22...	1255	1250	--	.08	--	.01	.20	.88	.80
MAY									
01...	1145	1700	--	.08	--	.00	.04	.01	.66
06...	1235	2610	--	.06	--	.00	.06	.04	.87
21...	1245	2440	--	.06	--	.00	.04	.03	.57
JUN									
02...	1200	1160	--	.07	--	.01	.04	.04	.48
18...	1205	1810	--	.03	--	.01	.03	.01	.49
JUL									
02...	1020	1830	--	.02	--	.00	.00	.00	1.1
16...	1130	486	--	.03	--	.01	.04	.06	--
AUG									
08...	1520	104	--	.31	--	.07	.07	.10	1.3
SEP									
12...	1200	154	--	.20	--	.03	.12	.11	1.5

DATE	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	ALGAL GROWTH POTEN-TIAL, BOTTLE TEST (MG/L)
OCT									
17...	.67	1.00	--	.85	15	.6	1.05	.095	--
NOV									
19...	.22	.40	--	.36	14	.2	.744	<.112	17
DEC									
12...	.32	.44	--	.34	5.3	.4	.648	.040	33
JAN									
13...	.74	.68	--	.12	--	2.5	3.04	.308	26
17...	.82	.41	--	.10	7.4	.7	.241	<.079	25
FEB									
12...	.41	.31	.24	.27	3.4	.9	.532	.045	26
19...	.84	.57	.18	.20	16	3.2	--	--	--
MAR									
11...	.51	.23	--	--	--	.2	.150	.059	17
APR									
15...	--	.30	.06	.07	3.8	1.6	1.29	.104	--
22...	.86	.29	.08	.05	4.4	1.1	.546	<.130	9.8
MAY									
01...	.34	.30	.06	.07	--	.8	.218	<.081	9.1
06...	.41	.36	.05	.05	5.9	.9	.253	<.073	3.9
21...	.38	.42	.07	.07	4.9	1.5	.370	<.116	6.1
JUN									
02...	.50	.16	.08	.07	5.1	.5	.559	.072	6.1
18...	.46	.20	.10	.07	5.2	.5	.844	.131	3.4
JUL									
02...	.58	.20	.09	.05	6.3	.7	.286	.048	2.8
16...	.65	.21	.16	.11	4.1	.3	.707	.104	6.0
AUG									
08...	.69	.60	.54	.14	9.0	.5	1.96	.258	18
SEP									
12...	.58	.38	.30	.27	13	--	2.19	.284	--

TABLE 19.--*Water-quality data for Carson River at Deer Run Road near Carson City, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (FT^3/S)	SEDIMENT, SUSPENDED (MG/L)	SEDIMENT, DISCHARGE, SUSPENDED (T/D)	SED. SUSP. FALL DIAM. % FINER THAN .002 MM	SED. SUSP. FALL DIAM. % FINER THAN .004 MM	SED. SUSP. FALL DIAM. % FINER THAN .008 MM
JAN							
13...	1330	3520	734	6980	--	32	38
17...	1130	1420	252	966	25	31	39
FEB							
12...	1350	325	26	23	--	--	--
19...	1455	2660	466	3350	--	--	--
MAR							
11...	1040	497	49	66	--	--	--
APR							
15...	1130	937	251	635	--	--	--
22...	1255	1250	200	675	--	--	--
MAY							
01...	1145	1700	293	1350	--	--	--
06...	1235	2610	438	3090	--	--	--
21...	1245	2440	485	3200	--	22	33
JUN							
02...	1200	1160	134	420	--	--	--
18...	1205	1810	229	1120	--	--	--
JUL							
02...	1020	1830	192	949	--	--	--
16...	1130	486	37	49	--	--	--
AUG							
08...	1520	104	14	3.9	--	--	--
SEP							
12...	1200	154	30	12	--	--	--

DATE	SED. SUSP. FALL DIAM. % FINER THAN .016 MM	SED. SUSP. FALL DIAM. % FINER THAN .031 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .125 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .250 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .500 MM	SED. SUSP. SIEVE DIAM. % FINER THAN 1.00 MM
JAN							
13...	46	52	60	71	83	96	100
17...	49	60	70	82	96	100	--
FEB							
12...	--	--	--	--	--	--	--
19...	--	--	65	--	--	--	--
MAR							
11...	--	--	--	--	--	--	--
APR							
15...	--	--	68	--	--	--	--
22...	--	--	68	--	--	--	--
MAY							
01...	--	--	62	--	--	--	--
06...	--	--	61	--	--	--	--
21...	45	56	67	79	92	100	--
JUN							
02...	--	--	45	--	--	--	--
18...	--	--	50	--	--	--	--
JUL							
02...	--	--	47	--	--	--	--
16...	--	--	--	--	--	--	--
AUG							
08...	--	--	--	--	--	--	--
SEP							
12...	--	--	--	--	--	--	--

TABLE 19.--*Water-quality data for Carson River at Deer Run Road near Carson City, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 17,79	JAN 13,80	JAN 17,80	APR 15,80	MAY 21,80	JUNE 2,80
TIME	1715	1330	1130	1130	1245	1200
TOTAL CELLS/ML	9000	390	910	780	65	120
DIVERSITY: DIVISION	1.0	1.0	0.2	0.0	0.0	0.0
.CLASS	1.0	1.0	0.2	0.0	0.0	0.0
..ORDER	1.8	1.3	0.6	0.8	0.7	0.9
...FAMILY	2.9	2.1	2.3	2.4	1.5	1.2
....GENUS	3.0	2.2	2.8	3.0	1.5	1.7

ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)												
.CHLOROPHYCEAE												
..CHLOROCOCCALES												
...MICRACTINIACEAE												
....GOLENKINIA	--	-	--	-	--	-	--	-	--	-	--	-
....MICRACTINIUM	--	-	--	-	--	-	--	-	--	-	--	-
...OOCYSTACEAE												
....ANKISTRODESMUS	200	2	--	-	--	-	--	-	--	-	--	-
....CHLORELLA	200	2	--	-	--	-	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	--	-	--	-	--	-	--	-
....TETRAEDRON	--	-	--	-	--	-	--	-	--	-	--	-
...SCENEDESMACEAE												
....CRUCIGENIA	--	-	--	-	--	-	--	-	--	-	--	-
....SCENEDESMUS	890	10	--	-	10	1	--	-	--	-	--	-
..VOLVOCALES												
...CHLAMYDOMONADACEAE												
....CHLAMYDOMONAS	81	1	--	-	10	1	--	-	--	-	--	-
....CHLOROGONIUM	--	-	--	-	--	-	--	-	--	-	--	-
...PHACOTACEAE												
....PTEROMONAS	--	-	--	-	--	-	--	-	--	-	--	-
CHRYSOPHYTA												
.BACILLARIOPHYCEAE												
..CENTRALES												
...COSCINODISCACEAE												
....CYCLOTELLA	2500#	27	35	9	40	4	140#	18	13#	20	13	11
....MELOSIRA	--	-	--	-	40	4	51	7	--	-	65#	56
..PENNALES												
...ACHNANTHACEAE												
....ACHNANTHES	410	5	--	-	--	-	13	2	--	-	--	-
....COCCONEIS	--	-	--	-	20	2	13	2	--	-	--	-
....RHOICOSPHENIA	--	-	--	-	5	1	--	-	--	-	--	-
...CYMBELLACEAE												
....CYMBELLA	120	1	5	1	15	2	64	8	--	-	--	-
....EPITHEMIA	160	2	--	-	35	4	--	-	--	-	--	-
...DIATOMACEAE												
....DIATOMA	--	-	10	3	20	2	--	-	--	-	--	-
....OPEPHORA	--	-	10	3	--	-	--	-	--	-	--	-
...FRAGILARIACEAE												
....FRAGILARIA	2600#	29	--	-	410#	45	77	10	--	-	--	-
....HANNAEA	--	-	--	-	5	1	--	-	--	-	--	-
....SYNEDRA	--	-	30	8	45	5	26	3	--	-	--	-
...GOMPHONEMATACEAE												
....GOMPHONEMA	120	1	10	3	25	3	220#	28	--	-	13	11
...NAVICULACEAE												
....NAVICULA	410	5	25	6	75	8	120	15	26#	40	--	-
....PINNULARIA	--	-	--	-	--	-	51	7	--	-	--	-
...NITZSCHIACEAE												
....NITZSCHIA	490	5	51	13	150#	17	13	2	26#	40	26#	22
RYPTOPHYTA (CRYPTOMONADS)												
.CRYPTOPHYCEAE												
..CRYPTOMONADALES												
...CRYPTOMONADACEAE												
....CRYPTOMONAS	--	-	--	-	--	-	--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)												
.CYANOPHYCEAE												
..CHROOCOCCALES												
...CHROOCOCCACEAE												
....AGMENELLUM	--	-	--	-	--	-	--	-	--	-	--	-
....ANACYSTIS	--	-	--	-	--	-	--	-	--	-	--	-
..HORMOGONALES												
...NOSTOCACEAE												
....ANABAENA	--	-	220#	55	--	-	--	-	--	-	--	-
....CYLINDROSPERMUM	280	3	--	-	--	-	--	-	--	-	--	-
...OSCILLATORIACEAE												
....OSCILLATORIA	--	-	--	-	--	-	--	-	--	-	--	-
....SCHIZOTHRIX	530	6	--	-	--	-	--	-	--	-	--	-
...RIVULARIACEAE												
....RAPHIDIOPSIS	--	-	--	-	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 19.--*Water-quality data for Carson River at Deer Run Road near Carson City, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 17,79		JAN 13,80		JAN 17,80		APR 15,80		MAY 21,80		JUNE 2,80	
TIME	1715		1330		1130		1130		1245		1200	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
EUGLENOPHYTA (EUGLENOIDS)												
.EUGLENOPHYCEAE												
..EUGLENALES												
...EUGLENACEAE												
....TRACHELOMONAS	--	-	--	-	--	-	--	-	--	-	--	-
PYRRHOPHYTA (FIRE ALGAE)												
.DINOPHYCEAE												
..PERIDINIALES												
...GLENODINIACEAE												
....GLENODINIUM	--	-	--	-	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 19.--*Water-quality data for Carson River at Deer Run Road near Carson City, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JULY 2,80		JULY 16,80		AUG 8,80		SEP 12,80	
TIME	1020		1130		1520		1200	
TOTAL CELLS/ML	340		410		3500		2100	
DIVERSITY: DIVISION	1.5		0.7		1.4		1.5	
.CLASS	1.5		0.7		1.4		1.5	
..ORDER	1.9		1.4		2.4		2.3	
...FAMILY	2.3		2.3		2.9		3.1	
....GENUS	2.6		2.6		2.9		3.4	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...MICRACTINIACEAE								
....GOLENKINIA	--	-	--	-	--	-	13	1
....MICRACTINIUM	--	-	--	-	26	1	--	-
...OOCYSTACEAE								
....ANKISTRODESMUS	13	4	--	-	78	2	90	4
....CHLORELLA	--	-	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	39	1	52	3
....TETRAEDRON	--	-	--	-	--	-	13	1
...SCENEDESMACEAE								
....CRUCIGENIA	52#	15	--	-	--	-	--	-
....SCENEDESMUS	--	-	--	-	52	1	280	14
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	--	-	52	13	190	6	65	3
....CHLOROGONIUM	--	-	--	-	39	1	--	-
...PHACOTACEAE								
....PTEROMONAS	--	-	--	-	52	1	--	-
CHRYSOPHYTA								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....CYCLOTELLA	26	8	26	6	340	10	190	9
....MELOSIRA	26	8	52	13	--	-	90	4
..PENNALES								
...ACHNANTHACEAE								
....ACHNANTHES	--	-	--	-	--	-	--	-
....COCCONEIS	--	-	--	-	*	0	--	-
....RHOICOSPHENIA	77#	23	--	-	--	-	13	1
...CYMBELLACEAE								
....CYMBELLA	--	-	--	-	--	-	--	-
....EPITHEMIA	--	-	--	-	--	-	13	1
...DIATOMACEAE								
....DIATOMA	--	-	--	-	--	-	--	-
....OPEPHORA	--	-	--	-	--	-	--	-
...FRAGILARIACEAE								
....FRAGILARIA	26	8	160#	38	--	-	450#	22
....HANNAEA	--	-	--	-	--	-	--	-
....SYNEDRA	--	-	13	3	*	0	13	1
...GOMPHONEMATACEAE								
....GOMPHONEMA	--	-	13	3	*	0	13	1
...NAVICULACEAE								
....NAVICULA	--	-	13	3	91	3	140	7
....PINNULARIA	--	-	--	-	--	-	--	-
...NITZSCHIACEAE								
....NITZSCHIA	--	-	78#	19	400	11	120	6
CRYPTOPHYTA (CRYPTOMONADS)								
.CRYPTOPHYCEAE								
..CRYPTOMONADALES								
...CRYPTOMONADACEAE								
....CRYPTOMONAS	--	-	--	-	52	1	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..CHROOCOCCALES								
...CHROOCOCCACEAE								
....AGMENELLUM	100#	31	--	-	--	-	--	-
....ANACYSTIS	13	4	--	-	740#	21	140	7
..HORMOGONALES								
...NOSTOCACEAE								
....ANABAENA	--	-	--	-	--	-	--	-
....CYLINDROSPERMUM	--	-	--	-	--	-	--	-
...OSCILLATORIACEAE								
....OSCILLATORIA	--	-	--	-	1200#	35	340#	16
....SCHIZOTHRIX	--	-	--	-	--	-	--	-
...RIVULARIACEAE								
....RAPHIDIOPSIS	--	-	--	-	170	5	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 19.--*Water-quality data for Carson River at Deer Run Road near Carson City, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JULY 2,80		JULY 16,80		JULY 23,80		AUG 8,80		SEP 12,80	
TIME	1020		1130		0000		1520		1200	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
EUGLENOPHYTA (EUGLENOIDS)										
.EUGLENOPHYCEAE										
..EUGLENALES										
...EUGLENACEAE										
....TRACHELOMONAS	--	-	--	-	--	-	--	-	13	1
PYRRHOPHYTA (FIRE ALGAE)										
.DINOPHYCEAE										
..PERIDINIALES										
...GLENODINIACEAE										
....GLENODINIUM	--	-	13	3	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 19.--*Water-quality data for Carson River at Deer Run Road near Carson City, Nev., water year 1980*--Cont.

DATE	TIME	OXYGEN DEMAND, BIOCHEM CARBON. DAYS LAGTIME AT 20°C	OXYGEN DEMAND, BIOCHEM CARBON. 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. ULT. (MG/L)	DEOXYGE-NATION CARBON. (K1 TO BASE E PER DAY AT 20°C)	DEOXYGE-NATION CARBON. (K1 TO BASE 10 PER DAY AT 20°C)	OXYGEN DEMAND, BIOCHEM UNINHIB 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB ULT. (MG/L)	OXYGEN DEMAND, BIOCHEM NITROG. DAYS LAGTIME AT 20°C	OXYGEN DEMAND, BIOCHEM NITROG. ULT. (MG/L)
1979												
Oct												
17	1715	--	1.8	3.9	4.4	0.11	0.05	2.6	6.7	7.2	3.7	2.8
Nov												
19	1225	.87	3.2	8.1	10.8	.07	.03	--	--	--	--	--
Dec												
12	1120	.45	3.0	4.8	4.9	.19	.08	2.6	5.9	6.1	4.9	2.1
1980												
Jan												
13	1330	--	4.0	9.5	11.6	0.09	0.04	4.4	10.9	14.2	--	--
17	1130	--	2.2	4.5	4.9	.12	.05	2.2	4.8	5.4	--	--
Feb												
12	1350	.17	1.4	3.0	3.4	.11	.05	1.4	4.6	5.0	5.6	1.6
Apr												
15	1130	1.14	1.0	2.6	3.4	.07	.03	--	--	--	--	--
May												
01	1145	--	1.6	2.8	2.9	.16	.07	1.6	2.9	3.1	--	--
06	1235	--	1.2	2.9	3.7	.08	.03	1.4	3.1	3.6	--	--
21	1245	.48	.6	1.4	1.8	.08	.03	.8	2.1	2.9	--	--
June												
02	1200	1.01	.9	1.7	1.8	.14	.06	--	--	--	--	--
18	1205	--	.8	2.4	3.5	.06	.03	--	--	--	--	--
July												
02	1020	--	1.2	2.4	2.7	.11	.05	1.1	2.8	3.5	--	--
Sept												
12	1200	.32	2.0	3.3	3.4	.18	.08	2.0	4.3	4.7	6.4	1.3

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev.,water year 1980*

[Abbreviations: BIOCHEM, biochemical; CARBON., carbonaceous; CELLS/ML, cells per milliliter; CHROMO, chromatography; DEG C, degrees Celsius; DIAM., diameter; FET-FLD, fixed-endpoint titration in field; FLUOR OM, fluormeter; FT^3/S, cubic feet per second; MG/L, milligrams per liter; MM of HG, millimeters of Mercury; SED, sediment; SUSP., suspended; T/D, tons per day; UG/L, micrograms per liter; ULT, ultimate; UMHOS, micromhos per centimeter at 25°C; UNIHIB, uninhibited; <, less than; --, data not available]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH, FIELD (UNITS)	BARO-METRIC PRES-SURE (MM OF HG)	TEMPER-ATURE, WATER (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
OCT											
19...	0955	1.4	639	8.6	--	13.0	8.6	97	--	--	--
NOV											
20...	1120	115	386	8.3	--	.0	11.8	95	35	7.9	34
DEC											
13...	1045	78	397	8.1	664	.5	--	--	35	7.5	38
JAN											
14...	1515	4900	198	7.9	--	6.0	9.5	90	17	3.7	8.8
18...	1155	1420	216	7.8	--	4.0	10.3	93	--	--	--
FEB											
13...	1115	369	304	8.0	645	6.5	10.6	102	30	6.7	24
20...	1215	2610	--	8.1	--	4.5	--	--	--	--	
MAR											
12...	0915	524	308	8.2	658	6.5	10.6	100	28	7.0	25
APR											
16...	0945	903	175	--	659	11.5	9.0	95	16	4.2	11
23...	1300	1130	146	7.8	650	8.0	10.0	99	--	--	--
MAY											
02...	1345	1500	118	7.6	653	13.0	9.2	101	--	--	--
07...	1000	2380	101	7.7	654	10.5	9.3	97	--	--	--
14...	0945	1020	162	7.8	651	12.0	8.8	96	14	3.7	10
21...	1540	1940	102	7.7	649	15.5	8.4	98	--	--	--
JUN											
03...	0930	1160	144	8.0	651	11.0	9.3	99	--	--	--
18...	0920	1430	111	7.8	654	16.5	8.2	98	9.4	2.5	6.6
JUL											
03...	0900	1640	96	7.7	658	15.0	8.2	94	--	--	--
17...	0950	496	185	8.0	656	22.0	7.2	95	16	3.9	13
AUG											
12...	0925	56	519	8.2	653	19.0	7.3	91	45	11	40
SEP											
16...	1050	101	416	8.3	658	16.5	9.0	107	39	9.5	38

DATE	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE FET-FLD (MG/L AS HCO3)	CAR-BONATE FET-FLD (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180°C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (T/D)
OCT											
19...	--	--	--	--	--	--	--	--	431	--	1.6
NOV											
20...	1.4	3.5	140	0	70	13	.4	21	238	254	73.9
DEC											
13...	1.5	3.9	160	0	72	12	.5	23	294	272	61.9
JAN											
14...	.5	3.4	57	0	34	6.5	.2	15	--	119	1570
18...	--	--	76	0	--	--	--	--	142	--	544
FEB											
13...	1.0	3.0	98	0	53	9.2	.2	23	202	199	201
20...	--	--	--	--	--	--	--	--	237	--	1670
MAR											
12...	1.1	2.9	110	0	55	9.6	.3	23	210	206	297
APR											
16...	.6	2.1	--	--	38	3.6	.2	19	118	115	288
23...	--	--	55	0	--	--	--	--	103	--	314
MAY											
02...	--	--	48	0	--	--	--	--	87	--	352
07...	--	--	46	0	--	--	--	--	75	--	482
14...	.6	2.1	63	0	22	3.8	.1	19	117	104	322
21...	--	--	46	0	--	--	--	--	74	--	388
JUN											
03...	--	--	60	0	--	--	--	--	92	--	288
18...	.5	1.8	51	0	11	2.1	.1	16	77	75	297
JUL											
03...	--	--	47	0	--	--	--	--	66	--	292
17...	.8	2.8	74	0	26	4.8	.2	21	125	122	167
AUG											
12...	1.4	5.8	160	0	110	15	.6	28	330	328	49.9
SEP											
16...	1.4	6.1	160	0	74	15	.5	24	--	285	77.7

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
19...	0955	1.4	0.00	--	0.02	--	0.02	0.00	0.45
NOV									
20...	1120	115	.05	--	.01	--	.02	.02	.49
DEC									
13...	1045	78	.30	--	.08	--	.01	.01	.50
JAN									
14...	1515	4900	.19	--	.14	--	.13	.08	2.0
18...	1155	1420	.29	--	.06	--	.07	.07	1.3
FEB									
13...	1115	369	.40	.39	.03	.03	.16	.12	.31
20...	1215	2610	--	.20	--	.02	.23	.00	1.3
MAR									
12...	0915	524	.29	.28	.01	.01	--	.04	--
APR									
16...	0945	903	.15	.15	.01	.01	.00	.02	1.0
23...	1300	1130	--	.15	--	.02	--	.04	--
MAY									
02...	1345	1500	--	.10	--	.00	.01	.03	.52
07...	1000	2380	--	.09	--	.01	.03	.03	.65
14...	0945	1020	.14	--	.01	--	.03	.04	.57
21...	1540	1940	--	.07	--	.00	.04	.01	.70
JUN									
03...	0930	1160	--	--	--	.01	.03	.01	.52
18...	0920	1430	.05	.05	.02	.01	.03	.01	1.0
JUL									
03...	0900	1640	--	.04	--	.00	.00	.02	.78
17...	0950	496	.05	--	.01	--	.00	.00	.60
AUG									
12...	0925	56	.00	.02	.02	.01	.00	.02	.45
SEP									
16...	1050	101	.07	--	.01	--	.00	.02	.83

DATE	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	ALGAL GROWTH POTEN-TIAL, BOTTLE TEST (MG/L)
OCT									
19...	0.43	0.13	--	0.08	4.2	0.1	0.364	<0.093	--
NOV									
20...	.18	.26	0.23	.22	17	--	.298	<.112	4.8
DEC									
13...	.30	.28	.28	.26	4.8	.2	.504	<.097	13
JAN									
14...	.61	.92	.15	.13	--	--	2.62	.154	39
18...	.41	.51	--	.13	11	.5	.325	<.071	19
FEB									
13...	.35	.19	.15	--	7.6	.8	.177	.000	22
20...	.45	.67	.15	.14	14	3.9	--	--	--
MAR									
12...	.36	.23	.13	--	8.2	.2	1.32	.094	13
APR									
16...	.89	.41	.07	.08	--	2.2	7.18	.180	6.1
23...	.59	.27	.08	.06	5.3	1.0	.719	<.090	15
MAY									
02...	.41	.32	.06	.06	4.8	.6	.703	.076	7.0
07...	.47	.44	.08	.08	5.4	1.5	.750	<.130	9.8
14...	.34	.21	.08	--	8.9	1.4	.435	<.145	--
21...	.45	.37	.08	.07	6.1	.3	1.27	.184	--
JUN									
03...	.52	.22	.10	.08	6.0	.7	.270	<.139	8.0
18...	.50	.25	.11	.08	3.8	--	.703	<.131	2.5
JUL									
03...	.48	.40	.10	.05	5.2	--	.361	.073	4.3
17...	.53	.23	.12	.11	9.0	.5	.775	.130	6.5
AUG									
12...	.26	.22	.18	.12	7.7	.2	1.51	.229	3.2
SEP									
16...	.80	.35	.28	--	6.0	.9	3.50	.417	3.0

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/D)	SED. SUSP. FALL DIAM. % FINER THAN .002 MM	SED. SUSP. FALL DIAM. % FINER THAN .004 MM	SED. SUSP. FALL DIAM. % FINER THAN .008 MM	SED. SUSP. FALL DIAM. % FINER THAN .016 MM
NOV								
20...	1120	115	5	1.6	--	--	--	--
DEC								
13...	1045	78	6	1.3	--	--	--	--
JAN								
14...	1515	4900	1160	15300	--	--	--	--
18...	1155	1420	381	1460	22	27	34	43
FEB								
13...	1115	369	19	19	--	--	--	--
20...	1215	2610	990	6980	--	--	--	--
MAR								
12...	0915	524	60	85	--	--	--	--
APR								
16...	0945	903	408	995	--	--	--	--
23...	1300	1130	273	833	--	--	--	--
MAY								
02...	1345	1500	458	1860	--	--	--	--
07...	1000	2380	712	4580	13	18	23	29
14...	0945	1020	261	719	--	--	--	--
21...	1540	1940	558	2920	--	--	--	--
JUN								
03...	0930	1160	270	846	--	--	--	--
18...	0920	1430	353	1360	--	--	--	--
JUL								
03...	0900	1640	506	2240	17	21	28	34
17...	0950	496	74	99	--	--	--	--
AUG								
12...	0925	56	12	1.8	--	--	--	--
SEP								
16...	1050	101	16	4.4	--	--	--	--

DATE	SED. SUSP. FALL DIAM. % FINER THAN .031 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .125 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .250 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .500 MM	SED. SUSP. SIEVE DIAM. % FINER THAN 1.00 MM	SED. SUSP. SIEVE DIAM. % FINER THAN 2.00 MM
NOV							
20...	--	--	--	--	--	--	--
DEC							
13...	--	--	--	--	--	--	--
JAN							
14...	--	62	--	--	--	--	--
18...	52	65	81	97	98	100	--
FEB							
13...	--	--	--	--	--	--	--
20...	--	48	--	--	--	--	--
MAR							
12...	--	--	--	--	--	--	--
APR							
16...	--	60	--	--	--	--	--
23...	--	53	--	--	--	--	--
MAY							
02...	--	--	--	--	--	--	--
07...	36	42	55	72	88	98	100
14...	--	53	--	--	--	--	--
21...	--	40	--	--	--	--	--
JUN							
03...	--	--	--	--	--	--	--
18...	--	35	--	--	--	--	--
JUL							
03...	41	47	59	78	92	99	100
17...	--	--	--	--	--	--	--
AUG							
12...	--	--	--	--	--	--	--
SEP							
16...	--	--	--	--	--	--	--

TABLE 20.--*Water-quality data for Careon River near Fort Churchill, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 19,79		NOV 20,79		JAN 14,80		JAN 18,80		MAR 12,80	
TIME	0955		1120		1515		1155		0915	
TOTAL CELLS/ML	2500		1700		35		870		150	
DIVERSITY: DIVISION	1.1		1.0		0.0		0.2		0.8	
.CLASS	1.1		1.0		0.0		0.2		0.8	
..ORDER	0.0		1.6		0.9		0.4		1.4	
...FAMILY	0.0		3.3		2.0		2.0		1.4	
....GENUS	0.0		3.6		2.0		2.3		1.4	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)										
.CHLOROPHYCEAE										
..CHLOROCOCCALES										
...CHARACIACEAE										
....SCHROEDERIA	--	-	--	-	--	-	--	-	--	-
...HYDRODICTYACEAE										
....PEDIASTRUM	--	-	53	3	--	-	--	-	--	-
...MICRACTINIACEAE										
....GOLENKINIA	--	-	--	-	--	-	--	-	--	-
....MICRACTINIUM	--	-	--	-	--	-	--	-	--	-
...OOCYSTACEAE										
....ANKISTRODESMUS	*	0	53	3	--	-	5	1	13	8
....CHLORELLA	110	4	140	8	--	-	--	-	--	-
....KIRCHNERIELLA	--	-	--	-	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	--	-	--	-	--	-
....TETRAEDRON	--	-	--	-	--	-	--	-	--	-
...SCENEDESMACEAE										
....SCENEDESMUS	66	3	170	10	--	-	30	3	--	-
....TETRASTRUM	--	-	--	-	--	-	--	-	--	-
..VOLVOCALES										
...CHLAMYDOMONADACEAE										
....CHLAMYDOMONAS	88	4	--	-	--	-	--	-	26#	17
....CHLOROGONIUM	--	-	--	-	--	-	--	-	--	-
....PLATYMONAS	*	0	--	-	--	-	--	-	--	-
...PHACOTACEAE										
....PTEROMONAS	--	-	--	-	--	-	--	-	--	-
CHRYSOPHYTA										
.BACILLARIOPHYCEAE										
..CENTRALES										
...COSCINODISCACEAE										
....COSCINODISCUS	--	-	--	-	--	-	--	-	--	-
....CYCLOTELLA	250	10	310#	18	10#	29	5	1	100#	67
....MELOSIRA	*	0	21	1	--	-	10	1	--	-
..PENNALES										
...ACHNANTHACEAE										
....ACHNANTHES	*	0	11	1	--	-	--	-	--	-
....COCCONEIS	*	0	43	2	5	14	10	1	--	-
...CYMBELLACEAE										
....AMPHORA	--	-	--	-	--	-	--	-	--	-
....CYMBELLA	44	2	11	1	--	-	5	1	--	-
....EPITHEMIA	33	1	32	2	--	-	5	1	--	-
...DIATOMACEAE										
....DIATOMA	*	0	85	5	10#	29	96	11	--	-
...EUNOTIACEAE										
....EUNOTIA	--	-	--	-	--	-	--	-	--	-
...FRAGILARIACEAE										
....ASTERIONELLA	--	-	--	-	--	-	--	-	--	-
....FRAGILARIA	1300#	50	170	10	--	-	480#	56	--	-
....HANNAEA	--	-	--	-	--	-	--	-	--	-
....SYNEDRA	*	0	53	3	10#	29	45	5	--	-
...GOMPHONEMATACEAE										
....GOMPHONEIS	--	-	--	-	--	-	--	-	--	
....GOMPHONEMA	33	1	75	4	--	-	20	2	--	-
...NAVICULACEAE										
....NAVICULA	110	4	210	12	--	-	61	7	--	-
....PLEUROSIGMA	--	-	11	1	--	-	--	-	--	-
...NITZSCHIACEAE										
....NITZSCHIA	77	3	230	14	--	-	86	10	13	8
...SURIRELLACEAE										
....SURIRELLA	--	-	--	-	--	-	5	1	--	-
CRYPTOPHYTA (CRYPTOMONADS)										
.CRYPTOPHYCEAE	*	0	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 20.--*Water-quality data for Careon River near Fort Churchill, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 19,79		NOV 20,79		JAN 14,80		JAN 18,80		MAR 12,80	
TIME	0955		1120		1515		1155		0915	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CYANOPHYTA (BLUE-GREEN ALGAE)										
.CYANOPHYCEAE										
..CHROOCOCCALES										
...CHROOCOCCACEAE										
....ANACYSTIS	--	-	--	-	--	-	--	-	--	-
..HORMOGONALES										
...NOSTOCACEAE										
....ANABAENA	330	13	--	-	--	-	--	-	--	-
....ANABAENOPSIS	--	-	--	-	--	-	--	-	--	-
...OSCILLATORIACEAE										
....OSCILLATORIA	--	-	--	-	--	-	--	-	--	-
....SCHIZOTHRIX	--	-	43	2	--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)										
.EUGLENOPHYCEAE										
..EUGLENALES										
...EUGLENACEAE										
....EUGLENA	--	-	--	-	--	-	--	-	--	-
....PHACUS	--	-	--	-	--	-	--	-	--	-
....TRACHELOMONAS	--	-	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	APR 16,80		MAY 14,80		MAY 21,80		JUNE 3,80	
TIME	0945		0945		1540		0930	
TOTAL CELLS/ML	8200		490		310		100	
DIVERSITY: DIVISION	0.0		0.3		1.5		1.1	
.CLASS	0.0		0.3		1.5		1.1	
..ORDER	0.4		1.1		1.6		1.1	
...FAMILY	2.8		1.5		2.0		1.1	
....GENUS	3.1		2.2		2.0		1.1	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...CHARACIACEAE								
....SCHROEDERIA	--	-	--	-	--	-	--	-
...HYDRODICTYACEAE								
....PEDIASTRUM	--	-	--	-	--	-	--	-
...MICRACTINIACEAE								
....GOLENKINIA	--	-	--	-	--	-	--	-
....MICRACTINIUM	--	-	--	-	--	-	--	-
...OOCYSTACEAE								
....ANKISTRODESMUS	--	-	--	-	--	-	13	13
....CHLORELLA	--	-	--	-	--	-	--	-
....KIRCHNERIELLA	--	-	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	--	-	--	-
....TETRAEDRON	--	-	--	-	--	-	--	-
...SCENEDESMACEAE								
....SCENEDESMUS	--	-	--	-	52#	17	--	-
....TETRASTRUM	--	-	--	-	--	-	--	-
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	--	-	29	6	--	-	--	-
....CHLOROGONIUM	--	-	--	-	--	-	--	-
....PLATYMONAS	--	-	--	-	--	-	--	-
...PHACOTACEAE								
....PTEROMONAS	--	-	--	-	--	-	--	-
CHRYSOPHYTA								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....COSCINODISCUS	--	-	14	3	--	-	--	-
....CYCLOTELLA	690	8	240#	50	13	4	--	-
....MELOSIRA	--	-	72	15	--	-	--	-
..PENNALES								
...ACHNANTHACEAE								
....ACHNANTHES	140	2	14	3	--	-	--	-
....COCCONEIS	--	-	--	-	--	-	--	-
...CYMBELLACEAE								
....AMPHORA	69	1	--	-	--	-	--	-
....CYMBELLA	410	5	--	-	--	-	--	-
....EPITHEMIA	69	1	--	-	--	-	--	-
...DIATOMACEAE								
....DIATOMA	--	-	--	-	--	-	--	-
...EUNOTIACEAE								
....EUNOTIA	69	1	--	-	--	-	--	-
...FRAGILARIACEAE								
....ASTERIONELLA	--	-	--	-	--	-	--	-
....FRAGILARIA	1200	14	--	-	--	-	--	-
....HANNAEA	69	1	--	-	--	-	--	-
....SYNEDRA	210	3	--	-	--	-	--	-
...GOMPHONEMATACEAE								
....GOMPHONEIS	140	2	--	-	--	-	--	-
....GOMPHONEMA	760	9	--	-	--	-	--	-
...NAVICULACEAE								
....NAVICULA	2100#	26	72	15	13	4	--	-
....PLEUROSIGMA	--	-	--	-	--	-	--	-
...NITZSCHIACEAE								
....NITZSCHIA	1600#	19	43	9	65#	21	77#	75
...SURIRELLACEAE								
....SURIRELLA	690	8	--	-	13	4	--	-
CRYPTOPHYTA (CRYPTOMONADS)								
.CRYPTOPHYCEAE	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
 * - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev., water year 1980*--Cont.

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	APR 16,80		MAY 14,80		MAY 21,80		JUNE 3,80	
TIME	0945		0945		1540		0930	
ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..CHROOCOCCALES								
...CHROOCOCCACEAE								
....ANACYSTIS	--	-	--	-	--	-	--	-
..HORMOGONALES								
...NOSTOCACEAE								
....ANABAENA	--	-	--	-	--	-	--	-
....ANABAENOPSIS	--	-	--	-	--	-	--	-
...OSCILLATORIACEAE								
....OSCILLATORIA	--	-	--	-	160#	50	--	-
....SCHIZOTHRIX	--	-	--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)								
.EUGLENOPHYCEAE								
..EUGLENALES								
...EUGLENACEAE								
....EUGLENA	--	-	--	-	--	-	13	13
....PHACUS	--	-	--	-	--	-	--	-
....TRACHELOMONAS	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JULY 3,80		AUG 12,80		SEP 16,80	
TIME	0900		0925		1050	
TOTAL CELLS/ML	740		1500		2600	
DIVERSITY: DIVISION	1.4		0.8		1.3	
.CLASS	1.4		0.8		1.3	
..ORDER	1.7		1.7		2.2	
...FAMILY	2.2		2.3		3.2	
....GENUS	2.2		2.6		3.5	
ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)						
.CHLOROPHYCEAE						
..CHLOROCOCCALES						
...CHARACIACEAE						
....SCHROEDERIA	--	-	--	-	--	-
...HYDRODICTYACEAE						
....PEDIASTRUM	--	-	--	-	300	12
...MICRACTINIACEAE						
....GOLENKINIA	--	-	13	1	--	-
....MICRACTINIUM	--	-	52	4	--	-
...OOCYSTACEAE						
....ANKISTRODESMUS	--	-	64	4	50	2
....CHLORELLA	--	-	--	-	--	-
....KIRCHNERIELLA	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	50	2
....TETRAEDRON	--	-	--	-	17	1
...SCENEDESMACEAE						
....SCENEDESMUS	100	14	130	9	320	12
....TETRASTRUM	--	-	--	-	--	-
..VOLVOCALES						
...CHLAMYDOMONADACEAE						
....CHLAMYDOMONAS	--	-	90	6	240	9
....CHLOROGONIUM	--	-	--	-	17	1
....PLATYMONAS	--	-	--	-	--	-
...PHACOTACEAE						
....PTEROMONAS	--	-	13	1	17	1
CHRYSOPHYTA						
.BACILLARIOPHYCEAE						
..CENTRALES						
...COSCINODISCACEAE						
....COSCINODISCUS	--	-	--	-	--	-
....CYCLOTELLA	--	-	140	10	440#	17
....MELOSIRA	39	5	190	13	67	3
..PENNALES						
...ACHNANTHACEAE						
....ACHNANTHES	--	-	--	-	--	-
....COCCONEIS	--	-	--	-	17	1
...CYMBELLACEAE						
....AMPHORA	--	-	--	-	--	-
....CYMBELLA	--	-	--	-	--	-
....EPITHEMIA	--	-	--	-	17	1
...DIATOMACEAE						
....DIATOMA	26	4	--	-	--	-
...EUNOTIACEAE						
....EUNOTIA	--	-	--	-	--	-
...FRAGILARIACEAE						
....ASTERIONELLA	--	-	26	2	--	-
....FRAGILARIA	270#	37	--	-	170	6
....HANNAEA	--	-	--	-	--	-
....SYNEDRA	--	-	26	2	34	1
...GOMPHONEMATACEAE						
....GOMPHONEIS	--	-	--	-	--	-
....GOMPHONEMA	--	-	--	-	--	-
...NAVICULACEAE						
....NAVICULA	13	2	26	2	320	12
....PLEUROSIGMA	--	-	--	-	--	-
...NITZSCHIACEAE						
....NITZSCHIA	52	7	680#	47	370	14
...SURIRELLACEAE						
....SURIRELLA	--	-	--	-	--	-
CRYPTOPHYTA (CRYPTOMONADS)						
.CRYPTOPHYCEAE	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JULY 3,80		AUG 12,80		SEP 16,80	
TIME	0900		0925		1050	
ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CYANOPHYTA (BLUE-GREEN ALGAE)						
.CYANOPHYCEAE						
..CHROOCOCCALES						
...CHROOCOCCACEAE						
....ANACYSTIS	--	-	--	-	100	4
..HORMOGONALES						
...NOSTOCACEAE						
....ANABAENA	--	-	--	-	--	-
....ANABAENOPSIS	230#	32	--	-	--	-
...OSCILLATORIACEAE						
....OSCILLATORIA	--	-	--	-	--	-
....SCHIZOTHRIX	--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)						
.EUGLENOPHYCEAE						
..EUGLENALES						
...EUGLENACEAE						
....EUGLENA	--	-	--	-	67	3
....PHACUS	--	-	--	-	--	-
....TRACHELOMONAS	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 20.--*Water-quality data for Carson River near Fort Churchill, Nev., water year 1980*--Cont.

DATE	TIME	OXYGEN DEMAND, BIOCHEM CARBON. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM CARBON. 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. ULT. (MG/L)	DEOXYGE-NATION CARBON. (K1 TO BASE E PER DAY AT 20°C)	DEOXYGE-NATION CARBON. (K1 TO BASE 10 PER DAY AT 20°C)	OXYGEN DEMAND, BIOCHEM UNINHIB 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB ULT. (MG/L)	OXYGEN DEMAND, BIOCHEM NITROG. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM NITROG. ULT. (MG/L)
1979												
Oct												
19	0955	.89	1.3	2.5	2.7	.13	.06	.9	2.0	2.3	--	--
Nov												
20	1120	.44	4.2	8.2	8.8	.13	.06	--	--	--	--	--
Dec												
13	1045	.01	2.6	4.3	4.4	.18	.08	2.7	4.7	5.0	--	--
1980												
Jan												
14	1515	--	4.4	9.9	11.6	.09	.04	5.1	11.1	12.8	--	--
18	1115	--	2.1	4.6	5.3	.10	.04	2.0	4.7	5.6	--	--
Feb												
13	1115	--	1.6	2.7	2.9	.16	.07	1.6	3.2	3.5	--	--
Mar												
12	0915	--	1.4	2.7	2.9	.13	.06	1.5	3.0	3.2	--	--
Apr												
16	0945	--	1.9	3.6	3.8	.13	.06	1.8	4.5	5.0	6.7	1.2
May												
02	1345	--	1.3	2.9	3.3	.10	.04	1.8	3.8	4.2	--	--
07	1000	.07	1.3	2.7	3.0	.11	.05	1.4	3.2	3.8	--	--
14	0945	.21	1.1	2.2	2.5	.11	.05	1.4	2.8	3.0	--	--
21	1540	--	1.1	2.6	3.4	.08	.03	1.1	2.5	3.0	--	--
June												
03	0930	.45	1.3	2.6	2.8	.13	.06	--	--	--	--	--
18	0920	--	1.0	2.3	2.9	.08	.03	1.1	2.7	3.5	--	--
July												
03	0900	.24	1.4	3.2	3.8	.10	.04	1.4	3.9	5.7	--	--
17	0950	.21	1.0	2.1	2.4	.10	.04	--	--	--	--	--
Aug												
12	0925	--	.5	1.2	1.4	.09	.04	.6	2.0	2.2	4.7	.8
Sept												
16	1050	--	1.7	2.8	2.9	.18	.08	1.6	3.2	3.4	--	--

TABLE 21.--*Water-quality data for Truckee Canal at U.S. Highway 50 above Lahontan Reservoir, Nev., water year 1980*

[Abbreviations: BIOCHEM, biochemical; CARBON., carbonaceous; CELLS/ML, cells per milliliter; CHROMO, chromatography; DEG C, degrees Celsius; DIAM., diameter; FET-FLD, fixed-endpoint titration in field; FLUOROM, fluormeter; FT^3/S, cubic feet per second; MG/L, milligrams per liter; MM of HG, millimeters of Mercury; SED, sediment; SUSP., suspended; T/D, tons per day; UG/L, micrograms per liter; ULT, ultimate; UMHOS, micromhos per centimeter at 25°C; UNIHIB, uninhibited; <, less than; --, data not available]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH, FIELD (UNITS)	BARO-METRIC PRES-SURE (MM OF HG)	TEMPER-ATURE, WATER (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
OCT											
19...	1155	230	227	8.3	--	13.5	8.4	93	--	--	--
NOV											
20...	1015	347	246	8.3	665	3.5	--	--	--	--	--
DEC											
13...	0945	E321	232	8.0	664	.5	12.2	97	--	--	--
JAN											
14...	0950	E387	129	7.5	634	4.0	9.6	88	--	--	--
18...	0950	E122	132	7.6	--	3.5	9.8	86	--	--	--
FEB											
13...	0850	E21	269	8.3	647	3.5	10.8	96	--	--	--
MAR											
12...	0855	31	220	8.2	656	5.0	10.6	96	15	5.3	20
APR											
16...	0955	E132	182	8.2	660	14.5	9.2	103	14	4.9	14
23...	0850	46	114	8.0	651	8.0	9.8	97	--	--	--
MAY											
02...	0850	E145	128	7.8	651	13.0	8.5	94	--	--	--
07...	0935	E110	112	8.2	654	15.0	9.8	113	--	--	--
14...	0925	116	124	8.0	651	12.5	9.6	105	9.3	3.3	9.7
20...	1445	88	109	8.5	652	20.0	9.2	118	--	--	--
JUN											
03...	0925	E104	116	7.9	650	12.5	9.2	101	--	--	--
17...	0945	E82	162	8.8	655	19.0	9.5	119	11	3.9	13
30...	1200	E168	208	7.9	--	20.0	7.6	97	--	--	--
JUL											
15...	0955	119	239	8.3	658	20.5	9.1	117	16	6.1	20
AUG											
11...	1030	86	227	8.6	654	22.5	7.9	107	16	6.1	17
SEP											
17...	0810	E199	255	7.6	657	16.5	5.8	68	16	6.1	22

DATE	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE FET-FLD (MG/L AS HCO3)	CAR-BONATE FET-FLD (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180°C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (T/D)
OCT											
19...	--	--	--	--	--	--	--	--	144	--	89.4
NOV											
20...	--	--	96	0	--	--	--	--	148	--	139
DEC											
13...	--	--	94	0	--	--	--	--	170	--	E147
JAN											
14...	--	--	47	0	--	--	--	--	87	--	E90.9
18...	--	--	48	0	--	--	--	--	92	--	E30.3
FEB											
13...	--	--	88	0	--	--	--	--	172	--	E9.8
MAR											
12...	1.1	2.6	73	0	19	18	.2	19	149	137	12.5
APR											
16...	.8	2.5	66	0	12	10	.1	19	115	111	E41.0
23...	--	--	48	0	--	--	--	--	74	--	9.1
MAY											
02...	--	--	68	0	--	--	--	--	95	--	E37.2
07...	--	--	48	0	--	--	--	--	80	--	E23.7
14...	.7	1.7	51	0	7.3	7.0	.1	18	90	84	28.2
20...	--	--	46	1	--	--	--	--	76	--	18.1
JUN											
03...	--	--	48	0	--	--	--	--	72	--	E20.2
17...	.9	2.6	57	4	8.6	9.7	.1	18	107	96	E23.7
30...	--	--	79	0	--	--	--	--	130	--	E59.0
JUL											
15...	1.1	4.2	92	0	21	13	.2	23	158	153	50.8
AUG											
11...	.9	4.0	85	2	18	11	.3	19	135	139	31.3
SEP											
17...	1.2	4.6	94	0	21	16	.2	20	172	157	E92.4

E: ESTIMATED.

TABLE 21.--*Water-quality data for Truckee Canal at U.S. Highway 50 above Lahontan Reservoir, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	NITRO-GEN, NITRATE TOTAL (MG/L AS N)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
19...	1155	230	1.0	--	.27	--	.16	.16	.73
NOV									
20...	1015	347	.82	--	.03	--	.28	.26	.38
DEC									
13...	0945	E321	.73	--	.02	--	.40	.39	.55
JAN									
14...	0950	E387	.47	--	.10	--	.12	.12	1.9
18...	0950	E122	.42	--	.04	--	.05	.05	1.3
FEB									
13...	0850	E21	--	.86	--	.04	.22	.20	.41
MAR									
12...	0855	31	--	.47	--	.02	--	.13	--
APR									
16...	0955	E132	--	.35	--	.05	.28	.29	.36
23...	0850	46	--	.24	--	.03	.10	.10	.72
MAY									
02...	0850	E145	--	.31	--	.02	.14	.11	.35
07...	0935	E110	--	.25	--	.02	.09	.09	.40
14...	0925	116	--	.26	--	.04	.10	.11	.50
20...	1445	88	--	.18	--	.01	.06	--	.35
JUN									
03...	0925	E104	--	.23	--	.02	.12	.11	.48
17...	0945	E82	--	.24	--	.03	.10	.04	--
30...	1200	E168	--	.63	--	.09	--	.09	--
JUL									
15...	0955	119	--	.90	--	.17	--	.05	--
AUG									
11...	1030	86	--	.73	--	.08	.02	.04	.97
SEP									
17...	0810	E199	--	1.30	--	.26	--	.48	--

DATE	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	ALGAL GROWTH POTEN-TIAL, BOTTLE TEST (MG/L)
OCT									
19...	.59	.61	--	.54	5.7	.2	1.64	.093	--
NOV									
20...	.28	.46	--	.48	4.6	.2	1.64	<.112	33
DEC									
13...	.33	.26	--	.26	4.9	.2	1.01	<.097	47
JAN									
14...	.73	.69	--	.08	--	--	7.73	.463	18
18...	.72	.30	--	.08	5.7	.9	.758	<.071	21
FEB									
13...	.45	.30	.22	.22	5.5	.7	1.95	.181	36
MAR									
12...	.32	.24	.20	.23	3.0	.3	2.53	.094	21
APR									
16...	.35	.20	.16	.17	3.8	.8	2.47	.129	--
23...	--	.12	.11	.08	5.9	.7	.222	.000	16
MAY									
02...	.32	.17	.15	.10	4.6	.2	1.39	.055	17
07...	.37	.16	.12	.10	4.1	.8	1.75	.080	11
14...	.52	.14	.12	.14	2.8	.7	.588	.084	18
20...	--	.16	.11	.09	6.1	.3	2.02	.182	--
JUN									
03...	.50	.16	.13	.11	5.8	.4	.619	.071	15
17...	--	.15	.14	.10	6.2	.4	2.18	.114	14
30...	.82	.34	.30	.20	10	.5	1.01	.054	--
JUL									
15...	.83	.47	.43	.33	4.6	.6	9.75	.829	35
AUG									
11...	.75	.37	.33	.24	11	.4	1.05	.151	14
SEP									
17...	.92	.79	.73	.71	5.5	.7	1.24	.126	44

E: ESTIMATED.

TABLE 21.--*Water-quality data for Truckee Canal at U.S. Highway 50 above Lahontan Reservoir, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/D)	SED. SUSP. FALL DIAM. % FINER THAN .004 MM	SED. SUSP. FALL DIAM. % FINER THAN .008 MM	SED. SUSP. FALL DIAM. % FINER THAN .016 MM	SED. SUSP. FALL DIAM. % FINER THAN .031 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .250 MM	SED. SUSP. SIEVE DIAM. % FINER THAN .500 MM
OCT											
19...	1155	230	58	36	--	--	--	--	--	--	--
JAN											
14...	0950	E387	602	E629	58	73	87	96	98	99	100
18...	0950	E122	130	E43	--	--	--	--	--	--	--
FEB											
13...	0850	E21	8	E.45	--	--	--	--	74	--	--
MAR											
12...	0855	31	11	.92	--	--	--	--	--	--	--
APR											
16...	0955	E132	23	E8.2	--	--	--	--	--	--	--
23...	0850	46	12	1.5	--	--	--	--	--	--	--
MAY											
02...	0850	E145	26	E10	--	--	--	--	--	--	--
07...	0935	E110	13	E3.9	--	--	--	--	--	--	--
14...	0925	116	12	3.8	--	--	--	--	--	--	--
20...	1445	88	21	5.0	--	--	--	--	--	--	--
JUN											
03...	0925	E104	18	E5.1	--	--	--	--	--	--	--
17...	0945	E82	26	E5.8	--	--	--	--	--	--	--
30...	1200	E168	15	E6.8	--	--	--	--	--	--	--
JUL											
15...	0955	119	17	5.5	--	--	--	--	--	--	--
AUG											
11...	1030	86	15	3.5	--	--	--	--	--	--	--
SEP											
17...	0810	E199	14	E7.5	--	--	--	--	--	--	--

E: ESTIMATED.

TABLE 21.--*Water-quality data for Truckee Canal at U.S. Highway 50 above Lahontan Reservoir, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	OCT 19,79	JAN 14,80	JAN 18,80	APR 16,80	MAY 14,80
TIME	1155	0950	0950	0955	0925
TOTAL CELLS/ML	20000	45	1500	1400	480
DIVERSITY: DIVISION	1.1	0.0	0.2	1.0	0.7
.CLASS	1.1	0.0	0.2	1.0	0.7
..ORDER	1.3	0.8	0.5	1.5	1.5
...FAMILY	1.9	1.9	2.3	2.9	1.8
....GENUS	2.0	2.1	2.5	3.1	2.2

ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)										
.CHLOROPHYCEAE										
..CHLOROCOCCALES										
...CHARACIACEAE										
....SCHROEDERIA	--	-	--	-	--	-	52	4	--	-
...HYDRODICTYACEAE										
....PEDIASTRUM	570	3	--	-	--	-	--	-	--	-
...MICRACTINIACEAE										
....GOLENKINIA	--	-	--	-	--	-	--	-	--	-
...OOCYSTACEAE										
....ANKISTRODESMUS	120	1	--	-	*	0	--	-	--	-
....CHODATELLA	--	-	--	-	--	-	--	-	--	-
....CLOSTERIOPSIS	--	-	--	-	--	-	--	-	--	-
....DICTYOSPHAERIUM	--	-	--	-	--	-	420#	30	--	-
....KIRCHNERIELLA	--	-	--	-	--	-	--	-	--	-
....OOCYSTIS	--	-	--	-	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	--	-	--	-	--	-
....TETRAEDRON	--	-	--	-	--	-	--	-	--	-
...SCENEDESMACEAE										
....ACTINASTRUM	--	-	--	-	--	-	--	-	--	-
....SCENEDESMUS	410	2	--	-	--	-	160	11	--	-
....TETRASTRUM	160	1	--	-	--	-	--	-	--	-
..VOLVOCALES										
...CHLAMYDOMONADACEAE										
....CHLAMYDOMONAS	--	-	--	-	--	-	--	-	13	3
..ZYGNEMATALES										
...DESMIDIACEAE										
....COSMARIUM	--	-	--	-	--	-	--	-	--	-
....STAURASTRUM	--	-	--	-	--	-	--	-	--	-
CHRYSOPHYTA										
.BACILLARIOPHYCEAE										
..CENTRALES										
...COSCINODISCACEAE										
....CYCLOTELLA	490	2	5	11	77	5	310#	22	230#	49
....MELOSIRA	160	1	--	-	*	0	78	6	52	11
....SKELETONEMA	--	-	5	11	--	-	--	-	--	-
..PENNALES										
...ACHNANTHACEAE										
....COCCONEIS	330	2	--	-	56	4	13	1	--	-
....RHOICOSPHENIA	120	1	--	-	14	1	39	3	--	-
...CYMBELLACEAE										
....CYMBELLA	*	0	--	-	*	0	26	2	--	-
....EPITHEMIA	--	-	--	-	*	0	--	-	--	-
...DIATOMACEAE										
....DIATOMA	290	1	--	-	98	6	26	2	52	11
...FRAGILARIACEAE										
....ASTERIONELLA	--	-	--	-	21	1	--	-	--	-
....FRAGILARIA	1600	8	--	-	840#	54	--	-	--	-
....SYNEDRA	*	0	--	-	14	1	39	3	--	-
...GOMPHONEMATACEAE										
....GOMPHONEMA	450	2	15#	33	70	5	100	7	--	-
...NAVICULACEAE										
....NAVICULA	820	4	15#	33	84	5	13	1	13	3
....PINNULARIA	--	-	--	-	--	-	26	2	--	-
...NITZSCHIACEAE										
....NITZSCHIA	570	3	5	11	170	11	52	4	52	11
...SURIRELLACEAE										
....SURIRELLA	--	-	--	-	*	.0	52	4	--	-
...TABELLARIACEAE										
....TABELLARIA	--	-	--	-	35	2	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)										
.CYANOPHYCEAE										
..CHROOCOCCALES										
...CHROOCOCCACEAE										
....ANACYSTIS	--	-	--	-	--	-	--	-	65	14
..HORMOGONALES										
...OSCILLATORIACEAE										
....OSCILLATORIA	14000#	69	--	-	28	2	--	-	--	-
...RIVULARIACEAE										
....RAPHIDIOPSIS	--	-	--	-	--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)										
.EUGLENOPHYCEAE										
..EUGLENALES										
...EUGLENACEAE										
....EUGLENA	--	-	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 21.--*Water-quality data for Truckee Canal at U.S. Highway 50 above Lahontan Reservoir, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

	JUNE 30,80	JULY 15,80	AUG 11,80	SEP 17,80
DATE	JUNE 30,80	JULY 15,80	AUG 11,80	SEP 17,80
TIME	1200	0955	1030	0810
TOTAL CELLS/ML	5200	34000	3600	3600
DIVERSITY: DIVISION	1.3	1.1	1.5	1.2
.CLASS	1.3	1.1	1.5	1.2
..ORDER	1.8	1.2	2.1	1.6
...FAMILY	2.3	1.8	2.9	2.3
....GENUS	2.9	2.1	3.5	2.4

ORGANISM	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...CHARACIACEAE								
....SCHROEDERIA	*	0	--	-	*	0	--	-
...HYDRODICTYACEAE								
....PEDIASTRUM	--	-	3600	11	210	6	--	-
...MICRACTINIACEAE								
....GOLENKINIA	--	-	--	-	*	0	--	-
...OOCYSTACEAE								
....ANKISTRODESMUS	75	1	400	1	90	3	*	0
....CHODATELLA	--	-	990	3	--	-	--	-
....CLOSTERIOPSIS	--	-	--	-	*	0	--	-
....DICTYOSPHAERIUM	1600#	31	--	-	--	-	--	-
....KIRCHNERIELLA	--	-	--	-	--	-	--	-
....OOCYSTIS	50	1	--	-	120	3	--	-
....SELENASTRUM	--	-	600	2	180	5	--	-
....TETRAEDRON	--	-	--	-	*	0	--	-
...SCENEDESMACEAE								
....ACTINASTRUM	--	-	--	-	210	6	--	-
....SCENEDESMUS	400	8	4800	14	590#	17	160	4
....TETRASTRUM	300	6	1600	5	100	3	--	-
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	150	3	--	-	77	2	91	2
..ZYGNEMATALES								
...DESMIDIACEAE								
....COSMARIUM	--	-	--	-	--	-	*	0
....STAURASTRUM	*	0	--	-	--	-	--	-
CHRYSOPHYTA								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....CYCLOTELLA	1100#	21	20000#	59	430	12	500	14
....MELOSIRA	650	13	400	1	52	1	100	3
....SKELETONEMA	--	-	--	-	--	-	--	-
..PENNALES								
...ACHNANTHACEAE								
....COCCONEIS	--	-	--	-	*	0	26	1
....RHOICOSPHENIA	--	-	--	-	26	1	26	1
...CYMBELLACEAE								
....CYMBELLA	--	-	--	-	--	-	--	-
....EPITHEMIA	--	-	--	-	--	-	--	-
...DIATOMACEAE								
....DIATOMA	--	-	--	-	--	-	78	2
...FRAGILARIACEAE								
....ASTERIONELLA	--	-	--	-	--	-	--	-
....FRAGILARIA	*	0	--	-	--	-	52	1
....SYNEDRA	--	-	--	-	26	1	--	-
...GOMPHONEMATACEAE								
....GOMPHONEMA	*	0	--	-	26	1	26	1
...NAVICULACEAE								
....NAVICULA	50	1	200	1	52	1	39	1
....PINNULARIA	--	-	--	-	--	-	--	-
...NITZSCHIACEAE								
....NITZSCHIA	300	6	790	2	170	5	160	4
...SURIRELLACEAE								
....SURIRELLA	--	-	--	-	--	-	--	-
...TABELLARIACEAE								
....TABELLARIA	--	-	--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..CHROOCOCCALES								
...CHROOCOCCACEAE								
....ANACYSTIS	430	8	400	1	930#	26	*	0
..HORMOGONALES								
...OSCILLATORIACEAE								
....OSCILLATORIA	--	-	--	-	230	6	1900#	52
...RIVULARIACEAE								
....RAPHIDIOPSIS	--	-	--	-	--	-	450	13
EUGLENOPHYTA (EUGLENOIDS)								
.EUGLENOPHYCEAE								
..EUGLENALES								
...EUGLENACEAE								
....EUGLENA	--	-	200	1	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 21.--*Water-quality data for Truckee Canal at U.S. Highway 50 above Lahontan Reservoir, Nev., water year 1980*--Continued

DATE	TIME	OXYGEN DEMAND, BIOCHEM CARBON. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM CARBON. 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. ULT. (MG/L)	DEOXYGE-NATION CARBON. (K1 TO BASE E PER DAY AT 20°C)	DEOXYGE-NATION CARBON. (K1 TO BASE 10 PER DAY AT 20°C)	OXYGEN DEMAND, BIOCHEM UNINHIB 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB ULT. (MG/L)	OXYGEN DEMAND, BIOCHEM NITROG. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM NITROG. ULT. (MG/L)
1979												
Oct												
19	1155	1.10	1.5	3.2	3.6	.11	.05	1.6	4.5	6.7	--	--
Nov												
20	1025	--	2.8	4.8	5.0	.16	.07	2.7	7.4	9.0	5.3	4.0
1980												
Jan												
14	0950	--	4.8	9.5	10.4	.12	.05	5.2	10.7	11.9	--	--
18	0950	--	1.8	3.3	3.5	.14	.06	2.1	4.2	4.6	--	--
Feb												
13	0850	--	2.4	4.2	4.3	.17	.07	2.5	5.1	5.3	5.4	1.0
Mar												
12	0855	--	2.2	3.4	3.4	.20	.09	2.3	4.0	4.2	--	--
Apr												
16	0955	--	1.8	4.1	4.8	.10	.04	1.9	5.3	6.2	8.0	1.3
23	0850	--	1.6	2.7	2.8	.18	.08	1.6	3.4	3.7	9.2	1.0
May												
02	0850	--	1.1	2.0	2.1	.15	.07	1.4	2.3	2.4	--	--
14	0925	--	1.5	2.8	3.1	.13	.06	1.4	3.6	4.9	--	--
20	1445	--	1.1	2.8	3.7	.07	.03	1.1	2.9	4.0	--	--
June												
03	0925	--	--	--	--	--	--	1.4	3.3	4.0	--	--
17	0945	--	1.6	2.9	3.1	.14	.06	1.9	3.7	4.0	--	--
30	1200	.11	1.4	2.8	3.1	.11	.05	1.7	3.8	4.4	--	--
July												
15	0955	--	2.8	5.3	5.6	.14	.06	2.8	6.5	7.0	6.7	1.4
Aug												
11	1030	.78	1.5	2.8	3.0	.13	.06	1.4	3.5	4.0	6.1	1.0
Sept												
17	0810	.12	1.6	4.2	5.8	.06	.03	2.3	7.2	9.7	9.7	3.9

TABLE 22.--*Water-quality data for Carson River below Lahontan Reservoir near Fallon, Nev., water year 1980*

[Abbreviations: BIOCHEM, biochemical; CARBON., carbonaceous; CELLS/ML, cells per milliliter; CHROMO, chromatography; DEG C, degrees Celsius; DIAM., diameter; FET-FLD, fixed-endpoint titration in field; FLUOROM, fluormeter; FT^3/S, cubic feet per second; MG/L, milligrams per liter; MM of HG, millimeters of Mercury; SED, sediment; SUSP., suspended; T/D, tons per day; UG/L, micrograms per liter; ULT, ultimate; UMHOS, micromhos per centimeter at 25°C; UNIHIB, uninhibited; <, less than; --, data not available]

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH, FIELD (UNITS)	BARO-METRIC PRES-SURE (MM OF HG)	TEMPER-ATURE, WATER (DEG C)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
OCT											
19...	1335	346	259	8.2	--	17.0	7.3	88	--	--	--
NOV											
20...	1230	6.2	315	9.3	--	8.0	15.9	156	--	--	--
DEC											
13...	1130	6.6	333	8.5	666	5.0	--	--	--	--	--
JAN											
14...	1115	4.5	374	8.3	--	8.0	9.8	96	--	--	--
FEB											
13...	1030	664	271	8.1	650	4.5	11.0	100	20	6.5	25
MAR											
12...	1050	415	276	8.0	660	6.5	11.3	107	21	5.9	26
APR											
16...	1315	893	282	8.1	662	9.5	10.4	105	23	6.2	25
23...	1050	893	281	7.8	654	10.0	10.0	103	--	--	--
MAY											
02...	1055	902	281	8.2	659	13.0	9.0	96	--	--	--
07...	1155	964	282	8.2	657	11.0	9.6	101	--	--	--
14...	1140	1420	280	8.0	653	12.5	9.4	102	22	5.9	23
20...	1600	1490	281	7.9	651	13.0	9.0	100	--	--	--
JUN											
03...	1115	1570	266	8.1	653	14.0	9.0	101	--	--	--
17...	1250	1280	255	7.9	656	15.0	8.3	95	23	5.6	20
30	1440	991	263	8.0	--	17.0	7.6	93	--	--	--
JUL											
15...	1210	1080	204	7.7	661	18.0	7.4	94	19	4.9	16
AUG											
11...	1320	978	210	7.9	655	20.0	6.3	81	18	4.7	15
SEP											
17...	1045	500	209	7.9	660	19.0	6.6	82	17	4.6	16

DATE	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE FET-FLD (MG/L AS HCO3)	CAR-BONATE FET-FLD (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180°C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (T/D)
OCT											
19...	--	--	--	--	--	--	--	--	167	--	156
NOV											
20...	--	--	92	18	--	--	--	--	187	--	3.1
DEC											
13...	--	--	130	3	--	--	--	--	231	--	4.1
JAN											
14...	--	--	140	0	--	--	--	--	235	--	2.8
FEB											
13...	1.2	3.7	99	0	36	17	.2	18	173	179	310
MAR											
12...	1.3	3.6	96	0	35	12	.2	17	188	171	211
APR											
16...	1.2	4.0	98	0	37	10	.2	18	185	175	446
23...	--	--	94	0	--	--	--	--	185	--	446
MAY											
02...	--	--	99	0	--	--	--	--	188	--	458
07...	--	--	99	0	--	--	--	--	184	--	479
14...	1.1	3.7	97	0	45	10	.2	18	187	176	717
20...	--	--	110	0	--	--	--	--	180	--	724
JUN											
03...	--	--	88	0	--	--	--	--	162	--	687
17...	1.0	3.5	86	0	34	7.9	.2	18	162	162	560
30...	--	--	86	0	--	--	--	--	150	--	401
JUL											
15...	.8	3.2	79	0	32	6.6	.3	18	150	142	437
AUG											
11...	.8	3.3	79	0	27	6.2	.3	19	134	134	354
SEP											
17...	.9	3.5	79	0	26	7.5	.2	19	148	140	200

TABLE 22.--*Water-quality data for Carson River below Lahontan Reservoir near Fallon, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/s)	NITRO-GEN, NITRATE TOTAL (MG/L (CFS)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NITRITE TOTAL (MG/L AS N)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
19...	1335	346	0.62	--	0.02	--	0.03	0.01	0.74
NOV									
20...	1230	6.2	.72	--	.02	--	.06	.04	.43
DEC									
13...	1130	6.6	.61	--	.04	--	.05	.03	.54
JAN									
14...	1115	4.5	.42	--	.08	--	.08	.06	.61
FEB									
13...	1030	664	--	.80	--	.01	.32	.33	--
MAR									
12...	1050	415	--	.70	--	.01	--	.25	--
APR									
16...	1315	893	--	.64	--	.03	.26	.26	.50
23...	1050	893	--	.55	--	.03	.14	.14	.72
MAY									
02...	1055	902	--	.59	--	.03	.10	.12	.84
07...	1155	964	--	.58	--	.04	.09	.11	.55
14...	1140	1420	--	.45	--	.02	.06	.07	.53
20...	1600	1490	--	.47	--	.01	.03	.01	1.2
JUN									
03...	1115	1570	--	.44	--	.01	.03	.01	.70
17...	1250	1280	--	.15	--	.02	.06	--	.62
30...	1440	991	--	.32	--	.02	.02	--	1.1
JUL									
15...	1210	1080	--	.32	--	.01	.01	--	.66
AUG									
11...	1320	978	--	.22	--	.02	.04	.04	.61
SEP									
17...	1045	500	--	.46	--	.02	--	.06	--

DATE	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L)	ALGAL GROWTH POTEN-TIAL, BOTTLE TEST (MG/L)
OCT									
19...	0.63	0.37	--	0.28	5.8	0.2	0.819	0.047	--
NOV									
20...	.28	.26	--	.22	9.1	.2	.595	<.112	23
DEC									
13...	.36	.28	--	.24	5.9	.2	.252	<.097	35
JAN									
14...	.62	.39	--	.21	8.1	--	3.23	.278	31
FEB									
13...	.63	.29	0.26	.29	3.9	.6	1.06	.045	35
MAR									
12...	.51	.31	.26	.28	4.3	.3	1.87	.094	38
APR									
16...	.50	.30	.26	.24	8.1	.7	.539	.051	--
23...	.28	.25	.22	.17	4.8	.2	.145	.027	33
MAY									
02...	.37	.24	.19	.15	5.8	.2	.230	.000	32
07...	.42	.31	.19	.18	6.6	.6	.427	.053	24
14...	.47	.21	--	--	6.4	.7	.176	<.088	28
20...	.79	.24	.18	.14	9.5	.2	.464	.062	20
JUN									
03...	.69	.22	.15	.12	7.6	.6	.716	.818	23
17...	--	.23	.12	.07	7.6	1.1	1.19	<.111	23
30...	--	.24	.07	.08	4.3	.8	.279	.028	13
JUL									
15...	--	.25	.15	.06	5.4	.6	1.88	.118	11
AUG									
11...	.52	.25	.20	.19	6.5	.2	2.26	.080	16
SEP									
17...	.50	.29	.21	.19	3.6	1.0	1.69	.067	43

TABLE 22.--*Water-quality data for Carson River below Lahontan Reservoir near Fallon, Nev., water year 1980*--Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (FT^3/S)	SEDI-MENT, SUS-PENDED (MG/L)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/D)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT					
19...	1335	346	63	59	82
JAN					
14...	1115	4.5	96	1.2	99
FEB					
13...	1030	664	10	18	72
MAR					
12...	1050	415	68	76	--
APR					
16...	1315	893	34	82	--
23...	1050	893	36	87	--
MAY					
02...	1055	902	28	68	93
07...	1155	964	32	83	--
14...	1140	1420	28	107	--
20...	1600	1490	32	129	--
JUN					
03...	1115	1570	45	191	--
17...	1250	1280	70	242	93
30...	1440	991	64	171	93
JUL					
15...	1210	1080	73	213	96
AUG					
11...	1320	978	23	61	--
SEP					
17...	1045	500	36	49	--

TABLE 22.--*Water-quality data for Carson River below Lahontan Reservoir near Fallon, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

	OCT 19,79		JAN 14,80		APR 16,80		MAY 14,80		JUNE 3,80	
TIME	1335		1115		1315		1140		1115	
TOTAL CELLS/ML	1100		140		78		13		720	
DIVERSITY: DIVISION	1.0		0.4		0.0		0.0		0.4	
.CLASS	1.0		0.4		0.0		0.0		0.4	
..ORDER	1.1		0.7		0.9		0.0		0.6	
...FAMILY	1.8		1.7		0.9		0.0		0.6	
....GENUS	1.8		1.7		1.6		0.0		0.6	
	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT	CELLS /ML	PER-CENT
ORGANISM										
CHLOROPHYTA (GREEN ALGAE)										
.CHLOROPHYCEAE										
..CHLOROCOCCALES										
...CHARACIACEAE										
....SCHROEDERIA	13	1	5	4	--	-	--	-	--	-
...OOCYSTACEAE										
....ANKISTRODESMUS	--	-	--	-	--	-	--	-	13	2
....OOCYSTIS	--	-	--	-	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	--	-	13#	100	--	-
...SCENEDESMACEAE										
....SCENEDESMUS	26	2	--	-	--	-	--	-	--	-
..VOLVOCALES										
...CHLAMYDOMONADACEAE										
....CHLAMYDOMONAS	--	-	--	-	--	-	--	-	--	-
CHRYSOPHYTA										
.BACILLARIOPHYCEAE										
..CENTRALES										
...COSCINODISCACEAE										
....CYCLOTELLA	13	1	5	4	26#	33	--	-	13	2
....MELOSIRA	--	-	--	-	--	-	--	-	26	4
....STEPHANODISCUS	--	-	--	-	26#	33	--	-	--	-
..PENNALES										
...ACHNANTHACEAE										
....COCCONEIS	--	-	--	-	--	-	--	-	--	-
....RHOICOSPHENIA	--	-	--	-	--	-	--	-	--	-
...CYMBELLACEAE										
....CYMBELLA	--	-	--	-	--	-	--	-	--	-
...FRAGILARIACEAE										
....FRAGILARIA	51	5	--	-	26#	33	--	-	--	-
....SYNEDRA	--	-	10	7	--	-	--	-	--	-
...GOMPHONEMATACEAE										
....GOMPHONEMA	39	3	--	-	--	-	--	-	--	-
...NAVICULACEAE										
....NAVICULA	77	7	35#	25	--	-	--	-	--	-
...NITZSCHIACEAE										
....NITZSCHIA	51	5	81#	57	--	-	--	-	--	-
CRYPTOPHYTA (CRYPTOMONADS)										
.CRYPTOPHYCEAE										
..CRYPTOMONADALES										
...CRYPTOCHRYSIDACEAE										
....CHROOMONAS	13	1	--	-	--	-	--	-	--	-
...CRYPTOMONADACEAE										
....CRYPTOMONAS	--	-	--	-	--	-	--	-	--	-
CYANOPHYTA (BLUE-GREEN ALGAE)										
.CYANOPHYCEAE										
..CHROOCOCCALES										
...CHROOCOCCACEAE										
....AGMENELLUM	--	-	--	-	--	-	--	-	--	-
....ANACYSTIS	--	-	--	-	--	-	--	-	13	2
..HORMOGONALES										
...NOSTOCACEAE										
....ANABAENA	64	6	--	-	--	-	--	-	--	-
....APHANIZOMENON	--	-	--	-	--	-	--	-	650#	91
...OSCILLATORIACEAE										
....OSCILLATORIA	770#	69	--	-	--	-	--	-	--	-
EUGLENOPHYTA (EUGLENOIDS)										
.EUGLENOPHYCEAE										
..EUGLENALES										
...EUGLENACEAE										
....EUTREPTIA	--	-	5	4	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
* - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 22.--*Water-quality data for Carson River below Lahontan Reservoir near Fallon, Nev., water year 1980*--Continued

PHYTOPLANKTON ANALYSES, OCTOBER 1979 TO SEPTEMBER 1980

DATE	JUNE 30,80	JULY 15,80	AUG 11,80	SEP 17,80
TIME	1440	0000	1320	1045
TOTAL CELLS/ML	240	4800	12000	7600
DIVERSITY: DIVISION	0.3	0.2	0.1	0.3
.CLASS	0.3	0.2	0.1	0.3
..ORDER	0.3	0.2	0.1	1.1
...FAMILY	0.3	0.2	0.4	1.1
....GENUS	0.3	0.2	0.4	1.2

ORGANISM	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT	CELLS /ML	PER- CENT
CHLOROPHYTA (GREEN ALGAE)								
.CHLOROPHYCEAE								
..CHLOROCOCCALES								
...CHARACIACEAE								
....SCHROEDERIA	--	-	--	-	--	-	--	-
...OOCYSTACEAE								
....ANKISTRODESMUS	--	-	--	-	--	-	--	-
....OOCYSTIS	--	-	--	-	--	-	--	-
....SELENASTRUM	--	-	--	-	--	-	--	-
...SCENEDESMACEAE								
....SCENEDESMUS	--	-	--	-	--	-	100	1
..VOLVOCALES								
...CHLAMYDOMONADACEAE								
....CHLAMYDOMONAS	--	-	--	-	--	-	--	-
CHRYSOPHYTA								
.BACILLARIOPHYCEAE								
..CENTRALES								
...COSCINODISCACEAE								
....CYCLOTELLA	--	-	*	0	--	-	*	0
....MELOSIRA	13	5	78	2	--	-	140	2
....STEPHANODISCUS	--	-	--	-	--	-	*	0
..PENNALES								
...ACHNANTHACEAE								
....COCCONEIS	--	-	--	-	--	-	*	0
....RHOICOSPHENIA	--	-	--	-	--	-	*	0
...CYMBELLACEAE								
....CYMBELLA	--	-	--	-	--	-	*	0
...FRAGILARIACEAE								
....FRAGILARIA	--	-	--	-	--	-	--	-
....SYNEDRA	--	-	--	-	--	-	--	-
...GOMPHONEMATACEAE								
....GOMPHONEMA	--	-	--	-	--	-	--	-
...NAVICULACEAE								
....NAVICULA	--	-	--	-	*	0	--	-
...NITZSCHIACEAE								
....NITZSCHIA	--	-	26	1	--	-	*	0
CRYPTOPHYTA (CRYPTOMONADS)								
.CRYPTOPHYCEAE								
..CRYPTOMONADALES								
...CRYPTOCHRYSIDACEAE								
....CHROOMONAS	--	-	--	-	--	-	--	-
...CRYPTOMONADACEAE								
....CRYPTOMONAS	--	-	--	-	*	0	*	0
CYANOPHYTA (BLUE-GREEN ALGAE)								
.CYANOPHYCEAE								
..CHROOCOCCALES								
...CHROOCOCCACEAE								
....AGMENELLUM	--	-	--	-	--	-	--	-
....ANACYSTIS	--	-	--	-	--	-	1800#	24
..HORMOGONALES								
...NOSTOCACEAE								
....ANABAENA	--	-	--	-	--	-	--	-
....APHANIZOMENON	230#	95	4700#	98	11000#	93	5400#	71
...OSCILLATORIACEAE								
....OSCILLATORIA	--	-	--	-	770	6	--	-
EUGLENOPHYTA (EUGLENOIDS)								
.EUGLENOPHYCEAE								
..EUGLENALES								
...EUGLENACEAE								
....EUTREPTIA	--	-	--	-	--	-	--	-

NOTE: # - DOMINANT ORGANISM; EQUAL TO OR GREATER THAN 15%
 * - OBSERVED ORGANISM, MAY NOT HAVE BEEN COUNTED; LESS THAN 1/2%

TABLE 22.--*Water-quality data for Carson River below Lahontan Reservoir near Fallon, Nev., water year 1980*--Continued

DATE	TIME	OXYGEN DEMAND, BIOCHEM CARBON. (DAYS LAGTIME AT 20°C)	OXYGEN DEMAND, BIOCHEM CARBON. 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM CARBON. ULT. (MG/L)	DEOXYGE-NATION CARBON. (K1 TO BASE E PER DAY AT 20°C)	DEOXYGE-NATION CARBON. (K1 TO BASE 10 PER DAY AT 20°C)	OXYGEN DEMAND, BIOCHEM UNINHIB 5-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB 20-DAY (MG/L)	OXYGEN DEMAND, BIOCHEM UNINHIB ULT. (MG/L)
1979										
Oct										
19	1335	.11	1.0	1.7	1.8	.16	.07	1.0	2.1	2.4
Nov										
20	1230	.03	4.0	7.8	8.4	.13	.06	5.9	10.4	10.9
Dec										
13	1130	--	4.4	7.1	7.3	.19	.08	--	--	--
1980										
Feb										
13	1030	--	1.3	2.5	2.7	.14	.06	1.5	3.3	3.9
Mar										
12	1050	.50	1.4	2.3	2.4	.17	.07	2.0	2.9	3.0
May										
02	1055	--	1.5	2.0	2.1	.25	.11	1.6	2.4	2.5
07	1155	--	1.2	2.0	2.1	.16	.07	1.2	2.7	3.1
14	1140	.30	.9	2.2	2.7	.09	.04	1.0	2.3	2.8
20	1600	--	.8	2.3	3.4	.06	.03	.9	2.4	3.4
June										
17	1250	--	.7	1.9	2.6	.06	.03	1.3	2.8	3.2
30	1440	0	1.2	2.4	2.5	.14	.06	1.5	2.8	2.9
July										
15	1210	--	1.1	2.5	3.0	.10	.04	1.5	2.9	3.2
Aug										
11	1320	.52	1.0	1.8	1.9	.15	.07	--	--	--
Sept										
17	1045	.35	1.9	2.9	3.0	.20	.09	1.1	2.1	2.3

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