PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF THREE RESERVOIRS IN WEST-CENTRAL MISSOURI, 1991–93

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Physical, Chemical, and Biological Characteristics of Three Reservoirs in West-Central Missouri, 1991–93

By David C. Heimann

Abstract

A comprehensive investigation of Prairie Lee Lake and Lake Jacomo was conducted from May 1991 through April 1992 to quantify physical, chemical, and biological characteristics of these recreational reservoirs in Jackson County, Missouri. A similar investigation was conducted from April 1992 through June 1993 at Harrisonville City Lake, a recreational and drinking-water supply reservoir in Cass County. The investigation of each reservoir included a bathymetric and sedimentation survey; chemical analyses of water and bottom sediments; and quantitative analyses of bacteria, and phytoplankton.

Water samples from Harrisonville City Lake (water samples were analyzed for pesticides only at this reservoir) were analyzed for 20 pesticides, and the concentration of 9 of 20 pesticides exceeded detection limits. The pesticides detected included atrazine, desethylatrazine, deisopropylatrazine, metolachlor, ametryn, propazine, alachlor, 2,4-D, and cyanazine. Atrazine concentrations were greater than the health-based maximum contaminant level of 3 micrograms per liter in all surface and bottom water samples collected between April and November 1992. The mean concentration of atrazine in 36 surface samples was 2.8 micrograms per liter, and the mean concentration of atrazine in 11 bottom samples was 3.3 micrograms per liter. None of the remaining eight pesticides that were detected exceeded health-based limits.

Results of sediment-depth surveys of the reservoirs indicated that the reservoirs have lost a considerable amount of their original volume. Approximately 1,180 acre-feet of sediment have accumulated in Prairie Lee Lake since the dam was built during 1939, resulting in a 29 percent loss in the original reservoir volume. In Lake Jacomo approximately 1,910 acre-feet of sediment have been deposited since 1959, resulting in an 8 percent loss in original volume. An estimated 1,130 acre-feet of sediment have accumulated in Harrisonville City Lake since 1972, resulting in a 14 percent loss in volume.

The mass and mass per acre loads of total suspended solids, ammonia, nitrate, and total phosphorus in stormwater-runoff samples from Prairie Lee Lake outflows were about one-third the mass and mass per acre loads of Prairie Lee Lake inflows, indicating that Prairie Lee Lake is a sediment and nutrient "trap." The estimated mass per acre loads of ammonia and nitrate from direct precipitation on Prairie Lee Lake, Lake Jacomo, and Harrisonville City Lake exceeded loads from tributary inflows for most sampled storms.

The differences in median values of water-clarity characteristics of the reservoirs, including Secchi depth, suspended solids, suspended sediment, and chlorophyll *a*, were compared between sites within an individual reservoir to determine if these differences were statistically significant. The only significant difference detected was in Secchi depth values between three Lake Jacomo sites (Kruskal-Wallis test, alpha = 0.05). It seems that Secchi depths were significantly lower at one site because of effects from the outflows of Prairie Lee Lake.

The spring and summer phytoplankton population in Prairie Lee Lake samples was dominated by cyanophytes. By late summer the chlorophytes became dominant in Prairie Lee

Lake and chrysophytes in Lake Jacomo samples. The phytoplankton population in Harrisonville City Lake was dominated by chrysophytes during much of the spring and summer of 1992. Cyanophytes comprised the largest part of the phytoplankton population in the late August samples. Chlorophytes were the dominant taxa in the October samples.

The temporal distribution of the total nitrogen to total phosphorus ratios calculated from surface samples in the reservoirs indicates that phosphorus is the nutrient that limits phytoplankton production throughout the spring and summer months. The data are less conclusive during the fall and winter months in Lake Jacomo and Harrisonville City Lake, and additional analyses would be needed to determine the nutrient that limits production during these months.

The trophic condition of the reservoirs was determined using Carlson's Trophic-State Index. There were inconsistences in results over time and between index values, but all three reservoirs were classified as mesotrophic to eutrophic. The trophic condition of the three reservoirs also was determined using classification criteria generated for Missouri reservoirs utilizing chlorophyll *a*, total nitrogen, and total phosphorus concentrations. Based on these criteria, Prairie Lee Lake was classified as eutrophic, and Lake Jacomo and Harrisonville City Lake were classified as mesotrophic to eutrophic.

INTRODUCTION

Prairie Lee Lake (figs. 1 and 2) is a recreational reservoir located in a basin affected by rapid urbanization. The quality of water in this reservoir is threatened by high bacteria counts, sedimentation, eutrophication, and pesticide contamination in bottom sediments. Historical (Buckner, 1976) and recent studies (Jackson County Parks and Recreation Department, written commun., 1990, 1991) indicated that fecal coliform densities in samples collected from Prairie Lee Lake and its tributaries have exceeded State standards [more than 200 col/100 mL (colonies per 100 milliliters)] for whole-body contact recreation (Missouri Department of Natural Resources, 1992). Prairie Lee Lake has been classified as highly eutrophic (Jones and Knowlton, 1993), and nutrient input from non-point sources has caused algal blooms associated with odor and aesthetic degradation. Chlordane concentrations in fish tissue samples from Prairie Lee Lake have exceeded the U.S. Food and Drug Administration's health-based "action level" of 300 μg/g (micrograms per gram; Alan Buchanan, Missouri Department of Conservation, written commun., 1991). The outflow from Prairie Lee Lake is uncontrolled and flows directly into Jackson County Lake, hereafter referred to as Lake Jacomo (fig. 2). Symptoms of eutrophication, including increased sedimentation, and fecal coliform contamination also occur in Lake Jacomo. A monitoring investigation was conducted from May 1991 through April 1992 by the U.S. Geological Survey in cooperation with Jackson County Parks and Recreation Department. The objectives of this investigation were to quantify physical, chemical, and biological characteristics of the two reservoirs (Prairie Lee Lake and Lake Jacomo) and to determine the extent and sources of contaminants in the reservoirs.

Harrisonville City Lake (fig. 3) is a drinking-water supply for many Cass County residents. The basin primarily drains agricultural land. The extent to which sediment, nutrients, and pesticides in the runoff are affecting this reservoir is not known. A monitoring investigation was conducted at this reservoir from April 1992 through March 1993 by the U.S. Geological Survey in cooperation with the Cass County Soil and Water Conservation District. The objectives of this investigation were to quantify sedimentation, pesticide loads, and algal production.

Purpose and Scope

This report presents selected physical, chemical, and biological data and describes the characteristics of three reservoirs—Prairie Lee Lake, Lake Jacomo, and Harrisonville City Lake—in west-central Missouri near Kansas City. A discussion of the physical characteristics of the reservoirs, including reservoir depth and volume, sediment thickness, and water clarity, is followed by a discussion of chemical characteristics, including physical properties (specific conductance, pH, temperature, alkalinity, and dissolved oxygen) and chemical constituents (nutrients and pesticides from one reservoir). The final section describes some of the biological characteristics of the reservoirs, including bacteria densities, phytoplankton

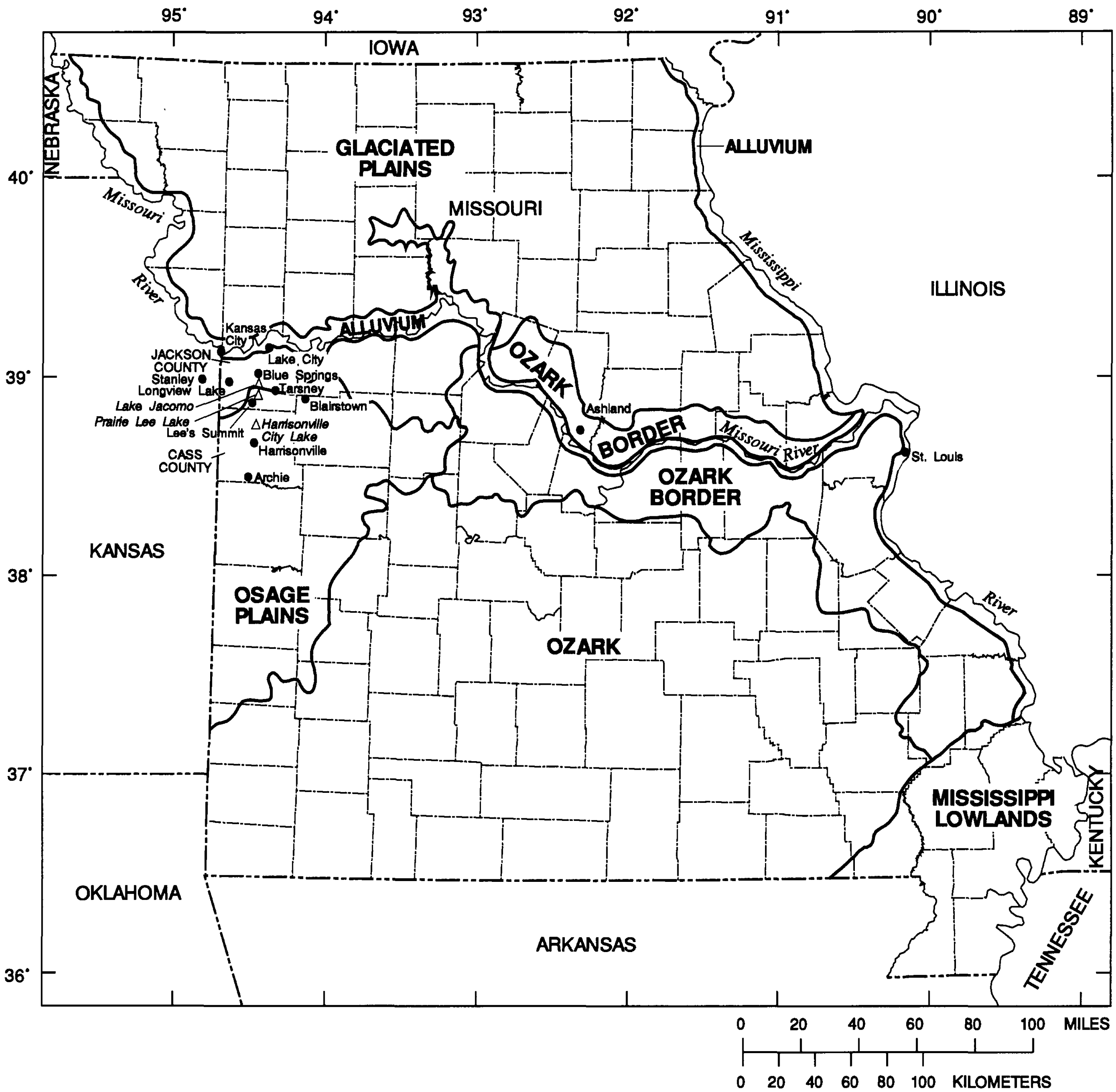

Figure 1. Location of three reservoirs in west-central Missouri and natural divisions of Missouri (modified from Nelson, 1985).

composition and densities, and zooplankton composition (at one reservoir).

Water samples were collected in the Prairie Lee Lake Basin from May 1991 through April 1992 from three reservoir monitoring sites at two depths, one outflow site, and three inflow sites. Water samples were collected in the Lake Jacomo Basin during this same period from three reservoir sites at two depths and one outflow site (fig. 2; tables 1 and 2). Laboratory analyses of water samples included total suspended solids, suspended sediment, and nutrient concentrations. Three bottom sediment samples were collected from each reservoir and analyzed for trace elements, total nitrogen (N) and phosphorus (P), and pesticides.

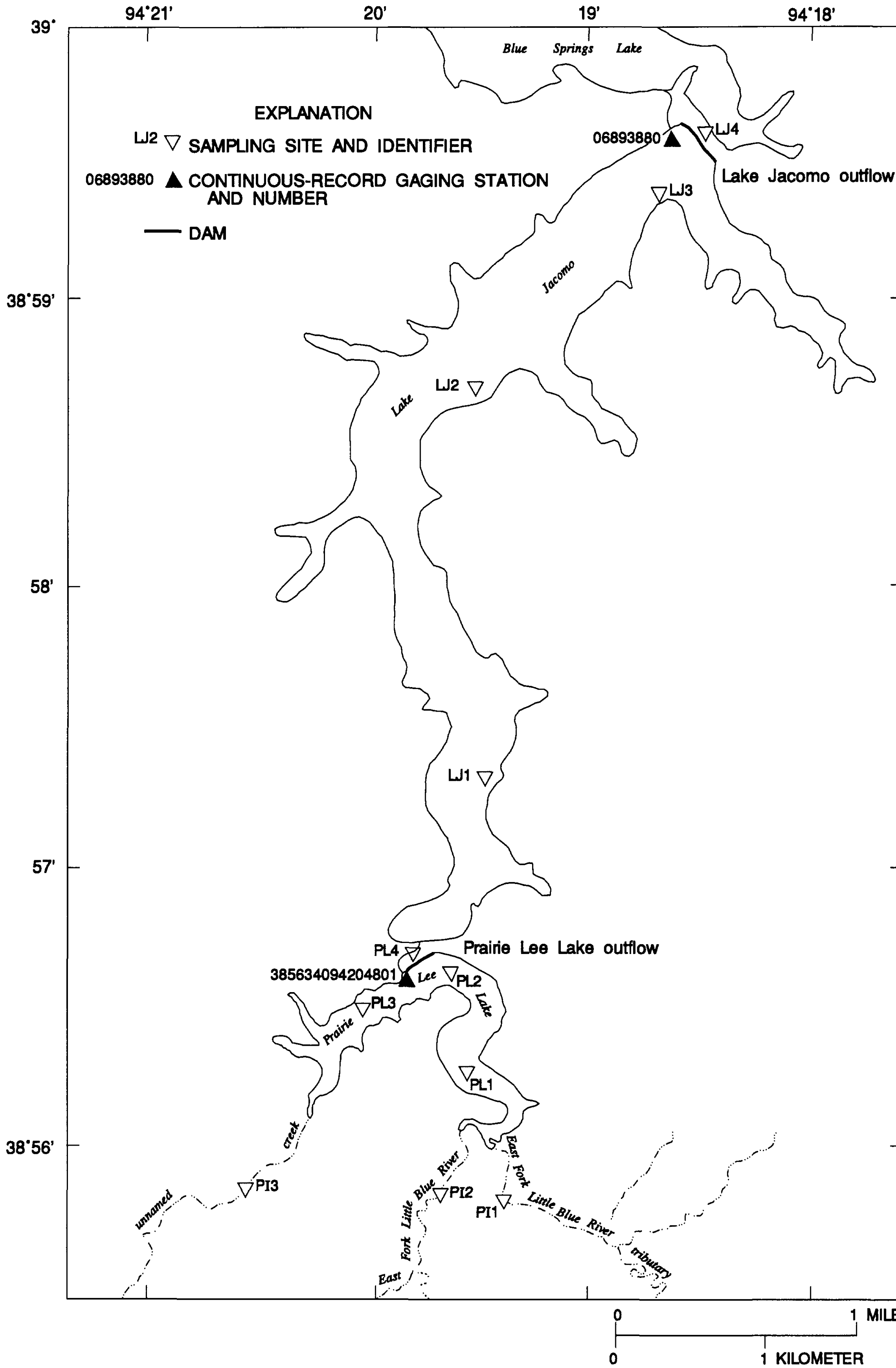

Figure 2. Location of sampling sites in Prairie Lee Lake and Lake Jacomo Basins, west-central Missouri.

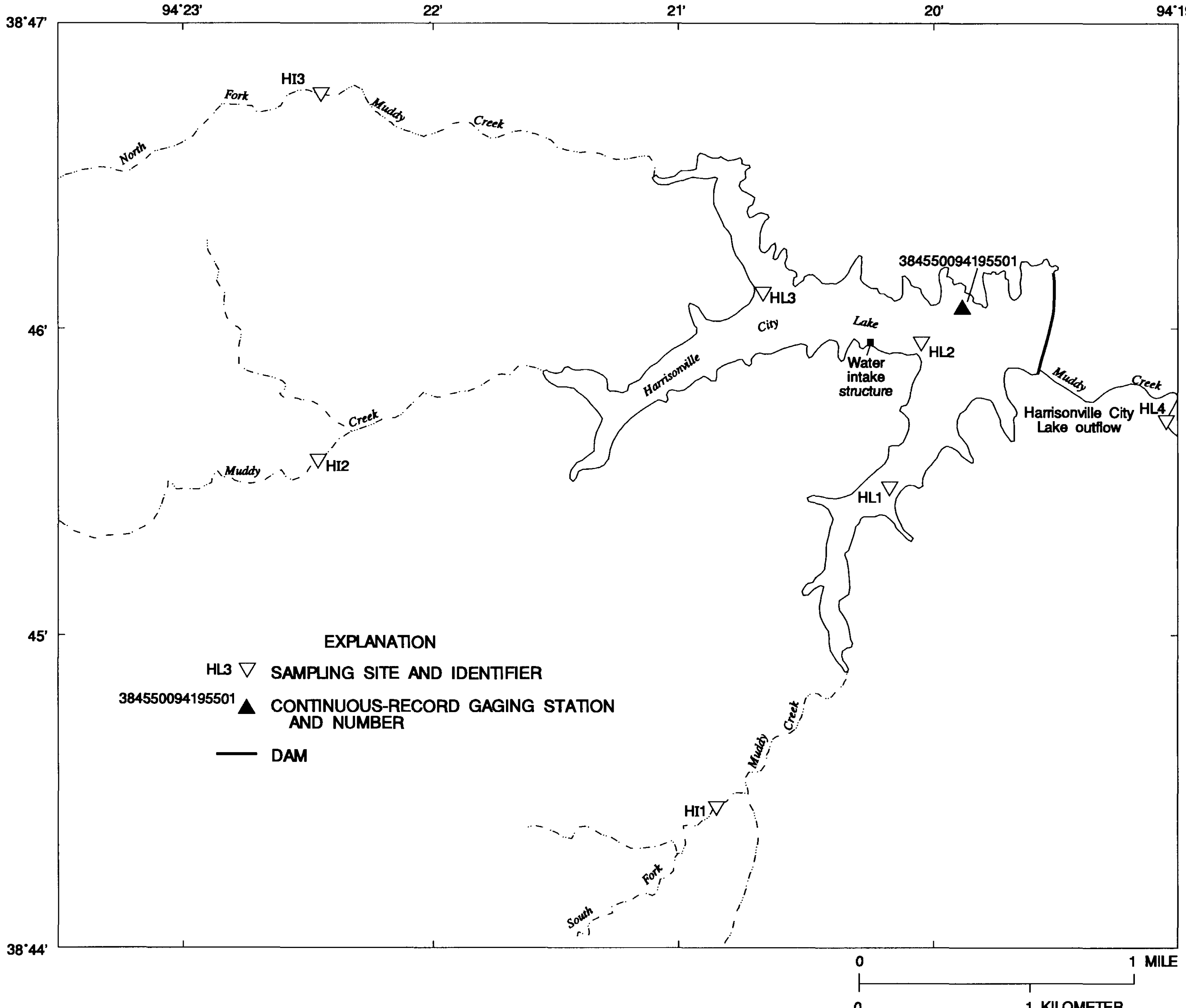

Figure 3. Location of sampling sites in Harrisonville City Lake Basin, west-central Missouri.

Table 1. Sampling site information for three reservoirs in west-central Missouri
[--, not applicable]

Site identifier (figs. 2 and 3)	U.S. Geological Survey number	Name	Sample depth (feet)
		Prairie Lee Lake	
PL1	385616094194502	Prairie Lee Lake, southeast arm at surface	1.5
	385616094194501	Prairie Lee Lake, southeast arm at bottom	20
PL2	385636094194402	Prairie Lee Lake, near dam at surface	1.5
	385636094194401	Prairie Lee Lake, near dam at bottom	44
PL3	385632094200102	Prairie Lee Lake, southwest arm at surface	1.5
	385632094200101	Prairie Lee Lake, southwest arm at bottom	36
		Lake Jacomo	
LJ1	385716094193202	Lake Jacomo, south site at surface	1.5
	385716094193201	Lake Jacomo, south site at bottom	18
LJ2	385841094193802	Lake Jacomo, central site at surface	1.5
	385841094193801	Lake Jacomo, central site at bottom	35
LJ3	385926094184002	Lake Jacomo, near dam at surface	1.5
	385926094184001	Lake Jacomo, near dam at bottom	45
		Harrisonville City Lake	
HL1	384520094201802	Harrisonville City Lake, south arm at surface	1.5
	384520094201801	Harrisonville City Lake, south arm at bottom	22
HL2	384559094200102	Harrisonville City Lake, near dam at surface	1.5
	384559094200101	Harrisonville City Lake, near dam at bottom	38
	384559094200103	Harrisonville City Lake, near dam at metalimnion	--
HL3	384604094214002	Harrisonville City Lake, west arm at surface	1.5
	384604094214001	Harrisonville City Lake, west arm at bottom	22

Table 2. Basin characteristics for inflow and outflow sampling sites for three reservoirs in west-central Missouri
[--, not applicable]

Site identifier (figs. 2 and 3)	U.S. Geological Survey number	Name	Drainage basin area (acres)
Inflow sites			
		Prairie Lee Lake	
PI1	385515094200501	East Fork Little Blue River Tributary near Lee's Summit	2,710
PI2	385515094202001	East Fork Little Blue River near Lee's Summit	1,830
PI3	385548094211601	Unnamed creek near Lee's Summit	1,520
		Lake Jacomo	
PL4	385634094204801	Prairie Lee Lake spillway	--
		Harrisonville City Lake	
HI1	384441094204301	South Fork Muddy Creek near Harrisonville	915
HI2	384525094223301	Muddy Creek near Harrisonville	538
HI3	384613094223101	North Fork Muddy Creek near Harrisonville	1,830
Outflow sites			
		Prairie Lee Lake	
PL4	385634094204801	Prairie Lee Lake outflow	--
		Lake Jacomo	
LJ4	06893880	Jackson County Lake near Blue Springs (Lake Jacomo) outflow	--
		Harrisonville City Lake	
HL4	384537094193501	Harrisonville City Lake downstream from outflow	--

Water samples were collected in the Harrisonville City Lake Basin April 1992 through March 1993 from three reservoir sites at multiple depths, one outflow site, and three inflow sites (fig. 3; tables 1 and 2). Analyses included concentrations of total suspended solids, suspended sediment, nutrients, and pesticides. Nine bottom sediment samples were collected from Harrisonville City Lake between October 1992 and June 1993. Three samples collected in October 1992 were analyzed for total N and P, trace elements, and pesticides. The remaining six bottom sediment samples were analyzed only for pesticides.

Statistical methods used in the analyses of collected physical, chemical, and biological data included the use of the Mann-Whitney test and the Kruskal-Wallis test (Helsel and Hirsch, 1992) and calculation of the Spearman's rank order correlation coefficient (Ott, 1993). The Mann-Whitney test is used to determine the statistical significance in the difference in the medians of two groups, whereas the Kruskal-Wallis test is used to determine the differences in medians from two or more groups. The Spearman's rank order correlation coefficient is calculated to determine the strength of the relation between two variables regardless of whether the association between the two variables is linear or nonlinear. A significance level of 0.05 was used in all statistical tests in this report.

Description of Study Area

Prairie Lee Lake and Lake Jacomo (fig. 2) are formed by man-made dams on the East Fork of the Little Blue River and both are used for recreation. Construction of Prairie Lee Lake Dam began during 1936 as a Works Progress Administration project to provide water for the area in time of drought (Kansas City Star, 1944). The dam was completed during 1939 but did not meet Federal government specifications; consequently, low pool levels were maintained while a new dam was constructed. The new dam was completed during 1944, and the current (1994) uncontrolled spillway was completed during 1957. Major inflow streams into Prairie Lee Lake include the East Fork Little Blue River tributary, the East Fork Little Blue River, and an unnamed creek (fig. 2). The tailwater from Prairie Lee Lake flows directly into Lake Jacomo, where the dam was completed during 1959. The outflow from Lake Jacomo is uncontrolled and flows directly into Blue Springs Lake, which was filled during 1987. The morphometric characteristics of Prairie Lee Lake and Lake Jacomo are summarized in table 3.

Harrisonville City Lake (fig. 3; table 3) was formed by a man-made dam on Muddy Creek and was completed during 1972. The reservoir provides approximately 13,000 residents with drinking water and also is used as a public recreational (boating and fishing) facility for Cass County residents. The major inflow streams include North Fork of Muddy Creek, Muddy Creek, and South Fork of Muddy Creek (fig. 3). The outflow of Harrisonville City Lake also is uncontrolled.

Hydrogeology

The surficial geology of the three reservoir basins consists of shales and limestones of Pennsylvanian age of the Kansas City and Pleasanton Groups (Hasan and others, 1988). Outcrops along the edge of Prairie Lee Lake, Lake Jacomo, and Harrisonville City Lake consist primarily of Bethany Falls Limestone.

Table 3. Morphometric characteristics of three reservoirs in west-central Missouri

Morphometric characteristic	Prairie Lee Lake[1]	Lake Jacomo[2]	Harrisonville City Lake[3]
Surface area (acres)	140	1,050	416
Drainage area (acres)	8,244	16,519	9,210
Shore length (miles)	5.2	18.4	11.9
Total volume (acre-feet)	2,860	20,800	6,930
Maximum depth (feet)	46	52	42
Average depth (feet)	20	20	17
Shore line development (ratio of reservoir perimeter to that of circle with equal area)	3.1	4.1	4.2

[1] Based on water-surface elevation of 800.24 feet.
[2] Based on water-surface elevation of 834.50 feet.
[3] Based on water-surface elevation of 896.10 feet.

The report by the U.S. Geological Survey and Missouri Division of Geology and Land Survey (1967, p. 297) summarizes the ground-water characteristics of the area by "...the low permeability of the Pennsylvanian strata impedes ground-water movement both laterally and vertically. Because of this, there is very little opportunity for ground water recharge and discharge." Therefore, the role of ground-water contributions in the characteristics of the reservoirs was not included in the study because the contribution was judged to be insignificant relative to the contribution from surface-water sources.

Soils

The soils along the ridges in the Prairie Lee Lake and Lake Jacomo Basins are composed of gently sloping to moderately sloping soils of the Macksburg-Sharpsburg-Sampsel association (Preston, 1984). The surface layer is composed of silty clay loam and silt loam with subsoils of silty clay and silty clay loam. Soils in this association are moderately well drained to poorly drained. The Snead-Menfro-Oska association also is present in upland areas and consists of silty clay loam and silt loam with subsoils of silty clay and silty clay loam. Soils in this association are moderately well drained. Soils in both associations are moderately erodible.

The Snead-Polo-Oska association is on ridgetops and sideslopes in the Harrisonville City Lake Basin, and soils of this association are well to moderately well drained (Simmons, 1985). Surface layers in this association consist of silty clay loam and silt loam with a subsoil of silty clay loam and silty clay. The Zook-Blackoar-Verdigris association is present along floodplains, and soils of this association are moderately to poorly drained. Surface layers consist of silty clay loam and silty loam with subsoils of silt loam and silty clay loam. The Macksburg-Sampsel-Greenton association is present in gently sloping and moderately sloping areas, and the soils are poorly drained. Surface layers consist of silt loam and silty clay loam with a subsoil of silty clay loam and silty clay. Soils in these associations are moderately erodible.

Land Use

Land use in the Prairie Lee Lake Basin is about 41 percent urban, 36 percent pasture, 15 percent cropland, 6 percent forest, and 2 percent water (Willis Staller, Jackson County Parks and Recreation Department, written commun., 1991). Adjacent to the reservoir are two public access areas of about 280 total acres. Most of the property adjacent to the reservoir is privately owned and residences line much of the shoreline. Land use in the East Fork Little Blue River Basin and unnamed creek basin (fig. 2) upstream from Prairie Lee Lake is largely urban and growth has stabilized. The land use in the East Fork Little Blue River tributary Basin predominantly is pasture with some stable urbanized areas, although numerous residential development projects are either under construction or pending approval. Land use in the Lake Jacomo Basin (excluding the Prairie Lee Lake Basin) is 33 percent open grasslands, 27 percent forest, 20 percent cropland, 13 percent water, and 7 percent urban (Willis Staller, written commun., 1991).

The primary land use in the Harrisonville City Lake Basin is agriculture. Approximately 50 percent of the basin is in crops, 42 percent is in pasture, 6 percent is in forest, 1 percent is urban, and 1 percent is in other miscellaneous uses (Karrie Clutter, Cass County Soil and Watershed Conservation District, written commun., 1992).

METHODS OF STUDY

The methods used in collecting and analyzing the various physical, chemical, and biological data are discussed in the following sections. The same methods were used in data collection at all three reservoirs.

Physical Characteristics

A bathymetric survey of the three reservoirs determined the water depth and other morphometric characteristics (table 3). During the bathymetric survey, a theodolite equipped with an electronic distance meter and data transmitter was located on shore to track the horizontal position of a boat equipped with a fathometer, data logger, and data receiver as the boat travelled across all navigable surface areas of the reservoirs. The horizontal position of the boat and corresponding water depth were stored instantaneously on the data logger. The data logger operator controlled the timing at which the data points of the boat position and water depth were stored and the number of points stored. The data points were downloaded onto a laptop computer and transferred to the U.S. Geological Survey computer system where a geographic information system (GIS) was used to generate the bathymetric maps.

Sediment-depth surveys, in addition to determining the sediment depth, provided data that were used to estimate the volume of sediment deposited since the formation of the reservoirs. The sediment-depth surveys in Prairie Lee Lake and Lake Jacomo were conducted in May 1992, and the survey in Harrisonville City Lake was conducted in April 1993. A boat crew collected sediment depths by manually driving sections of 0.5-in. (inch) diameter rod into the reservoir bed material. The original reservoir bottom was estimated to be located at the point of refusal at the reservoir bottom (Rausch and Heinemann, 1968). In deeper water [greater than 20 ft (feet)] where it was impractical to use long lengths of 0.5-in. diameter pipe, a gravity corer modified to accept the 0.5-in. diameter pipe was used. The corer was raised with a boom and reel mounted on a pontoon boat. The coring device, which weighed approximately 65 lb (pounds), was allowed to free fall through the water and sediment column. The point to refusal was determined from a depth indicator on the reel. The sediment depth was determined by subtracting the current reservoir depth from the depth to refusal. At locations where the water was between 15 and 25 ft deep, both manual and corer methods could be used. The number of sediment-depth points at each reservoir was determined by the size of the reservoir and the variability in sediment depths. The number of points on the reservoirs ranged from 50 at Prairie Lee Lake to 101 at Harrisonville City Lake. The boat location at each sediment-depth point was plotted on a 7.5-minute topographic map. The data point depicting the sample location was later digitized and entered into the GIS with the sediment-depth information to create a coverage of the original lake bottom. The difference between the current reservoir bottom coverage and the original reservoir bottom coverage, or the volume of sediment deposited, was calculated using a statistical function of the GIS.

Water-clarity data were collected to determine the major factors controlling water clarity in the reservoirs. Water-clarity data, including Secchi disk depth (hereafter referred to as Secchi depth) and total suspended solids, suspended sediment, and chlorophyll *a* concentrations, were determined at each reservoir site. Secchi depth is a measure of water transparency. A 20-cm (centimeter) diameter white disk was lowered through the water column until the disk disappeared from sight and then the disk was raised until it was visible again. The average of the two depths was the Secchi depth. Thus, the smaller the Secchi depth, the less transparent the water. Water samples were collected using a Teflon Kemmerer[1] or Van-Dorn type point sampler following the sampling recommendations of Ward and Harr (1990). Chlorophyll samples were collected at all surface sites using a U.S. Geological Survey DH-48 sampler over the depth corresponding to the Secchi depth. The suspended solids samples were analyzed by the U.S. Geological Survey laboratory in Arvada, Colorado, in accordance with methods described by Fishman and Friedman (1989). Suspended sediment analyses were conducted at the U.S. Geological Survey, Rolla, Missouri, using methods described by Guy (1969). Chlorophyll analyses were conducted at the U.S. Geological Survey laboratory in Arvada, Colorado, in accordance with methods described in Britton and Greeson (1987).

Chemical Characteristics

Physical properties and chemical constituents determined from sample points in the water column at each reservoir site included specific conductance, pH, alkalinity, temperature, dissolved oxygen, total (unfiltered) N species, total P, and orthophosphate (PO_4). Water samples were collected in the same manner and frequency as were water-clarity samples. Temperature and dissolved oxygen concentrations were measured onsite with an electronic meter at 2-ft intervals during stratification and 5-ft intervals during remaining periods. All instruments were calibrated using methods recommended by the manufacturers and the U.S. Geological Survey. Nutrient samples were analyzed by the U.S. Geological Survey laboratory in Arvada, Colorado, according to methods described by Fishman and Friedman (1989).

In addition to the above physical properties and chemical constituents, water samples at Harrisonville City Lake were analyzed for pesticides, including triazine herbicides. Water samples that were to be analyzed for triazine herbicides were collected monthly at the same time and location as the other samples. These samples were collected using a Teflon Kemmerer sampler and analyzed by the U.S. Geological Survey laboratory in Lawrence, Kansas, by gas chromatography/

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[1]Use of brand names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

mass spectrometry using solid-phase extraction techniques described by Thurman and others (1990). Additional water samples were collected monthly at Harrisonville City Lake from October 1992 through March 1993 at the three surface sites and analyzed for pesticides by the U.S. Environmental Protection Agency laboratory in Kansas City, Kansas, using methods described in a report by the U.S. Environmental Protection Agency (1988).

Bottom sediment samples were collected at three sites in each of the reservoirs using a U.S. Geological Survey BMH-54 bottom material sampler. Samples were analyzed for total N, total P, trace elements, and pesticides. Bottom sediment samples were collected once at Prairie Lee Lake and Lake Jacomo and three times at Harrisonville City Lake. Inorganic analyses of all sediment samples were conducted by the U.S. Geological Survey laboratory, Arvada, Colorado, using methods described by Fishman and Friedman (1989). Organic analyses of the bottom sediment samples from Prairie Lee Lake, Lake Jacomo, and Harrisonville City Lake (for samples collected in October 1992) were conducted by the U.S. Geological Survey laboratory, Arvada, Colorado, using methods described by Wershaw and others (1987). Analyses of the additional six bottom sediment samples from Harrisonville City Lake were conducted by the U.S. Environmental Protection Agency laboratory in Kansas City, Kansas, using methods described in a report by the U.S. Environmental Protection Agency (1988).

Biological Characteristics

Fecal coliform and fecal streptococcal bacteria densities were determined for the water column of each reservoir and for stormwater-runoff samples collected at inflow and outflow sites. The membrane filter method was used to determine bacteria densities (Britton and Greeson, 1987).

Phytoplankton samples were collected at all three surface sites on Prairie Lee Lake and Lake Jacomo from May 1991 through September 1992 and at all three surface sites on Harrisonville City Lake from May through October 1992. A 1-L (liter) water sample was collected using a U.S. Geological Survey DH-48 depth-integrated sampler to the same depth as the Secchi depth. The sample was treated with 10 mL (milliliters) of Lugol's solution[2] as a preservative. Phytoplankton samples collected from May 14 through June 12, 1991, were analyzed by Chadwick and Associates, Littleton, Colorado. Subsequent phytoplankton samples were analyzed at Southwest Missouri State University in Springfield.

Zooplankton samples were collected at Harrisonville City Lake from May through October 1992, using procedures described by Britton and Greeson (1987). Samples were collected using a 202-µm (micrometer) plankton net at a single vertical section through the entire water column at each of the three sampling sites. Samples were preserved with 5 percent neutral formalin solution. Zooplankton samples were analyzed at Southwest Missouri State University.

Reservoir Inflow and Outflow and Precipitation

Monitoring of reservoir inflow and outflow included quantitative measurements of discharge and determination of physical properties, nutrients, and fecal coliform and fecal streptococcal bacteria densities. The inflow sites were monitored monthly and during three storms. The outflow sites were sampled only during three storms. Sampling sites in the Prairie Lee Lake and Lake Jacomo Basins were located at three tributaries to Prairie Lee Lake, the Prairie Lee Lake outflow (site PL4), and the Lake Jacomo outflow (site LJ4; fig. 2; table 2). Three tributaries of Harrisonville City Lake and the outflow downstream from the outflow (site HL4) were sampled (fig. 3; table 2).

Staff gages and continuous-record gages were used to monitor reservoir inflows and outflows. The inflow sites were equipped with staff gages, and discharge was measured to generate a stage-discharge rating curve. The surface elevations of Prairie Lee Lake, Lake Jacomo, and Harrisonville City Lake were recorded with continuous-record gages. The outflows of the three reservoirs were measured to generate an elevation-discharge rating curve between reservoir elevation (stage) and reservoir outflow discharge.

The chemical characteristics of inflow and outflow water samples were determined from both monthly and stormwater-runoff samples. Water samples were collected monthly at the inflow sites and analyzed for N and P species concentrations and suspended sediment concentration. Samples were collected using the equal-width-increment (EWI) method

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[2]A staining and preservative solution for phytoplankton composed of iodine crystals, potassium iodide, acetic acid, and distilled water (Rodhe and others, 1958).

(Guy and Norman, 1970). Multiple samples collected during the storms using the EWI method were composited on the basis of the part of the total discharge hydrograph that was represented by the sample. The sample representing the largest part of the discharge hydrograph was given full weight; the full volume was used in the composite, and the remaining samples were proportioned accordingly. The flow-weighted composite storm sample was analyzed for N and P species, suspended sediment, and suspended volatile solids concentrations. Grab samples were collected in sterilized sample bottles at the centroid of flow during stormwater-runoff sampling for the determination of fecal coliform and fecal streptococcal bacteria densities.

Precipitation data for the Prairie Lee Lake and Lake Jacomo Basins were collected from May 1991 to April 1992 at the James A. Reed Memorial Wildlife Area in Lee's Summit (table 4). Precipitation data for the Harrisonville City Lake Basin were collected at Harrisonville City Lake from April 1992 through July 1993.

PHYSICAL CHARACTERISTICS

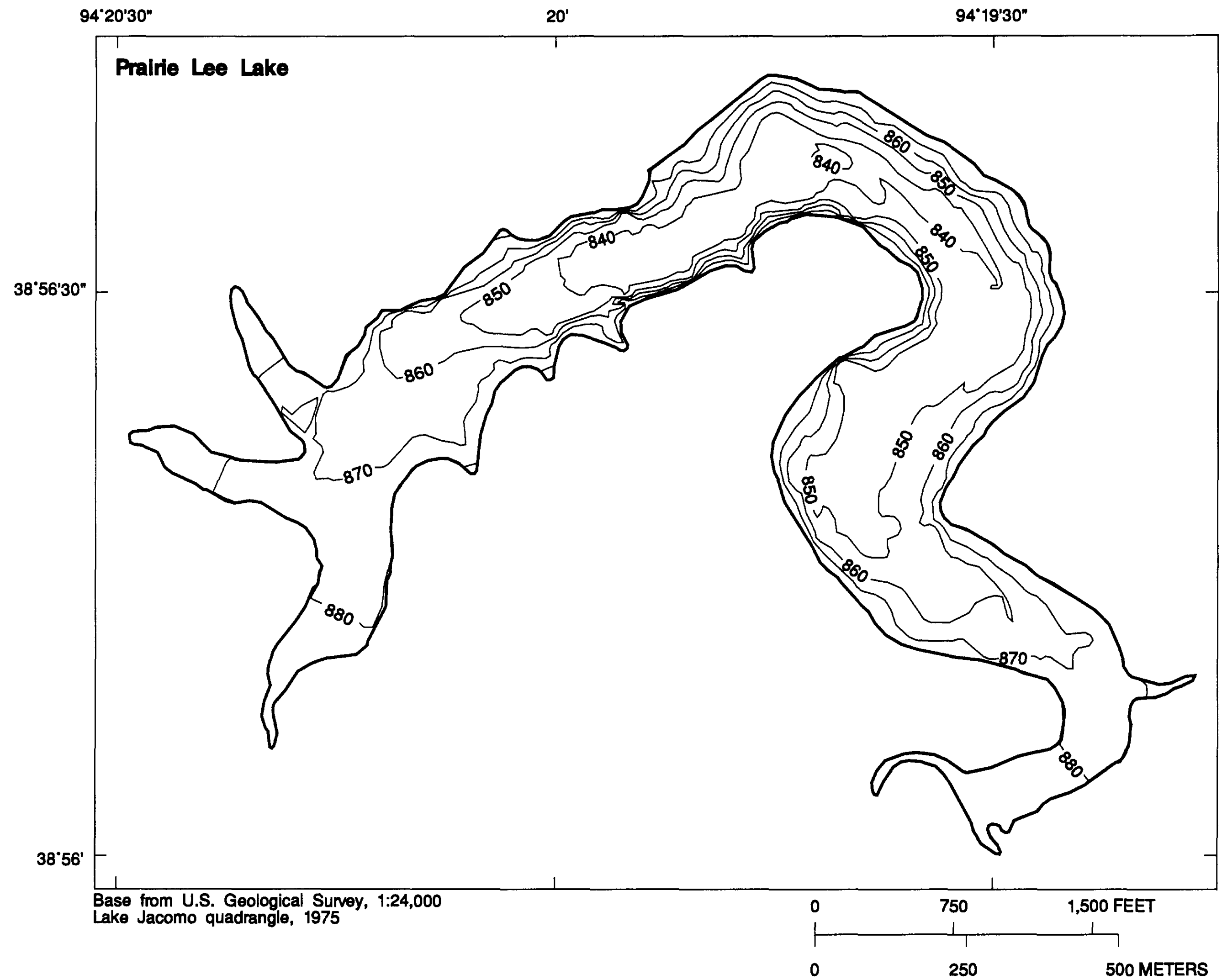
Physical characteristics of the three reservoirs, which were measured during the investigation, are described in the following sections. These characteristics include water depth, sediment thickness, and water clarity.

Water Depth

The water-depth information collected from the three reservoirs was used to construct bathymetric maps (fig. 4), depth-area curves (hypsographic curves), and depth-capacity curves for each reservoir (fig. 5). This information aids in the recreational use of the reservoirs and in determining the hydrologic characteristics of the reservoirs. Using the depth-area and depth-capacity curves for Prairie Lee Lake (fig. 5), it can be determined, for example, that at a depth of 30 ft the reservoir would have a surface area that is about 30 percent of the total surface area at the time of the bathymetric survey (140 acres) and 12 percent of the total reservoir capacity [2,860 acre-ft (acre-feet)].

Table 4. Precipitation data for James A. Reed Memorial Wildlife Area in Lee's Summit, Missouri, May 1991–April 1992, and Harrisonville City Lake, near Harrisonville, Missouri, April 1992–July 1993

	James A. Reed Memorial Wildlife Area		Harrisonville City Lake
Date	Monthly precipitation, May 1991-April 1992, in inches	Date	Monthly precipitation, April 1992-March 1993, in inches
May 1991	6.73	April 1992	5.60
June 1991	1.42	May 1992	1.40
July 1991	3.68	June 1992	3.39
August 1991	1.89	July 1992	4.99
September 1991	7.08	August 1992	2.95
October 1991	3.44	September 1992	3.00
November 1991	3.08	October 1992	2.50
December 1991	1.79	November 1992	8.85
January 1992	.67	December 1992	5.40
February 1992	1.79	January 1993	1.65
March 1992	3.78	February 1993	2.45
April 1992	5.57	March 1993	2.05
		April 1993	5.50
		May 1993	6.90
		June 1993	4.10
		July 1993	16.90



EXPLANATION

——850—— BATHYMETRIC CONTOUR--Shows altitude of the reservoir bottom. Contour interval 10 feet. Datum is sea level

Figure 4. Bathymetric maps of three reservoirs in west-central Missouri.

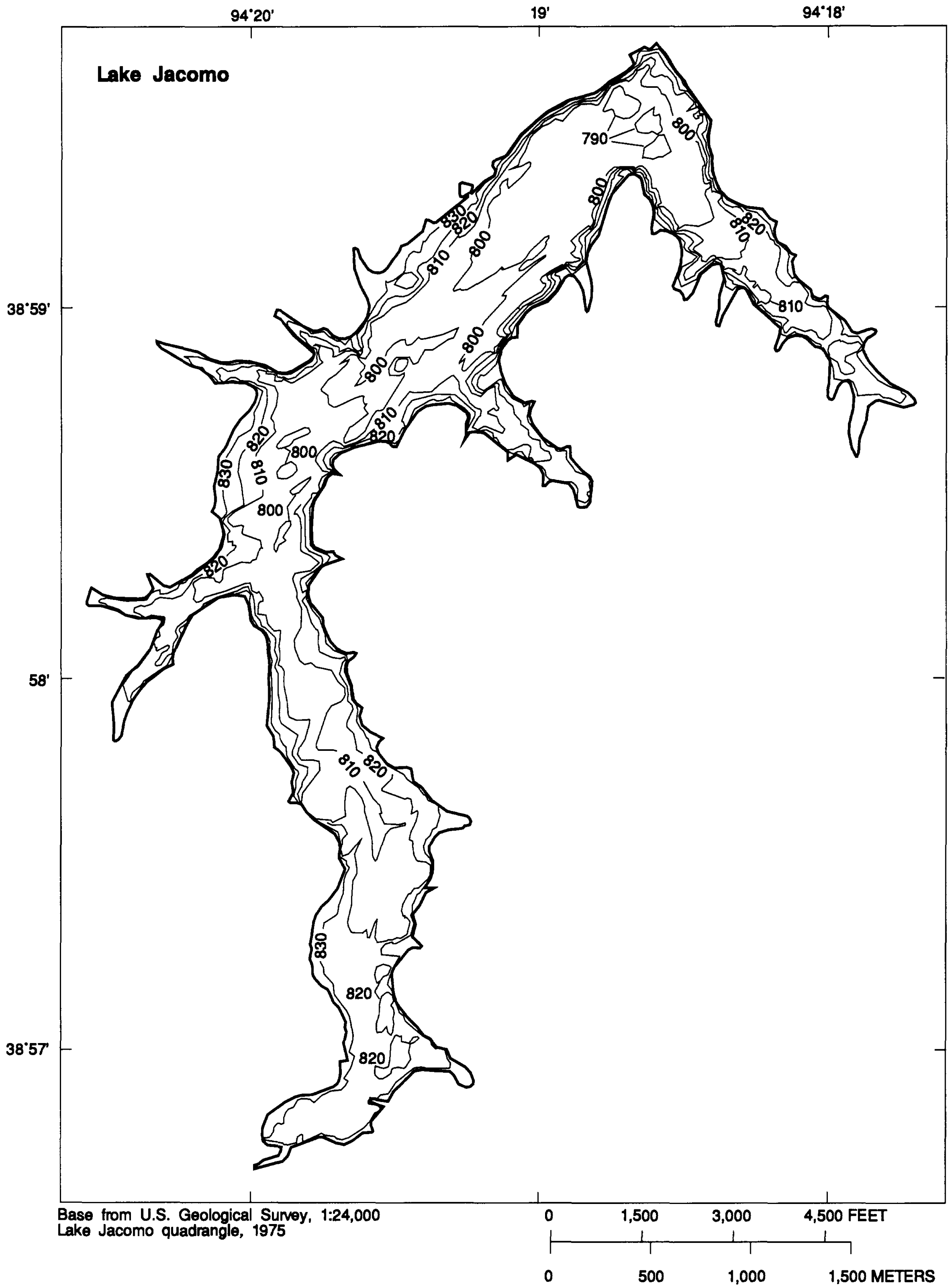


Figure 4. Bathymetric maps of three reservoirs in west-central Missouri--Continued.

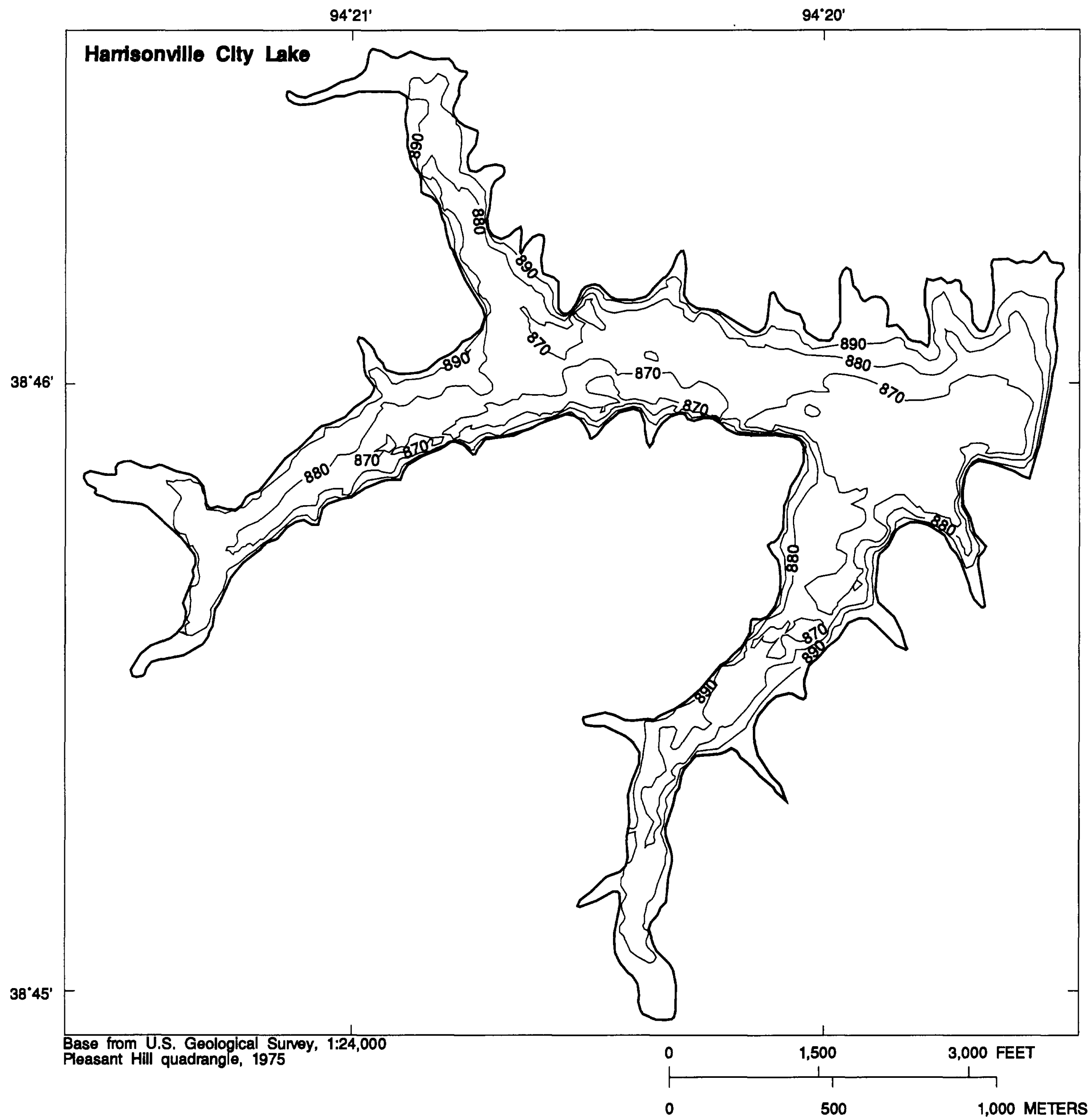


Figure 4. Bathymetric maps of three reservoirs in west-central Missouri--Continued.

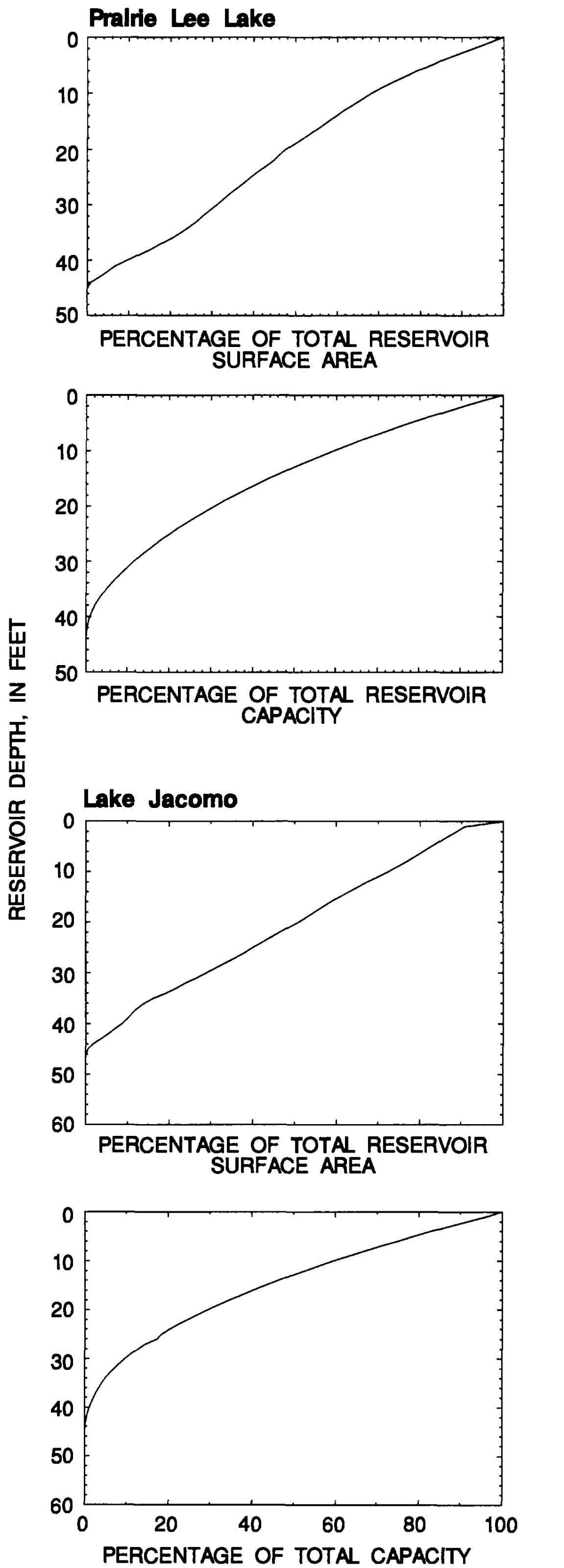


Figure 5. Depth-area and depth-capacity curves of three reservoirs in west-central Missouri.

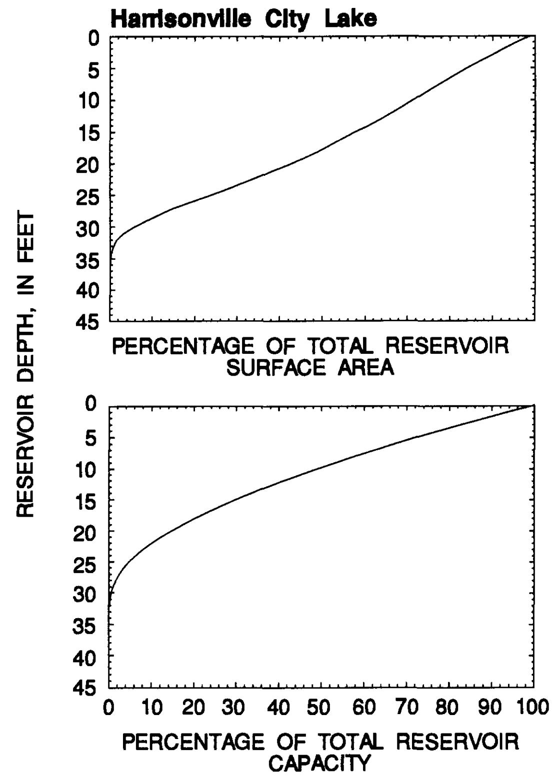


Figure 5. Depth-area and depth-capacity curves of three reservoirs west-central Missouri--Continued.

The total reservoir capacity and inflow volume can be used to determine the hydraulic residence time in a reservoir. The hydraulic residence time is a quantitative measurement of the time required to displace the volume of a reservoir with inflow volume. The result was calculated using the following equation:

$$RT = \frac{V}{(DA)\ (R)},$$

where

RT is hydraulic residence time, in years;
V is volume of reservoir, in acre-feet;
DA is drainage area of reservoir basin, in acres; and
R is runoff from basin, in feet per year.

The volume of the reservoir was determined from the bathymetric survey. The long-term mean values of runoff (R) for the East Fork Little Blue River Basin were obtained from Gerbert and others (1989) and from mean runoff values calculated from seven continuous-record gaging stations in Missouri and Kansas located near the study area. The mean runoff values were weighted based on years of record (table 5; U.S. Geological Survey, 1954-91). A mean annual runoff value of 0.72 ft/yr (foot per year) was obtained from Gerbert and others (1989), and the mean annual runoff

Table 5. Associated continuous-record gaging station data used in calculating mean annual runoff for study basins

[in/yr, inches per year; ft/yr, foot per year]

Station (fig. 1)	Years of record[1]	Mean runoff[2] (in/yr)	Weighted runoff[3] (in/yr)
South Grand River at Archie, Missouri	18	11.48	1.55
Blue River near Stanley, Kansas	18	9.51	1.29
East Fork Little Blue River below Longview Lake, Missouri	20	11.14	1.68
East Fork Little Blue River near Blue Springs, Missouri	15	11.10	1.25
Little Blue River near Lake City, Missouri	37	11.05	3.07
Big Creek near Blairstown, Missouri	15	10.40	1.17
Sni-A-Bar Creek near Tarsney, Missouri	10	10.55	.79

[1] Represents periods when streamflow was not regulated by reservoirs.
[2] Data from U.S. Geological Survey (1954-91).
[3] Weighted mean annual runoff = 10.8 in/yr = 0.90 ft/yr.

value determined from the seven continuous-record gaging stations was 0.90 ft/yr (table 5).

The calculated hydraulic residence times for the three reservoirs are listed in table 6. Prairie Lee Lake has the lowest hydraulic residence time of 0.38 to 0.49 year, depending on the runoff value used; the reservoir receives a mean annual inflow volume equivalent to about two to three times its capacity. Lake Jacomo, which has a hydraulic residence time of 1.40 to 1.76 years, receives a mean annual inflow volume equivalent to about 60 to 70 percent of its capacity. Harrisonville City Lake has a hydraulic residence time of 0.84 to 1.05 years and receives a mean annual inflow volume approximately equal to the reservoir capacity.

Sediment Thickness

Sedimentation historically has been a concern in both Prairie Lee Lake and Lake Jacomo, and dredging operations were undertaken during the 1970's to alleviate the effects of sedimentation in the more intensely affected areas (Willis Staller, written commun., 1991; table 7). Sediment decreases recreational opportunities in the reservoirs by limiting access to areas of the reservoirs. Sediment also decreases water clarity, the capacity, and "life expectancy" of the reservoir. Sediment deposits in excess of 12 ft were measured in the southeast arm of Prairie Lee Lake during the 1992 sedimentation survey (fig. 6) despite dredging operations that took place in this arm during 1973 and 1978 (table 7). Water depths in the upstream reach of the southeast arm of Prairie Lee Lake following dredging were about 6 ft (Willis Staller, oral commun., 1993). Based on post-dredging water depths in the southeast arm and measured maximum water depths during 1992 of 0 to 2 ft, more than 4 ft of sediment have been deposited in this arm since the last dredging operation during 1978. This thickness of sediment indicates an estimated average deposition rate of about 0.3 ft/yr during 14 years. A large quantity of sediment also has been deposited on the southwest arm of the reservoir, although the areal extent and thickness are not as great as the extent and thickness in the southeast arm. A total of 3 acres or 2 percent of the total surface area of Prairie Lee Lake has been lost because of sedimentation in the reservoir. This is based on the comparison of the 1992 surface to that depicted on the 1975 revi-

Table 6. Hydraulic residence times for three reservoirs in west-central Missouri

Reservoir (figs. 1 and 2)	Hydraulic residence time using annual runoff values from Gebert and others (1989), in years	Hydraulic residence time using annual runoff values computed from seven continuous-record gaging stations, in years
Prairie Lee Lake	0.49	0.38
Lake Jacomo	1.76	1.40
Harrisonville City Lake	1.05	.84

Table 7. Sediment dredging record, Prairie Lee Lake and Lake Jacomo, west-central Missouri, 1973–80

Location (fig. 6)	Year	Estimated quantity removed (acre-feet)
	Prairie Lee Lake	
Southeast arm	1973	3.9
Southeast arm	1978	14.8
	Total	18.7
	Lake Jacomo	
Liggett Cove	1974	2.0
Rotary Camp Cove	1975	3.0
South Boat Basin	1976	.3
Liggett Cove	1977	10.9
Sailboat Cove	1977	2.0
Cove 10	1980	1.0
	Total	19.2

sion of the topographic map of the area. The volume of sediment calculated from the sediment-depth survey was 1,160 acre-ft, which equates to a 29 percent loss in the original reservoir volume. About 19 acre-ft of sediment were removed during the 1973 and 1978 dredging operations. Therefore, a total of about 1,180 acre-ft of sediment has been deposited in the 53 years since the reservoir was filled, and this value corresponds to an average deposition rate of about 0.15 ft/yr over the entire area of the reservoir.

In Lake Jacomo the greatest sediment deposition has occurred in the west-central arm of the reservoir where more than 9 ft of sediment were measured. Other areas of thick sediment deposition include Sailboat and Liggett Coves (fig. 6). These areas were dredged in the mid-1970's (table 7). The volume of sediment calculated from the sediment-depth survey was 1,890 acre-ft or 8 percent of the original reservoir volume. A total of about 19 acre-ft of sediment was removed during the 1974 to 1980 dredging operations (table 7). An estimated total of about 1,910 acre-ft of sediment has been deposited in the 33 years since the reservoir dam was built. The average deposition rate for the entire reservoir is about 0.06 ft/yr.

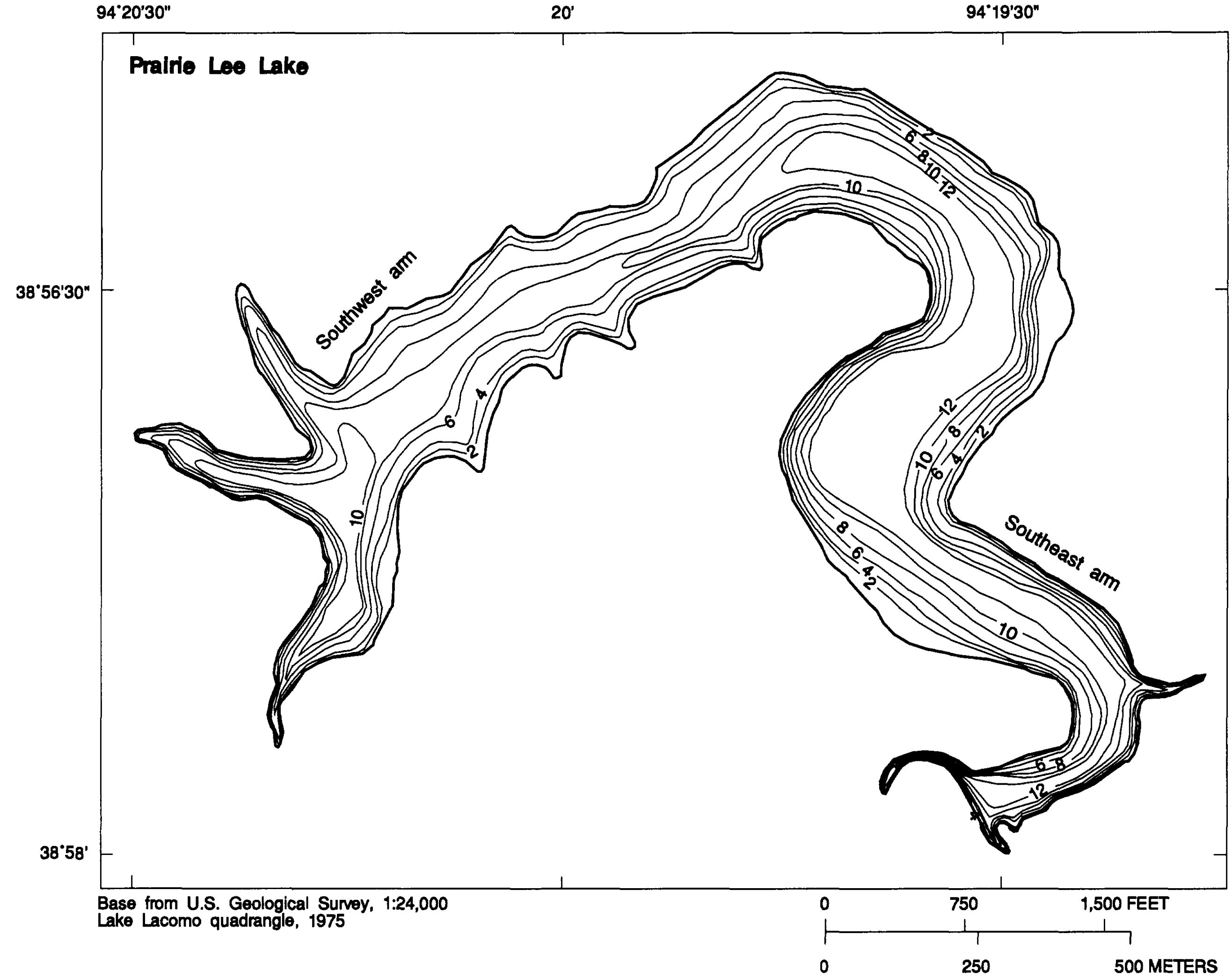
Although the sediment trap efficiency of Prairie Lee Lake was not determined in this study, this reservoir probably is a settling basin for Lake Jacomo by trapping suspended sediment in runoff. The sediment retention capacity of Prairie Lee Lake is limited, however, by the reservoir's relatively small capacity and short hydraulic residence time in comparison to the capacity and residence time of Lake Jacomo.

The areas of greatest deposition in the Harrisonville City Lake (fig. 6) include the northwest and southwest arms of the reservoir where more than 9 ft of sediment were measured. An estimated 1,130 acre-ft of sediment have been deposited in the 21 years since the reservoir was completed, resulting in a 14 percent loss in the original reservoir volume. The average sediment deposition rate over the entire reservoir is about 0.13 ft/yr.

Water Clarity

The following section summarizes the results of measurements and analyses of water-clarity characteristics of the study reservoirs, including Secchi depth and total suspended solids, suspended sediment, and chlorophyll *a* concentrations (table 8; fig. 7). The spatial variation in the median values of these characteristics within each individual reservoir was analyzed along with the degree of correlation between Secchi depth and total suspended solids, suspended sediment, and chlorophyll *a* concentrations.

There were no significant differences between median Secchi depth values (table 8; fig. 7) determined from measurements at three surface sites within Prairie Lee Lake or at sites within Harrisonville City Lake. There was a significant difference between median values between sites within Lake Jacomo [Kruskal-Wallis test, α (alpha) = 0.05] because of the



EXPLANATION

——10—— LINE OF EQUAL SEDIMENT THICKNESS--Interval, in feet, is variable

Figure 6. Sediment-thickness maps of three reservoirs in west-central Missouri.

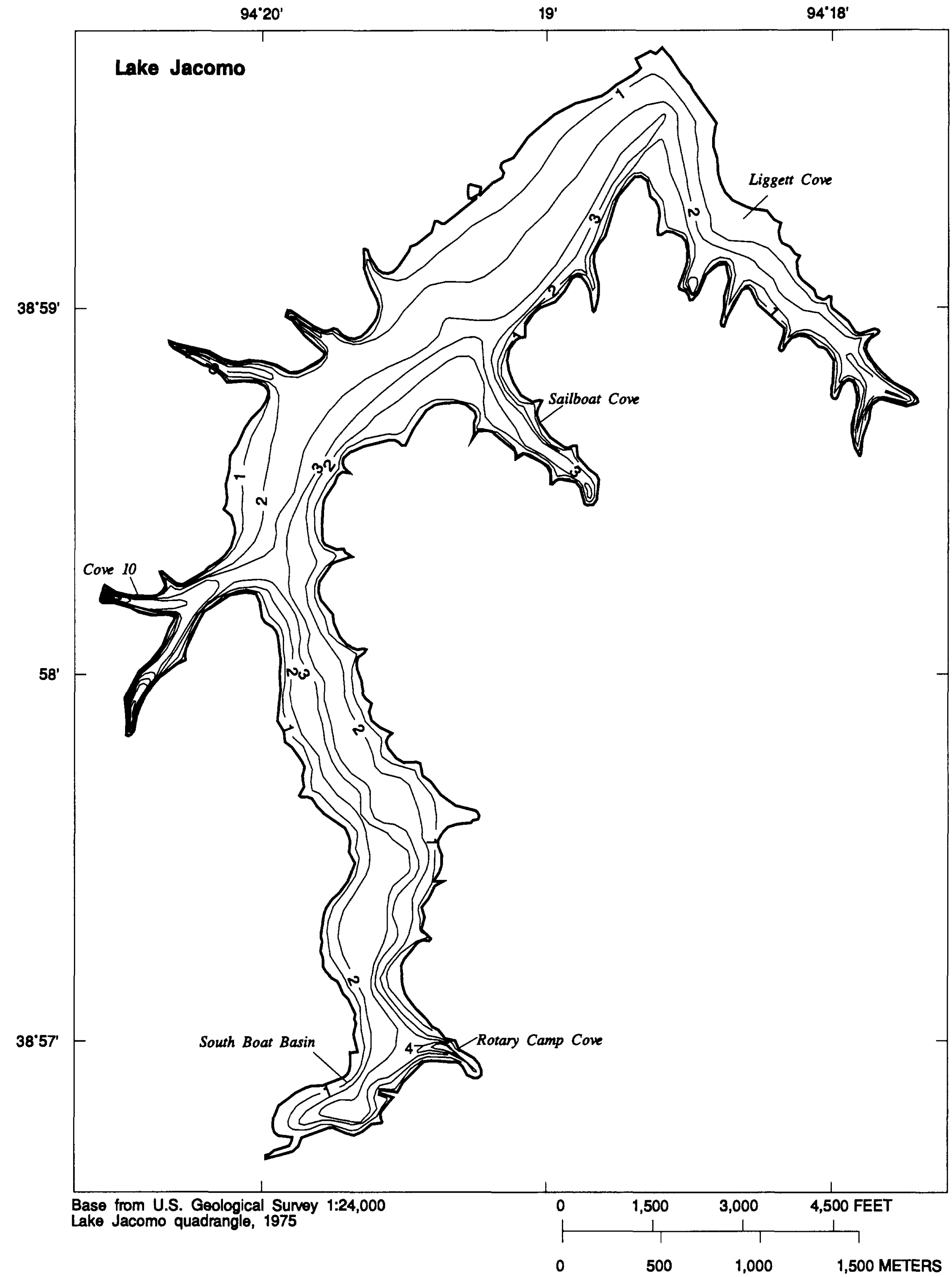


Figure 6. Sediment-thickness maps of three reservoirs in west-central Missouri--Continued.

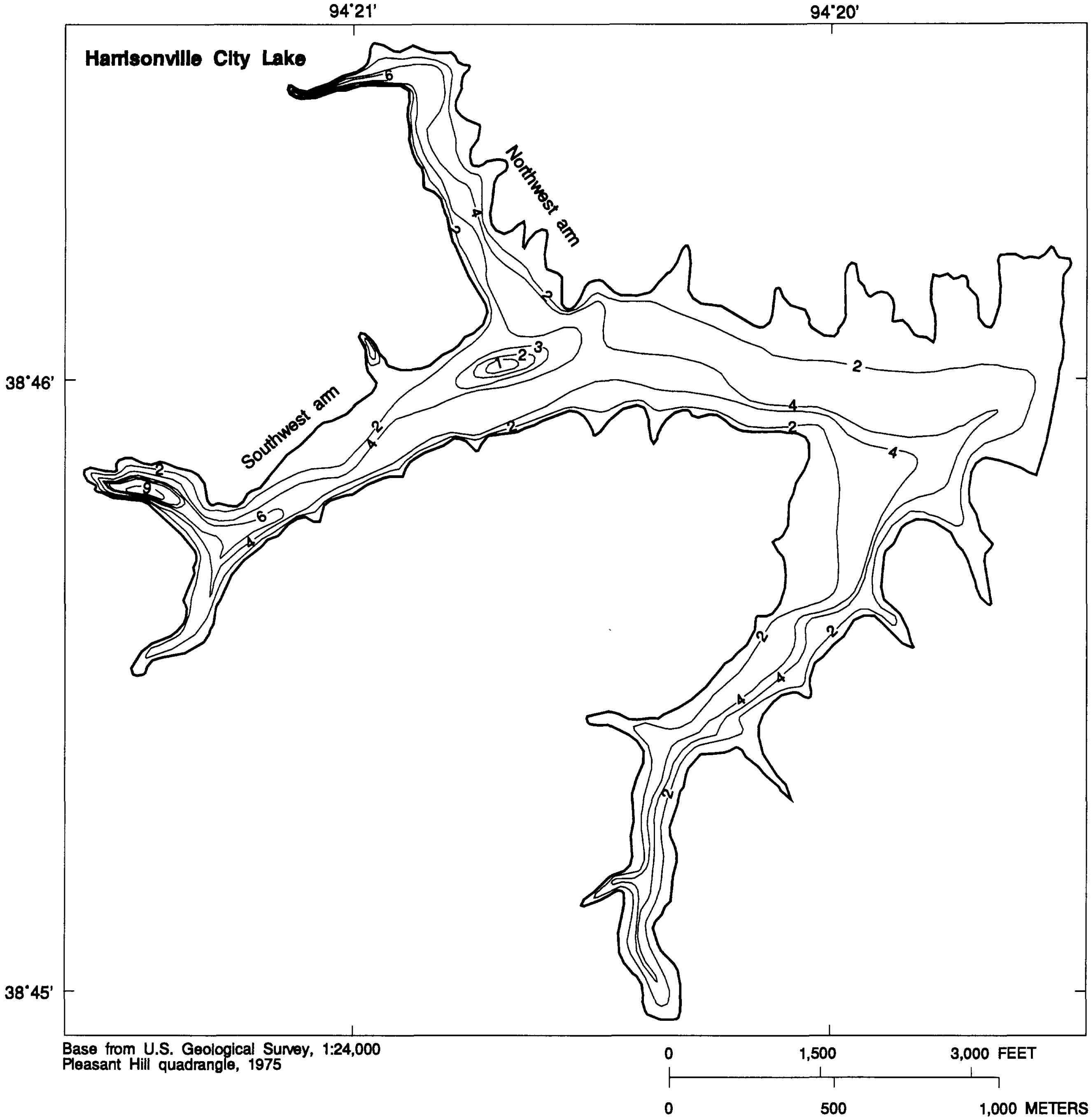


Figure 6. Sediment-thickness maps of three reservoirs in west-central Missouri--Continued.

Table 8. Summary statistics of water-clarity characteristics in surface and bottom samples from three reservoirs in west-central Missouri

[ft, feet; mg/L, milligrams per liter; µg/L, micrograms per liter]

Water-clarity characteristic	Number of samples	Maximum	Minimum	Median
Prairie Lee Lake--Site PL1 (southeast arm at surface)				
Secchi depth (ft)	15	6.9	2.0	3.5
Total suspended solids (mg/L)	16	16	1	2
Suspended sediment (mg/L)	14	17	1	10
Chlorophyll *a* (µg/L)	16	26	.4	7.2
Prairie Lee Lake--Site PL1 (southeast arm at bottom)				
Total suspended solids (mg/L)	16	32	1	8
Suspended sediment (mg/L)	13	41	1	12
Prairie Lee Lake--Site PL2 (near dam at surface)				
Secchi depth (ft)	17	6.6	2.2	3.5
Total suspended solids (mg/L)	15	14	1	2
Suspended sediment (mg/L)	14	15	4	10
Chlorophyll *a* (µg/L)	17	23	.4	6.2
Prairie Lee Lake--Site PL2 (near dam at bottom)				
Total suspended solids (mg/L)	16	39	1	10
Suspended sediment (mg/L)	15	56	1	21
Prairie Lee Lake--Site PL3 (southwest arm at surface)				
Secchi depth (ft)	15	6.7	2.2	3.3
Total suspended solids (mg/L)	15	12	1	4
Suspended sediment (mg/L)	14	30	2	10
Chlorophyll *a* (µg/L)	16	14	.3	7.2
Prairie Lee Lake--Site PL3 (southwest arm at bottom)				
Total suspended solids (mg/L)	16	54	3	12
Suspended sediment (mg/L)	14	149	3	27

Table 8. Summary statistics of water-clarity characteristics in surface and bottom samples from three reservoirs in west-central Missouri–Continued

Water-clarity characteristic	Number of samples	Maximum	Minimum	Median
Lake Jacomo--Site LJ1 (south site at surface)				
Secchi depth (ft)	17	7.6	2.1	3.5
Total suspended solids (mg/L)	16	15	1	2
Suspended sediment (mg/L)	12	16	1	10
Chlorophyll *a* (µg/L)	17	11	2.2	7.7
Lake Jacomo--Site LJ1 (south site at bottom)				
Total suspended solids (mg/L)	16	36	1	6
Suspended sediment (mg/L)	14	30	1	12
Lake Jacomo--Site LJ2 (central site at surface)				
Secchi depth (ft)	16	10.1	3.8	5.3
Total suspended solids (mg/L)	16	12	1	1
Suspended sediment (mg/L)	13	13	1	4
Chlorophyll *a* (µg/L)	16	15	.5	6.4
Lake Jacomo--Site LJ2 (central site at bottom)				
Total suspended solids (mg/L)	16	33	1	7
Suspended sediment (mg/L)	12	25	1	12
Lake Jacomo--Site LJ3 (near dam at surface)				
Secchi depth (ft)	16	10.5	3.8	5.4
Total suspended solids (mg/L)	16	20	1	2
Suspended sediment (mg/L)	12	11	1	4
Chlorophyll *a* (µg/L)	17	13	.4	5.3
Lake Jacomo--Site LJ3 (near dam at bottom)				
Total suspended solids (mg/L)	16	39	1	9
Suspended sediment (mg/L)	12	53	1	8

Table 8. Summary statistics of water-clarity characteristics in surface and bottom samples from three reservoirs in west-central Missouri--Continued

Water-clarity characteristic	Number of samples	Maximum	Minimum	Median
Harrisonville City Lake--Site HL1 (south arm at surface)				
Secchi depth (ft)	10	4.5	2.3	3.2
Total suspended solids (mg/L)	10	28	1	8
Suspended sediment (mg/L)	12	17	3	7
Chlorophyll *a* (µg/L)	10	11	3.5	6.3
Harrisonville City Lake--Site HL2 (near dam at surface)				
Secchi depth (ft)	16	7	1.7	3.8
Total suspended solids (mg/L)	16	19	1	6
Suspended sediment (mg/L)	17	43	.6	10
Chlorophyll *a* (µg/L)	16	27	1.9	5.3
Harrisonville City Lake--Site HL2 (near dam at bottom)				
Total suspended solids (mg/L)	15	28	1	9
Suspended sediment (mg/L)	16	59	3	20
Harrisonville City Lake--Site HL3 (west arm at surface)				
Secchi depth (ft)	10	5	2.1	3.0
Total suspended solids (mg/L)	10	18	1	10
Suspended sediment (mg/L)	12	22	1	10
Chlorophyll *a* (µg/L)	9	9	3.9	5.5

lower median Secchi depth at site LJ1 relative to median values at sites LJ2 and LJ3. The transparency of the water at site LJ1 possibly is affected by the outflow from Prairie Lee Lake because the median Secchi depth seems closer to the median depths of PL1, PL2, and PL3 than to LJ2 and LJ3.

The median total suspended solids and suspended sediment concentrations were greater in bottom samples than in surface samples from the three reservoirs (table 8; fig. 7) because dead plankton, bacteria, and sediment in the surface layers settle into the bottom layers of the lakes. The differences in median concentrations of these properties between the three surface sites or between the bottom sites within an individual reservoir were not significant (Kruskal-Wallis test, $\alpha = 0.05$).

Chlorophyll *a* is contained in all phytoplankton and is used as an indicator of phytoplankton biomass.

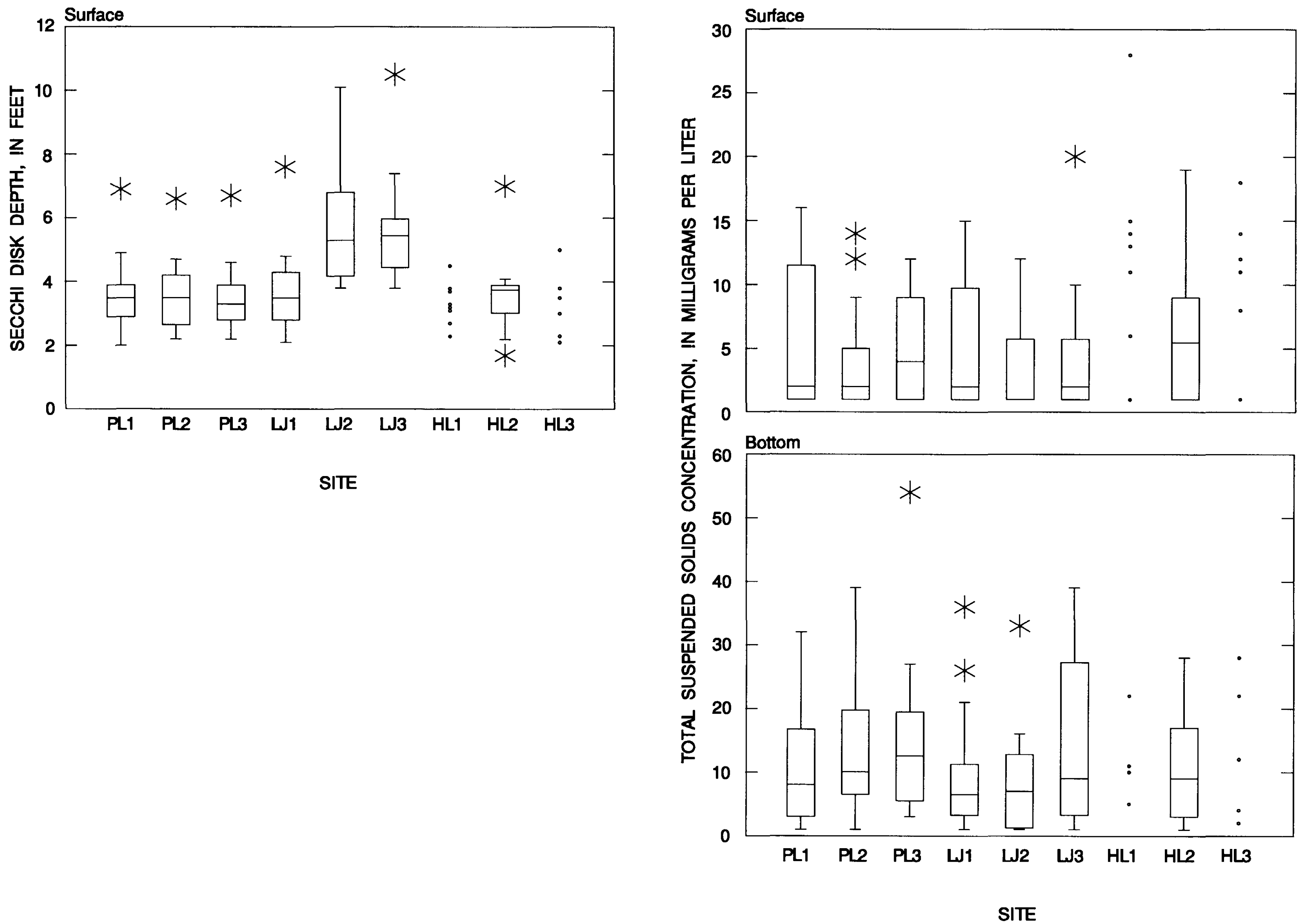


Figure 7. Secchi disk depth and total suspended solids, suspended sediment, chlorophyll *a*, and suspended sediment concentrations in water samples from three reservoirs in west-central Missouri.

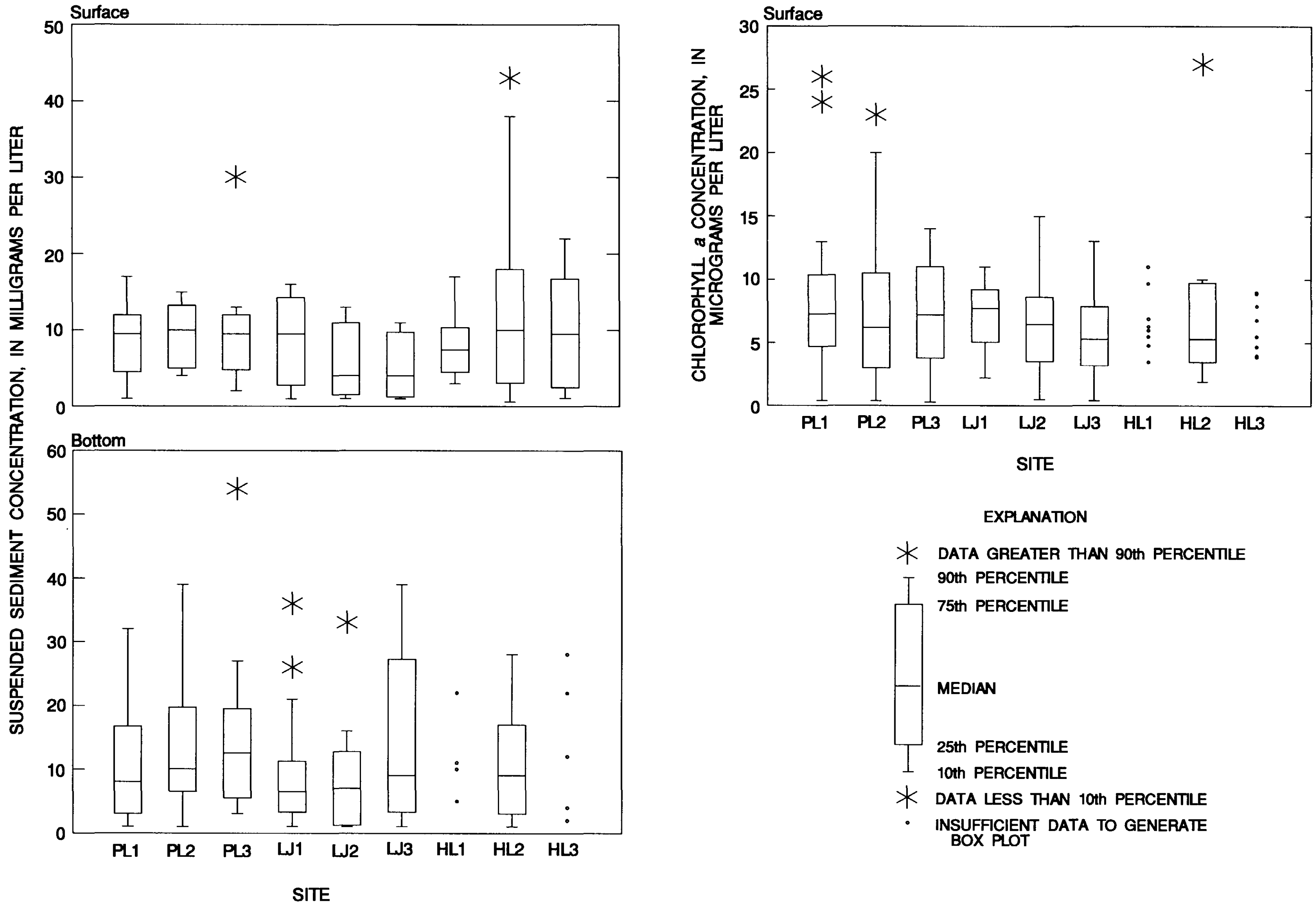


Figure 7. Secchi disk depth and total suspended solids, suspended sediment, chlorophyll *a*, and suspended sediment concentrations in water samples from three reservoirs in west-central Missouri--Continued.

The maximum chlorophyll *a* concentrations in the reservoirs were measured during June through October, corresponding to the period of maximum phytoplankton production. Minimum chlorophyll *a* concentrations were measured in November through January during periods of lower phytoplankton production. The differences in median chlorophyll *a* concentrations (fig. 7) between sites within an individual reservoir were not significant (Kruskal-Wallis test, α = 0.05).

Secchi depth values were correlated with total suspended solids concentrations, suspended sediment concentrations, and chlorophyll *a* concentrations to determine which independent water-clarity characteristic had the greatest effect on Secchi depth in these reservoirs and the degree to which a relation existed. The correlation analyses were determined by using Spearman's rank order correlation coefficient (r_s; Ott, 1993, p. 465-468). This correlation coefficient measures the monotonic association between y and x; that is, it measures whether y increases or decreases with x regardless of whether the increase (or decrease) is linear or nonlinear. In each reservoir, the highest correlation existed between Secchi depth and suspended sediment concentrations, although the degree of correlation was weak. The r_s value was -0.46 (r_s ranges from -1 to +1) for Prairie Lee Lake data, -0.42 for Lake Jacomo data, and -0.12 for Harrisonville City Lake data.

CHEMICAL CHARACTERISTICS

The chemical characteristics of samples collected from the water columns of the three reservoirs are discussed in the following section. This is followed by a discussion of the chemical characteristics of reservoir inflow samples and bottom sediment samples.

Reservoir Water Column

The results of measurements and analyses of physical properties and chemical constituents from samples of the water columns of each of the three reservoirs are presented. These results are followed by a discussion of the trophic state of the reservoirs that was determined from selected water-clarity characteristics and chemical constituents of the water.

Physical Properties and Chemical Constituents

The following section presents the summarized results for selected physical properties and chemical constituents from surface and bottom samples of the water columns of the three reservoirs. The Kruskal-Wallis test was used to determine significant differences in the median values of many of the physical properties and chemical constituents in water samples from the three sampling sites within each reservoir. The results of the Kruskal-Wallis tests can be used to determine if there are significant differences in the spatial distribution of physical properties and chemical constituents in these reservoirs and can be used in determining optimum sampling procedures for future studies in these and similar reservoirs in Missouri. Statistical tests were not conducted on results from the Harrisonville City Lake bottom samples because there were not sufficient data at all sites.

Specific Conductance

Specific conductance is the measure of the ability of a solution to conduct electricity. As the ion concentration of a solution increases and the solution's ability to conduct electricity increases, the specific conductance of the solution increases. Therefore, specific conductance can be used as an indication of the ion concentration of a solution.

The median specific conductance values were higher for bottom samples than for surface samples at the same site (fig. 8; table 9, at the back of this report). This increase is most likely the result of differences in the release of dissolved material from the bottom sediments and is related to water depth and period of thermal stratification. The deeper sites have a longer period of thermal stratification and anoxic conditions, which favors the release of dissolved materials from the bottom sediments. The difference in median specific conductance values between surface samples within any individual reservoir was not statistically significant (Kruskal-Wallis test, α = 0.05), but there was a significant difference between median specific conductance values for bottom samples from Lake Jacomo.

pH

The pH value is a measurement of the hydrogen ion activity, and in most lakes and reservoirs it is regulated by the carbon dioxide-bicarbonate-carbonate (CO_2-HCO_3-CO_3) buffering system (Wetzel, 1983).

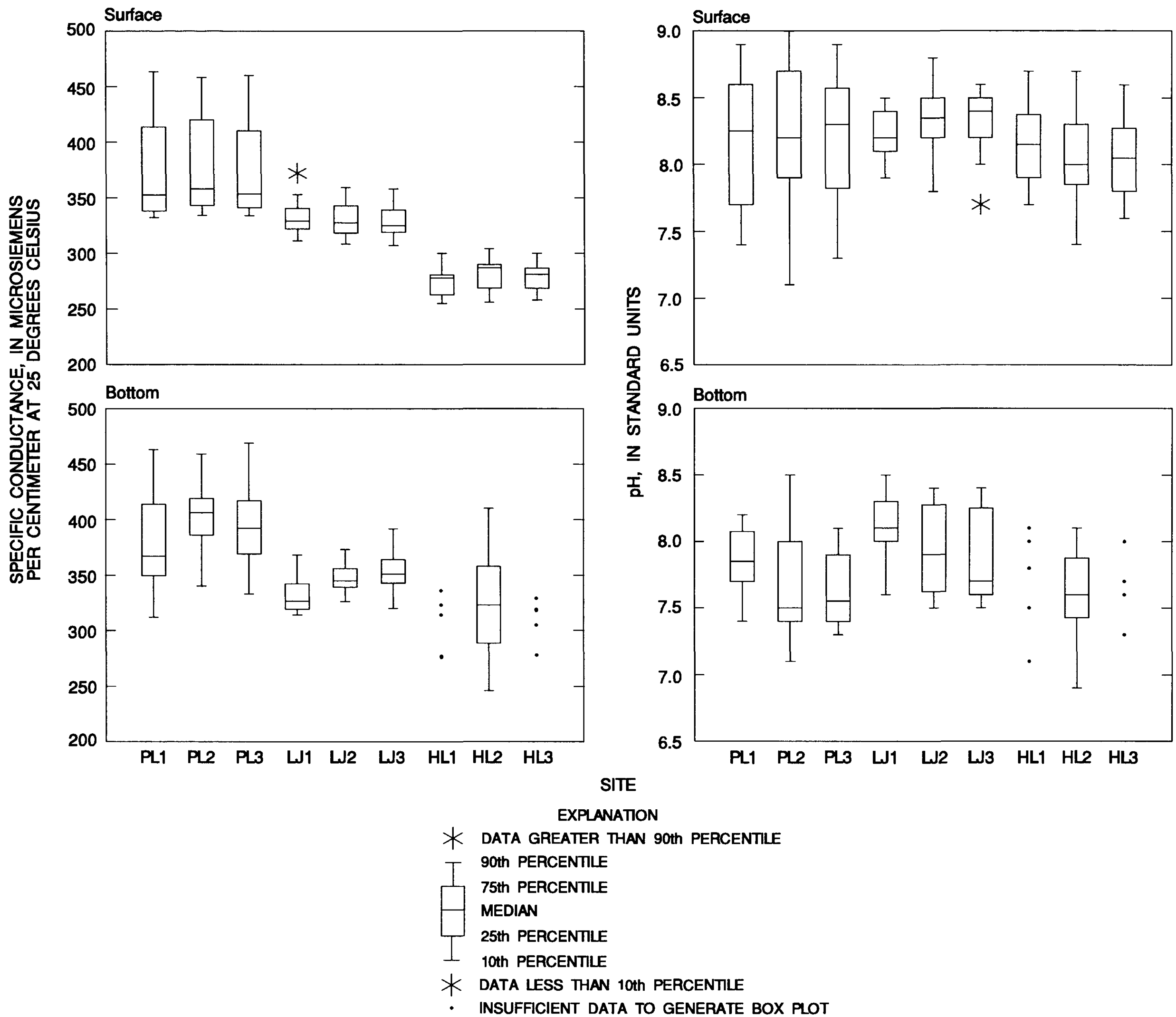


Figure 8. Specific conductance and pH values in water samples from three reservoirs in west-central Missouri.

Biological processes such as photosynthesis and respiration can affect the concentration of dissolved CO_2 in lakes and reservoirs and, therefore, affect the pH value. The pH in most lakes and reservoirs ranges from about 6 to 9. The pH in surface and bottom samples from the three reservoirs was within this range (fig. 8; table 9). The surface samples from each reservoir had higher median pH values than bottom samples from the reservoir, which can be attributed, in part, to photosynthetic activity (lower CO_2 concentration) in the surface waters. The difference in median pH values between surface or between bottom samples in an individual reservoir was not statistically significant (Kruskal-Wallis test, $\alpha = 0.05$).

Water Temperature

Water temperature profile data were collected to determine the timing and degree of thermal stratification in the reservoirs. In the early spring, water temperatures in lakes and reservoirs in temperate zones are uniform throughout the water column, but as the air temperature increases, a thermal gradient develops between the warmer surface waters (epilimnion) and the cooler deeper waters (hypolimnion). The thermal gradient plane (thermocline) results in a resistant barrier to mixing of water between the epilimnion and the hypolimnion; the gradient layer between the two zones is termed the metalimnion. In shallow waters, thermal stratification continues until the warmer waters of the epilimnion extend to the lake bottom. In deeper waters, thermal stratification continues until fall when the water in the epilimnion cools and the thermocline degrades to the point where complete mixing occurs.

Thermal stratification also can occur in lakes and reservoirs in temperate zones during winter months. Water is most dense near 4 °C (degrees Celsius). When a lake surface freezes, there can be 3 to 4 degrees difference in temperature between the ice on the surface and the bottom water. Winter stratification in the lower Midwestern States usually is short. Neither Prairie Lee Lake nor Lake Jacomo was covered with ice during the winter of 1991-92, but sections of Harrisonville City Lake were covered with ice between December 1992 and February 1993.

Water temperature varied substantially with depth and time as depicted at the deepest sites in the three study reservoirs (fig. 9). Temperatures ranged from 0 °C at Harrisonville City Lake during ice cover in January and February 1993 to about 27 °C, which was measured at each reservoir during July. All three reservoirs displayed typical thermal depth profiles for reservoirs of this size in the lower Midwestern States because thermal stratification conditions were present from May through late September or early October at the deepest sites.

Dissolved Oxygen

Dissolved oxygen is a critical requirement in the metabolic processes of aerobic aquatic organisms, and the distribution of dissolved oxygen in a lake or reservoir will greatly determine the distribution of these organisms. During thermal stratification, the hypolimnion is physically isolated from atmospheric and biological reaeration processes. In productive lakes or reservoirs, dissolved oxygen concentrations are substantially decreased in the hypolimnion by chemical reduction and biological respiration reactions. Dissolved oxygen concentrations varied substantially with depth and time in the three study reservoirs (fig. 9) and ranged from about 0.1 mg/L (milligram per liter) in the hypolimnion of each reservoir during thermal stratification to about 10 mg/L throughout the water column in winter. Anoxic conditions were present in the hypolimnion of Prairie Lee Lake for approximately 90 days at the shallowest bottom site (PL1) and about 150 days at the deepest site (PL2). In Lake Jacomo, anoxic conditions in the hypolimnion ranged from 30 days at the shallowest bottom site (LJ1) to about 140 days at the deepest site (LJ3). Similarly, in Harrisonville City Lake, anoxic conditions were present for about 90 days at HL1 and 150 days at the deepest bottom site (HL2).

Alkalinity

The alkalinity of a solution is a measure of the capacity of the solutes in the solution to neutralize acids (Hem, 1985). The greater the alkalinity of a solution, the greater its acid-neutralizing capacity. In most lakes and reservoirs, alkalinity is produced by two dissolved CO_2 species, HCO_3 and CO_3. The alkalinity of the bottom samples was higher than the alkalinity in the surface samples (fig. 10; table 9). This increase could be explained by the addition of dissolved CO_2 species in the bottom waters as products of decomposition and by the dissolution of calcium carbonate ($CaCO_3$) from the bottom sediments (Wetzel, 1983). Although there were no significant differences in median alkalinity between surface samples within an individual reservoir, there were significant differences in median alkalinity between bottom samples within

Prairie Lee Lake and bottom samples within Lake Jacomo (Kruskal-Wallis test, $\alpha = 0.05$). These differences are likely caused by the variable effects of thermal stratification and periods of anoxic conditions in these reservoirs.

Nitrogen

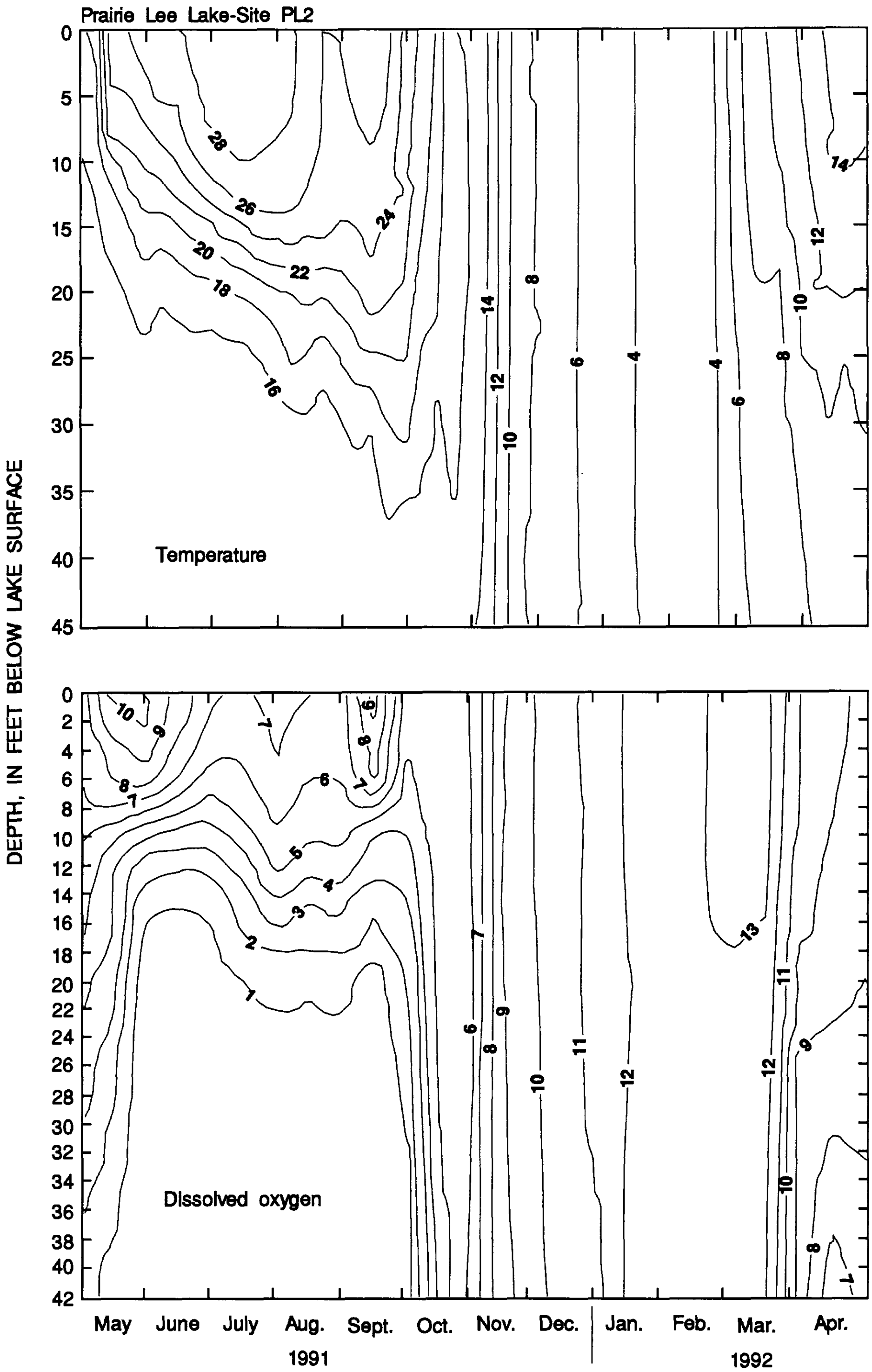
Nitrogen is an important element in biological processes and occurs in both inorganic and organic forms in lakes and reservoirs. The most abundant form of N in surface and bottom water samples in all three reservoirs typically was total organic N (fig. 11; table 9). Organic N is that form present in living and dead plant and animal tissue. Concentrations of total organic N are closely related to changes in the phytoplankton and zooplankton populations. The maximum total organic N concentration measured in the surface samples from Prairie Lee Lake was 1.4 mg/L at site PL3 on June 6 and June 26, 1991; from Lake Jacomo, 1.1 mg/L at site LJ2 on June 25, 1991; and from Harrisonville City Lake, 1.1 mg/L at site HL2 on May 19, 1992. These sample dates correspond to the periods in which some of the largest phytoplankton counts and biomass were measured in the surface waters of these reservoirs. Phytoplankton and zooplankton population dynamics are factors affecting the range in distribution of total organic N at a particular site in a reservoir, but median total organic N concentrations for surface and bottom samples were not significantly different from one site to another within an individual reservoir (Kruskal-Wallis test, $\alpha = 0.05$).

The median concentrations of total ammonia ($NH_3 + NH_4^{+1}$, hereafter referred to as NH_3) as N for surface samples from the three reservoirs were about an order of magnitude less than median total organic N concentrations for these samples (fig. 11; table 9). There were no significant differences between median concentrations of NH_3 for surface-water samples in any individual reservoir (Kruskal-Wallis test, $\alpha =$ 0.05). The median concentrations of NH_3 for bottom samples also were typically less than median total organic N concentrations at all sites; however, the range in NH_3 concentrations for bottom samples was larger than that of total organic N concentrations (fig. 11; table 9). The maximum NH_3 concentrations for bottom samples at all reservoir sites were measured from samples collected during thermal stratification. Factors that may account for the relatively higher concentrations of NH_3 in the bottom samples than concentrations for surface samples at a site include: (1) settling organic material that decomposes and releases NH_3; (2) bacterial nitrification [conversion of NH_3 to nitrate (NO_3) and nitrite (NO_2)] that is not taking place in the anoxic hypolimnion as it is in the aerobic epilimnion; and (3) the release of NH_3 from bottom sediments under anoxic conditions (Wetzel, 1983). There were significant differences in median NH_3 concentrations for bottom samples from the three sites within Prairie Lee Lake and in samples from the three bottom sites within Lake Jacomo. This difference can most likely be explained by the variation in the period of anoxic conditions in the hypolimnion, which ranged from 30 to 150 days in these reservoirs depending on sampling depth, and the variation in the corresponding period of NH_3 releases from the bottom sediments.

The total NO_3 as N concentrations for surface and bottom samples from Prairie Lee Lake and Harrisonville City Lake were similar to, but somewhat less than, total organic N concentrations for these reservoirs. Concentrations of total NO_3 for both surface and bottom samples from Lake Jacomo were less than total organic N and NH_3 concentrations for this reservoir. There were no statistically significant differences in the median NO_3 concentrations between surface or bottom samples within a reservoir (Kruskal-Wallis test, $\alpha = 0.05$). Total NO_3 concentrations for surface and bottom samples from Lake Jacomo did not exceed 0.19 mg/L during the sampling period, but maximum NO_3 concentrations for Prairie Lee Lake, immediately upstream from Lake Jacomo, were near 1 mg/L for both surface and bottom samples. The most probable explanation for the low concentrations of NO_3 for Lake Jacomo relative to those for Prairie Lee Lake is that NO_3 loads are less for Lake Jacomo inflows than loads for Prairie Lee Lake inflows. The NO_3 entering Prairie Lee Lake from inflows is "trapped" and is not transported into Lake Jacomo (see "Reservoir Inflow" section), and NO_3 loads are low from the relatively undisturbed local Lake Jacomo Basin.

Phosphorus

Phosphorus is the nutrient that limits biological activity in most lakes and reservoirs (Hutchinson, 1957). An increased availability of P in such water bodies can quickly lead to increased phytoplankton production. The range in total P and total orthophosphate (PO_4) as P concentrations in the bottom water samples from the three reservoirs exceeded the range in the surface water samples from these reservoirs (fig. 12; table 9). This range, as in similar ranges for other



EXPLANATION

—10— LINE OF EQUAL TEMPERATURE AND DISSOLVED OXYGEN CONCENTRATION--Interval is variable. Temperature is in degrees Celsius and Dissolved oxygen is in milligrams per liter

Figure 9. Depth-time distribution of water temperature and dissolved oxygen in three reservoirs in west-central Missouri.

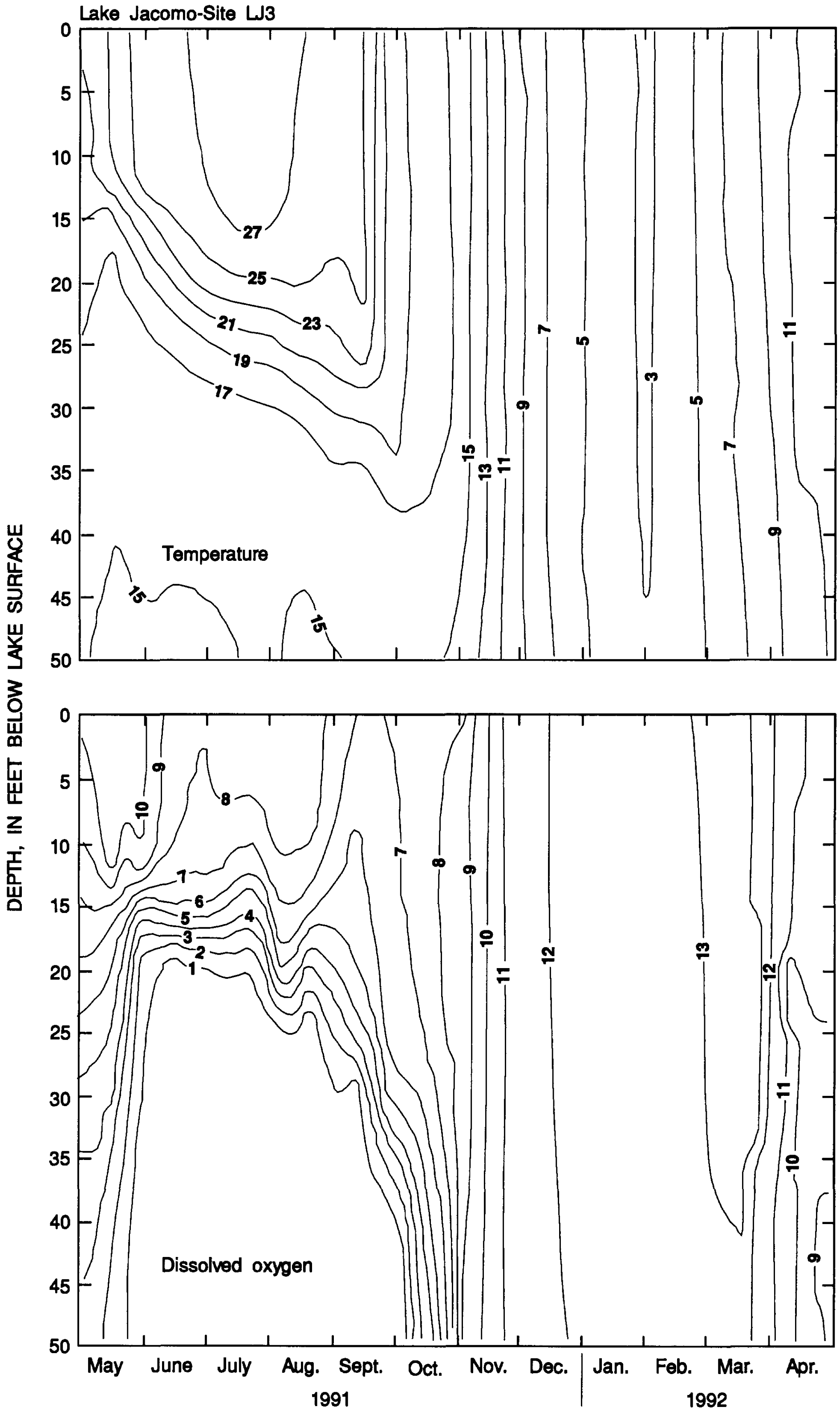


Figure 9. Depth-time distribution of water temperature and dissolved oxygen in three reservoirs in west-central Missouri--Continued.

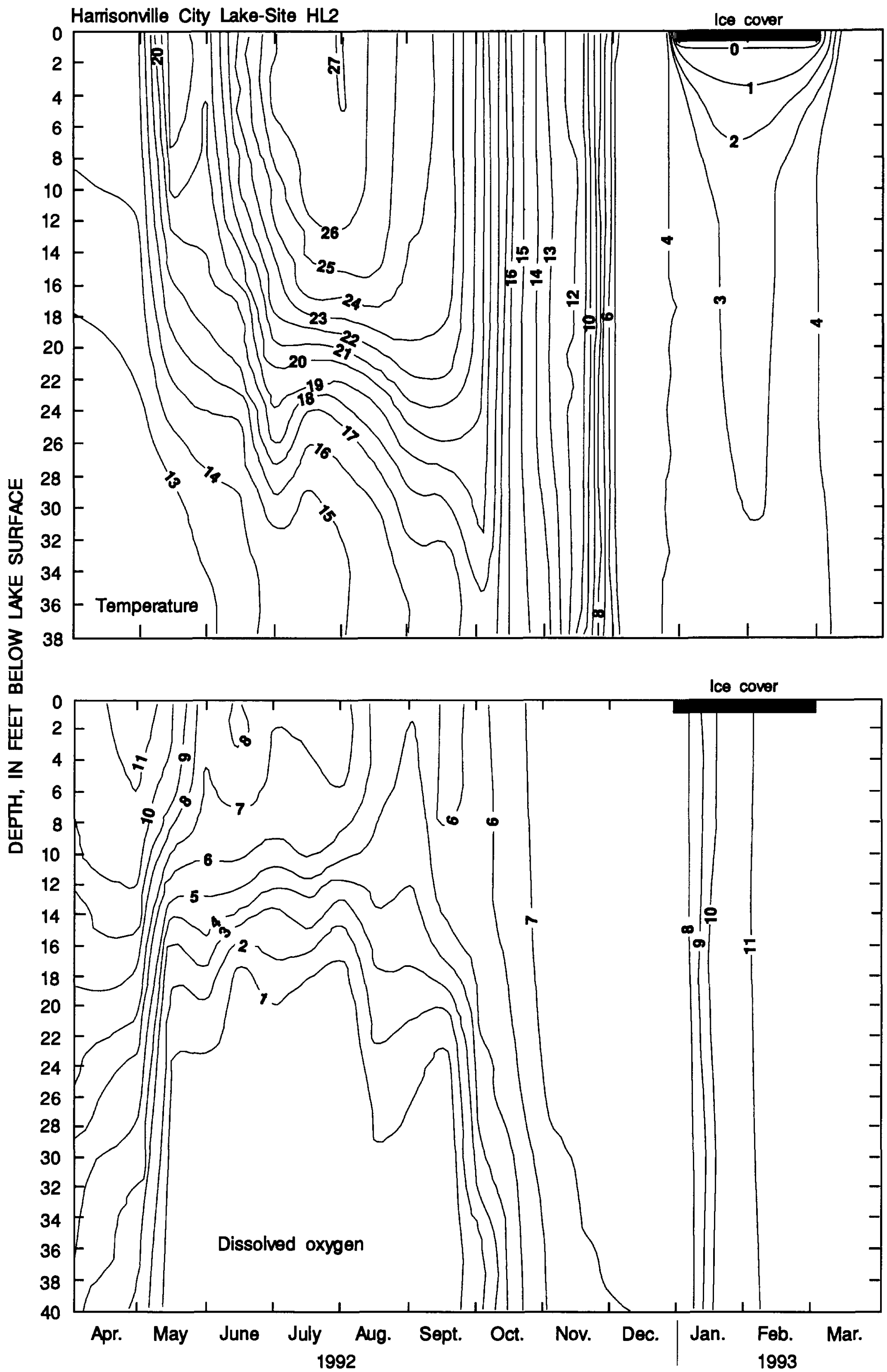


Figure 9. Depth-time distribution of water temperature and dissolved oxygen in three reservoirs in west-central Missouri--Continued.

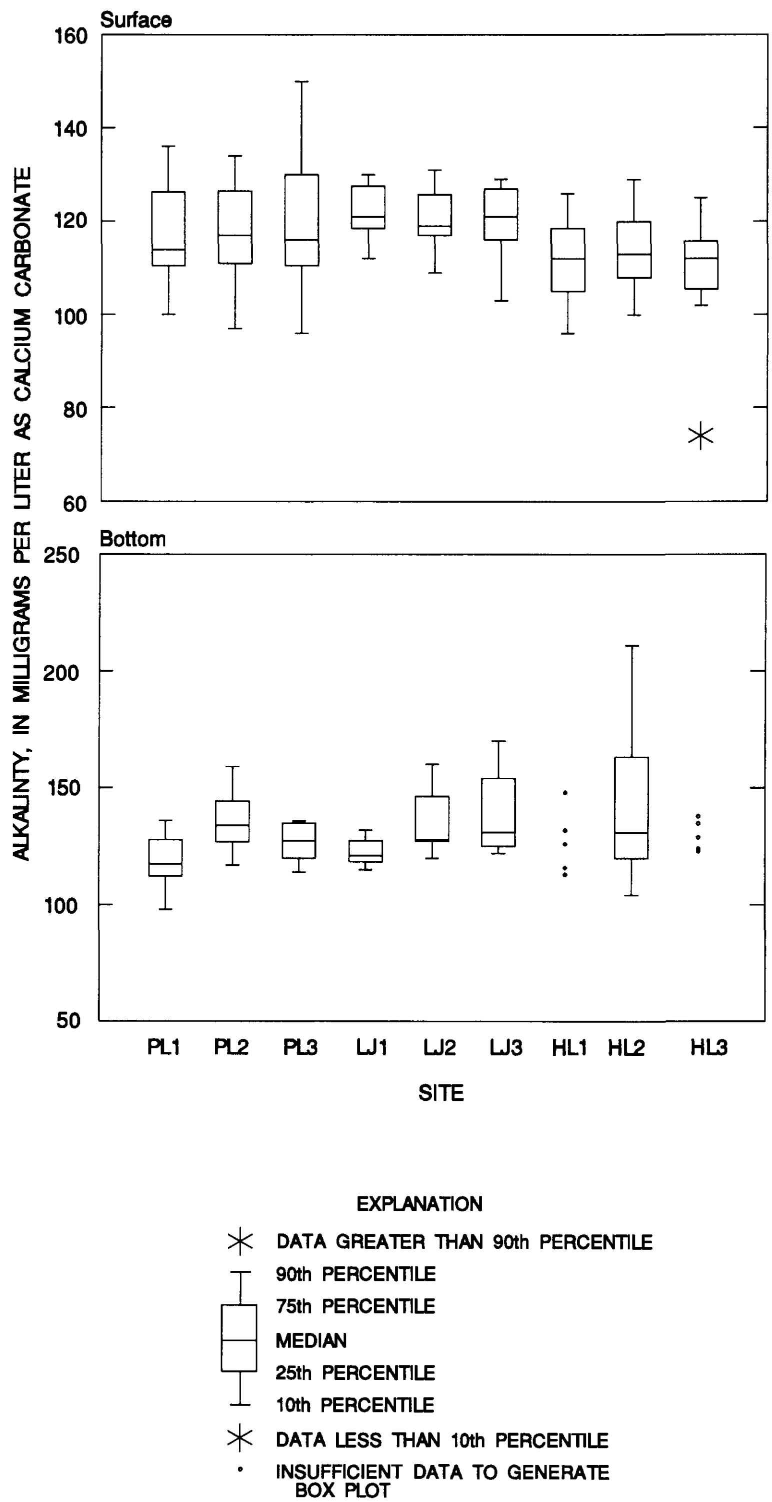


Figure 10. Alkalinity in water samples from three reservoirs in west-central Missouri.

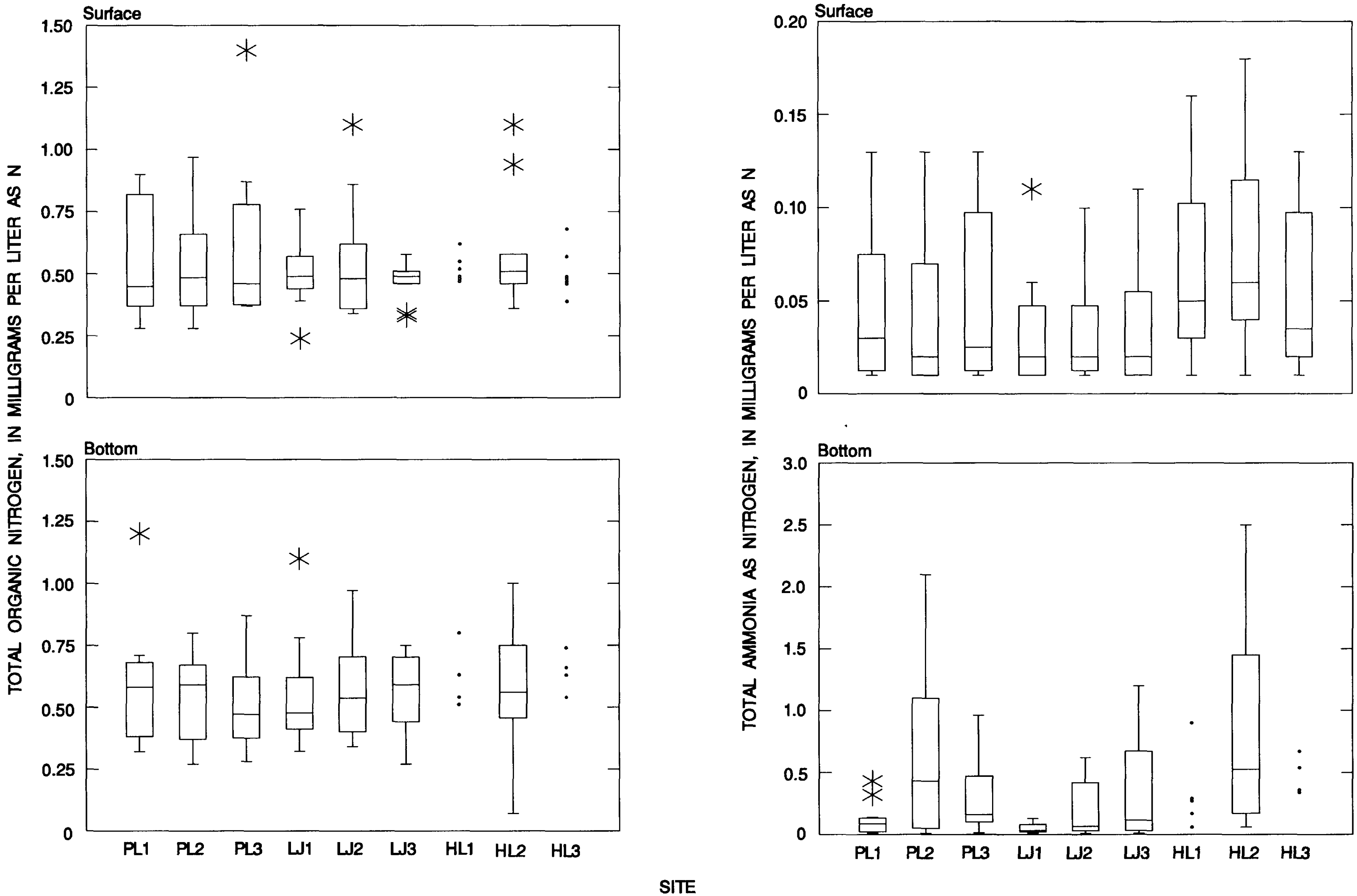


Figure 11. Total organic nitrogen, total ammonia, and total nitrate concentrations in water samples from three reservoirs in west-central Missouri.

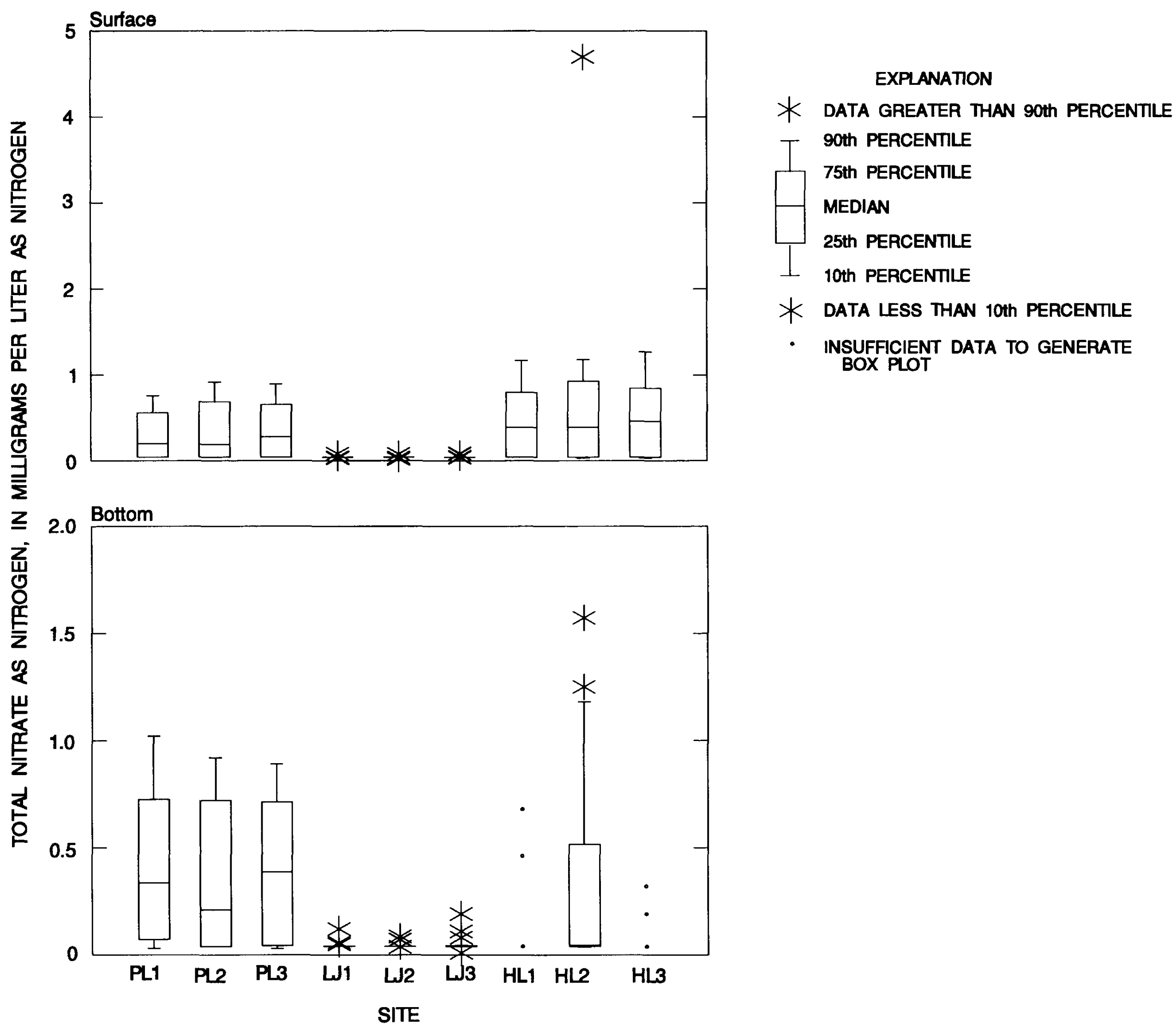


Figure 11. Total organic nitrogen, total ammonia, and total nitrate concentrations in water samples from thre reservoirs in west-central Missouri--Continued.

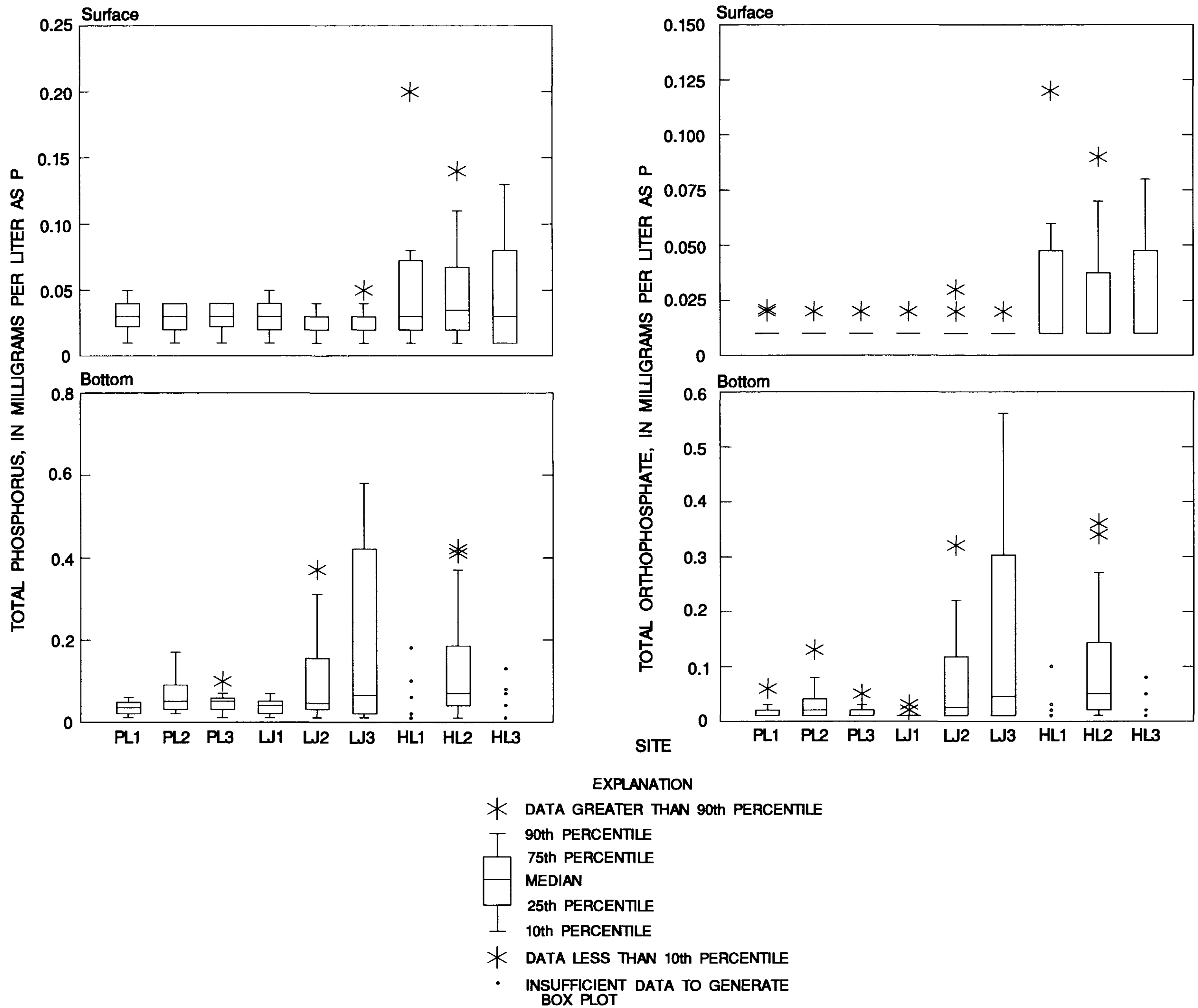


Figure 12. Total phosphorus and total orthophosphate concentrations in water samples from three reservoirs in west-central Missouri.

physical properties and chemical constituents, can be attributed to effects of thermal stratification and anoxic conditions in the hypolimnion.

Several studies have shown that P is released from the bottom sediments into the hypolimnion during anoxic conditions (Mortimer, 1941, 1942; Cooke and others, 1977; Theis and McCabe, 1978; Larsen and others, 1981; Nurnberg and Peters, 1984; Field and Duerk, 1988), although the release of P can occur under aerobic conditions as well (Hutchinson, 1957; Holdren and Armstrong, 1980). There may be as much as a one-thousand fold increase in the release rate of P under anoxic conditions in comparison to the release rate under aerobic conditions (Wetzel, 1983). During thermal stratification, the thermocline provides a physical barrier between the mixing of the P-rich hypolimnion and the P-deficient epilimnion, although P may "leak" through the metalimnion by wind action, vertical entrainment, and diffusion (Stauffer and Lee, 1973; Mortimer, 1974; Larsen and others, 1981; Kortmann and others, 1982). During the fall, when thermal stratification degrades and aerobic conditions develop, much of the available P may combine with ferric iron (Fe^{+3}) to form ferric phosphate or may be absorbed onto ferric hydroxide and $CaCO_3$ and precipitate from the water column.

The maximum concentrations of total P and PO_4 in bottom samples from all the reservoirs occurred during periods of anoxic conditions in the hypolimnion. The maximum concentration of total P and PO_4 for surface samples of Prairie Lee Lake and Lake Jacomo occurred following degradation of the thermocline and subsequent mixing of the hypolimnion and epilimnion. In Harrisonville City Lake the maximum concentrations of total P and PO_4 for surface samples occurred on the January 27 and the February 24, 1993, sampling dates. On these dates ice covered much of the main body of the lake, and water samples were collected from shore. The elevated total P and PO_4 concentrations were likely because of activity of geese in open waters near shore. When comparing median total P and PO_4 concentrations for surface and bottom samples within a reservoir, the only significant difference (Kruskal-Wallis test, $\alpha = 0.05$) was detected in median PO_4 concentrations for bottom samples from the three Lake Jacomo sites.

The total N to total P ratio (TN:TP) commonly is used as an indicator of whether N or P is limiting phytoplankton production in a lake or reservoir. The TN:TP ratio in algal cells is about 15:1. A TN:TP ratio greater than 20 is used as an indicator that P is limiting phytoplankton production, whereas a TN:TP ratio of less than 10 is an indicator that N is limiting phytoplankton production. A TN:TP of between 10 and 20 indicates transition conditions. The TN:TP ratio from Prairie Lee Lake surface samples remained greater than 20 throughout the sampling period. There were periods in the fall and winter months in which the average TN:TP ratio in surface samples from Lake Jacomo and Harrisonville City Lake was in transition conditions. The transition period corresponded with the degradation of the thermocline and mixing of the P-rich hypolimnion with the epilimnion, which increased P concentrations in the epilimnion and decreased TN:TP ratios. Additional bioassay analyses would be needed to determine which nutrient is limiting phytoplankton production during this period. In Harrisonville City Lake, the low TN:TP ratios in September through February can be attributed to mixing of the P-rich hypolimnion with the epilimnion as the thermocline degraded and to the higher P concentrations in the January 27 and February 24, 1993, near shore samples collected during ice cover on the reservoir.

Pesticides

Twenty pesticides were analyzed in surface and bottom samples collected from Harrisonville City Lake between April 1992 and March 1993 (table 10, at the back of this report). Nine pesticides were detected in the samples, including (listed in decreasing frequency of detection) atrazine, desethylatrazine, deisopropylatrazine, metolachlor, ametryn, propazine, alachlor, 2,4-D, and cyanazine.

Atrazine, a pre-emergence and post-emergence herbicide used for control of some annual grasses and broadleaf weeds in corn, fallow land, sorghum, fruit crops, and lawns (Montgomery, 1993), was detected in all surface and bottom samples collected from the reservoir. Concentrations ranged from 0.55 μg/L (microgram per liter) at site HL3 for the surface sample on January 27, 1993, to 4.67 μg/L at site HL2 for the bottom sample on May 19, 1992. Atrazine concentrations exceeded the maximum contaminant level (MCL) of 3 μg/L for drinking water (U.S. Environmental Protection Agency, 1992) for all surface and bottom samples collected between late April and early November 1992. The 3 μg/L MCL for atrazine for drinking water is based on the mean concentration of at least four quarterly samples. The concentration of atrazine did not exceed the MCL for any sample collected in the reservoir between December 1992 and March 1993. The mean concentration (2.8 µg/L) of all surface samples collected from April 1992 to March 1993 was less than the MCL, although concentrations of 26 of the 36 surface samples (excluding duplicates and replicates) exceeded the MCL. Site HL2 was the only site for which bottom samples were collected throughout the entire 12-month period. The mean atrazine concentration in 11 bottom samples from this site was 3.3 µg/L, and concentrations for 8 of 11 samples exceeded the MCL.

Atrazine primarily is applied to crops in the spring, and the greatest potential for transport of atrazine into surface waters is during stormwater runoff immediately following application (Thurman and others, 1991). Once atrazine has been transported into a lake or reservoir during a spring or early summer runoff, it is likely to remain in the system until it degrades or there is a sufficient amount of inflow to "flush" the reservoir contents. At site HL2 in Harrisonville City Lake where atrazine concentrations exceeded the MCL from late April to early November 1992 (fig. 13), there were no large discharges from the reservoir outflow structures during this period based on reservoir stages. There was not a substantial decrease in atrazine concentrations during the late April-early November retention period, and the concentration of the atrazine degradation products desethylatrazine and deisopropylatrazine remained relatively unchanged.

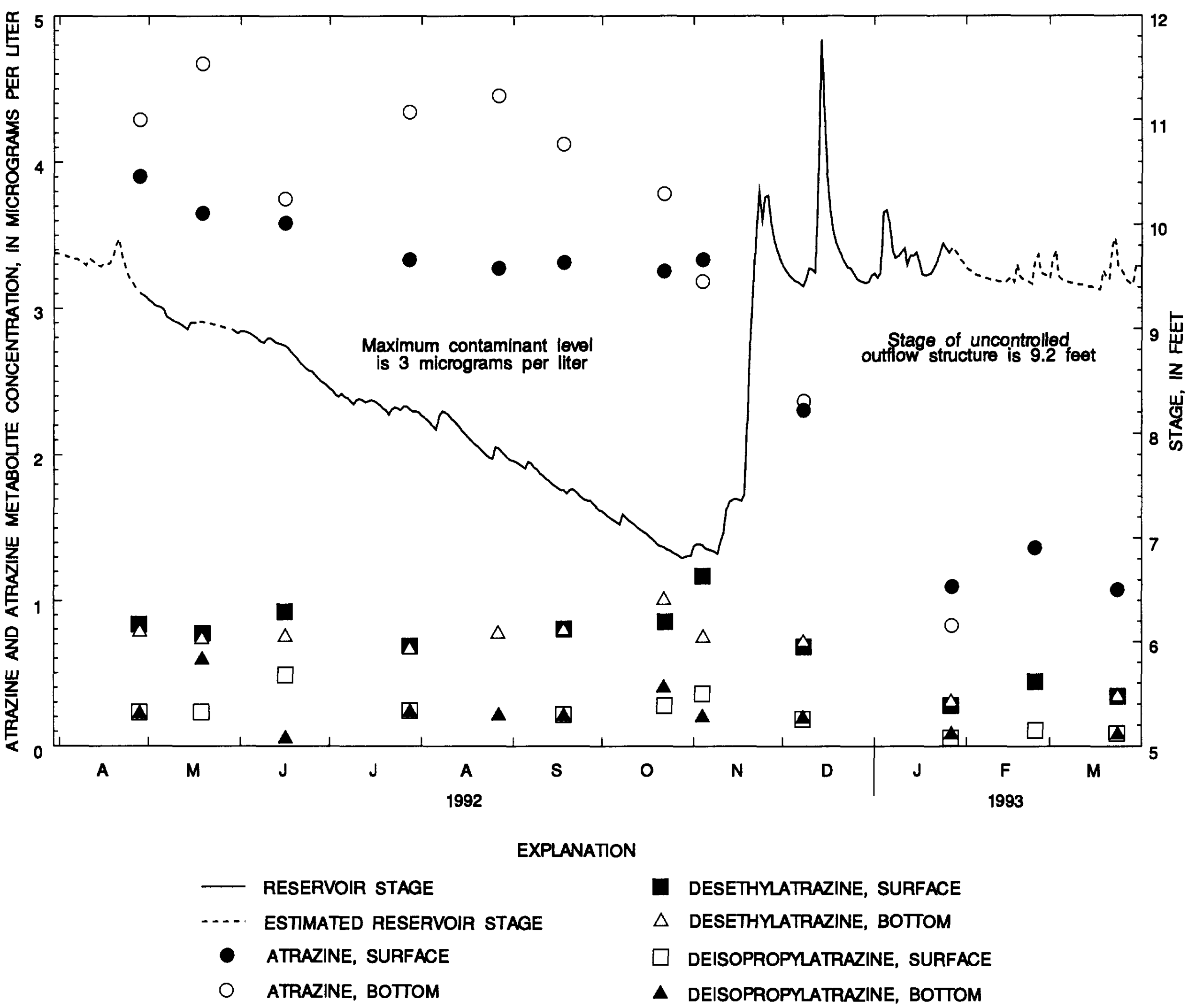


Figure 13. Temporal distribution of atrazine and atrazine metabolites and reservoir stage, Harrisonville City Lake, west-central Missouri, site HL2.

The reservoir stage increased beginning in mid-November, and by late November the water level in the reservoir exceeded the outflow structures. There was a substantial decrease in atrazine concentrations in the December 8, 1992, samples, which were the first water samples collected following the beginning of reservoir outflows. It seems that the reservoir contents were "flushed" during November and December 1992 as inflows into the reservoir were about 6,600 acre-ft, which is equivalent to about 95 percent of the volume of the reservoir. By January 27, 1993, the atrazine concentrations in surface and bottom samples decreased to about 1 μg/L.

The concentration of atrazine in the surface samples at site HL2 remained lower than concentrations in the bottom samples collected between April and October 1992 (fig. 13). A statistical comparison of the median atrazine concentration for the surface and bottom samples collected at site HL2 during this period indicates there was a significant difference between atrazine concentrations in the surface and bottom samples (Mann-Whitney test, $\alpha = 0.05$). Possible explanations for this difference include: (1) photodegradation and volatilization of atrazine at the surface waters of the reservoir; (2) the pre-thermal stratification inflows would tend to have a higher concentration of atrazine and would be cooler and more dense than later inflows, which may contain a lower concentration of atrazine and be warmer and have a tendency to remain above the thermocline; and (3) adsorption of atrazine onto particulate organic matter in the surface water, which subsequently settled out into the bottom waters of the reservoir.

Maximum concentrations of eight other pesticides detected in water samples from Harrisonville City Lake did not exceed established health-based limits. Desethylatrazine was detected in all surface and bottom samples. A maximum concentration of 1.1 μg/L was detected at site HL2 at the surface on November 4, 1992. Metolachlor, a pre-emergence herbicide used to control most annual grasses and many annual weeds in corn, milo, and soybeans (Montgomery, 1993), also was detected in all surface and bottom samples; the maximum concentration detected was 1.48 μg/L in a bottom sample from site HL2 on April 28, 1992. Deisopropylatrazine was detected in 61 of 62 water samples, and the maximum concentration detected was 0.59 μg/L in a bottom sample from site HL2 on May 19, 1992. Ametryn, a herbicide used to control broadleaf and grass weeds in corn, was detected in 32 of 62 samples, and the maximum concentration of 0.08 μg/L was detected in a bottom sample from site HL2 on September 18 and October 22, 1992. Propazine, a selective pre-emergence herbicide used to control annual grasses and broadleaf weeds in milo and sweet sorghum, was detected in 11 of 62 water samples, and the maximum concentration detected was 0.21 μg/L in a bottom sample at site HL2 on April 28, 1992. Alachlor, a pre-emergence, early post-emergence, or soil-incorporated herbicide used to control most annual grasses and many annual broadleaf weeds in corn, milo, soybeans, and certain woody ornamentals, was detected in 2 of 62 samples, at a concentration of 0.09 μg/L in a surface and a bottom sample at site HL1 on September 18, 1992. The herbicide 2,4-D, which is used for post-emergence control of annual and perennial broadleaf weeds in fruits, vegetables, turfs, and ornamental plants, was detected in 2 of 15 samples, at a maximum concentration of 0.35 μg/L in a surface sample from site HL3 on March 24, 1993. Cyanazine, a herbicide used in the control of annual grasses and broadleaf weeds in cereals and soybeans, was detected in 1 of 62 samples, at a concentration of 0.13 μg/L in a bottom sample from site HL2 on June 16, 1992.

Trophic State

One method of classifying the productivity of lakes and reservoirs is through the Trophic-State Index (TSI) described in a report by Carlson (1977). The Secchi depth [TSI(SD)], chlorophyll concentration [TSI(CHL)], and total P concentration [TSI(TP)] are used as factors to calculate trophic-state indices. Indices are scaled from 0 to 100 and each major division (of 10) represents a doubling in algal biomass. Indices less than 40 indicate more oligotrophic conditions, greater than 50 indicate more eutrophic conditions, and between 40 and 50 indicate mesotrophic conditions (Reckhow, 1979). The results for the three reservoirs vary by factors [TSI(SD), TSI(CHL), and TSI(TP)] and with time (fig. 14). One factor from each reservoir consistently was in the mesotrophic range, including TSI(TP) at Prairie Lee Lake and Lake Jacomo and TSI(CHL) at Harrisonville City Lake. The TSI(CHL) and TSI(TP) during summer months may be better indicators of the trophic state in these reservoirs because the Secchi depth in reservoirs in the Osage Plains physiographic province of Missouri can be more a function of total suspended solids than of phytoplankton effects (Jones and Knowlton, 1993).

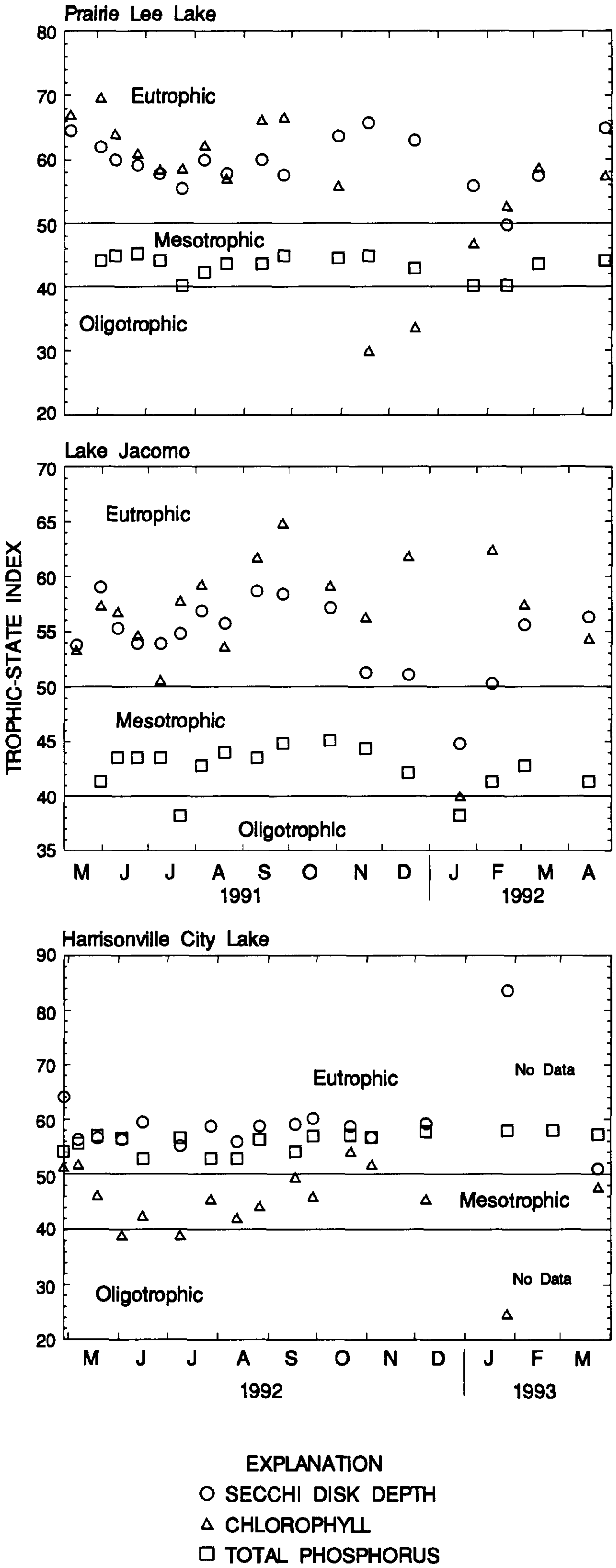


Figure 14. Mean surface Trophic-State Index values for three reservoirs in west-central Missouri.

All three reservoirs would be classified as mesotrophic to eutrophic.

A trophic state classification system was developed for lakes and reservoirs in Missouri by Jones and Knowlton (1993) based on ranges in chlorophyll *a*, total N (Kjeldahl and NO_3), and total P concentrations (table 11). Using this classification system and the data (median concentration in surface samples) collected from the current study, Prairie Lee Lake can be classified as eutrophic, and Lake Jacomo and Harrisonville City Lake can be classified as mesotrophic to eutrophic (table 12).

Reservoir Inflow

Water-quality monitoring sites were established upstream from Prairie Lee Lake and Harrisonville City Lake (table 2; figs. 2 and 3) to determine sources and relative contributions of suspended solids, nutrients, and sediment. Samples for pesticide concentrations also were collected in base flow and stormwater runoff from the Harrisonville City Lake inflow sites. The results of these analyses are discussed in the following sections.

Selected Constituent Loads

The mass and mass per acre loads of selected constituents, including total suspended solids, NH_3, NO_3, and TP, were determined for the three inflow basins into Prairie Lee Lake (sites PI1, PI2, and PI3), the single major inflow into Lake Jacomo (site PL4), and for the three major inflow basins into Harrisonville City Lake (sites HI1, HI2, and HI3; figs. 15 through 17). These data provide insight into the relative contributions of these constituents from each basin for selected storms.

No consistent relation is evident between storm precipitation and constituent loads from any of the three Prairie Lee Lake tributaries; however, the largest contributions of constituents occurred during the larger storms. Constituent loads from the PI2 basin seem to be the most consistent, that is, constituent loads increased with storm size for all constituents for all storms (fig. 15). The poor relation between the constituent loads and storm size for the PI3 basin probably was caused by a temporary disturbance in the basin. The stream channel was altered to install public sewer system lines, which resulted in a substantial increase in constituent loads from runoff during the storm with 1.4-in. of precipitation relative to consistent loads

Table 11. Trophic state classification criteria for Missouri lakes and reservoirs based on chlorophyll *a*, total nitrogen, and total phosphorus concentrations (modified from Jones and Knowlton, 1993)

[µg/L, micrograms per liter; mg/L, milligrams per liter; <, less than; ≥, greater than or equal to; >, greater than]

Trophic state	Chlorophyll *a* (µg/L)	Total nitrogen (mg/L)	Total phosphorus (mg/L)
Oligotrophic	<3	<0.3	<0.01
Mesotrophic	≥3-7	≥.3-.5	≥.01-.025
Eutrophic	≥7-40	≥.5-1.2	≥.025-.10
Hypereutrophic	>40	>1.2	>.10

Table 12. Constituent concentrations used in trophic state classification of three reservoirs in west-central Missouri

[Concentrations are median values in surface samples; µg/L, micrograms per liter; mg/L, milligrams per liter]

	Prairie Lee Lake		Lake Jacomo		Harrisonville City Lake	
	Concentration	Trophic state	Concentration	Trophic state	Concentration	Trophic state
Chlorophyll *a* (µg/L)	12	Eutrophic	7	Mesotrophic	6	Mesotrophic
Total nitrogen (mg/L)	.10	Eutrophic	.70	Eutrophic	1.03	Eutrophic
Total phosphorus (mg/L)	.03	Eutrophic	.03	Eutrophic	.02	Mesotrophic

from storms with 0.75- and 1.25-in. of precipitation. With the exception of the storm with 1.4-in. of precipitation, the mass and mass per acre loads of constituents from the PI3 basin were the lowest of the three sites. The mass and mass per acre loads of NH_3 and NO_3 from direct precipitation on Prairie Lee Lake were estimated using 1992 mean annual concentrations from the National Atmospheric Deposition Program site in Ashland, Missouri [fig. 1; National Atmospheric Deposition Program (NRSP-3)/National Trends Network, 1993]. The estimated mass loads of NH_3 and NO_3 from precipitation on Prairie Lee Lake exceeded loads from some tributary basins during several of the smaller (less than 1.4-in. of precipitation) storms. When put in terms of mass per acre, the loads of NH_3 and NO_3 from direct precipitation exceeded loads of these constituents from tributary runoff during most storms.

The mass and mass per acre loads of total suspended solids, NH_3, NO_3, and TP from the Lake Jacomo inflow site are similar to the smallest loads of these constituents from individual Prairie Lee Lake inflow basins for two concurrent storms with 1.25- and 1.75-in. of precipitation (fig. 16). The sum of the constituent loads into Prairie Lee Lake from the three major inflow basins was more than three times the sum of the outflow loads during these two storms, indicating that Prairie Lee Lake "trapped" suspended solids and nutrients that would have otherwise entered Lake Jacomo. The mass and mass per acre loads of NH_3 and NO_3 from the Prairie Lee Lake outflow into Lake Jacomo were substantially less than loads from direct precipitation on the reservoir.

The runoff loads of total suspended solids, dissolved NH_3, NO_3, and TP determined for the Harrisonville City Lake tributaries varied between sites and storms (fig. 17). In terms of mass, the largest single storm loads of all the constituents occurred during storms with less than 1.5-in. of precipitation from the HI2 and HI3 basins. The HI2 and HI3 basins primarily are in agricultural land use that causes large temporal variations in land cover. Loads of all four constituents from the HI1 basin increased with increasing precipitation. The HI1 basin was the least disturbed of the three basins sampled, and the land use includes a golf course, pasture, and a relatively small amount of cropland as compared to the agricultural land use in the HI2 and HI3 basins. The higher loads of total suspended solids from the HI2 and HI3 sites were evident from the results of the sediment depth survey map, because sediment depths were greater in the lake downstream from the HI2 and HI3 tributaries than downstream from the HI1 tributary (fig. 5). The 1992 mean concentrations of NH_3 and NO_3 in precipitation

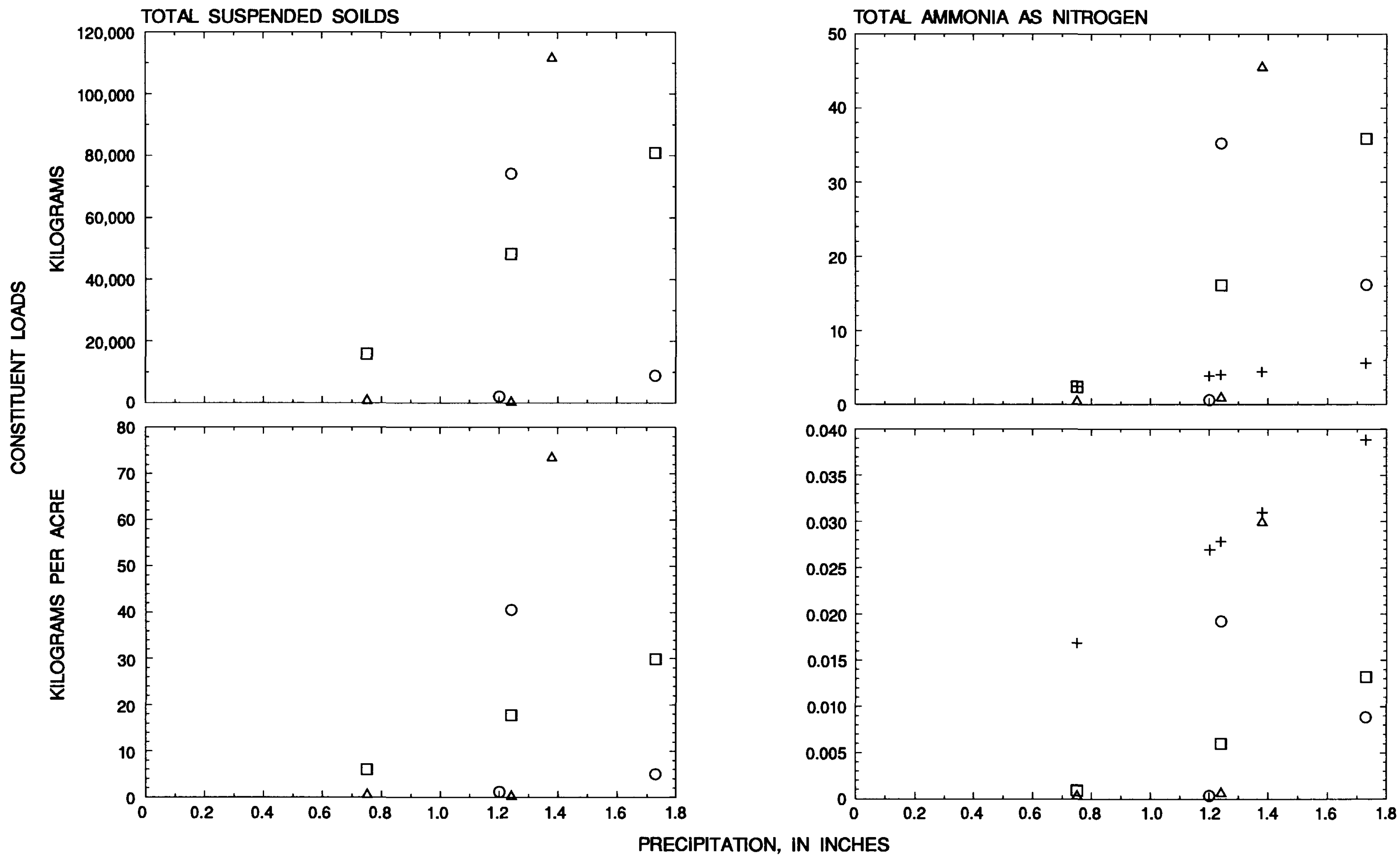


Figure 15. Storm loads for selected constituents at inflow sites, Prairie Lee Lake, west-central Missouri.

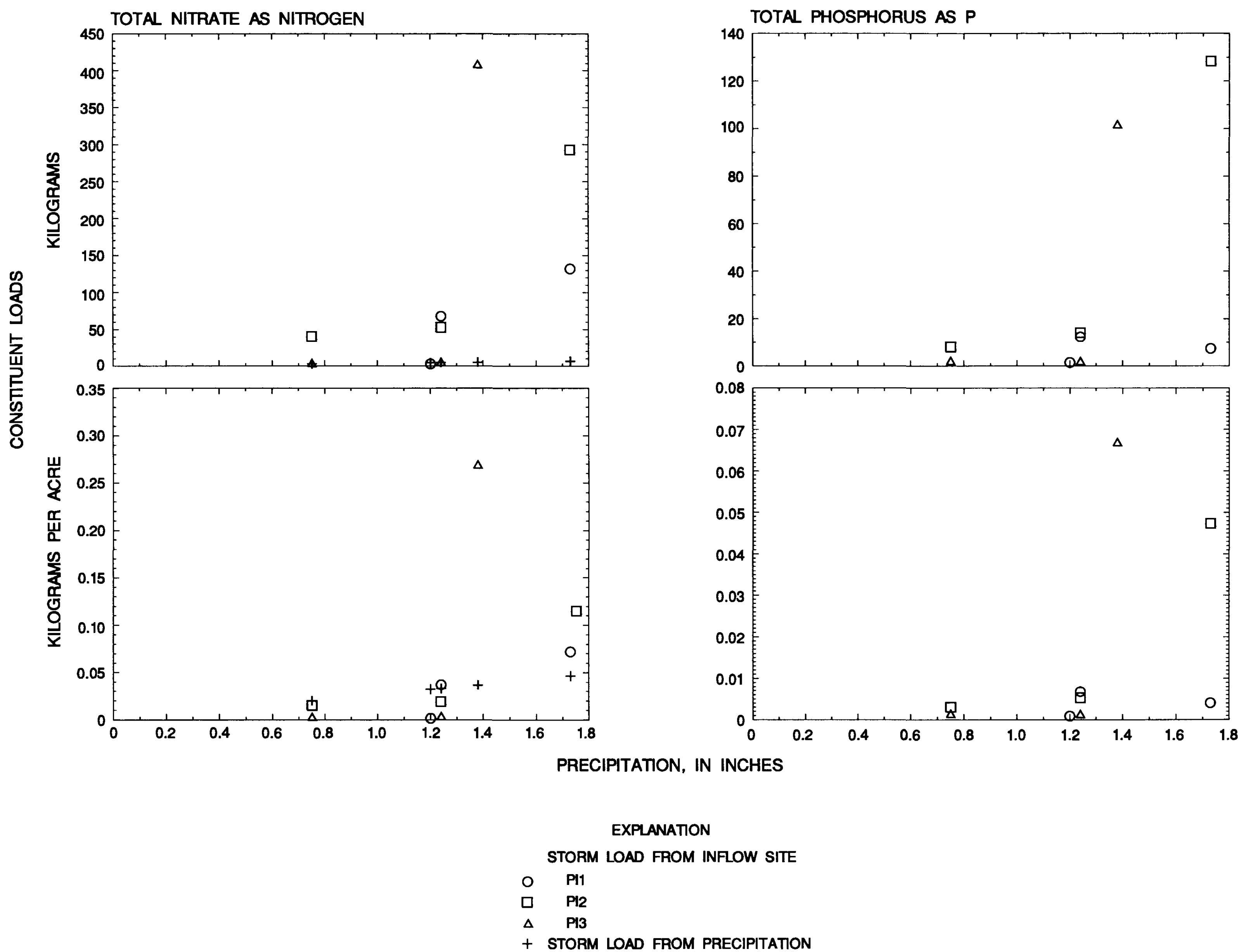


Figure 15. Storm loads for selected constituents at inflow sites, Prairie Lee Lake, west-central Missouri--Continued.

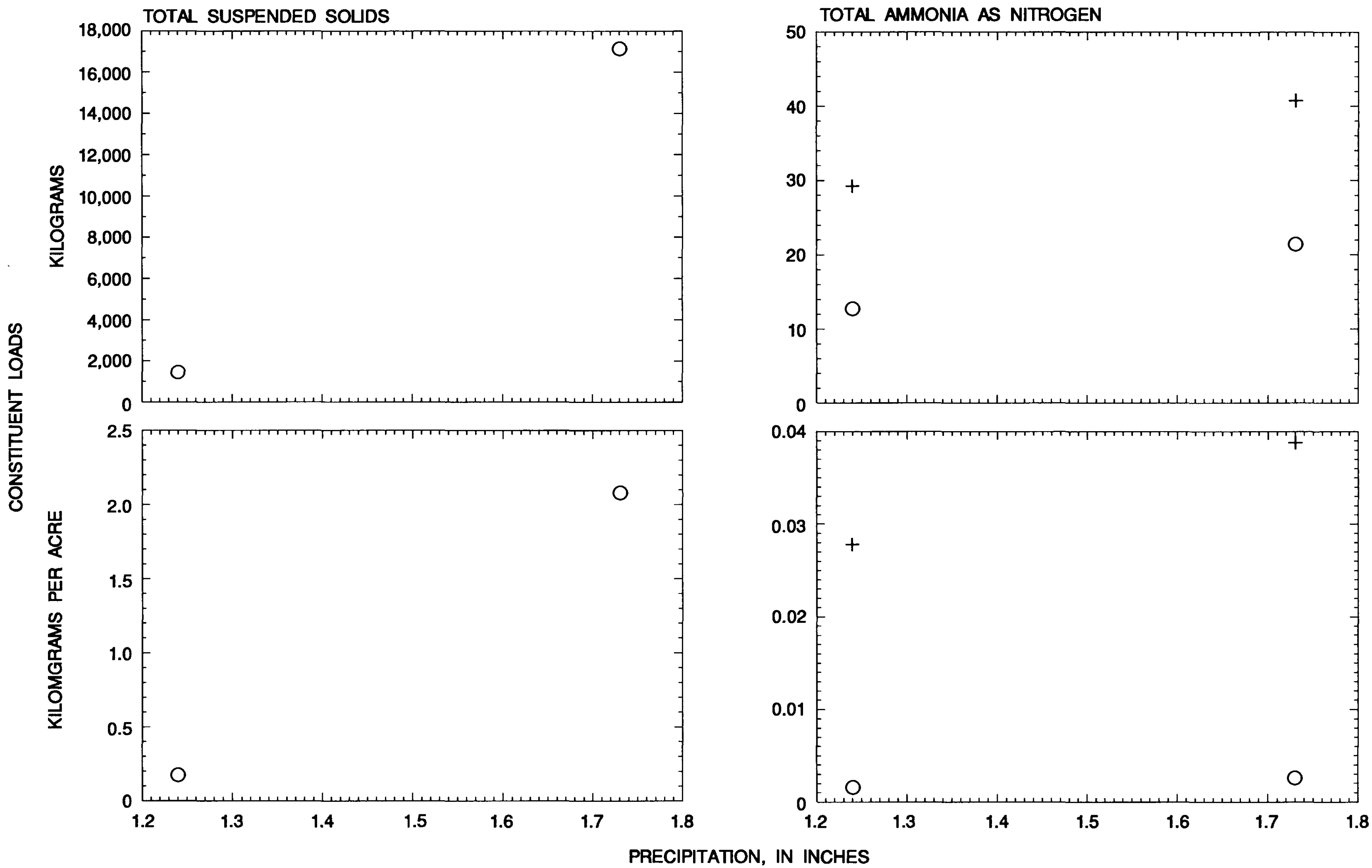


Figure 16. Storm loads for selected constituents at the inflow site, Lake Jacomo, west-central Missouri.

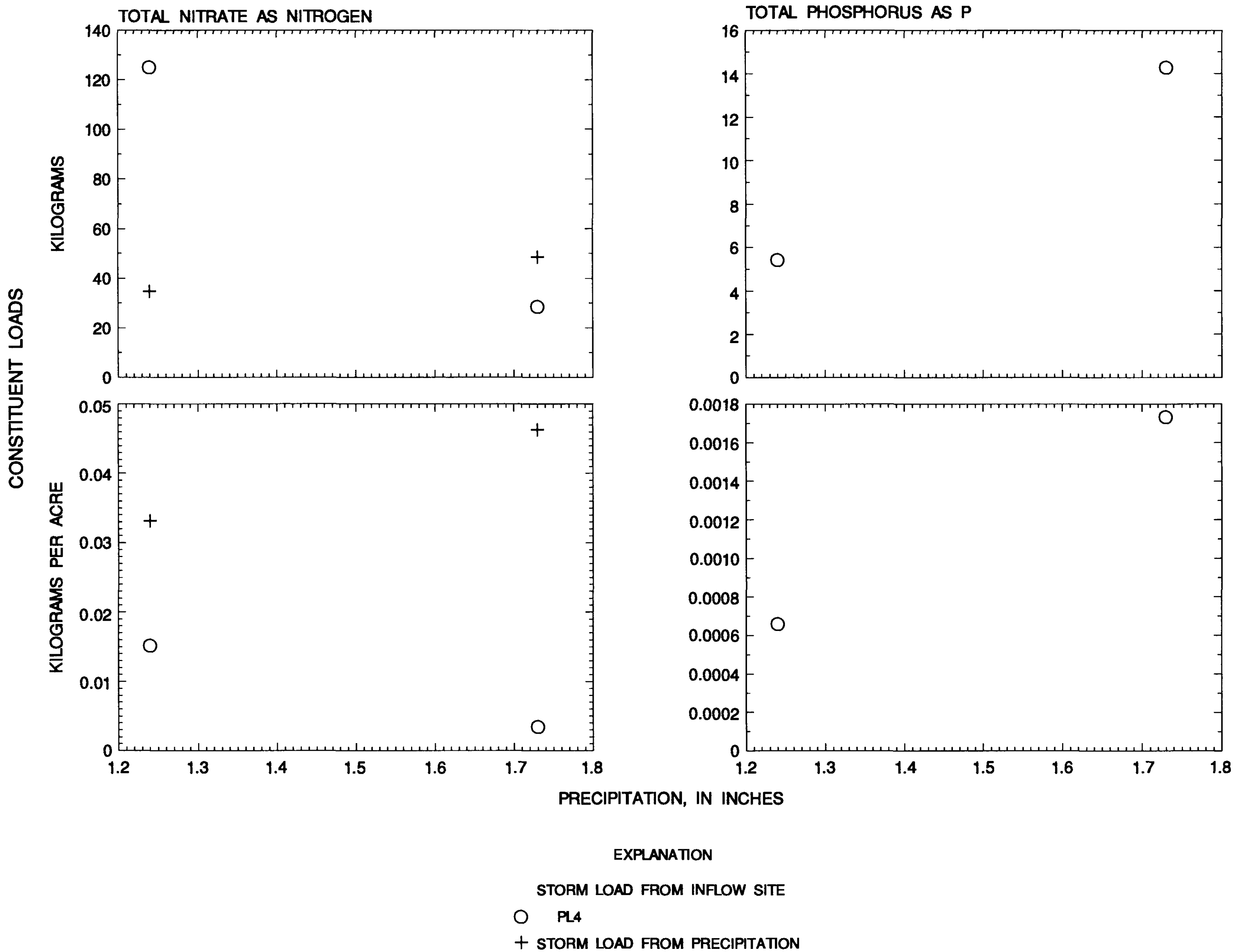


Figure 16. Storm loads for selected constituents at the inflow site, Lake Jacomo, west-central Missouri--Continued.

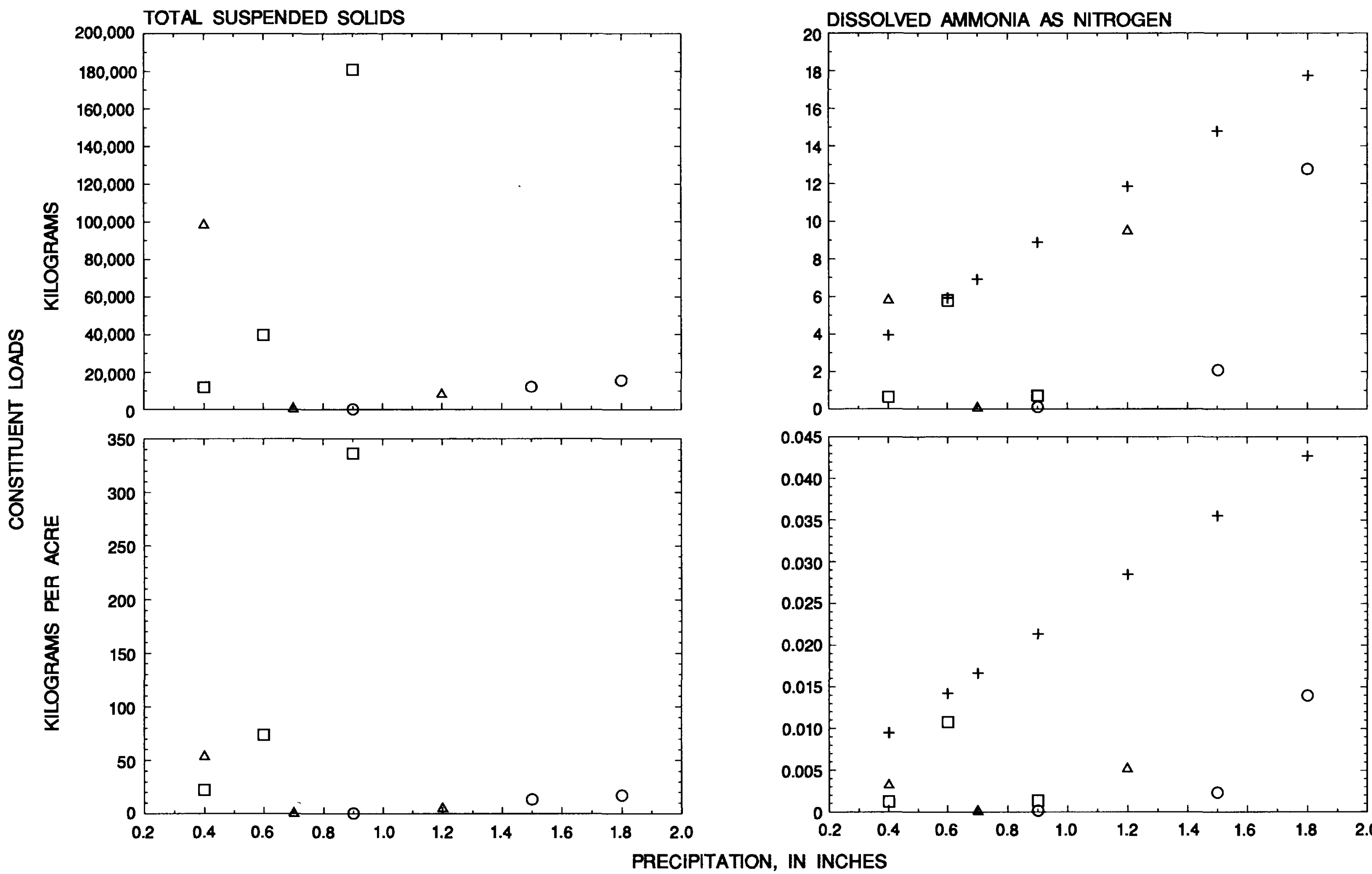


Figure 17. Storm loads for selected constituents at inflow sites, Harrisonville City Lake, west-central Missouri.

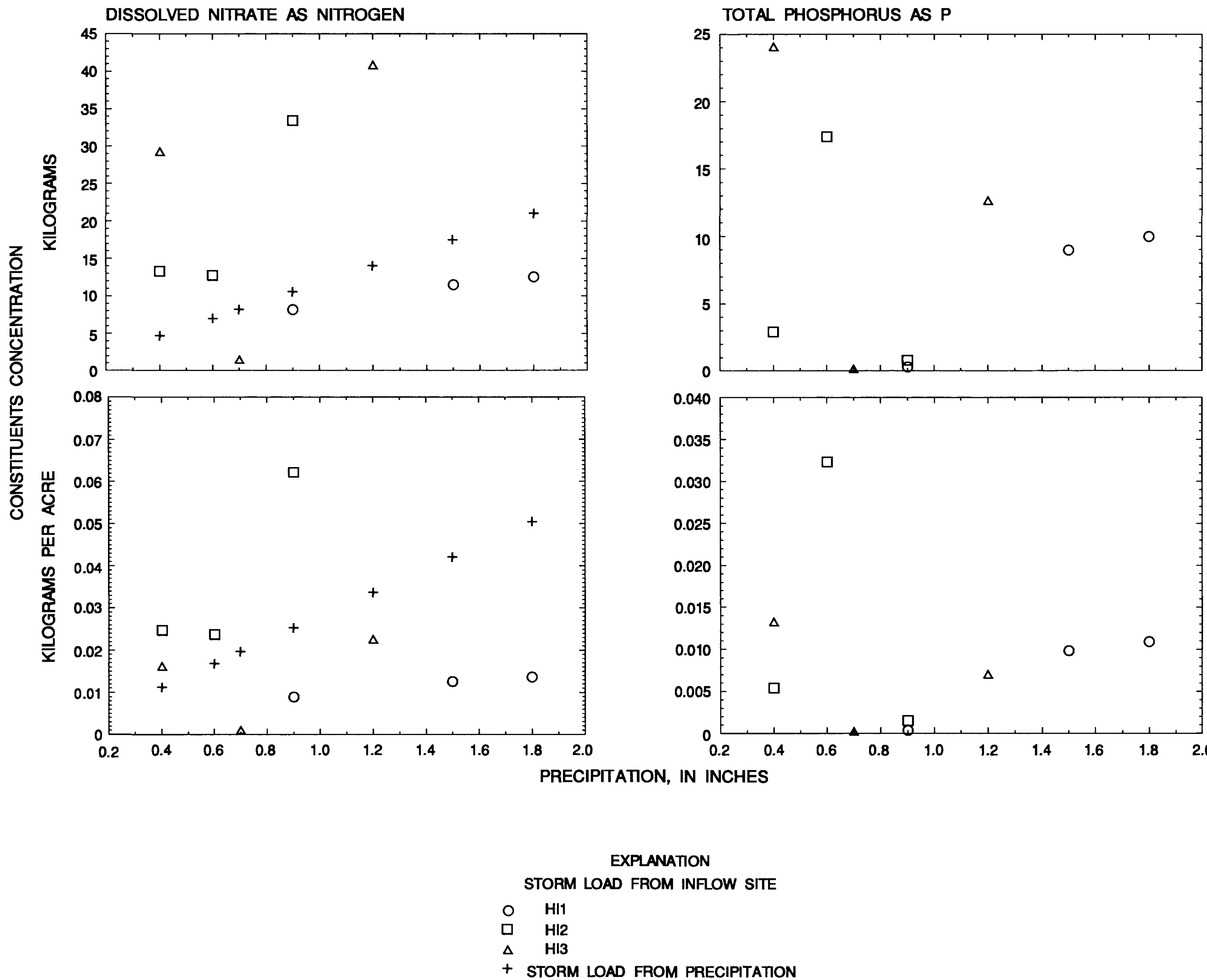


Figure 17. Storm loads for selected constituents at inflow sites, Harrisonville City Lake, west-central Missouri--Continued.

from the National Atmospheric Deposition Program site in Ashland, Missouri (fig. 1), were used to estimate concentrations of these constituents in precipitation during the 1992-93 sampling period (National Atmospheric Deposition Program, 1993). The mass loads of NH_3 from all basins were less than that from precipitation for all but one storm, and the mass per acre loads of NH_3 from the basins were less than loads from precipitation on the reservoir for all storms. The mass and mass per acre loads of NO_3 from the HI1 basin were less than loads from precipitation for each storm, but the mass loads from HI2 and HI3 exceeded those from precipitation during all but one storm. The mass per acre loads from HI2 exceeded loads from precipitation for all storms.

Pesticide Analysis

Water samples from the three Harrisonville City Lake inflow sites were analyzed for 13 pesticides; 7 of these were detected during this study (table 13, at the back of this report). Thirty-six samples were collected monthly from April 1992 through June or July 1993 and during three selected storms. Pesticides detected include (listed in decreasing frequency of detection) atrazine, desethylatrazine, metolachlor, deisopropylatrazine, alachlor, propazine, and prometon. Concentrations of atrazine detected in samples from the sites ranged from 0.07 to 28.0 µg/L and exceeded the health-based MCL of 3 µg/L in three samples. No other pesticide was detected in concentrations that exceeded established health-based limits.

Based on inconsistencies between the reservoir and inflow pesticide data, additional emphasis would need to be placed on spring and summer runoff sampling to accurately determine loads of pesticides in Harrisonville City Lake. Although ametryn was detected in 32 reservoir samples and cyanazine was detected in 1 reservoir sample (table 10), these compounds were not detected in any of the inflow samples. Prometon was detected in one inflow sample, but it was not detected in any of the reservoir samples.

Reservoir Bottom Sediments

Bottom sediments were sampled at the three reservoirs and analyzed for volatile solids, nutrient, and trace element concentrations (table 14). There seems to be a direct relation between volatile solids concentration, an indication of organic matter content, and nutrient concentration in most bottom sediment samples. The nutrient (TN and TP) concentrations in bottom sediment samples from one or more sites in each reservoir exceeded those concentrations detected in reference samples of sandstone, shale, and limestone (Hem, 1985), indicating additional anthropogenic contributions were present. The trace element concentrations in bottom sediments of the three reservoirs generally were within the reported concentration range of trace elements listed for the reference samples. The deepest reservoir sampling sites PL2, LJ3, and HL2 (table 1) tended to have the largest concentrations of nutrients and trace elements.

The pesticide analyses of bottom sediment samples from Prairie Lee Lake indicated the presence of aldrin, chlordane, DDD, DDE, DDT, dieldrin, endrin, and mirex (table 15). Most of the same pesticides were detected in Lake Jacomo and Harrisonville City Lake, albeit at fewer sites in lower concentrations than in Prairie Lee Lake. These compounds historically have been used in the control of insects in residential areas. Whereas nutrient and trace element concentrations tended to be greater in samples from the deepest sites, the concentrations of pesticides in bottom sediments seemed to have a greater variation between sites.

The technical chlordane (sum of cis-chlordane, trans-chlordane, cis-nonachlor, and trans-nonachlor isomers) concentrations in fish tissue from Prairie Lee Lake exceeded the U.S. Food and Drug Administration's "action level" of 300 µg/kg (micrograms per kilogram) during 1985, 1987, 1988, and 1989 (Alan Buchanan, written commun., 1991). The chlordane concentrations in bottom sediments of Lake Jacomo generally were less than the concentration in Prairie Lee Lake, and the likely source of the chlordane was from Prairie Lee Lake outflows because there is little urban area in the local Lake Jacomo Basin.

In addition to samples collected in October 1992 at Harrisonville City Lake, bottom samples were collected in March and June 1993 and analyzed for additional pesticides. All pesticide concentrations were less than the detection limits, with the exception of 2,4-D, which exceeded the detection limit with a concentration of 69 µg/kg in the March 24, 1993, sample at site HL1.

BIOLOGICAL CHARACTERISTICS

The results of bacteria and phytoplankton analyses of samples collected from the three reservoirs are presented in the following sections. The results of

Table 14. Selected constituent concentrations in bottom sediment samples from three reservoirs in west-central Missouri

[Concentrations are in micrograms per gram unless indicated; mg/kg, milligrams per kilogram; <, less than; --, no data available]

Site identifier (figs. 2 and 3)	Date	Solids, volatile (mg/kg)	Nitrogen, ammonia plus organic (mg/kg)	Phosphorus (mg/kg)	Aluminum	Cadmium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Zinc
Prairie Lee Lake													
PL1	04-15-92	62,400	2,100	630	8,200	<1	15	11,000	20	410	0.04	20	53
PL2	04-15-92	96,000	3,200	800	15,000	2	24	19,000	30	820	.04	20	87
PL3	04-15-92	90,500	2,400	870	14,000	<1	22	17,000	30	590	.05	20	98
Lake Jacomo													
LJ1	04-14-92	77,500	2,700	720	11,000	<1	24	20,000	30	990	.04	30	88
LJ2	04-14-92	92,100	3,000	1,000	14,000	2	27	23,000	30	1,000	.04	30	90
LJ3	04-14-92	27,000	1,900	710	8,100	<1	17	150,000	20	390	.03	20	67
Harrisonville City Lake													
HL1	10-22-92	95,500	2,900	330	14,000	1	22	18,000	20	750	.04	20	74
HL2	10-22-92	113,000	2,000	1,029	18,000	<1	32	25,000	20	1,300	.05	30	86
HL3	10-22-92	100,000	1,800	348	14,000	<1	22	17,000	20	820	.04	20	61
Reference samples[a]													
Sandstone		--	--	539	32,100	.02	15	18,600	14	392	.057	2.6	16
Shale		--	600	733	80,100	.18	45	38,800	80	575	.27	29	130
Limestone		--	--	281	8,970	.048	44	8,190	16	842	.046	13	16

[a] Sandstone, shale, and limestone analyses from Hem (1985).

Table 15. Pesticide concentrations in bottom sediment samples from three reservoirs in west-central Missouri

[Concentrations are in micrograms per kilogram; --, no data available; <, less than]

Site identifier (figs. 2 and 3)	Date	Alachlor	Aldrin	Atrazine	Chlordane	Cyanzine	DDD	DDE	DDT
					Prairie Lee Lake				
PL1	04-15-92	--	12	--	8	--	3.3	2.5	0.2
PL2	04-15-92	--	3	--	11	--	1.8	1.6	.1
PL3	04-15-92	--	.6	--	47	--	1.2	2.1	1
					Lake Jacomo				
LJ1	04-14-92	--	.5	--	<1	--	1.0	2.2	<.1
LJ2	04-14-92	--	.1	--	<1	--	.9	2.4	<.1
LJ3	04-14-92	--	<.1	--	8	--	3.6	1.9	.3
					Harrisonville City Lake				
HL1	10-22-92	--	.2	<150	1	<50	<.1	.5	<.1
	03-24-93	<34	--	<780	--	<260	--	--	--
	06-23-93	<86	--	<2,000	--	<660	--	--	--
HL2	10-22-92	<6.5	.1	<150	4	<50	.9	<.2	<.1
	03-24-93	<44	--	<1,000	--	<340	--	--	--
	06-23-93	<250	--	<5,800	--	<1,900	--	--	--
HL3	10-22-92	--	1.4	<150	3	<50	<.1	.6	<.1
	03-24-93	<38	--	<880	--	<290	--	--	--
	06-23-93	<96	--	<2,200	--	<74	--	--	--

Table 15. Pesticide concentrations in bottom sediment samples from three reservoirs in west-central Missouri--Continued

Site identifier (figs. 2 and 3)	Date	Dieldrin	Endosulfan	Endrin	Heptachlor	Lindane	Methoxy-chlor	Methyl parathion	Metolachlor
Prairie Lee Lake--Continued									
PL1	04-15-92	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--	--
PL2	04-15-92	14	<.1	.2	<.1	<.1	<1	--	--
PL3	04-15-92	3	<.1	<.1	<.1	<.1	<.1	--	--
Lake Jacomo--Continued									
LJ1	04-14-92	1.1	<.1	<.2	<.1	<.1	<1	--	--
LJ2	04-14-92	<.1	<.1	<.1	<.1	<.1	<1	--	--
LJ3	04-14-92	.1	<.1	<.1	<.1	<.1	<1	--	--
Harrisonville City Lake--Continued									
HL1	10-22-92	.3	<.1	<.1	<.1	<.1	<.1	<30	<25
	03-24-93	--	--	--	--	--	--	<160	<130
	06-23-93	--	--	--	--	--	--	<400	<330
HL2	10-22-92	1.8	<.1	<.1	<.1	<.1	<.1	<30	<25
	03-24-93	--	--	--	--	--	--	<200	<170
	06-23-93	--	--	--	--	--	--	<1,200	<960
HL3	10-22-92	2.3	<.1	<.1	<.1	<.1	<.1	<30	<25
	03-24-93	--	--	--	--	--	--	<180	<150
	06-23-93	--	--	--	--	--	--	<440	<370

Table 15. Pesticide concentrations in bottom sediment samples from three reservoirs in west-central Missouri--Continued

Site identifier (figs. 2 and 3)	Date	Metribuzin	Mirex	PCB	PCN	Perthane	Propazine	Toxaphene	2,4-D
				Prairie Lee Lake--Continued					
PL1	04-15-92	--	<0.1	<1	<1	<1	--	<10	--
PL2	04-15-92	--	.1	<1	<1	<1	--	<10	--
PL3	04-15-92	--	<.1	<1	<1	<1	--	<10	--
				Lake Jacomo--Continued					
LJ1	04-14-92	--	<.1	<1	<1	<1	--	<10	--
LJ2	04-14-92	--	<.1	<1	<1	<1	--	<10	--
LJ3	04-14-92	--	<.2	<1	<1	<1	--	<10	--
				Harrisonville City Lake--Continued					
HL1	10-22-92	<2	<.1	<1	<1	<1	<3	<10	<27
	03-24-93	<10	--	--	--	--	<25	--	69
	06-23-93	<26	--	--	--	--	<40	--	<170
HL2	10-22-92	<2	<.1	<1	<1	<1	<3	<10	<29
	03-24-93	<14	--	--	--	--	<57	--	<84
	06-23-93	<77	--	--	--	--	<120	-	<240
HL3	10-22-92	<2	<.1	<1	<1	<1	<3	<10	<27
	03-24-93	<23	--	--	--	--	<27	--	<82
	06-23-93	<30	--	--	--	--	<44	--	<190

zooplankton analyses of samples collected from Harrisonville City Lake also are discussed.

Bacteria

Fecal coliform and fecal streptococcal bacteria are used as indicators of contamination of water because the normal habitats for these organisms are the intestines and feces of human and animals (Britton and Greeson, 1987). Missouri has established a standard of 200 col/100 mL for coliform bacteria in surface waters used for whole-body-contact recreation (Missouri Department of Natural Resources, 1992). This standard applies to the recreation season from April 1 through October 31 and during periods when the water body is not affected by stormwater runoff. Fecal coliform densities exceeded 200 col/100 mL in Prairie Lee Lake surface samples at sites PL1 and PL2 on November 18, 1991 (table 16); however, these densities did not exceed State standards because the samples were collected after the recreation season. Fecal coliform densities in surface samples from Lake Jacomo (table 17) and Harrisonville City Lake (table 18) did not exceed 200 col/100 mL during the 12-month sample period. Fecal coliform densities in bottom samples from Prairie Lee Lake exceeded 200 col/100 mL during the recreation season three times at site PL1, two times at site PL2, and three times at site PL3. No fecal coliform densities in bottom samples from Lake Jacomo exceeded State standards, and two bottom samples from Harrisonville City Lake site HL2 exceeded State standards. The differences in median fecal coliform densities between surface samples or between bottom samples for the sites in an individual reservoir were not significant (Kruskal-Wallis test, $\alpha = 0.05$). Median fecal streptococcal densities from surface and bottom samples from the three reservoirs were similar to median fecal coliform densities (tables 16 to 18). The differences in median fecal streptococcal densities for surface and bottom samples for sites within an individual reservoir were not significant for any of the three reservoirs (Kruskal-Wallis test, $\alpha = 0.05$).

Fecal coliform and fecal streptococcal bacteria densities in stormwater-runoff samples from the reservoir inflows (tables 19 to 21) were substantially greater than the densities in the reservoir samples, indicating runoff is a major source of bacteria to the study reservoirs. Fecal coliform densities in Prairie Lee Lake inflows ranged from 830 to 600,000 col/100 mL; fecal streptococcal densities in these inflows ranged from 9,500 to 380,000 col/100 mL (table 19). Fecal coliform densities in the Lake Jacomo inflow (PL4) during storms ranged from 7 to 10,000 col/100 mL, and fecal streptococcal bacteria densities ranged from 17 to 36,000 col/100 mL (table 20). The differences in bacteria densities between Prairie Lee Lake and Lake Jacomo inflows can be attributed to dilution of inflows, die-off of bacteria, and settling of the bacteria into bottom waters. Buckner (1976) studied the population dynamics of fecal coliform and fecal streptococcal bacteria in Prairie Lee Lake and Lake Jacomo and concluded that the primary source of bacteria into these reservoirs was from Prairie Lee Lake inflows during stormwater runoff. Fecal coliform densities in stormwater-runoff samples from Harrisonville City Lake inflows ranged from 4,500 to 310,000 col/100 mL, whereas fecal streptococcal densities during runoff ranged from 8,100 to 95,000 col/100 mL (table 21). These high bacteria densities indicate that runoff from inflows also is a primary source of bacteria to this reservoir.

Plankton

A summary of results from phytoplankton and zooplankton analyses are given in the following sections. Phytoplankton samples were collected from all three reservoirs, whereas zooplankton samples were collected only at Harrisonville City Lake.

Phytoplankton

Phytoplankton (algae) are microscopic, predominantly free-floating plants. The phytoplankton population of a lake or reservoir is the primary food source for other trophic levels and can have major effects on productivity and water quality. Phytoplankton blooms can adversely affect water quality by producing toxins, decreasing water clarity, or decreasing dissolved oxygen concentrations through die-off and subsequent decomposition.

Temporal peaks in the mean phytoplankton density of cyanophytes (blue-green algae) in surface samples from Prairie Lee Lake occurred in the early June and July 1992 samples, indicative of algal blooms (table 22, at the back of this report; fig. 18). The major phytoplankton density peak (June 3, 1992) was about 925,000 algal cells/mL (cells per milliliter), 94 percent of which was cyanophytes, primarily *Aphanocapsa delicatissima*. Cyanophytes are considered "nuisance"

Table 16. Bacteria densities in water samples from Prairie Lee Lake, west-central Missouri

[Bacteria densities are in colonies per 100 milliliters; --, no data available; K, non-ideal colony count]

Date	Site PL1		Site PL2		Site PL3	
	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci
			Surface samples			
05-15-91	--	--	60	170	--	--
06-03-91	K10	K1	K6	K1	K18	K1
06-12-91	36	K4	K10	K10	22	K12
06-26-91	K10	110	K10	K10	K10	K10
07-10-91	K20	K10	K10	K10	K10	K10
07-24-91	K170	25	64	K8	100	93
08-07-91	K10	K10	K10	K10	K4	K1
08-21-91	K10	K10	K1	K2	K1	20
09-12-91	68	--	53	--	K140	--
09-26-91	K4	--	K1	--	K5	--
10-30-91	K5	K19	K9	K10	K7	K7
11-18-91	330	K1,500	220	710	140	K910
12-17-91	20	80	K9	75	K7	51
01-23-92	K10	K2	K1	K1	K1	K1
02-13-92	K1	K1	K1	K1	K1	K4
03-04-92	K1	K6	K1	K1	K1	K3
04-15-92	130	37	92	K14	K60	K8
Maximum	**330**	**1,500**	**220**	**710**	**140**	**910**
Minimum	**1**	**1**	**1**	**1**	**1**	**1**
Median	**10**	**10**	**10**	**10**	**8**	**9**

Table 16. Bacteria densities in water samples from Prairie Lee Lake, west-central Missouri–Continued

Date	Site PL1		Site PL2		Site PL3	
	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci
Bottom samples						
05-15-91	--	--	75	250	--	--
06-03-91	K710	K900	K1,000	K1,200	58	45
06-12-91	180	310	600	1,200	520	K1,100
06-26-91	K40	K30	K130	310	360	510
07-10-91	K70	K90	K110	K180	K90	K110
07-24-91	250	340	K100	60	K80	K90
08-07-91	K10	K20	K40	K10	43	K13
08-21-91	K10	K20	K19	K7	23	K19
09-12-91	K300	--	K190	--	K600	--
09-26-91	K4	--	120	--	21	--
10-30-91	K8	26	K11	K9	K4	K12
11-18-91	530	K1,300	110	240	210	620
12-17-91	22	82	K18	74	K17	68
01-23-92	K1	K6	K1	K6	K1	K1
02-13-92	K1	K2	K1	K1	K1	K1
03-04-92	K1	K1	K3	K1	K3	K1
04-15-92	170	79	88	K11	70	71
Maximum	**710**	**1,300**	**1,000**	**1,200**	**600**	**1,100**
Minimum	**1**	**1**	**1**	**1**	**1**	**1**
Median	**31**	**54**	**88**	**67**	**50**	**56**

Table 17. Bacteria densities in water samples from Lake Jacomo, west-central Missouri

[Bacteria densities are in colonies per 100 milliliters; K, non-ideal colony count; --, no data available]

Date	Site LJ1		Site LJ2		Site LJ3	
	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci
			Surface samples			
05-15-91	K1	K2	--	--	K1	K1
05-31-91	K15	K15	K4	K2	K2	K1
06-11-91	K6	K3	27	45	K2	K1
06-24-91	K7	K4	K8	K1	K8	K1
07-09-91	K1	K2	K3	K10	K1	K1
07-22-91	55	K2	K5	K10	K3	K1
08-05-91	K5	K1	K1	K1	K1	K3
08-20-91	K9	32	K2	K2	K1	K5
09-10-91	27	36	K10	28	25	64
10-28-91	K2	K13	K5	K6	K8	28
11-20-91	39	37	--	K2	--	K4
12-18-91	K1	K1	K4	K2	K1	K1
01-21-92	K1	K1	K1	K1	K1	K1
02-11-92	K1	K3	K1	K4	K1	38
03-03-92	K1	K1	K1	K2	K1	K1
04-14-92	K6	K8	K2	K1	K1	K1
Maximum	**55**	**37**	**27**	**45**	**25**	**64**
Minimum	**1**	**1**	**1**	**1**	**1**	**1**
Median	**6**	**3**	**4**	**2**	**1**	**1**

Table 17. Bacteria densities in water samples from Lake Jacomo, west-central Missouri–Continued

Date	Site LJ1		Site LJ2		Site LJ3	
	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci
Bottom samples						
05-15-91	K6	K10	--	--	K1	K2
05-31-91	39	50	90	140	K12	K15
06-11-91	70	240	63	64	20	51
06-24-91	K18	34	60	34	40	31
07-09-91	K12	K12	23	26	K12	K15
07-22-91	30	K3	53	K8	20	K15
08-05-91	23	K9	K16	K7	K13	K7
08-20-91	26	70	K5	23	K5	K18
09-10-91	K16	45	K16	41	K15	K12
10-28-91	K4	K8	K9	K16	K5	K3
11-20-91	42	31	--	K5	--	K10
12-18-91	K1	K10	K1	K2	K1	K2
01-21-92	K1	K1	K1	K5	K1	K1
02-11-92	K1	K3	K1	K1	K1	K1
03-03-92	K1	K1	K2	K2	K1	K1
04-14-92	K3	K1	K1	K1	K1	K1
Maximum	**70**	**240**	**90**	**140**	**40**	**51**
Minimum	**1**	**1**	**1**	**1**	**1**	**1**
Median	**14**	**10**	**12**	**8**	**5**	**10**

Table 18. Bacteria densities in water samples from Harrisonville City Lake, west-central Missouri

[Bacteria densities are in colonies per 100 milliliters; K, non-ideal colony count; --, no data available]

Date	Site HL1		Site HL2		Site HL3		Site HL2	
	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci	Fecal coliform	Fecal streptococci
	Surface samples						Bottom samples	
04-28-92	56	K17	34	95	75	K12	440	150
05-07-92	--	--	K9	K3	--	--	39	29
05-19-92	K10	K5	K1	K1	K3	K1	23	K11
06-03-92	--	--	K9	K12	--	--	K1	K11
06-16-92	K10	K3	K3	K15	K3	K2	K10	K7
07-09-92	--	--	K1	K1	--	--	K1	K6
07-28-92	K2	K1	K10	K3	20	K1	K1	K1
08-13-92	--	--	K3	K1	--	--	K13	62
08-27-92	40	59	K1	K11	52	K1	K12	21
09-18-92	K4	K12	K5	K1	K10	K2	K2	K3
09-29-92	--	--	K1	K3	--	--	K4	K9
10-22-92	K1	K1	K1	K1	K3	K1	K2	K1
11-04-92	23	43	K2	K5	K16	21	K1	K4
12-08-92	41	K10	46	K8	42	K14	43	K7
01-27-93	95	520	16	K8	K1	K1	990	640
02-24-93	K2	K1	--	K17	K2	K2	--	--
03-24-93	K7	K6	K1	K3	K1	K1	K3	K1
Maximum	**95**	**520**	**46**	**95**	**75**	**21**	**70**	**640**
Minimum	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Median	**10**	**8**	**3**	**3**	**7**	**2**	**14**	**8**

Table 19. Bacteria densities in stormwater-runoff samples in Prairie Lee Lake inflow sites, west-central Missouri

[col/100 mL, colonies per 100 milliliters; K, non-ideal colony count; --, no data]

Date	Number of samples	Fecal coliform (col/100 mL)	Number of samples	Fecal streptococci (col/100 mL)
		East Fork Little Blue River tributary near Lee's Summit (PI1)		
02-14-92	1	K830	1	K26,000
03-18-92	3	5,500-40,000	3	14,000-K110,000
04-19-92	4	K26,000-K500,000	4	74,000-K380,000
04-20-92	3	K160,000-K390,000	3	51,000-K105,000
06-10-92	3	K480,000-K600,000	--	--
		East Fork Little Blue River near Lee's Summit (PI2)		
02-14-92	3	1,900-3,300	3	9,800-K35,000
03-18-92	2	11,000-14,000	2	K54,000
03-19-92	1	14,000	1	K58,000
04-19-92	5	18,000-37,000	5	K88,000-K340,000
04-20-92	2	21,000	2	50,000-79,000
		Unnamed creek near Lee's Summit (PI3)		
02-14-92	2	2,400-3,600	2	K11,000-K64,000
03-18-92	2	4,500-6,800	2	9,500-22,000
04-20-92	4	22,000-38,000	4	59,000-99,000

Table 20. Bacteria densities in stormwater-runoff samples from Lake Jacomo inflow site PL4, west-central Missouri

[Bacteria densities are in colonies per 100 milliliters; K, non-ideal colony count]

Date	Number of samples	Fecal coliform	Number of samples	Fecal streptococci
02-17-92	1	32	1	30
03-18-92	2	K7-25	2	K19-64
03-19-92	1	K200	1	K240
04-19-92	3	36-100	3	K17-340
04-20-92	1	K10,000	2	K1,000-36,000
04-21-92	1	K8,200	1	K11,000

Table 21. Bacteria densities in stormwater-runoff samples from Harrisonville City Lake inflow sites, west-central Missouri

[Bacteria densities are in colonies per 100 milliliters; K, non-ideal colony count]

Date	Number of samples	Fecal coliform	Number of samples	Fecal streptococci
		South Fork Muddy Creek near Harrisonville (HI1)		
11-18-92	5	4,500-310,000	5	K13,000-95,000
		Muddy Creek near Harrisonville (HI2)		
11-22-92	3	12,000-22,000	3	35,000-55,000
04-13-93	2	25,000-47,000	2	19,000-83,000
07-01-93	1	K79,000	1	K88,000
		North Fork Muddy Creek near Harrisonville (HI3)		
11-19-92	3	19,000-22,000	3	61,000-67,000
04-13-93	2	25,000-45,000	2	8,100-9,900

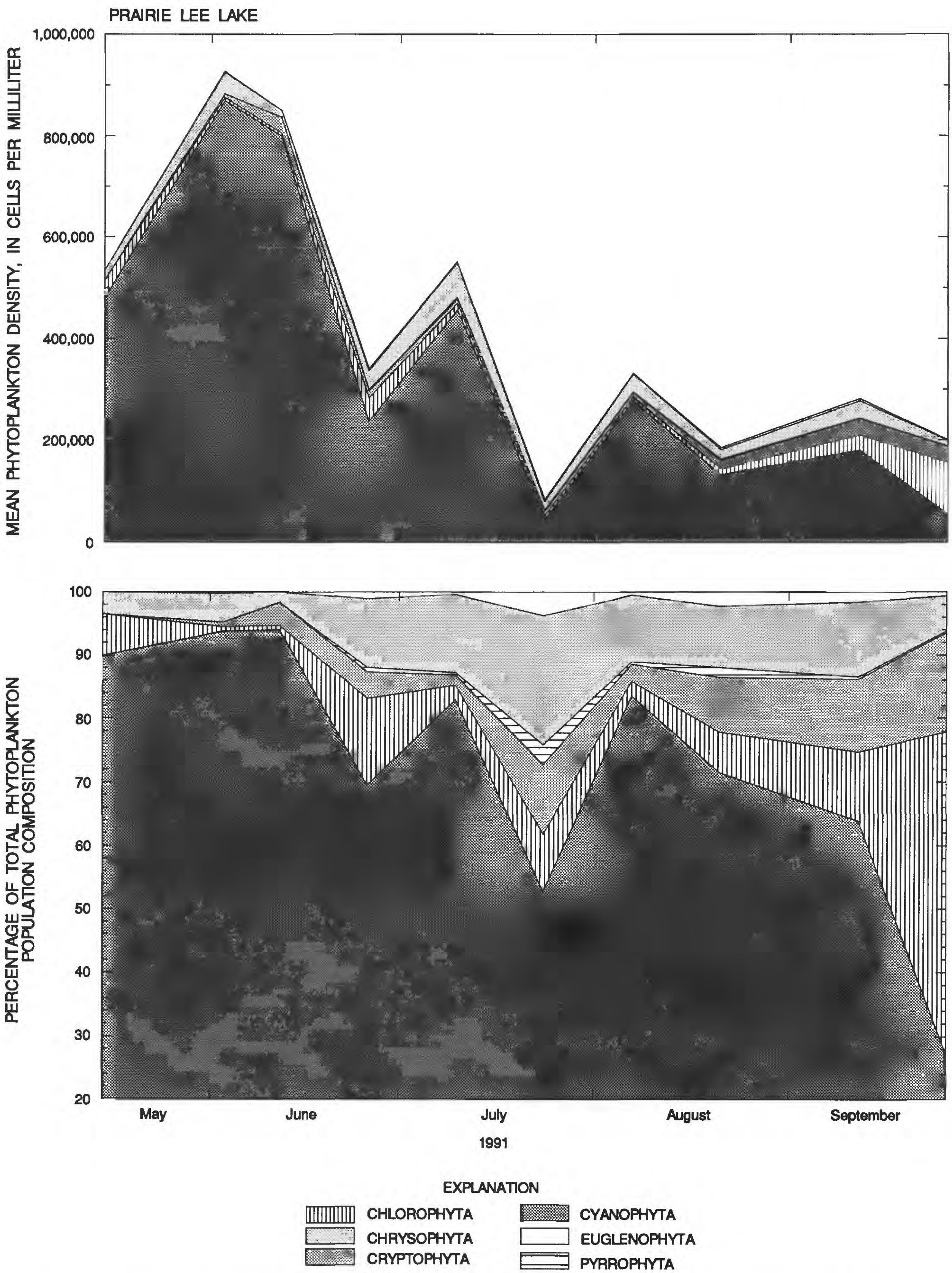


Figure 18. Phytoplankton density and composition by taxonomic division from surface samples from three reservoirs in west-central Missouri.

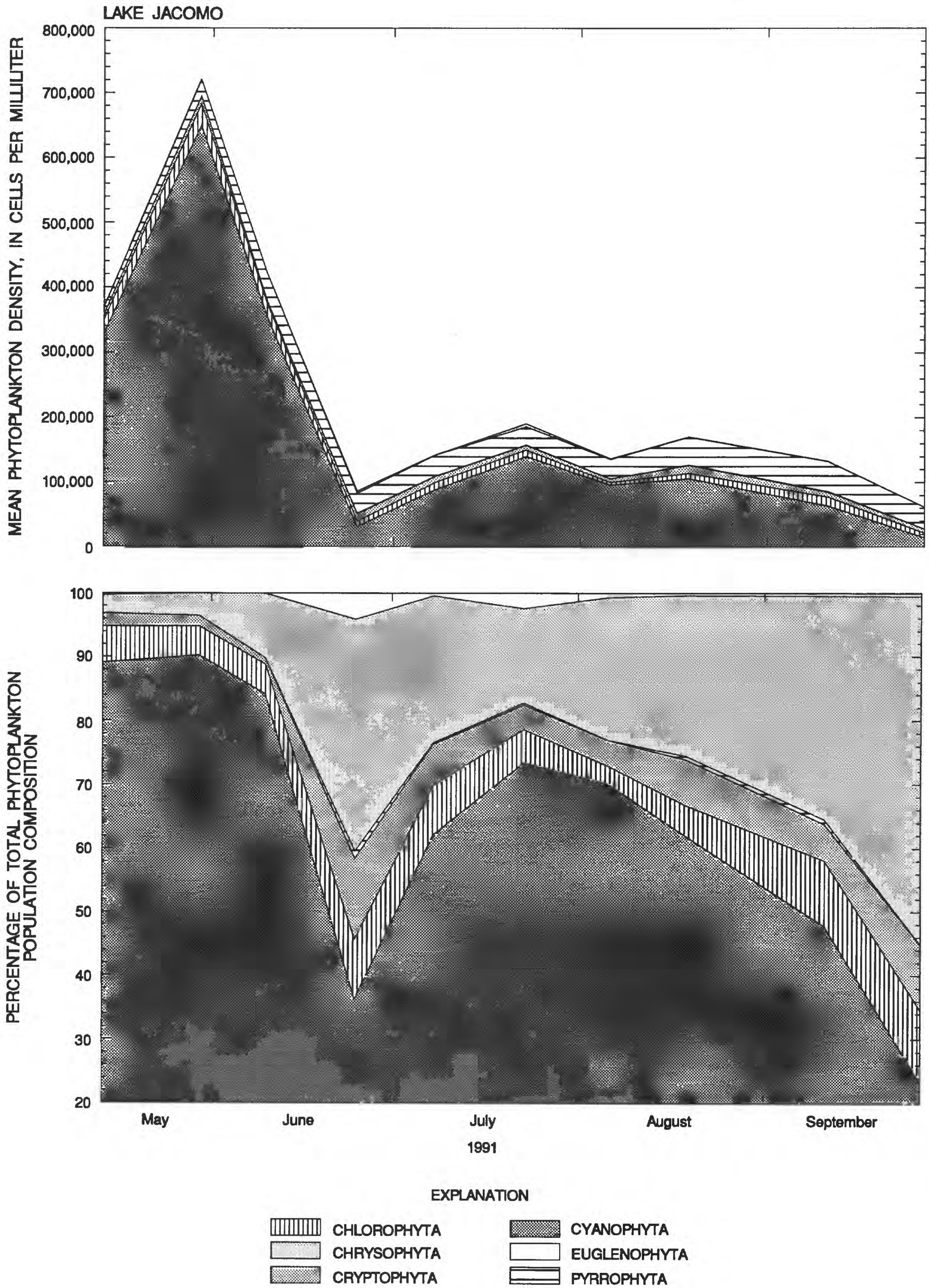


Figure 18. Phytoplankton density and composition by taxonomic division from surface samples from three reservoirs in west-central Missouri--Continued.

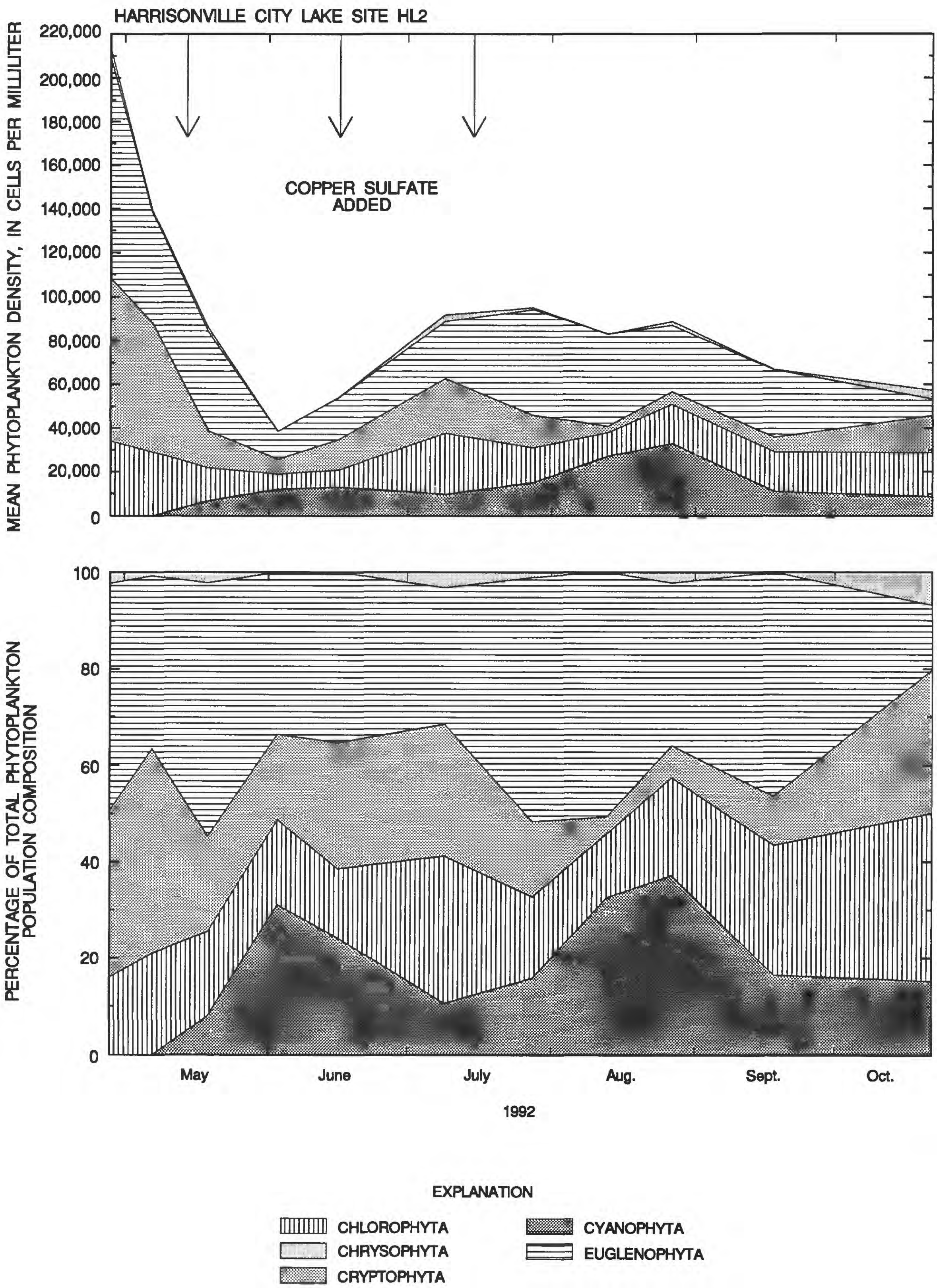


Figure 18. Phytoplankton density and composition by taxonomic division from surface samples from three reservoirs in west-central Missouri--Continued.

algae and commonly are associated with taste, odor, and aesthetic concerns in lakes and reservoirs. In the summer, when temperatures are high and inorganic nutrients are low, many cyanophytes are capable of fixing elemental N, thus enabling them, in part, to dominate other types of phytoplankton once they are established in a lake or reservoir (Bush and Welch, 1972). The mean surface phytoplankton density in Prairie Lee Lake reached a summer low in July 1991 following a second summer peak in the phytoplankton population. The cell density remained relatively low in the August and September samples, and the composition began to diversify near the end of September when the phytoplankton population became dominated by chlorophytes (primarily *Ankistrodesmus sp.*) rather than the cyanophyte species (fig. 18). This change in the phytoplankton composition may be explained by the introduction of additional nutrients, which may have been at growth-limiting levels for many of the other phytoplankton species, into the surface waters after fall destratification (Shapiro, 1973).

The temporal distribution of mean phytoplankton density in surface samples from Lake Jacomo indicates the May 30, 1991, samples contained the highest mean phytoplankton density at about 725,000 cells/mL, and the population was dominated by cyanophytes (primarily *Aphanocapsa delicatissima*; table 22; fig. 18). There was a decline in the algal population in the June 25, 1991, samples to less than 100,000 cells/mL, and a larger part of the population was comprised of chrysophytes. In the September 27, 1991, samples, the population was dominated by chrysophytes (primarily unknown flagellates), which comprised 55 percent of the total phytoplankton population (fig. 18).

The temporal distribution of phytoplankton density at Harrisonville City Lake was determined using results from surface samples from site HL2 because this site was sampled more frequently during the summer months than the remaining two sites (fig. 18; table 22). One hundred and fifty pounds of copper sulfate was added to the west arm of the reservoir in mid-May, mid-June, and mid-July by the city of Harrisonville to control phytoplankton density near the drinking-water supply intake structure (fig. 3), but the effects of this treatment on the phytoplankton population were not determined.

The maximum phytoplankton density in surface samples from site HL2 was about 210, 000 cells/mL on April 28, 1992, and the minimum was about 40,000 cells/mL on June 3, 1992 (fig. 18). Phytoplankton of the division Chrysophyta (primarily unknown flagellates) comprised the largest part of the population in all but the August 27 and October 22, 1992, samples. Cyanophytes were not detected in the April 28, 1992, sample, but comprised about 30 percent of the population by June 3, 1992 (primarily *Anacystis sp.*). The largest percentage of cyanophytes (primarily *Oscillatoria sp.*) in the phytoplankton population was 35 percent in the August 27, 1992, sample. Chlorophytes (primarily *Scenedesmus sp.*) dominated the phytoplankton population in the October 22, 1992, sample.

Zooplankton

Zooplankton, microscopic free floating animals, are grazers of phytoplankton and the primary food source of fish. Zooplankton are, therefore, an important component of the food chain in aquatic ecosystems. The dominant zooplankton in samples collected from Harrisonville City Lake included two genera of rotifers, five genera of cladocerans, and four genera of copepods (table 23, at the back of this report). These genera are common in Missouri reservoirs (John Havel, Southwest Missouri State University, written commun., 1993) and in other regions of North America (Edmondson, 1959). A notable feature of the October sample was the presence of *Daphnia lumholtzi*, an exotic but increasingly common species in Missouri reservoirs (John Havel, written commun., 1993). Copepod densities generally were greater than the density of cladocerans or rotifers in the April through August 1992 samples (fig. 19). There was a substantial increase in the cladoceran population in September, and was the largest part of the zooplankton population in September and October. The rotifer population was relatively small throughout the sampling period.

Zooplankton population dynamics are difficult to discern and are affected by numerous factors, including reservoir conditions, phytoplankton population density and composition, interactions with other zooplankton, and feeding characteristics of the vertebrate population. The dominant rotifer detected was *Asplanchna*, which preys on algae and small zooplankton. The dominant cladoceran genera sampled included *Daphnia* and *Bosmina*. Most cladocerans feed on particulate matter filtered from the water column. The copepod population was dominated by species in the genera *Diaptomus* that mainly feed on

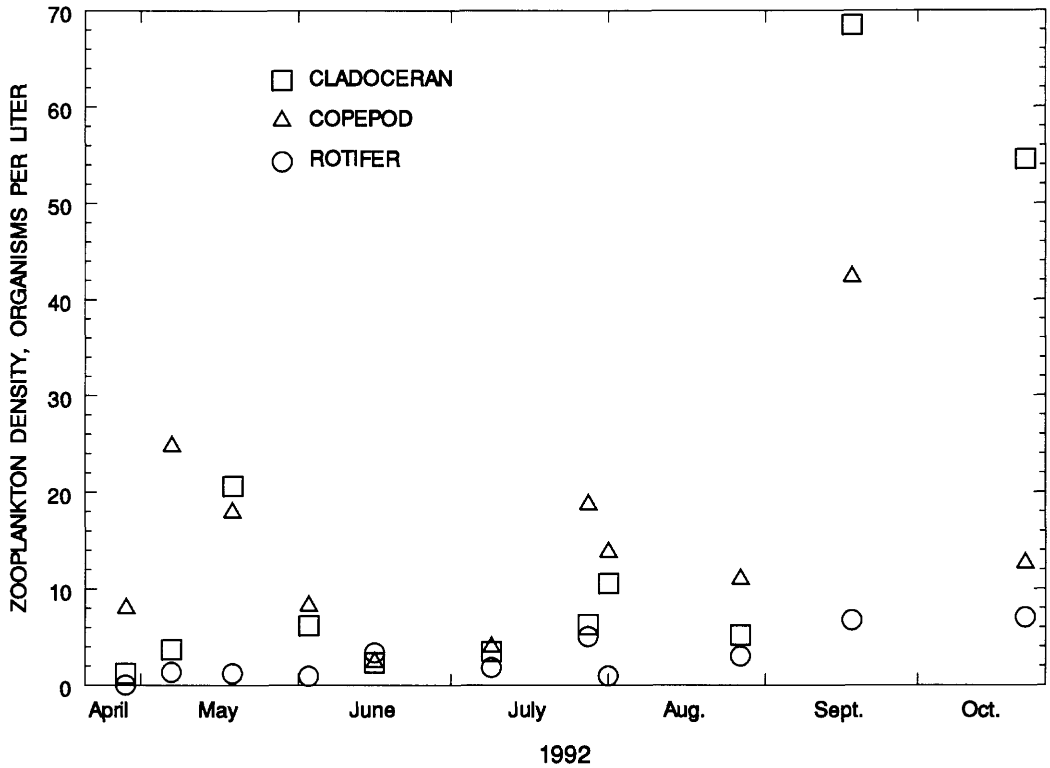


Figure 19. Zooplankton density by taxa, Harrisonville City Lake, west-central Missouri, site HL2.

detritus and phytoplankton (Wetzel, 1983). The autumn peak in zooplankton population could be the result of the increased diversity in the phytoplankton population that corresponded with the onset of fall destratification.

SUMMARY AND CONCLUSIONS

Water and bottom sediments were sampled in Prairie Lee Lake and Lake Jacomo, Jackson County, Missouri, from May 1991 through April 1992, and were sampled in Harrisonville City Lake, Cass County, from April 1992 through March 1993, to determine general physical, chemical, and biological characteristics of these reservoirs. Water from the major inflows to each reservoir were sampled to determine relative nutrient and sediment contributions from the tributary basins.

Approximately 1,180 acre-feet of sediment had accumulated in Prairie Lee Lake since the dam was built during 1939, resulting in a 29 percent loss in the original reservoir volume. In Lake Jacomo, approximately 1,910 acre-feet have been deposited since 1959, resulting in an 8 percent loss in original volume. Harrisonville City Lake has accumulated an estimated 1,130 acre-feet of sediment since 1972, resulting in a 14 percent loss in volume.

The differences in median values of water-clarity characteristics of the reservoirs, including Secchi depth, suspended solids, suspended sediment, and chlorophyll *a*, were compared between sites within an individual reservoir to determine if these differences were significant. The only significant difference detected was in Secchi depth values between Lake Jacomo sites LJ1, LJ2, and LJ3 (Kruskal-Wallis test, $\alpha = 0.05$). It seems that Secchi depths were significantly lower at site LJ1 because of effects from the outflows of Prairie Lee Lake.

Suspended sediment was the water-clarity characteristics that had the highest correlation with Secchi depth in each reservoir. The correlations were low, however, and Spearman's rank order correlation coefficients for this relation ranged from -0.12 at Harrisonville City Lake to -0.46 at Prairie Lee Lake.

There were no significant differences in physical properties and chemical constituents between surface sites at any of the three individual reservoirs. There were, however, significant differences (Kruskal-Wallis test, $\alpha = 0.05$) detected in median specific conductance, alkalinity, total ammonia, and total orthophosphate between some bottom sites within individual reservoirs. These differences can be attributed to the variable effects of thermal stratification and corresponding period of anoxic conditions with water depth.

The temporal distribution of the total nitrogen to total phosphorus ratio calculated from surface water samples in the reservoirs indicate that phosphorus is the nutrient limiting phytoplankton production throughout the spring and summer months. The data are less conclusive during the fall and winter months in Lake Jacomo and Harrisonville City Lake, and additional analyses would be needed to determine the limiting nutrient during these periods.

Water samples from Harrisonville City Lake were analyzed for 20 pesticides, and concentrations of 9 of the 20 pesticides exceeded detection limits. The pesticides detected included atrazine, desethylatrazine, deisopropylatrazine, metolachlor, ametryn, propazine, alachlor, 2,4-D, and cyanazine. Atrazine concentrations were greater than the Federal health-based maximum contaminant level of 3 micrograms per liter in all surface and bottom samples collected between late April and early November 1992. The mean concentration of atrazine in 36 surface samples was 2.8 micrograms per liter and the mean concentration of atrazine in 11 bottom water samples was 3.3 micrograms per liter. None of the remaining eight pesticides detected exceeded health-based limits.

The trophic condition of the reservoirs were determined using the Trophic-State Index that uses Secchi depths, chlorophyll concentrations, and total phosphorus concentrations. The results were inconsistent over time and between index values, but all three reservoirs can be classified as mesotrophic to eutrophic. The trophic condition of the three reservoirs also was determined using a classification generated for Missouri lakes and reservoirs using chlorophyll *a*, total nitrogen, and total phosphorus concentrations. Based on these criteria, Prairie Lee Lake is classified as eutrophic, and Lake Jacomo and Harrisonville City Lake are classified as mesotrophic to eutrophic.

The major inflows to each of the three reservoirs were sampled during stormwater runoff and analyzed for suspended solids, ammonia, nitrate, and total phosphorus to determine relative contributions of these constituents. The outflow from Prairie Lee Lake is the major inflow to Lake Jacomo. Based on samples from concurrent storms, the mass and mass per acre loads of suspended solids, ammonia, nitrate, and total phosphorus in Prairie Lee Lake outflow were about one-third the loads of Prairie Lee Lake inflows, indicating Prairie Lee Lake is a sediment and nutrient "trap." The mass per acre contributions of ammonia and nitrate from direct precipitation on Prairie Lee Lake, Lake Jacomo, and Harrisonville City Lake exceeded loads from tributary inflows for most storms.

The Harrisonville City Lake tributaries were sampled for 13 pesticides monthly from April 1992 through June or July 1993 and during selected storms. Seven of the 13 herbicides were detected, including atrazine, desethylatrazine, metolachlor, deisopropylatrazine, alachlor, propazine, and prometon. Atrazine concentrations ranged from 0.12 to 28.1 micrograms per liter and exceeded the maximum contaminant level in three samples.

The spring and summer phytoplankton population in Prairie Lee Lake samples was dominated by cyanophytes. By late summer the chlorophytes became dominant in Prairie Lee Lake, and chrysophytes became dominant in Lake Jacomo possibly as the result of additional nutrient availability following destratification. The phytoplankton population in Harrisonville City Lake was dominated by chrysophytes during much of the spring and summer of 1992. Cyanophytes comprised the largest proportion of the phytoplankton population in late August samples, and in October samples, chlorophytes were the dominant taxa.

The three study reservoirs receive non-point sources of runoff from anthropogenic disturbances in the tributary basins. In the case of Prairie Lee Lake Basin, residential construction from continuing urbanization has contributed to high sediment deposition in the reservoir. Results indicate that suspended solids and nutrient concentrations in Prairie Lee Lake inflows are substantially greater than those for Prairie Lee Lake outflows. Prairie Lee Lake can be a settling basin for stormwater runoff entering Lake Jacomo, but this function is limited by the low retention time of the reservoir—a factor that is continuously decreasing because the capacity of the reservoir is decreasing. Sediment, nutrients, and pesticides enter Harrisonville City Lake largely because of agricultural practices. Whereas nutrient loads may not pose a large threat to the water quality in this reservoir at this time (1994), sediment deposition and pesticide concentrations, primarily herbicides, are threatening the effective uses of this reservoir.

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TABLES

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Table 9. Summary statistics of selected physical properties and chemical constituents from three reservoirs in west-central Missouri

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; $CaCO_3$, calcium carbonate; <, less than]

Physical property or constituent	Number of samples	Maximum	Minimum	Median
Prairie Lee Lake--Site PL1 (east arm at surface)				
Specific conductance (µS/cm)	16	463	332	352
pH	16	8.9	7.4	8.2
Alkalinity, total (mg/L as $CaCO_3$)	16	136	100	114
Organic nitrogen, total (mg/L)	13	.90	.28	.45
Ammonia as nitrogen, total (mg/L)	16	.13	<.01	.03
Nitrate as nitrogen, total (mg/L)	15	.76	<.05	.20
Phosphorus, total (mg/L)	16	.05	<.01	.03
Orthophosphate as phosphorus, total (mg/L)	16	.02	<.01	.01
Prairie Lee Lake--Site PL1 (east arm at bottom)				
Specific conductance (µS/cm)	16	463	312	367
pH	16	8.2	7.4	7.8
Alkalinity, total (mg/L as $CaCO_3$)	16	136	98	118
Organic nitrogen, total (mg/L)	15	1.2	.32	.58
Ammonia as nitrogen, total (mg/L)	16	.43	<.01	.08
Nitrate as nitrogen, total (mg/L)	16	1.0	<.05	.34
Phosphorus, total (mg/L)	16	.06	<.01	.04
Orthophosphate as phosphorus, total (mg/L)	16	.06	<.01	.01
Prairie Lee Lake--Site PL2 (near dam at surface)				
Specific conductance (µS/cm)	17	458	334	358
pH	17	9.0	7.1	8.2
Alkalinity, total (mg/L as $CaCO_3$)	17	134	97	117
Organic nitrogen, total (mg/L)	12	.97	.28	.48
Ammonia as nitrogen, total (mg/L)	15	.13	<.01	.02
Nitrate as nitrogen, total (mg/L)	15	.92	<.05	.19
Phosphorus, total (mg/L)	15	.04	<.01	.03
Orthophosphate as phosphorus, total (mg/L)	15	.02	<.01	.01

Table 9. Summary statistics of selected physical properties and chemical constituents from three reservoirs in west-central Missouri--Continued

Physical property or constituent	Number of samples	Maximum	Minimum	Median
Prairie Lee Lake--Site PL2 (near dam at bottom)				
Specific conductance (µS/cm)	17	459	340	406
pH	17	8.5	7.1	7.5
Alkalinity, total (mg/L as $CaCO_3$)	17	159	117	134
Organic nitrogen, total (mg/L)	15	.80	.27	.59
Ammonia as nitrogen, total (mg/L)	15	2.1	.01	.43
Nitrate as nitrogen, total (mg/L)	15	.92	<.05	.21
Phosphorus, total (mg/L)	15	.17	.02	.05
Orthophosphate as phosphorus, total (mg/L)	15	.13	<.01	.02
Prairie Lee Lake--Site PL3 (west arm at surface)				
Specific conductance (µS/cm)	16	460	334	374
pH	16	8.9	7.3	8.3
Alkalinity, total (mg/L as $CaCO_3$)	16	150	96	116
Organic nitrogen, total (mg/L)	13	1.4	.37	.46
Ammonia as nitrogen, total (mg/L)	16	.13	<.01	.02
Nitrate as nitrogen, total (mg/L)	16	.90	<.05	.28
Phosphorus, total (mg/L)	16	.04	.01	.03
Orthophosphate as phosphorus, total (mg/L)	16	.02	<.01	.01
Prairie Lee Lake--Site PL3 (west arm at bottom)				
Specific conductance (µS/cm)	15	469	333	392
pH	16	8.1	7.3	7.6
Alkalinity, total (mg/L as $CaCO_3$)	16	136	114	128
Organic nitrogen, total (mg/L)	16	.87	.28	.47
Ammonia as nitrogen, total (mg/L)	16	.96	<.01	.16
Nitrate as nitrogen, total (mg/L)	16	.89	<.05	.39
Phosphorus, total (mg/L)	16	.10	<.01	.05
Orthophosphate as phosphorus, total (mg/L)	16	.05	<.01	.02

Table 9. Summary statistics of selected physical properties and chemical constituents from three reservoirs in west-central Missouri--Continued

Physical property or constituent	Number of samples	Maximum	Minimum	Median
Lake Jacomo--Site LJ1 (south site at surface)				
Specific conductance (µS/cm)	17	372	311	329
pH	17	8.5	7.9	8.2
Alkalinity, total (mg/L as $CaCO_3$)	17	130	112	121
Organic nitrogen, total (mg/L)	11	.76	.24	.49
Ammonia as nitrogen, total (mg/L)	16	.11	<.01	.02
Nitrate as nitrogen, total (mg/L)	16	.08	<.05	<.05
Phosphorus, total (mg/L)	16	.05	<.01	.03
Orthophosphate as phosphorus, total (mg/L)	16	.02	<.01	.01
Lake Jacomo--Site LJ1 (south site at bottom)				
Specific conductance (µS/cm)	16	368	314	327
pH	17	8.5	7.6	8.1
Alkalinity, total (mg/L as $CaCO_3$)	17	132	115	121
Organic nitrogen, total (mg/L)	14	1.1	.32	.48
Ammonia as nitrogen, total (mg/L)	15	.13	<.01	.03
Nitrate as nitrogen, total (mg/L)	15	.12	<.05	<.05
Phosphorus, total (mg/L)	15	.07	<.01	.04
Orthophosphate as phosphorus, total (mg/L)	15	.03	<.01	.01
Lake Jacomo--Site LJ2 (central site at surface)				
Specific conductance (µS/cm)	16	359	308	328
pH	16	8.8	7.8	8.4
Alkalinity, total (mg/L as $CaCO_3$)	16	131	109	119
Organic nitrogen, total (mg/L)	13	1.1	.34	.48
Ammonia as nitrogen, total (mg/L)	16	.10	<.01	.02
Nitrate as nitrogen, total (mg/L)	16	.08	<.05	<.05
Phosphorus, total (mg/L)	16	.04	<.01	.03
Orthophosphate as phosphorus, total (mg/L)	16	.03	<.01	.01

Table 9. Summary statistics of selected physical properties and chemical constituents from three reservoirs in west-central Missouri--Continued

Physical property or constituent	Number of samples	Maximum	Minimum	Median
Lake Jacomo--Site LJ2 (central site at bottom)				
Specific conductance (μS/cm)	15	373	326	345
pH	16	8.4	7.5	7.9
Alkalinity, total (mg/L as $CaCO_3$)	16	160	120	128
Organic nitrogen, total (mg/L)	16	.97	.34	.54
Ammonia as nitrogen, total (mg/L)	16	.62	.01	.06
Nitrate as nitrogen, total (mg/L)	16	.09	<.05	<.05
Phosphorus, total (mg/L)	16	.37	<.01	.04
Orthophosphate as phosphorus, total (mg/L)	16	.32	<.01	.02
Lake Jacomo--Site LJ3 (near dam at surface)				
Specific conductance (μS/cm)	17	358	307	325
pH	17	8.6	7.7	8.4
Alkalinity, total (mg/L as $CaCO_3$)	17	129	103	121
Organic nitrogen, total (mg/L)	11	.58	.33	.49
Ammonia as nitrogen, total (mg/L)	16	.11	<.01	.02
Nitrate as nitrogen, total (mg/L)	16	.09	<.05	<.05
Phosphorus, total (mg/L)	16	.05	<.01	.02
Orthophosphate as phosphorus, total (mg/L)	16	.02	<.01	.01
Lake Jacomo--Site LJ3 (near dam at bottom)				
Specific conductance (μS/cm)	17	392	320	351
pH	17	8.4	7.5	7.7
Alkalinity, total (mg/L as $CaCO_3$)	17	170	122	131
Organic nitrogen, total (mg/L)	14	.75	.27	.59
Ammonia as nitrogen, total (mg/L)	16	1.2	<.01	.12
Nitrate as nitrogen, total (mg/L)	16	.19	<.05	<.05
Phosphorus, total (mg/L)	16	.58	.01	.06
Orthophosphate as phosphorus, total (mg/L)	16	.56	<.01	.04

Table 9. Summary statistics of selected physical properties and chemical constituents from three reservoirs in west-central Missouri--Continued

Physical property or constituent	Number of samples	Maximum	Minimum	Median
Harrisonville City Lake--Site HL1 (south arm at surface)				
Specific conductance (µS/cm)	12	300	255	278
pH	12	8.7	7.7	8.2
Alkalinity, total (mg/L as $CaCO_3$)	12	126	96	112
Organic nitrogen, total (mg/L)	7	.62	.39	.49
Ammonia as nitrogen, total (mg/L)	12	.16	<.01	.05
Nitrate as nitrogen, total (mg/L)	12	1.2	<.05	.40
Phosphorus, total (mg/L)	12	.20	<.01	.03
Orthophosphate as phosphorus, total (mg/L)	12	.12	<.01	.01
Harrisonville City Lake--Site HL2 (near dam at surface)				
Specific conductance (µS/cm)	17	304	256	287
pH	17	8.7	7.4	8.0
Alkalinity, total (mg/L as $CaCO_3$)	17	129	100	113
Organic nitrogen, total (mg/L)	11	1.1	.36	.51
Ammonia as nitrogen, total (mg/L)	16	.18	.02	.06
Nitrate as nitrogen, total (mg/L)	16	4.7	<.05	.39
Phosphorus, total (mg/L)	16	.14	<.01	.04
Orthophosphate as phosphorus, total (mg/L)	16	.09	<.01	.01
Harrisonville City Lake--Site HL2 (near dam at bottom)				
Specific conductance (µS/cm)	16	410	246	323
pH	16	8.1	6.9	7.6
Alkalinity, total (mg/L as $CaCO_3$)	16	211	104	131
Organic nitrogen, total (mg/L)	13	1.0	.07	.56
Ammonia as nitrogen, total (mg/L)	16	2.5	.06	.52
Nitrate as nitrogen, total (mg/L)	16	1.6	<.05	<.05
Phosphorus, total (mg/L)	16	.42	<.01	.07
Orthophosphate as phosphorus, total (mg/L)	16	.36	<.01	.05

Table 9. Summary statistics of selected physical properties and chemical constituents from three reservoirs in west-central Missouri--Continued

Physical property or constituent	Number of samples	Maximum	Minimum	Median
Harrisonville City Lake--Site HL3 (west arm at surface)				
Specific conductance (μS/cm)	12	300	198	281
pH	12	8.6	7.6	8.0
Alkalinity, total (mg/L as $CaCO_3$)	12	125	74	112
Organic nitrogen, total (mg/L)	8	.68	.39	.48
Ammonia as nitrogen, total (mg/L)	12	.13	.01	.04
Nitrate as nitrogen, total (mg/L)	12	1.3	<.05	.46
Phosphorus, total (mg/L)	12	.13	<.01	.03
Orthophosphate as phosphorus, total (mg/L)	12	.08	<.01	.01

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri

[Concentrations are dissolved in micrograms per liter; <, less than; --, no data available]

Site identifier (fig. 3)	Date	Dissolved									
		Alachlor	Ametryn	Atrazine	Cyanazine	Desethyl-atrazine	Deiso-propyl-atrazine	Metol-achlor	Metribuzin	Prometon	Prometryn
					Harrisonville City Lake, south arm at surface						
HL1	04-28-92	<0.05	<0.05	3.66	<0.05	0.83	0.23	0.86	<0.05	<0.05	<0.05
	05-19-92	<.05	<.05	3.68	<.05	.76	.23	.63	<.05	<.05	<.05
	06-16-92	<.05	<.05	3.62	<.05	.80	.26	.63	<.05	<.05	<.05
	07-28-92	<.05	.05	3.45	<.05	.72	.26	.35	<.05	<.05	<.05
	08-27-92	<.05	.07	3.43	<.05	.89	.27	.36	<.05	<.05	<.05
	09-18-92	.09	.06	3.32	<.05	.82	.23	.30	<.05	<.05	<.05
	D09-18-92	.18	.07	3.33	<.05	.82	.23	.30	<.05	<.05	<.05
	10-22-92	<.05	.08	3.55	<.05	1.0	.32	.26	<.05	<.05	<.05
	11-04-92	<.05	.07	3.06	<.05	.91	.26	.24	<.05	<.05	<.05
	12-08-92	<.05	.06	2.33	<.05	.60	.18	.20	<.05	<.05	<.05
	D12-08-92	<.05	.06	2.28	<.05	.70	.21	.21	<.05	<.05	<.05
	01-27-93	<.05	<.05	.66	<.05	.20	.05	.14	<.05	<.05	<.05
	02-24-93	<.05	<.05	1.29	<.05	.46	.27	.13	<.05	<.05	<.05
	D02-24-93	<.05	<.05	1.33	<.05	.47	.12	.13	<.05	<.05	<.05
	03-24-93	<.05	<.05	1.04	<.05	.33	.09	.09	<.05	<.05	<.05
					Harrisonville City Lake, south arm at bottom						
HL1	05-19-92	<0.05	<0.05	4.30	<0.05	0.80	0.42	0.88	<0.05	<0.05	<0.05
	06-16-92	<.05	<.05	3.98	<.05	.83	.25	.73	<.05	<.05	<.05
	07-28-92	<.05	.06	3.49	<.05	.78	.27	.42	<.05	<.05	<.05
	D07-28-92	<.05	.06	3.49	<.05	.79	.25	.41	<.05	<.05	<.05
	08-27-92	<.05	.06	3.06	<.05	.71	.21	.31	<.05	<.05	<.05
	09-18-92	.09	.06	3.34	<.05	.81	.23	.30	<.05	<.05	<.05

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri–Continued

Site identifier (fig. 3)	Date	Dissolved			Total						
		Propazine	Simazine	Terbutryn	Aldicarb, total	Carbofuran, total	Methyl parathion, total	Pendi-methalin, total	Propachlor, total	Trifluralin, total	2,4-D, total
				Harrisonville City Lake, south arm at surface--Continued							
HL1	04-28-92	<0.05	<0.05	<0.05	--	--	--	--	--	--	--
	05-19-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	06-16-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	07-28-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	08-27-92	.05	<.05	<.05	--	--	--	--	--	--	--
	09-18-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	[D]09-18-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	10-22-92	.05	<.05	<.05	<1.00	<1.50	<0.30	<0.03	<0.10	<0.02	<0.05
	11-04-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	12-08-92	<.05	<.05	<.05	--	--	<.30	<.03	<.10	<.02	<.05
	[D]12-08-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	01-27-93	<.05	<.05	<.05	--	--	<.30	<.03	<.10	<.02	<.05
	02-24-93	<.05	<.05	<.05	<1.00	<1.50	<.30	<.03	<.10	<.02	<.05
	[D]02-24-93	<.05	<.05	<.05	--	--	--	--	--	--	--
	03-24-93	<.05	<.05	<.05	<1.00	<1.50	<.30	<.03	<.10	<.02	<.35
				Harrisonville City Lake, south arm at bottom--Continued							
HL1	05-19-92	<0.05	<0.05	<0.05	--	--	--	--	--	--	--
	06-16-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	07-28-92	.05	<.05	<.05	--	--	--	--	--	--	--
	[D]07-28-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	08-27-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	09-18-92	<.05	<.05	<.05	--	--	--	--	--	--	--

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri–Continued

Site identifier (fig. 3)	Date	Dissolved									
		Alachlor	Ametryn	Atrazine	Cyanazine	Desethyl-atrazine	Deiso-propyl-atrazine	Metol-achlor	Metribuzin	Prometon	Prometryn
		Harrisonville City Lake, near dam at surface									
HL2	04-28-92	<0.05	<0.05	3.90	<0.05	0.83	0.23	1.00	<0.05	<0.05	<0.05
	D04-28-92	<.05	<.05	3.54	<.05	.76	.21	.98	<.05	<.05	<.05
	05-19-92	<.05	<.05	3.65	<.05	.77	.23	.64	<.05	<.05	<.05
	06-16-92	<.05	<.05	3.58	<.05	.92	.48	.60	<.05	<.05	<.05
	07-28-92	<.05	.05	3.33	<.05	.68	.24	.33	<.05	<.05	<.05
	08-27-92	<.05	<.05	3.27	<.05	.85	.43	.47	<.05	<.05	<.05
	09-18-92	<.05	.06	3.31	<.05	.79	.21	.30	<.05	<.05	<.05
	10-22-92	<.05	.07	3.25	<.05	.85	.27	.22	<.05	<.05	<.05
	D10-22-92	<.05	.07	3.33	<.05	.85	.28	.23	<.05	<.05	<.05
	11-04-92	<.05	.09	3.56	<.05	1.1	.35	.30	<.05	<.05	<.05
	12-08-92	<.05	.06	2.30	<.05	.67	.18	.19	<.05	<.05	<.05
	01-27-93	<.05	<.05	1.09	<.05	.27	.06	.16	<.05	<.05	<.05
	02-24-93	<.05	<.05	1.36	<.05	.44	.11	.12	<.05	<.05	<.05
	03-24-93	<.05	<.05	1.07	<.05	.34	.09	.10	<.05	<.05	<.05
	D03-24-93	<.05	<.05	1.05	<.05	.33	.09	.10	<.05	<.05	<.05

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri--Continued

Site identifier (fig. 3)	Date	Dissolved			Total						
		Propazine	Simazine	Terbutryn	Aldicarb, total	Carbofuran, total	Methyl parathion, total	Pendi-methalin, total	Propachlor, total	Trifluralin, total	2,4-D, total
Harrisonville City Lake, near dam at surface--Continued											
HL2	04-28-92	<0.05	<0.05	<0.05	--	--	--	--	--	--	--
	D04-28-92	<.05	<.05	--	--	--	--	--	--	--	--
	05-19-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	06-16-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	07-28-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	08-27-94	<.05	<.05	<.05	--	--	--	--	--	--	--
	09-18-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	10-22-92	<.05	<.05	<.05	<1.00	<1.50	<0.30	<0.03	<0.10	<0.02	<0.05
	D10-22-92	<.05	<.05	<.05	--	--	<.30	<.03	<.10	<.02	<.02
	11-04-92	.05	<.05	<.05	--	--	--	--	--	--	--
	12-08-92	<.05	<.05	<.05	--	--	<.30	<.03	<.10	<.02	--
	01-27-93	<.05	<.05	<.05	--	--	<.30	<.03	<.10	<.02	<.05
	02-24-93	<.05	<.05	<.05	<1.00	<1.50	<.30	<.03	<.10	<.02	<.05
	03-24-93	<.05	<.05	<.05	<1.00	<1.50	<.30	<.03	<.10	<.02	.32
	D03-24-93	<.05	<.05	<.05	--	--	--	--	--	--	--

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri–Continued

Site identifier (fig. 3)	Date	Dissolved									
		Alachlor	Ametryn	Atrazine	Cyanazine	Desethyl-atrazine	Deiso-propyl-atrazine	Metol-achlor	Metribuzin	Prometon	Prometryn
					Harrisonville City Lake, near dam at bottom						
HL2	04-28-92	<0.05	<0.05	4.29	<0.05	0.78	0.22	1.48	<0.05	<0.05	<0.05
	05-19-92	<.05	<.05	4.67	<.05	.73	.59	1.17	<.05	<.05	<.05
	06-16-92	<.05	<.05	3.75	.13	.75	<.05	.54	<.05	<.05	<.05
	07-28-92	<.05	.06	3.98	<.05	.66	.23	.60	<.05	<.05	<.05
	D07-28-92	<.05	.06	4.34	<.05	.71	.40	.71	<.05	<.05	<.05
	08-27-92	<.05	.07	4.45	<.05	.77	.21	.64	<.05	<.05	<.05
	09-18-92	<.05	.08	4.12	<.05	.79	.20	.64	<.05	<.05	<.05
	D09-18-92	<.05	.08	4.36	<.05	.83	.21	.72	<.05	<.05	<.05
	10-22-92	<.05	.08	3.78	<.05	1.0	.40	.27	<.05	<.05	<.05
	11-04-92	<.05	.07	3.18	<.05	.74	.20	.25	<.05	<.05	<.05
HL2	12-08-92	<.05	.06	2.36	<.05	.71	.19	.24	<.05	<.05	<.05
	01-27-93	<.05	<.05	.82	<.05	.30	.08	.12	<.05	<.05	<.05
	D01-27-93	<.05	<.05	.97	<.05	.33	.08	.10	<.05	<.05	<.05
	03-24-93	<.05	<.05	1.07	<.05	.34	.08	.10	<.05	<.05	<.05

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri--Continued

Site identifier (fig. 3)	Date	Dissolved			Total						
		Propazine	Simazine	Terbutryn	Aldicarb, total	Carbofuran, total	Methyl parathion, total	Pendi-methalin, total	Propachlor, total	Trifluralin, total	2,4-D, total
Harrisonville City Lake, near dam at bottom--Continued											
HL2	04-28-92	0.21	<0.05	<0.05	--	--	--	--	--	--	--
	05-19-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	06-16-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	07-28-92	.05	<.05	<.05	--	--	--	--	--	--	--
	[D]07-28-92	.06	<.05	<.05	--	--	--	--	--	--	--
	08-27-92	.05	<.05	<.05	--	--	--	--	--	--	--
	09-18-92	.05	<.05	<.05	--	--	--	--	--	--	--
	[D]09-18-92	.06	<.05	<.05	--	--	--	--	--	--	--
	10-22-92	.05	<.05	<.05	--	--	--	--	--	--	--
	11-04-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	12-08-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	01-27-93	<.05	<.05	<.05	--	--	--	--	--	--	--
	[D]01-27-93	<.05	<.05	<.05	--	--	--	--	--	--	--
	03-24-93	<.05	<.05	<.05	--	--	--	--	--	--	--

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri--Continued

Site identifier (fig. 3)	Date	Dissolved									
		Alachlor	Ametryn	Atrazine	Cyanazine	Desethyl-atrazine	Deiso-propyl-atrazine	Metol-achlor	Metribuzin	Prometon	Prometryn
				Harrisonville City Lake, near dam at metalimnion							
HL2	05-19-92	<0.05	<0.05	3.72	<0.05	0.75	0.20	0.67	<0.05	<0.05	<0.05
	06-16-92	<.05	<.05	4.11	<.05	.75	.24	.92	<.05	<.05	<.05
	07-28-92	<.05	.07	3.42	<.05	.71	.26	.38	<.05	<.05	<.05
	08-27-92	<.05	.06	3.24	<.05	.79	.24	.33	<.05	<.05	<.05
	09-18-92	<.05	.07	3.60	<.05	.87	.23	.36	<.05	<.05	<.05
				Harrisonville City Lake, west arm at surface							
HL3	04-28-92	<0.05	<0.05	3.88	<0.05	0.78	0.22	1.08	<0.05	<0.05	<0.05
	05-19-92	<.05	<.05	3.78	<.05	.79	.22	.65	<.05	<.05	<.05
	[D]05-19-92	<.05	<.05	3.72	<.05	.79	.22	.65	<.05	<.05	<.05
	06-16-92	<.05	<.05	4.17	<.05	1.0	.33	.64	<.05	<.05	<.05
	07-28-92	<.05	.05	3.38	<.05	.75	.21	.35	<.05	<.05	<.05
	08-27-92	<.05	.06	3.73	<.05	.82	.21	.34	<.05	<.05	<.05
	09-18-92	<.05	.07	3.58	<.05	.86	.22	.31	<.05	<.05	<.05
	10-22-92	<.05	.07	3.18	<.05	.90	.28	.24	<.05	<.05	<.05
	11-04-92	<.05	.05	3.34	<.05	.67	.22	.13	<.05	<.05	<.05
	12-08-92	<.05	.05	2.17	<.05	.64	.18	.20	<.05	<.05	<.05
	01-27-93	<.05	<.05	.55	<.05	.17	.05	.09	<.05	<.05	<.05
	02-24-93	<.05	<.05	1.31	<.05	.42	.11	.12	<.05	<.05	<.05
	03-24-93	<.05	<.05	1.04	<.05	.33	.09	.09	<.05	<.05	<.05
	[D]03-24-93	<.05	<.05	1.23	<.05	.42	.15	.11	<.05	<.05	<.05

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri--Continued

Site identifier (fig. 3)	Date	Dissolved			Total						
		Propazine	Simazine	Terbutryn	Aldicarb, total	Carbofuran, total	Methyl parathion, total	Pendi-methalin, total	Propachlor, total	Trifluralin, total	2,4-D, total
Harrisonville City Lake, near dam at metalimnion--Continued											
HL2	05-19-92	<0.05	<0.05	<0.05	--	--	--	--	--	--	--
	06-16-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	07-28-92	.06	<.05	<.05	--	--	--	--	--	--	--
	08-27-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	09-18-92	<.05	<.05	<.05	--	--	--	--	--	--	--
Harrisonville City Lake, west arm at surface--Continued											
HL3	04-28-92	<0.05	<0.05	<0.05	--	--	--	--	--	--	--
	05-19-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	D05-19-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	06-16-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	07-28-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	08-27-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	09-18-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	10-22-92	<.05	<.05	<.05	<1.00	<1.50	<0.30	<0.03	<0.10	<0.25	<0.02
	11-04-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	12-08-92	<.05	<.05	<.05	--	--	<.30	<.03	<.10	<.02	<.05
	01-27-93	<.05	<.05	<.05	--	--	<.30	<.03	<.10	<.02	<.05
	02-24-93	<.05	<.05	<.05	<1.00	<1.50	<.30	<.03	<.10	<.02	<.05
	03-24-93	<.05	<.05	<.05	<1.00	<1.50	<.30	<.03	<.10	<.02	.35
	D03-24-93	<.05	<.05	<.05	--	--	--	--	--	--	--

Table 10. Pesticide concentrations in water samples from Harrisonville City Lake, west-central Missouri—Continued

Site identifier (fig. 3)	Date	Dissolved									
		Alachlor	Ametryn	Atrazine	Cyanazine	Desethyl-atrazine	Deiso-propyl-atrazine	Metol-achlor	Metribuzin	Prometon	Prometryn
Harrisonville City Lake, west arm at bottom											
HL3	05-19-92	<0.05	<0.05	3.87	<0.05	0.73	0.19	0.77	<0.05	<0.05	<0.05
	06-16-92	<.05	<.05	4.06	<.05	.90	.27	.72	<.05	<.05	<.05
	07-28-92	<.05	.06	3.70	<.05	.75	.27	.41	<.05	<.05	<.05
	08-27-92	<.05	.06	3.68	<.05	.79	.20	.36	<.05	<.05	<.05
	[D]08-27-92	<.05	.05	3.09	<.05	.55	.12	.34	<.05	<.05	<.05
	09-18-92	<.05	.06	3.40	<.05	.81	.21	.28	<.05	<.05	<.05

Site identifier (fig. 3)	Date	Dissolved			Total						
		Propazine	Simazine	Terbutryn	Aldicarb, total	Carbofuran, total	Methyl parathion, total	Pendi-methalin, total	Propachlor, total	Trifluralin, total	2,4-D, total
Harrisonville City Lake, west arm at bottom--Continued											
HL3	05-19-92	<0.05	<0.05	<0.05	--	--	--	--	--	--	--
	06-16-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	07-28-92	.05	<.05	<.05	--	--	--	--	--	--	--
	08-27-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	[D]08-27-92	<.05	<.05	<.05	--	--	--	--	--	--	--
	09-18-92	<.05	<.05	<.05	--	--	--	--	--	--	--

[D] Duplicate sample.

Table 13. Pesticide concentrations in water samples from Harrisonville City Lake inflow sites, west-central Missouri

[Concentrations are dissolved in micrograms per liter; <, less than]

Site identifier (fig. 3)	Station number	Date	Alachlor	Ametryn	Atrazine	Cyanazine	Desethyl-atrazine	Deiso-propyl-atrazine
				South Fork Muddy Creek near Harrisonville				
HI1	384441094204301	04-30-92	<0.05	<0.05	0.12	<0.05	0.07	<0.05
		05-20-92	<.05	<.05	.28	<.05	.08	<.05
		06-17-92	<.05	<.05	.13	<.05	.05	<.05
		07-29-92	<.05	<.05	.33	<.05	.10	.06
		08-27-92	<.05	<.05	.56	<.05	.23	.08
		09-29-92	<.05	<.05	<.05	<.05	<.05	<.05
		10-22-92	<.05	<.05	.07	<.05	<.05	<.05
		11-04-92	<.05	<.05	.45	<.05	.19	.08
		[a]11-18-92	<.05	<.05	.85	<.05	.28	.12
		[D]11-18-92	<.05	<.05	.96	<.05	.31	.13
		12-08-92	<.05	<.05	.42	<.05	.18	.06
		01-27-93	<.05	<.05	.47	<.05	.16	.05
		02-24-93	<.05	<.05	.39	<.05	.15	<.05
		03-24-93	<.05	<.05	.38	<.05	.14	<.05
		[a]04-28-93	<.05	<.05	.74	<.05	.35	.18
		[a]07-01-93	<.05	<.05	9.48	<.05	1.33	.35

Table 13. Pesticide concentrations in water samples from Harrisonville City Lake inflow sites, west-central Missouri--Continued

Site identifier (fig. 3)	Date	Metol-achlor	Metribuzin	Prometon	Prometryn	Propazine	Simazine	Terbutryn
			South Fork Muddy Creek near Harrisonville--Continued					
HI1	04-30-92	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	05-20-92	.10	<.05	<.05	<.05	<.05	<.05	<.05
	06-17-92	<.05	<.05	<.05	<.05	<.05	<.05	<.05
	07-29-92	.08	<.05	<.05	<.05	<.05	<.05	<.05
	08-27-92	.26	<.05	<.05	<.05	<.05	<.05	<.05
	09-29-92	<.05	<.05	<.05	<.05	<.05	<.05	<.05
	10-22-92	<.05	<.05	<.05	<.05	<.05	<.05	<.05
	11-04-92	.12	<.05	<.05	<.05	<.05	<.05	<.05
	[a]11-18-92	.24	<.05	<.05	<.05	<.05	<.05	<.05
	[a]11-18-92	.31	<.05	<.05	<.05	<.05	<.05	<.05
	12-08-92	.12	<.05	<.05	<.05	<.05	<.05	<.05
	01-27-93	.12	<.05	<.05	<.05	<.05	<.05	<.05
	02-24-93	.06	<.05	<.05	<.05	<.05	<.05	<.05
	03-24-93	.05	<.05	<.05	<.05	<.05	<.05	<.05
	[a]04-28-93	.18	<.05	<.05	<.05	<.05	<.05	<.05
	[a]07-01-93	3.77	<.05	<.05	<.05	.12	<.05	<.05

Table 13. Pesticide concentrations in water samples from Harrisonville City Lake inflow sites, west-central Missouri–Continued

Site identifier (fig. 3)	Station number	Date	Alachlor	Ametryn	Atrazine	Cyanazine	Desethyl-atrazine	Deiso-propyl-atrazine
				Muddy Creek near Harrisonville				
HI2	384525094223301	04-30-92	<0.05	<0.05	1.88	<0.05	0.16	<0.05
		05-20-92	<.05	<.05	1.08	<.05	.11	<.05
		[a]11-22-92	<.05	<.05	.57	<.05	.21	.07
		12-08-92	<.05	<.05	.18	<.05	.10	<.05
		01-27-93	.07	<.05	.31	<.05	.12	<.05
		02-24-93	<.05	<.05	.15	<.05	.05	<.05
		03-24-93	<.05	<.05	.28	<.05	.14	<.05
		[a]04-13-93	<.05	<.05	.69	<.05	.26	.11
		[a]07-01-93	.07	<.05	1.82	<.05	.45	.19
				North Fork Muddy Creek near Harrisonville				
HI3	384613094223101	04-30-92	<0.05	<0.05	2.17	<0.05	0.32	0.07
		05-20-92	<.05	<.05	.60	<.05	.23	<.05
		06-17-92	<.05	<.05	.43	<.05	.25	<.05
		08-27-92	<.05	<.05	.08	<.05	.07	<.05
		11-04-92	<.05	<.05	3.11	<.05	.41	.12
		[a]11-19-92	.10	<.05	1.24	<.05	.58	.16
		12-08-92	.07	<.05	1.12	<.05	.50	.11
		01-27-93	.10	<.05	.48	<.05	.28	.07
		[D]01-27-93	.08	<.05	.64	<.05	.35	<.05
		02-24-93	.11	<.05	.40	<.05	.24	<.05
		03-24-93	.20	<.05	.31	<.05	.18	<.05
		[a]04-13-93	.09	<.05	.27	<.05	<.05	<.05
		[a]06-18-93	.19	<.05	28.0	<.05	5.15	2.65

Table 13. Pesticide concentrations in water samples from Harrisonville City Lake inflow sites, west-central Missouri–Continued

Site identifier (fig. 3)	Date	Metol-achlor	Metribuzin	Prometon	Prometryn	Propazine	Simazine	Terbutryn
				Muddy Creek near Harrisonville--Continued				
HI2	04-30-92	0.74	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	05-20-92	.27	<.05	<.05	<.05	<.05	<.05	<.05
	[a]11-22-92	.29	<.05	<.05	<.05	<.05	<.05	<.05
	12-08-92	.07	<.05	<.05	<.05	<.05	<.05	<.05
	01-27-93	.16	<.05	<.05	<.05	<.05	<.05	<.05
	02-24-93	<.05	<.05	<.05	<.05	<.05	<.05	<.05
	03-24-93	.09	<.05	<.05	<.05	<.05	<.05	<.05
	[a]04-13-93	.30	<.05	<.05	<.05	<.05	<.05	<.05
	[a]07-01-93	.72	<.05	<.05	<.05	<.05	<.05	<.05
				North Fork Muddy Creek near Harrisonville--Continued				
HI3	04-30-92	0.97	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	05-20-92	.11	<.05	<.05	<.05	<.05	<.05	<.05
	06-17-92	.05	<.05	<.05	<.05	<.05	<.05	<.05
	08-27-92	<.05	<.05	.13	<.05	<.05	<.05	<.05
	11-04-92	<.05	<.05	<.05	<.05	<.05	<.05	<.05
	[a]11-19-92	.31	<.05	<.05	<.05	<.05	<.05	<.05
	12-08-92	.07	<.05	<.05	<.05	<.05	<.05	<.05
	01-27-93	.12	<.05	<.05	<.05	<.05	<.05	<.05
	[D]01-27-93	.11	<.05	<.05	<.05	<.05	<.05	<.05
	02-24-93	<.05	<.05	<.05	<.05	<.05	<.05	<.05
	03-24-93	<.05	<.05	<.05	<.05	<.05	<.05	<.05
	[a]04-13-93	.05	<.05	<.05	<.05	<.05	<.05	<.05
	[a]06-18-93	14.29	<.05	<.05	<.05	<.05	<.05	<.05

[a] Stormwater-runoff samples.
[D] Duplicate samples.

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri

[cells/mL, cells per milliliter; µm³/mL, cubic micrometers per milliliter; --, no data available]

DIVISION CLASS *Genus species*	Site PL1 Density (cells/mL)	Site PL1 Biovolume (µm³/mL)	Site PL2 Density (cells/mL)	Site PL2 Biovolume (µm³/mL)	Site PL3 Density (cells/mL)	Site PL3 Biovolume (µm³/mL)
			Prairie Lee Lake May 15, 1991			
CHRYSOPHYTA						
Unknown flagellate	--	--	11,000	78,000	--	--
BACILLARIOPHYCEAE						
Aulacoseira granulata	--	--	51	14,000	--	--
Aulacoseira italica	--	--	110	36,000	--	--
Cyclotella meneghiniana	--	--	1,100	93,000	--	--
Cyclotella stelligera	--	--	150	20,000	--	--
Cymbella minuta	--	--	800	130,000	--	--
Melosira varians	--	--	280	12,000	--	--
Nitzschia acicularis	--	--	1,600	430,000	--	--
Nitzschia palea	--	--	2,400	620,000	--	--
Stephanodiscus astraea var minutula	--	--	130	130,000	--	--
Synedra delicatissima	--	--	800	100,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus falcatus	--	--	1,900	1,200,000	--	--
Chlamydomonas sp.	--	--	11,000	4,900,000	--	--
Chlorella ellipsoidea	--	--	3,700	63,000	--	--
Chlorococcum humicola	--	--	3,700	550,000	--	--
Selenastrum minutum	--	--	15,000	270,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Aphanocapsa delicatissima	--	--	270,000	270,000	--	--
Aphanocapsa elachista	--	--	22,000	89,000	--	--
Chroococcus sp.	--	--	32,000	510,000	--	--
Microcystis aeruginosa	--	--	160,000	2,300,000	--	--
			June 3, 1991			
CHRYSOPHYTA						
Unknown flagellate	30,000	210,000	30,000	210,000	9,900	69,000
BACILLARIOPHYCEAE						
Asterionella formosa	1,200	390,000	--	--	--	--
Aulacoseira granulata	--	--	86	24,000	--	--
Aulacoseira italica	740	240,000	--	--	1,100	340,000
Aulacoseira italica var tenuissima	99	9,100	--	--	--	--
Cocconeis placentula var euglypta	1,200	1,200,000	--	--	830	810,000
Cyclotella menghiniana	5,000	410,000	4,800	400,000	11,000	870,000
Cyclotella stelligera	790	100,000	430	56,000	1,400	180,000
Fragilaria vaucheriae	--	--	--	--	830	160,000
Melosira varians	2,200	100,000	1,600	74,000	780	35,000
Nitzschia acicularis	--	--	13,000	3,600,000	830	220,000
Nitzschia palea	--	--	1,500	390,000	2,500	650,000
Nitzschia sigma	2,500	300,000	--	--	--	--
Stephanodiscus astraea var minutula	1,100	1,000,000	430	420,000	920	890,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Carteria sp.	5,000	140,000	--	--	--	--
Chloroccum humicola	--	--	--	--	5,000	730,000
Selenastrum minutum	5,000	89,000	--	--	5,000	89,000
CYANOPHYTA						
CYANOPHYCEAE						
Aphanocapsa delicatissima	770,000	770,000	760,000	760,000	880,000	880,000
Aphanocapsa elachista	59,000	240,000	--	--	--	--
Chroococcus sp.	15,000	240,000	74,000	1,200,000	15,000	240,000
Oscillatoria angusta	40,000	240,000	--	--	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	5,000	120,000	--	--	--	--
Cryptomonas erosa	5,000	470,000	--	--	5,000	470,000
Rhodomonas minuta	--	--	--	--	5,000	54,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena sp.	5,000	8,400,000	--	--	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri–Continued

DIVISION CLASS *Genus species*	Site PL1 Density (cells/mL)	Site PL1 Biovolume (μm^3/mL)	Site PL2 Density (cells/mL)	Site PL2 Biovolume (μm^3/mL)	Site PL3 Density (cells/mL)	Site PL3 Biovolume (μm^3/mL)
Prairie Lee Lake--Continued June 12, 1991						
CHRYSOPHYTA						
Unknown flagellate	22,000	160,000	7,400	52,000	7,400	52,000
BACILLARIOPHYCEAE						
Asterionella formosa	2,100	670,000	--	--	--	--
Aulacoseira italica var tenuissima	85	7900	--	--	--	--
Aulacoseira italica	--	--	--	--	100	33,000
Cocconeis pediculus	--	--	--	--	620	5,300,000
Cocconeis placentula var euglypta	--	--	--	--	410	410,000
Cyclotella meneghiniana	3,000	250,000	2,100	170,000	5,100	420,000
Cyclotella stelligera	85	11,000	1,100	140,000	210	27,000
Fragilaria crotonensis	--	--	--	--	620	240,000
Fragilaria vaucheriae	--	--	--	--	210	40,000
Melosira varians	4,000	180,000	4,200	190,000	4,400	200,000
Navicula cryptocephala	--	--	--	--	210	270,000
Nitzschia acicularis	2,100	570,000	--	--	--	--
Nitzschia palea	--	--	--	--	210	54,000
Stephanodiscus astraea var minutula	260	250,000	--	--	100	100,000
Surirella linearis	2,100	880,000	--	--	--	--
Synedra ulna	1,100	1,500,000	--	--	--	--
Unknown diatoms	--	--	--	--	210	3,500
CHRYSOPHYCEAE						
Mallomonas sp.	--	--	--	--	7,400	10,000,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Chlorella ellipsoidea	7,400	130,000	--	--	--	--
Chloroccum humicola	--	--	--	--	5,000	730,000
Selenastrum minutum	--	--	--	--	5,000	89,000
CYANOPHYTA						
CYANOPHYCEAE						
Aphanocapsa delicatissima	770,000	770,000	880,000	880,000	280,000	280,000
Aphanocapsa elachista	--	--	97,000	390,000	54,000	220,000
Aphanothece nidulans	--	--	52,000	260,000	--	--
Chroococcus sp.	7,400	120,000	15,000	240,000	5,000	79,000
Dactylococcopsis fascicularis	--	--	--	--	2,500	120,000
Oscillatoria angusta	22,000	130,000	140,000	850,000	--	--
Oscillatoria limnetica	--	--	--	--	72,000	1,500,000
CRYPTOPHYTA						
CHRYPTOPHYCEAE						
Chroomonas sp.	37,000	930,000	45,000	1,100,000	12,000	310,000
June 26, 1991						
CHRYSOPHYTA						
Unknown flagellate I	25,000	360,000	--	--	13,000	180,000
Unknown flagellate II	--	--	39,000	555,000,00	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	7,700	12,000,000	1,900	3,000,000	2,900	4,600,000
Melosira I	970	710,000	1,900	1,400,000	970	710,000
Melosira II	--	--	--	--	970	1,400,000
Synedra I	4,800	1,000,000	3,900	820,000	5,800	1,200,000
Synedra II	970	3,100,000	970	3,100,000	--	--
CHRYSOPHYCEAE						
Mallomonas sp.	--	--	970	370,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	3,900	12,000	--	--	--	--
Ankistrodesmus II	2,900	50,000	3,900	67,000	970	17,000
Carteria I	--	--	970	600,000	--	--
Chlamydomonas I	970	400,000	1,900	790,000	--	--
Chlorogonium I	1,900	120,000	970	61,000	2,900	180,000
Closteriopsis sp.	7,700	1,500,000	6,800	1,300,000	6,800	1,300,000
Coelastrum II	13,000	8,800,000	9,700	89,000,000	8,700	80,000,000
Crucigenia II	1,900	390,000	--	--	--	--
Dictyosphaerium sp.	--	--	970	170,000	970	170,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site PL1 Density (cells/mL)	 Biovolume (μm^3/mL)	Site PL2 Density (cells/mL)	 Biovolume (μm^3/mL)	Site PL3 Density (cells/mL)	 Biovolume (μm^3/mL)
Prairie Lee Lake--Continued June 26, 1991--Continued						
CHLOROPHYTA--Continued						
CHLOROPHYCEAE--Continued						
Golenkinia sp.	970	32,000	970	32,000	970	32,000
Oocystis sp.	970	510,000	1,900	1,000,000	970	510,000
Scenedesmus I	--	--	--	--	970	430,000
Scenedesmus II	970	29,000	970	29,000	1,900	58,000
Scenedesmus III	--	--	970	97,000	--	--
Selenastrum sp.	9,700	160,000	22,000	370,000	16,000	270,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	--	--	3,900	2,000,000	1,900	1,000,000
Oscillatoria III	390,000	63,000,000	460,000	75,000,000	320,000	52,000,000
Oscillatoria IV	2,900	6,900,000	11,000	25,000,000	970	2,300,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	970	17,000	3,900	69,000	1,900	34,000
Cryptomonas I	--	--	3,900	330,000	9,700	820,000
Cryptomonas II	7,700	150,000	13,000	250,000	1,900	39,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	--	--	970	7,200,000	--	--
Lepocinclis sp.	--	--	970	100,000	--	--
Trachelomonas IV	--	--	2,900	780,000	1,900	520,000
Trachelomonas V	--	--	1,900	10,000,000	--	--
Trachelomonas VII	1,900	1,000,000	--	--	970	510,000
PYRROPHYTA						
DINOPHYCEAE						
Gymnodinium sp.	--	--	970	1,700,000	--	--
Peridinium sp.	--	--	3,900	10,000,000	--	--
July 10, 1991						
CHRYSOPHYTA						
Unknown flagellate I	--	--	22,000	310,000	26,000	370,000
Unknown flagellate II	17,000	25,000,000	--	--	970	1,400,000
BACILLARIOPHYCEAE						
Cyclotella sp.	970	1,500,000	--	--	970	1,500,000
Melosira I	--	--	--	--	4,800	3,600,000
Rhizosolenium sp.	970	720,000	--	--	970	720,000
Synedra I	76,000	16,000,000	110,000	23,000,000	52,000	11,000,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	970	3,000	--	--	970	2,900
Ankistrodesmus II	--	--	1,900	33,000	--	--
Botryococcus sp.	--	--	--	--	970	1,700,000
Closteriopsis sp.	1,900	370,000	--	--	--	--
Coelastrum II	--	--	3,900	270,000	1,900	1,300,000
Crucigenia II	970	190,000	--	--	5,800	1,200,000
Oocystis sp.	970	510,000	2,900	1,500,000	--	--
Scenedesmus II	--	--	--	--	970	29,000
Selenastrum sp.	1,900	32,000	4,800	81,000	--	--
Tetraedron I	--	--	--	--	2,900	760,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	1,900	1,000,000	4,800	2,500,000	--	--
Dactylococcopsis sp.	190,000	27,000,000	710,000	100,000,000	430,000	60,000,000
Lyngbya sp.	6,800	200,000	3,900	120,000	5,800	170,000
Oscillatoria II	--	--	5,800	950,000	--	--
Oscillatoria III	2,900	470,000	--	--	3,900	630,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Cryptomonas I	3,900	330,000	3,900	330,000	--	--
Cryptomonas II	5,900	120,000	5,800	120,000	7,700	150,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site PL1 Density (cells/mL)	Site PL1 Biovolume (μm^3/mL)	Site PL2 Density (cells/mL)	Site PL2 Biovolume (μm^3/mL)	Site PL3 Density (cells/mL)	Site PL3 Biovolume (μm^3/mL)
Prairie Lee Lake--Continued July 10, 1991--Continued						
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	970	7,200,000	--	--	--	--
Trachelomonas I	--	--	--	--	1,900	4,100,000
Trachelomonas IV	970	260,000	1,900	520,000	970	260,000
Trachelomonas VI	--	--	--	--	970	1,100,000
PYRROPHYTA						
DINOPHYCEAE						
Peridinium sp.	--	--	1,900	5,100,000	3,900	10,000,000
July 24, 1991						
CHRYSOPHYTA						
Unknown flagellate I	12,000	160,000	11,000	150,000	6,800	96,000
BACILLARIOPHYCEAE						
Cyclotella sp.	1,900	3,000,000	--	--	--	--
Nitzschia I	970	690,000	--	--	--	--
Nitzschia II	970	50,000	--	--	970	50,000
Rhizosolenium sp.	970	720,000	970	720,000		
Synedra I	3,900	820,000	6,800	1,400,000	2,900	620,000
CHRYSOPHYCEAE						
Chrysoamoeba sp.	970	3,000,000	970	3,000,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus II	--	--	970	17,000	1,900	33,000
Crucigenia I	1,900	120,000	--	--	--	--
Oocystis sp.	970	510,000	--	--	--	--
Quadrigula sp.	--	--	--	--	970	48,000
Selenastrum sp.	970	16,000	2,900	48,000	--	--
Tetraedron I	--	--	6,800	1,800,000	--	--
Tetraedron II	3,900	2,200,000	--	--	970	560,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	1,900	1,000,000	13,000	6,600,000	4,800	2,500,000
Dactylococcopsis sp.	17,000	2,500,000	30,000	4,200,000	2,900	410,000
Lyngbya sp.	9,700	290,000	21,000	640,000	8,700	260,000
Oscillatoria I	5,800	950,000	5,800	950,000	2,900	470,000
Raphidiopsis sp.	970	15,000	2,900	46,000	970	15,000
Synechococcus sp.	--	--	--	--	2,900	130,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	970	17,000	970	17,000	--	--
Cryptomonas I	--	--	1,900	160,000	970	82,000
Cryptomonas II	9,700	190,000	4,800	97,000	7,700	150,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	--	--	970	7,200,000	--	--
Trachelomonas IV	--	--	--	--	970	260,000
Trachelomonas VI	2,900	3,200,000	3,900	4,300,000	970	1,100,000
PYRROPHYTA						
DINOPHYCEAE						
Gymnodinium sp.	1,900	350,000	--	--	2,900	5,200,000
Peridinium sp.	970	2,600,000	970	2,600,000	970	2,600,000
August 7, 1991						
CHRYSOPHYTA						
Unknown flagellate I	5,800	82,000	14,000	190,000	14,000	190,000
Unknown flagellate II	3,900	5,500,000	--	--	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	7,700	12,000,000	6,800	11,000,000	3,900	6,100,000
Nitzschia I	--	--	--	--	970	690,000
Synedra I	8,700	1,800,000	4,800	1,000,000	15,000	3,300000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site PL1 Density (cells/mL)	Site PL1 Biovolume (μm^3/mL)	Site PL2 Density (cells/mL)	Site PL2 Biovolume (μm^3/mL)	Site PL3 Density (cells/mL)	Site PL3 Biovolume (μm^3/mL)
	Prairie Lee Lake--Continued August 7, 1991--Continued					
CHRYSOPHYCEAE						
Kephyrion sp.	--	--	--	--	970	63,000
Chrysoamoeba sp.	970	3,000,000	--	--	--	--
Mallomonas I	--	--	1,900	740,000	970	370,000
Mallomonas II	6,800	15,000,000	4,800	10,000,000	3,900	8,300,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	970	3,000	--	--
Ankistrodesmus II	970	17,000	970	17,000	--	--
Chlamydomonas I	970	400,000	--	--	1,900	790,000
Chlorogonium I	--	--	1,900	120,000	--	--
Closteriopsis sp.	970	180,000	--	--	970	180,000
Dictyosphaerium sp.	--	--	970	170,000	--	--
Quadrigula sp.	--	--	970	48,000	--	--
Selenastrum sp.	1,900	32,000	1,900	32,000	4,800	81,000
Sphaerellopsis sp.	970	63,000	--	--	--	--
Tetraedron II	--	--	970	560,000	--	--
Tetraedron III	--	--	970	250,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	11,000	5,600,000	2,900	1,500,000	15,000	8,100,000
Dactylococcopsis sp.	--	--	970	140,000	--	--
Lyngbya sp.	20,000	610,000	8,700	260,000	9,700	290,000
Oscillatoria I	80,000	13,000,000	110,000	18,000,000	68,000	11,000,000
Raphidiopsis sp.	140,000	2,200,000	230,000	3,600,000	140,000	2,100,000
CRYPTOPHYTA						
Chroomonas sp.	970	17,000	1,900	34,000	3,900	69,000
Cryptomonas I	1,900	160,000	--	--	3,900	330,000
Cryptomonas II	--	--	6,800	140,000	7,700	150,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	2,900	22,000,000	--	--	--	--
Trachelomonas IV	970	260,000	--	--	--	--
Trachelomonas V	--	--	--	--	970	5,100,000
PYRROPHYTA						
DINOPHYCEAE						
Ceratium sp.	1,900	7,300,000	--	--	--	--
Peridinium sp.	--	--	--	--	1,900	5,100,000
	August 21, 1991					
CHRYSOPHYTA						
Unknown flagellate I	9,700	140,000	8,700	120,000	15,000	210,000
BACILLARIOPHYCEAE						
Cyclotella sp.	5,800	9,100,000	--	--	3,900	6,100,000
Synedra I	970	210,000	3,900	820,000	4,800	1,000,000
CHRYSOPHYCEAE						
Chrysoamoeba sp.	--	--	970	3,000,000	--	--
Kephyrion sp.	2,900	190,000	--	--	970	63,000
Mallomonas II	--	--	--	--	970	2,100,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus II	970	17,000	3,900	12,000	--	--
Carteria I	--	--	--	--	970	600,000
Chlamydomonas I	1,900	790,000	--	--	970	400,000
Closteriopsis sp.	970	180,000	970	180,000	--	--
Cosmarium sp.	--	--	970	93,000	--	--
Scenedesmus II	1,900	860,000	970	430,000	--	--
Selenastrum sp.	4,800	81,000	7,700	130,000	1,900	32,000
Sphaerellopsis sp.	--	--	--	--	1,900	130,000
Tetraedron I	970	250,000	1,900	510,000	970	250,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	3,900	630,000	24,000	13,000,000	7,700	4,100,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site PL1 Density (cells/mL)	 Biovolume (μm^3/mL)	Site PL2 Density (cells/mL)	 Biovolume (μm^3/mL)	Site PL3 Density (cells/mL)	 Biovolume (μm^3/mL)
	Prairie Lee Lake--Continued					
	August 21, 1991--Continued					
CYANOPHYTA--Continued						
CYANOPHYCEAE--Continued						
Gloeocapsa sp.	--	--	--	--	970	63,000
Lyngbya sp.	13,000	380,000	32,000	950,000	27,000	810,000
Oscillatoria I	61,000	10,000,000	75,000	12,000,000	93,000	15,000,000
Raphidiopsis sp.	8,700	140,000	22,000	350,000	34,000	530,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	2,900	52,000	--	--	6,800	120,000
Cryptomonas I	18,000	1,600,000	4,800	410,000	2,900	240,000
Cryptomonas II	6,800	140,000	3,900	77,000	970	19,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	4,800	36,000,000	--	--	--	--
Trachelomonas I	--	--	970	2,000,000	--	--
Trachelomonas IV	--	--	1,900	520,000	--	--
Trachelomonas V	970	5,100,000	970	5,100,000	2,900	15,000,000
PYRROPHYTA						
DINOPHYCEAE						
Gymnodinium sp.	--	--	--	--	2,900	5,200,000
Peridinium sp.	--	--	1,900	5,100,000	--	--
	September 12, 1991					
CHRYSOPHYTA						
Unknown flagellate I	12,000	1,60,000	17,000	250,000	24,000	340,000
Unknown flagellate II	970	1,400,000	--	--	970	1,400,000
BACILLARIOPHYCEAE						
Cyclotella sp.	970	1,500,000	970	1,500,000	3,900	6,100,000
Eunotia sp.	970	9,700	--	--	970	9,700
Nitzschia I	1,900	1,400,000	--	--	1,900	1,400,000
Rhizosolenium sp.	970	720,000	--	--	--	--
Synedra I	7,700	1,600,000	--	--	7,700	1,600,000
CHRYSOPHYCEAE						
Kephyrion sp.	2,900	190,000	970	63,000	970	63,000
Mallomonas I	1,900	740,000	--	--	9,700	3,700,000
Mallomonas II	970	2,100,000	--	--	--	--
Ochromonas sp.	970	110,000	--	--	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus II	28,000	490,000	15,000	250,000	14,000	230,000
Carteria I	970	600,000	--	--	970	600,000
Chlamydomonas I	2,900	1,200,000	1,900	790,000	2,900	1,200,000
Chlorogonium I	1,900	120,000	1,900	120,000	970	61,000
Closteriopsis sp.	--	--	1,900	370,000	1,900	370,000
Coelastrum II	970	670,000	--	--	--	--
Crucigenia II	970	62,000	--	--	--	--
Scenedesmus I	1,900	860,000	970	430,000	2,900	1,300,000
Selenastrum sp.	1,900	32,000	970	16,000	970	16,000
Sphaerellopsis sp.	970	63,000	--	--	--	--
Stichococcus sp.	--	--	--	--	970	12,000
Tetraedron I	1,900	510,000	970	250,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	43,000	22,000,000	28,000	15,000,000	27,000	14,000,000
Gloeocapsa sp.	1,900	65,000	--	--	--	--
Lyngbya sp.	88,000	2,600,000	48,000	1,400,000	38,000	1,100,000
Oscillatoria I	81,000	13,000,000	52,000	8,500,000	82,000	13,000,000
Raphidiopsis sp.	21,000	330,000	6,800	110,000	17,000	270,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	970	17,000	--	--	24,000	430,000
Cryptomonas I	7,700	650,000	4,800	410,000	20,000	1,700,000
Cryptomonas II	20,000	410,000	14,000	270,000	4,800	97,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site PL1 Density (cells/mL)	Site PL1 Biovolume (μm^3/mL)	Site PL2 Density (cells/mL)	Site PL2 Biovolume (μm^3/mL)	Site PL3 Density (cells/mL)	Site PL3 Biovolume (μm^3/mL)
Prairie Lee Lake--Continued						
September 12, 1991--Continued						
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Trachelomonas I	1,900	4,100,000	--	--	2,900	6,100,000
Trachelomonas II	--	--	--	--	970	4,100,000
Trachelomonas III	1,900	4,200,000	--	--	970	2,100,000
Trachelomonas IV	1,900	520,000	970	260,000	--	--
Trachelomonas V	--	--	--	--	1,900	10,000,000
PYRROPHYTA						
DINOPHYCEAE						
Ceratium sp.	--	--	--	--	970	3,700,000
Gymnodinium sp.	970	1,700,000	--	--	--	--
Peridinium sp.	970	2,600,000	970	2,600,000	--	--
September 26, 1991						
CHRYSOPHYTA						
Unknown flagellate I	1,900	27,000	7,700	110,000	7,700	110,000
BACILLARIOPHYCEAE						
Cyclotella sp.	970	1,500,000	1,900	3,000,000	1,900	3,000,000
Synedra I	2,900	620,000	970	210,000	3,900	820,000
CHRYSOPHYCEAE						
Kephyrion sp.	1,900	130,000	--	--	--	--
Ochromonas sp.	970	110,000	--	--	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus II	84,000	1,500,000	120,000	2,000,000	89,000	1,500,000
Carteria I	--	--	1,900	1,200,000	--	--
Chlamydomonas I	--	--	970	400,000	--	--
Chlorogonium I	--	--	970	61,000	--	--
Closteriopsis sp.	--	--	--	--	970	180,000
Coelastrum I	--	--	--	--	970	670,000
Crucigenia I	970	62,000	--	--	--	--
Scenedesmus I	--	--	1,900	860,000	--	--
Scenedesmus II	--	--	--	--	1,900	58,000
Scenedesmus III	--	--	--	--	970	97,000
Selenastrum sp.	2,900	48,000	970	16,000	--	--
Tetraedron I	970	250,000	--	--	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	8,700	4,600,000	6,800	3,500,000	14,000	7,100,000
Gloeocapsa sp.	970	63,000	--	--	--	--
Lyngbya sp.	12,000	350,000	7,700	230,000	12,000	350,000
Oscillatoria I	23,000	3,800,000	20,000	3,300,000	32,000	5,200,000
Oscillatoria II	970	160,000	970	160,000	--	--
Raphidiopsis sp.	4,800	76,000	11,000	170,000	11,000	170,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	19,000	340,000	5,800	100,000	13,000	220,000
Cryptomonas I	3,900	330,000	--	--	5,800	490,000
Cryptomonas II	16,000	330,000	23,000	460,000	6,800	140,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	970	7,200,000	--	--	970	7,200,000
Trachelomonas IV	1,900	520,000	--	--	--	--
PYRROPHYTA						
DINOPHYCEAE						
Ceratium sp.	--	--	970	59,000	970	3,700,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri–Continued

DIVISION CLASS *Genus species*	Site LJ1 Density (cells/mL)	Site LJ1 Biovolume (μm^3/mL)	Site LJ2 Density (cells/mL)	Site LJ2 Biovolume (μm^3/mL)	Site LJ3 Density (cells/mL)	Site LJ3 Biovolume (μm^3/mL)
		Lake Jacomo May 15, 1991				
CHRYSOPHYTA						
Unknown flagellate	11,000	53,000	--	--	1,600	7,800
BACILLARIOPHYCEAE						
Asterionella formosa	51	14,000	--	--	880	240,000
Aulacoseira granulata	460	110,000	--	--	1,600	400,000
Aulacoseira italica var tenuissima	--	--	--	--	350	36,000
Cyclotella meneghiniana	530	56,000	--	--	1,400	150,000
Cyclotella sp.	--	--	--	--	180	37,000
Cyclotella stelligera	300	52,000	--	--	800	140,000
Fragilaria vaucheriae	17	3,400	--	--	--	--
Melosira varians	530	18,000	--	--	880	29,000
Navicula miniscula	17	2,700	--	--	--	--
Nitzschia acicularis	1,900	650,000	--	--	2,700	940,000
Stephanodiscus astraea var minutula	300	150,000	--	--	270	130,000
Synedra delicatissima	34	21,000	--	--	160	99,000
Synedra delicatissima var angustissima	140	330,000	--	--	80	200,000
Synedra ulna	--	--	--	--	80	840,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Chlamydomonas sp.	--	--	--	--	780	99,000
Chlorella ellipsoidea	6,400	76,000	--	--	1,600	19,000
Chlorococcum humicola	--	--	--	--	2,300	190,000
Oocystis pusilla	--	--	--	--	2,300	170,000
Scenedesmus quadricauda var longispina	--	--	--	--	1,600	39,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Cryptomonas erosa	2,100	100,000	--	--	1,600	77,000
Rhodomonas minuta	2,100	11,000	--	--	2,300	12,000
CYANOPHYTA						
CYANOPHYCEAE						
Aphanocapsa delicatissima	220,000	220,000	--	--	120,000	120,000
Aphanothece nidulans	--	--	--	--	3,900	20,000
Chroococcus sp.	17,000	200,000	--	--	2,300	28,000
Dactylococcopsis fascicularis	2,100	45,000	--	--	--	--
Microcystis aeruginosa	--	--	--	--	20,000	78,000
		May 30, 1991				
CHRYSOPHYTA						
Unknown flagellate	20,000	99,000	--	--	9,900	50,000
BACILLARIOPHYCEAE						
Achnanthes minutissima	37	2,000	--	--	--	--
Asterionella formosa	--	--	--	--	140	37,000
Aulacoseira granulata	--	--	400	99,000	480	120,000
Aulacoseira italica var tenuissima	1,400	140,000	--	--	--	--
Cyclotella meneghiniana	2,300	240,000	1,300	140,000	900	95,000
Cyclotella sp.	--	--	--	--	140	28,000
Cyclotella stelligera	--	--	560	96,000	830	140,000
Gomphonema parvulum	--	--	170	100,000	--	--
Melosira varians	900	30,000	530	17,000	1,000	34,000
Nitzschia acicularis	4,900	1,700,000	1,800	630,000	4,800	1,700,000
Nitzschia palea	--	--	990	260,000	--	--
Stephanodiscus astraea var minutula	450	230,000	210	100,000	480	240,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus falcatus	--	--	3,000	280,000	--	--
Chlorella ellipsoidea	--	--	24,000	290,000	25,000	300,000
Chlorococcum humicola	--	--	5,900	470,000	--	--
Scenedesmus bijuga	--	--	--	--	20,000	650,000
Scenedesmus quadricauda var longispina	--	--	12,000	300,000	--	--
Selenastrum minutum	9,900	250,000	3,000	74,000	15,000	370,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri–Continued

DIVISION CLASS *Genus species*	Site LJ1		Site LJ2		Site LJ3	
	Density (cells/mL)	Biovolume (μm^3/mL)	Density (cells/mL)	Biovolume (μm^3/mL)	Density (cells/mL)	Biovolume (μm^3/mL)
	Lake Jacomo--Continued May 30, 1991--Continued					
CYANOPHYTA						
CYANOPHYCEAE						
Aphanocapsa delicatissima	700,000	700,000	590,000	590,000	710,000	710,000
Aphanothece nidulans	--	--	--	--	20,000	99,000
Chroococcus sp.	5,000	59,000	21,000	250,000	25,000	300,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Cryptomonas erosa	5,000	240,000	15,000	730,000	15,000	730,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena sp.	--	--	3,000	2,700,000	--	--
	June 11, 1991					
CHRYSOPHYTA						
Unknown flagellate	17,000	85,000	21,000	100,000	9,900	50,000
BACILLARIOPHYCEAE						
Asterionella formosa	6,600	360,000	--	--	--	--
Aulacoseira granulata	870	220,000	--	--	--	--
Cyclotella meneghiniana	530	56,000	1,300	140,000	2,500	260,000
Cyclotella ocellata	9	1,600	--	--	--	--
Cyclotella sp.	--	--	--	--	830	170,000
Cyclotella stelligera	110	19,000	--	--	830	140,000
Cymbella minuta	1,100	2,400,000	--	--	--	--
Melosira varians	120	4,000	--	--	--	--
Nitzschia acicularis	14,000	5,000,000	1,800	630,000	35,000	12,000,000
Nitzschia palea	1,100	290,000	990	260,000	--	--
Stephanodiscus astraea	9	34,000	--	--	--	--
Stephanodiscus astraea var minutula	470	240,000	210	100,000	830	420,000
Stephanodiscus niagarae	9	13,000	--	--	--	--
Synedra delicatissima	1,100	680,000	--	--	--	--
Synedra delicatissima var angustissima	3,300	8,100,000	--	--	--	--
CHRYSOPHYCEAE						
Dinobryon divergens	--	--	3,000	780,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Chlorella ellipsoidea	6,400	76,000	24,000	290,000	25,000	300,000
Chlorococcum humicola	4,200	340,000	5,900	470,000	5,000	390,000
Crucigenia quadrata	8,500	76,000	--	--	--	--
Selenastrum minutum	2,100	53,000	--	--	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Aphanocapsa delicatissima	250,000	250,000	400,000	400,000	560,000	14,000,000
Aphanothece nidulans	200,000	990,000	48,000	240,000	--	--
Chroococcus sp.	11,000	130,000	15,000	180,000	--	--
Dactylococcopsis fascicularis	--	--	3,000	62,000	--	--
Lungbya limnetica	--	--	24,000	310,000	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Cryptomonas erosa	6,400	310,000	--	--	--	--
Rhodomonas minuta	2,100	11,000	15,000	74,000	--	--
	June 25, 1991					
CHRYSOPHYTA						
Unknown flagellate I	14,000	190,000	19,000	270,000	24,000	340,000
Unknown flagellate II	1,900	2,700,000	--	--	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	--	--	2,900	4,600,000	2,900	4,600,000
Melosira I	1,900	1,400,000	970	2,900	--	--
Nitzschia II	2,900	150,000	--	--	970	50,000
Rhizosolenium sp.	--	--	970	720,000	--	--
Synedra I	4,800	1,000,000	5,800	1,200,000	4,800	1,000,000
Synedra III	--	--	--	--	3,900	77,000
CHRYSOPHYCEAE						
Dinobryon I	--	--	970	630,000	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site LJ1 Density (cells/mL)	Site LJ1 Biovolume (μm^3/mL)	Site LJ2 Density (cells/mL)	Site LJ2 Biovolume (μm^3/mL)	Site LJ3 Density (cells/mL)	Site LJ3 Biovolume (μm^3/mL)
			Lake Jacomo--Continued June 25, 1991--Continued			
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	970	3,000	--	--
Chlorogonium I	--	--	970	61,000	1,900	120,000
Closteriopsis sp.	970	180,000	--	--	--	--
Dictyosphaerium sp.	970	170,000	--	--	--	--
Golenkinia sp.	--	--	970	32,000	--	--
Oocystis sp.	1,900	1,000,000	--	--	--	--
Scenedesmus I	--	--	--	--	970	430,000
Scenedesmus II	--	--	--	--	970	29,000
Scenedesmus III	970	97,000	--	--	--	--
Selenastrum sp.	3,900	64,000	970	16,000	1,900	32,000
Treubaria sp.	--	--	--	--	970	63,000
CYANOPHYTA						
CYANOPHYCEAE						
Anabaena sp.	--	--	--	--	970	240,000
Anacystis sp.	--	--	--	--	3,900	2,000,000
Dactylococcopsis sp.	--	--	970	140,000	9,700	1,400,000
Lyngbya sp.	970	29,000	--	--	970	29,000
Oscillatoria I	1,900	320,000	3,900	630,000	1,900	320,000
Synechococcus sp.	26,000	1,200,000	37,000	1,600,000	1,900	85,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	1,900	34,000	4,800	86,000	1,900	34,000
Cryptomonas I	970	82,000	--	--	--	--
Cryptomonas II	1,900	39,000	2,900	58,000	2,900	58,000
Cryptomonas III	9,700	2,500,000	970	250,000	970	250,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	1,900	14,000,000	--	--	--	--
Trachelomonas I	1,900	4,100,000	--	--	--	--
Trachelomonas VI	3,900	6,800,000	970	1,100,000	970	1,700,000
PYRROPHYTA						
DINOPHYCEAE						
Ceratium sp.	970	3,700,000	--	--	970	3,700,000
Peridinium sp.	970	2,600,000	--	--	--	--
			July 9, 1991			
CHRYSOPHYTA						
Unknown flagellate I	16,000	220,000	11,000	150,000	15,000	220,000
BACILLARIOPHYCEAE						
Cyclotella sp.	7,900	12,000,000	--	--	--	--
Melosira I	2,000	1,500,000	1,900	1,400,000	--	--
Rhizosolenium sp.	970	740,000	970	720,000	--	--
Synedra I	7,900	1,700,000	7,700	1,600,000	2,900	620,000
Synedra II	970	3,200,000	970	3,100,000	--	--
Synedra III	22,000	430,000	6,800	140,000	3,900	77,000
CHRYSOPHYCEAE						
Dinobryon I	--	--	1,900	1,300,000	1,900	1,300,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	--	--	1,900	6,100
Ankistrodesmus II	3,000	51,000	1,900	33,000	--	--
Chlorogonium I	970	62,000	970	61,000	--	--
Closteriopsis sp.	990	190,000	1,900	370,000	--	--
Dictyosphaerium sp.	990	180,000	--	--	--	--
Micrataenuim sp.	--	--	--	--	970	440,000
Platymonas sp.	990	380,000	--	--	--	--
Scenedesmus I	990	440,000	--	--	--	--
Scenedesmus II	--	--	970	29,000	--	--
Selenastrum sp.	2,000	33,000	970	16,000	2,900	48,000
Tetraedron I	990	260,000	--	--	--	--
Treubaria sp.	--	--	1,900	130,000	970	63,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site LJ1 Density (cells/mL)	Site LJ1 Biovolume (μm^3/mL)	Site LJ2 Density (cells/mL)	Site LJ2 Biovolume (μm^3/mL)	Site LJ3 Density (cells/mL)	Site LJ3 Biovolume (μm^3/mL)
Lake Jacomo--Continued July 9, 1991--Continued						
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	--	--	1,900	1,000,000	--	--
Dactylococcopsis sp.	990	140,000	--	--	3,900	550,000
Lyngbya sp.	18,000	530,000	18,000	550,000	35,000	1,000,000
Oscillatoria I	4,900	810,000	7,700	1,300,000	1,900	320,000
Raphidiopsis sp.	6,900	110,000	16,000	260,000	14,000	210,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	2,000	35,000	7,700	140,000	970	17,000
Cryptomonas I	990	83,000	--	--	--	--
Cryptomonas II	11,000	220,000	3,900	77,000	4,800	97,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	2,000	15,000,000	970	7,200,000	--	--
Trachelomonas VI	--	--	970	1,100,000	--	--
PYRROPHYTA						
DINOPHYCEAE						
Ceratium sp.	--	--	970	3,700,000	--	--
Peridinium sp.	990	2,600,000	--	--	--	--
July 23, 1991						
CHRYSOPHYTA						
Unknown flagellate I	9,700	140,000	3,900	55,000	8,700	120,000
BACILLARIOPHYCEAE						
Cyclotella sp.	2,900	4,600,000	2,900	4,600,000	3,900	6,100,000
Melosira I	4,800	3,600,000	2,900	2,100,000	--	--
Synedra I	3,900	820,000	2,900	620,000	4,800	1,000,000
Synedra II	--	--	--	--	970	3,100,000
Synedra III	9,700	190,000	2,900	58,000	--	--
CHRYSOPHYCEAE						
Dinobryon I	--	--	1,900	1,300,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	3,900	12,000	3,900	12,000	970	3,000
Ankistrodesmus II	970	17,000	--	--	--	--
Chlamydomonas I	2,900	1,200,000	2,900	1,200,000	970	400,000
Chlorogonium I	--	--	1,900	120,000	--	--
Closteriopsis sp.	1,900	370,000	1,900	370,000	--	--
Crucigenia I	--	--	970	62,000	--	--
Dictyosphaerium sp.	970	170,000	--	--	--	--
Scenedesmus III	--	--	--	--	970	97,000
Selenastrum sp.	970	16,000	1,900	32,000	970	16,000
Tetraedron I	--	--	970	250,000	--	--
Treubaria sp.	--	--	--	--	970	63,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	1,900	1,000,000	970	510,000	970	510,000
Aphanotheca sp.	970	4,100,000	--	--	--	--
Dactylococcopsis sp.	7,700	1,100,000	3,900	550,000	2,900	410,000
Lyngbya sp.	31,000	920,000	86,000	2,600,000	110,000	3,200,000
Oscillatoria I	11,000	1,700,000	4,800	790,000	5,800	950,000
Raphidiopsis sp.	5,800	91,000	85,000	1,300,000	110,000	1,700,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	1,900	34,000	1,900	34,000	1,900	34,000
Cryptomonas I	--	--	--	--	970	82,000
Cryptomonas II	970	19,000	3,900	77,000	3,900	77,000
Cryptomonas III	--	--	1,900	500,000	--	--
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	12,000	86,000,000	--	--	--	--
Trachelomonas I	970	2,000,000	--	--	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site LJ1 Density (cells/mL)	Site LJ1 Biovolume (μm^3/mL)	Site LJ2 Density (cells/mL)	Site LJ2 Biovolume (μm^3/mL)	Site LJ3 Density (cells/mL)	Site LJ3 Biovolume (μm^3/mL)
	Lake Jacomo--Continued					
	July 23, 1991--Continued					
PYRROPHYTA						
DINOPHYCEAE						
Gymnodinium sp.	1,900	3,500,000	--	--	--	--
	August 6, 1991					
CHRYSOPHYTA						
Unknown flagellate I	6,800	96,000	9,700	140,000	22,000	310,000
BACILLARIOPHYCEAE						
Cyclotella sp.	5,800	9,100,000	3,900	6,100,000	5,800	9,100,000
Melosira I	8,700	6,400,000	14,000	10,000,000	5,800	4,300,000
Nitzschia I	--	--	3,900	2,800,000	--	--
Synedra I	4,800	1,000,000	2,900	620,000	2,900	620,000
Synedra III	1,900	39,000	--	--	--	--
CHRYSOPHYCEAE						
Mallomonas II	--	--	970	2,100,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	--	--	1,900	6,100
Ankistrodesmus II	--	--	970	17,000	--	--
Chlamydomonas I	970	400,000	4,800	2,000,000	--	--
Closteriopsis sp.	--	--	970	180,000	--	--
Coelastrum II	970	8,900,000	--	--	--	--
Crucigenia I	--	--	970	62,000	--	--
Dictyosphaerium sp.	--	--	970	170,000	--	--
Selenastrum sp.	--	--	2,900	48,000	--	--
Tetraedron I	--	--	970	250,000	970	250,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	1,900	1,000,000	3,900	2,000,000	--	--
Dactylococcopsis sp.	--	--	2,900	410,000	3,900	550,000
Lyngbya sp.	45,000	1,300,000	110,000	3,300,000	87,000	2,600,000
Merismopedia sp.	--	--	3,900	650,000	--	--
Oscillatoria I	4,800	790,000	3,900	630,000	4,800	790,000
Raphidiopsis sp.	4,800	76,000	2,900	46,000	9,700	150,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	1,900	34,000	970	17,000	--	--
Cryptomonas I	--	--	6,800	570,000	--	--
Cryptomonas II	4,800	97,000	3,900	77,000	1,900	39,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	2,900	22,000,000	970	7,200,000	--	--
	August 19, 1991					
CHRYSOPHYTA						
Unknown flagellate I	8,700	120,000	5,800	82,000	7,700	110,000
BACILLARIOPHYCEAE						
Cyclotella sp.	7,700	12,000,000	5,800	9,100,000	2,900	4,600,000
Melosira I	23,000	17,000,000	9,700	7,100,000	12,000	8,500,000
Melosira II	2,900	4,300,000	--	--	--	--
Nitzschia I	--	--	1,900	1,400,000	--	--
Synedra I	970	210,000	1,900	410,000	3,900	820,000
CHRYSOPHYCEAE						
Mallomonas II	970	2,100,000	970	2,100,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus II	970	3,000	--	--	--	--
Chlamydomonas I	--	--	--	--	1,900	790,000
Chlorogonium I	1,900	120,000	--	--	--	--
Closteriopsis sp.	--	--	970	180,000	970	180,000
Dictyosphaerium sp.	--	--	970	170,000	--	--
Golenkinia sp.	--	--	1,900	65,000	--	--
Selenastrum sp.	1,900	32,000	2,900	48,000	3,900	64,000
Tetraedron I	970	250,000	--	--	970	250,000
Treubaria sp.	970	63,000	--	--	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site LJ1 Density (cells/mL)	Site LJ1 Biovolume (μm^3/mL)	Site LJ2 Density (cells/mL)	Site LJ2 Biovolume (μm^3/mL)	Site LJ3 Density (cells/mL)	Site LJ3 Biovolume (μm^3/mL)
	Lake Jacomo--Continued August 19, 1991--Continued					
CYANOPHYTA						
CYANOPHYCEAE						
Anabaenopsis sp.	3,900	630,000	970	160,000	--	--
Anacystis sp.	5,800	3,000,000	18,000	9,600,000	6,800	3,500,000
Dactylococcopsis sp.	2,900	410,000	8,700	1,200,000	5,800	820,000
Gloeocapsa sp.	970	63,000	6,800	440,000	3,900	250,000
Lyngbya sp.	18,000	550,000	45,000	1,300,000	63,000	1,900,000
Oscillatoria I	27,000	4,400,000	33,000	5,400,000	30,000	4,900,000
Raphidiopsis sp.	6,800	110,000	7,700	120,000	8,700	140,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	4,800	86,000	--	--	2,900	52,000
Cryptomonas I	7,700	650,000	970	82,000	2,900	240,000
Cryptomonas II	11,000	210,000	6,800	140,000	2,900	58,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	--	--	--	--	970	7,200,000
Trachelomonas IV	970	260,000	--	--	--	--
PYRROPHYTA						
DINOPHYCEAE						
Peridinium sp.	970	2,600,000	--	--	--	--
	September 11, 1991					
CHRYSOPHYTA						
Unknown flagellate I	30,000	420,000	26,000	370,000	6,800	96,000
BACILLARIOPHYCEAE						
Cyclotella sp.	9,700	15,000,000	4,800	7,600,000	--	--
Melosira I	6,800	5,000,000	15,000	11,000,000	2,900	2,100,000
Melosira II	3,900	5,700,000	970	1,400,000	--	--
Synedra I	16,000	3,500,000	11,000	2,300,000	2,900	1,800,000
Synedra II	970	3,100,000	--	--	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	--	--	1,900	6,100
Ankistrodesums II	1,900	33,000	--	--	--	--
Actinastrum sp.	970	1,700,000	--	--	--	--
Carteria I	970	600,000	970	600,000	--	--
Chlamydomonas I	1,900	790,000	--	--	--	--
Chlorogonium I	1,900	120,000	970	61,000	--	--
Chlorogonuim II	970	970,000	--	--	--	--
Closteriopsis sp.	--	--	--	--	970	180,000
Crucigenia I	1,900	120,000	2,900	190,000	--	--
Crucigenia II	--	--	970	190,000	--	--
Dictyosphaerium sp.	--	--	--	--	970	170,000
Platymonas sp.	970	370,000	--	--	970	370,000
Quadrigula sp.	970	48,000	--	--	--	--
Scenedesmus II	970	29,000	--	--	--	--
Selenastrum sp.	4,800	81,000	3,900	64,000	3,900	250,000
Sphaerellopsis sp.	--	--	--	--	970	63,000
Tetraedron I	--	--	--	--	970	250,000
CYANOPHYTA						
CYANOPHYCEAE						
Anabaena sp.	--	--	--	--	970	240,000
Anabaenopsis sp.	--	--	--	--	970	160,000
Anacystis sp.	4,800	2,500,000	--	--	5,800	3,000,000
Dactylococcopsis sp.	5,800	820,000	20,000	2,900,000	9,700	1,400,000
Gloeocapsa sp.	--	--	--	--	5,800	380,000
Lyngbya sp.	--	--	37,000	1,100,000	29,000	870,000
Oscillatoria I	49,000	8,100,000	69,000	11,000,000	2,900	470,000
Oscillatoria III	--	--	--	--	9,700	1,600,000
Oscillatoria IV	--	--	--	--	36,000	85,000,000
Raphidiopsis sp.	2,900	46,000	8,700	140,000	3,900	61,000
Synechococcus sp.	970	43,000	--	--	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site LJ1 Density (cells/mL)	Site LJ1 Biovolume (μm^3/mL)	Site LJ2 Density (cells/mL)	Site LJ2 Biovolume (μm^3/mL)	Site LJ3 Density (cells/mL)	Site LJ3 Biovolume (μm^3/mL)
	Lake Jacomo--Continued September 11, 1991--Continued					
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	8,700	160,000	1,900	34,000	1,900	34,000
Cryptomonas I	2,900	240,000	--	--	4,800	410,000
Cryptomonas II	--	--	2,900	58,000	970	19,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Trachelomonas V	1,900	10,000,000	--	--	--	--
PYRROPHYTA						
DINOPHYCEAE						
Dinobryon sp.	--	--	1,900	1,300,000	2,900	1,900,000
	September 27, 1991					
CHRYSOPHYTA						
Unknown flagellate I	19,000	270,000	21,000	300,000	16,000	230,000
Unknown flagellate II	1,900	2,700,000	--	--	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	3,900	6,100,000	3,900	6,100,000	--	--
Fragillaria II	--	--	970	97,000	970	48,000
Melosira I	13,000	9,300,000	9,700	7,100,000	1,900	1,400,000
Melosira II	12,000	17,000,000	13,000	19,000,000	12,000	17,000,000
Nitzschia II	970	50,000	--	--	970	50,000
Synedra I	970	210,000	8,700	1,800,000	5,800	1,200,000
Synedra II	--	--	--	--	970	3,100,000
CHRYSOPHYCEAE						
Chrysoamoeba sp.	--	--	--	--	970	3,000,000
Kephryion sp.	--	--	970	63,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	970	2,900	--	--	--	--
Ankistrodesmus II	1,900	33,000	--	--	--	--
Carteria I	1,900	1,200,000	--	--	--	--
Coelastrum I	--	--	1,900	1,300,000	970	670,000
Crucigenia I	970	62,000	--	--	--	--
Dictyosphaerium sp.	2,900	520,000	1,900	350,000	--	--
Golenkinia sp.	--	--	970	32,000	--	--
Micrataenium sp.	--	--	1,900	870,000	--	--
Platymonas sp.	--	--	1,900	740,000	1,900	740,000
Selenastrum sp.	5,800	99,000	2,900	48,000	970	16,000
Tetraedron II	970	560,000	--	--	970	250,000
Treubaria sp.	--	--	--	--	970	63,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	3,900	2,000,000	8,700	4,600,000	--	--
Dactylococcopsis sp.	--	--	--	--	970	140,000
Lyngbya sp.	3,900	120,000	1,900	58,000	3,900	120,000
Oscillatoria I	16,000	2,700,000	11,000	1,700,000	9,700	1,600,000
Raphidiopsis sp.	2,900	46,000	4,800	76,000	--	--
Synechococcus sp.	--	--	--	--	1,900	85,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	3,900	70,000	--	--	1,900	34,000
Cryptomonas I	970	81,000	--	--	--	--
Cryptomonas II	8,700	170,000	2,900	58,000	--	--
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	--	--	--	--	970	7,200,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri–Continued

DIVISION CLASS *Genus species*	Site HL1 Density (cells/mL)	Site HL1 Biovolume (μm^3/mL)	Site HL2 Density (cells/mL)	Site HL2 Biovolume (μm^3/mL)	Site HL3 Density (cells/mL)	Site HL3 Biovolume (μm^3/mL)
		Harrisonville City Lake April 28, 1992				
CHRYSOPHYTA						
Unknown flagellate I	--	--	2,900	4,100,000	53,000	750,000
Unknown flagellate II	23,000	330,000	--	--	970	1,400,000
BACILLARIOPHYCEAE						
Cyclotella sp.	15,000	24,000,000	8,700	14,000,000	8,700	14,000,000
Eunotia sp.	970	9,700	--	--	--	--
Melosira I	970	710,000	--	--	--	--
Nitzschia sp.	970	690,000	--	--	--	--
CHRYSOPHYCEAE						
Kephryion sp.	6,800	440,000	1,900	130,000	9,700	630,000
Laygnion sp.	--	--	2,900	1,500,000	--	--
Mallomonas I	11,000	4,100,000	21,000	8,100,000	20,000	7,800,000
Mallomonas II	970	970,000	--	--	1,940	1,900,000
Ochromonas sp.	970	110,000	970	110,000	4,800	550,000
Quadrigula sp.	--	--	--	--	1,900	97,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	8,700	27,000	6,800	21,000	6,800	21,000
Carteria I	--	--	970	600,000	--	--
Chlamydomonas I	4,800	2,000,000	2,900	1,200,000	2,900	1,200,000
Chlamydomonas II	2,900	1,800,000	2,900	1,800,000	970	590,000
Chlorella sp.	2,900	330,000	1,900	220,000	--	--
Dictyosphaerium sp.	--	--	4,800	870,000	--	--
Stichococcus sp.	2,900	37,000	9,700	120,000	8,700	110,000
Selenastrum sp.	2,900	48,000	3,900	64,000	7,700	130,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	28,000	500,000	41,000	720,000	46,000	810,000
Cryptomonas I	26,000	2,200,000	16,000	1,400,000	--	--
Cryptomonas II	--	--	16,000	330,000	13,000	250,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Trachelomonas I	3,900	8,200,000	970	2,000,000	--	--
Trachelomonas II	3,900	16,000,000	970	4,100,000	--	--
Trachelomonas III	6,800	15,000,000	2,900	6,200,000	1,900	4,200,000
		May 7, 1992				
CHRYSOPHYTA						
Unknown flagellate I	--	--	42,000	590,000	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	--	--	2,900	4,600,000	--	--
Synedra I	--	--	970	3,100,000	--	--
CHRYSOPHYCEAE						
Laygnion sp.	--	--	970	510,000	--	--
Kephyrion sp.	--	--	2,900	190,000	--	--
Mallomonas I	--	--	970	370,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	2,900	8,700	--	--
Ankistrodesmus II	--	--	6,800	120,000	--	--
Arthrodesmus sp.	--	--	970	1,700,000	--	--
Carteria I	--	--	970	600,000	--	--
Chlamydomonas I	--	--	1,900	790,000	--	--
Selenastrum sp.	--	--	1,900	32,000	--	--
Stichococcus sp.	--	--	9,700	120,000	--	--
Scenedesmus I	--	--	3,900	1,700,000	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	--	--	46,000	830,000	--	--
Cryptomonas II	--	--	13,000	250,000	--	--
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Trachelomonas I	--	--	970	2,000,000	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site HL1 Density (cells/mL)	Site HL1 Biovolume (μm^3/mL)	Site HL2 Density (cells/mL)	Site HL2 Biovolume (μm^3/mL)	Site HL3 Density (cells/mL)	Site HL3 Biovolume (μm^3/mL)
Harrisonville City Lake--Continued May 19, 1992						
CHRYSOPHYTA						
Unknown flagellate I	95,000	1,300,000	445,000	630,000	64,000	900,000
BACILLARIOPHYCEAE						
Cyclotella sp.	3,900	6,100,000	--	--	--	--
Synedra I	970	210,000	--	--	--	--
CHRYSOPHYCEAE						
Mallomonas II	970	2,100,000	--	--	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	3,900	12,000	3,900	12,000
Ankistrodesmus II	3,900	67,000	--	--	--	--
Carteria I	4,800	3,000,000	--	--	--	--
Chlamydomonas I	1,900	790,000	--	--	--	--
Chlorella sp.	970	110,000	--	--	--	--
Crucigenia I	970	62,000	970	62,000	970	62,000
Scenedesmus II	970	2,900	3,900	120,000	5,800	170,000
Selenastrum sp.	9,700	160,000	4,800	81,000	5,800	97,000
Tetraedron I	1,900	510,000	1,900	510,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	40,000	21,000,000	6,800	3,500,000	18,000	9,600,000
Oscillatoria I	970	160,000	--	--	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	17,000	310,000	14,000	240,000	8,700	160,000
Cryptomonas I	3,900	330,000	--	--	--	--
Cryptomonas II	3,900	77,000	3,900	77,000	2,900	58,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	--	--	970	7,200,000	--	--
Phacus sp.	--	--	970	97,000	--	--
Trachelomonas I	970	2,000,000	--	--	--	--
June 3, 1992						
CHRYSOPHYTA						
Unknown flagellate I	--	--	11,000	150,000	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	--	--	1,900	3,000,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	970	3,000	--	--
Selenastrum sp.	--	--	4,800	81,000	--	--
Tetraedron sp.	--	--	970	250,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	--	--	11,000	5,600,000	--	--
Lyngbya sp.	--	--	970	29,000	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	--	--	3,900	69,000	--	--
Cryptomonas II	--	--	970	19,000	--	--
Cryptomonas III	--	--	1,900	500,000	--	--
June 16, 1992						
CHRYSOPHYTA						
Unknown flagellate I	15,000	210,000	15,000	220,000	11,000	15,0000
Unknown flagellate II	970	1,400,000	970	1,400,000	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	--	--	2,900	4,600,000	2,900	4,600,000
CHRYSOPHYCEAE						
Kephyrion sp.	--	--	--	--	970	63,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site HL1 Density (cells/mL)	Site HL1 Biovolume (μm^3/mL)	Site HL2 Density (cells/mL)	Site HL2 Biovolume (μm^3/mL)	Site HL3 Density (cells/mL)	Site HL3 Biovolume (μm^3/mL)
		Harrisonville City Lake--Continued June 16, 1992--Continued				
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	970	3,000	1,900	6,000	--	--
Ankistrodesmus II	--	--	--	--	970	17,000
Chlamydomonas I	970	400,000	--	--	--	--
Crucigenia I	--	--	--	--	970	62,000
Dictyospaeria sp.	--	--	970	170,000	--	--
Golenkinia sp.	--	--	970	32,000	-	--
Scenedesmus I	--	--	970	430,000	--	--
Scenedesmus II	--	--	--	--	1,900	58,000
Selenastrum sp.	2,900	48,000	1,900	32,000	3,900	64,000
XANTHOPHYCEA						
Botryococcus sp.	--	--	970	1,700,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	27,000	14,000,000	9,700	5,100,000	3,900	2,000,000
Synechococcus sp.	4,800	210,000	2,900	130,000	2,900	130,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	13,000	220,000	14,000	240,000	11,000	190,000
Cryptomonas II	2,900	58,000	--	--	--	--
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	970	7,200,000	--	--	--	--
PYRROPHYTA						
DINOPHYCEAE						
Gymnodinium sp.	970	1,700,000	--	--	--	--
		July 9, 1992				
CHRYSOPHYTA						
Unknown flagellate II	--	--	14,000	19,000,000	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	--	--	5,800	9,100,000	--	--
Melosira I			970	710,000		
Nitzschia sp.	--	--	3,900	200,000	--	--
Synedra I	--	--	1,900	410,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	6,800	21,000	--	--
Chlorogonium I	--	--	970	61,000	--	--
Closteriopsis sp.	--	--	970	180,000	--	--
Crucigenia I	--	--	1,900	120,000	--	--
Micratanium sp.	--	--	3,900	1,700,000	--	--
Scenedesmus I	--	--	1,900	58,000	--	--
Selenastrum sp.	--	--	2,900	48,000	--	--
Tetraedron I	--	--	970	250,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	--	--	6,800	3,500,000	--	--
Dactylococcopsis sp.	--	--	970	140,000	--	--
Oscillatoria III	--	--	970	160,000	--	--
Oscillatoria IV	--	--	970	2,300,000	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	--	--	20,000	360,000	--	--
Cryptomonas I	--	--	2,900	240,000	--	--
Cryptomonas II	--	--	1,900	39,000	--	--
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Trachelomonas I	--	--	970	2,000,000	--	--
Trachelomonas IV	--	--	970	260,000	--	--
Trachelomonas VII	--	--	970	510,000	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri–Continued

DIVISION CLASS *Genus species*	Site HL1 Density (cells/mL)	Site HL1 Biovolume (μm^3/mL)	Site HL2 Density (cells/mL)	Site HL2 Biovolume (μm^3/mL)	Site HL3 Density (cells/mL)	Site HL3 Biovolume (μm^3/mL)
	Harrisonville City Lake--Continued July 28, 1992					
CHRYSOPHYTA						
Unknown flagellate I	--	--	20,000	290,000	30,000	420,000
Unknown flagellate II	19,000	27,000,000	--	--	--	--
BACILLARIOPHYCEAE						
Cyclotella sp.	3,900	6,100,000	6,800	11,000,000	11,000	17,000,000
Melosira I	970	710,000	3,900	2,800,000	970	710,000
Melosira II	--	--	970	1,400,000	970	1,400,000
Nitzschia I	--	--	970	690,000	--	--
Rhizosolenium I	--	--	970	720,000	1,900	1,400,000
Synedra I	12,000	2,500,000	15,000	3,100,000	21,000	4,500,000
CHRYSOPHYCEAE						
Mallomonas II	970	970,000	--	--	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	2,900	9,100	970	3,000	2,900	9,100
Ankistrodesmus II	--	--	1,900	33,000	970	17,000
Actinastrum sp.	--	--	--	--	1,900	3,400,000
Carteria I	2,900	1,800,000	970	600,000	--	--
Characium sp.	1,000	50,000	--	--	--	--
Chlamydomonas I	--	--	1,900	790,000	1,900	790,000
Chlorella sp.	--	--	970	110,000	--	--
Chlorogonium II	--	--	--	--	970	970,000
Closteriopsis sp.	--	--	--	--	2,900	550,000
Cosmarium sp.	970	93,000	970	93,000	--	--
Crucigenium II	--	--	--	--	4,800	970,000
Dictyosphaerium sp.	970	170,000	970	170,000	970	170,000
Euastrum sp.	1,900	460,000	--	--	--	--
Golenkinia sp.	--	--	970	32,000	--	--
Scenedesmus I	--	--	1,900	860,000	4,800	2,200,000
Scenedesmus II	1,900	58,000	--	--	--	--
Selenastrum sp.	3,900	640,00	2,900	48,000	2,900	48,000
Tetraedron I	1,900	510,000	1,900	510,000	970	250,000
Oocystis sp.	--	--	--	--	1,900	1,000,000
CYANOPHYTA						
CYANOPHYCEAE						
Anabaena sp.	--	--	--	--	970	240,000
Anacystis sp.	2,900	1,500,000	5,800	3,000,000	7,700	4,100,000
Aphanizomenon sp.	2,900	380,000	--	--	--	--
Dactylococcopsis sp.	--	--	1,900	270,000	--	--
Gomphosphaeria sp.	--	--	970	160,000	--	--
Merismopedia sp.	1,900	330,000	970	160,000	4,800	820,000
Oscillatoria I	--	--	2,900	470,000	970	160,000
Oscillatoria IV	--	--	970	2,300,000	--	--
Raphidiopsis sp.	--	--	970	15,000	--	--
Synechococcus sp.	-	--	970	43,000	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	9,700	170,000	14,000	240,000	3,900	69,000
Cryptomonas I	11,000	900,000	1,900	160,000	--	--
Cryptomonas II	1,900	39,000	--	--	970	19,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	--	--	970	7,200,000	--	--
Trachelomonas II	--	--	--	--	1,900	8,100,000
Trachelomonas IV	--	--	--	--	970	260,000
PYRROPHYTA						
DINOPHYCEAE						
Ceratium sp.	970	3,700,000	--	--	--	--
Gymnodinium sp.	1,900	3,500,000	--	--	--	--
CHRYSOPHYTA						
Unknown flagellate II	--	--	21,000	30,000,000	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site HL1 Density (cells/mL)	Site HL1 Biovolume (μm^3/mL)	Site HL2 Density (cells/mL)	Site HL2 Biovolume (μm^3/mL)	Site HL3 Density (cells/mL)	Site HL3 Biovolume (μm^3/mL)
Harrisonville City Lake--Continued August 13, 1992						
BACILLARIOPHYCEAE						
Cyclotella sp.	--	--	4,800	7,600,000	--	--
Melosira I	--	--	4,800	3,600,000	--	--
Melosira II	--	--	1,900	2,800,000	--	--
Nitzschia I	--	--	970	690,000	--	--
Synedra I	--	--	6,800	1,400,000	--	--
Synedra II	--	--	1,900	3,500,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	--	--	970	3,000	--	--
Ankistrodesmus II	--	--	1,900	33,000	--	--
Crucigenia II	--	-	970	190,000	--	--
Euastrum sp.	--	--	970	230,000	--	--
Golenkinia sp.	--	--	970	32,000	--	--
Scenedesmus II	--	--	970	29,000	--	--
Selenastrum sp.	--	--	3,900	64,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	--	--	5,800	3,000,000	--	--
Gloeocapsa sp.	--	--	970	63,000	--	--
Lyngbya sp.	--	--	1,900	58,000	--	--
Merismopedia sp.	--	--	9,700	1,600,000	--	--
Oscillatoria III	--	--	4,800	790,000	--	--
Oscillatoria IV	--	--	2,900	6,900,000	--	--
Raphidiopsis sp.	--	--	970	15,000	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	--	--	970	17,000	--	--
Cryptomonas I	--	--	1,900	160,000	--	--
August 27, 1992						
CHRYSOPHYTA						
Unknown flagellate I	6,800	96,000	6,800	96,000	4,800	68,000
BACILLARIOPHYCEAE						
Cyclotella sp.	9,700	15,000,000	5,800	9,100,000	4,800	760,0000
Melosira I	970	710,000	11,000	7,800,000	5,800	430,0000
Melosira II	--	--	--	--	1,900	280,0000
Navicula sp.	970	50,000	--	--	--	--
Synedra I	6,800	1,400,000	6,800	1,400,000	8,700	1,800,000
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	970	3,000	1,900	6,000	970	3,000
Ankistrodesmus II	970	17,000	2,900	50,000	--	--
Carteria I	970	600,000	--	--	--	--
Chlamydomonas I	--	--	970	400,000	2,900	1,200,000
Chlorogonium I	--	--	4,800	300,000	--	--
Crucigenia I	--	--	--	--	970	62,000
Dictyosphaerium sp.	--	--	970	170,000	--	--
Golenkinia sp.	--	--	--	--	970	32,000
Oocystis sp.	970	510,000	--	--	--	--
Pediastrum I	--	--	970	160,000	--	--
Platymonas I	970	370,000	--	--	--	--
Scenedesmus I	--	--	--	--	970	430,000
Scenedesmus II	--	--	1,900	58,000	--	--
Selenastrum sp.	970	16,000	2,900	48,000	970	16,000
Tetraedron I	970	250,000	--	--	1,900	510,000
Tetraedron II	2,900	1,700,000	--	--	--	--
Tetraedron III	--	--	970	250,000	--	--

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site HL1 Density (cells/mL)	Site HL1 Biovolume (μm^3/mL)	Site HL2 Density (cells/mL)	Site HL2 Biovolume (μm^3/mL)	Site HL3 Density (cells/mL)	Site HL3 Biovolume (μm^3/mL)
Harrisonville City Lake--Continued August 27, 1992--Continued						
CYANOPHYTA						
CYANOPHYCEAE						
Anabaenopsis sp.	--	--	970	160,000	--	--
Anacystis sp.	9,700	5,100,000	3,900	2,000,000	3,900	2,000,000
Dactylococcopsis sp.	1,900	270,000	--	--	--	--
Gloeocapsa sp.	--	--	1,900	130,000	970	63,000
Lyngbya sp.	9,700	290,000	5,800	170,000	6,800	200,000
Merismopedia sp.	--	--	970	160,000	970	160,000
Oscillatoria I	14,000	2,200,000	1,900	320,000	15,000	2,500,000
Oscillatoria III	--	--	13,000	2,100,000	--	--
Oscillatoria IV	--	--	--	--	--	--
Raphidiopsis sp.	6,800	110,000	4,800	76,000	3,900	61,000
Synechococcus sp.	1,900	85,000	--	--	970	43,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	3,900	69,000	3,900	69,000	970	17,000
Cryptomonas I	8,700	730,000	970	82,000	970	19,000
Cryptomonas II	--	--	970	19,000	970	82,000
EUGLENOPHYTA						
EUGLENOPHYCEAE						
Euglena I	970	7,200,000	970	7,400	5,800	43,000,000
Trachelomonas I	--	--	970	4,200	--	--
PYRROPHYTA						
DINOPHYCEAE						
Gymnodinium sp.	--	--	--	--	1,900	3,500,000
September 18, 1992						
CHRYSOPHYTA						
Unknown flagellate I	6,800	96,000	4,800	68,000	4,800	68,000
BACILLARIOPHYCEAE						
Cyclotella sp.	13,000	20,000,000	20,000	32,000,000	12,000	18,000,000
Melosira I	--	--	--	--	970	1,400,000
Synedra I	2,900	620,000	970	210,000	2,900	620,000
Synedra II	--	--	4,800	15,000,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Carteria I	--	--	--	--	970	600,000
Chlamydomonas I	--	--	970	400,000	--	--
Coelastrum I	--	--	--	--	970	670,000
Crucigenia I	1,900	120,000	970	62,000	970	62,000
Crucigenia II	2,900	580,000	--	--	--	--
Euastrum sp.	--	--	1,900	460,000	--	--
Golenkinia sp.	--	--	--	--	970	32,000
Gonium sociale I	970	300,000	--	--	--	--
Phacotus sp.	--	--	970	590,000	--	--
Quadrigula sp.	970	48,000	--	--	--	--
Scenedesmus II	2,900	87,000	8,700	260,000	3,900	120,000
Selenastrum sp.	1,900	32,000	1,900	32,000	970	16,000
Tetraedron I	1,900	510,000	2,900	760,000	--	--
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	2,900	1,500,000	2,900	1,500,000	7,700	4,100,000
Dactylococcopsis sp.	--	--	970	29,000	970	29,000
Merismopedia sp.	--	--	--	--	970	160,000
Oscillatoria II	--	--	3,900	630,000	--	--
Oscillatoria III	--	--	--	--	2,900	470,000
Raphidiopsis sp.	--	--	970	15,000	970	15,000
Synechococcus I	1,900	85,000	970	43,000	970	43,000
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	2,900	52,000	4,800	86,000	2,900	52,000
Cryptomonas I	4,800	410,000	1,900	160,000	--	--
Cryptomonas II	--	--	--	--	2,900	58,000

Table 22. Phytoplankton densities and biovolumes in three reservoirs in west-central Missouri--Continued

DIVISION CLASS *Genus species*	Site HL1 Density (cells/mL)	Site HL1 Biovolume (μm^3/mL)	Site HL2 Density (cells/mL)	Site HL2 Biovolume (μm^3/mL)	Site HL3 Density (cells/mL)	Site HL3 Biovolume (μm^3/mL)
Harrisonville City Lake--Continued October 22, 1992						
CHRYSOPHYTA						
Unknown flagellate I	--	--	4,800	68,000	2,900	41,000
BACILLARIOPHYCEAE						
Cyclotella sp.	970	1,500,000	--	--	4,800	7,600,000
Melosira I	--	--	970	710,000	970	710,000
Nitzschia I	970	690,000	970	690,000	--	--
Synedra I	--	--	970	210,000	--	--
CHLOROPHYTA						
CHLOROPHYCEAE						
Ankistrodesmus I	3,900	12,000	970	3,000	4,800	15,000
Ankistrodesmus II	--	--	970	17,000	970	17,000
Carteria I	970	600,000	3,900	2,400,000	4,800	3,000,000
Chlorella sp.	--	--	970	13,000	--	--
Closteriopsis sp.	970	180,000	--	--	--	--
Crucigenia I	4,800	310,000	970	62,000	3,900	250,000
Crucigenia II	--	--	--	--	970	190,000
Dictyosphaerium sp.	--	--	3,900	700,000	--	--
Platymonas sp.	--	--	970	370,000	--	--
Scenedesmus II	5,800	170,000	3,900	120,000	5,800	170,000
Scenedesmus III	--	--	--	--	970	250,000
Selenastrum sp.	4,800	81,000	3,900	64,000	3,900	64,000
Tetraedron II	--	--	--	--	1,900	1,100,000
CYANOPHYTA						
CYANOPHYCEAE						
Anacystis sp.	5,800	3,000,000	6,800	3,500,000	4,800	2,500,000
Gloeocapsa sp.	970	63,000	--	--	--	--
Oscillatoria II	970	160,000	970	160,000	--	--
Synechococcus sp.	1,900	85,000	970	43,000	--	--
CRYPTOPHYTA						
CRYPTOPHYCEAE						
Chroomonas sp.	--	--	970	17,000	5,800	100,000
Cryptomonas I	1,900	160,000	6,800	570,000	4,800	410,000
Cryptomonas II	--	--	9,700	190,000	--	--
EUGLENOPHYCEAE						
Euglena sp.	2,900	22,000,000	--	--	4,800	37,000,000
Lepocinclis sp.	--	--	3,900	410,000	--	--
PYRROPHYTA						
DINOPHYCEAE						
Gymnodinium II	--	--	--	--	1,900	62,000

Table 23. Zooplankton densities in Harrisonville City Lake, west-central Missouri

[--, not available; organisms per liter]

PHYLUM CLASS Order *Genus*	Site HL1	Site HL2	Site HL3
	April 28, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	0.38	0.72	2.01
Daphnia	1.74	.49	1.93
Ceriodaphnia	--	--	.08
Copepoda			
Diaptomus	7.92	7.07	26.9
Thermocyclops	2.64	.90	3.79
ROTATORIA			
Asplanchna	--	--	.81
	May 7, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	--	1.40	--
Daphnia	--	2.29	--
Copepoda			
Diaptomus	--	10.7	--
Thermocyclops	--	12.7	--
Macrocyclops	--	1.33	--
ROTATORIA			
Keretella	--	1.33	--
	May 19, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	6.26	8.80	0.55
Daphnia	2.64	11.6	3.82
Ceriodaphnia	.06	.21	.14
Diaphanosoma	.12	.05	.05
Chydoridae	--	--	.05
Copepoda			
Diaptomus	3.86	14.0	3.41
Thermocyclops	1.1	3.0	1.01
Macrocyclops	.18	.89	.37
Cyclops	.06	--	--
ROTATORIA			
Asplanchna	1.41	1.2	1.2

Table 23. Zooplankton densities in Harrisonville City Lake, west-central Missouri--Continued

PHYLUM CLASS Order *Genus*	Site HL1	Site HL2	Site HL3
	June 3, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	--	2.64	--
Daphnia	--	3.32	--
Ceriodaphnia	--	.18	--
Diaphanosoma	--	.06	--
Copepoda			
Diaptomus	--	7.49	--
Thermocyclops	--	.18	--
Macrocyclops	--	.55	--
ROTATORIA			
Asplanchna	--	.92	--
	June 16, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	5.31	0.80	10.44
Daphnia	10.43	.80	8.42
Ceriodaphnia	2.18	.46	5.69
Diaphanosoma	1.59	.26	6.21
Copepoda			
Diaptomus	14.7	2.08	60.5
Thermocyclops	--	.07	--
Macrocyclops	3.42	.23	4.84
ROTATORIA			
Asplanchna	3.42	3.36	40.7
	July 9, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	--	0.71	--
Daphnia	--	.46	--
Ceriodaphnia	--	1.80	--
Diaphanosoma	--	.49	--
Copepoda			
Diaptomus	--	3.07	--
Macrocyclops	--	.63	--
Cyclops	--	.25	--
ROTATORIA			
Asplanchna	--	1.80	--

Table 23. Zooplankton densities in Harrisonville City Lake, west-central Missouri--Continued

PHYLUM CLASS Order *Genus*	Site HL1	Site HL2	Site HL3
	July 28, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	0.90	0.31	2.27
Daphnia	6.15	1.08	8.98
Ceriodaphnia	9.65	4.45	12.36
Diaphanosoma	3.16	.45	1.66
Copepoda			
Diaptomus	13.55	13.39	14.14
Thermocyclops	--	.34	.11
Macrocyclops	4.74	4.94	6.87
ROTATORIA			
Asplanchna	5.76	5.04	4.16
	August 13, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	--	1.19	--
Daphnia	--	1.83	--
Ceriodaphnia	--	6.76	--
Diaphanosoma	--	.82	--
Copepoda			
Diaptomus	--	6.47	--
Thermocyclops	--	5.09	--
Macrocyclops	--	2.23	--
ROTATORIA			
Asplanchna	--	.95	--
	August 27, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	3.82	1.38	2.52
Daphnia	.34	.40	1.98
Ceriodaphnia	3.34	2.08	5.66
Diaphanosoma	7.64	1.33	3.14
Copepoda			
Diaptomus	15.62	5.34	14.72
Thermocyclops	4.01	2.67	5.39
Macrocyclops	.68	2.97	1.77
ROTATORIA			
Asplanchna	12.04	3.00	3.92
Keretella	--	--	.07

Table 23. Zooplankton densities in Harrisonville City Lake, west-central Missouri–Continued

PHYLUM CLASS Order *Genus*	Site HL1	Site HL2	Site HL3
	September 18, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	14.34	27.68	15.55
Daphnia	7.50	24.33	10.81
Ceriodaphnia	7.33	13.31	9.16
Diaphanosoma	24.12	3.17	4.13
Copepoda			
Diaptomus	8.82	14.11	8.18
Thermocyclops	6.75	20.66	8.38
Macrocyclops	1.67	7.56	1.54
ROTATORIA			
Asplanchna	3.86	6.72	9.02
	October 22, 1992		
ARTHROPODA			
CRUSTACEA			
Cladocera			
Bosmina	37.46	22.06	14.27
Daphnia	8.34	28.69	40.67
Ceriodaphnia	3.83	3.53	3.19
Diaphanosoma	--	.32	.13
Copepoda			
Diaptomus	7.04	4.76	4.24
Thermocyclops	4.17	4.60	8.75
Macrocyclops	12.45	3.25	2.36
ROTATORIA			
Asplanchna	1.16	7.02	10.11