WATER QUALITY OF THE LEXINGTON RESERVOIR, SANTA CLARA COUNTY, CALIFORNIA, 1978-80

By *Rick T. Iwatsubo, Marc A. Sylvester* (U.S. Geological Survey), and *Isabel S. Gloege* (Santa Clara Valley Water District)

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 87-4253

Prepared in cooperation with the

SANTA CLARA VALLEY WATER DISTRICT

Sacramento, California
1988

DEPARTMENT OF THE INTERIOR

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CONVERSION FACTORS

Within this report, both metric (International System or SI) and inch-pound units are used. For stream sites, water-quality characteristics are reported in metric units, and physical characteristics, velocity, discharge, area, and altitude are reported in inch-pound units. Depth is reported in metric units. Conversion factors for inch-pound units to metric units for the terms used in this report are listed below.

Multiply inch-pound unit	By	To obtain SI unit
acre	0.4047	hectare
acre-ft (acre-foot)	1,233	m^3 (cubic meter)
ft (foot)	0.3048	m (meter)
ft^3/s (cubic foot per second)	0.02832	m^3/s (cubic meter per second)
inch	25.4	mm (millimeter)
in/yr (inch per year)	25.4	mm/yr (millimeter per annum)
mile	1.609	km (kilometer)
mi^2 (square mile)	2.590	km^2 (square kilometer)
degree Fahrenheit (°F)	°C = 5/9 (°F-32)	degree Celsius (°C)

Additional abbreviations

cells/mL	cells per milliliter
colonies/100 mL	colonies per 100 milliliters
μg/L	microgram per liter
meq/L	milliequivalent per liter
mg/L	milligram per liter
TSI	trophic state index
$(mg\ C/m^2)/d$	milligram carbon per square meter per day
$(mg\ O_2/m^3)/d$	milligram oxygen per cubic meter per day
μS/cm	microsiemens per centimeter

The use of brand names in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

Sea Level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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By *Rick T. Iwatsubo, Marc A. Sylvester,* and *Isabel S. Gloege*[1]

ABSTRACT

A study to describe water-quality conditions of Lexington Reservoir and Los Gatos Creek upstream from Lexington Reservoir was done from June 1978 through September 1980. Results of the study show that water samples from Lexington Reservoir and Los Gatos Creek upstream from the reservoir generally met water-quality objectives for municipal and domestic-water supply, water-contact recreation, noncontact water recreation, cold and warm freshwater habitat, wildlife habitat, and fish spawning. Water-temperature profiles show that Lexington Reservoir can be classified as a warm monomictic lake. During the summer, dissolved-oxygen concentrations generally were not below 5.0 milligrams per liter in the hypolimnion; only once during the study (August 1978) did bottom waters become anoxic. In Lexington Reservoir, water transparency generally decreased with depth. The euphotic zone ranged from 1.0 to 5.4 meters, depending on the amount of suspended solids and algae in the water, and generally was greater in the summer than in the spring.

Calcium and bicarbonate generally were the dominant ions in water samples collected from all stations except during spring, following the rainy season, when waters were a mixed cation bicarbonate type. Nitrogen concentrations were greater at reservoir-sampling stations than at the stream-sampling station. Most of the nitrogen was in the ammonia and organic forms. The amount of dissolved nitrate in the reservoir appeared to be related to phytoplankton abundance. Phosphorus concentrations ranged from less than 0.01 to 0.10 milligram per liter, were similar at all sampling stations, and changed little with depth or from one sampling date to the next. Trace-element concentrations generally were less than 100 micrograms per liter.

[1]Santa Clara Valley Water District.

Blue-green algae were predominant in reservoir samples. A phytoplankton bloom, composed mostly of the blue-green algae, *Aphanizomenon*, was observed during May 1980. Values of Carlson's trophic-state index, calculated from phytoplankton chlorophyll-*a* concentrations, indicated that Lexington Reservoir generally is not eutrophic. Estimates of net primary productivity in the reservoir ranged from -1,000 to 5,700 milligrams of oxygen per cubic meter per day, which are typical for an oligotrophic to mesotrophic lake. Concentrations of fecal-coliform and fecal-streptococcal bacteria generally were less than 10 colonies per 100 milliliters at reservoir-sampling stations and 100 colonies per 100 milliliters at the stream-sampling station.

INTRODUCTION

Lexington Reservoir, formed by the construction of Lexington Dam across Los Gatos Creek, is located in the Santa Cruz Mountains a few miles south of Santa Clara Valley, California (fig. 1). The Lexington Reservoir drainage basin consists of approximately 37 mi^2 of heavily vegetated mountainous terrain with a combination of low-level brush and dense forest. Although most of the drainage basin is sparsely populated, several low-density housing communities are located just south of the reservoir and along the southwest boundary of the basin.

The principal use of Lexington Reservoir is for water conservation. Surface-water runoff is impounded in the reservoir and released to percolation areas during the dry summer months. Water released from Lexington Reservoir supplements the natural recharge of the ground-water basin and satisfies increased ground-water pumping demands. Along with water conservation, the reservoir's beneficial uses include recreation and sport fishing.

Background

In order to develop a comprehensive water-management program, a well-developed water-quality monitoring program is needed. Factors that can influence water-quality conditions of reservoirs and streams need to be identified and evaluated. In the early 1970's, the Santa Clara Valley Water District (District) staff recognized that the existing water-quality monitoring program would not provide data that would adequately describe water-quality conditions at their reservoirs. Therefore, a more extensive water-quality monitoring program was begun.

At about the same time, Lexington Reservoir began to have water-quality problems (primarily an increase in algal production) associated with an increased number of failing individual septic-tank systems. In order to understand water-quality conditions in the Lexington Reservoir and to determine any changes in the reservoir caused by man's activities in the drainage basin, the U.S. Geological Survey, in cooperation with the Santa Clara Valley Water District, initiated a water-quality study of the reservoir in 1978.

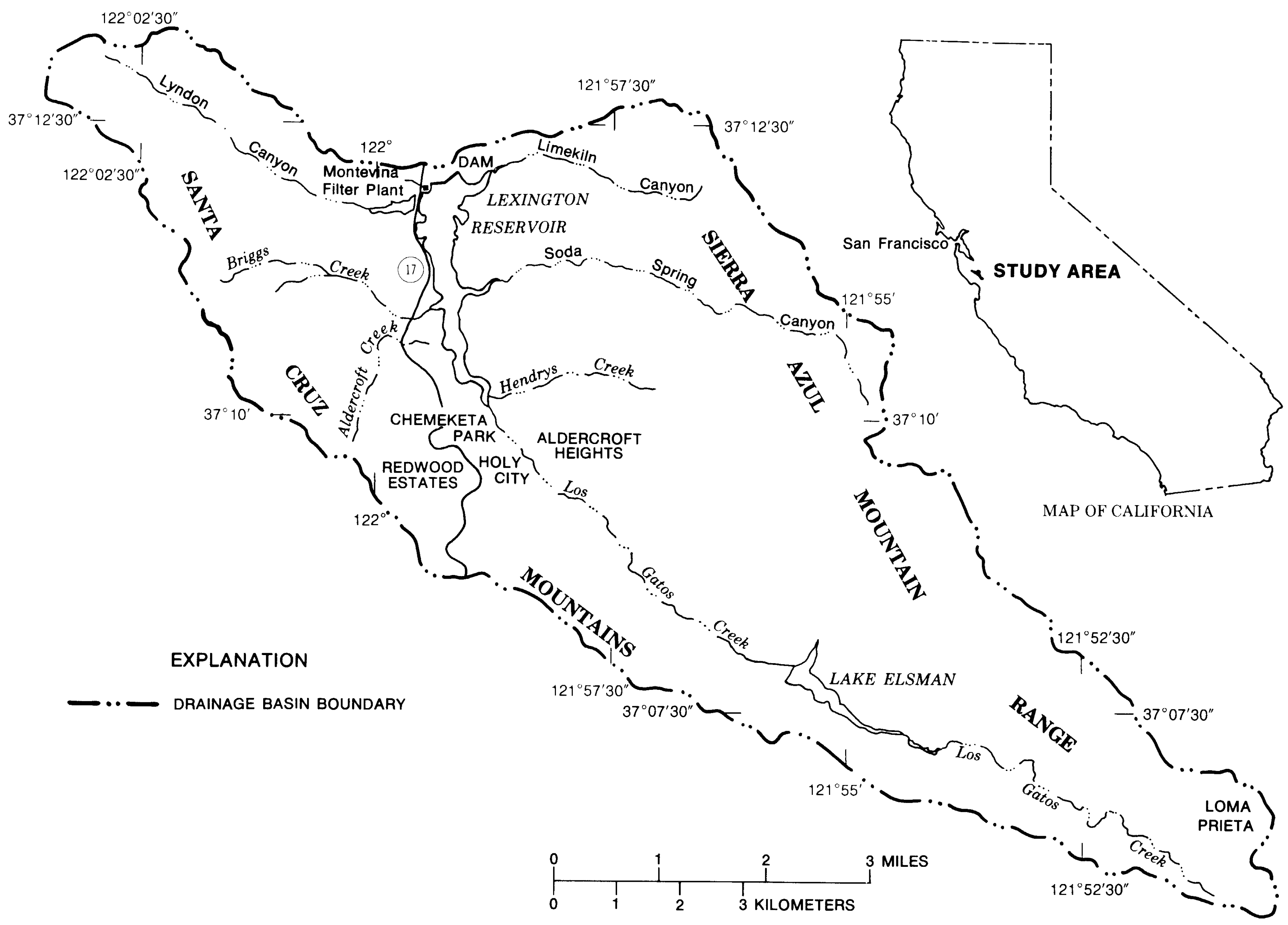


FIGURE 1.—Location of study area.

Purpose and Scope

The purpose of this report is to describe the water-quality conditions of Lexington Reservoir and Los Gatos Creek upstream from the reservoir from June 1978 through September 1980. This report is part of a long-term study to document water-quality conditions and to determine any significant water-quality changes as the result of man's activities in the drainage basin. The information collected during the study also can be used to evaluate the District's current reservoir-monitoring network in order to determine if their water-quality monitoring objectives are being met. In addition, the District will use the information collected to manage Lexington Reservoir for water conservation as well as for recreational purposes.

This report is based on data collected from 1978 through 1980. During seven field trips, data were collected at three reservoir-sampling stations and at the station Los Gatos Creek above the reservoir. Physical and chemical data collected included reservoir volume, water temperature, dissolved oxygen, pH, specific conductance, light transmission, water transparency, major chemical ions and nutrients, and selected trace elements. Biological characteristics data included phytoplankton, estimates of primary productivity, and bacteria.

DESCRIPTION OF THE STUDY AREA

Reservoir and Stream

Lexington Reservoir was formed by construction of Lexington Dam across Los Gatos Creek in 1952. The dam is a rolled earthfill type, 195 ft high and 830 ft long at the crest, which provides a maximum usable storage capacity of 20,210 acre-ft and a surface area of 404 acres when full.

The principal stream in the study area is Los Gatos Creek which originates in the southeastern end of the drainage basin and flows northwesterly for about 3 miles into Lake Elsman. Los Gatos Creek then continues for about 4 miles before emptying into Lexington Reservoir. Various additional tributaries feed directly into Lexington Reservoir. Lyndon Canyon, Briggs Creek, and Aldercroft Creek flow into Lexington on the west side, and Limekiln Canyon, Soda Spring Canyon, and Hendrys Creek flow into the east side of the reservoir (fig. 1).

Part of the runoff from about 29 mi^2 of the drainage basin is diverted from Lake Elsman by San Jose Water Works to their Montevina Filter Plant (fig. 1). Maximum production at this plant is 16,000 acre-ft per year, or approximately 45 percent of the total mean runoff from the Los Gatos Creek drainage basin upstream from Lexington Dam. Additional amounts of water are taken from intakes located on several tributaries throughout the drainage basin.

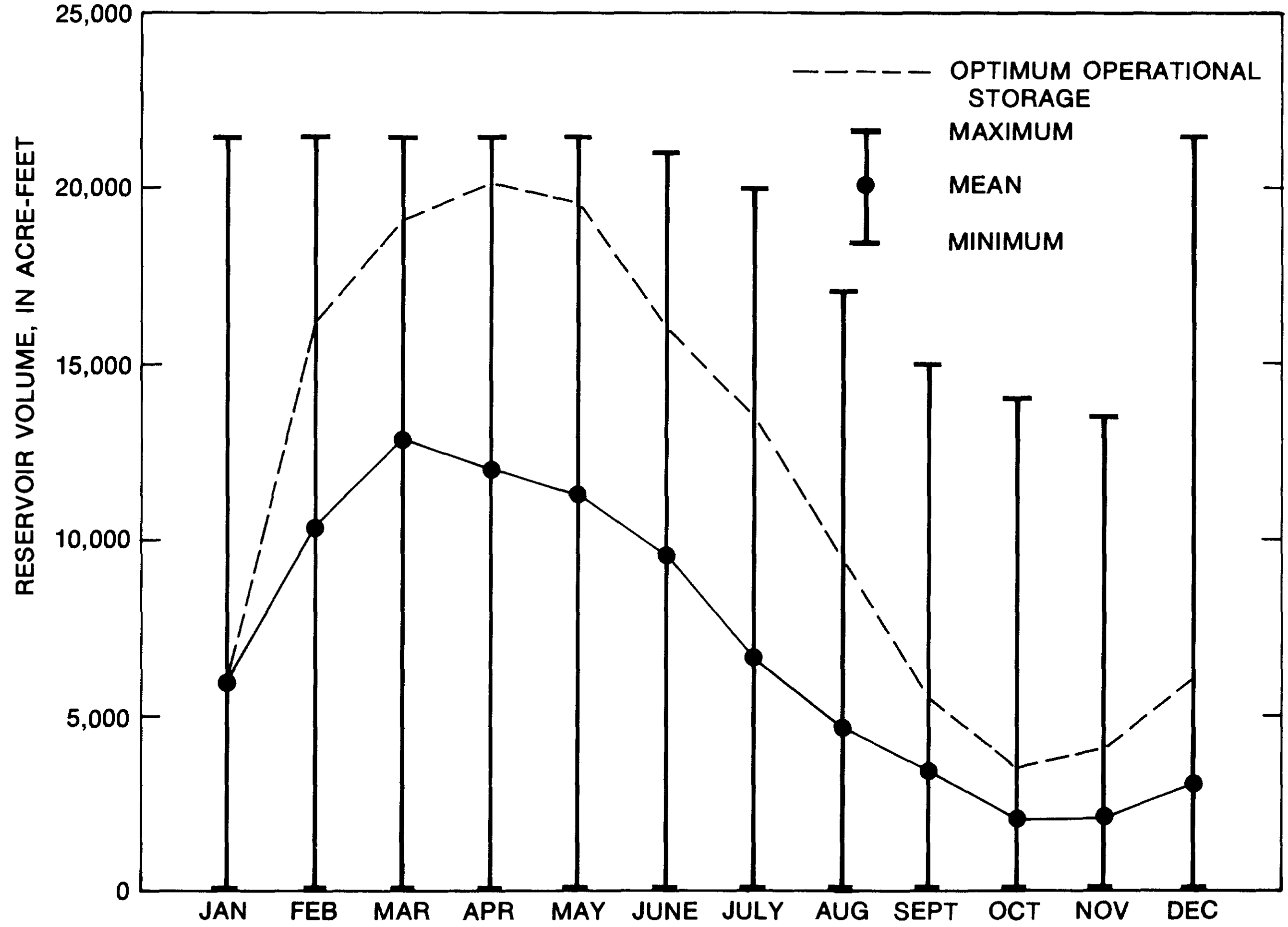
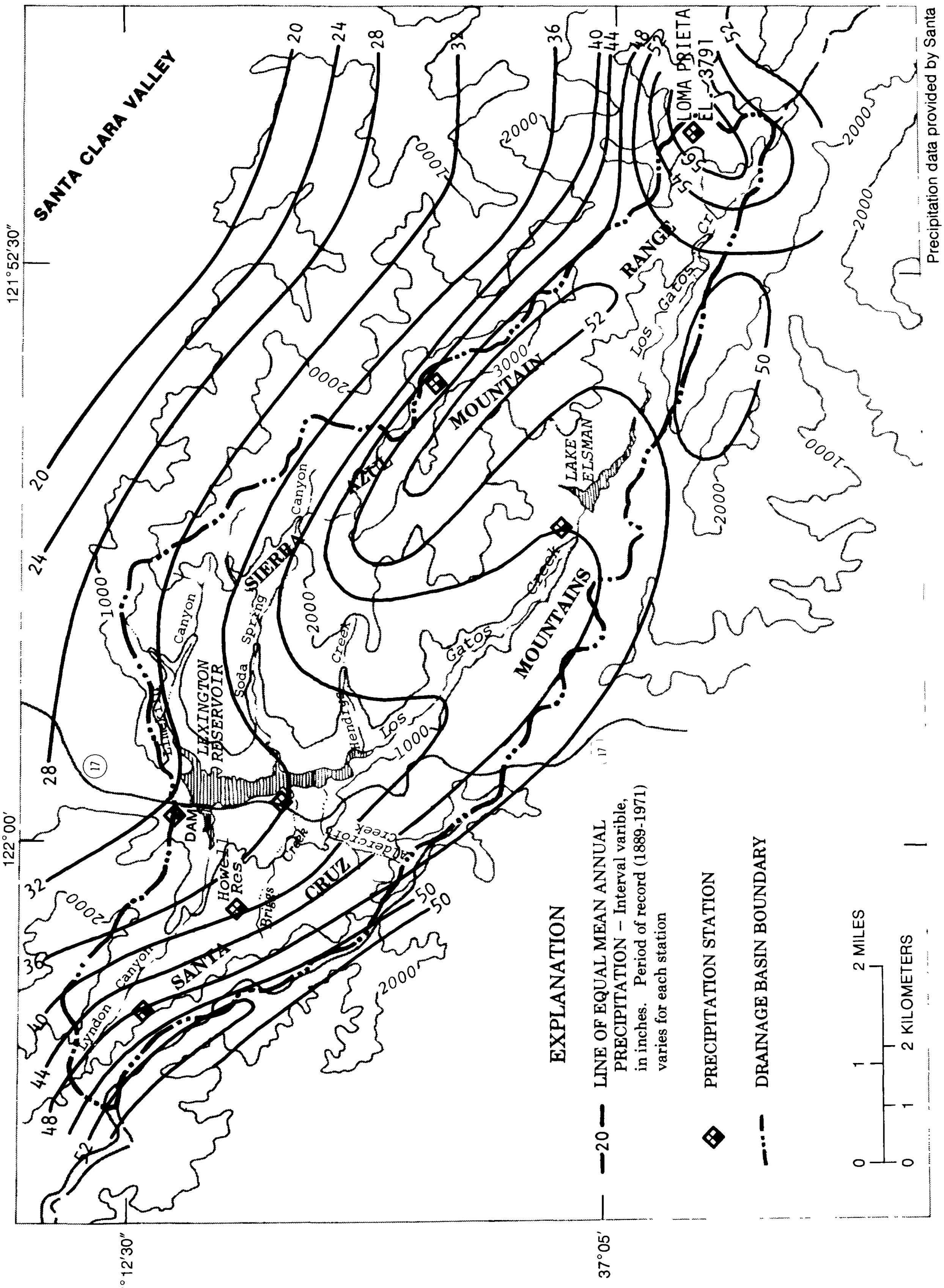


FIGURE 2.—Optimum operational storage curve, and monthly maximum, minimum, and mean reservoir volume, Lexington Reservoir, 1952-80.

Water from Lexington Reservoir, released through a bottom-withdrawal outlet, flows down Los Gatos Creek for recharge in the Los Gatos recharge system, which consists of Los Gatos Creek streambed and two offstream percolation ponds. The District's optimum operational storage curve for Lexington Reservoir during a typical water year is shown in figure 2. In addition, monthly maximum, minimum, and mean reservoir volumes are shown for 1952-80.

Topography

The topography of the Lexington Reservoir drainage basin is mountainous with steep slopes occasionally interrupted with rounded, grass-covered fluvial terraces. The steep slopes are heavily vegetated with a combination of low-level brush and large areas of dense forest. The altitude of the drainage basin ranges from 3,791 ft at the top of Loma Prieta to 650 ft at the spillway crest of Lexington Dam (fig. 3).



Precipitation data provided by Santa Clara Valley Water District

FIGURE 3.—Mean annual precipitation in the study area.

Geology and Soils

The major geological feature of the study area is the San Andreas fault zone, which roughly parallels Los Gatos Creek to Lexington Reservoir and then follows Lyndon Canyon to the northwest. The fault zone divides the drainage basin into two distinct geologic units. The drainage area located northeast of the San Andreas fault zone is part of the Sierra Azul Mountain Range and is underlain by a combination of the Jurassic and Cretaceous Franciscan Complex and unnamed Cretaceous rock formations. The Franciscan assemblage is exposed over a large part of the Sierra Azul Mountain Range and consists of graywacke sandstone, shale, chert, volcanic rocks, gabbro, and serpentine. The drainage area southwest of the fault zone is part of the Santa Cruz Mountains and consists of sandstone and shale formations.

Bedrock units throughout the drainage basin are covered in places by landslide deposits. These unconsolidated to partly consolidated deposits are most common on the southwest side of the San Andreas fault zone. Unconsolidated alluvial deposits, consisting of sand, gravel, and silt, occur along the main channel of Los Gatos Creek and along some of the tributary streams.

Climate

Air temperatures in the Lexington Reservoir drainage basin generally are mild throughout the year. In summer, typical maximum daily temperatures average 82 °F, and minimum daily temperatures average 46 °F. In winter, maximum daily temperatures average 60 °F, and minimum daily temperatures average 37 °F. Monthly mean air temperatures for the study period are shown in table 1.

Precipitation in the study area ranges from an average of 32 in/yr in the vicinity of Lexington Dam to 56 in/yr in the Loma Prieta area at the southeast end of the drainage basin (fig. 3). Seven precipitation stations within the Lexington Reservoir drainage basin provided information for drawing the lines of equal mean annual precipitation shown in figure 3.

Monthly evaporation rates at Lexington Reservoir were measured during the study period, June 1978 through September 1980, by using a U.S. Weather Bureau Class A Land Pan. The mean annual evaporation rate for the study period was 38.2 inches.

TABLE 1.--*Monthly mean air temperatures, in degrees Fahrenheit, measured at Lexington Reservoir, 1978-80*

[Data from Santa Clara Valley Water District, written commun., 1983; --, no data]

Month	Year		
	1978	1979	1980
January	--	44	48
February	--	45	52
March	--	51	50
April	--	53	54
May	--	61	57
June	64	65	60
July	68	69	68
August	69	67	65
September	64	68	66
October	63	60	--
November	50	51	--
December	42	49	--

Land Use

Land use in Lexington Reservoir drainage basin consists predominantly of nonresidential uses including agricultural, recreational, and open-space property. Agricultural uses are relatively insignificant and are limited primarily to Christmas tree farms, orchards, and vineyards scattered throughout the drainage basin. Recreational uses include boating and fishing on the reservoir and the use of two parks. Residential development (population about 2,500) is west and south of the reservoir. Most of the development is located immediately south of Lexington Reservoir in the communities of Redwood Estates, Holy City, Chemeketa Park, and Aldercroft Heights (fig. 1).

FIELD AND LABORATORY METHODS

Lexington Reservoir

At each Lexington Reservoir station (fig. 4), vertical profiles of water temperature, dissolved oxygen, pH, and specific conductance were made by using a Martek multiparameter water-quality instrument. Light-transmission profiles were measured using a Martek transmissometer. Transparency was measured using a Secchi disk and a Montedoro Whitney portable underwater solar illuminance instrument.

Water samples for chemical analysis and phytoplankton determination were collected using a modified Van Dorn sampler. Samples collected for chemical analysis from June 1978 through June 1979 were sent to the Survey's Denver National Water-Quality Laboratory in Arvada, Colorado, and analyzed following the methods described by Brown and others (1970) and Skougstad and others (1979). Samples collected from March through September 1980 were sent to the District's laboratory in Los Gatos, California, and analyzed following the methods described by the American Public Health Association and others (1976). A quality-assurance program was established between the Survey and the District's laboratory for this analytical work. The District's laboratory participated in the Survey's Standard Reference Water Sample Program and periodically received blind samples to analyze. Phytoplankton samples were sent to the Survey's Atlanta National Water-Quality Laboratory in Doraville, Georgia, for identification, enumeration, and determination of chlorophyll concentration following the methods described by Greeson and others (1977).

Water samples for fecal-coliform and fecal-streptococcal bacteria were collected in sterile bottles near the water surface at each station and analyzed by using the membrane-filter method (Greeson and others, 1977). At the center of the reservoir, primary productivity was estimated by using the oxygen light- and dark-bottle method (Greeson and others, 1977). Evaporation rate was measured at Lexington Reservoir by using a U.S. Weather Bureau Class A Land Pan and the method described by Veihmeyer (1964).

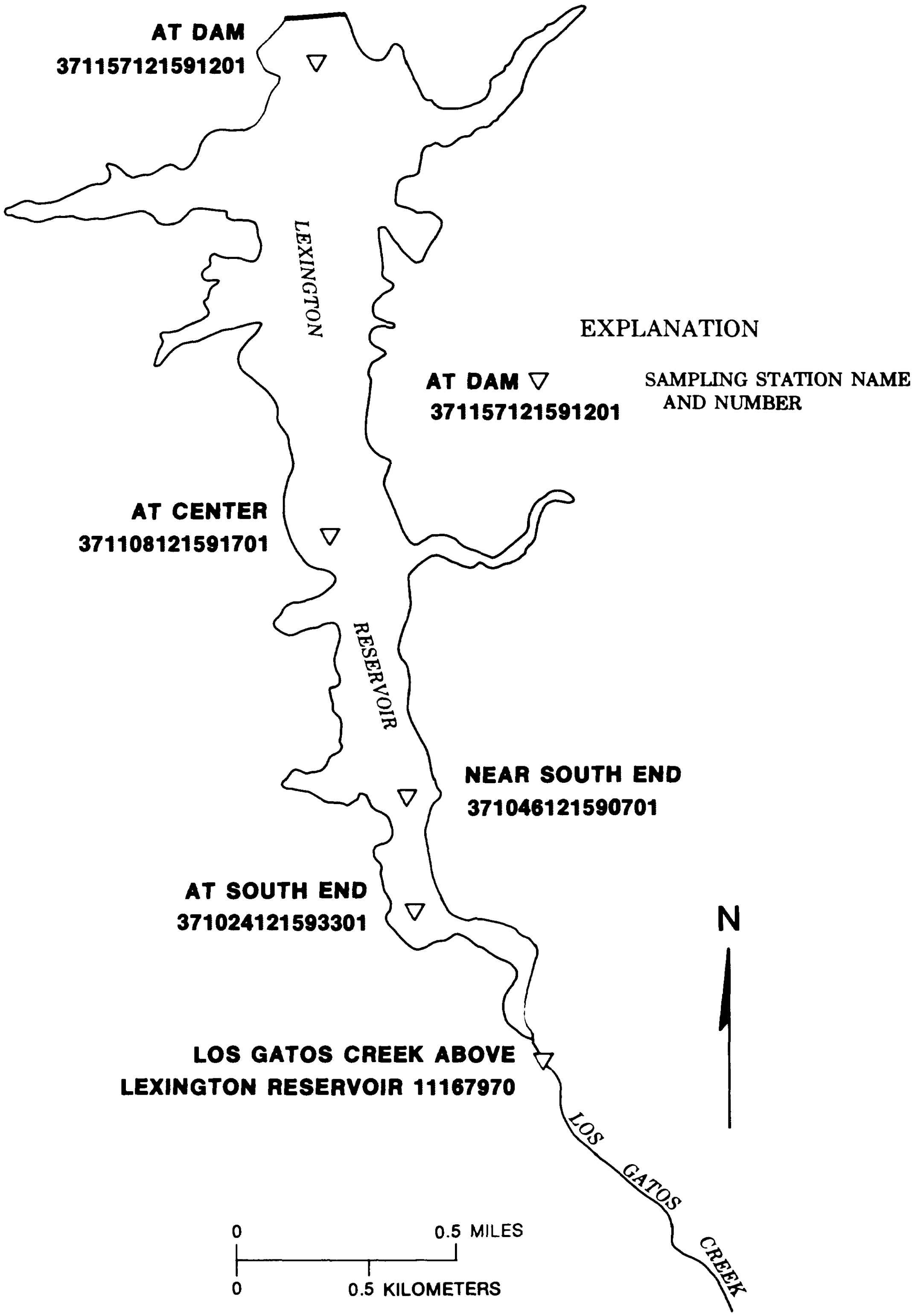


FIGURE 4.—Location of Lexington Reservoir and Los Gatos Creek sampling stations.

Los Gatos Creek

At the station Los Gatos Creek above Lexington Reservoir (fig. 4), water temperature was measured with a hand-held mercury thermometer. Portable field instruments were used to determine specific conductance and pH. Dissolved-oxygen concentrations were determined by the Alsterberg-azide modification of the Winkler method (Brown and others, 1970; Skougstad and others, 1979). Water discharge was measured using the procedures described by Buchanan and Somers (1969).

Water samples for chemical analysis were collected with a hand-held depth-integrating sampler and the equal width increment (EWI) method (U.S. Geological Survey, 1977). The Survey and District laboratories analyzed the samples using the methods previously cited.

Bacterial samples were collected at the centroid of flow in sterile bottles and analyzed in the same manner as the reservoir samples.

SAMPLING DESIGN

In 1978 the District's water-quality monitoring network was revised because of changing water and land-use activities; the increasing complexities of regulations governing the quality of water distributed for various purposes combined to make the existing network outmoded (Pederson and others, 1978). The revised reservoir-monitoring network entails a priority ranking of drainage basins with reservoirs and the sampling of reservoirs and their major tributary on a 3-year rotational basis.

Lexington Reservoir was the first reservoir sampled under the new water-quality monitoring network designed by the Survey and the District. The three reservoir stations, at dam, at center, and at or near south end (depending on the reservoir level), depict the deepest part of the reservoir, the center, and the end nearest the inflow, respectively. Los Gatos Creek is the major inflow to the reservoir, and the station is located immediately upstream from the reservoir (fig. 4).

The types and frequency of physical, chemical, and biological data collected under the revised reservoir-monitoring network are presented in table 2. Deviations from this sampling-schedule matrix were made periodically during the study.

Quarterly sampling did not take place because the reservoir never filled during the second year of the study, and it was decided not to sample unless the reservoir volume was significantly different than it was during the same season of the previous year. In addition, equipment failure and errors in sampling procedures occasionally resulted in deviation from the sampling-schedule matrix.

TABLE 2.--*Sampling-schedule matrix for Lexington Reservoir and Los Gatos Creek, 1978-80*

[-- not determined]

Location	Constituent and sampling frequency[1]								
	Reservoir volume or stream discharge	Depth, water temperature, specific conductance, pH, dissolved oxygen[2]	Trans-parency and light trans-mission[2]	Major ion[3] plus SiO_2 F, B, and Fe	Nutrients[4]	Trace elements[5]	Fecal coliform and strep-tococcal bacteria[6]	Phyto-plankton identifi-cation enumeration and chlorophyll *a* and *b*	Primary produc-tivity[7]
Reservoir[8]	4	4	4	4	4	1	4	4	4
Los Gatos Creek EWI[9] sample	4	4	--	4	4	1	4	--	--

[1]Sampling frequency: Four times per year (spring, summer, autumn, and winter or at various reservoir volumes); one time per year (late summer).
[2]Profiles at each reservoir station.
[3]Major ions = calcium, magnesium, sodium, potassium, bicarbonate, sulfate, and chloride.
[4]Nutrients = Dissolved: nitrite plus nitrate, ammonia, ammonia plus organic nitrate, and ortho phosphate; Total: nitrite plus nitrate, ammonia, ammonia plus organic nitrogen, and phosphate.
[5]Trace elements = Dissolved: aluminum, arsenic, cadmium, cobalt, chromium, copper, mercury, manganese, molybdenum, nickel, lead, selenium, vanadium, and zinc. One sample collected at center station only.
[6]Sample collected near surface only.
[7]Center reservoir station only.
[8]Three reservoir stations were sampled during each visit (location of the south-end station varied with reservoir level). Major ions, nutrients, and phytoplankton samples were collected from the epilimnion, metalimnion, and hypolimnion during reservoir stratification.
[9]EWI (equal-width increment) method used except for pH, dissolved oxygen, and bacteria, which were taken at centroid of flow.

PHYSICAL AND CHEMICAL CHARACTERISTICS

Reservoir Volume

The volume of water stored in Lexington Reservoir varies seasonally throughout the year (fig. 2). The amount of variation is dependent primarily on inflow resulting from precipitation and the quantity of water released from the outflow. Reservoir volumes during the study period illustrated in figure 5 ranged from 15-percent full during December 1979 to 103-percent full during February 1980. In 1979, a relatively dry year, maximum volume reached only 44-percent full (April). Sampling dates and the percentage volume of the reservoir at the time of sampling also are shown in figure 5. A comparison was made between the mean monthly reservoir volume computed for the 1952-80 period and the volume at the time of sampling (table 3). Except during 1979, all reservoir volumes at the time of sampling exceeded the mean monthly volumes by at least 55 percent.

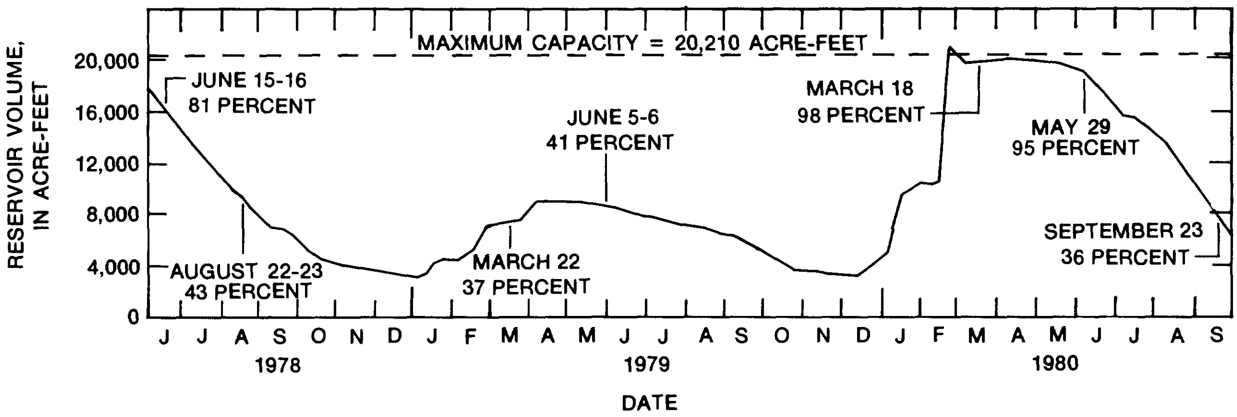


FIGURE 5.—Volume, sampling dates, and percentage of maximum capacity at time of sampling for Lexington Reservoir, 1978–80.

TABLE 3.--*Comparison between mean monthly volume of Lexington Reservoir for 1952-80 and volume at times of sampling, 1978-80*

Sampling date	Figure 7	Reservoir volume (acre-feet): Mean monthly (1952-80)	Reservoir volume (acre-feet): At time of sampling (1978-80)	Percent of difference
1978				
June 15-16	a	9,572	16,458	72
August 22-23	b	4,718	8,606	82
1979				
March 22	c	12,787	7,379	-42
June 5-6	d	9,572	8,284	-13
1980				
March 18	e	12,787	19,850	55
May 29	f	12,252	19,221	71
September 23	g	3,387	7,231	113

Water Temperature

Water temperature influences physical conditions, chemical reactions, and life processes in the aquatic environment. The density of fresh water is primarily temperature dependent; fresh water reaches maximum density at about 4 °C. This particular property of water is extremely important to thermal patterns and reservoir stratification. Chemical reactions such as the solubility of elements and compounds in water are, in part, temperature dependent. The concentration of dissolved oxygen in water is inversely related to temperature. The higher the water temperature, the less dissolved oxygen the water can hold. Metabolic processes of aquatic organisms are directly related to temperature. In addition, water temperature is a controlling factor of the presence or absence of many aquatic organisms. Extreme temperatures may be lethal to aquatic organisms because of their specific temperature-tolerance ranges.

Water temperatures measured at Lexington Reservoir ranged from 9.6 °C to 24.2 °C during the study. The warmest water temperature was measured during August 1978 at the upstream end of the reservoir where depth is the shallowest and the influence of insolation on water temperature is the greatest. The coldest water temperature was measured during March 1979 at the dam where the reservoir is the deepest.

Lexington Reservoir is monomictic, undergoes seasonal temperature changes, and is thermally stratified during warm late-spring and summer periods. Hutchinson (1957) defines a warm monomictic lake as one in which the water never attains a temperature of less than 4 °C at any depth, circulates freely in the winter at or above 4 °C, and stratifies in the summer. Warm monomictic lakes typically occur in the warm and oceanic parts of the Temperate Zone.

Seasonal changes in water-temperature profiles that generally take place at Lexington Reservoir and other reservoirs in the San Francisco Bay area can be described as follows. During the winter, homothermic (same temperature) water conditions exist. There is no density stratification, wind circulates the water, and the reservoir is uniformly mixed from surface to bottom (fig. 6). As spring approaches, the surface water of the reservoir begins to warm because of increased exposure to the sun. Density stratification due to differences in water temperature begins to occur, and wind mixing is limited to the upper water layer. Water temperatures continue to increase as summer approaches. Density stratification increases, and, as a result, three distinct water layers are formed. The upper water layer, the epilimnion, is thermally uniform and contains the warmest water in the reservoir. The lower water layer, the hypolimnion, is usually uniform and contains the coldest and most dense water in the reservoir. The metalimnion, a water mass with temperatures that decrease rapidly with depth, occurs between the epilimnion and hypolimnion. With the onset of autumn, the surface water cools and increases in density. Stratification of the reservoir decreases as the cool dense surface water sinks or is circulated by the wind. As winter approaches, the water of the reservoir becomes homothermic, and the annual thermal cycle repeats (Britton and others, 1975).

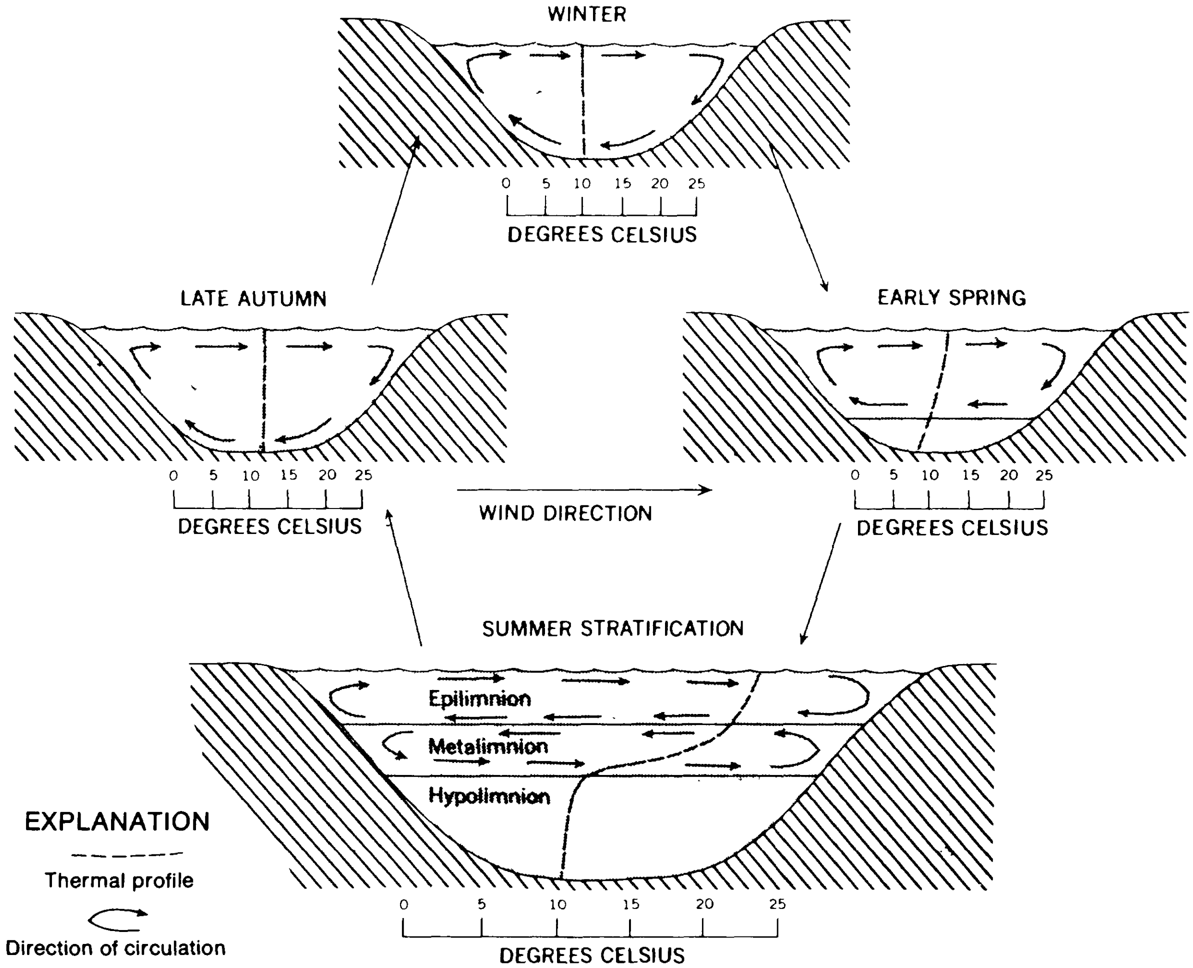
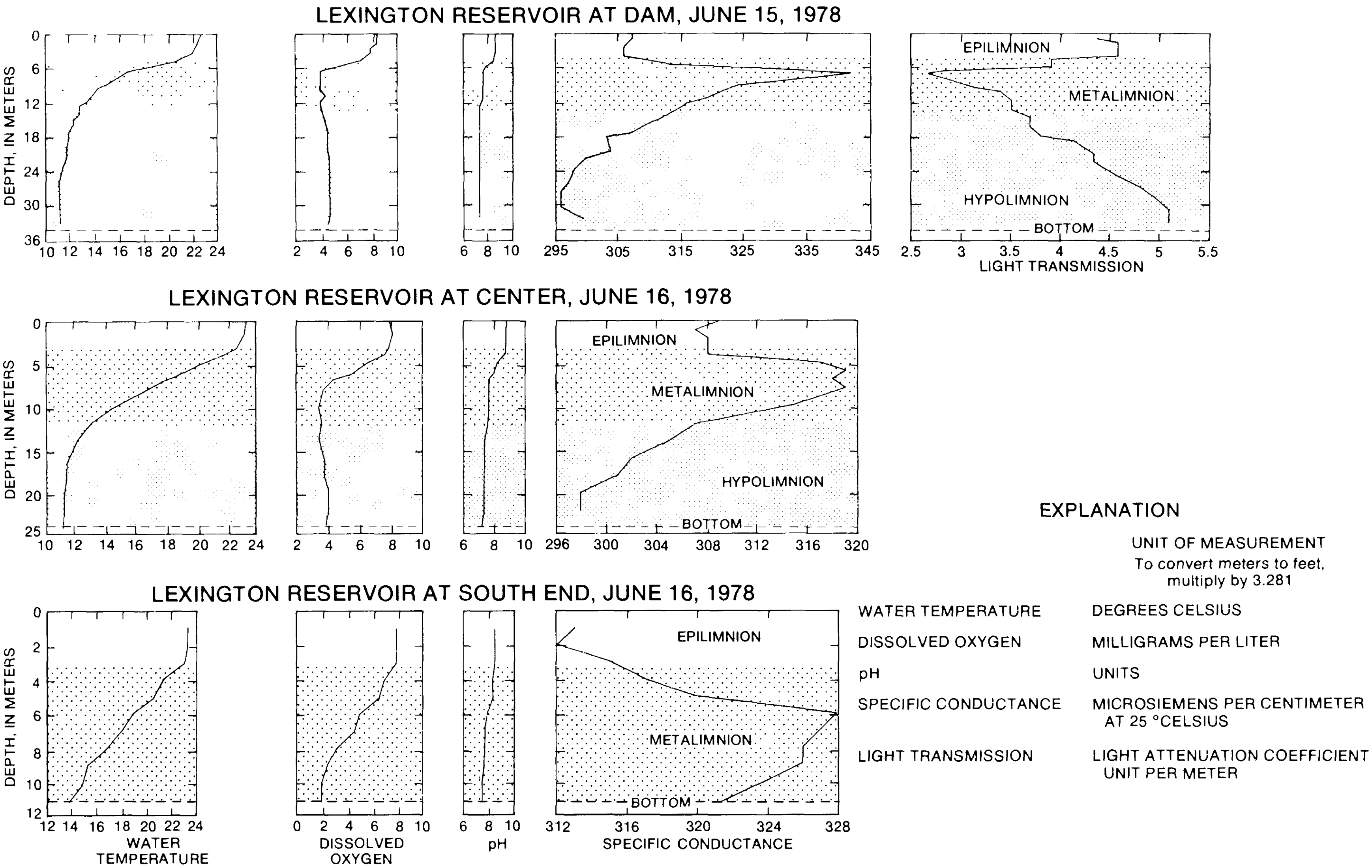


FIGURE 6.—Seasonal thermal profiles of a warm monomictic lake (from Britton and others, 1975).

Water-temperature profiles indicated that Lexington Reservoir was slightly stratified during March 1980; strongly stratified during June 1978, March 1979, and May 1980; and not stratified during September 1980. The degree to which the reservoir was stratified depended not only on seasonality (ambient air temperature and wind), but also on the volume (depth) of water in the reservoir and the release of water as governed by the District's reservoir operational scheme.

Seasonal variations of water temperature can be illustrated by comparing the temperature profiles of March and May of 1980 (figs. 7e and 7f). Volume of the reservoir changed very little (98 to 95 percent); yet, the reservoir went from slightly stratified during March to strongly stratified during May. This seasonal variation follows the typical annual thermal cycle for reservoirs in the San Francisco Bay area discussed earlier. As summer approaches, the water warms and stratification increases.



7a.—June 15-16, 1978.

FIGURE 7.—Water-temperature, dissolved-oxygen, pH, specific conductance, and light-transmission profiles for Lexington Reservoir, 1978-80 (note scale change).

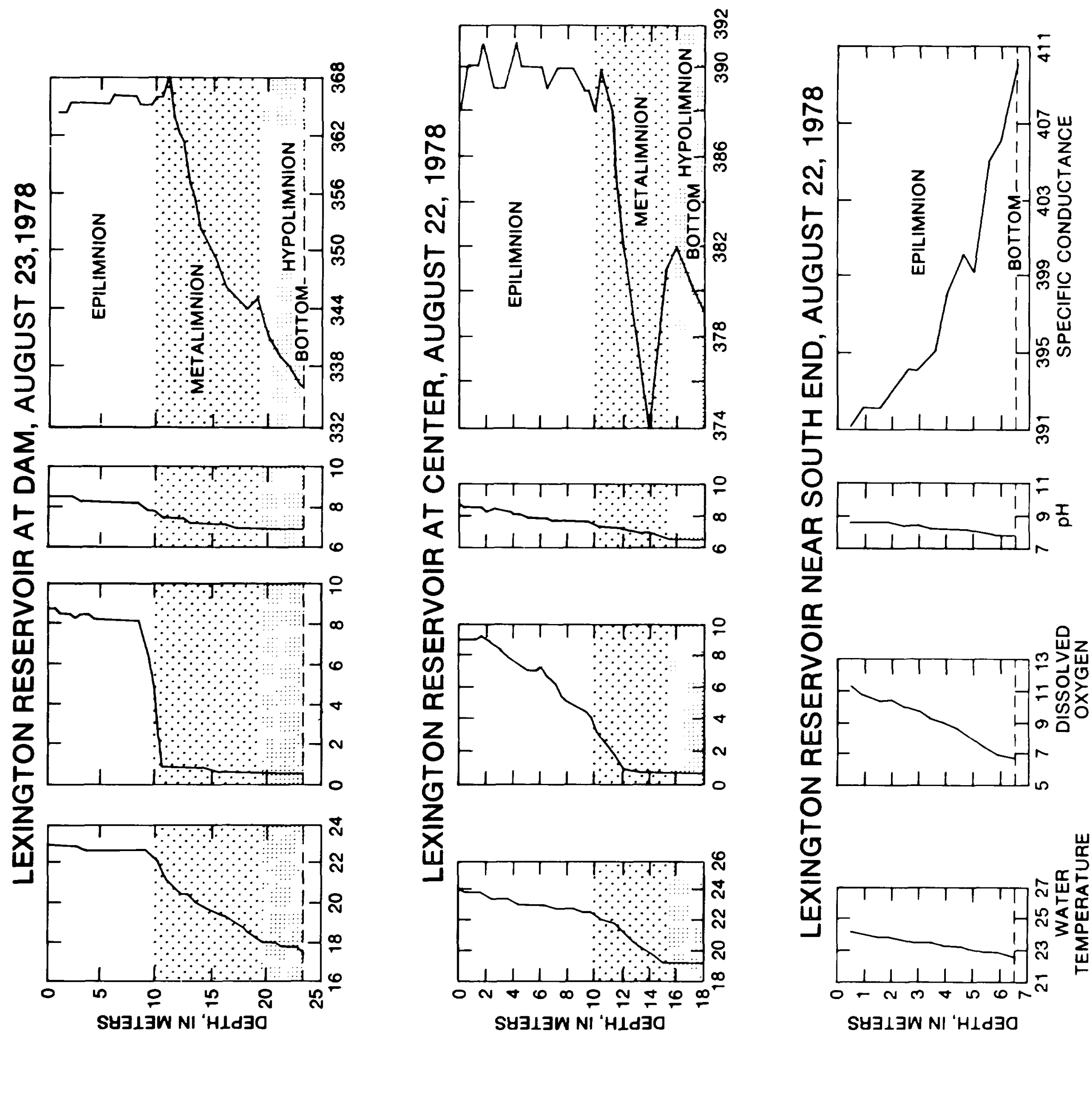


FIGURE 7b.—August 22-23, 1978.

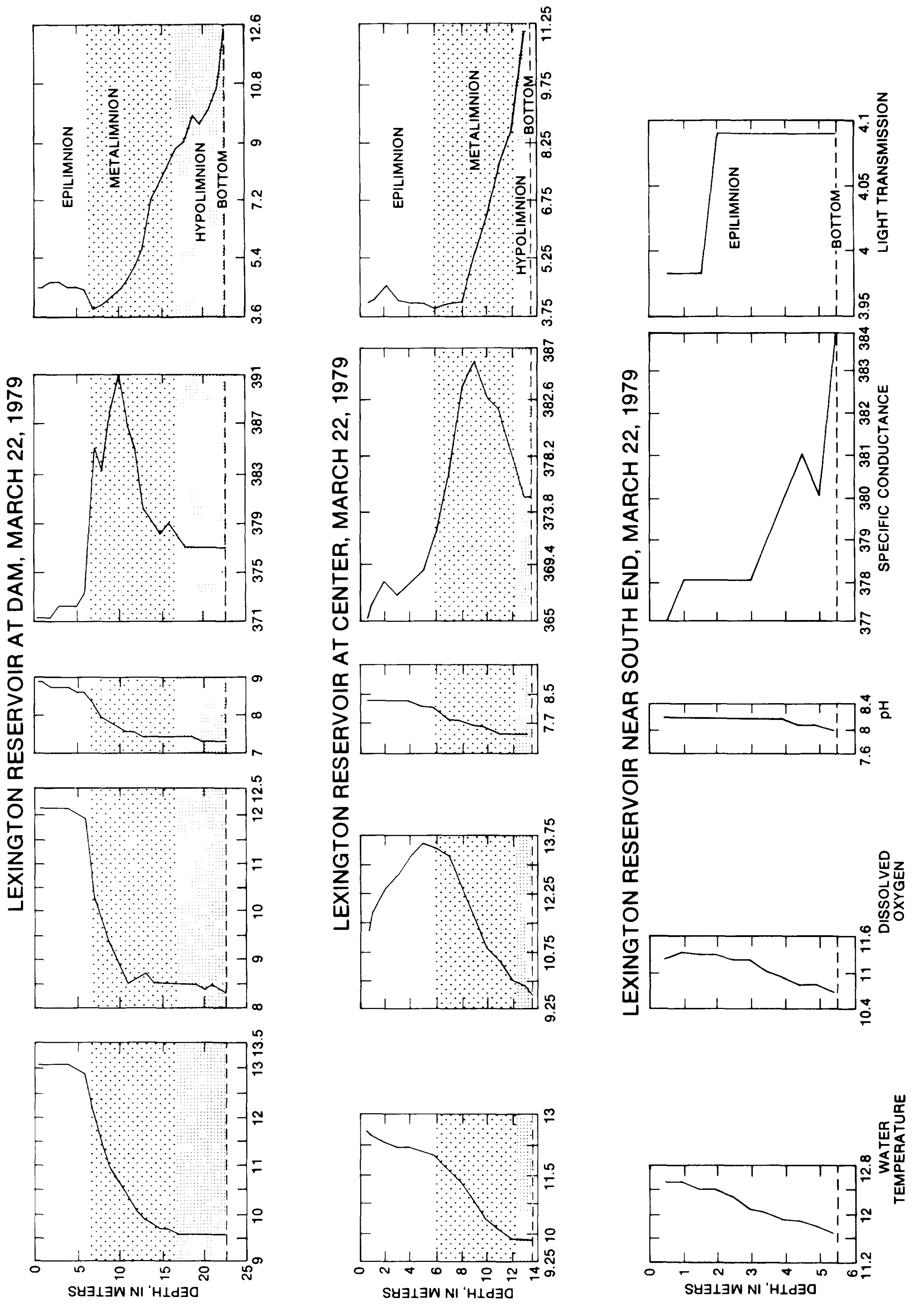


FIGURE 7c.—March 22, 1979.

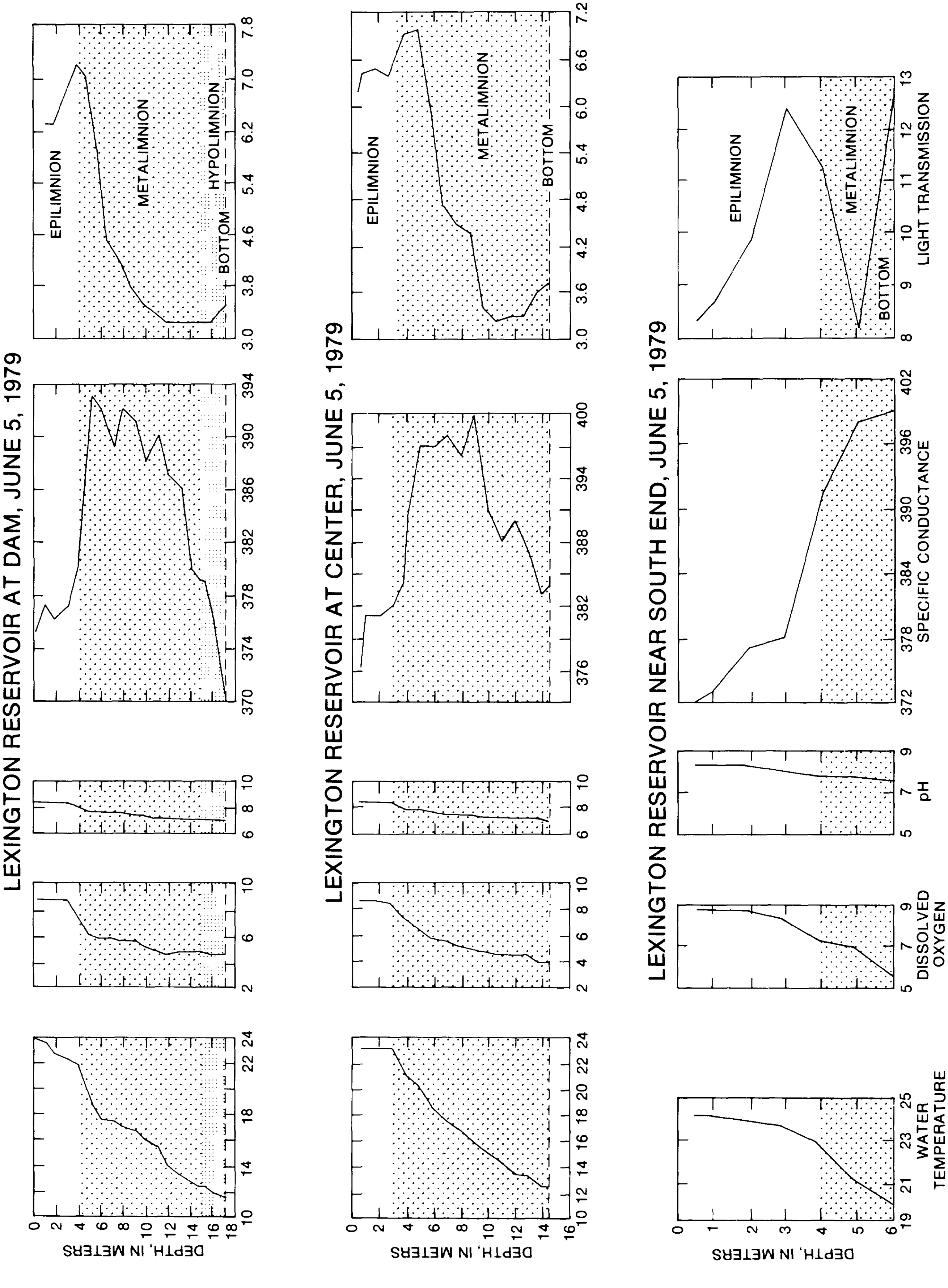


FIGURE 7d.—June 5, 1979.

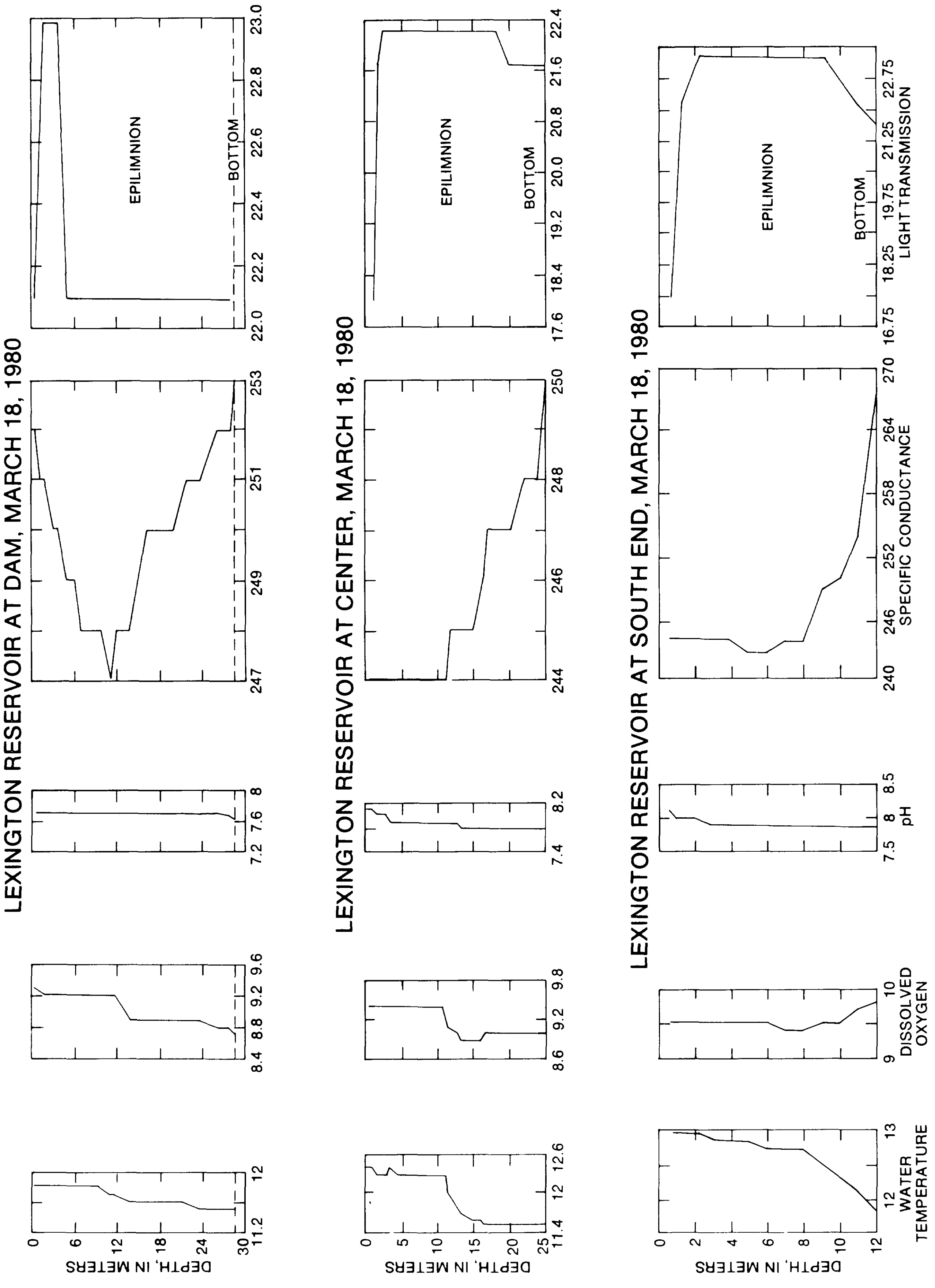


FIGURE 7e.—March 18, 1980.

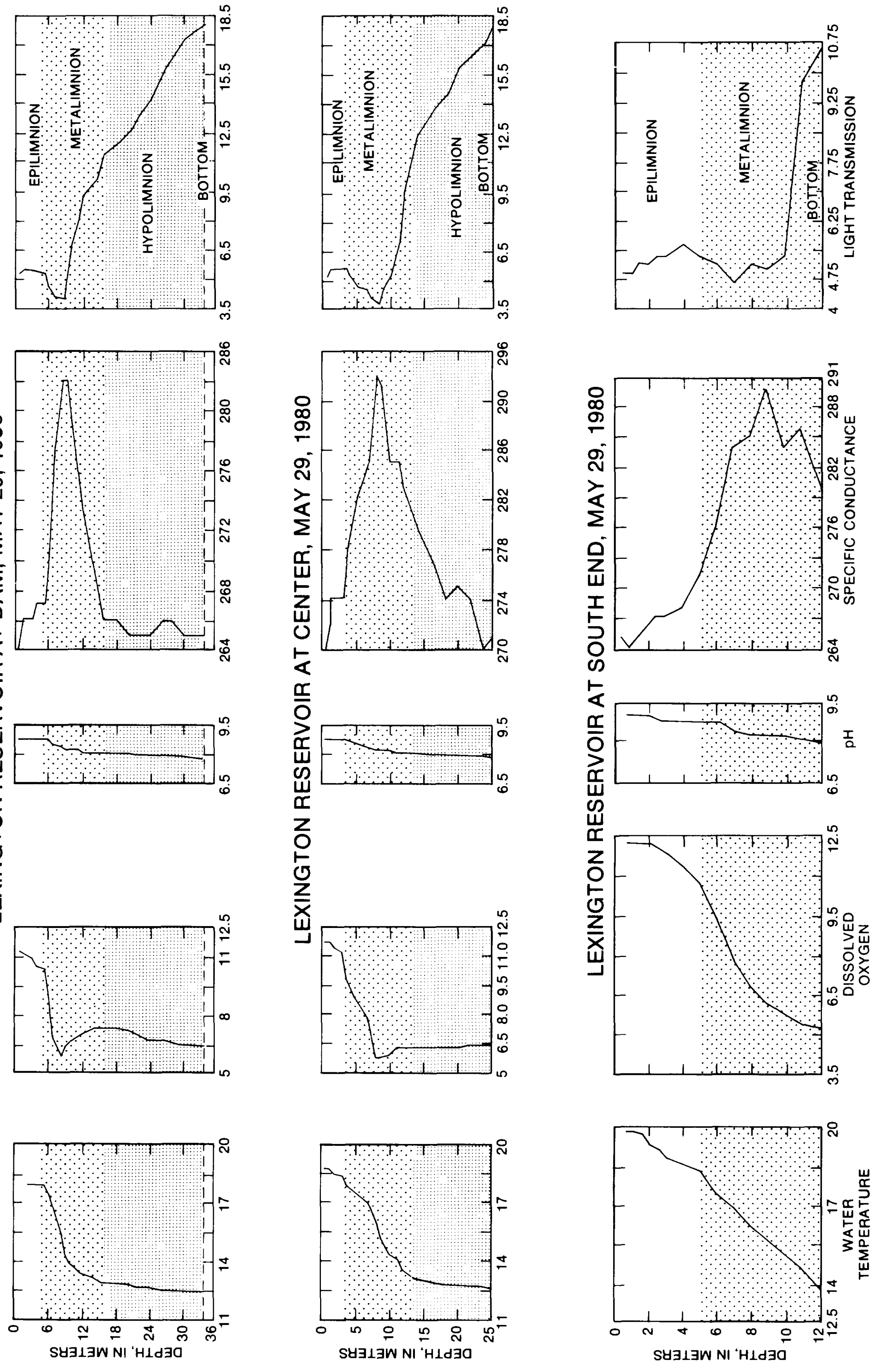


FIGURE 7f.—May 29, 1980.

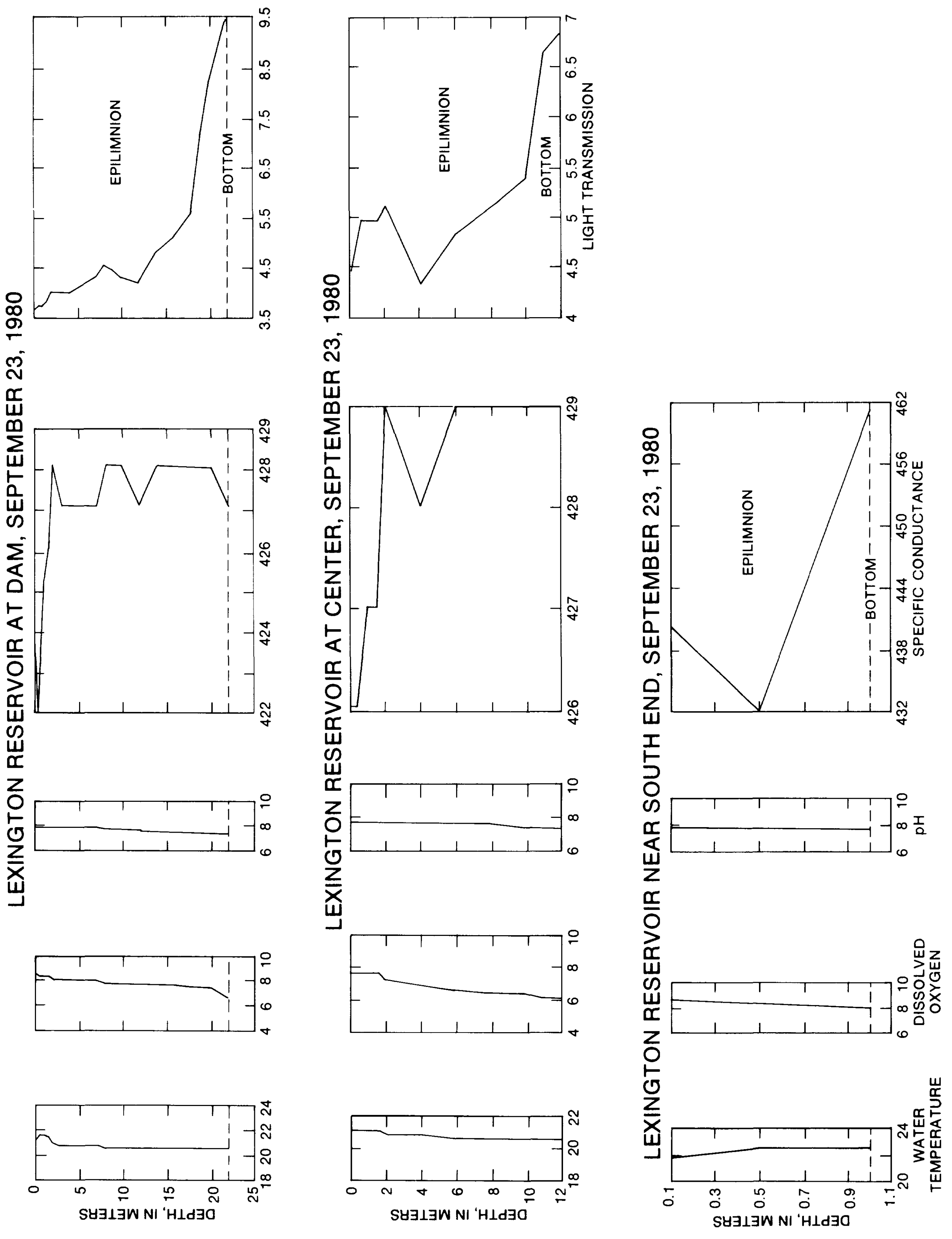


FIGURE 7g.—September 23, 1980.

Volume of Lexington Reservoir also influenced the stratification of the reservoir. During March 1979 and March 1980, the volumes of the reservoir were greatly different (37 percent and 98 percent, respectively). Temperature profiles (fig. 7) indicate that the reservoir was stratified during March 1979 when the reservoir volume was low, as compared to March 1980 when the reservoir was nearly full and only slightly stratified. With less water in the reservoir (March 1979), the water warmed faster and stratification occurred sooner.

Lexington Reservoir was not stratified during the September 1980 visit. Water temperature was nearly the same from surface to bottom, and both the metalimnion and hypolimnion were absent. During August 1978 and June 1979 visits, the hypolimnion was either absent or nearly absent. The elimination or reduction of the hypolimnion and metalimnion primarily was the result of releasing water through the dam. The intake to the reservoir release is located about 130 ft below the crest of the spillway. During drawdown of the reservoir, the cooler underlying water is released. Whenever enough water is released, both the hypolimnion and metalimnion can be eliminated from the reservoir (as was the case during the September 1980 visit).

Areal variations in water-temperature profiles during each visit also are shown in figure 7. At the deeper stations (dam and center), the epilimnion, metalimnion, and hypolimnion generally were present. However, at the shallower station, only the epilimnion and metalimnion were present. This areal variation is illustrated in figure 8.

Water temperature was measured during each visit at Los Gatos Creek above Lexington Reservoir. Temperatures ranging from 10.0 to 19.0 °C represent the water temperature at the time of measurement and do not reflect the maximum, mean, and minimum temperatures that can occur in the stream. In order to assess the influence of stream temperature on reservoir temperature, additional data are needed.

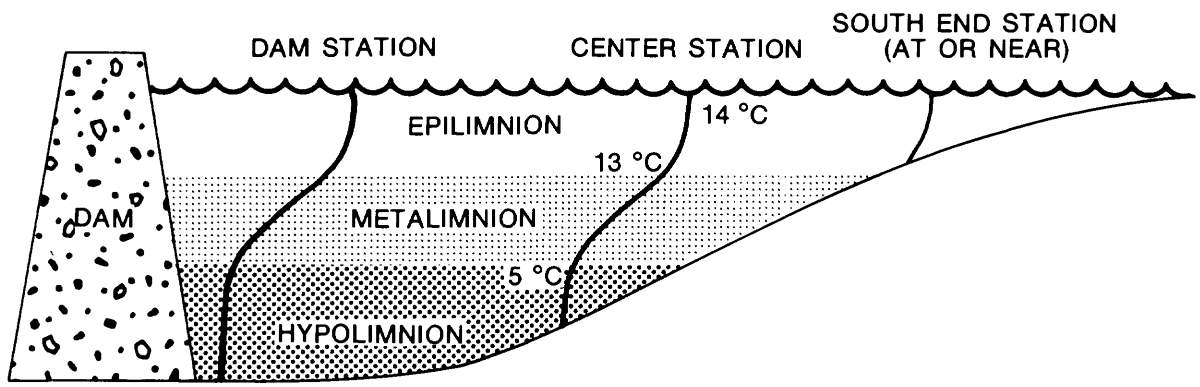


FIGURE 8.—Generalized areal variations in water-temperature profiles (solid lines) for Lexington Reservoir during thermal stratification period. Approximate temperature, in degrees Celsius, is given for the station at center.

Dissolved Oxygen

Dissolved oxygen is essential for maintaining most life processes of aquatic organisms and is commonly used as an indicator of biological activity. Like water temperature, dissolved-oxygen concentration is a controlling factor of the presence or absence of many aquatic organisms. Most aquatic organisms have an optimal range of dissolved-oxygen concentrations and a minimum concentration below which death occurs. The exception to this is the aquatic organisms that can survive in anaerobic conditions.

The quantity of oxygen that dissolves in water is a function of water temperature, barometric pressure, salinity of the water, biological activity, and water turbulence (for example, wind-generated waves). Oxygen solubility is inversely related to water temperature and salinity, and is directly related to barometric pressure.

The primary sources of dissolved oxygen in water are from the atmosphere and photosynthesis. During photosynthesis, chlorophyll-bearing plants (and some bacteria), in the presence of sunlight, consume carbon dioxide and produce oxygen. Respiration is the associated process whereby organisms obtain their energy by oxidizing organic material to carbon dioxide and water (a process which consumes oxygen). Chemical-reduction processes also remove dissolved oxygen from water, especially in the hypolimnion.

Dissolved-oxygen concentrations measured at Lexington Reservoir ranged from 0.6 to 13.5 mg/L during the study. Concentrations generally were greatest during the spring near the surface and least during the summer near the bottom.

As the waters in Lexington Reservoir become thermally stratified, oxygen stratification also takes place. Dissolved-oxygen profiles shown in figure 7 follow similar seasonal and areal patterns to the temperature profiles. During the winter, the waters of the reservoir circulate freely, and dissolved-oxygen concentrations are nearly equal from surface to bottom. When the reservoir stratifies during the summer, waters of the epilimnion have higher concentrations of dissolved oxygen than waters of the hypolimnion. In the epilimnion, oxygen production exceeds oxygen consumption. Waters are aerated by direct exposure to the atmosphere and by photosynthesis. If photosynthesis is great enough, waters may become supersaturated with oxygen. In the hypolimnion, oxygen consumption exceeds oxygen production. Aeration of water by direct contact with the atmosphere does not occur and photosynthesis does not take place because of insufficient light penetration. If decomposition, respiration, and chemical-reduction processes are great enough, all the dissolved oxygen may be utilized and waters of the hypolimnion will become anaerobic.

The dissolved-oxygen profile at the center station did not typically follow the temperature profile during March 1979 (fig. 7c). Rather than having a higher dissolved-oxygen concentration at the surface, the maximum concentration occurred near the epilimnion-metalimnion interface. Phytoplankton samples collected from the epilimnion and metalimnion indicated that densities were greater in the metalimnion (1,100 cells/mL in the epilimnion compared with 2,000 cells/mL in the metalimnion). Reid (1961) described this condition as metalimnetic-oxygen maximum.

During May 1980, at the dam and center stations, the dissolved-oxygen profiles indicated a metalimnetic-oxygen minimum condition (Hutchinson, 1957). At the time of sampling, the reservoir was stratified, and an algae bloom was occurring. The metalimnetic-oxygen minimum probably is the result of oxidizable material (dead phytoplankton) sinking downward from the epilimnion to the metalimnion. As this material reached the metalimnion, the sinking rate decreased because of thermal-density differences of the water. Once slowed down, bacterial decomposition of this material consumed oxygen and caused the metalimnetic-oxygen minimum.

Dissolved-oxygen concentrations measured during each visit to the station Los Gatos Creek above Lexington Reservoir ranged from 9.6 to 12.4 mg/L. These values represent the concentration at the time of sampling and do not represent the maximum, mean, and minimum concentrations that can occur in the stream. The variability of dissolved-oxygen concentrations reflects primarily the amount of photosynthesis that occurs in Los Gatos Creek; however, streamflow differences (turbulence) also can influence dissolved-oxygen concentrations.

pH

The pH of water is defined as the negative logarithm of the hydrogen-ion activity. Solutions with a pH less than 7 are termed acidic, solutions with a pH greater than 7 are termed basic, and solutions with a pH of 7 are neutral. Both chemical and biological processes that occur in the aquatic environment are influenced, in part, by the hydrogen-ion activity.

The pH values measured at Lexington Reservoir ranged from 6.5 to 8.9 during the study. The pH profiles (fig. 7) show a slight decrease from surface to bottom, which is probably due to the amount of carbon dioxide released during respiration. In Lexington Reservoir, the greatest decrease in pH with depth occurs when the reservoir is thermally stratified. Seasonal and areal variations in pH were minimal.

At the station Los Gatos Creek above Lexington Reservoir, pH was measured during each visit, but seasonal variations could not be distinguished from the data. In order to do so, additional pH measurements are needed.

Specific Conductance

Specific conductance is a measure of the capability of a solution to conduct an electrical current and is expressed in microsiemens per centimeter (μS/cm) at 25 °C. Specific conductance commonly is used to estimate the concentration of dissolved solids in water.

Specific-conductance values measured at Lexington Reservoir ranged from 243 to 461 μS/cm during the study and varied with reservoir volume (fig. 5). The smallest values were observed when the reservoir was the fullest (98 percent full during March 1980) and the largest value was observed when the reservoir was the shallowest (36 percent full during September 1980). This variation probably is the result of rainfall runoff and increased surface-water flow during the rainy season and of increased evaporation and little or no rainfall runoff during the summer.

Variations in specific conductance measured during each sampling period were minimal between sampling stations. Vertical profiles (fig. 7) show that larger specific-conductance values generally occurred in the metalimnion.

An estimate of the dissolved-solids concentration (DS), in milligrams per liter, of the water in Lexington Reservoir can be approximated by inserting the specific-conductance value (SC) into the following equation:

$$DS = 0.49(SC)+42.9 \qquad (1)$$

(correlation coefficient = 0.88; number of observations = 53; significant at 0.01 level).

Specific conductance measured during each visit to Los Gatos Creek above Lexington Reservoir ranged from 301 to 565 μS/cm. As seen at many streams in California, specific conductance of Los Gatos Creek varied inversely with stream discharge. During each sampling period, the specific-conductance value of Los Gatos Creek was greater than the average specific-conductance value of the reservoir.

Dissolved-solids concentrations of Los Gatos Creek can be approximated using the following equation:

$$DS = 0.52(SC)+81.2 \qquad (2)$$

(correlation coefficient = 0.77; number of observations = 6; significant at 0.1 level).

Light Transmission

Light transmission in water is defined as the amount of light that will pass through a path of defined length. Suspended materials such as algae and sediment are two major interferences that can limit light transmission through water. The usefulness of this measurement is to describe the optical properties of water, in particular, to determine if zones of suspended materials exist. Such zones may be indicative of biological activity (algal blooms) or areas where the exchange of solutes between sediment and water can occur. Light transmission is expressed as light-attenuation coefficient (α) which is calculated from the equation (Austin, 1973; Bradford and Iwatsubo, 1980):

$$\alpha = - \frac{1}{L} \ln T, \tag{3}$$

where L is the horizontal path length, in meters; and T is the fraction of light transmitted. The smaller the light-attenuation coefficient, the clearer the water.

Vertical profiles of light-attenuation coefficients are shown in figure 7. During June and August 1978, light transmission was not measured because of electrical problems with the instrument. Light-attenuation coefficient values ranged from 2.62 to 23.24 units per meter and generally increased with depth. Profiles made during June 1979 (dam and center stations) were exceptions. Maximum coefficient values were measured between 4 and 6 meters and then decreased with depth. Spring rains and associated runoff prior to the June 1979 sampling probably caused surface waters of the reservoir to become slightly more turbid than bottom waters. Vertical profiles also indicate that the presence of phytoplankton can influence light transmission. Larger light-attenuation coefficients measured in the epilimnion, than in the metalimnion, sometimes were due to suspended phytoplankton in the epilimnion (August 1978, June 1979, and May 1980; tables 4 and 5).

Areal variations in light transmission were minimal during each sampling period with the south-end station having slightly lower light-attenuation coefficient values than the other stations. Light transmission varied seasonally with larger light-attenuation coefficient values measured in the spring when suspended solids from winter and spring runoff were highest. Light-attenuation coefficient values were smaller during the summer when much of the suspended solids had settled to the bottom of the reservoir.

TABLE 4.--*Lexington Reservoir phytoplankton composition, concentration, and frequency of occurrence, 1978-80*

[Concentrations in cells per milliliter; --, no observation; m, meters, in depth]

Organism	6-16-78			3-18-80			5-29-80		
	1 m	6 m	10 m	1 m	6 m	10 m	1 m	7 m	12 m
	Lexington Reservoir at south end								
Bacillariophyta (diatoms)									
Bacillariophyceae:									
Asterionella	--	--	--	--	--	--	11,000	6,200	2,000
Cocconeis	--	--	29	--	--	--	--	--	--
Cyclotella	15	--	--	150	13	39	--	34	--
Fragilaria	260	950	260	--	--	--	--	--	--
Melosira	--	440	--	--	--	--	--	300	--
Navicula	--	15	--	--	--	--	--	--	--
Nitzschia	--	--	--	14	--	--	--	34	--
Rhizosolenia	--	--	--	--	--	--	--	--	--
Stephanodiscus	15	--	--	--	--	--	--	--	13
Surirella	--	--	--	--	--	--	--	--	--
Synedra	--	--	--	--	--	--	--	--	--
Chlorophyta (green algae)									
Chlorophyceae:									
Ankistrodesmus	--	--	--	--	--	--	--	--	--
Chlamydomonas	--	--	--	110	65	39	--	--	--
Closteriopsis	--	--	--	--	--	--	--	--	--
Closterium	--	--	--	--	--	--	--	--	--
Coelastrum	120	--	--	--	--	--	--	--	--
Cosmarium	--	--	--	--	--	--	--	--	--
Crucigenia	--	--	--	--	--	--	--	--	--
Dictyosphaerium	--	--	--	--	--	--	--	--	--
Elakatothrix	--	--	--	--	--	--	--	--	--
Gloeocystis	--	--	--	--	--	--	--	--	--
Golenkinia	--	--	--	--	--	--	--	--	--
Kirchneriella	--	--	--	14	--	--	--	--	--
Micractinium	--	--	--	--	--	--	--	--	--
Oocystis	220	--	--	--	--	--	--	810	65
Pandorina	--	--	--	--	--	--	--	--	--
Scenedesmus	--	--	--	--	--	78	75	--	--
Schroederia	--	--	--	--	--	--	93	--	--
Selenastrum	--	--	--	--	--	--	--	--	--
Sphaerocystis	--	--	--	--	--	--	--	270	100
Tetrastrum	--	--	--	55	--	--	--	--	--
Westella	--	--	--	--	--	--	--	--	--
Chrysophyta (yellow-brown algae)									
Chrysophyceae:									
Dinobryon	--	--	--	--	--	--	--	--	--
Mallomonas	--	--	--	--	--	--	--	--	--
Ochromonas	--	--	--	--	--	--	--	--	--
Xanthophyceae:									
Ophiocytium	--	--	--	--	--	--	--	--	--
Cryptophyta (crytomonads)									
Crytophyceae:									
Chroomonas	--	--	--	--	--	--	--	--	--
Cryptomonas	--	--	--	--	--	--	--	--	13
Cyanophyta (blue-green algae)									
Cyanophyceae:									
Agmenellum	--	--	--	--	--	--	--	--	--
Anabaena	2,900	180	--	--	--	--	19,000	4,500	230
Anacystis	--	--	--	--	--	--	--	--	--
Aphanizomenon	--	--	--	--	--	--	150,000	23,000	160
Coccochloris	--	--	--	--	--	--	--	--	--
Dactylococcopsis	--	--	--	--	--	--	--	--	--
Lyngbya	--	--	--	--	--	--	--	--	--
Oscillatoria	2,200	1,700	--	120	--	--	--	--	--
Euglenophyta (euglenoids)									
Euglenophyceae:									
Euglena	--	--	--	--	--	--	--	--	--
Phacus	--	--	--	--	--	--	--	--	--
Trachelmonas	--	--	--	--	--	--	--	--	--
Pyrrhophyta (dinoflagellates)									
Dinophyceae:									
Ceratium	--	--	--	--	--	--	--	--	--
Glenodinium	--	--	--	--	--	--	--	--	--
Peridinium	--	--	--	--	--	--	--	--	--

TABLE 4.--*Lexington Reservoir phytoplankton composition, concentration, and frequency of occurrence, 1978-80*--Continued

Organism	8-22-78			3-22-79		6-05-79		9-23-80
	1 m	3 m	6 m	1 m	4 m	1 m	5 m	1 m
				Lexington Reservoir near south end				
Bacillariophyta (diatoms)								
Bacillariophyceae:								
Asterionella	--	--	--	40	12	--	--	--
Cocconeis	--	--	--	--	--	--	--	--
Cyclotella	14	--	--	86	390	--	--	4,800
Fragilaria	--	--	--	--	--	--	--	--
Melosira	83	230	--	120	94	--	--	--
Navicula	--	--	--	--	--	--	--	--
Nitzschia	--	--	--	--	--	--	--	--
Rhizosolenia	--	--	--	--	--	--	--	--
Stephanodiscus	--	--	--	--	--	--	--	--
Surirella	--	--	--	--	--	--	--	--
Synedra	--	--	--	15	--	--	--	--
Chlorophyta (green algae)								
Chlorophyceae:								
Ankistrodesmus	--	14	--	--	24	--	--	--
Chlamydomonas	--	--	--	35	--	--	--	140
Closteriopsis	--	--	--	--	--	--	--	--
Closterium	--	--	--	--	--	--	--	--
Coelastrum	--	--	--	--	--	1,000	500	--
Cosmarium	--	--	--	--	--	--	--	--
Crucigenia	--	--	--	--	--	--	--	--
Dictyosphaerium	--	41	--	--	--	--	--	96
Elakatothrix	--	--	--	--	--	--	--	--
Gloeocystis	--	--	--	--	--	--	--	--
Golenkinia	--	--	--	--	--	--	--	--
Kirchneriella	--	--	--	--	140	--	--	--
Micractinium	--	--	--	20	--	--	--	--
Oocystis	55	96	140	10	94	13,000	6,500	--
Pandorina	--	--	--	--	--	--	--	--
Scenedesmus	--	--	--	--	--	--	--	--
Schroederia	41	150	41	--	--	1,800	330	96
Selenastrum	--	--	14	--	--	1,100	300	--
Sphaerocystis	--	82	--	--	--	6,500	2,000	--
Tetrastrum	--	--	--	--	--	--	--	--
Westella	--	--	--	--	--	510	--	--
Chrysophyta (yellow-brown algae)								
Chrysophyceae:								
Dinobryon	--	--	--	--	--	--	--	48
Mallomonas	--	--	--	--	12	--	--	48
Ochromonas	--	14	--	--	--	--	--	--
Xanthophyceae:								
Ophiocytium	--	82	--	--	--	--	--	--
Cryptophyta (crytomonads)								
Crytophyceae:								
Chroomonas	--	--	--	--	--	--	--	--
Cryptomonas	--	--	--	--	--	130	--	--
Cyanophyta (blue-green algae)								
Cyanophyceae:								
Agmenellum	--	--	--	--	--	--	--	--
Anabaena	15,000	20,000	4,000	610	470	--	--	--
Anacystis	96	--	83	35	380	--	--	48
Aphanizomenon	11,000	9,900	1,400	--	--	--	--	--
Coccochloris	--	--	--	--	200	--	--	--
Dactylococcopsis	--	--	--	--	--	--	--	--
Lyngbya	--	--	--	--	--	--	--	--
Oscillatoria	--	--	--	--	240	--	--	--
Euglenophyta (euglenoids)								
Euglenophyceae:								
Euglena	--	--	--	5	--	--	--	--
Phacus	--	--	--	--	--	--	--	--
Trachelmonas	41	27	14	230	610	--	--	96
Pyrrhophyta (dinoflagellates)								
Dinophyceae:								
Ceratium	--	--	14	--	--	--	--	--
Glenodinium	--	--	--	15	12	--	--	--
Peridinium	110	210	83	--	--	--	--	--

TABLE 4.--*Lexington Reservoir phytoplankton composition, concentration, and frequency of occurrence, 1978-80*--Continued

Organism	6-16-78			8-22-78			3-22-79			6-05-79		
	1 m	6 m	20 m	1 m	1.7 m	13 m	1 m	9 m	12 m	1 m	5 m	13 m
Lexington Reservoir at center												
Bacillariophyta (diatoms)												
Bacillariophyceae:												
Asterionella	--	--	--	--	--	--	--	--	31	--	--	--
Cocconeis	--	--	--	--	--	--	--	--	--	--	--	--
Cyclotella	--	--	14	--	28	--	50	360	82	--	32	--
Fragilaria	660	880	160	--	--	--	--	--	13	--	--	--
Melosira	--	--	--	55	--	83	30	--	13	--	--	--
Navicula	--	--	--	--	--	--	--	--	6	--	--	--
Nitzschia	--	--	--	--	--	--	5	--	38	--	64	--
Rhizosolenia	--	44	--	--	--	--	--	--	--	--	--	--
Stephanodiscus	--	--	--	--	--	--	--	--	--	--	--	--
Surirella	--	--	--	--	--	--	--	13	--	--	--	--
Synedra	--	--	--	--	--	--	--	--	--	--	--	--
Chlorophyta (green algae)												
Chlorophyceae:												
Ankistrodesmus	--	--	--	14	--	--	--	13	6	--	--	--
Chlamydomonas	--	--	--	--	--	55	--	--	--	34	--	--
Closteriopsis	--	--	--	--	--	--	--	--	--	--	--	--
Closterium	--	--	--	--	--	--	--	--	--	--	--	--
Coelastrum	--	--	--	--	--	--	--	--	--	--	--	--
Cosmarium	--	--	--	--	--	--	--	--	--	--	--	--
Crucigenia	--	--	--	--	--	--	--	--	--	--	--	--
Dictyosphaerium	--	--	--	55	--	--	--	--	--	--	--	--
Elakatothrix	--	--	--	--	--	--	--	--	--	--	--	--
Gloeocystis	--	--	--	--	--	--	--	--	--	--	--	--
Golenkinia	--	--	--	--	--	--	--	--	6	--	--	--
Kirchneriella	--	--	--	--	--	--	35	89	13	--	--	--
Micractinium	--	--	--	--	--	--	--	--	--	--	--	--
Oocystis	--	59	140	--	14	180	40	51	25	5,800	6,200	210
Pandorina	--	--	--	--	--	--	--	410	--	--	--	--
Scenedesmus	59	--	--	--	--	--	--	51	13	130	--	100
Schroederia	--	--	--	110	14	14	--	--	--	1,300	290	290
Selenastrum	--	--	--	--	--	--	--	--	--	610	420	--
Sphaerocystis	--	--	72	--	110	--	--	--	--	980	1,300	--
Tetrastrum	--	--	--	--	--	--	--	--	--	--	--	--
Westella	--	--	--	--	--	--	--	--	--	--	--	--
Chrysophyta (yellow-brown algae)												
Chrysophyceae:												
Dinobryon	--	--	--	--	--	--	--	--	--	--	--	--
Mallomonas	--	--	--	--	--	--	5	13	--	--	--	--
Ochromonas	--	--	--	14	--	--	--	--	--	--	--	--
Xanthophyceae:												
Xanthophyceae:	--	--	--	--	--	--	--	--	--	--	--	--
Cryptophyta (crytomonads)												
Crytophyceae:												
Chroomonas	--	--	--	--	--	--	5	--	--	67	--	--
Cryptomonas	--	--	--	--	--	--	50	--	6	--	--	--
Cyanophyta (blue-green algae)												
Cyanophyceae:												
Agmenellum	--	--	--	--	--	--	--	--	--	--	--	--
Anabaena	1,800	--	--	11,000	1,100	69	250	--	--	--	--	--
Anacystis	--	--	--	--	--	--	30	140	50	--	--	26
Aphanizomenon	--	--	--	3,500	--	500	--	--	--	--	--	--
Coccochloris	--	--	--	--	--	--	--	--	--	--	--	--
Dactylococcopsis	--	--	--	--	--	--	--	--	--	--	--	--
Lyngbya	--	--	--	--	--	--	--	--	--	--	--	--
Oscillatoria	1,300	470	--	--	--	--	330	--	310	--	--	--
Euglenophyta (euglenoids)												
Euglenophyceae:												
Euglena	--	--	--	--	--	--	--	--	--	--	--	--
Phacus	--	--	--	--	--	--	--	--	--	--	--	--
Trachelmonas	--	--	--	--	--	41	210	830	530	67	--	--
Pyrrhophyto (dinoflagellates)												
Dinophyceae:												
Ceratium	--	--	--	14	--	--	--	--	--	--	--	--
Glenodinium	--	--	--	--	--	--	--	26	--	--	--	--
Peridinium	--	--	--	28	55	--	15	--	13	--	--	--

TABLE 4.--*Lexington Reservoir phytoplankton composition, concentration, and frequency of occurrence, 1978-80*--Continued

Organism	3-18-80			5-29-80			9-23-80		
	1 m	13 m	20 m	1 m	8 m	24 m	1 m	4 m	11 m
				Lexington Reservoir at center--Continued					
Bacillariophyta (diatoms)									
Bacillariophyceae:									
Asterionella	--	--	--	6,300	3,300	--	--	52	--
Cocconeis	--	--	--	--	--	--	--	--	--
Cyclotella	350	170	78	--	--	--	2,000	26	13
Fragilaria	--	--	--	--	--	--	--	--	--
Melosira	--	14	--	--	--	--	--	430	--
Navicula	--	28	--	--	--	--	--	--	--
Nitzschia	--	--	--	--	--	--	--	26	--
Rhizosolenia	--	--	--	--	--	--	--	--	--
Stephanodiscus	--	--	--	--	--	--	--	--	--
Surirella	--	--	--	--	--	--	--	--	--
Synedra	--	--	--	--	--	--	--	--	--
Chlorophyta (green algae)									
Chlorophyceae:									
Ankistrodesmus	--	--	39	--	--	--	--	--	--
Chlamydomonas	110	28	--	--	--	--	20	--	--
Closteriopsis	--	--	--	--	--	--	--	--	--
Closterium	--	--	--	--	--	--	--	--	--
Coelastrum	--	--	--	--	--	90	--	--	--
Cosmarium	--	--	--	--	--	--	--	--	--
Crucigenia	--	--	--	--	--	--	81	--	52
Dictyosphaerium	--	--	--	--	--	--	--	39	--
Elakatothrix	--	--	--	--	--	--	26	--	--
Gloeocystis	--	--	--	--	--	--	--	--	--
Golenkinia	--	--	--	--	--	--	--	--	--
Kirchneriella	--	--	--	--	--	--	--	--	--
Micractinium	--	--	--	--	--	--	--	--	--
Oocystis	--	--	--	--	52	13	20	--	--
Pandorina	--	--	--	--	--	--	--	--	--
Scenedesmus	--	--	--	--	--	--	--	52	--
Schroederia	--	--	--	--	--	--	--	--	--
Selenastrum	--	--	--	--	--	--	--	--	--
Sphaerocystis	--	--	--	--	--	100	--	--	--
Tetrastrum	--	--	--	--	--	--	--	--	--
Westella	--	--	--	--	--	--	--	--	--
Chrysophyta (yellow-brown algae)									
Chrysophyceae:									
Dinobryon	--	--	--	--	--	--	--	--	--
Mallomonas	--	--	--	--	--	--	20	--	--
Ochromonas	41	14	--	--	--	--	--	--	--
Xanthophyceae:									
Ophiocytium	--	--	--	--	--	--	--	--	--
Cryptophyta (crytomonads)									
Crytophyceae:									
Chroomonas	--	--	--	--	--	--	--	--	--
Cryptomonas	14	--	--	--	--	--	--	--	--
Cyanophyta (blue-green algae)									
Cyanophyceae:									
Agmenellum	--	--	--	--	--	--	160	--	--
Anabaena	--	--	--	28,000	--	--	--	--	52
Anacystis	--	--	--	--	--	--	20	13	--
Aphanizomenon	--	--	--	170,000	5,100	--	--	--	--
Coccochloris	--	--	--	--	--	--	--	--	--
Dactylococcopsis	--	--	--	--	--	--	--	--	--
Lyngbya	--	--	--	--	--	--	--	--	--
Oscillatoria	--	120	--	--	--	--	--	--	--
Euglenophyta (euglenoids)									
Euglenophyceae:									
Euglena	--	--	--	--	--	--	--	--	--
Phacus	--	--	--	--	--	--	--	--	--
Trachelmonas	14	--	--	--	--	--	20	26	--
Pyrrhophyto (dinoflagellates)									
Dinophyceae:									
Ceratium	--	--	--	--	--	--	--	--	--
Glenodinium	--	--	--	--	--	--	--	--	--
Peridinium	--	--	--	--	--	--	--	--	--

TABLE 4.--*Lexington Reservoir phytoplankton composition, concentration, and frequency of occurrence, 1978-80*--Continued

Organism	6-15-78			8-23-78			3-22-79		
	1 m	6 m	30 m	1 m	11 m	22 m	1 m	7 m	20 m
				Lexington Reservoir at dam					
Bacillariophyta (diatoms)									
Bacillariophyceae:									
Asterionella	--	--	--	--	--	--	61	38	63
Cocconeis	--	--	14	--	--	--	--	--	--
Cyclotella	--	250	--	--	--	--	240	220	94
Fragilaria	510	2,800	3,600	--	--	--	--	--	--
Melosira	--	250	--	27	22	--	150	130	69
Navicula	--	--	--	--	--	--	--	--	--
Nitzschia	--	--	--	--	--	--	--	--	6
Rhizosolenia	--	--	--	--	--	--	--	--	--
Stephanodiscus	--	--	--	--	--	--	--	--	--
Surirella	--	--	--	--	--	--	--	--	--
Synedra	--	--	--	--	--	--	--	9	31
Chlorophyta (green algae)									
Chlorophyceae:									
Ankistrodesmus	--	--	--	5	--	--	--	19	--
Chlamydomonas	--	--	14	--	--	--	--	--	--
Closteriopsis	--	--	--	--	--	--	30	--	--
Closterium	--	--	--	--	--	--	--	--	--
Coelastrum	--	--	--	--	--	--	--	--	--
Cosmarium	--	21	--	--	--	--	--	--	--
Crucigenia	--	--	--	--	--	--	91	--	--
Dictyosphaerium	--	--	--	--	--	--	--	--	--
Elakatothrix	--	--	--	--	--	3	--	--	--
Gloeocystis	--	--	--	--	--	--	240	--	--
Golenkinia	--	--	--	--	--	--	--	--	--
Kirchneriella	--	--	--	--	--	--	270	57	--
Micractinium	--	--	--	--	--	--	--	--	--
Oocystis	180	--	14	21	--	--	240	76	--
Pandorina	--	--	--	--	--	--	--	--	--
Scenedesmus	--	--	--	--	--	--	61	38	--
Schroederia	--	--	--	--	--	--	--	--	
Selenastrum	--	--	--	--	--	--	--	--	--
Sphaerocystis	--	--	--	230	140	--	--	--	--
Tetrastrum	--	--	--	--	--	--	--	--	--
Westella	--	--	--	--	--	--	--	--	--
Chrysophyta (yellow-brown algae)									
Chrysophyceae:									
Dinobryon	--	--	--	--	--	--	--	--	--
Mallomonas	--	--	--	--	--	--	--	47	--
Ochromonas	--	--	--	--	--	--	--	9	--
Xanthophyceae:									
Ophiocytium	--	--	--	--	--	--	--	--	--
Cryptophyta (crytomonads)									
Crytophyceae:									
Chroomonas	--	--	--	--	--	--	--	--	--
Cryptomonas	--	--	--	--	--	--	--	--	--
Cyanophyta (blue-green algae)									
Cyanophyceae:									
Agmenellum	--	--	--	--	--	--	--	--	--
Anabaena	1,100	--	--	14,000	5,400	--	3,000	2,000	--
Anacystis	--	--	--	--	--	--	1,000	570	160
Aphanizomenon	--	--	--	11,000	--	--	--	--	--
Coccochloris	--	--	--	--	--	--	2,200	28	--
Dactylococcopsis	--	--	--	21	--	--	--	--	--
Lyngbya	--	--	--	--	110	--	--	--	--
Oscillatoria	440	840	330	--	--	--	300	95	--
Euglenophyta (euglenoids)									
Euglenophyceae:									
Euglena	--	--	--	--	--	--	--	--	--
Phacus	--	--	--	--	--	--	--	--	6
Trachelmonas	--	--	--	27	22	--	910	300	430
Pyrrhophyta (dinoflagellates)									
Dinophyceae:									
Ceratium	--	--	--	--	--	--	--	--	--
Glenodinium	--	--	--	--	--	--	120	28	--
Peridinium	--	--	--	--	--	--	--	--	--

TABLE 4.--*Lexington Reservoir phytoplankton composition, concentration, and frequency of occurrence, 1978-80*--Continued

Organism	6-05-79			3-18-80			5-29-80			9-23-80	
	1 m	5 m	15 m	1 m	11 m	26 m	1 m	8 m	32 m	5 m	18 m
Lexington Reservoir at dam--Continued											
Bacillariophyta (diatoms)											
Bacillariophyceae:											
Asterionella	--	--	--	--	--	--	12,000	3,500	--	100	77
Cocconeis	--	--	--	--	--	--	--	--	--	--	--
Cyclotella	--	--	--	39	180	28	86	--	--	90	26
Fragilaria	--	--	--	--	--	--	--	--	--	--	--
Melosira	--	--	--	--	--	--	1,200	280	--	--	--
Navicula	--	--	--	--	--	--	--	--	--	--	--
Nitzschia	--	13	--	--	--	--	--	--	--	--	26
Rhizosolenia	--	--	--	--	--	--	--	--	--	--	--
Stephanodiscus	--	--	--	--	--	--	--	77	--	--	13
Surirella	--	--	--	--	--	--	--	--	--	--	--
Synedra	--	--	--	--	--	--	--	--	--	--	--
Chlorophyta (green algae)											
Chlorophyceae:											
Ankistrodesmus	34	--	--	--	14	14	--	--	--	--	--
Chlamydomonas	--	--	--	--	41	41	--	--	--	13	--
Closteriopsis	--	--	--	--	--	--	--	--	--	--	--
Closterium	--	--	--	--	--	--	--	--	--	--	13
Coelastrum	540	--	--	--	--	--	--	150	--	--	--
Cosmarium	--	--	--	--	--	--	--	--	--	--	--
Crucigenia	--	--	--	--	--	--	--	--	--	--	--
Dictyosphaerium	--	--	--	--	--	--	--	--	--	--	77
Elakatothrix	--	--	--	--	--	--	--	--	--	--	--
Gloeocystis	--	--	--	--	--	--	--	--	--	--	--
Golenkinia	--	--	--	--	--	--	--	--	--	--	--
Kirchneriella	--	--	--	--	--	--	--	--	--	--	--
Micractinium	--	--	--	--	--	--	--	--	--	--	--
Oocystis	5,200	2,900	300	--	--	--	--	77	--	--	--
Pandorina	--	--	--	--	--	--	--	--	--	--	--
Scenedesmus	67	130	260	--	--	--	690	77	--	--	--
Schroederia	740	--	--	--	--	--	--	--	--	39	--
Selenastrum	740	26	13	--	--	--	--	--	--	--	--
Sphaerocystis	--	100	--	--	--	--	--	--	--	--	--
Tetrastrum	--	--	--	--	--	--	--	--	--	--	--
Westella	--	--	--	--	--	--	--	--	--	--	--
Chrysophyta (yellow-brown algae)											
Chrysophyceae:											
Dinobryon	--	--	--	--	--	--	--	--	--	26	--
Mallomonas	--	--	--	--	--	--	--	--	--	--	--
Ochromonas	--	--	--	--	--	--	--	--	--	--	--
Xanthophyceae:											
Ophiocytium	--	--	--	--	--	--	--	--	--	--	--
Cryptophyta (crytomonads)											
Crytophyceae:											
Chroomonas	--	--	--	--	--	--	--	--	--	--	--
Cryptomonas	100	26	--	--	--	--	--	--	--	--	--
Cyanophyta (blue-green algae)											
Cyanophyceae:											
Agmenellum	--	--	--	--	--	--	--	--	--	--	--
Anabaena	--	--	--	--	--	--	17,000	1,000	--	--	77
Anacystis	--	--	--	--	--	--	--	--	--	64	26
Aphanizomenon	--	--	--	--	--	--	140,000	2,000	--	--	--
Coccochloris	--	--	--	--	--	--	--	--	--	--	--
Dactylococcopsis	--	--	--	--	--	--	--	--	--	--	--
Lyngbya	--	--	--	--	--	--	--	--	--	--	--
Oscillatoria	--	450	1,200	1,400	220	--	--	--	--	390	--
Euglenophyta (euglenoids)											
Euglenophyceae:											
Euglena	--	--	--	--	--	--	--	--	--	--	--
Phacus	--	--	--	--	--	--	--	--	--	--	--
Trachelmonas	34	--	--	--	14	--	--	--	--	--	--
Pyrrhophyto (dinoflagellates)											
Dinophyceae:											
Ceratium	--	--	--	--	--	--	--	--	--	--	--
Glenodinium	--	--	--	--	--	--	--	--	--	--	--
Peridinium	--	--	--	--	--	--	--	--	--	--	--

TABLE 5.--*Lexington Reservoir phytoplankton and phytoplankton chlorophyll-*a *concentrations, 1978-80*

[--, missing value]

Date	Time (hours)	Depth (meters)	Phyto-plankton concen-tration (cells per milli-liter)	Phyto-plankton chloro-phyll-*a* concen-tration (micro-grams per liter)
Lexington Reservoir at south end				
6/16/78	1100	1.0	5,700	4.04
	1110	6.0	3,300	.73
	1120	10.0	290	.00
3/18/80	1330	1.0	470	1.56
	1345	6.0	78	1.76
	1350	10.0	160	1.04
5/29/80	1415	1.0	180,000	35.7
	1425	7.0	35,000	11.5
	1435	12.0	2,500	1.41
Lexington Reservoir near south end				
3/22/79	1345	1.0	1,200	4.79
	1355	4.0	2,700	3.57
6/05/79	1240	1.0	24,000	5.38
	1245	5.0	9,700	3.59
9/23/80	1345	1.0	5,300	5.10
Lexington Reservoir at center				
6/16/78	1000	1.0	3,800	2.80
	1015	6.0	1,500	.78
	1025	20.0	390	.47
8/22/78	1230	1.0	15,000	16.1
	1245	7.0	1,300	42.7
	1300	13.0	940	36.7
3/22/79	1230	1.0	1,100	6.32
	1245	9.0	2,000	2.16
	1250	12.0	1,200	1.73
6/05/79	1115	1.0	9,000	3.79
	1120	5.0	8,300	3.64
	1130	13.0	340	.60
Lexington Reservoir at center--Continued				
3/18/80	1145	1.0	520	0.90
	1200	13.0	370	.00
	1215	20.0	120	.00
5/29/80	1041	1.0	210,000	30.9
	1050	8.0	8,400	5.16
	1100	24.0	210	.40
9/23/80	1100	1.0	2,400	3.62
	1115	4.0	680	1.69
	1125	11.0	120	1.17
Lexington Reservoir at dam				
6/15/78	1200	1.0	2,200	4.00
	1215	6.0	4,200	.69
	1236	30.0	4,000	.64
8/23/78	1005	1.0	25,000	23.2
	1030	11.0	5,700	7.04
	1045	22.0	3	.00
3/22/79	1500	1.0	9,000	9.67
	1505	7.0	3,600	5.40
	1515	20.0	870	--
6/05/79	1445	1.0	7,400	2.74
	1455	5.0	3,600	2.21
	1503	15.0	1,700	.00
3/18/80	1000	1.0	1,400	.82
	1015	11.0	470	.42
	1030	26.0	83	.00
5/29/80	1250	1.0	170,000	34.5
	1300	8.0	7,200	6.33
	1310	32.0	0	.04
9/23/80	1250	1.0	--	4.08
	1300	5.0	720	2.63
	1310	18.0	340	2.73

Water Transparency

Water transparency refers to the depth to which light can penetrate through water. The zone of photosynthetic activity is controlled, in part, by the depth to which there is sufficient light for photosynthesis. The presence of material that can scatter or absorb light, such as algae and suspended sediment (solids), will limit the depth to which light will penetrate. The depth at which the light intensity is 1 percent of the surface value generally defines the zone of photosynthetic activity or euphotic zone.

Water-transparency profiles are shown in figure 9. At the south-end station, transparency measurements were not made during June 1978 because of equipment problems. During September 1980, due to an error in measuring procedures, the euphotic zone was only partially measured at each station. Depth of the euphotic zone ranged from 1.0 to 5.4 m during the study period.

Water transparency varied seasonally during the study period. Transparency was the greatest during the June 1978 sampling when suspended solids were lowest (visual observation). Transparency was least (euphotic zone was 1.0 m) during the March 1980 sampling when suspended solids from winter and spring runoff were highest (visual observation). Abundance of algae also can influence water transparency. From spring to summer sampling, increases in the abundance of algae coincided with decreases in transparency (fig. 9 and table 5). Variations in water transparency were minimal among stations.

Major Ions

Major ions are electrically charged chemical elements that make up the bulk of dissolved substances in water. Major anions include bicarbonate, carbonate, sulfate, chloride, and fluoride; major cations include calcium, magnesium, sodium, and potassium. In water-quality investigations, the concentrations of major ions are determined to classify water type and to provide information on water-quality changes and suitability of water for various beneficial uses. In addition, major ions are a source of nutrients for aquatic organisms and can influence their growth and production.

Bicarbonate was the dominant anion and calcium generally was the dominant cation in Lexington Reservoir and in Los Gatos Creek upstream from Lexington Reservoir (fig. 10). At stations Los Gatos Creek above Lexington Reservoir, and Lexington Reservoir at south end and at center, the percentage contribution of calcium to the milliequivalents per liter of cations was less in March 1980 samples when the percentage contribution of sodium plus potassium increased. At stations Los Gatos Creek above Lexington Reservoir, and Lexington Reservoir at center and at dam, the percentage contribution of bicarbonate to the milliequivalents per liter of anions was less in March 1979 samples when the percentage contribution of sulfate increased. In March 1980 samples, no cation was dominant (made up more than 50 percent of total milliequivalents per liter of cations), and the water was classified as a mixed cation bicarbonate type. The accumulation of runoff in the reservoir during the rainy season probably was one contributing factor to this change in major-ion composition.

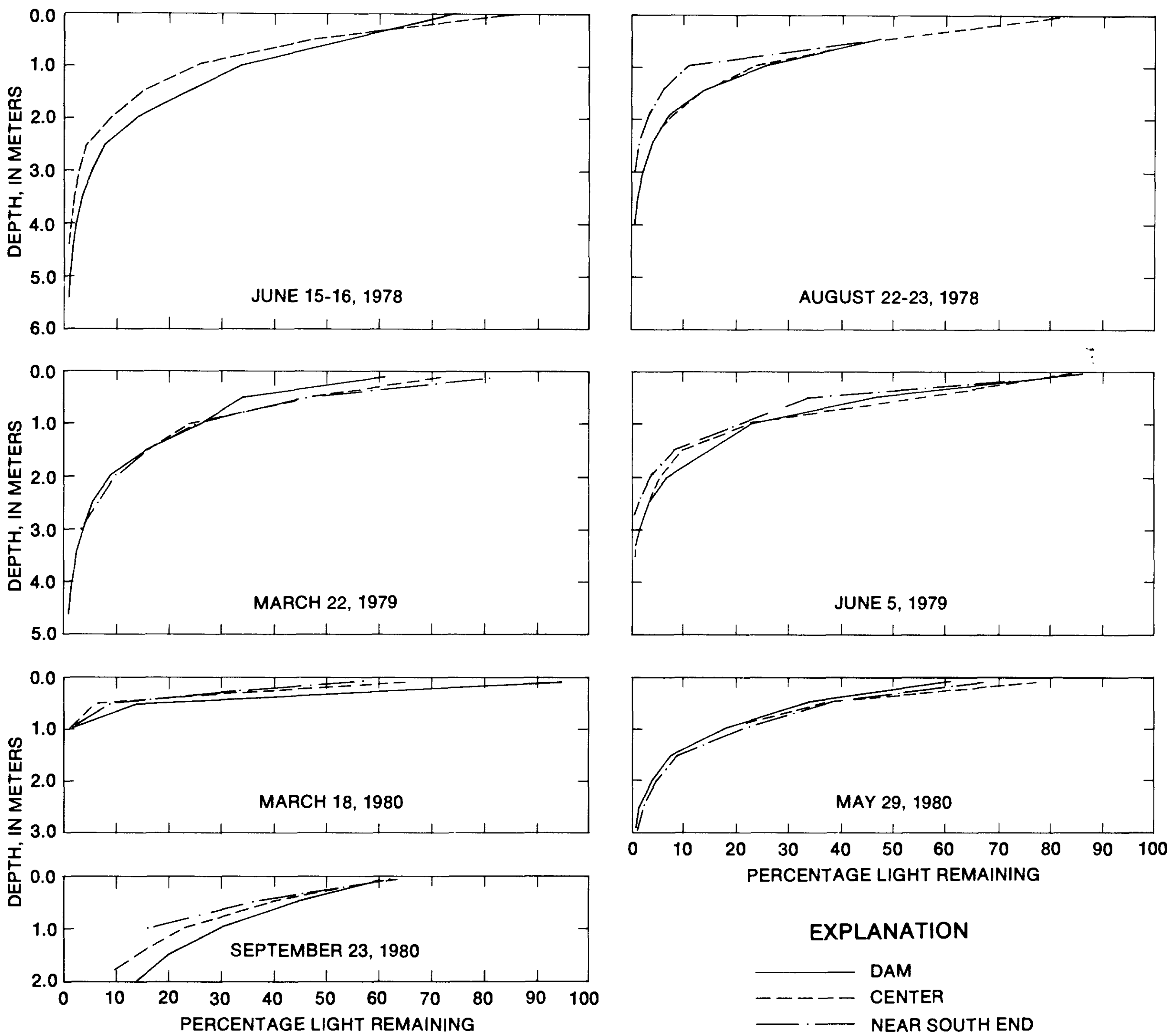


FIGURE 9.—Water-transparency profiles for Lexington Reservoir, 1978-80.

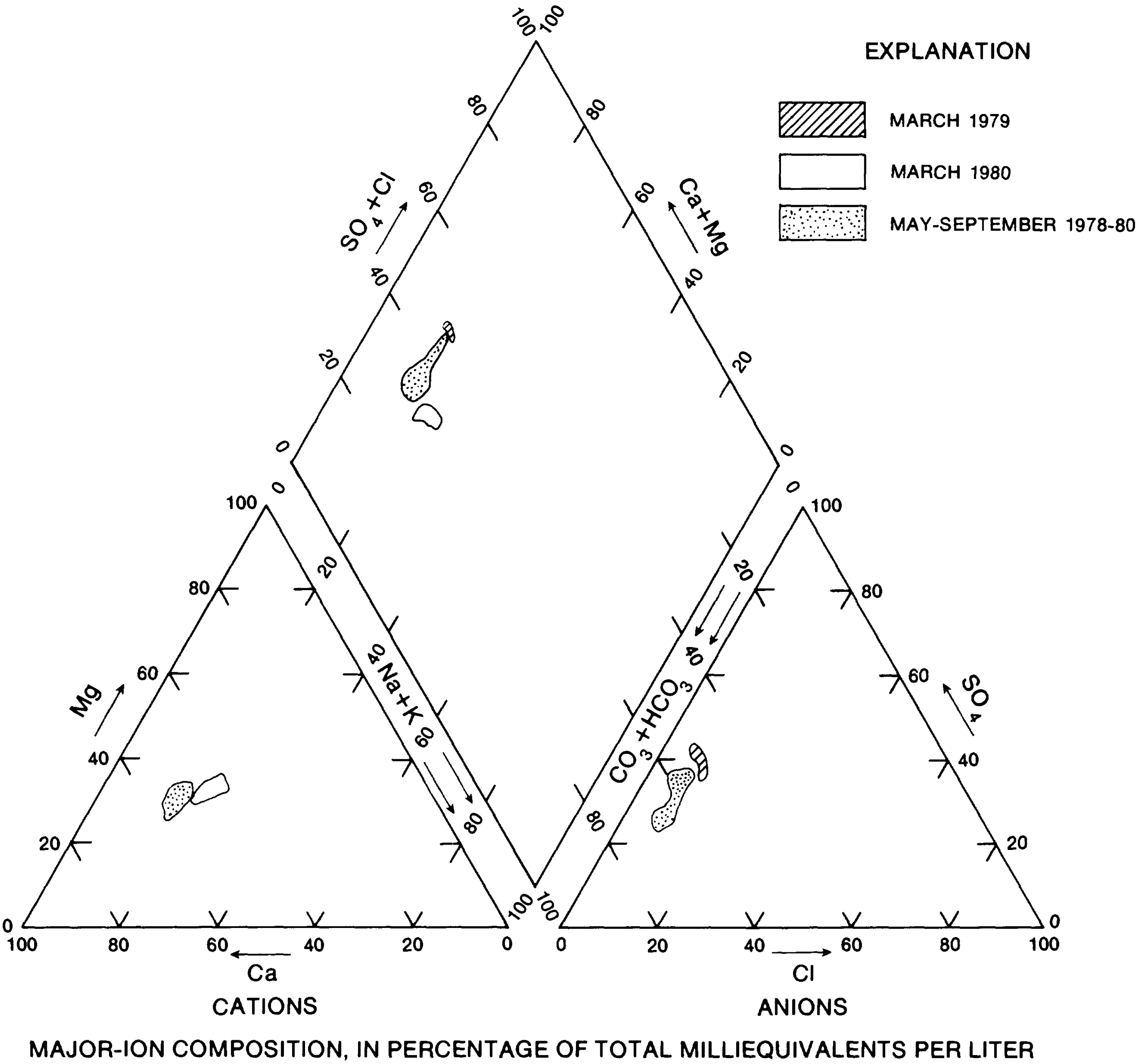


FIGURE 10.—Major ion composition of water in Lexington Reservoir and Los Gatos Creek upstream from Lexington Reservoir, 1978-80.

Nitrogen and Phosphorus

Nitrogen and phosphorus compounds are required by all organisms for growth and reproduction. Although there are other essential plant nutrients, nitrogen and phosphorus are the most common nutrients in natural water that can occur in growth-limiting concentrations. In contrast, nonlimiting quantities of nitrogen and phosphorus may result in rapid plant production and may cause nuisance conditions, such as algal blooms.

Most nitrogen was in the ammonia and organic forms (figs. 11 and 12). Median concentrations of total ammonia plus organic nitrogen in samples ranged from 0.27 mg/L at Los Gatos Creek above Lexington Reservoir to 0.57 mg/L at Lexington Reservoir at south end (fig. 11). The minimum concentration of total ammonia plus organic nitrogen in samples was 0.06 mg/L at Los Gatos Creek above Lexington Reservoir, and the maximum was 2.9 mg/L at Lexington Reservoir at south end. Median concentrations of total nitrate as nitrogen in samples ranged from 0.24 mg/L at Los Gatos Creek above Lexington Reservoir and at Lexington Reservoir at south end, to 0.38 mg/L at Lexington Reservoir at dam (fig. 12). The minimum concentration of total nitrate as nitrogen in samples was 0.00 mg/L at Lexington Reservoir at center, and the maximum was 0.59 mg/L at the same station.

Concentrations of total nitrate as nitrogen (fig. 12) generally increased from Los Gatos Creek above Lexington Reservoir (median of 0.24 mg/L) to Lexington Reservoir at dam (median of 0.38 mg/L). Concentrations of ammonia plus organic nitrogen (fig. 11) were greater at reservoir stations (median of greater than 0.38 mg/L) than at Los Gatos Creek above Lexington Reservoir (median of 0.27 mg/L).

Concentrations of total nitrate as nitrogen generally were greater in samples taken near the reservoir bottom than at other depths (table 6). Concentrations of ammonia plus organic nitrogen did not appear to be depth related.

At Lexington Reservoir at south end, concentrations of dissolved and total nitrate as nitrogen were inversely related to concentrations of phytoplankton chlorophyll-*a* (correlation coefficients = -0.83 and -0.86, respectively; number of observations = 6; significant at 0.05 level). Concentrations of dissolved nitrate as nitrogen also were inversely related to concentrations of phytoplankton cells and chlorophyll-*a* at Lexington Reservoir at center (correlation coefficients = -0.98 and -0.99, respectively; number of observations = 5; significant at 0.01 level). Concentrations of dissolved ammonia plus organic nitrogen, at Lexington Reservoir at south end, were directly related to concentrations of phytoplankton cells and chlorophyll-*a* (correlation coefficient = 0.90 and 0.87, respectively; number of observations = 9; significant at 0.01 level). At the same station, concentrations of total ammonia plus organic nitrogen also were directly related to concentrations of phytoplankton cells and chlorophyll-*a* (correlation coefficient = 0.95 and 0.92, respectively; number of observations = 9; significant at 0.01 level). Concentrations of total ammonia plus organic nitrogen were directly related to concentrations of phytoplankton cells at Lexington Reservoir at dam (correlation coefficient = 0.75; number of observations = 19; significant at 0.01 level). These correlations indicate that nitrogen concentrations in Lexington Reservoir are, at least partially, controlled by phytoplankton uptake of dissolved nitrate and its subsequent incorporation into phytoplankton tissue as organic nitrogen.

Concentrations of total phosphorus as phosphorus and dissolved orthophosphorus as phosphorus were similar in samples from all stations, ranging from less than 0.01 to 0.10 mg/L and from less than 0.01 to 0.07 mg/L, respectively (table 6). Phosphorus concentrations changed little with depth and from one sampling date to the next. Correlations between phosphorus concentrations and concentrations of phytoplankton cells and chlorophyll-*a* and -*b* were not significant at the 0.05 level.

Trace Elements

Trace elements are present in minute quantities in natural water. Most trace elements are essential to life but may be both limiting and lethal factors to aquatic organisms. For example, copper in low concentrations is an essential trace element required for growth of aquatic plants but is toxic to plants at higher concentrations.

Except for boron, concentrations of trace elements in samples analyzed were less than 100 μg/L (table 7). Most reported trace elements were less than detection limits. Boron concentrations in samples ranged from 60 to 280 μg/L; concentrations greater than or equal to 100 μg/L were observed during September 1980; the reason for this is not known. During September 1980, due to a collection error, trace-element samples were collected at all stations and at various depths rather than at the center station only. Concentrations of trace elements did not appear to change from surface to bottom waters of the reservoir. At the time of sampling, the reservoir was not thermally stratified because bottom withdrawals eliminated the metalimnion and hypolimnion.

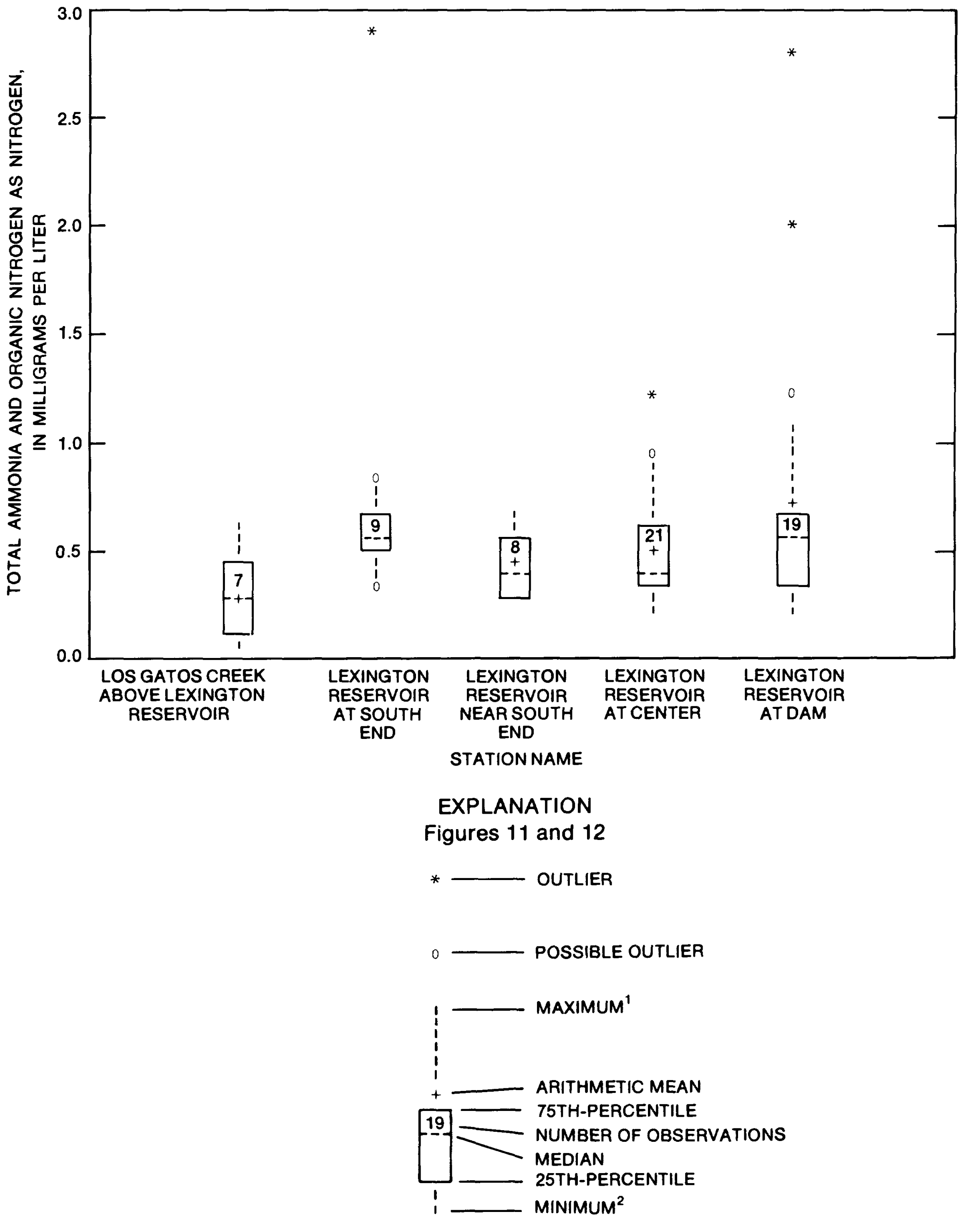
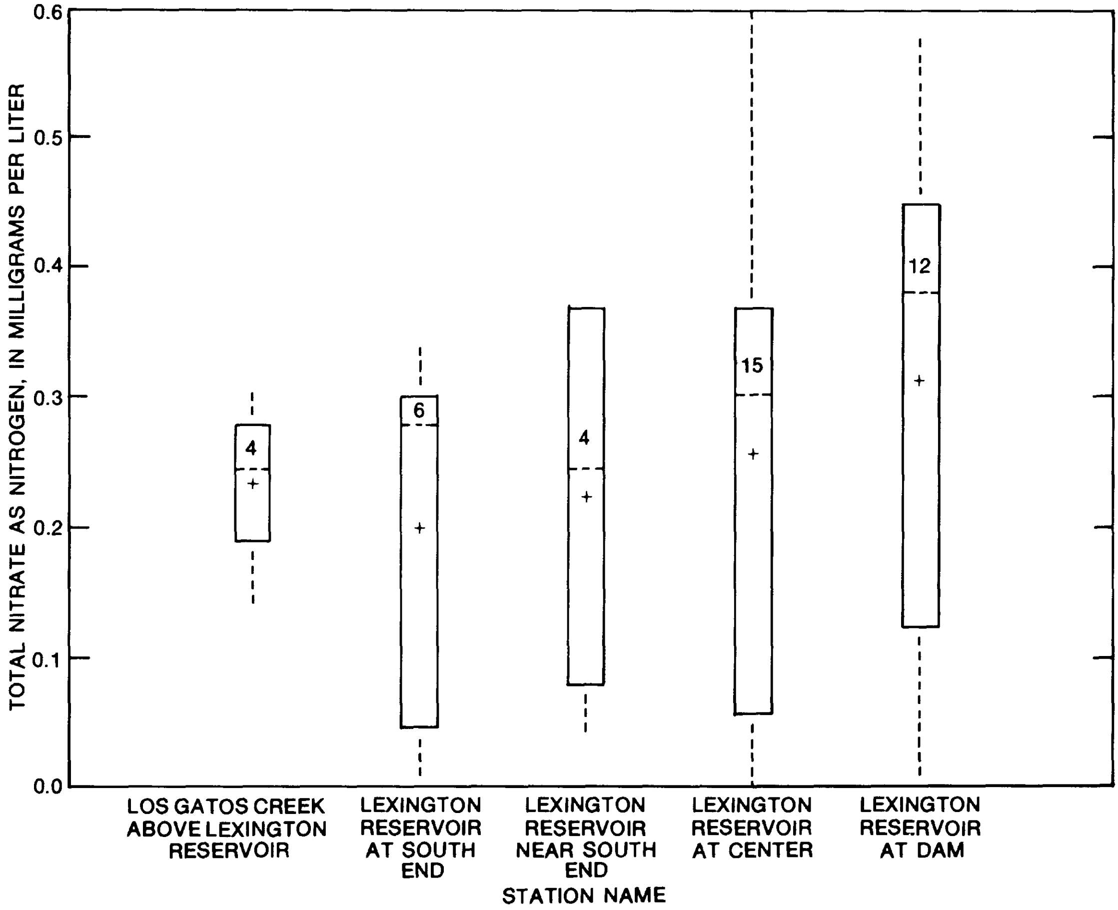


FIGURE 11.—Comparison of total ammonia and organic nitrogen concentrations at sampling stations, Lexington Reservoir and Los Gatos Creek above Lexington Reservoir, 1978-80.



EXPLANATION—Continued

OUTLIER: Value is greater then 75th-percentile or less than 25th-percentile by more than 1.5 times the interquartile range(75th-percentile minus 25th-percentile)

POSSIBLE OUTLIER: Value is greater then 75th-percentile or less than 25th-percentile by 1.0 to 1.5 times the interquartile range

[1] Maximum except for outliers and possible outliers
[2] Minimum except for outliers and possible outliers

FIGURE 12.—Comparison of total nitrate concentrations at sampling stations, Lexington Reservoir and Los Gatos Creek above Lexington Reservoir, 1978-80.

TABLE 6.--*Streamflow, sampling depth, and nitrogen and phosphorus concentrations,*

[A, chemical-quality samples analyzed by Santa Clara

Date	Time	Streamflow, instantaneous (ft^3/s)	Sampling depth (m)	Nitrogen, nitrate, total (mg/L as N)	Nitrogen, nitrate, dissolved (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, nitrite, dissolved (mg/L as N)	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)
								11167970 LOS GATOS CREEK	
1978									
June 16	1200	--	--	--	--	--	--	0.24	0.21
Aug 23	1200	--	--	--	--	--	--	.08	.08
1979									
Mar 23	1030	3.2	--	0.25	--	<0.01	--	.25	.30
June 6	1015	2.1	--	.14	--	.02	--	.16	.17
1980									
Mar 19A	0915	37	--	.30	0.20	<.01	<0.01	--	--
May 30A	0930	2.4	--	.24	.23	<.01	<.01	--	--
Sept 24	1430	.07	--	--	--	--	--	--	--
								371024121593301 LEXINGTON	
1978									
June 16	1100	--	1.0	--	--	--	--	0.01	<0.10
	1110	--	6.0	--	--	--	--	.01	<.10
	1120	--	10.0	--	--	--	--	.20	.22
1980									
Mar 18A	1330	--	1.0	0.26	0.30	<0.01	<0.01	--	--
A	1345	--	6.0	.30	.30	<.01	<.01	--	--
A	1350	--	10.0	.29	.34	<.01	<.01	--	--
May 29A	1415	--	1.0	<.01	<.01	<.01	<.01	--	--
A	1425	--	7.0	.04	<.01	<.01	<.01	--	--
A	1435	--	12.0	.33	.31	<.01	<.01	--	--
								371046121590701 LEXINGTON	
1978									
Aug 22	1410	--	1.0	--	--	--	--	<0.10	<0.10
	1500	--	3.0	--	--	--	--	<.10	<.10
	1515	--	6.0	--	--	--	--	<.10	.01
1979									
Mar 22	1345	--	1.0	0.37	--	0.02	--	.39	.40
	1355	--	4.0	.37	--	.02	--	.39	.41
June 5	1240	--	1.0	.05	--	.02	--	.07	.11
	1245	--	5.0	.11	--	.02	--	.13	.14
1980									
Sept 23A	1345	--	1.0	--	--	--	--	--	--

Los Gatos Creek above Lexington Reservoir and Lexington Reservoir stations, 1978-80

Valley Water District; --, no observation; <, less than]

Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, organic, total (mg/L as N)	Nitrogen, dissolved, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, ammonia + organic, dissolved (mg/L as N)	Nitrogen, total (mg/L as N)	Phos-phorus, total (mg/L as P)	Phosphorus, ortho, dissolved (mg/L as P)
ABOVE LEXINGTON RESERVOIR								
0.01	0.01	0.36	0.27	0.37	0.28	0.61	0.01	0.04
.01	.01	.16	--	.17	--	.25	.06	.06
.01	.01	.11	.13	.12	.14	.37	.03	.05
.01	.01	.05	.10	.06	.10	.22	.04	.04
.00	.01	.47	.36	.47	.37	--	.09	.02
.04	.03	.59	.37	.63	.40	--	.07	.04
.01	.00	.26	.20	.27	.20	--	--	--
RESERVOIR AT SOUTH END								
0.01	0.01	0.33	0.04	0.34	0.05	0.35	0.01	<0.01
.01	.01	.31	.29	.32	.30	.33	<.01	<.01
.06	.01	.44	.01	.50	.02	.70	<.01	<.01
.06	.01	.58	.52	.64	.53	--	.08	.02
.03	.01	.54	.47	.57	.48	--	.06	.03
.01	.00	.82	.69	.83	.69	--	.07	.03
.07	.03	2.8	2.0	2.90	2.0	--	.06	.01
.06	.04	.44	.26	.50	.30	--	.04	.02
.04	.04	.62	.46	.66	.50	--	.06	.02
RESERVOIR NEAR SOUTH END								
0.14	<0.01	0.54	0.23	0.68	0.23	0.68	0.05	<0.01
.12	<.01	.52	.48	.64	.48	.64	<.03	<.01
.01	.01	.44	.19	.45	.20	.45	<.03	<.01
.03	<.01	.28	.16	.31	.16	.70	.02	.02
.03	.01	.27	.22	.30	.23	.69	.02	.02
.02	.01	.24	.17	.26	.18	.33	.03	.01
.04	<.01	.25	.25	.29	.25	.42	.03	.01
.00	.00	.48	.43	.48	.43	--	--	--

TABLE 6.--*Streamflow, sampling depth, and nitrogen above Lexington Reservoir and Lexington*

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Sampling depth (m)	Nitrogen, nitrate, total (mg/L as N)	Nitrogen, nitrate, dissolved (mg/L as N)	Nitrogen, nitrite, total (mg/L as N)	Nitrogen, nitrite, dissolved (mg/L as N)	Nitrogen, NO_2+NO_3, total (mg/L as N)	Nitrogen, NO_2+NO_3, dissolved (mg/L as N)
								371108121591701 LEXINGTON	
1978									
June 16	1000	--	1.0	--	--	--	--	0.02	0.01
	1015	--	6.0	--	--	--	--	.01	<.10
	1025	--	20.0	--	--	--	--	.43	.44
Aug 22	1230	--	1.0	--	--	--	--	.01	.01
	1245	--	7.0	--	--	--	--	.01	.01
	1300	--	13.0	--	--	--	--	.05	.03
1979									
Mar 22	1230	--	1.0	0.36	--	0.02	--	.38	.40
	1245	--	9.0	.50	--	.02	--	.52	.57
	1250	--	12.0	.59	--	.02	--	.61	.54
June 5	1115	--	1.0	.06	--	.02	--	.08	.11
	1120	--	5.0	.11	--	.04	--	.15	.16
	1130	--	13.0	.44	--	<.01	--	.44	.38
1980									
Mar 18A	1145	--	1.0	.30	0.31	<.01	<0.01	--	--
	1146	--	1.0	.35	--	.01	--	.36	.37
A	1200	--	13.0	.36	.36	<.01	<.01	--	--
A	1215	--	20.0	.25	.39	.01	<.01	--	--
May 29A	1040	--	1.0	<.01	.08	<.01	<.01	--	--
	1041	--	1.0	.02	--	.02	--	.04	.01
A	1050	--	8.0	.10	.10	<.01	<.01	--	--
A	1100	--	24.0	.37	.35	<.01	<.01	--	--
Sept 23	1100	--	1.0	.00	--	.00	--	.00	.00
A	1115	--	4.0	--	--	--	--	--	--
A	1125	--	11.0	--	--	--	--	--	--
								371157121591201 LEXINGTON	
1978									
June 15	1200	--	1.0	--	--	--	--	0.02	0.01
	1215	--	6.0	--	--	--	--	.01	.01
	1236	--	30.0	--	--	--	--	.45	.44
Aug 23	1005	--	1.0	--	--	--	--	.02	.02
	1030	--	11.0	--	--	--	--	.05	.06
	1045	--	22.0	--	--	--	--	.08	.09
1979									
Mar 22	1500	--	1.0	0.33	--	0.02	--	.35	.38
	1505	--	7.0	.35	--	.02	--	.37	.42
	1515	--	20.0	.57	--	.02	--	.59	.63
June 5	1445	--	1.0	.06	--	.02	--	.08	.11
	1455	--	5.0	.10	--	.08	--	.18	.17
	1503	--	15.0	.47	--	<.01	--	.47	.44
1980									
Mar 18A	1000	--	1.0	.40	0.38	<.01	<0.01	--	--
A	1015	--	11.0	.47	.49	<.01	<.01	--	--
A	1030	--	26.0	.42	.41	<.01	<.01	--	--
May 29A	1250	--	1.0	<.01	.07	<.01	<.01	--	--
A	1300	--	8.0	.14	.12	<.01	<.01	--	--
A	1310	--	32.0	.40	.40	<.01	<.01	--	--
Sept 23A	1250	--	1.0	--	--	--	--	--	--
A	1300	--	5.0	--	--	--	--	--	--
A	1310	--	18.0	--	--	--	--	--	--

and phosphorus concentrations, Los Gatos Creek Reservoir stations, 1978-80--Continued

Nitrogen, ammonia, total (mg/L as N)	Nitrogen, ammonia, total (mg/L as N)	Nitrogen, organic, total (mg/L as N)	Nitrogen, dissolved, total (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, ammonia + organic, dissolved (mg/L as N)	Nitrogen, total (mg/L as N)	Phos-phorus, total (mg/L as P)	Phosphorus, ortho, dissolved (mg/L as P)
RESERVOIR AT CENTER								
0.01	0.01	0.48	0.53	0.49	0.54	0.51	0.01	<0.01
.01	<.01	.38	.05	.39	.05	.40	<.01	<.01
.01	<.01	.71	.15	.72	.15	1.2	.01	<.01
.05	.01	.30	.25	.35	.26	.36	.03	<.01
.01	<.01	.23	.15	.24	.15	.25	.02	.01
.03	.03	.18	.14	.21	.17	.26	.02	.01
.04	<.01	.33	.19	.37	.19	.75	.02	.02
.04	.03	.28	.17	.32	.20	.84	.02	.01
.06	.06	.23	.19	.29	.25	.90	.02	.02
.04	<.01	.30	.19	.34	.19	.42	.03	<.01
.09	.01	.16	.20	.25	.21	.40	.02	.05
.03	<.01	.21	.29	.24	.29	.68	.02	.01
.01	.00	.93	.47	.94	.47	--	.10	.03
.02	.01	.56	.44	.58	.45	.94	.05	.02
.01	.00	.56	.46	.57	.46	--	.06	.03
.01	.01	.83	.34	.84	.35	--	.06	.03
--	--	--	--	--	--	--	.04	.01
.09	.03	.54	.25	.63	.28	.67	.07	.01
.04	.03	1.2	1.4	1.20	1.4	--	.02	.01
.04	.03	.33	.36	.37	.39	--	.07	<.04
.00	.00	.76	.54	.76	.54	.76	.02	.00
.00	.00	--	.60	--	.60	--	--	--
.00	.00	.45	.41	.45	.41	--	--	--
RESERVOIR AT DAM								
0.01	<0.01	0.49	0.37	0.50	0.37	0.52	<0.01	<0.01
.01	<.01	2.0	.35	2.0	.35	2.0	<.01	<.01
.01	<.01	1.2	.09	.12	.09	1.7	<.01	.01
.03	.01	.59	.37	.62	.38	.64	.03	.01
.01	.02	.36	.22	.37	.24	.42	.02	.01
.06	.06	.94	.18	1.0	.26	1.1	.03	.02
.02	<.01	.29	.15	.31	.15	.66	.02	.01
.03	.01	.26	.20	.29	.21	.66	.02	.01
.07	.06	.25	.22	.32	.28	.91	.03	.02
.02	.01	.18	.16	.20	.17	.28	.02	.02
.04	<.01	.23	.20	.27	.20	.45	.02	<.01
.02	<.01	.19	.20	.21	.20	.68	.02	.07
.01	.01	.53	.53	.54	.54	--	.08	.03
.04	.01	.52	.44	.56	.45	--	.08	.03
.04	.01	.62	.47	.66	.48	--	.01	.03
.07	.03	2.7	.31	2.8	.34	--	.06	.02
.06	.03	.61	.38	.67	.41	--	.07	.05
.04	.03	.58	.23	.62	.26	--	.06	.04
.00	.01	--	.47	--	.48	--	--	--
.00	.00	.54	.56	.54	.56	--	--	--
.00	.00	--	.51	--	.51	--	--	--

TABLE 7.--*Streamflow, sampling depth, and trace-element concentrations, Los*

[ND, not detected; A, trace-element sample analyzed by Santa

Date	Time	Streamflow, instantaneous (ft^3/s)	Sampling depth (m)	Aluminum, dissolved (µg/L as Al)	Arsenic, dissolved (µg/L as As)	Boron, dissolved (µg/L as B)	Cadmium, dissolved (µg/L as Cd)	Chromium, dissolved (µg/L as Cr)	Cobalt, dissolved (µg/L as Co)	Copper, dissolved (µg/L as Cu)
										11167970 LOS GATOS CREEK
1978										
June 16	1200	--	--	--	--	80	--	--	--	--
Aug 23	1200	--	--	--	--	90	--	--	--	--
1979										
June 6	1015	2.1	--	30	4	--	ND	ND	ND	ND
1980										
Sept 24	1430	.07	--	10	1	100	<1	0	<3	1
	A 1431	--	--	70	<10	280	<1	<10	<10	<10
										371024121593301 LEXINGTON
1978										
June 16	1100	--	1.0	--	--	60	--	--	--	--
	1110	--	6.0	--	--	70	--	--	--	--
	1120	--	10.0	--	--	70	--	--	--	--
										371046121590701 LEXINGTON
1978										
Aug 22	1410	--	1.0	--	--	70	--	--	--	--
	1500	--	3.0	--	--	70	--	--	--	--
	1515	--	6.0	--	--	70	--	--	--	--
1980										
Sept 21A	1345	--	1.0	70	<10	250	<1	<10	<10	<10
										371108121591701 LEXINGTON
1978										
June 16	1000	--	1.0	--	--	60	--	--	--	--
	1015	--	6.0	--	--	60	--	--	--	--
	1025	--	20.0	--	--	60	--	--	--	--
Aug 22	1230	--	1.0	--	--	70	--	--	--	--
	1245	--	7.0	--	--	70	--	--	--	--
	1300	--	13.0	--	--	60	--	--	--	--
1979										
June 5	1115	--	1.0	40	3	--	ND	ND	ND	ND
1980										
Sept 23A	1100	--	1.0	60	<10	250	<1	<10	<10	<10
	A 1115	--	4.0	70	<10	250	<1	<10	<10	<10
	A 1125	--	11.0	70	<10	250	<1	<10	<10	<10
										371157121591201 LEXINGTON
1978										
June 15	1200	--	1.0	--	--	60	--	--	--	--
	1215	--	6.0	--	--	60	--	--	--	--
	1236	--	30.0	--	--	60	--	--	--	--
Aug 23	1005	--	1.0	--	--	70	--	--	--	--
	1030	--	11.0	--	--	70	--	--	--	--
	1045	--	22.0	--	--	60	--	--	--	--
1980										
Sept 21A	1250	--	1.0	70	<10	250	<1	<10	<10	<10
	A 1300	--	5.0	60	<10	250	<1	<10	<10	<10
	A 1310	--	18.0	80	<10	280	<1	<10	<10	<10

Gatos Creek above Lexington Reservoir and Lexington Reservoir stations, 1978-80

Clara Valley Water District; --, no observation; <, less than]

Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Manganese, dissolved (µg/L as n)	Mercury, dissolved (µg/L as g)	Molybdenum, dissolved (µg/L as Mo)	Nickel, dissolved (µg/L as Ni)	Selenium, dissolved (µg/L as Se)	Vanadium, dissolved (µg/L as V)	Zinc, dissolved (µg/L as Zn)
ABOVE LEXINGTON RESERVOIR								
<10	--	--	--	--	--	--	--	--
<10	--	--	--	--	--	--	--	--
<10	ND	60	<0.1	<1	2	<1	--	<20
<10	0	20	.0	<10	4	0	<3.0	<3
<50	<10	30	<.5	--	<50	<10	<100	<50
RESERVOIR AT SOUTH END								
<10	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
RESERVOIR NEAR SOUTH END								
20	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--
<50	<10	70	<0.5	--	<50	<10	<100	50
RESERVOIR AT CENTER								
30	--	--	--	--	--	--	--	--
<10	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--
<10	ND	20	<0.1	<1	ND	<1	--	<20
<50	<10	20	<.5	<10	<50	<10	<100	60
<50	<10	10	<.5	--	<50	<10	<100	50
<50	<10	20	<.5	--	<50	<10	<100	50
RESERVOIR AT DAM								
<10	--	--	--	--	--	--	--	--
<10	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
<10	--	--	--	--	--	--	--	--
<10	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--
<50	<10	10	<0.5	--	<50	<10	<100	60
<50	<10	10	<.5	--	<50	<10	<100	50
<50	<10	20	<.5	--	<50	<10	<100	50

BIOLOGICAL CHARACTERISTICS

Phytoplankton Composition, Concentration, and Frequency of Occurrence

Blue-green algae generally predominated in phytoplankton samples from Lexington Reservoir (fig. 13). Diatoms, green algae, or euglenoids were predominant at times. A consistent seasonal pattern in phytoplankton composition was not observed.

The most prevalent (frequently found) phytoplankter in all samples collected was the green alga, *Oocystis* (table 4). This alga was present in 7 of 8 samples from the near south end station, 13 of 21 samples from the center station, and 9 of 20 samples from the dam station. The blue-green alga, *Anabaena*, was the most prevalent phytoplankter (5 of 9 samples) at the south-end station, whereas the blue-green alga, *Oscillatoria*, was the most prevalent phytoplankter (10 of 20 samples) at the dam station. Other prevalent algae were:

Cyclotella (diatom), 5 of 9 samples from the south-end station;
Schroederia (green alga) and *Trachelmonas* (euglenoid), 6 of 8 samples, and *Anabaena* and *Anacystis* (blue-green algae), 5 of 8 samples from the near south-end station;
Cyclotella, 12 of 21 samples from the center station; and
Cyclotella, 10 of 20 samples, and *Melosira* (diatom) and *Anabaena*, 8 of 20 samples from the dam station.

Algae prevalent in Lexington Reservoir are widespread and are found in all types of water (oligotrophic to eutrophic), except for *Anabaena* and *Anacystis*, which are commonly found in hard, warm, or eutrophic waters, and *Trachelmonas*, which are indicative of warm waters having a high content of organic matter (P.E. Greeson, U.S. Geological Survey, written commun., 1977).

The most abundant (cells per milliliter) phytoplankter collected was the blue-green alga, *Aphanizomenon* (table 4). A bloom of this alga was occurring when the reservoir was sampled May 29, 1980, and extended from near the water surface to 8 meters in depth. Near the water surface during this bloom condition, the percentage saturation of dissolved oxygen sampled ranged from 120 percent at the dam station to 135 percent at the south-end station. Except for this bloom, the blue-green alga, *Anabaena*, was generally the most abundant phytoplankter. Other abundant algae were:

Asterionella (diatom) at the south-end station;
Cyclotella (diatom), *Oocystis* (green alga), and *Sphaerocystis* (green alga) at the near south-end station;
Asterionella and *Oocystis* at the center station; and
Asterionella, *Fragilaria* (diatom), and *Oocystis* at the dam station.

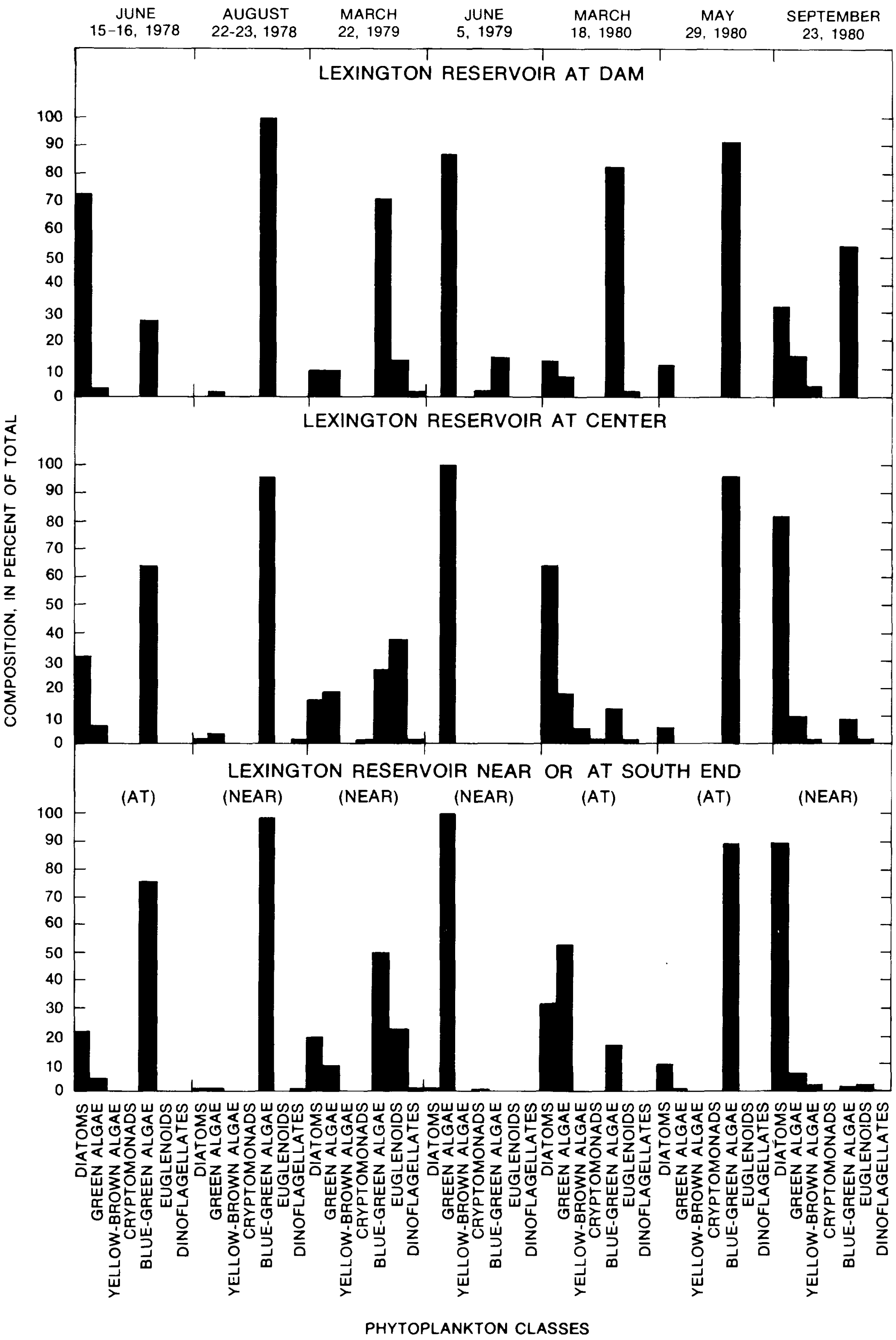


FIGURE 13.—Relative abundance of phytoplankton classes in samples collected from Lexington Reservoir, 1978-80.

Aphanizomenon and *Anabaena* are commonly found in hard, warm, or eutrophic waters. Cyclotella are widespread and are commonly found in all types of water. Oocytis are widespread and indicative of oligotrophic waters. *Asterionella* are widespread and indicative of mesotrophic to eutrophic waters (P.E. Greeson, U.S. Geological Survey, written commun., 1977). Abundant concentrations of *Aphanizomenon*, *Anabaena*, and *Asterionella* can cause taste and odor problems in water (American Public Health Association and others, 1981, pl. A).

Phytoplankton concentrations generally were less in March and September samples than in May, June, and August samples (tables 4 and 5). The mean number of species collected per sample was greatest (nine species) at the near south-end station. The mean number of species collected per sample at the south-end station was five and at the center and dam stations was six.

Phytoplankton Chlorophyll-*a* Concentrations

Concentrations of phytoplankton and chlorophyll-*a* (table 5) were directly related (correlation coefficient = 0.66; number of observations = 54; significant at 0.01 level). Concentrations of phytoplankton were greatest in samples collected May 29, 1980, during a bloom of the blue-green alga, *Aphanizomenon*. Except for the August 22, 1978, sampling at the center station, chlorophyll-*a* concentrations also were greatest during May 29, 1980, sampling. Concentrations of phytoplankton and chlorophyll-*a* generally were greater near the water surface (1-m depth) than deeper in the reservoir.

Trophic-State Index

Phytoplankton chlorophyll-*a* concentrations have been used to calculate a trophic-state index (TSI), which indicates the trophic status (degree of nutrient enrichment) of a water body (Carlson, 1977; 1979). This TSI ranges from 0 to 100, with values from 0 to 10 indicating oligotrophic waters and values greater than 50 indicating eutrophic waters (Carlson, 1979). Oligotrophic waters pertain to waters in which primary production is low as a consequence of a small supply of available nutrients, whereas eutrophic waters pertain to waters in which primary production is high because of a large supply of available nutrients. Mesotrophic waters (discussed later) pertain to waters in which primary production occurs at a greater rate than in oligotrophic waters, but at a lesser rate than in eutrophic waters (Britton and others, 1975). TSI also can be calculated from total phosphorus concentrations and Secchi-disk measurements.

TSI values for Lexington Reservoir calculated from concentrations of phytoplankton chlorophyll-*a* and total phosphorus generally agree (table 8). TSI values calculated from Secchi-disk measurements are generally different than those calculated from phytoplankton chlorophyll-*a* concentrations. TSI values calculated from phytoplankton chlorophyll-*a* concentrations are generally less than 50, which indicates that Lexington Reservoir is generally not eutrophic. Some TSI values are greater than 50, generally when phytoplankton concentrations exceeded 10,000 cells/mL.

TABLE 8.--*Trophic-state index for Lexington Reservoir, 1978-80*

[--, missing values]

Station	Date	Trophic-state index calculated from: Phytoplankton chlorophyll-*a* concentration at 1-meter depth	Total phosphorus concentration at 1-meter depth	Secchi disk measurements
At south end	6/16/78	44	37	52
	3/18/80	35	67	73
	5/29/80	66	63	57
Near south end	3/22/79	46	47	53
	6/05/79	47	53	63
	9/23/80	47	--	63
At center	6/16/78	41	37	53
	8/22/78	58	53	56
	3/22/79	49	47	52
	6/05/79	44	53	57
	3/18/80	30	61	73
	5/29/80	64	65	57
	9/23/80	43	47	57
At dam	6/15/78	44	37	49
	8/23/78	61	53	55
	3/22/79	53	47	54
	6/05/79	40	47	59
	3/18/80	29	67	73
	5/29/80	65	63	56
	9/23/80	44	--	53

TSI results generally agree with trophic-status classifications given in this report (such as oligotrophic to mesotrophic except during algal blooms). The authors caution that TSI values only indicate the general trophic status of a water body and do not define the actual or absolute trophic status. Differences between TSI values calculated from phytoplankton chlorophyll-*a* concentrations and Secchi-disk measurements probably were due to nonalgal particulate matter in the water.

Primary Productivity

Estimates of net primary productivity in Lexington Reservoir at the center station ranged from -1,000 to 5,700 (mg O_2/m^3)/d (table 9). Net primary productivity values were usually positive, which indicated production exceeded respiration. When primary productivity measurements were made, the euphotic zone ranged from 3.5 to 4.8 m in depth. Gross and net primary productivity were usually greater in the upper 2 m of the euphotic zone than deeper in the euphotic zone. The reverse was usually the case for respiration. Net primary productivity estimates, at depth, were greatest August 22, 1978, and were least June 5, 1979.

Primary productivity estimated for the euphotic zone was least June 5, 1979, when respiration exceeded primary production at depths of 3 and 3.7 m (table 9). Except for the August 22, 1978, value, estimates of the euphotic zone primary productivity, excluding the top 1 m of water, are typical of mesotrophic lakes. The August 22, 1978, estimate [3,400 (mg C/m^2)/d)] is characteristic of euphotic lakes (Wetzel, 1983; Crim, 1975).

A seasonal variation of increasing primary productivity and respiration from spring to summer is indicated. More estimates of primary productivity and respiration throughout the year would be needed to determine if such a trend actually exists.

Bacteria

Fecal-coliform and fecal-streptococcal bacteria concentrations were generally less than 10 colonies/100 mL in Lexington Reservoir (table 10). Concentrations of these bacteria were similar at the four reservoir-sampling stations. Samples from the station Los Gatos Creek above Lexington Reservoir had greater concentrations of these bacteria than samples from the reservoir. The median concentrations of fecal-coliform and fecal-streptococcal bacteria at the station Los Gatos Creek above Lexington Reservoir were 40 colonies/100 mL and 90 colonies/100 mL, respectively. No trends in bacterial concentrations were apparent.

TABLE 9.--*Light- and dark-bottle estimates of primary productivity in Lexington Reservoir at center station, 1978-80*

Date	Depth at which 1 percent of incident light remained	Bottle depth	Gross primary productivity	Net primary productivity	Respiration	Euphotic zone primary productivity[1]
	Meters		Milligrams oxygen per cubic meter per day			Milligrams carbon per square meter per day
6/15/78	4.4	1.0	2,400	1,600	800	600
		2.0	800	800	0	
		3.0	1,600	0	1,600	
		4.3	0	0	0	
8/22/78	3.8	1.0	6,300	5,700	580	3,400
		2.0	6,900	4,600	2,300	
		3.0	2,900	1,200	1,700	
		4.0	3,500	580	2,900	
3/22/79	4.8	1.0	1,400	480	960	600
		2.0	1,400	1,400	0	
		3.0	0	0	0	
		4.0	1,400	0	1,400	
6/05/79	3.5	1.0	2,500	1,500	1,000	240
		2.0	1,500	1,000	500	
		3.0	500	-500	1,000	
		3.7	0	-1,000	1,000	
9/23/80	--	.90	3,100	2,300	770	320
		1.8	1,500	-770	2,300	

[1]Estimated primary production of the euphotic zone, excluding the interval from lake's surface to 1 m in depth (Greeson and others, 1977).

TABLE 10.--*Bacterial concentrations for Lexington Reservoir and Los Gatos Creek above Lexington Reservoir, 1978-80*

[K, non-ideal colony count; <, actual value known to be less than the value shown; --, no observation]

Date	Time	Streamflow (cubic feet per second)	Sampling depth (meters)	Fecal-coliform bacteria	Fecal-streptococcal bacteria
				Colonies per 100 milliliters	
		Los Gatos Creek above Lexington Reservoir			
6/16/78	1200	--	--	28	130
8/23/78	1200	--	--	40	--
3/23/79	1030	3.2	--	16	K10
6/06/79	1015	2.1	--	57	160
3/19/80	0915	37	--	K16	K12
5/30/80	0930	2.4	--	62	49
9/24/80	1430	.07	--	89	200
		Lexington Reservoir at south end			
6/16/78	1058	--	0.10	K1	K1
3/18/80	1351	--	.10	<1	K7
5/29/80	1440	--	.10	<1	<1
		Lexington Reservoir near south end			
8/22/78	1411	--	0.10	K4	--
3/22/79	1340	--	.10	K1	K2
6/05/79	1400	--	.10	<1	K4
9/23/80	1620	--	.10	<1	<1
		Lexington Reservoir at center			
6/16/78	0958	--	0.10	<1	K2
8/22/78	1227	--	.10	<1	--
3/22/79	1225	--	.10	<1	K1
6/05/79	1415	--	.10	<1	K2
3/18/80	1355	--	.10	K14	<1
5/29/80	1445	--	.10	<1	<1
9/23/80	1625	--	.10	<1	<1
		Lexington Reservoir at dam			
6/15/78	1157	--	0.10	<1	<1
8/23/78	1000	--	.10	<1	--
3/22/79	1455	--	.10	K4	K10
6/05/79	1430	--	.10	K7	34
3/18/80	1400	--	.10	K14	K23
5/29/80	1450	--	.10	<1	<1
9/23/80	1630	--	.10	K1	<1

COMPARISONS OF WATER-QUALITY CONDITIONS WITH WATER-QUALITY OBJECTIVES

Existing and potential beneficial uses of water in Lexington Reservoir are municipal and domestic supply, water-contact recreation, noncontact water recreation, cold and warm freshwater habitat, wildlife habitat, and fish spawning. Water-quality objectives (table 11) have been established to maintain water suitable for these beneficial uses (California Regional Water Quality Control Board, San Francisco Bay Region, 1982). Objectives for water-quality properties and constituents measured or analyzed during this study are listed in table 11.

Water samples from Lexington Reservoir and from the station Los Gatos Creek above Lexington Reservoir generally met water-quality objectives (table 12). The only objective not met at the station Los Gatos Creek above Lexington Reservoir was the concentration of manganese at 60 μg/L in a sample taken June 6, 1979. The objectives for pH and dissolved oxygen frequently were not met at reservoir stations. The pH objective was not met in water near the surface of the reservoir, and the dissolved-oxygen objective was not met in water near the bottom of the reservoir, when the reservoir was thermally stratified.

Most pH values greater than the 8.5 objective were measured May 29, 1980, when phytoplankton concentrations ranged from 170,000 cells/mL at the south end to 210,000 cells/mL at the center (concentrations were about 10 times those observed during other sampling dates). Phytoplankton take carbon dioxide from the water during photosynthesis, thus making the water more alkaline. Dissolved oxygen near the reservoir surface was greater than usual May 29, 1980; near the surface where pH values were greater than 8.5, dissolved oxygen averaged 11.0 mg/L and 119-percent saturation. During other samplings, dissolved-oxygen concentrations near the surface were usually less than 9.0 mg/L (percent saturation values not available for most other samplings). Increased dissolved-oxygen and phytoplankton concentrations measured May 29, 1980, indicate that photosynthesis was greater than usual.

Even though dissolved-oxygen objectives frequently were not met in the hypolimnion, anoxic conditions occurred infrequently, and dissolved-oxygen concentrations in the hypolimnion generally were very near the 5.0-mg/L objective for warm-water habitat. When the reservoir was thermally stratified, decreases in dissolved oxygen from near the surface to near the bottom of the reservoir ranged from 3.1 to 8.4 mg/L. Of the seven measuring periods, the hypolimnion was anoxic only at the center and dam stations during the August 22-23, 1978, sampling. At Lexington Reservoir near south end, the lowest dissolved-oxygen concentration, 6.9 mg/L, was measured during the August 22, 1978, sampling when water at this station was only slightly thermally stratified because of the shallow water depth (only 6.5 m); Lexington Reservoir at south end was not covered by water during this sampling. At other times when the reservoir was thermally stratified, dissolved oxygen in the hypolimnion was usually greater than 4.0 mg/L.

The only other water-quality objective not met at reservoir stations was the municipal-supply objective for manganese. The manganese concentration was 70 μg/L in a September 23, 1980, sample from Lexington Reservoir near south end.

TABLE 11.--*Water-quality objectives applicable to Lexington Reservoir*

[Values in milligrams per liter, except turbidity, in Nephelometric Turbidity Units; pH, in units; and bacteria, in numbers per 100 mL. Source: California Regional Water Quality Control Board, San Francisco Bay Region, 1982]

Property or constituent	Objective: Minimum	Mean[1]	Maximum[2]	Median	Comments
Turbidity	--	--	--	--	Municipal supply[3]
pH	6.5	--	8.5	--	Controllable water-quality factors shall not cause changes greater than 0.5 unit in normal ambient pH.
Dissolved oxygen	7.0	--		80 percent[4]	Cold-water habitat.
	5.0	--		80 percent[4]	Warm-water habitat.
Fecal-coliform bacteria		20/100 mL		--	Municipal supply.
	--	200/100 mL[5]	--	--	Water-contact recreation.
		2,000/100 mL[6]	--	--	Noncontact water recreation.
Un-ionized ammonia[7]	--	--	0.4	0.025	
Arsenic	--	--	0.05	--	Municipal supply.
Chloride	--	--	250/500	--	Do.
Cadmium	--	--	0.01	--	Do.
Chromium	--	--	0.05	--	Do.
Copper	--	--	1.0	--	Do.
Fluoride	--	--	[8]0.8-1.7	--	Do.
Iron	--	--	0.3	--	Do.
Lead	--	--	0.05	--	Do.
Manganese	--	--	0.05	--	Do.
Mercury	--	--	0.002	--	Do.
Nitrite plus nitrate as nitrogen	--	--	10	--	Do.
Sulfate	--	--	250/500	--	Do.
Dissolved solids	--	--	500/1,000	--	Do.
Specific conductance	--	--	900/1,600	--	Do.
Zinc	--	--	5.0	--	Do.

[1]Mean based on a minimum of five consecutive samples collected within a 30-day period; arithmetic mean except objective for water-contact recreation, which is log mean.

[2]Maximum = limiting concentration where only one number; threshold concentration is first number and limiting concentration is second number where two values are given.

[3]Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas of 10 Nephelometric Turbidity Units (NTU) or more. Waters of characteristically low natural turbidity (high clarity) shall be maintained so that discharges do not cause visible, esthetically undesirable contrast with the natural appearance of the water.

[4]Median dissolved-oxygen concentration for any 3 consecutive months shall not be less than 80 percent of the dissolved-oxygen content at saturation.

[5]90th percentile less than 400/100 mL.

[6]90th percentile less than 4,000/100 mL.

[7]The method for calculating un-ionized ammonia concentrations is that given in Appendix B of the Revised San Francisco Bay Region Basin Plan (California Regional Water Quality Control Board, 1982).

[8]Allowable concentration varies with annual average of maximum daily air temperature.

TABLE 12.--*Lexington Reservoir and Los Gatos Creek above Lexington Reservoir sampling stations having water not in compliance with water-quality objectives, 1978-80*

Station name	Property or constituent and objective	Number of times objective was exceeded	Number of samples
Los Gatos Creek above Lexington Reservoir	Manganese: maximum, municipal supply	1	3
Lexington Reservoir at south end	pH: maximum;	9	40
	Dissolved oxygen: minimum, cold-water habitat;	13	40
	Dissolved oxygen: minimum, warm-water habitat	6	40
Lexington Reservoir near south end	Dissolved oxygen: minimum, cold-water habitat;	3	34
	Manganese: maximum, municipal supply	1	1
Lexington Reservoir at center	pH: maximum;	15	138
	Dissolved oxygen: minimum, cold-water habitat;	58	138
	Dissolved oxygen: minimum, warm-water habitat	30	138
Lexington Reservoir at dam	pH: maximum;	19	175
	Dissolved oxygen: minimum, cold-water habitat;	66	175
	Dissolved oxygen: minimum, warm-water habitat	46	175

NEED FOR FUTURE STUDIES

Future studies can be divided into two categories: Short-term interpretive studies and a sustained long-term monitoring program. Short-term interpretive studies are primarily problem oriented, whereas long-term monitoring is designed to provide a broad coverage of water-quality conditions and identify changes in water quality of Lexington Reservoir and Los Gatos Creek upstream from the reservoir. Information gained from these studies would help the District in managing Lexington Reservoir for all beneficial uses.

Short-Term Studies

Algal blooms occurring in Lexington Reservoir can degrade the esthetic value of the reservoir as well as the quality of water. Investigations could be made to determine the frequency, durations, and seasonal and areal distribution of algal blooms, and the major algal species that compose algal blooms.

A nutrient budget has not been developed for Lexington Reservoir and its tributaries. Sources of the nutrients that enter the reservoir, the quantity of nutrients, period of peak-nutrient input, and the means by which nutrients are transported to the reservoir (in the dissolved or suspended state) are not known. In addition, algal-growth potential tests could be made to determine nutrient-level limiting factors.

Oxygen light- and dark-bottle estimates indicated seasonal variations of increasing primary productivity from spring to summer. Further information is needed to describe this seasonal trend and extend the period to include winter to autumn. Carbon-14 light- and dark-bottle methods could be considered in future primary-productivity investigations. In addition, the collection of phytoplankton samples, at the same depths where the primary production measurements are made, would provide information to relate the types and quantity of algae to primary productivity.

Britton and others (1974) reported high mercury concentrations in fish collected from Lexington Reservoir. Although dissolved mercury concentrations were always less than 0.5 μg/L during this study, an assessment of the source of mercury and its distribution in reservoir and tributary bottom sediments could be considered. In addition, bioaccumulation and biomagnification of mercury in benthic invertebrates and fish could be evaluated.

Long-Term Studies

During fiscal year 1984 the water-quality monitoring program for Lexington Reservoir and Los Gatos Creek upstream from the reservoir was to sample twice per year and to make the same water-quality measurements at two stations in the reservoir (dam and center) and at the station Los Gatos Creek above the reservoir. A suggested alternative to this program could be to sample the reservoir at least quarterly but only at the deepest station near the dam. Los Gatos Creek also could be sampled at least quarterly with the intent of obtaining samples throughout the usual range of streamflows for this stream.

Reservoir sampling could be adapted to seasonal processes of water and sediment inflow, temperature stratification, and algal production. Such a sampling program would be facilitated by installing a streamflow-gaging station on Los Gatos Creek at or near the site sampled during this study and by installing a series of thermistors from a buoy at the sampling station near the dam where the water is deepest. The streamflow gage would provide a continuous record of water discharge, which could be used to select sampling times and to compute loads of materials transported by the stream into the reservoir. The thermistors, distributed from near the surface to near the bottom of the reservoir, would provide a continuous record of water temperature, which could define the onset, breakup, and degree of thermal stratification in the reservoir.

SUMMARY

This report describes the water-quality conditions of Lexington Reservoir (a water-supply and conservation reservoir) in Santa Clara County, California, and Los Gatos Creek upstream from the reservoir during June 1978 through September 1980. The report is part of a continuing study to document water-quality conditions and to determine any significant water-quality changes (particularly those that are man-caused) in Lexington Reservoir and Los Gatos Creek upstream from the reservoir.

Reservoir volumes during the study period (June 1978 through September 1980) ranged from 15 to 103 percent full. Except in 1979 (a relatively dry year), all reservoir volumes at the time of sampling exceeded the historical mean monthly volumes by at least 55 percent.

Water-temperature profiles show that Lexington Reservoir can be classified as a warm monomictic lake (water temperature is never less than 4 °C at any depth, circulates freely in the winter at or above 4 °C, and is stratified in the summer). Water was warmest (24.2 °C) during August 1978 at the upstream end of the reservoir, where the reservoir is shallowest, and was coldest (9.6 °C) during March 1979 at the dam, where the reservoir is deepest. The degree to which the reservoir was thermally stratified depended upon ambient air temperature, wind, volume of water in the reservoir, and the volume of water released from the reservoir. At the station Los Gatos Creek above Lexington Reservoir, water temperatures at the times of sampling ranged from 10.0 to 19.0 °C.

Dissolved-oxygen profiles were similar to water-temperature profiles. When the reservoir was slightly stratified, dissolved-oxygen concentrations were nearly equal from surface to bottom. During the summer when the reservoir was strongly stratified, dissolved-oxygen concentrations were greater in the epilimnion than in the hypolimnion. Dissolved-oxygen concentrations ranged from 0.6 to 13.5 mg/L and were generally greatest in the spring near the surface and least in the summer near the bottom of the reservoir. Both metalimnetic-oxygen minimum and maximum conditions were observed and were related to phytoplankton concentrations in the epilimnion and metalimnion. Dissolved-oxygen concentrations at the station Los Gatos Creek above Lexington Reservoir ranged from 9.6 to 12.4 mg/L.

Values of pH ranged from 6.5 to 8.9, and generally decreased from the surface to the bottom of the reservoir as the result of photosynthesis (uptake of carbon dioxide) in the epilimnion and carbon-dioxide production (from respiration) in the aphotic zone of the reservoir.

In Lexington Reservoir, specific conductance ranged from 243 to 461 μS/cm and varied with reservoir volume. Values were smallest when the reservoir was fullest and largest when the reservoir was lowest. This inverse relation results primarily from inflow water being lower in dissolved solids during the rainy season than during the dry season and from increased evaporation during the summer. Specific conductance generally was greater in the metalimnion than in the epilimnion or hypolimnion.

Light-transmission profiles show that the water clarity of Lexington Reservoir generally decreases with depth. Exceptions to this pattern occurred when light transmission was reduced because phytoplankton concentrations were greater in the epilimnion than in the metalimnion and hypolimnion and also when transmission measurements were made following a rainstorm that caused turbid surface waters to flow into the reservoir. Water clarity was less in the spring than in the summer, primarily because of the inflow of turbid water during the rainy season (November to May). By summer much of the suspended material brought into the reservoir during the rainy season had settled to the bottom of the reservoir.

On the basis of water-transparency profiles, the depth of the euphotic zone in Lexington Reservoir ranged from 1.0 to 5.4 m. The euphotic zone was greatest during the summer when suspended solids were least. The euphotic zone was least during the spring when suspended solids were greatest and during the spring and summer when algae were abundant.

Lexington Reservoir and Los Gatos Creek upstream from Lexington Reservoir generally have a calcium bicarbonate water type. During March, the water tended to become a mixed cation bicarbonate type with the increased percentage contribution of sodium plus potassium to the total milliequivalent per liter of cations. The accumulation of rainfall runoff in the reservoir during the rainy season probably was one factor that caused this change in major-ion composition.

Most of the nitrogen in samples from Lexington Reservoir and from Los Gatos Creek upstream from Lexington Reservoir was in the ammonia and organic forms. Concentrations of ammonia plus organic nitrogen were greater (median value greater than 0.38 mg/L) at reservoir stations than at the station Los Gatos Creek above Lexington Reservoir (median value 0.27 mg/L). Concentrations of total nitrate as nitrogen generally increased from Los Gatos Creek above Lexington Reservoir (median value 0.24 mg/L) to Lexington Reservoir at dam (median value 0.38 mg/L). Concentrations of total nitrate tended to increase with depth whereas concentrations of ammonia plus organic nitrogen did not change with depth. At some reservoir stations, nitrate concentrations were inversely related, and concentrations of ammonia plus organic nitrogen were directly related to concentrations of phytoplankton cells or chlorophyll-*a*. These relations indicate that nitrogen concentrations in Lexington Reservoir are, at least partially, controlled by phytoplankton uptake of dissolved nitrate and its subsequent incorporation into tissue as organic nitrogen.

Phosphorus concentrations ranged from less than 0.01 to 0.10 mg/L, were similar at all stations, and changed little with depth and from one sampling date to the next. Correlations between phosphorus concentrations and concentrations of phytoplankton cells and chlorophyll-*a* and -*b* were not significant at the 0.05 level.

Except for boron, concentrations of trace elements were less than 100 μg/L. Boron concentrations ranged from 60 to 280 μg/L.

Blue-green algae generally predominated in phytoplankton samples from Lexington Reservoir. Diatoms, green algae, or euglenoids were predominant at times. Algal genera prevalent in Lexington Reservoir are commonly found in oligotrophic and mesotrophic waters, except for some genera, such as *Anabaena*, that are commonly found in hard, warm, or eutrophic waters. A phytoplankton bloom was observed during the May 29, 1980, sampling, when the blue-green alga, *Aphanizomenon*, was abundant. Such blooms can cause taste and odor problems in water. Phytoplankton concentrations generally were less in March and September samples than in May, June, and August samples.

Values of Carlson's TSI, calculated from phytoplankton chlorophyll-*a* concentrations, were generally less than 50, indicating that Lexington Reservoir is generally not eutrophic. TSI values calculated from total phosphorus concentrations generally agreed with the values calculated from chlorophyll-*a* concentrations, whereas TSI values calculated from Secchi-disk measurements differed primarily due to nonalgal particulate matter in the water.

Estimates of net primary productivity in Lexington Reservoir ranged from -1,000 to 5,700 (mg O_2/m^3)/d. The generally positive net primary productivity values indicate that production exceeded respiration. Estimates of the euphotic zone primary productivity, excluding the top 1 m of water, were typical of mesotrophic lakes, except for the August 22, 1978, estimate [3,400 (mg C/m^2)/d)] which was characteristic of eutrophic lakes.

In Lexington Reservoir samples, fecal-coliform and fecal-streptococcal bacteria concentrations were usually less than 10 colonies/100 mL. Samples from the station Los Gatos Creek above Lexington Reservoir had greater concentrations of fecal-coliform and fecal-streptococcal bacteria (median values of 40 and 90 colonies/100 mL, respectively) than the reservoir.

Water from Lexington Reservoir and from Los Gatos Creek above Lexington Reservoir generally met water-quality objectives to maintain water suitable for municipal and domestic supply, water-contact recreation, noncontact water recreation, cold and warm freshwater habitat, wildlife habitat, and fish spawning. The only objectives frequently not met were those for pH and dissolved oxygen. The pH objective was not met in water near the surface of Lexington Reservoir. Most pH values greater than the 8.5 objective were measured May 29, 1980, when phytoplankton concentrations exceeded 170,000 cells/mL. Phytoplankton use carbon dioxide from the water during photosynthesis, thus making the water more alkaline. The dissolved-oxygen objective was not met in the hypolimnion near the bottom of the reservoir, when the reservoir was thermally stratified due to the predominance of oxygen consumption over oxygen-production activities in the hypolimnion and from the lack of oxygen replenishment from surface waters.

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