Limnological Survey of Lake Kemp, Texas: 1999

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Introduction

The upper reaches of the Red River drainage basin, in southwest Oklahoma and north-central Texas, drain an area underlain by extensive marine evaporite deposits (Sonnenfeld 1984) that was formed by subsidence of inland seas during the Permian. As a result of spring seepage and dissolution of exposed deposits, tributaries of the Red River deliver a high load of dissolved solids, particularly sodium chloride, into the Red River, limiting its usefulness as a water supply for agricultural, industrial, and municipal uses.

The Tulsa District, U.S. Army Corps of Engineers has proposed constructing a number of chloride control facilities to intercept and dispose of these saline inflows to the Red River and its tributaries (USACOE 1994). This proposed project, the Red River Chloride Control Project, would intercept saline flows using a combination of dikes, inflatable weirs, and pumps, and dispose of these saline flows by export to brine disposal lakes and by deep-well injection into deep, porous strata. Operation of these control structures is expected to considerably reduce salinity in the Red River and affected tributaries: the ten naturally occurring sources of chloride loading into the Red River and its tributaries targeted by the Red River Chloride Control Project contribute a daily average of 3,208 metric tons of chloride to the river.

The Wichita River, a tributary of the Red River, drains arid and semiarid lands in north-central Texas. The river is formed by union of the North Wichita River, the Middle Wichita River, and the South Wichita River. The Red River Chloride Control Project proposes construction of three chloride control structures in the Wichita River basin: the

Y Ranch low flow dam (North Wichita River), the Lowrance low flow dam (Middle Wichita River), and the Bateman Low Flow Dam (South Wichita River). The Wichita River drainage area contains extensive deposits of sodium chloride and gypsum, of marine origin (Joerns 1961) and numerous springs and seeps deliver chlorides into the river (Lewis and Dalquest 1957; Joerns 1961). The USACOE (1972) indicates that brines in the Wichita River are primarily sodium chloride with a high sulfate concentration. Chloride concentrations in these springs and seeps range from 5000 to 30,000 mg/l, but chloride concentrations in deep aquifers exceed 100,000 mg/l (Garza 1983).

Construction of chloride control structures on the South Wichita River was authorized in 1974 and construction began in the fall of 1976. These structures include a low flow dam (Bateman low flow dam) with an inflatable weir to collect brine flows emitting from the South Wichita River drainage and a pump station and pipeline to deliver collected brines to Truscott Brine Lake. The low flow dam is located at South Wichita River km 135, in King County, Texas. Under low flow conditions, when chloride concentrations are greatest in the river, the dam is inflated and impounds the river. These impounded brines are exported to Truscott Brine Lake. During periods of high flow, the dam deflates, allowing passage of waters with lower chloride concentrations. The Bateman low flow dam went into operation in May 1987.

The Wichita River is impounded at river km 228 to form Lake Kemp. Construction and operation of chloride control structures on the Wichita River also is expected to reduce chloride loading into Lake Kemp. Historically, the average chloride load into Lake Kemp was about 408 metric tons per day.

Baldys et al. (1996) examined concentrations of total dissolved solids and chloride at several sites on the South Wichita and Wichita rivers. They reported that operation of the Bateman chloride control facility had significantly reduced chloride and dissolved solids concentrations at all sites studied.

A preliminary study of the effects of the Bateman chloride control facility on water quality in Lake Kemp (Baldys et al. 1996) was inconclusive. Baldys et al. (1996) found weak evidence of a decrease in chloride and dissolved solids concentrations in Lake Kemp and strong evidence of a decrease in these parameters in the Wichita River downstream from the lake. However, high runoff early in their study led them to question whether these decreases were due to chloride control or dilution. Wilde (1999) sampled Lake Kemp in 1997 and, based on a comparison of his results with those of previous studies, suggested that chloride loading into the lake may have decreased by as much as 33% between 1992 and 1997. The purposes of this study are to continue a program for monitoring the physical, chemical, and biological limnology of Lake Kemp that began in 1997-1998. This monitoring program will provide baseline data on the limnology of Lake Kemp and provide information with which to assess potential effects of the chloride control structures on water quality and productivity of the lake.

Description of the Study Area

Lake Kemp is a moderately large impoundment of the Wichita River located in north-central Baylor County, Texas, at river km 228. Lake Kemp is approximately 13 km north of Seymour, TX, and 64 km southwest of Wichita Falls, TX. The lake was impounded in October 1922, but the dam was not completed until August 1923. The

height of the dam was increased by approximately 5 m in 1973. The dam now is 2710 m long and rises 35.1 m above the bed of the Wichita River. The spillway is located at an elevation of 360.6 m above sea level. At top of the conservation pool, the water level is at an elevation of 348.7 m. Lake Kemp has a surface area of 6,314 ha (15,590 acres), a volume of 0.432 km^3 (268,000 acre-feet), and mean and maximum depths of 9.6 (Ground and Groeger 1994) and 17 m (Wilde 1999), respectively.

Lake Kemp was impounded for flood control and irrigation. The lake is operated by the City of Wichita Falls and the Wichita County Water Improvement District No. 2. Waters from the lake currently are used for irrigation in the Wichita River Valley, for oil field operations, and municipal and industrial uses. Flood storage in Lake Kemp is managed by the U.S. Army Corps of Engineers.

The drainage area of Lake Kemp is 5,403 km^2 (2,086 square miles) and is composed primarily of range (86.7%) and cropland (13.3%). Compared with other Texas river basins, the Wichita River drainage basin is highly erosible (Greiner 1982). Most erosion (71%) in the basin is sheet and rill erosion, both of which are associated with overland runoff following rain events.

Baylor County has a mild climate with a 214 day (frost free) growing season (Ramos 1995). The mean annual air temperature is 17^{o}C; mean air temperatures in July (summer) and January (winter) are 36 and -3^{o}C, respectively. Annual rainfall is 69 cm per year (Ramos 1995) and the evaporation rate is 152 cm per year (Joerns 1961). Winds are highly variable. Prevailing winds are out of the south in spring and summer, and out of the north in winter.

Methods

In general, sampling was conducted in accordance with the monitoring plan developed by Burks (1996). Sampling was conducted from June 1999 through February (March 2) 2000 at six locations on Lake Kemp (Figure 1). These sites were chosen to include two locations (K1 and K2) representative of limnetic conditions, two locations (K3 and K4) that were transitional between riverine and limnetic conditions, and two locations (K5 and K6) that were riverine in nature. The Wichita River has deposited an extensive, shallow (< 1 m) delta in much of the upper reaches of Lake Kemp, therefore, sites K5 and K6 may not represent truly riverine conditions, but both sites are strongly influenced by the river. Field measurements only were made at site K5.

On each sampling date, vertical profiles of water temperature, pH, dissolved oxygen, and conductivity were collected with a Hydrolab Reporter multiprobe water analyzer. Measurements were made from the surface to within 0.5 m of the bottom, in 1 m depth increments, at each station. Transparency was measured with a Secchi disc. Photosynthetically active radiation (PAR) was measured with a LI-COR model LI-192SA underwater Quantum Sensor. PAR was measured at the surface and at 1 m depth increments until $\leq$ 1% of incident surface radiation was detected. PAR readings were log transformed and linear regression was used to estimate extinction coefficients ($\varepsilon\lambda$) using the formula:

$$\ln(I_z) = \ln(I_o) - \varepsilon\lambda z$$

where I_z is the intensity of light at depth z, I_o is the intensity of light penetrating the

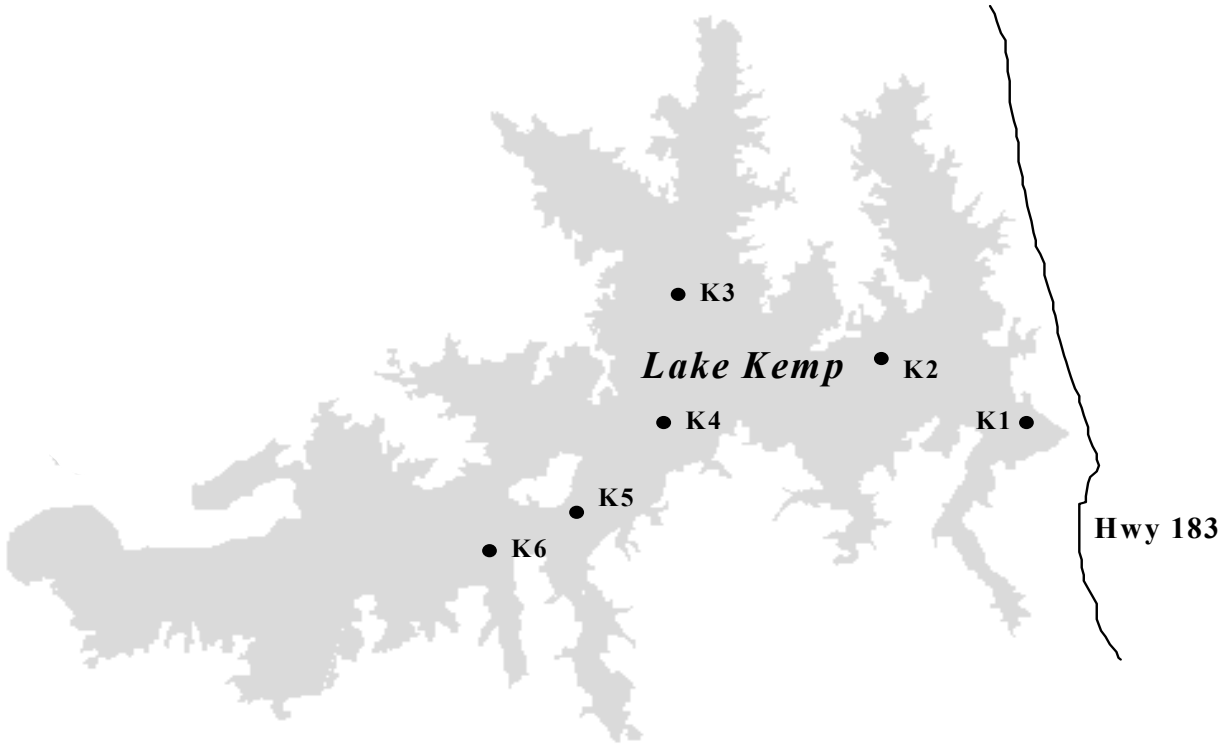

Figure 1. Map of Lake Kemp, Texas, showing sampling sites. Coordinates of sampling sites are: K1 (33°45'07.8769"N, 99°09'08.0067"W), K2 (33°46'02.2543"N, 99°10'02.2807"W), K3 (33°45'52.6767"N, 99°12'29.5711"W), K4 (33°45'02.0317"N, 99°12'12.17.7930"W), K5 (33°44'42.8598"N, 99°12'56.8601"W), and K6 (33°44'16.6801"N, 99°13'25.5716"W).

surface, z is the path length (depth, m), and $\varepsilon\lambda$ is the extinction coefficient (Horne and Goldman 1994).

Water samples for alkalinity, turbidity, total dissolved solids, total suspended solids, nutrients, and ion analyses were collected at depths of 0.5 m and at 0.5 m above the lake bottom using a pump sampler. Three replicate samples were taken, surface and bottom, at sites K2 and K3, and 10 replicate samples were taken for turbidity at sites K1, K4, and K6. Samples were preserved on ice or, in the case of nitrate samples were preserved with hydrochloric acid.

Samples for measurements of alkalinity, turbidity, and chlorophyll-*a* were maintained in controlled rooms, under chain-of-custody, until analyses were completed at Texas Tech University. Turbidity was measured with a LaMotte turbidity meter following NPDES method 180.1 (U.S. EPA 1993). Alkalinity was determined using NPDES method 310.1 (U.S. EPA 1983).

Samples for chlorophyll-*a* determinations and phytoplankton cell counts were collected from a depth of 0.5 m. Three replicate samples were taken at each sampling site (K1-K4, K6) for phytoplankton. For chlorophyll-*a* determinations, three replicate samples were taken at sites K2 and K3, and 10 replicate samples were collected at sites K1, K4, and K6. Phytoplankton samples were preserved with Lugol's solution (Lind 1979). Chlorophyll-*a* was measured with a Turner model 10-AU fluorometer following Standard Method 10200 H. Chlorophyll (American Public Health Association 1996), for fluorometric analysis of chlorophyll-*a*. Chlorophyll-*a* concentrations were corrected for phaeophytin as described by this method. Phytoplankton samples were counted using

settling chambers and an inverted microscope as described by Wetzel and Likens (1991). All organisms in each field were identified to genus and enumerated. Counts were used to estimate phytoplankton densities as the number of cells per ml.

Zooplankton samples were collected with three replicate vertical tows of a Wisconsin plankton net, from 3 x Secchi depth to the surface. Zooplankton samples were preserved with a 5%-sucrose formalin solution. Sample volumes were adjusted to yield counts greater than 100 for common organisms. Three replicate 1 ml subsamples were drawn from each zooplankton sample with a calibrated pipette and placed in Sedgwick-Rafter cells. Zooplankton were counted under a compound microscope, at 40x magnification. All organisms in each subsample were identified to genus or species and enumerated. Counts were used to estimate zooplankton densities as the number of individuals per liter.

Samples for total dissolved solids, total suspended solids, nutrients, and ion analyses were maintained in controlled rooms, under chain-of-custody, until they were delivered to a contract lab (TraceAnalysis, Lubbock, Texas) for analysis. Total dissolved solids (filterable residue), and total suspended solids (non-filterable residue) were measured following NPDES methods 160.1, and 160.2 (U.S. EPA 1983), respectively. Total phosphorus (NPDES method 365.2), total nitrogen (= Keldahl nitrogen [NPDES method 351] + nitrate + nitrite), and hardness (NPDES method 130) were analyzed according to methods described in U.S. EPA (1983). Cations (calcium, potassium, magnesium, and sodium) were analyzed by inductively-coupled plasma spectrophotometry. Anions (chloride, sulfate, nitrite, nitrate, and phosphate) were analyzed by ion chromatography.

At the conclusion of sampling on each sampling date, 20 l of de-ionized water was pumped through the water sampling device. Water samples were collected from the effluent stream, preserved as field blank samples, and analyzed by the contract lab for nutrients, anions, and cations. Results for these field blanks are presented in Appendix D.

Results

Thermal Structure

Lake Kemp was thermally stratified from June through August at the two deeper sites, K1 and K2, with a well developed thermocline present at the 26^{o}C isocline at a depth of 12 m (Figure 2). Elsewhere in the lake, at sites K3-K6, a combination of shallow depth (< 10 m) and wind-driven mixing prevented development of any stable thermal stratification during summer (Figures 2 and 3). Surface water temperatures throughout the lake ranged between 26 and 28^{o}C from June through August.

Surface water temperatures cooled to 24^{o}C in September and, by this time, thermal stratification had broken down at sites K1 and K2. From September through March all study sites were isothermal (Figures 2 and 3). Temperatures throughout the water column decreased to 20^{o}C in October, 10 to 12^{o}C in November, and 8^{o}C in December. Temperatures throughout the lake increased to 10 ^{o}C in January and to 12^{o}C in March.

Except for the development of thermal stratification at sites K1 and K2, during June through August, there was little spatial heterogeneity in water temperatures in Lake Kemp.

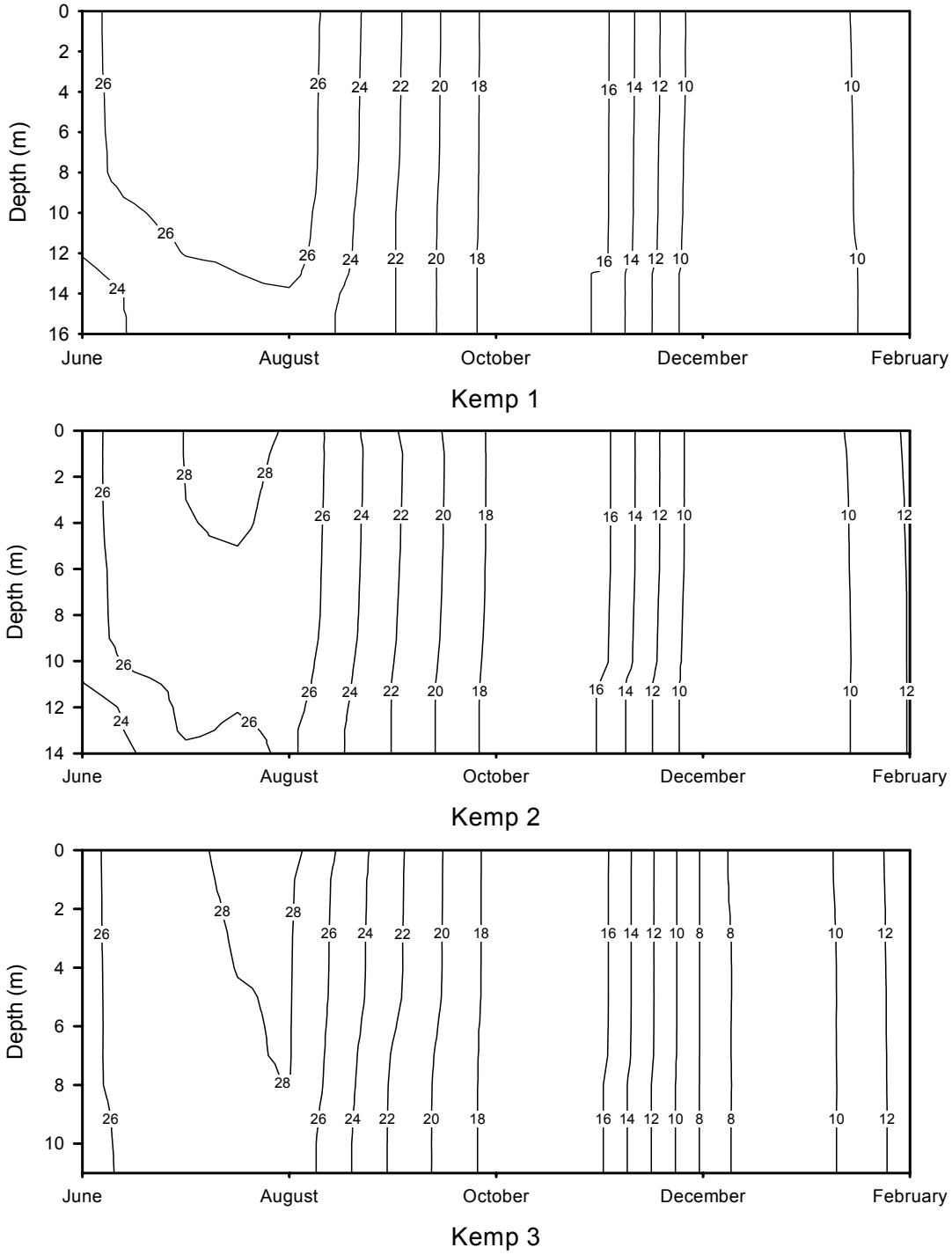

Figure 2. Temperature (^{O}C) isoclines at sites K1-K3 in Lake Kemp, Texas, June 1999 through February 2000.

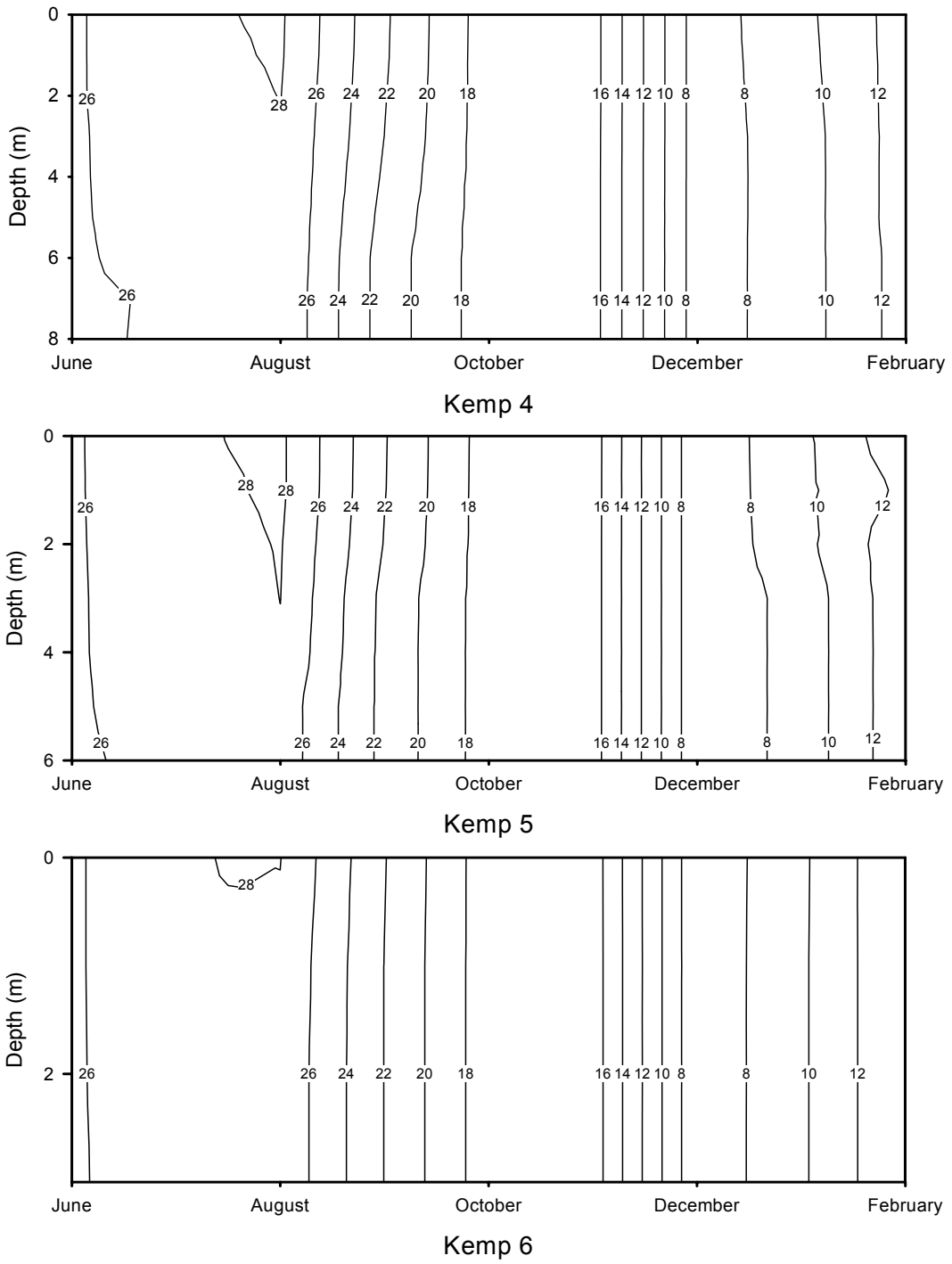

Figure 3. Temperature (^{O}C) isoclines at sites K4-K6 in Lake Kemp, Texas, June 1999 through February 2000.

Conductivity

Conductivity showed substantial vertical heterogeneity at sites K1 and K2 during June through August, during the period that Lake Kemp was thermally stratified (Figure 4). At sites K1 and K2, conductivity was approximately 4800 μS/cm at the surface, but increased to 5000 μS/cm at the bottom at K1 and 5200 μS/cm at K2. Conductivity at sites K3-K6 ranged between 4400 and 5000 μS/cm during June through August (Figures 4 and 5). There was no evident spatial variation in conductivity between sites K3-K6; however, conductivity at these sites showed a progressive increase from 4400 to 4600 μS/cm in June to 5000 μS/cm in August.

With the breakdown of thermal stratification in September, conductivity was uniform throughout the water column at each site through February (Figures 4 and 5). At sites K1-K3, conductivity progressively increased through time from 5000 μS/cm in September to 5400 μS/cm in February. Conductivity showed similar increases, from September through February, at sites K4-K6 with maximum conductivity at these sites ranging from 5200 μS/cm (K6) to 5800 μS/cm (K5).

Dissolved Oxygen

Surface and midwater oxygen concentrations remained at 7.0 ppm, or greater, at all sites in Lake Kemp during June through August (Figures 6 and 7). Depletion of metalimnetic and hypolimnetic oxygen resulted in anoxic conditions in the lower 3 to 4 m at sites K1 and K2, and along the lake bottom at site K3. Oxygen concentrations

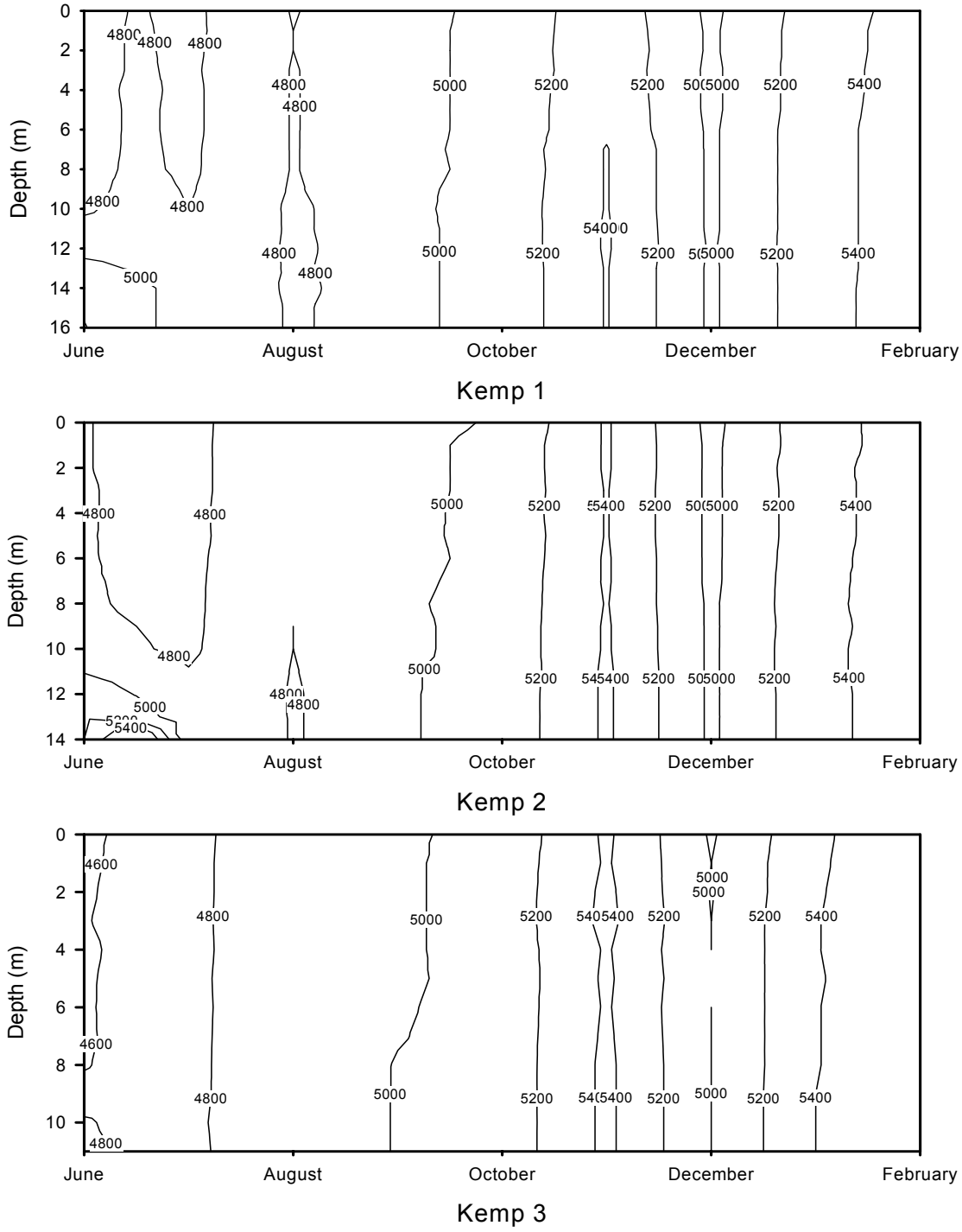

Figure 4. Conductivity (µS/cm) isoclines at sites K1-K3 in Lake Kemp, Texas, June 1999 through February 2000.

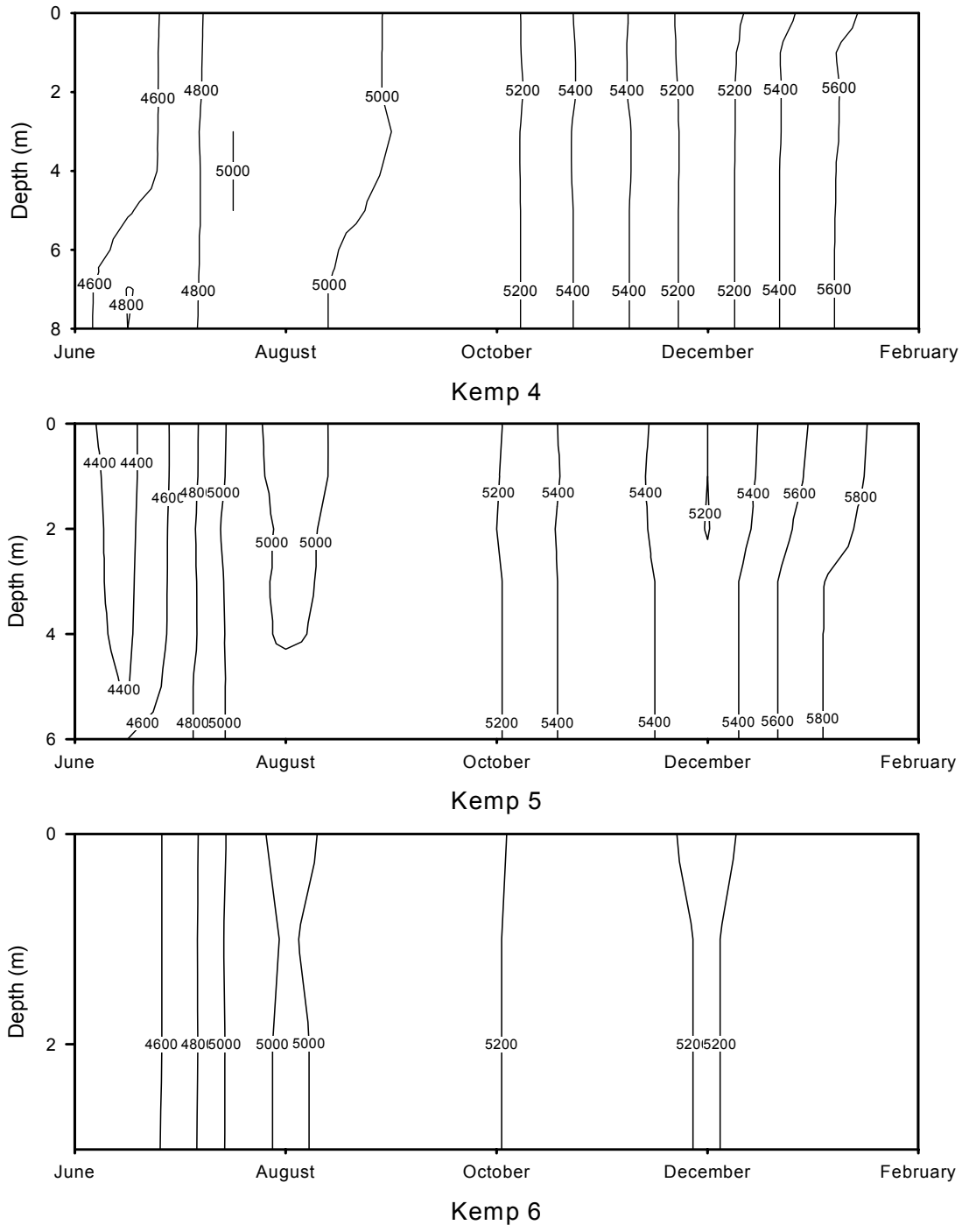

Figure 5. Conductivity (µS/cm) isoclines at sites K4-K6 in Lake Kemp, Texas, June 1999 through February 2000.

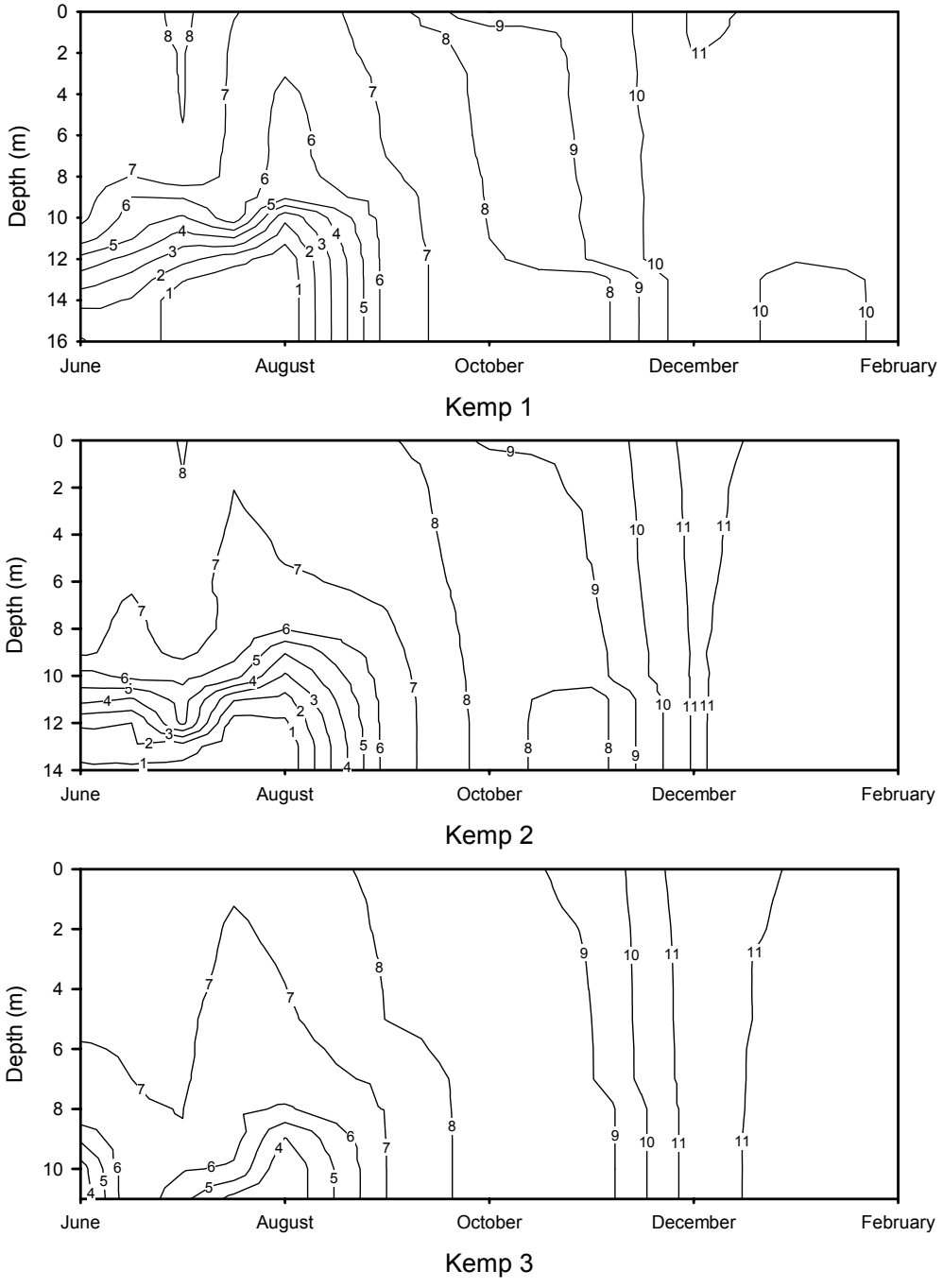

Figure 6. Dissolved oxygen (ppm) isoclines at sites K1-K3 in Lake Kemp, Texas, June 1999 through February 2000.

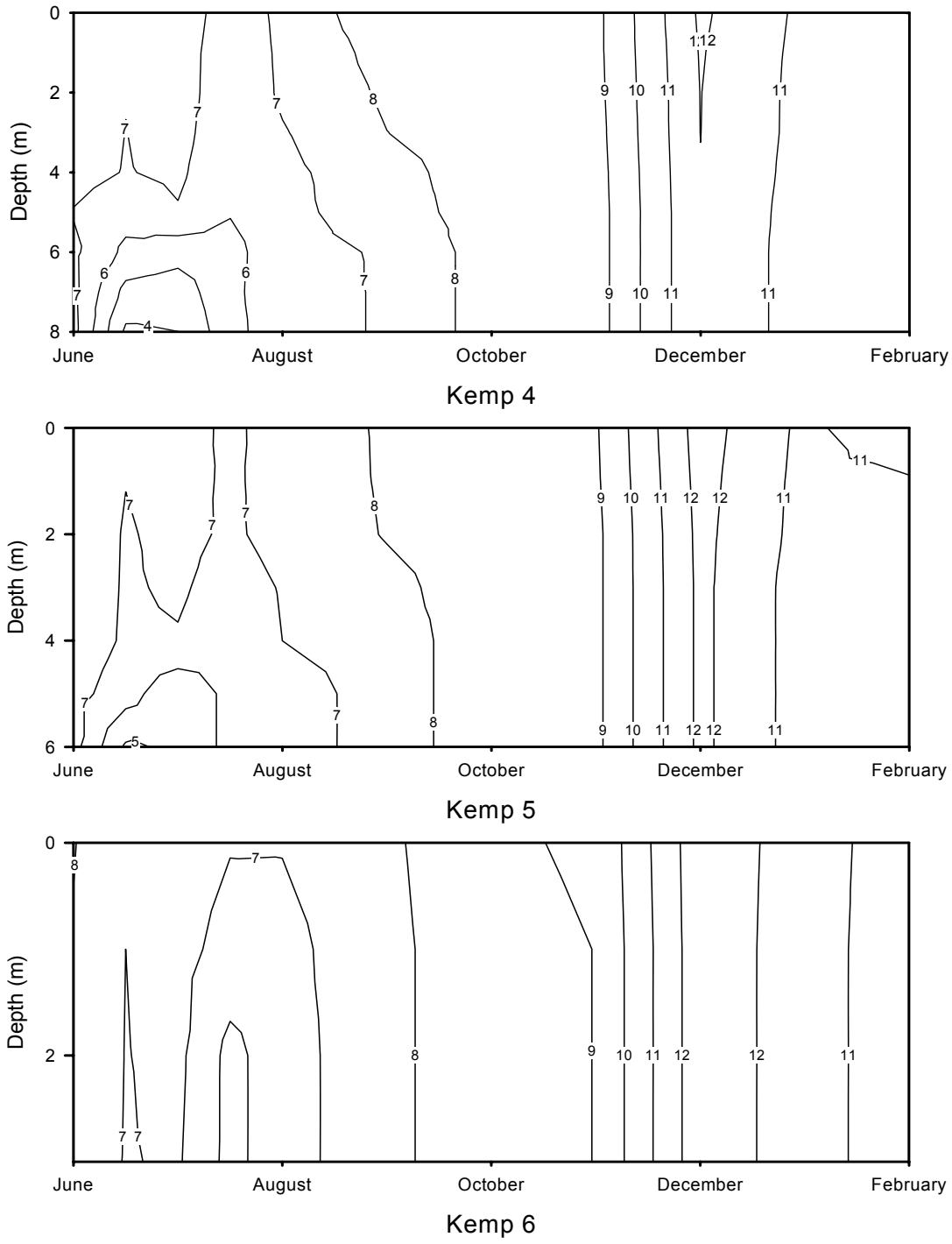

Figure 7. Dissolved oxygen (ppm) isoclines at sites K4-K6 in Lake Kemp, Texas, June 1999 through February 2000.

decreased from surface to bottom at sites K4-K6, but did not fall below 4.0 ppm at K4, or below 5.0 ppm at sites K5 and K6.

Thermal stratification was disrupted beginning in September and dissolved oxygen concentrations were then uniform throughout the water column, ranging between 7.0 and 8.0 ppm at all sites (Figures 6 and 7). Dissolved oxygen concentrations remained uniform throughout the water column at all sites during the remainder of the study period. Dissolved oxygen concentrations increased from 8.0 ppm in October to 11.0 to 12.0 in December. Dissolved oxygen concentrations remained at 11.0 to 12.0 throughout Lake Kemp during January and February.

pH

During June through August, pH in Lake Kemp was greater than 8.0 from the surface to the thermocline, which was located at a depth of 12 m, at sites K1-K2 (Figure 8). Below this depth, pH generally decreased toward the lake bottom and reached a minimum of 7.2 in August. pH at sites K3 and K4 was greater than 8.0 to a depth of 6 (K4) to 8 m (K3) (Figures 8 and 9), pH increased toward the bottom at both sites reaching a minimum of 7.2 at K3 and 7.8 at K4. There was little evident vertical variation in pH at sites K5 and K5 during June through August (Figure 9), with the pH always greater than 8.0.

Following the breakdown of thermal stratification at sites K1-K2, pH ranged from 8.1 to 8.4 during September through February. In general, pH was slightly lower at K1 and K2 than at K3-K6 (Figures 8 and 9).

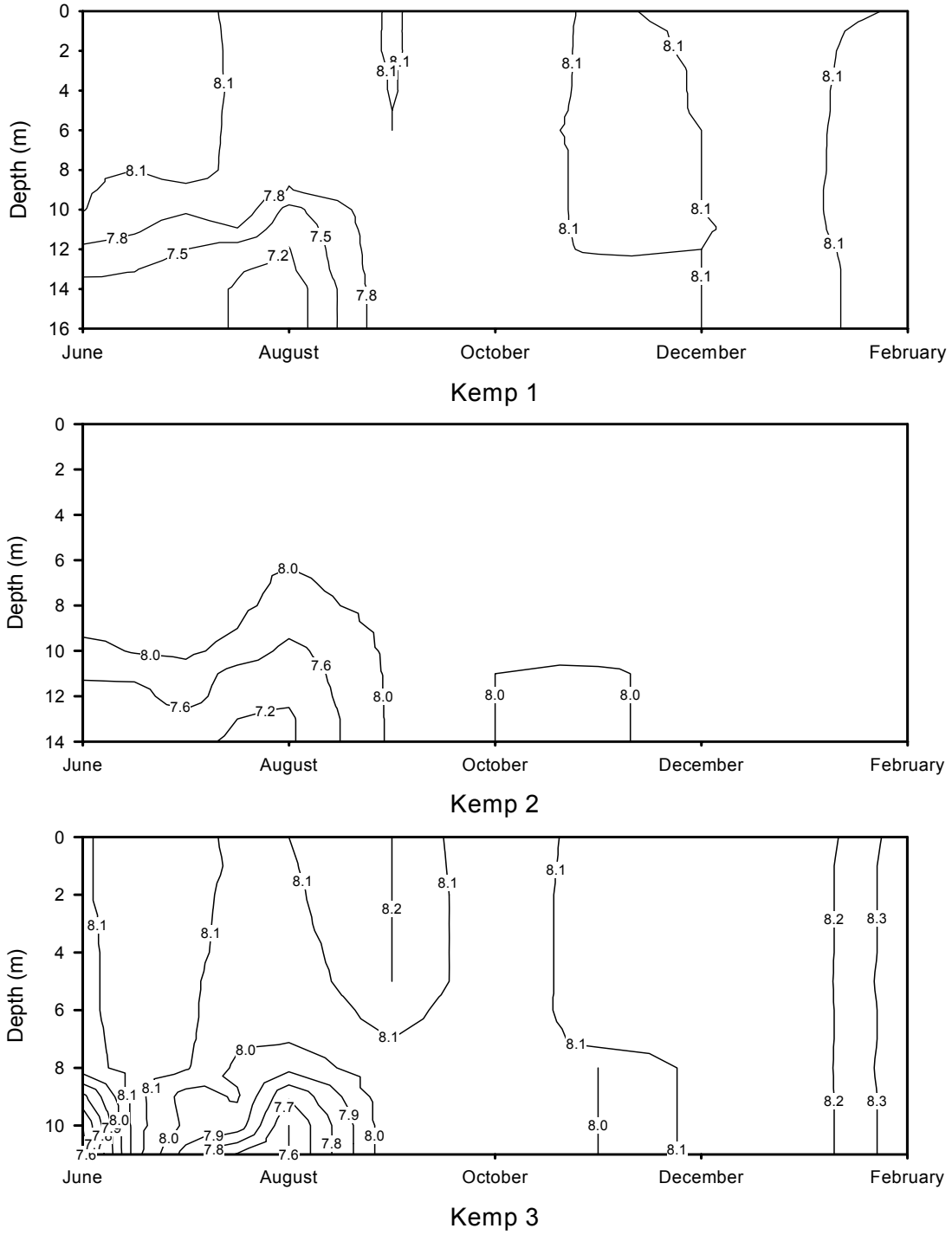

Figure 8. pH isoclines at sites K1-K3 in Lake Kemp, Texas, June 1999 through February 2000.

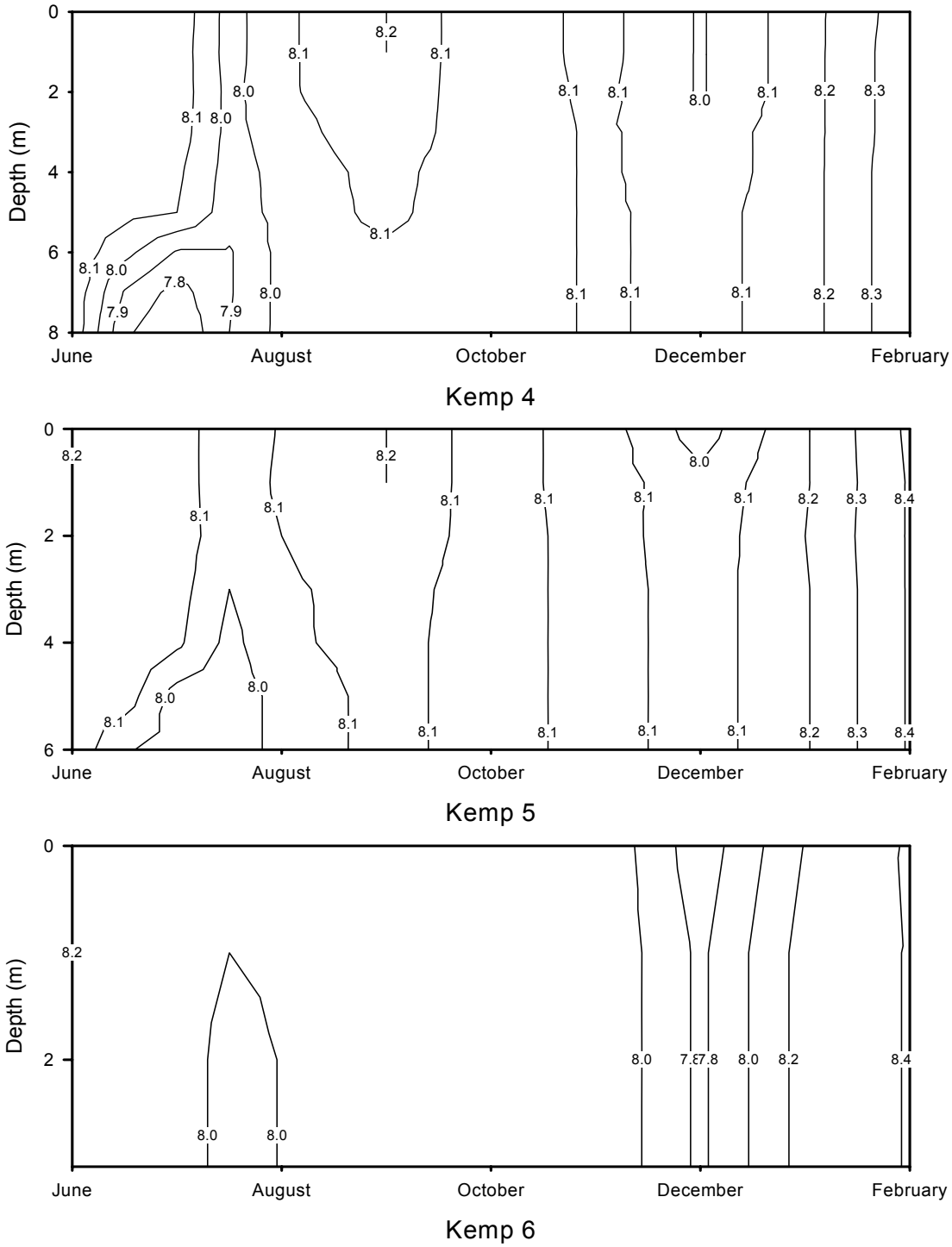

Figure 9. pH isoclines at sites K4-K6 in Lake Kemp, Texas, June 1999 through February 2000.

Photosythetically Active Radiation

Light extinction coefficients $\varepsilon\lambda$ varied among sites and dates by a factor of seven throughout the study period (Table 1). A minimum extinction coefficient of 0.6901 was observed at site K2 in July and a maximum of 4.6920 was observed at site K6 in December. An extinction coefficient of 0.693 indicates a 50% extinction per meter; a coefficient of 2.3 indicates a 90% extinction per meter.

Extinction coefficients progressively decreased downlake from an average of 2.7385 at K6 to 0.8962 at K1. There was little seasonal pattern evident in light extinction; however, light extinction coefficients were generally greatest throughout the lake in December.

Using the extinction coefficients in Table 1, the depth of the euphotic zone in Lake Kemp can be determined (Figure 10). Depth of the euphotic zone was greatest at sites K1 and K2 and decreased progressively uplake to site K6. The euphotic zone generally was between 4 and 7+ m at sites K1 and K2, between 2 and 3 m at sites K3 and K4, and between 2 and 4 m at sites K5 and K6. Seasonal variation in depth of the euphotic zone was the same as that described for light extinction above.

Transparency

Secchi depth varied among sites and dates by less than 1.5 m throughout the study period (Figure 11). A minimum Secchi depth of 0.20 m was observed at site K6 in December and a maximum Secchi depth of 1.55 m was observed at site K1 in June.

Table 1. Light extinction coefficients (ελ) at sites K1-K6 in Lake Kemp, Texas, June 1999 through February 2000.

Date	K1	K2	K3	K4	K5	K6
14 June 1999	0.8974	0.9226	1.3468	1.9290	2.4997	2.6926
30 June 1999	0.7830	0.7854	1.0974	1.2897	1.6403	2.3757
31 July 1999	0.8951	0.6901	1.0253	1.1231	1.4294	2.0229
22 August 1999	0.8257	0.7971	0.9946	1.1460	1.3874	2.9072
26 September 1999	1.1044	0.9523	1.0146	1.1459	1.5272	3.4661
27 October 1999	0.9010	0.8718	1.1870	1.6534	1.9083	1.9083
17 November 1999	0.7149	0.7937	1.3958	1.8962	2.3562	2.2590
20 December 1999	0.9280	1.4571	2.0379	2.2076	2.5249	4.6920
20 January 2000	0.9757	1.2473	1.1561	1.8501	2.5013	2.6756
2 March 2000	0.9371	0.4566	1.0683	1.3050	1.3610	2.3858

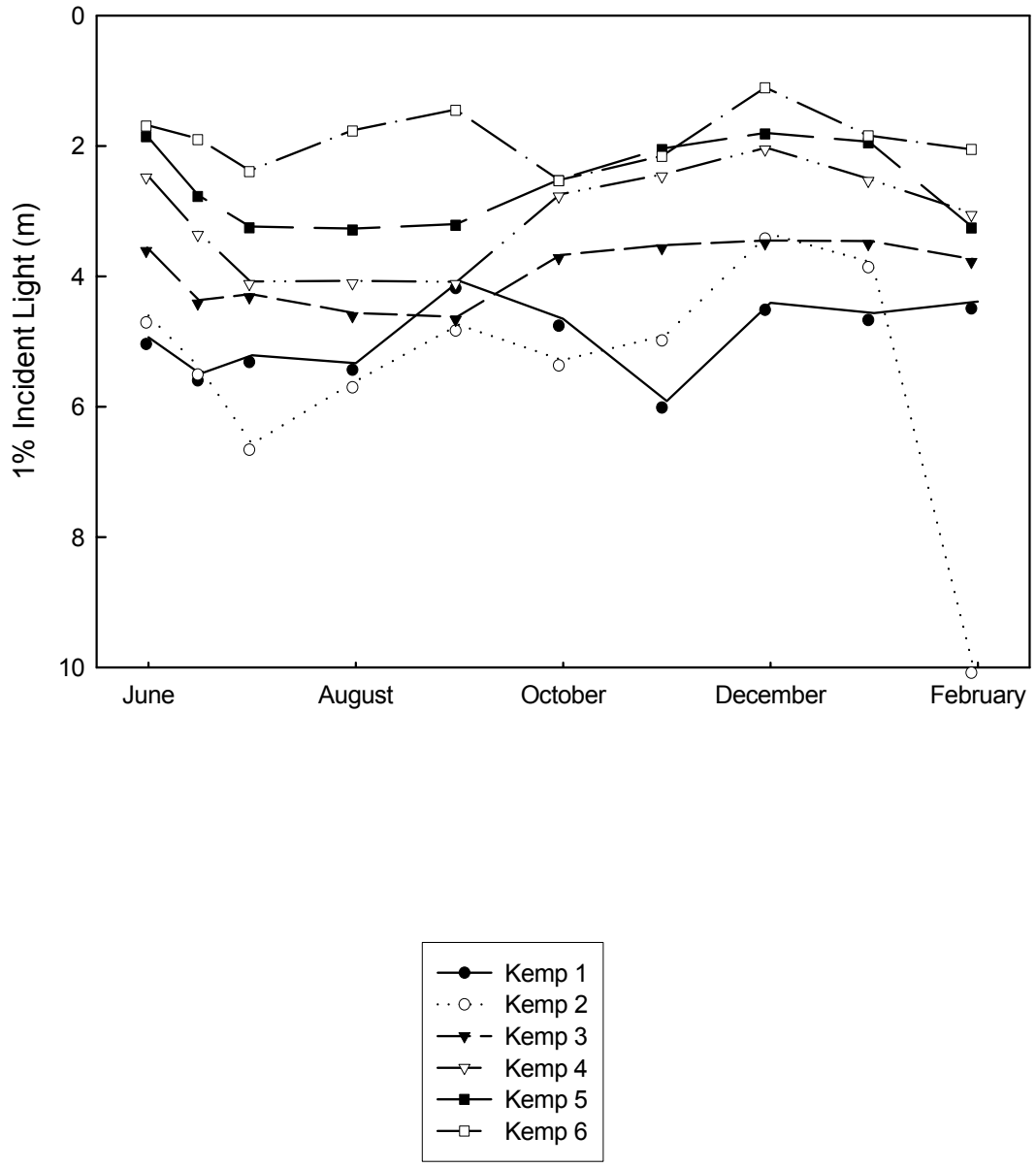

Figure 10. Euphotic zone, based on 1% penetration of incident light (photosynthetically active radiation), at sites K1-K6 in Lake Kemp, Texas, June 1999 through February 2000.

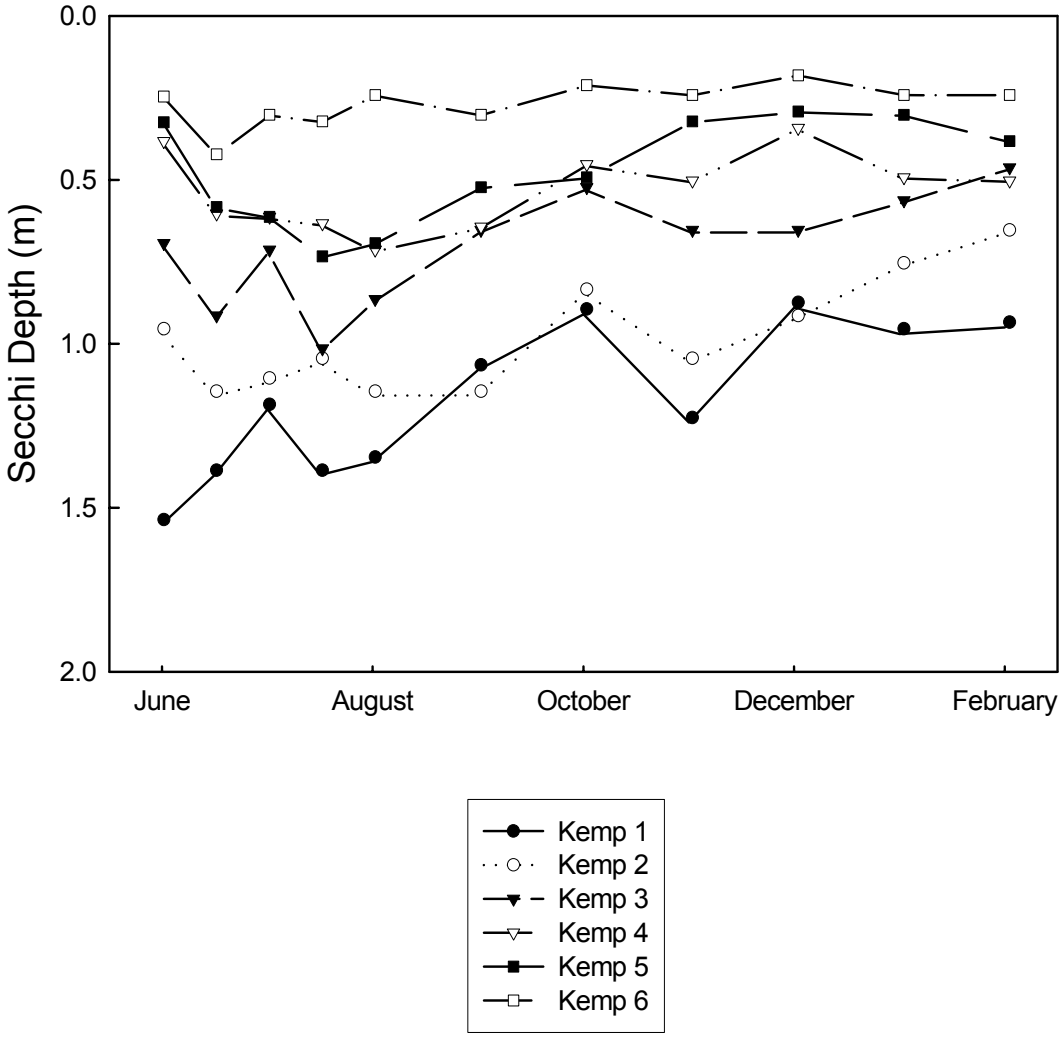

Figure 11. Secchi depth (m) at sites K1-K6 in Lake Kemp, Texas, June 1999 through February 2000.

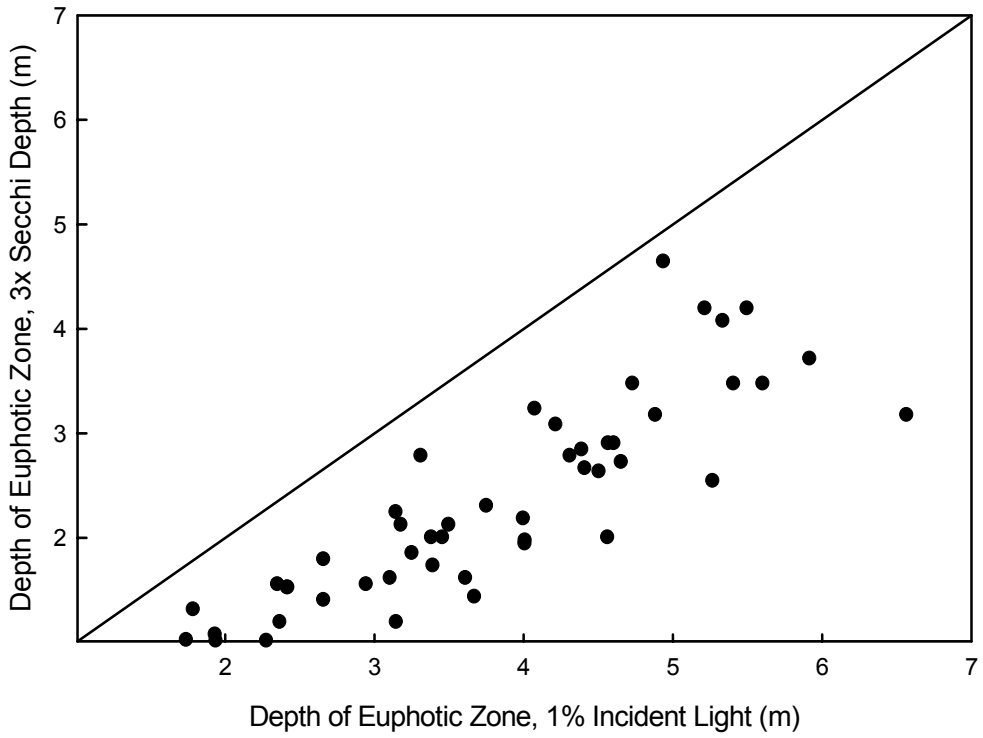

Figure 12. Comparison of euphotic zones based on 1% penetration of incident light (photosynthetically active radiation) and 3x Secchi depth, in Lake Kemp, Texas, June 1999 through February 2000. Diagonal line shows the expected 1:1 ratio between the two measures.

In general, Secchi depth progressively increased downlake from an average of 0.29 m at K6 to 1.17 m at K1. There was little seasonal pattern evident in Secchi depth, most temporal variation may be the result of the variation in the intensity and duration of winds, which induced suspension of bottom sediments. However, Secchi depth was usually lowest in the winter, December through February.

The depth of the euphotic zone is sometimes approximated as 3x Secchi depth. This approximation is inadequate in Lake Kemp (Figure 12). The euphotic zone, based on light extinction, was consistently greater than that approximated by 3x Secchi depth.

Turbidity

Surface turbidity ranged from a minimum of 6.89 NTUs to a maximum of 56.2 NTUs throughout the study period (Figure 13). Bottom turbidity ranged from a minimum of 7.34 NTUs to a maximum of 314.4 NTUs. In general, turbidity progressively decreased downlake from site K6 (surface mean = 39.51 NTU; bottom mean = 99.59 NTU) to site K1 (surface mean = 11.79 NTU; bottom mean = 15.07 NTU).

There was little evident seasonal variation in turbidity. At the surface, turbidity was variable and highest in October, December, and January (Figure 13). Bottom turbidity was more variable than surface turbidity, especially at sites K4 and K6. The greatest turbidities observed were at K6 in late July (314.4 NTU) and August (283.9 NTU), presumably as a result of the very shallow depth and strong winds at this site in July and August 1999.

There was no relationship between sample standard deviations (SD) for turbidity and number of replicate samples collected. Ten replicate turbidity samples were taken,

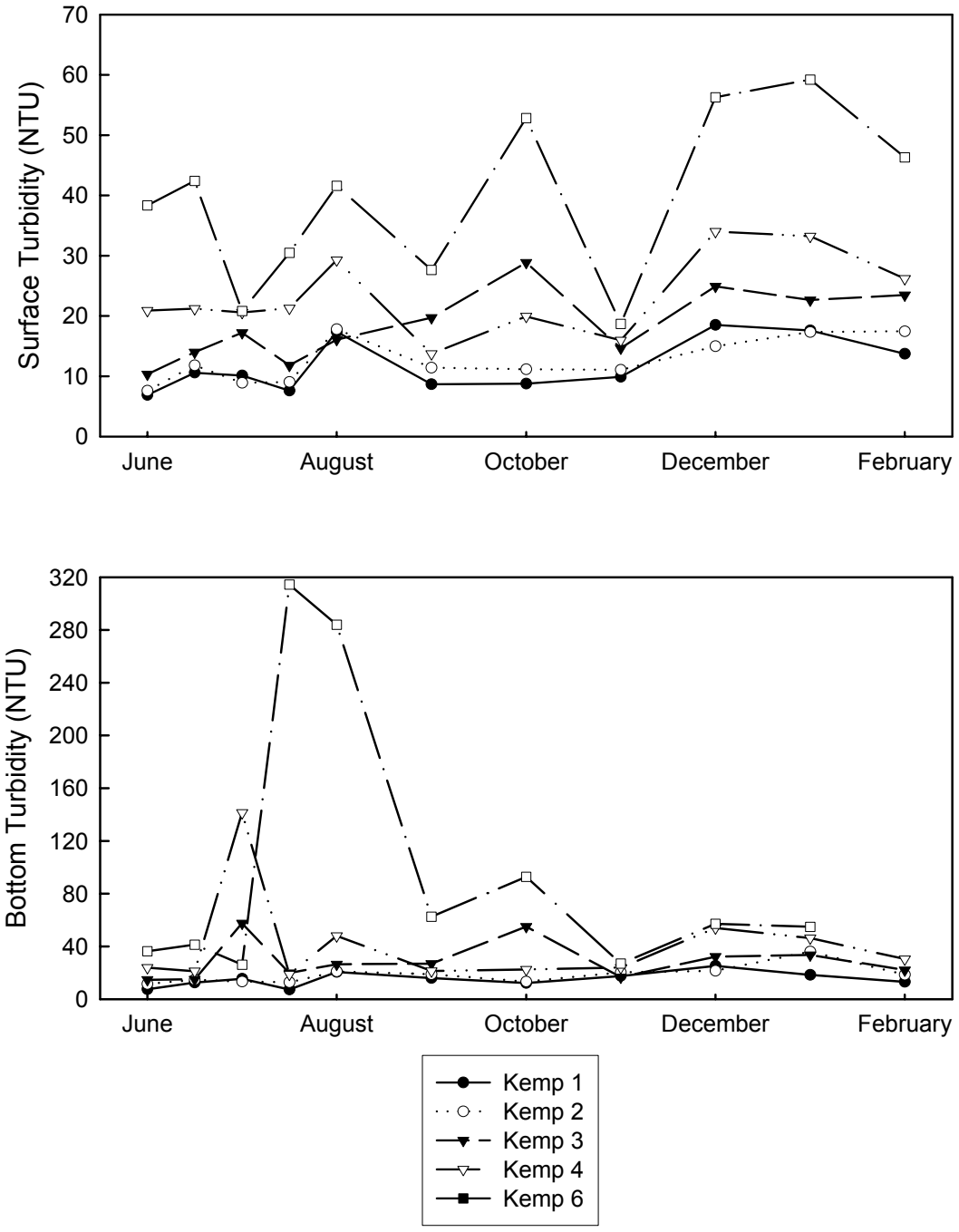

Figure 13. Mean turbidity (NTU) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

surface and bottom, at sites K1, K4, and K6. Mean standard deviations for these sites, were 0.96 (K1), 1.81 (K4), and 2.70 (K6) in surface samples and 1.16 (K1), 3.30 (K4), and 18.81 (K6) in bottom samples. Mean standard deviations for turbidity at sites K2 and K3, respectively, were 0.73 and 0.92 in surface samples and 1.03 and 1.74 in bottom samples. Bottom samples are more variable than surface samples and variability, particularly in bottom samples, increased uplake from K1 to K6. There appears to be no relationship between sample variability and number of samples (three versus ten).

Mean turbidity, across all sample sites, dates, and depths is presented in Appendix B. Mean turbidity, by site, is presented in Appendix C.

Total Suspended Solids

Total suspended solids (TSS) at the surface varied considerably among sample sites on most sampling dates (Figure 14). At sites K1-K3, surface TSS concentrations generally ranged between 1.0 and 8.3 mg/l. At site K4, surface TSS ranged from 1.0 to 20.0 mg/l and at site K6 TSS ranged from 4.0 to 27.0 mg/l. There was no obvious seasonal pattern to variation in surface TSS.

TSS was considerably more variable in bottom than in surface samples (Figure 14). TSS ranged from 1.0 to 51.3 mg/l at K1, 1.3 to 19.7 mg/l at K2, 2.5 to 35.67 mg/l at K3, 3.33 to 75.0 mg/l at K4, and 12.0 to 76.0 mg/l at K6. There was no obvious seasonal pattern to variation in TSS samples from the bottom.

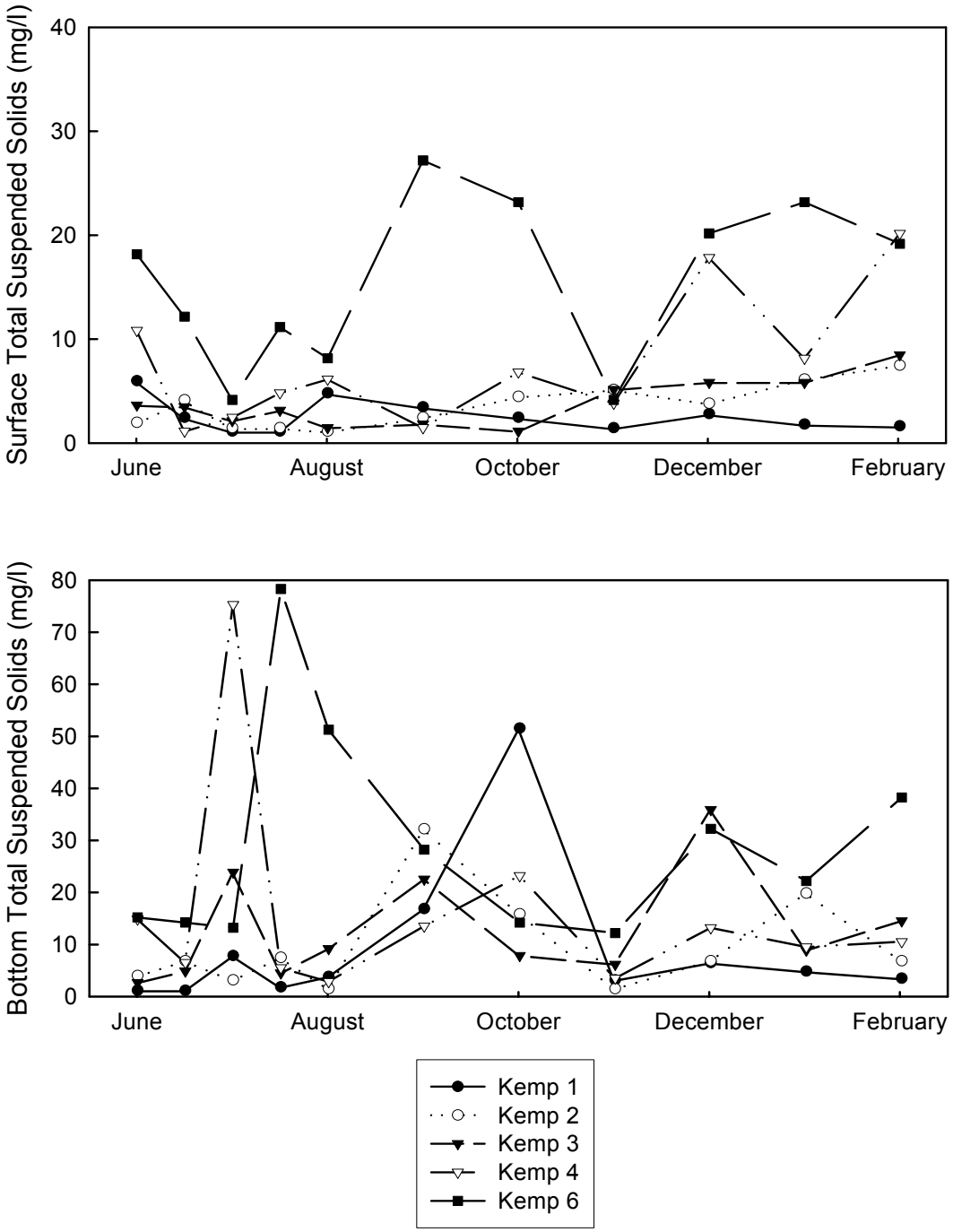

Figure 14. Mean total suspended solids (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

Surface TSS usually was greatest at site K6 (mean = 15.36 mg/l) and decreased downlake to site K1 (2.51 mg/l). Bottom TSS was greatest at site K6 (28.81 mg/l) and progressively decreased downlake to site K1 (9.12 mg/l).

Mean total suspended solids concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean total suspended solids concentrations, by site, are presented in Appendix C.

Total Dissolved Solids

Total dissolved solids (TDS) ranged from 2467 mg/l (K2) to 2700 mg/l (K6) at the surface in early June (Figure 15). For the remainder of the study period, surface TDS generally showed a progressive increase at all sites. By February, TDS ranged from 3400 mg/l at K2 to 3733 mg/l at K6. There was little consistent pattern in variation in surface TDS among sites, except that TDS was greater at K6 (mean = 3185 mg/l), K1 (3156 mg/l), and K4 (mean = 3145 mg/l) than at K2 and K3. Although there was pronounced temporal variation in TDS, there was no evident seasonal pattern of variation.

Total dissolved solids (TDS) at the bottom ranged from 2667 mg/l at K2 and K6 to 2800 mg/l at K3 and K4 in early June (Figure 15). TDS progressively increased through the study period, ranging from 3400 mg/l at K2 to 3800 mg/l at K1 in February. There was no evident spatial or seasonal pattern to variation in TDS.

Mean total dissolved solids concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean total dissolved solids concentrations, by site, are presented in Appendix C.

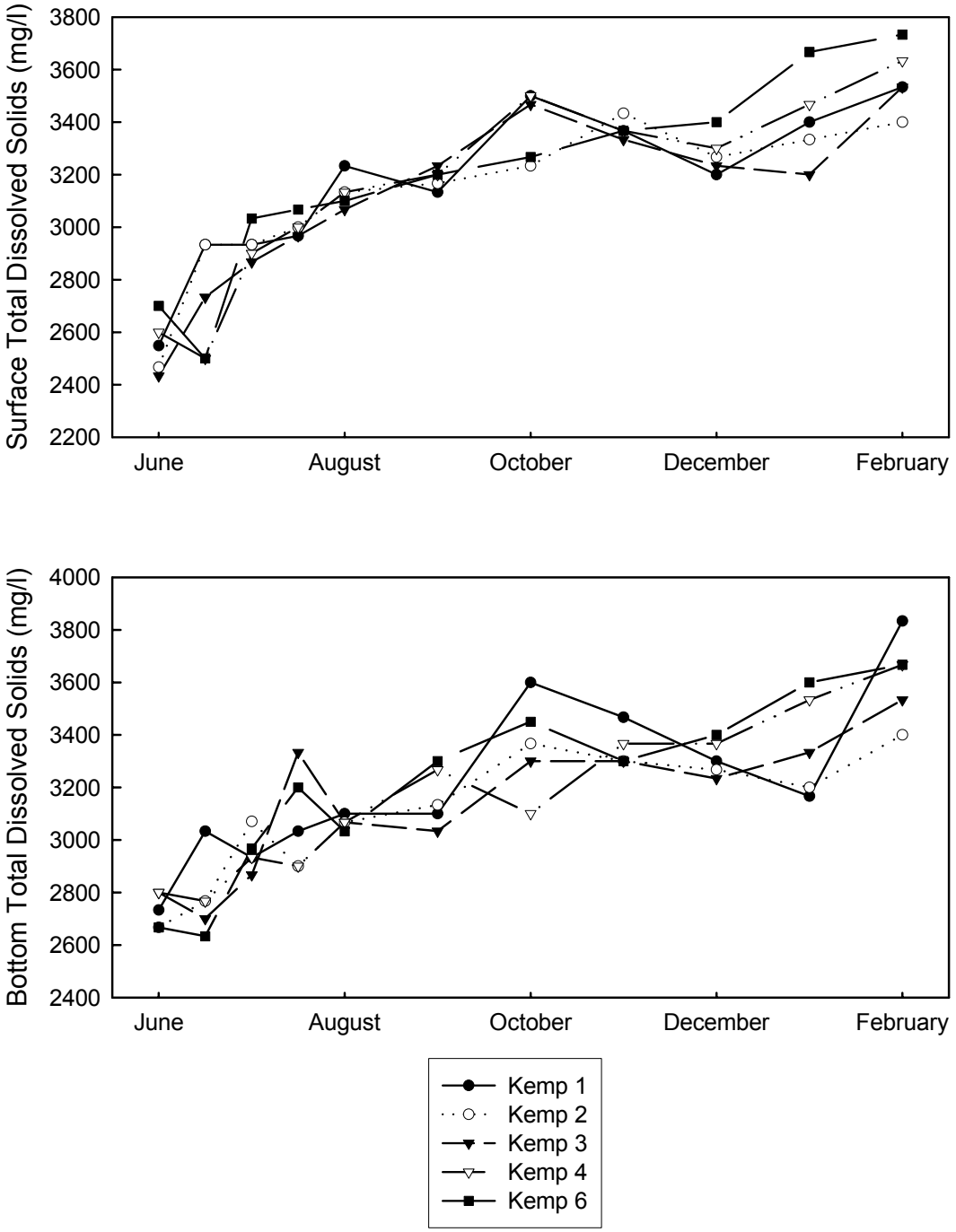

Figure 15. Mean total dissolved solids (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

Total Alkalinity

In surface waters, total alkalinity ranged from 92.0 (K2) to 93.8 mg/l $CaCO_3$ (K6) in early June (Figure 16). Total alkalinity at the surface generally decreased through November when it ranged from 77.7 mg/l $CaCO_3$ at site K6 to 79.7 mg/l $CaCO_3$ at site K1. Total alkalinity was variable from November to January, but showed no evident pattern. However, in February, alkalinity in surface waters increased at all sites, ranging from 97.9 mg/l $CaCO_3$ at K1 to 100.8 mg/l $CaCO_3$ at K6. There was no evident spatial pattern to the variation observed in total alkalinity.

Total alkalinity at the bottom ranged from 83.8 to111.3 mg/l $CaCO_3$ in Lake Kemp. Seasonal variation in alkalinity mirrored that observed at the surface: alkalinity decreased from early June (92.5 to 94.5 mg/l $CaCO_3$) through November (77.8 to 87.7 mg/l $CaCO_3$). Alkalinity showed no evident change from November through January, but then increasing (96.7 to 101.7 mg $CaCO_3$/l) in February. In general, total alkalinity was greatest at site K1 (mean = 93.4 mg/l $CaCO_3$) and decreased uplake to site K6 (mean = 86.8 mg/l $CaCO_3$).

Mean alkalinity, across all sample sites, dates, and depths is presented in Appendix B. Mean alkalinity, by site, is presented in Appendix C.

Hardness

Hardness ranged from slightly over 779 to 1323 mg/l $CaCO_3$ in both surface and bottom samples (Figure 17). At the surface, hardness varied from 796 mg/l $CaCO_3$ at K6 to 876 mg/l $CaCO_3$ at K2 in early June. Hardness progressively increased through

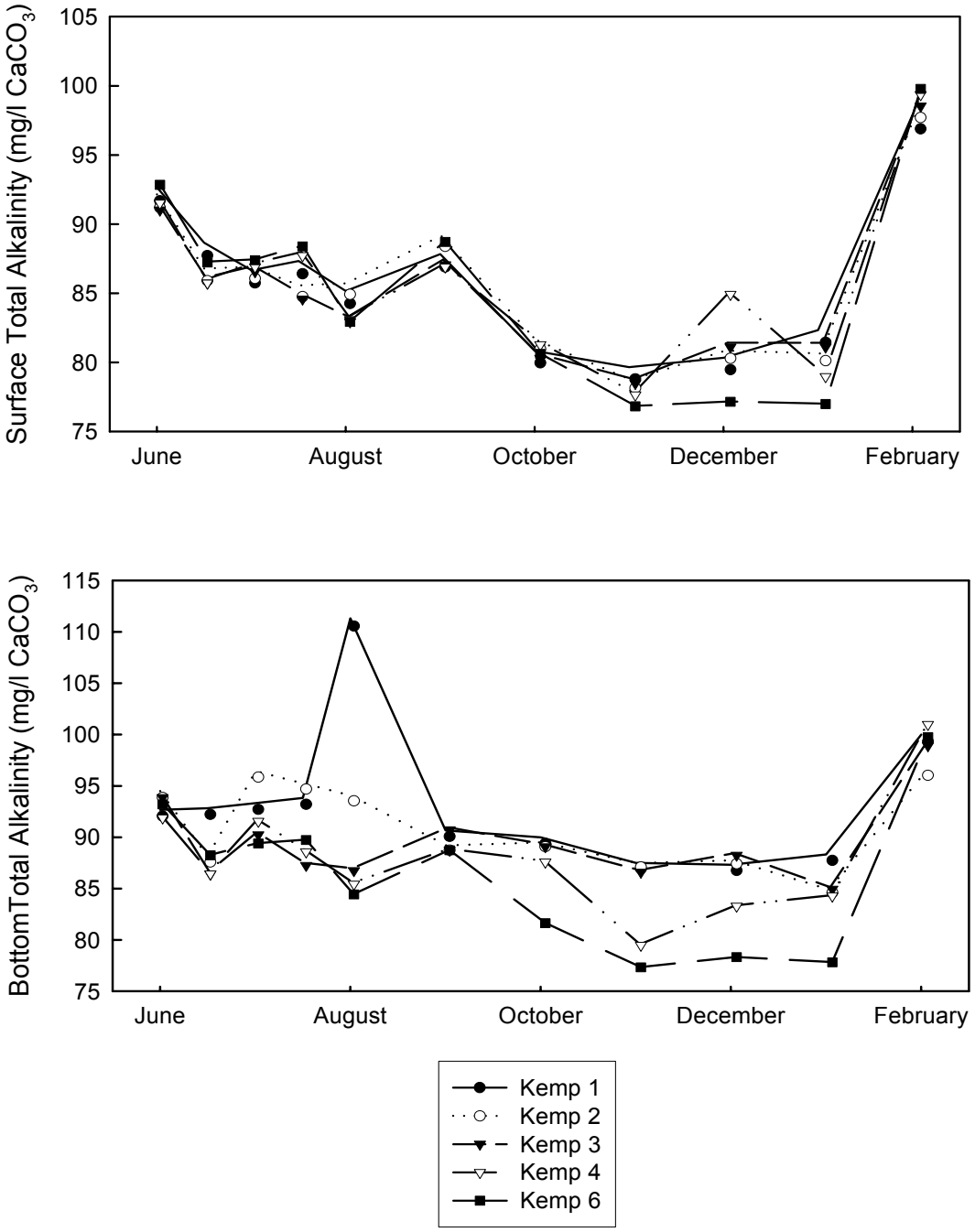

Figure 16. Mean total alkalinity (mg/l $CaCO_3$) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

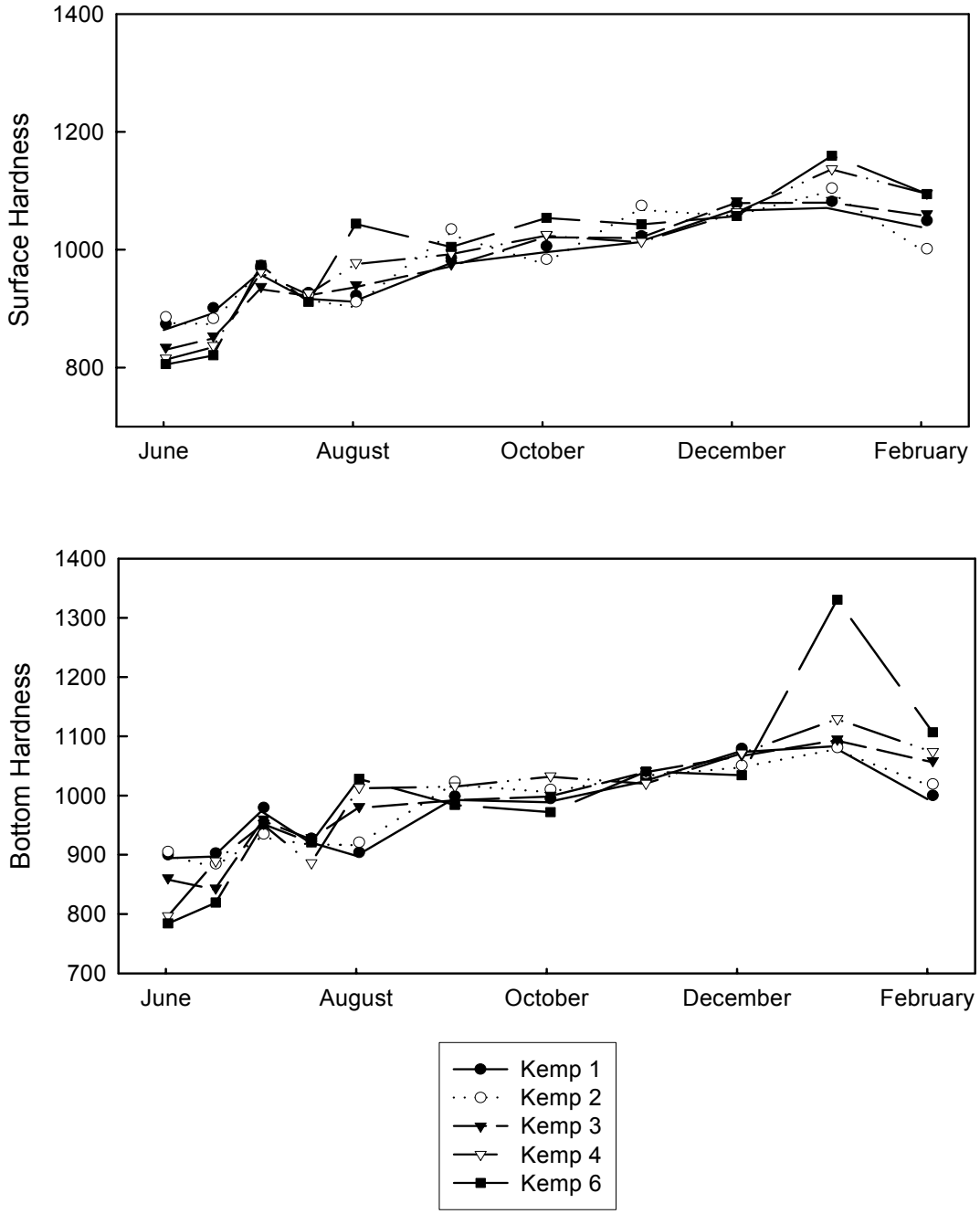

Figure 17. Mean hardness (mg/l $CaCO_3$) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

February when it varied between 991 mg/l $CaCO_3$ at K2 and 1084 mg/l $CaCO_3$ at site K4. On average, hardness was lowest at K1 (mean = 973 mg/l $CaCO_3$) and progressively increased upstream to site K6 (mean = 986 mg/l $CaCO_3$).

Temporal variation in hardness in bottom samples paralleled that in surface samples. Hardness ranged from 779 mg/l $CaCO_3$ at K6 to 900 mg/l $CaCO_3$ at K2 in early June (Figure 17). Hardness increased at all sites from June through February when it varied between 994 mg/l $CaCO_3$ at K1 and 1323 mg/l $CaCO_3$ at site K6. Overall, hardness in bottom samples was lowest at sites K1-K3 (mean = 975 to 979 mg/l $CaCO_3$) and increase uplake at sites K4 (mean = 983 mg/l $CaCO_3$) and K6 (mean = 991 mg/l $CaCO_3$).

Mean hardness, across all sample sites, dates, and depths is presented in Appendix B. Mean hardness, by site, is presented in Appendix C.

Calcium

Calcium concentrations showed similar ranges in both surface (223 to 309 mg/l) and bottom (220 to 355 mg/l) samples throughout the study period (Figure 18). Spatial and seasonal trends in calcium were nearly identical in surface and bottom samples and closely followed those described above for hardness. Surface calcium concentrations ranged from 224 mg/l at site K6 to 242 mg/l at site K2 in early June and then progressively increased through February (range = 274 to 300 mg/l). Bottom calcium concentrations ranged from 220 mg/l at site K6 to 248 mg/l at site K2 in early June and then progressively increased through February (range = 275 to 306 mg/l).

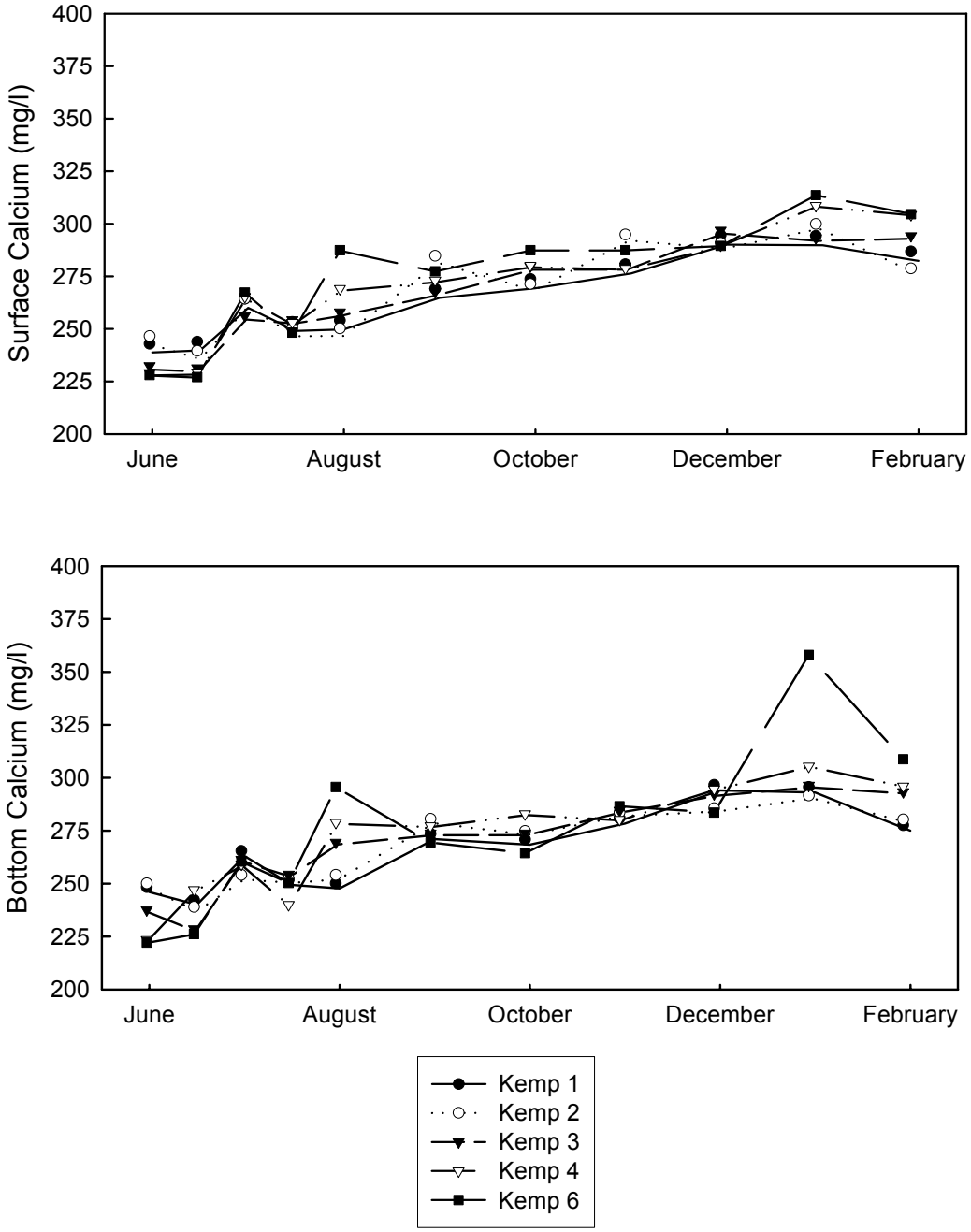

Figure 18. Mean calcium concentrations (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

Mean calcium concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean calcium concentrations, by site, are presented in Appendix C.

Magnesium

Magnesium concentrations showed similar ranges in both surface (range = 58 to 91 mg/l) and bottom samples (56 to 106 mg/l) throughout the study period (Figure 19). There was generally little difference among sites, on any given date, in magnesium concentrations.

In both surface and bottom samples, magnesium concentrations were lowest in early June (surface range = 58 to 66 mg/l; bottom range = 56 to 68 mg/l) and then progressively increased throughout the remainder of the study period. In February, surface magnesium concentrations ranged from 74 to 82 mg/l and bottom concentrations ranged from 75 to 82 mg/l.

Mean magnesium concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean magnesium concentrations, by site, are presented in Appendix C.

Sodium

Sodium concentrations in surface samples ranged between 575 and 770 mg/l, sodium concentrations in bottom samples were slightly more variable and ranged

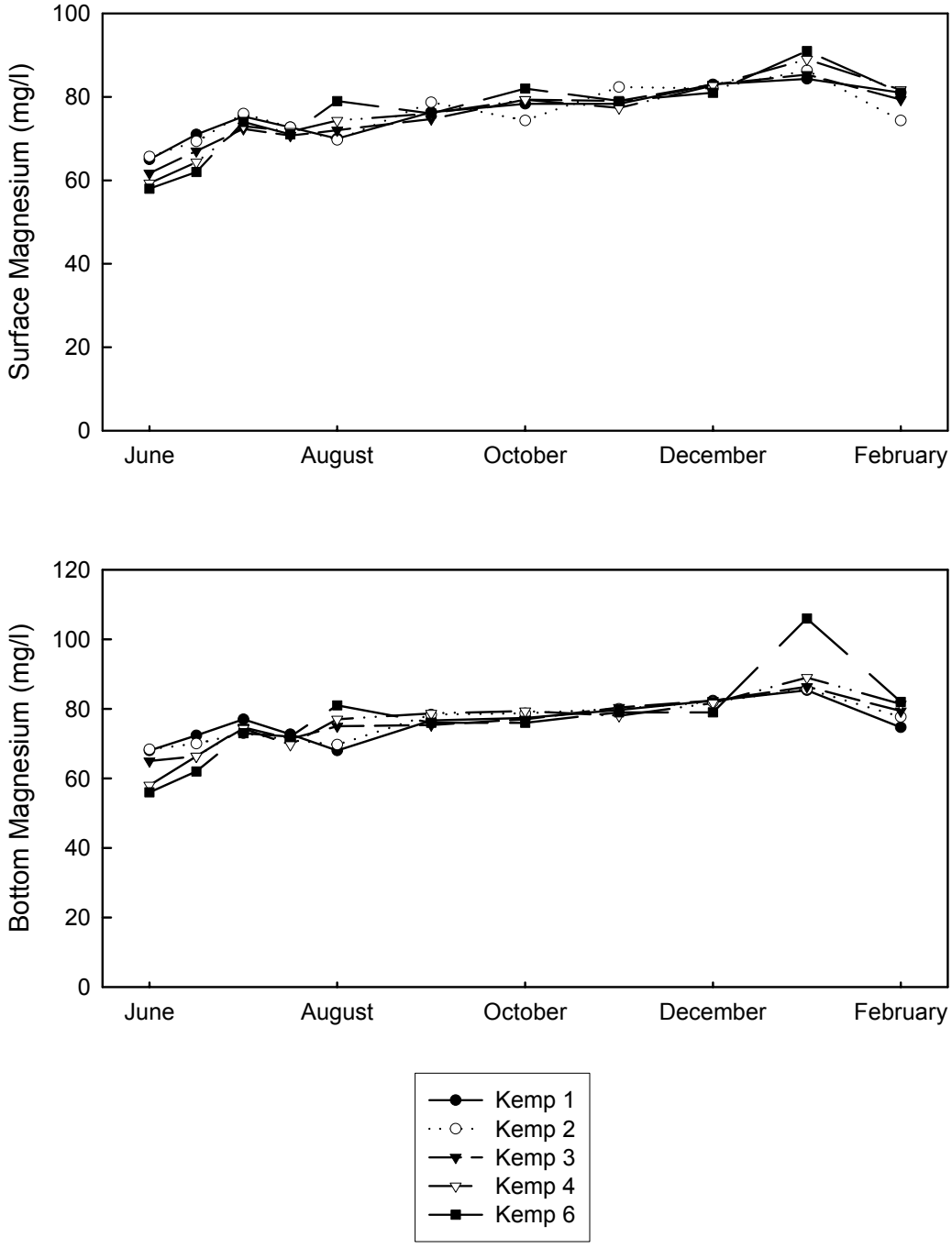

Figure 19. Mean magnesium concentrations (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

between 568 and 865 mg/l during the study period (Figure 20). Although sodium concentrations varied throughout the study period, there was no consistent spatial pattern in either surface or bottom samples.

Sodium concentrations generally were lowest in early June (surface range = 575 to 643 mg/l; bottom range = 569 to 671 mg/l). Sodium concentrations increased slightly in late June (surface range = 637 to 693 mg/l; bottom range = 638 to 710 mg/l) and decreased in early July (surface range = 585 to 630 mg/l; bottom range = 568 to 637 mg/l). Sodium concentrations increased throughout the lake until December (surface range = 739 to 770 mg/l; bottom range = 733 to 765 mg/l). Sodium concentrations remained high, but variable in January (surface range = 703 to 751 mg/l; bottom range = 699 to 865 mg/l) and February (surface range = 695 to 760 mg/l; bottom range = 691 to 764 mg/l).

Mean sodium concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean sodium concentrations, by site, are presented in Appendix C.

Potassium

Potassium concentrations ranged from 8.0 to 9.2 mg/l in surface and bottom samples throughout the study period (Figure 21). There were no consistent differences among sites in surface and bottom potassium concentrations.

Potassium concentrations in Lake Kemp were lowest in early June (surface range = 8.0 to 9.0 mg/l; bottom range = 8.0 to 9.2 mg/l) and then progressively increased

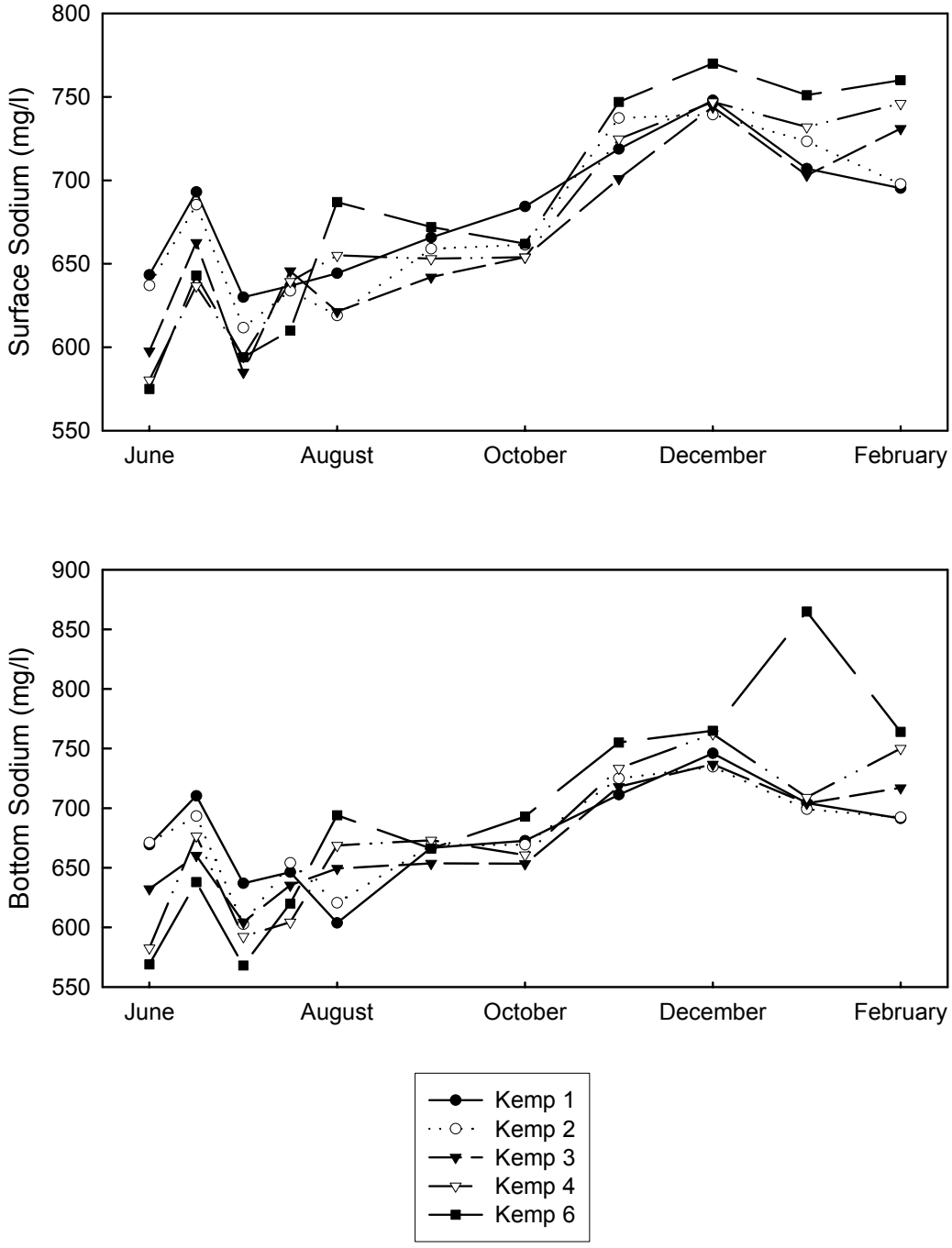

Figure 20. Mean sodium concentrations (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

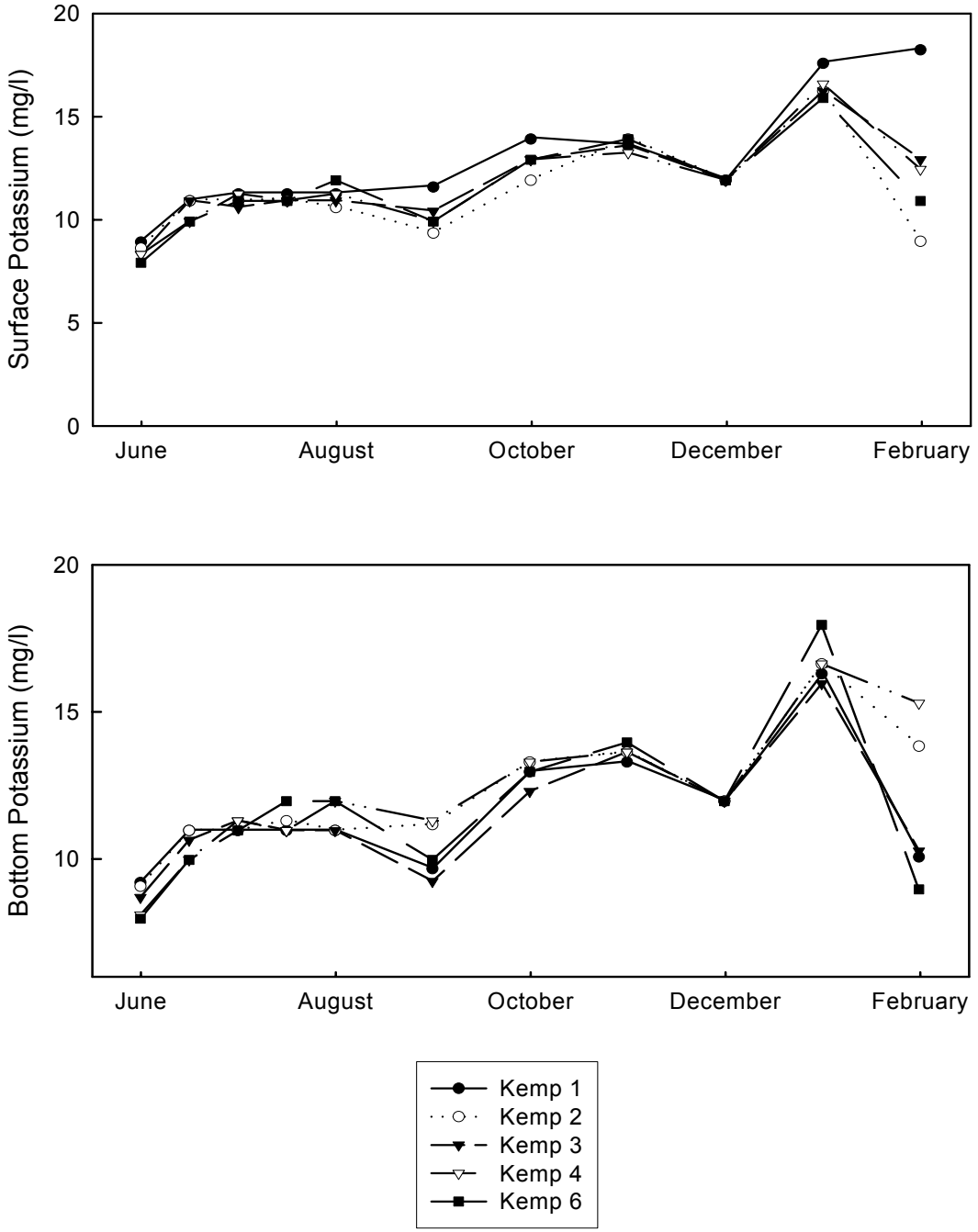

Figure 21. Mean potassium concentrations (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

through January (surface range = 16.0 to 17.7 mg/l; bottom range = 16.0 to 18.0 mg/l), before decreasing slightly in February (surface range = 16.0 to 18.0 mg/l; bottom range = 9.0 to 15.3 mg/l).

Mean potassium concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean potassium concentrations, by site, are presented in Appendix C.

Chloride

Chloride concentrations showed similar ranges in both surface (987 to 1433 mg/l) and bottom (983 to 1400 mg/l) samples throughout the study period (Figure 22). Mean chloride concentrations in surface and bottom samples were 1168 and 1172 mg/l, respectively. There was no evident spatial variation in chloride concentrations in either surface or bottom samples. Both surface and bottom samples showed the same temporal pattern of variation. Chloride concentrations in both surface and bottom waters were lowest in early June (surface range = 987 to 1133 mg/l; bottom range = 983 to 1367 mg/l) and, with the exception of a slight decrease in early July, progressively increased through February (surface range = 1200 to 1400 mg/l; bottom range = 1233 to 1400 mg/l).

Mean chloride concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean chloride concentrations, by site, are presented in Appendix C.

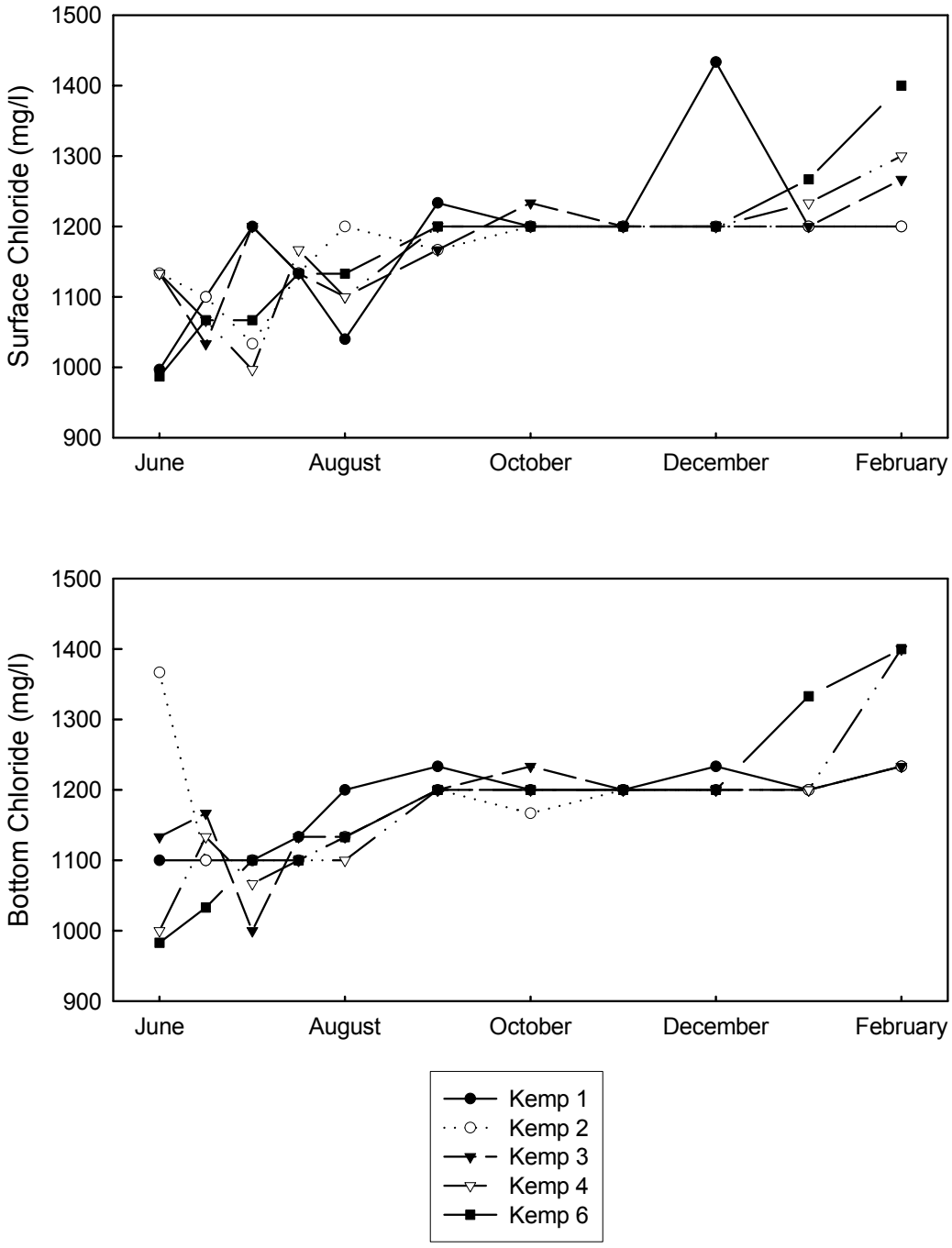

Figure 22. Mean chloride concentrations (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

Sulfate

Sulfate concentrations showed similar ranges in both surface (733 to 1233 mg/l) and bottom (737 to 1200 mg/l) samples throughout the study period (Figure 23). Mean sulfate concentrations in surface and bottom samples were 861 and 872 mg/l, respectively. There was no evident spatial pattern in surface and bottom sulfate concentrations; generally there was little variation among sites in sulfate concentrations except in December and January. Sulfate concentrations were lowest in early June (surface range = 733 to 753 mg/l; bottom range = 737 to 813 mg/l) and progressively increased through February (surface range = 910 to 1000 mg/l; bottom range = 910 to 990 mg/l) .

Mean sulfate concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean sulfate concentrations, by site, are presented in Appendix C.

Nutrients

Concentrations of nitrite nitrogen (NO_2), nitrate nitrogen (NO_3), and especially total nitrogen (TN) in Lake Kemp often were below laboratory detection limits (NO_2 = 0.04 mg/l; NO_3 = 0.01 mg/l; TN = 8.3 mg/l). Laboratory detection limits were elevated in part because of interference from high total dissolved solids concentrations in Lake Kemp, which required dilution of samples.

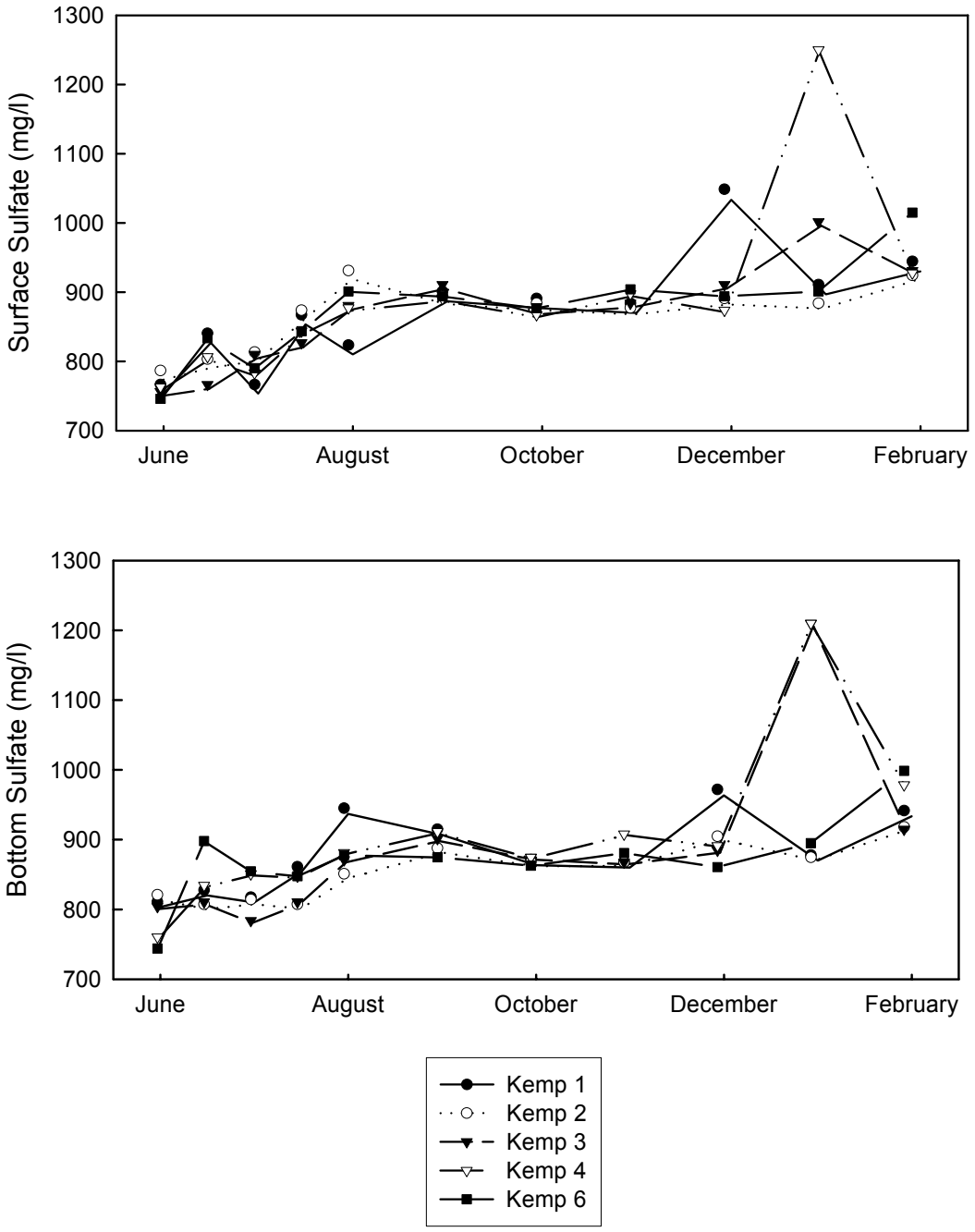

Figure 23. Mean sulfate concentrations (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

Nitrite concentrations

Surface nitrite concentrations generally were low (range = 0.04 to 0.78 mg/l; excluding samples from K6 in late July with mean = 0.303 mg/l) during June through August while Lake Kemp was stratified (Table 2). After the breakdown of stratification in September, nitrite concentrations slowly increased through November (range = 0.04 to 0.127 mg/l) and then increased markedly in December (range = 0.046to 0.461 mg/l), January (range = 0.087 to 0.993 mg/l), and February (range = 0.04 to 02.15 mg/l). Although nitrite concentrations varied considerably among sites, there was no consistent spatial pattern.

Bottom nitrite concentrations generally were low (range = 0.04 to 0.164 mg/l; excluding samples from K6 in late July with mean = 0.546 mg/l) during June through August while the lake was stratified (Table 2). Nitrite concentrations decreased in September (0.04 mg/l) after the breakdown of stratification and then increased through December (range = 0.04 to 0.342 mg/l), January (range = 0.060 to 0.800 mg/l), and February (range = 0.044 to 0.513 mg/l). There was no evident pattern to the spatial variation in nitrite concentrations.

Nitrate concentrations

Nitrate concentrations in surface and bottom samples were $\leq$ 0.01 mg/l throughout the study period, except in early June at sites K1-K3 (Table 3).

Table 2. Mean nitrite nitrogen (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February (March 2) 2000.

Date	Depth	K1	K2	K3	K4	K6
14 June 1999	Surface	0.0553	0.0483	0.0723	0.0780	0.0500
	Bottom	0.0623	0.0970	0.0653	0.1637	0.0443
30 June 1999	Surface	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400
	Bottom	0.0447	<0.0400	<0.0400	<0.0400	<0.0400
14 July 1999	Surface	<0.0400	<0.0400	<0.0400	<0.0400	0.0430
	Bottom	<0.0400	<0.0400	0.0417	<0.0400	0.0660
31 July 1999	Surface	<0.0400	0.0600	0.1100	0.1200	0.3033
	Bottom	<0.0400	<0.0400	0.0410	0.5460	0.0807
22 August 1999	Surface	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400
	Bottom	<0.0400	<0.0400	<0.0400	<0.0400	<0.0400
26 September 1999	Surface	<0.0400	<0.0400	<0.0400	0.0733	<0.0400
	Bottom	<0.0400	0.0547	0.0480	0.0443	<0.0400
27 October 1999	Surface	0.0480	0.0567	0.0523	0.0600	0.2267
	Bottom	0.0457	<0.0400	<0.0400	0.0877	0.0633
17 November 1999	Surface	<0.0400	0.1277	<0.0400	0.1087	<0.0400
	Bottom	<0.0400	0.0437	<0.0400	0.0793	0.0953
20 December 1999	Surface	0.4610	0.1817	0.1000	0.0587	0.0457
	Bottom	0.3417	0.0990	0.0753	<0.0400	0.2367
20 January 2000	Surface	0.0867	0.0867	0.6627	0.9933	0.1910
	Bottom	0.0667	0.1887	0.8000	0.0597	0.1157
2 March 2000	Surface	0.2667	0.0613	0.0953	2.1507	<0.0400
	Bottom	0.2663	0.0670	0.0440	0.5103	0.0600

Table 3. Mean nitrate nitrogen (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February (March 2) 2000.

Date	Depth	K1	K2	K3	K4	K6
14 June 1999	Surface	0.0120	0.0120	0.0140	<0.0100	<0.0100
	Bottom	0.0403	0.0563	0.0713	<0.0100	<0.0100
30 June 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
14 July 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
31 July 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
22 August 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
26 September 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
27 October 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
17 November 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
20 December 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
20 January 2000	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
2 March 2000	Surface	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100

Total nitrogen concentrations

Total nitrogen concentrations in surface and bottom samples were below laboratory detection limits (≤ 8.3 mg/l) throughout the study period (Table 4).

Soluble (ortho) phosphorus concentrations

Soluble phosphorus concentrations in surface and bottom samples ranged from 0.01 to 0.101 mg/l (surface) and 0.01 to 0.095 (bottom) samples throughout the study period (Table 5). Surface soluble phosphorus concentrations ranged from 0.01 to 0.032 mg/l in June and July and then increased to 0.047 to 0.101 mg/l in August. Following the breakdown of thermal stratification in September, soluble phosphorus concentrations were variable, but consistently greater than during the period of summer stratification and ranged between 0.01 and 0.059 mg/l. On average, surface soluble phosphorus concentrations were greatest at K6 (0.036 mg/l) and decreased progressively downlake to site K1 (0.020 mg/l).

Soluble phosphorus concentrations at the bottom ranged from 0.01 to 0.086 mg/l in June and July and then increased to 0.066 to 0.0932 mg/l in August. Following the breakdown of thermal stratification in September, soluble phosphorus concentrations were variable, but consistently greater than during the period of summer stratification and ranged between 0.01 and 0.058 mg/l. On average, bottom soluble phosphorus concentrations were greatest at K6 (0.046 mg/l) and decreased progressively downlake to site K1 (0.024mg/l).

Table 4. Mean total nitrogen (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February (March 2) 2000.

Date	Depth	K1	K2	K3	K4	K6
14 June 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
30 June 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
14 July 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
31 July 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
22 August 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
26 September 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
27 October 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
17 November 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
20 December 1999	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
20 January 2000	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3
2 March 2000	Surface	<8.3	<8.3	<8.3	<8.3	<8.3
	Bottom	<8.3	<8.3	<8.3	<8.3	<8.3

Table 5. Mean soluble (ortho) phosphorus (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February (March 2) 2000.

Date	Depth	K1	K2	K3	K4	K6
14 June 1999	Surface	0.0123	<0.0100	0.0103	0.0127	0.0143
	Bottom	0.0137	0.0150	0.0163	0.0150	0.0203
30 June 1999	Surface	<0.0100	<0.0100	<0.0100	<0.0100	0.0283
	Bottom	<0.0100	<0.0100	<0.0100	0.0157	0.0270
14 July 1999	Surface	0.0120	0.0113	0.0173	0.0227	0.0323
	Bottom	0.0173	0.0153	0.0283	0.0863	0.0377
31 July 1999	Surface	<0.0100	<0.0100	<0.0100	0.0103	0.0207
	Bottom	<0.0100	<0.0100	0.0103	0.0120	0.0703
22 August 1999	Surface	0.0473	0.0800	0.0877	0.0913	0.1007
	Bottom	0.0657	0.0880	0.0953	0.0940	0.1230
26 September 1999	Surface	<0.0100	0.0203	0.0237	0.0260	0.0563
	Bottom	0.0173	0.0250	0.0337	0.0450	0.0600
27 October 1999	Surface	<0.0100	<0.0100	0.0130	0.0213	0.0263
	Bottom	0.0167	0.0180	0.0190	0.0300	0.0250
17 November 1999	Surface	0.0177	0.0543	<0.0100	0.0220	0.0290
	Bottom	0.0227	0.0307	0.0127	0.0233	0.0303
20 December 1999	Surface	0.0140	0.0107	0.0110	<0.0100	<0.0100
	Bottom	<0.0100	<0.0100	<0.0100	0.0117	<0.0100
20 January 2000	Surface	<0.0400	<0.0400	0.0590	<0.0400	<0.0400
	Bottom	<0.0400	<0.0400	0.0450	<0.0400	0.0427
2 March 2000	Surface	<0.0400	<0.0400	0.0413	0.0450	0.0453
	Bottom	<0.0400	<0.0400	0.0427	0.0440	0.0577

Total phosphorus concentrations

Total phosphorus concentrations in surface and bottom samples generally were less than laboratory detection limits (≤ 0.10 to 0.20 mg/l), except in June and July during summer stratification (Table 6).

Chlorophyll a

Chlorophyll *a* concentrations were variable and ranged from 9.3 to 34.2 μg/l in early June and then increased slightly to 26.3 to 38.9 μg/l in late June. Chlorophyll *a* concentrations decreased slightly in July (range = 19.8 to 29.2 μg/l) through September (range = 22.8 to 34.4 μg/l) and then progressively increased from October (range = 28.3 to 38.4 μg/l) through February (range = 31.8 to 54.5 μg/l). Chlorophyll *a* concentrations were generally lowest at sites K1 (mean = 28.1 μg/l) and K2 (mean = 25.3 μg/l) and then progressively increased uplake to site K6 (36.3 μg/l)

Ten replicate chlorophyll *a* samples were taken at sites K1, K4, and K6. Mean standard deviations for these sites, standard deviations for each site ranged from 1.340 to 7.149 (K1), 1.339 to 12.513 (K4), and 2.276 to 9.450 (K6). Standard deviations at sites K2 and K3, at which only three replicate samples were collected, ranged from 1.790 to 9.4746 (K2) and 1.887 to 6.174 (K3). Thus, there appears to be no increase in precision associated with increasing sample sizes for chlorophyll *a* from three to ten.

Table 6. Mean total phosphorus (mg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February (March 2) 2000.

Date	Depth	K1	K2	K3	K4	K6
14 June 1999	Surface	0.1867	0.1867	0.2000	0.2033	0.1867
	Bottom	0.1933	0.1967	0.2067	0.1967	0.2133
30 June 1999	Surface	0.0267	<0.0200	<0.0200	<0.0200	<0.0200
	Bottom	0.0233	<0.0200	<0.0200	<0.0200	<0.0200
14 July 1999	Surface	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
	Bottom	<0.1000	<0.1000	0.1300	0.1433	0.1033
31 July 1999	Surface	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
	Bottom	<0.1000	0.1067	<0.1000	<0.1000	0.1133
22 August 1999	Surface	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
	Bottom	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
26 September 1999	Surface	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
	Bottom	<0.1000	<0.1000	<0.1000	<0.1000	0.1033
27 October 1999	Surface	<0.1500	<0.1500	<0.1500	<0.1500	<0.1500
	Bottom	0.1533	<0.1500	<0.1500	<0.1500	<0.1500
17 November 1999	Surface	<0.2000	<0.2000	<0.2000	<0.2000	<0.2000
	Bottom	<0.2000	<0.2000	<0.2000	<0.2000	<0.2000
20 December 1999	Surface	<0.2000	<0.2000	<0.2000	<0.2000	<0.2000
	Bottom	<0.2000	<0.2000	<0.2000	<0.2000	<0.2000
20 January 2000	Surface	<0.2000	<0.2000	<0.2000	<0.2000	<0.2000
	Bottom	<0.2000	<0.2000	<0.2000	<0.2000	<0.2000
2 March 2000	Surface	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000
	Bottom	<0.1000	<0.1000	<0.1000	<0.1000	<0.1000

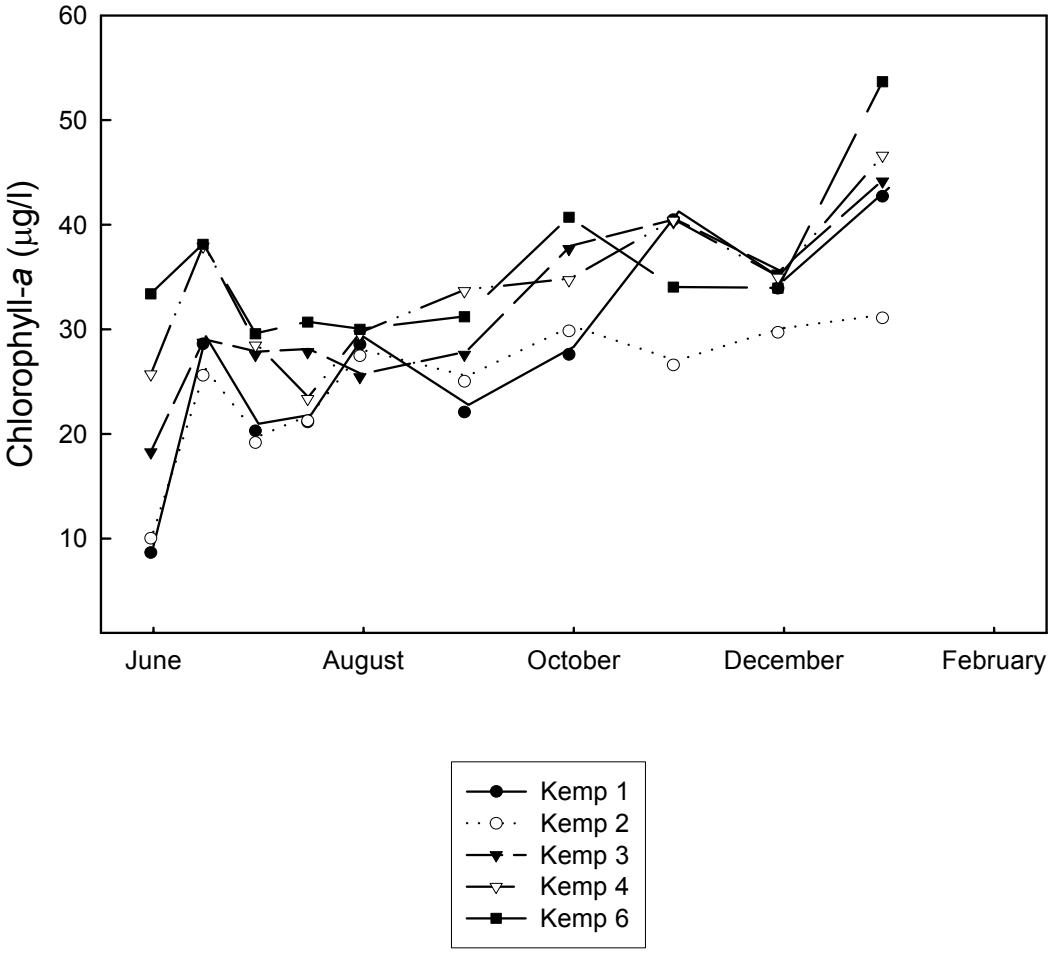

Figure 24. Mean chlorophyll-*a* concentrations (µg/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

Mean chlorophyll *a* concentrations, across all sample sites, dates, and depths are presented in Appendix B. Mean chlorophyll *a* concentrations, by site, are presented in Appendix C.

Phytoplankton Cell Counts

Phytoplankton samples have been collected and counts are currently being made. Results will be provided as a separate report by August 31, 2001.

Zooplankton Counts

Zooplankton densities ranged from 163 to 319 individuals/l in early June (Figure 25) and, although variable, gradually decreased through October (range = 59 to 130 individuals/l) at all sites. Zooplankton densities increased in November (range = 89 to 602 individuals/l), except at site K6 (1 individual/l). Zooplankton densities were extremely low (range = 1 to 8 individuals/l) throughout Lake Kemp in December, increased dramatically in January (range = 9 to 1524 individuals/l) and decreased again in February (range = 1 to 7 individuals/l). In general, zooplankton densities were lowest at sites K1 (mean = 139 individuals/l) and K2 (mean = 137 individuals/l) and were greatest at site K4 (mean = 283 individuals/l).

Zooplankton Assemblage

Copepod nauplii represented 24 to 100% of the Lake Kemp zooplankton assemblage (Figures 26 and 27). Copepod nauplii were proportionally most abundant in

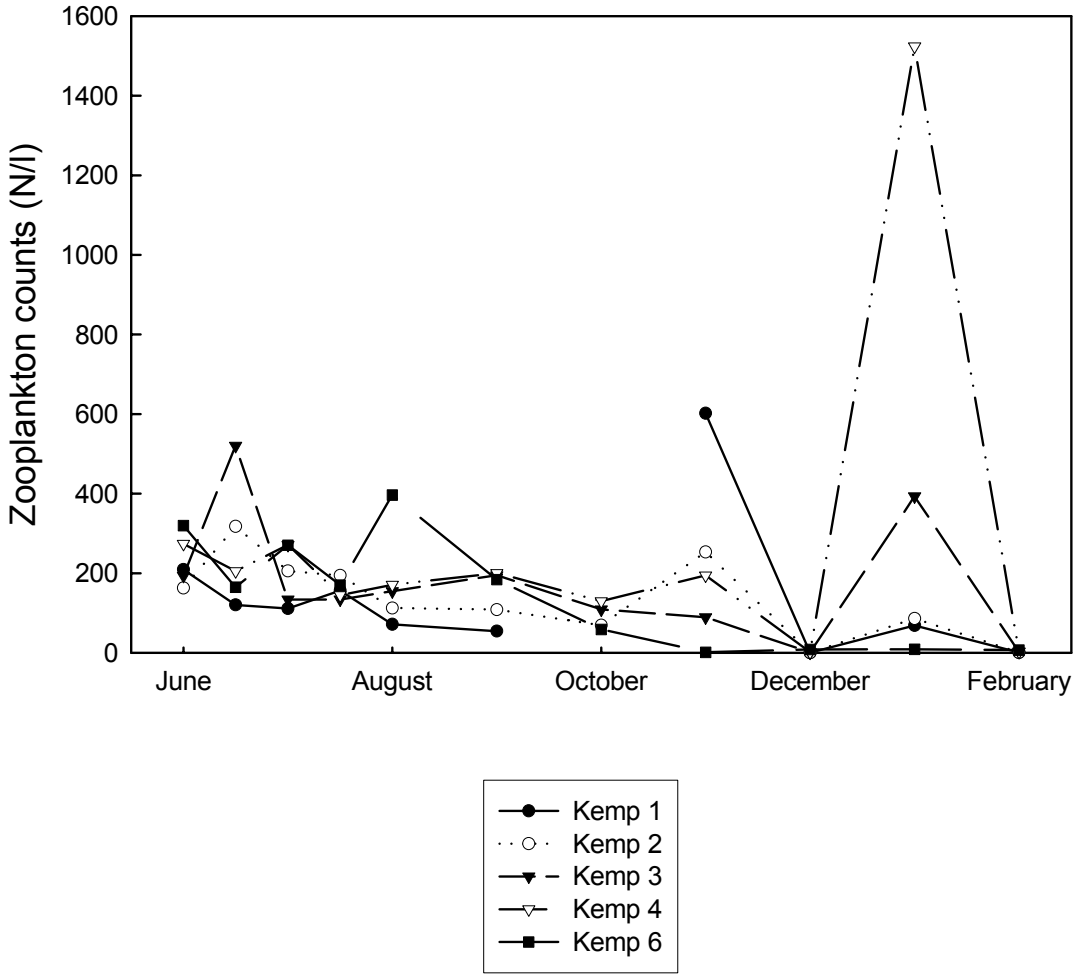

Figure 25. Mean zooplankton counts (individuals/l) at sites K1-K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

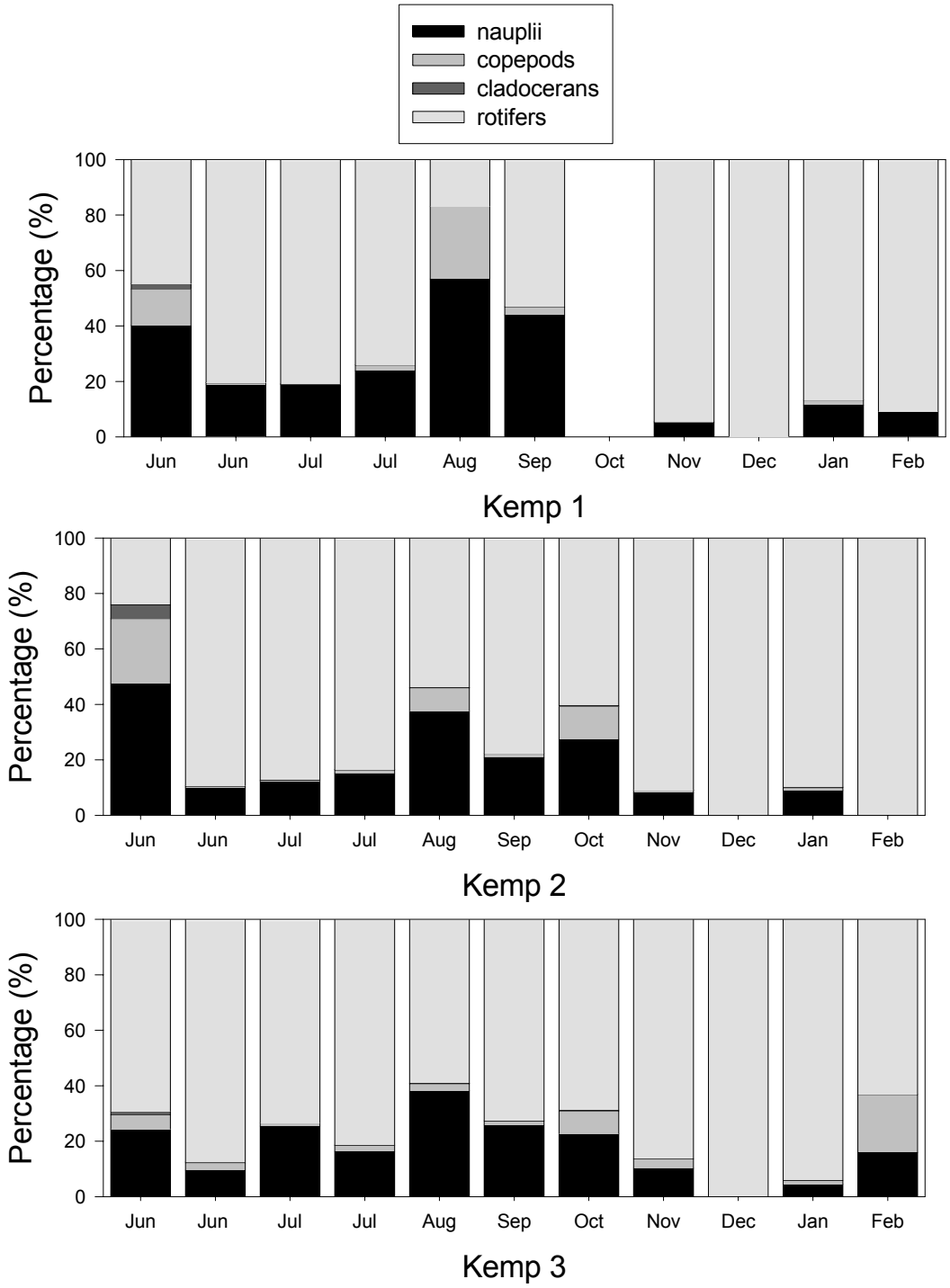

Figure 26. Relative abundance (%) of major zooplankton groups at sites K1-K3 in Lake Kemp, Texas, June 1999 through February 2000.

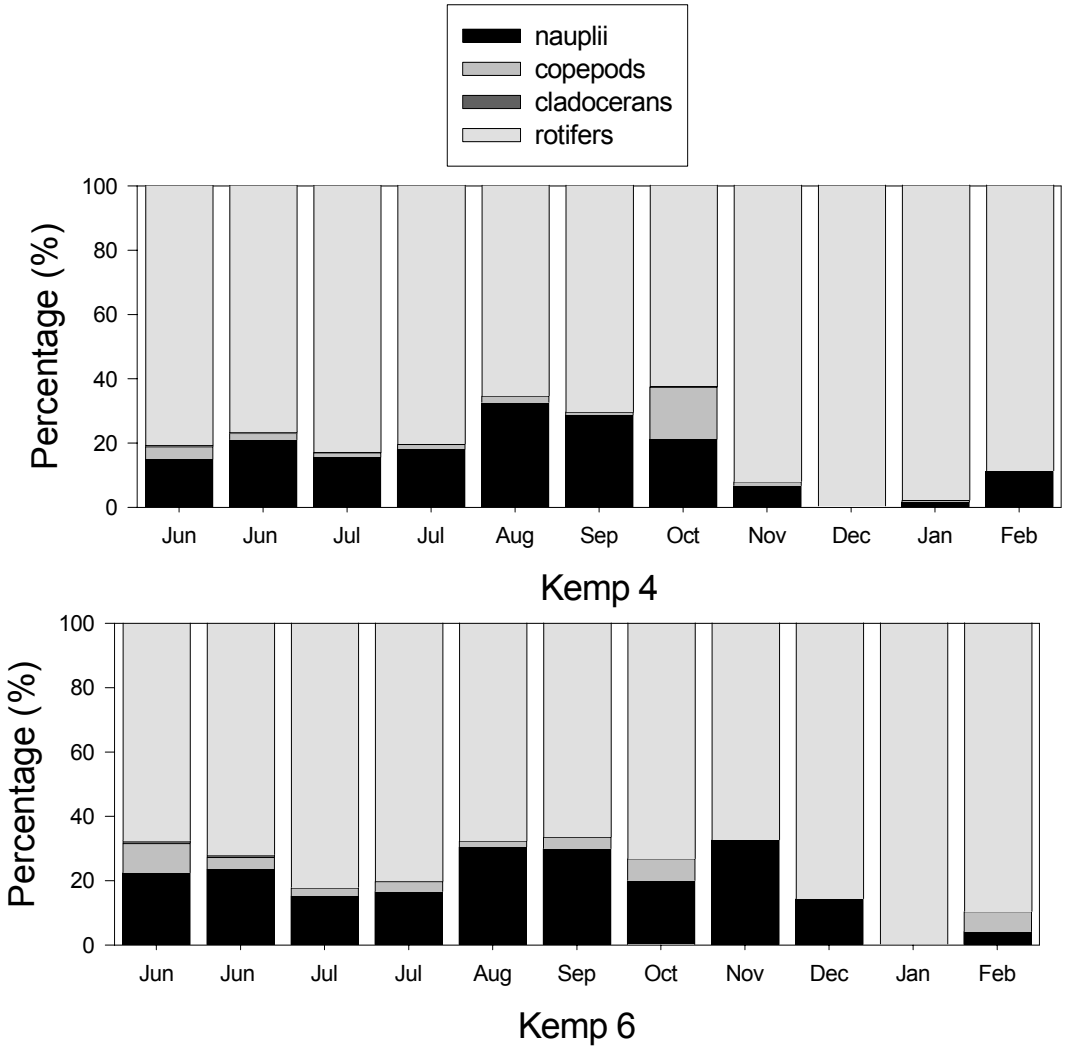

Figure 27. Relative abundance (%) of major zooplankton groups at sites K4 and K6 in Lake Kemp, Texas, June 1999 through February 2000.

June through October when they represented 1 to 67% of the assemblage. Copepod copepodites and adults (Acanthocyclops sp., Eurytemora affinis, and Mesocyclops edax) made up 0 to 26% of the zooplankton, but, on average, represented only 4% of the zooplankton assemblage. Copepodite and adult copepods were most abundant in early June and February.

Cladocerans (primarily Bosmina longirostris, Daphnia ambigua, D. parvula, and D. pulex) were a small part of the Lake Kemp zooplankton assemblage, representing 0 to 5% (mean = 0.3%) of the zooplankton. Cladocerans were proportionately most abundant in June.

Rotifers (primarily Brachionus spp., Keratella cochlearis, K. quadrata, and Syncheata sp.) composed 17 to 100% (mean = 78%) of the Lake Kemp zooplankton assemblage. Rotifers were proportionately most abundant in June through August and were least abundant in November through February.

Lake Elevation

The surface elevation of Lake Kemp ranged from 345.4 m to 348.2 m above sea level during the study period (Figure 28). Lake elevation was less than 347.8 m in early June and then increased slightly to 348.2 in late June. Thereafter, lake elevation decreased progressively through January, when it reached a minimum of 345.5 m. In February, lake level increased to 346.3 m.

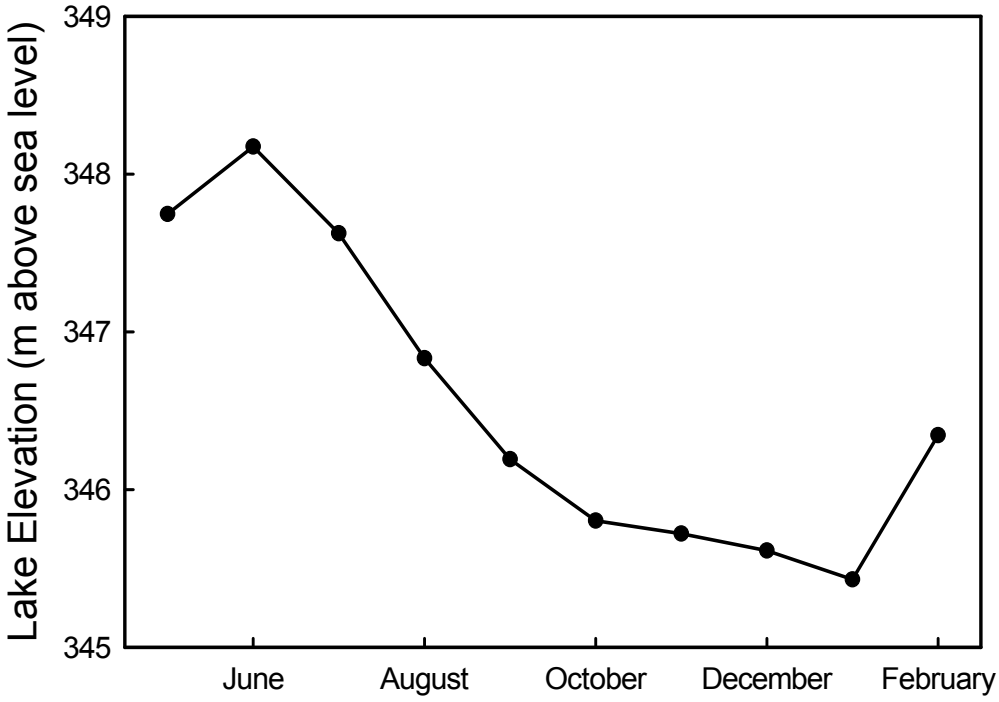

Figure 28. Lake Kemp water level (m) from May 1999 through February 2000.

Discussion

Physical Limnology of Lake Kemp

Lake Kemp can be characterized as a warm monomictic lake (Wilde 1999), similar in limnology to other moderately large, north central Texas reservoirs (e.g., Harris and Silvey 1940; Sterner 1994). The lake in both 1997 (Wilde 1999) and 1999 (this study) developed a stable thermocline at a depth of 10 (1997) to 12 m (1999). Stratification in both years developed in June and persisted through August, with turnover occurring in September. Consistency among years in the development, depth, and persistence of thermal stratification is common (Horne and Goldman 1994); however, these characteristics are relatively more variable in reservoirs than in natural lakes (Wetzel 1983). Variation between 1997 and 2000 in the depth of the thermocline may be attributable to interannual differences in inflow, duration and intensity of winds, and lake level.

Water level fluctuations in Lake Kemp were relatively small during 1999-2000. Lake elevation varied between 345.4 and 348.2 m. Lake levels were greatest in June, during the early part of the study, and then increased throughout most of the study period as a result of an extended drought in the Lake Kemp drainage basin. This decrease in lake level, and the resulting concentration of dissolved substances, was the most striking limnological feature of Lake Kemp in 1999-2000. As a result of reduced inflows into Lake Kemp during 1999-2000 the overflow, indicated by low conductivity waters, observed in 1997 did not develop in 1999.

During the period of summer stratification, the hypolimnion of Lake Kemp quickly became anoxic. Anoxia also developed in 1997 (Wilde 1999). With the development of thermal stratification developed at sites K1 and K2 in early June, near bottom oxygen concentrations quickly decreased at these sites. In June, oxygen concentrations below 12 m were reduced and were less than 1 mg/l below 12 m at sites K1 and K2. Although there was no well developed thermal stratification at site K3, bottom waters at this site also were anoxic during June through August.

Cole and Hannon (1990) proposed a conceptual model for the development and spread of anoxic conditions in the hypolimnia of reservoirs. They suggested the anoxic zone first develops in the thalweg at the downlake end of the active sedimentation zone and then progresses both uplake and downlake from that zone. Development and spread of this anoxic zone continues throughout the period of summer stagnation, until it extends from the free flowing river at one end of the reservoir to the dam at the other. At the same time, the anoxic zone develops outward and laterally from the thalweg. Cole and Hannon (1990) suggested that development and spread of the anoxic zone could be completed in a matter of days in shallow eutrophic lakes. This model is consistent with the development of the anoxic hypolimnetic zone in Lake Kemp.

According to the model of Cole and Hannon (1990), anoxic conditions first develop at, and propagate outward from, the downlake end of the zone of active sedimentation because decomposition of allochthonous organic matter consumes more oxygen than is produced by photosynthesis. Wilde (1999) speculated that development and spread of anoxic conditions in Lake Kemp appeared to be related to high runoff from the Wichita River, which resulted in a rapid increase in lake level and may have

transported a considerable amount of organic material into the lake. Because anoxia developed in the hypolimnion of Lake Kemp in 1999 in the absence of inflow events, decomposition of allochthonous organic matter appears to be responsible for anoxic conditions.

Chemical Limnology of Lake Kemp

The chemical limnology of reservoirs is largely influenced by the chemistry of their inflows (Blaxter 1977), which is in turn influenced by the geology of their watersheds (Wetzel 1983; Jones and Knowlton 1993; Riera et al. 1992). The relative concentration of major ions in fresh waters generally is $Ca^{++} > Mg^{++} > Na^{+} > K^{+}$, and the relative concentrations of major anions is $CO_3^{--} > SO_4^{--} > Cl^{-}$ (Wetzel 1983). In Lake Kemp, the relative concentration of these ions, based on lakewide averages during 1999-2000, is Na^{+} (675 mg/l) > Ca^{++} (287 mg/l) > Mg^{++} (76 mg/l) > K^{+} (12 mg/l) for cations and Cl^{-} (1170 mg/l) > SO_4^{--} (867 mg/l) > CO_3^{--} for anions. The relative concentrations of these ions was similar in 1997 (Wilde 1999) and reflects several processes. First, the predominance of sodium and chloride in Lake Kemp results from the dissolution of halides in the Wichita River drainage and their import into the lake. Second, the relatively high concentration of sulfates in Lake Kemp is due to dissolution of gypsum ($CaSO_4\,2H_20$) deposits, which are common in West Texas (Sonnefeld 1984) including the Wichita River basin (Joerns 1961). Third, the relatively low concentration of calcium, which is less than 1/3 that of sulfates, likely results from precipitation of $CaCO_3$, which begins to reach supersaturation and precipitate when alkalinity exceeds 100 to 125 mg/l $CaCO_3$ (Gorham et al. 1983; Kilham 1990) as it generally does in Lake

Kemp. Precipitation of calcium, as $CaCO_3$, may be increased in Lake Kemp as a result of the high chloride concentrations in the lake (e.g., Strumm and Morgan 1996). Fourth, the relatively high concentration of magnesium in Lake Kemp is a result of dissolution of dolomitic limestones ($CaMg(CO_3)_2$) in the Wichita River drainage basin (Joerns 1961).

Lake Kemp has a high conductivity and alkalinity, and high concentrations of dissolved solids including calcium, sodium, chloride, and sulfate. Ground and Groeger (1994) classified 80 Texas reservoirs based on a number of morphometric and chemical characteristics and found consistent differences among reservoirs based on their geographic location. Lake Kemp shares several characteristics with other west Texas reservoirs, including high concentrations of dissolved solids such as calcium, sodium, chloride, sulfate, and carbonates.

Compared with the 1997 results of Wilde (1999), concentrations of dissolved solids increased in Lake Kemp in 1999-2000. Total dissolved solids was approximately 13% greater (2781 mg/l in 1997 versus 3131 mg/l in 1999-2000). Similar increases between studies were observed in calcium (250 versus 297 mg/l), potassium (8.1 versus 12 mg/l), sodium (635 versus 675 mg/l), chloride (1021 versus 1170 mg/l), and sulfate (791 versus 867 mg/l). Except for potassium, which was present in low concentration, the increase in concentrations from 1997 to 1999-2000 ranged from 6 to 19%. The increase between studies is probably due, at least in part, to low runoff into Lake Kemp in 1999-2000.

High levels of total dissolved solids in Lake Kemp water interfered with nutrient analyses in lake sample, limiting instrument sensitivity, so that analytical results were at or below laboratory detection limits for several nutrients. Nitrite and nitrate nitrogen

concentrations ranged from <0.04 to 072 mg/l and <0.010 to 6.1 mg/l, respectively. Soluble phosphorus and total phosphorus concentrations in Lake Kemp ranged from <0.01 to 0.129 mg/l and 0 to 0.220 mg/l, respectively. Ground and Groeger (1996) reported an average total phosphate concentration for Lake Kemp, based on analyses conducted by the Texas Water Commission (1988), of 18 μg/l. However, Wilde (1999) suggesed that Ground and Groeger (1996) made an error in their calculations and that the correct concentration was 9 μg/l. Based on these results, Lake Kemp would appear to be mesotrophic (Likens 1975; Walker 1990).

Wilde (1999) reported that samples collected from Lake Kemp by the Texas Natural Resource Conservation Commission during 1983 to 1997 yield a N:P ratio of approximately 3.5:1, indicating potential nitrogen limitation in the lake (Horne and Goldman 1994). However, given the relatively low concentrations of both nitrogen and phosphorus in Lake Kemp, both are likely to limit phytoplankton growth (Elster et al. 1990) and may explain the predominance of cyanobacteria in the phytoplankton of Lake Kemp (Wilde 1999).

Based on chlorophyll *a* concentrations, which ranged from 0.84 to 63.9 μg/l throughout the present study, Lake Kemp can be characterized as meso eutrophic according to the criteria of Likens (1975), Carlson (1977), and Walker (1990). Mean growing season chlorophyll *a* concentrations in 1999 were 28.0 μg/l throughout the lake and 25.4 μg/l at site K1, near the dam. Wilde (1999) reported mean chlorophyll a concentrations in 1997 to be 1.5 μg/l throughout the lake and 15.7 μg/l at site K1, near the dam. Ground and Groeger (1996) reported a mean growing season (May through October) chlorophyll *a* concentration of 9.6 μg/l near the dam at Lake Kemp. Results of

these studies, as well as those of the Texas Natural Conservation Commission (1998), suggest that chlorophyll *a* concentrations in Lake Kemp were unusually high in the 1999 growing season, possibly because of increased nutrient availability and the low abundance of crustacean zooplankton, which can reduce phytoplankton biomass (Wetzel 1983; Horne and Goldman 1994).

Biological Limnology of Lake Kemp

Reservoirs generally are viewed as comprising three relatively distinct zones, which include an uplake, riverine zone, a river reservoir transition zone, and a downlake, lacustrine zone. These zones vary in a number of physical, chemical, and biological characteristics (Marzolf 1984; Kimmel and Groeger 1986). The riverine zone is characterized by relatively high flow, high nutrient concentrations, light limitation due to high suspended particle concentrations, and moderately low phytoplankton and zooplankton abundances. The transition zone is characterized by reduced flow, moderately high nutrient concentrations, and reduced concentrations of suspended particles due to sedimentation. Because of relatively high nutrient availability and increased light penetration as suspended solids settle out, this zone typically has high concentrations of phytoplankton and zooplankton. The lacustrine zone has low flow, high light penetration, and depends on nutrient supply by internal recycling, so it is commonly nutrient limited. Concentrations of phytoplankton and zooplankton usually are reduced in this zone, compared with those in the transition zone.

According to this, one would expect the greatest chlorophyll *a* concentrations, phytoplankton counts, and zooplankton densities to occur at sites K3 and K4. In 1997

and 1999-2000, chlorophyll *a* concentrations in Lake Kemp were greatest at site K6 and then progressively increase downlake to site K1. However, zooplankton densities generally were greatest in 1999-2000 at K3-K4. In general, conditions in Lake Kemp are generally consistent with the conceptual models of Marzolf (1984) and Kimmel and Groeger (1986).

Rotifers dominated the Lake Kemp zooplankton assemblage in 1999-2000, whereas in 1997 copepods, especially copepod nauplii, dominated the assemblage. Because the zooplankton of Lake Kemp has been studied only in 1997 and 1999-2000, it is impossible to determine whether the difference in zooplankton composition among studies represents a progressive change or is the result of limnological conditions during the present study. As a result of drought, water levels in Lake Kemp lowered throughout the study period, resulting in an increase in dissolved solids in the lake. It is possible that the zooplankton assemblage was affected by increased dissolved solids in the lake because many rotifers are euryhaline.

Potential Effects of Chloride Control Structures on the Limnology of Lake Kemp

Baldys et al. (1996) studied TDS and chloride concentrations from October 1982 through September 1992, at several sites on the South Wichita and Wichita rivers upstream from Lake Kemp, at the dam at Lake Kemp, and in the Wichita River downstream from the lake to assess the potential effects of the Bateman low flow dam. They found evidence of a highly significant ($\underline{P} < 0.0001$) decrease in TDS and chloride concentrations in the South Wichita and Wichita rivers upstream from Lake Kemp. They also found suggestive evidence of decreases in TDS ($\underline{P} = 0.108$) and chloride ($\underline{P} = 0.083$)

in Lake Kemp and strong evidence for decreases in both TDS and chloride ($\underline{P} < 0.0001$) downstream from Lake Kemp. However, Baldys et al. (1996) believed the evidence for a decrease in chloride concentrations in Lake Kemp and the Wichita River downstream were inconclusive.

In 1997, Wilde (1999) reported mean surface TDS, calculated across all samples, (mean = 2732 mg/l, range = 1959 to 3414 mg/l) and bottom TDS (mean = 2793 mg/l, range = 2325 to 3332 mg/l) were slightly greater than those (mean = 2562 mg/l) observed by Baldys et al. (1996). However, chloride concentrations (surface mean = 1000 mg/l; range = 530 to 1367 mg/l) and bottom TDS (mean = 1042 mg/l; range = 587 to 1400 mg/l) were substantially lower in 1997 than reported by Baldys et al. (1996). These results suggest that chloride concentrations decreased approximately 33% in Lake Kemp between 1992 and 1997 (Wilde 1999). Alan Plummer and Associates, Inc. (1998), updated the analyses of Baldys et al. (1996) to include recently available information and similarly concluded that chloride concentrations in Lake Kemp had decreased 30% since operation of the Bateman facility had begun.

Mean chloride concentrations in Lake Kemp increased in 1999-2000 compared with earlier results of Wilde (1999). In 1999-2000, mean chloride concentrations were 1170 mg/l (over all samples), 1168 mg/l in surface samples, and 1172 mg/l in bottom samples. Increased chloride concentrations in 1999-2000 are probably due, in part, to reduced inflows into Lake Kemp in 1999. However, the lake has a hydraulic residence over 2+ years, so that timing and magnitude of inflow and drought events in 1998 early 1999 may have influenced chloride concentrations observed during this study. Absence of information on the limnology of Lake Kemp between the study of Wilde (1999) and

the current study, precludes any description of these potential events. Additional, and more regular, monitoring of chloride concentrations in the Wichita River and a better understanding of the chemical limnology of Lake Kemp are necessary to better understand chloride dynamics in the lake.

Wilde (1999) suggested that several lines of evidence indicated that chloride concentrations in Lake Kemp had decreased since the mid 1980s, but that the available evidence was not conclusive because variation in sampling and analytical protocols, and seasonal and inflow (dilution) related variation in chloride concentrations might account for some of the observed temporal differences in chloride concentrations. Results of the present study, showing a lakewide increase in chloride concentrations between 1997 and 1999-2000 further complicate any attempt to determine whether chloride concentrations in Lake Kemp have decreased since operation of the Bateman chloride control facility began. Continued monitoring of chloride concentrations at USGS gauging stations on the North and South Wichita rivers, or on the Wichita River upstream from Lake Kemp should be conducted in conjunction with future limnological surveys of Lake Kemp

At present, available information is still inadequate to allow any assessment of potential changes in turbidity, nutrient concentrations, and phytoplankton productivity in Lake Kemp as a result of operation of the Bateman chloride control facility.

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APPENDICES

APPENDIX A

Water Chemistry Summarized Across All Sampling Sites, Dates, and Depths

Appendix A: Water Chemistry Summarized Across All Sampling Sites and Depths

Parameter	Units	Mean	Minimum	Maximum	Standard Deviation	N
Alkalinity	mg/l CaC03	88.2	77.5	111.5	6.3	330
Hardness	mg/l CaC03	978.1	771.0	1404.0	91.9	329
Total Dissolved Solids	mg/l	3150.6	2200.0	4400.0	321.5	329
Total Suspended Solids	mg/l	10.9	1.0	96.0	14.2	329
Turbidity	NTU	34.4	6.2	599.0	50.2	782
Chloride	mg/l	1169.7	930.0	1600.0	98.0	330
Sulfate	mg/l	867.2	720.0	1300.0	85.3	328
Calcium	mg/l	267.0	218.0	376.0	24.5	329
Magnesium	mg/l	75.7	55.0	113.0	7.7	329
Sodium	mg/l	867.2	720.0	1300.0	85.3	328
Potassium	mg/l	11.9	7.8	22.0	2.4	329
Chlorophyll	ug/l	32.3	0.8	64.0	9.9	359

APPENDIX B

Water Chemistry Summaries by Site

Appendix B: Water Chemistry Summaries by Site

Parameter	Units	Sampling Site	Depth	Mean	Minimum	Maximum	Standard Deviation	N
Alkalinity	mg/l CaC03	K1	All depths combined	89.9	79.0	111.5	7.1	66
Alkalinity	mg/l CaC03	K1	Surface	86.3	79.0	98.8	5.4	33
Alkalinity	mg/l CaC03	K1	Bottom	93.4	87.0	111.5	6.7	33
Hardness	mg/l CaC03	K1	All depths combined	974.5	857.0	1114.0	68.9	66
Hardness	mg/l CaC03	K1	Surface	972.7	857.0	1114.0	72.1	33
Hardness	mg/l CaC03	K1	Bottom	976.3	890.0	1113.0	66.5	33
Total Dissolved Solids	mg/l	K1	All depths combined	3184.0	2300.0	4400.0	323.9	66
Total Dissolved Solids	mg/l	K1	Surface	3158.9	2300.0	3600.0	306.7	33
Total Dissolved Solids	mg/l	K1	Bottom	3209.1	2700.0	4400.0	343.1	33
Total Suspended Solids	mg/l	K1	All depths combined	5.8	1.0	58.0	10.9	66
Total Suspended Solids	mg/l	K1	Surface	2.5	1.0	8.0	2.1	33
Total Suspended Solids	mg/l	K1	Bottom	9.1	1.0	58.0	14.7	33
Turbidity	NTU	K1	All depths combined	13.4	6.2	26.4	5.1	220
Turbidity	NTU	K1	Surface	11.8	6.2	22.8	4.2	110
Turbidity	NTU	K1	Bottom	15.1	6.7	26.4	5.3	110
Chloride	mg/l	K1	All depths combined	1175.9	930.0	1600.0	106.2	66
Chloride	mg/l	K1	Surface	1176.1	930.0	1600.0	136.0	33
Chloride	mg/l	K1	Bottom	1175.8	1000.0	1300.0	66.3	33
Sulfate	mg/l	K1	All depths combined	868.6	730.0	1100.0	76.0	66
Sulfate	mg/l	K1	Surface	862.7	730.0	1100.0	88.4	33
Sulfate	mg/l	K1	Bottom	874.6	770.0	1100.0	62.0	33
Calcium	mg/l	K1	All depths combined	265.2	236.0	309.0	18.7	66
Calcium	mg/l	K1	Surface	264.5	236.0	301.0	19.2	33
Calcium	mg/l	K1	Bottom	266.0	239.0	309.0	18.5	33
Magnesium	mg/l	K1	All depths combined	75.9	65.0	88.0	5.6	66
Magnesium	mg/l	K1	Surface	75.9	65.0	88.0	6.0	33
Magnesium	mg/l	K1	Bottom	75.8	67.0	86.0	5.3	33
Sodium	mg/l	K1	All depths combined	678.4	602.0	754.0	40.3	66
Sodium	mg/l	K1	Surface	678.8	617.0	751.0	41.6	33
Sodium	mg/l	K1	Bottom	678.1	602.0	754.0	39.7	33
Potassium	mg/l	K1	All depths combined	12.2	8.7	21.0	2.5	66
Potassium	mg/l	K1	Surface	12.9	8.8	21.0	2.9	33
Potassium	mg/l	K1	Bottom	11.6	8.7	17.0	2.0	33
Chlorophyll	ug/l	K1	All depths combined	28.4	0.8	48.6	10.2	100
Chlorophyll	ug/l	K1	Surface	28.4	0.8	48.6	10.2	100

Appendix B: Water Chemistry Summaries by Site

Parameter	Units	Sampling Site	Depth	Mean	Minimum	Maximum	Standard Deviation	N
Alkalinity	mg/l CaC03	K2	All depths combined	88.8	78.5	101.3	5.5	66
Alkalinity	mg/l CaC03	K2	Surface	86.2	78.5	101.3	5.6	33
Alkalinity	mg/l CaC03	K2	Bottom	91.4	84.5	98.8	4.0	33
Hardness	mg/l CaC03	K2	All depths combined	974.8	867.0	1131.0	72.0	66
Hardness	mg/l CaC03	K2	Surface	974.8	867.0	1131.0	76.4	33
Hardness	mg/l CaC03	K2	Bottom	974.8	868.0	1081.0	68.6	33
Total Dissolved Solids	mg/l	K2	All depths combined	3110.8	2300.0	3500.0	268.9	66
Total Dissolved Solids	mg/l	K2	Surface	3118.2	2300.0	3500.0	285.5	33
Total Dissolved Solids	mg/l	K2	Bottom	3103.3	2500.0	3500.0	255.4	33
Total Suspended Solids	mg/l	K2	All depths combined	6.5	1.0	37.0	7.6	66
Total Suspended Solids	mg/l	K2	Surface	3.5	1.0	11.0	3.0	33
Total Suspended Solids	mg/l	K2	Bottom	9.5	1.0	37.0	9.4	33
Turbidity	NTU	K2	All depths combined	15.5	6.8	38.4	6.1	66
Turbidity	NTU	K2	Surface	12.6	6.8	19.1	3.6	33
Turbidity	NTU	K2	Bottom	18.3	10.5	38.4	6.8	33
Chloride	mg/l	K2	All depths combined	1171.2	1000.0	1500.0	78.0	66
Chloride	mg/l	K2	Surface	1160.6	1000.0	1300.0	65.9	33
Chloride	mg/l	K2	Bottom	1181.8	1100.0	1500.0	88.2	33
Sulfate	mg/l	K2	All depths combined	852.1	770.0	950.0	45.1	66
Sulfate	mg/l	K2	Surface	855.5	770.0	950.0	50.9	33
Sulfate	mg/l	K2	Bottom	848.8	780.0	930.0	39.0	33
Calcium	mg/l	K2	All depths combined	265.6	234.0	306.0	19.4	66
Calcium	mg/l	K2	Surface	265.8	234.0	306.0	20.8	33
Calcium	mg/l	K2	Bottom	265.3	234.0	292.0	18.2	33
Magnesium	mg/l	K2	All depths combined	75.7	65.0	89.0	6.0	66
Magnesium	mg/l	K2	Surface	75.6	65.0	89.0	6.3	33
Magnesium	mg/l	K2	Bottom	75.9	68.0	86.0	5.9	33
Sodium	mg/l	K2	All depths combined	674.3	572.0	763.0	43.3	66
Sodium	mg/l	K2	Surface	673.2	594.0	763.0	46.0	33
Sodium	mg/l	K2	Bottom	675.5	572.0	747.0	41.0	33
Potassium	mg/l	K2	All depths combined	11.8	8.5	22.0	2.5	66
Potassium	mg/l	K2	Surface	11.4	8.5	17.0	2.2	33
Potassium	mg/l	K2	Bottom	12.2	8.6	22.0	2.7	33
Chlorophyll	ug/l	K2	All depths combined	25.3	4.0	33.4	7.2	30
Chlorophyll	ug/l	K2	Surface	25.3	4.0	33.4	7.2	30

Appendix B: Water Chemistry Summaries by Site

Parameter	Units	Sampling Site	Depth	Mean	Minimum	Maximum	Standard Deviation	N
Alkalinity	mg/l CaC03	K3	All depths combined	88.1	79.0	100.0	5.2	66
Alkalinity	mg/l CaC03	K3	Surface	86.1	79.0	100.0	5.6	33
Alkalinity	mg/l CaC03	K3	Bottom	90.0	85.5	100.0	4.0	33
Hardness	mg/l CaC03	K3	All depths combined	972.4	820.0	1110.0	82.5	66
Hardness	mg/l CaC03	K3	Surface	966.0	820.0	1110.0	85.6	33
Hardness	mg/l CaC03	K3	Bottom	978.8	834.0	1106.0	80.1	33
Total Dissolved Solids	mg/l	K3	All depths combined	3116.7	2200.0	3700.0	309.1	66
Total Dissolved Solids	mg/l	K3	Surface	3097.0	2200.0	3600.0	329.3	33
Total Dissolved Solids	mg/l	K3	Bottom	3136.4	2600.0	3700.0	291.4	33
Total Suspended Solids	mg/l	K3	All depths combined	8.2	1.0	55.0	9.5	66
Total Suspended Solids	mg/l	K3	Surface	3.7	1.0	13.0	3.3	33
Total Suspended Solids	mg/l	K3	Bottom	12.6	1.0	55.0	11.5	33
Turbidity	NTU	K3	All depths combined	23.8	10.0	59.3	12.2	66
Turbidity	NTU	K3	Surface	18.5	10.0	29.4	5.8	33
Turbidity	NTU	K3	Bottom	29.0	14.3	59.3	14.6	33
Chloride	mg/l	K3	All depths combined	1168.2	1000.0	1500.0	93.1	66
Chloride	mg/l	K3	Surface	1169.7	1000.0	1500.0	98.4	33
Chloride	mg/l	K3	Bottom	1166.7	1000.0	1400.0	89.0	33
Sulfate	mg/l	K3	All depths combined	865.8	740.0	1200.0	99.8	66
Sulfate	mg/l	K3	Surface	854.6	740.0	1200.0	85.3	33
Sulfate	mg/l	K3	Bottom	877.0	760.0	1200.0	112.6	33
Calcium	mg/l	K3	All depths combined	265.2	224.0	306.0	22.4	66
Calcium	mg/l	K3	Surface	263.3	224.0	306.0	23.1	33
Calcium	mg/l	K3	Bottom	267.1	225.0	298.0	21.9	33
Magnesium	mg/l	K3	All depths combined	75.3	61.0	88.0	6.7	66
Magnesium	mg/l	K3	Surface	74.9	61.0	86.0	7.1	33
Magnesium	mg/l	K3	Bottom	75.7	65.0	88.0	6.4	33
Sodium	mg/l	K3	All depths combined	666.0	560.0	749.0	47.1	66
Sodium	mg/l	K3	Surface	662.5	560.0	749.0	51.7	33
Sodium	mg/l	K3	Bottom	669.5	593.0	739.0	42.4	33
Potassium	mg/l	K3	All depths combined	11.7	8.3	17.0	2.1	66
Potassium	mg/l	K3	Surface	11.9	8.3	17.0	2.2	33
Potassium	mg/l	K3	Bottom	11.5	8.5	16.0	2.0	33
Chlorophyll	ug/l	K3	All depths combined	32.1	14.9	47.2	8.5	29
Chlorophyll	ug/l	K3	Surface	32.1	14.9	47.2	8.5	29

Appendix B: Water Chemistry Summaries by Site

Parameter	Units	Sampling Site	Depth	Mean	Minimum	Maximum	Standard Deviation	N
Alkalinity	mg/l CaC03	K4	All depths combined	87.7	78.0	102.5	6.1	66
Alkalinity	mg/l CaC03	K4	Surface	86.8	78.0	101.3	6.6	33
Alkalinity	mg/l CaC03	K4	Bottom	88.6	79.5	102.5	5.5	33
Hardness	mg/l CaC03	K4	All depths combined	979.6	782.0	1158.0	96.9	66
Hardness	mg/l CaC03	K4	Surface	975.8	792.0	1158.0	98.0	33
Hardness	mg/l CaC03	K4	Bottom	983.4	782.0	1131.0	97.1	33
Total Dissolved Solids	mg/l	K4	All depths combined	3153.0	2300.0	3700.0	338.9	66
Total Dissolved Solids	mg/l	K4	Surface	3145.5	2300.0	3700.0	365.8	33
Total Dissolved Solids	mg/l	K4	Bottom	3160.6	2700.0	3700.0	315.2	33
Total Suspended Solids	mg/l	K4	All depths combined	11.7	1.0	80.0	15.9	66
Total Suspended Solids	mg/l	K4	Surface	7.5	1.0	40.0	7.9	33
Total Suspended Solids	mg/l	K4	Bottom	16.0	1.0	80.0	20.3	33
Turbidity	NTU	K4	All depths combined	32.2	12.5	158.0	26.2	220
Turbidity	NTU	K4	Surface	23.3	12.5	37.7	6.7	110
Turbidity	NTU	K4	Bottom	41.0	13.0	158.0	34.3	110
Chloride	mg/l	K4	All depths combined	1163.5	990.0	1400.0	94.1	66
Chloride	mg/l	K4	Surface	1163.3	990.0	1300.0	86.6	33
Chloride	mg/l	K4	Bottom	1163.6	1000.0	1400.0	102.5	33
Sulfate	mg/l	K4	All depths combined	887.9	720.0	1300.0	118.3	65
Sulfate	mg/l	K4	Surface	879.1	730.0	1300.0	126.1	32
Sulfate	mg/l	K4	Bottom	896.4	720.0	1200.0	111.5	33
Calcium	mg/l	K4	All depths combined	267.7	219.0	312.0	25.8	66
Calcium	mg/l	K4	Surface	266.6	220.0	312.0	26.0	33
Calcium	mg/l	K4	Bottom	268.9	219.0	306.0	26.0	33
Magnesium	mg/l	K4	All depths combined	75.6	57.0	92.0	8.2	66
Magnesium	mg/l	K4	Surface	75.3	59.0	92.0	8.3	33
Magnesium	mg/l	K4	Bottom	75.8	57.0	89.0	8.2	33
Sodium	mg/l	K4	All depths combined	671.6	575.0	776.0	59.5	66
Sodium	mg/l	K4	Surface	669.3	576.0	776.0	59.1	33
Sodium	mg/l	K4	Bottom	673.9	575.0	771.0	60.7	33
Potassium	mg/l	K4	All depths combined	12.0	8.1	19.0	2.5	66
Potassium	mg/l	K4	Surface	11.8	8.1	18.0	2.5	33
Potassium	mg/l	K4	Bottom	12.3	8.1	19.0	2.5	33
Chlorophyll	ug/l	K4	All depths combined	34.3	10.3	59.4	9.4	100
Chlorophyll	ug/l	K4	Surface	34.3	10.3	59.4	9.4	100

Appendix B: Water Chemistry Summaries by Site

Parameter	Units	Sampling Site	Depth	Mean	Minimum	Maximum	Standard Deviation	N
Alkalinity	mg/l CaC03	K6	All depths combined	86.5	77.5	102.5	7.0	66
Alkalinity	mg/l CaC03	K6	Surface	86.3	77.5	102.5	7.1	33
Alkalinity	mg/l CaC03	K6	Bottom	86.8	77.5	101.3	6.9	33
Hardness	mg/l CaC03	K6	All depths combined	989.2	771.0	1404.0	128.8	65
Hardness	mg/l CaC03	K6	Surface	986.4	787.0	1164.0	107.4	33
Hardness	mg/l CaC03	K6	Bottom	992.1	771.0	1404.0	149.5	32
Total Dissolved Solids	mg/l	K6	All depths combined	3189.2	2500.0	3800.0	361.5	65
Total Dissolved Solids	mg/l	K6	Surface	3184.9	2500.0	3800.0	365.0	33
Total Dissolved Solids	mg/l	K6	Bottom	3193.8	2500.0	3800.0	363.6	32
Total Suspended Solids	mg/l	K6	All depths combined	22.3	1.0	96.0	18.0	65
Total Suspended Solids	mg/l	K6	Surface	15.4	1.0	29.0	8.1	33
Total Suspended Solids	mg/l	K6	Bottom	29.4	6.0	96.0	22.3	32
Turbidity	NTU	K6	All depths combined	68.1	15.7	599.0	82.7	210
Turbidity	NTU	K6	Surface	39.5	15.7	63.5	13.6	110
Turbidity	NTU	K6	Bottom	99.6	15.8	599.0	111.1	100
Chloride	mg/l	K6	All depths combined	1169.9	960.0	1400.0	116.9	66
Chloride	mg/l	K6	Surface	1168.5	970.0	1400.0	115.1	33
Chloride	mg/l	K6	Bottom	1171.2	960.0	1400.0	120.5	33
Sulfate	mg/l	K6	All depths combined	861.7	720.0	1000.0	66.5	65
Sulfate	mg/l	K6	Surface	858.8	720.0	1000.0	68.9	33
Sulfate	mg/l	K6	Bottom	864.7	730.0	1000.0	65.0	32
Calcium	mg/l	K6	All depths combined	271.4	218.0	376.0	33.5	65
Calcium	mg/l	K6	Surface	270.0	219.0	313.0	28.1	33
Calcium	mg/l	K6	Bottom	272.8	218.0	376.0	38.8	32
Magnesium	mg/l	K6	All depths combined	76.2	55.0	113.0	11.1	65
Magnesium	mg/l	K6	Surface	75.9	57.0	93.0	9.3	33
Magnesium	mg/l	K6	Bottom	76.5	55.0	113.0	12.9	32
Sodium	mg/l	K6	All depths combined	684.8	557.0	923.0	81.5	65
Sodium	mg/l	K6	Surface	679.3	573.0	780.0	68.6	33
Sodium	mg/l	K6	Bottom	690.5	557.0	923.0	93.8	32
Potassium	mg/l	K6	All depths combined	11.6	7.8	19.0	2.5	65
Potassium	mg/l	K6	Surface	11.6	7.9	16.0	2.2	33
Potassium	mg/l	K6	Bottom	11.7	7.8	19.0	2.8	32
Chlorophyll	ug/l	K6	All depths combined	36.3	16.9	64.0	8.5	100
Chlorophyll	ug/l	K6	Surface	36.3	16.9	64.0	8.5	100

APPENDIX C

Lake Kemp Physicochemical Profiles

Lake Kemp Physicochemical Profiles: 14 June 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K1	6/14/1999	10:00	16.0	1.55	0.0	25.41	8.14	7.89	4700	1774.000
K1	6/14/1999	10:00	16.0	1.55	1.0	25.41	8.14	7.78	4700	667.900
K1	6/14/1999	10:00	16.0	1.55	2.0	25.39	8.14	7.70	4700	163.600
K1	6/14/1999	10:00	16.0	1.55	3.0	25.39	8.14	7.62	4700	111.200
K1	6/14/1999	10:00	16.0	1.55	4.0	25.39	8.14	7.62	4700	33.460
K1	6/14/1999	10:00	16.0	1.55	5.0	25.39	8.14	7.62	4700	20.340
K1	6/14/1999	10:00	16.0	1.55	6.0	25.39	8.14	7.62	4700	7.111
K1	6/14/1999	10:00	16.0	1.55	7.0	25.37	8.14	7.56	4710	.
K1	6/14/1999	10:00	16.0	1.55	8.0	25.37	8.13	7.51	4710	.
K1	6/14/1999	10:00	16.0	1.55	9.0	25.37	8.13	7.49	4710	.
K1	6/14/1999	10:00	16.0	1.55	10.0	25.38	8.11	7.26	4760	.
K1	6/14/1999	10:00	16.0	1.55	11.0	24.74	7.97	6.44	4880	.
K1	6/14/1999	10:00	16.0	1.55	12.0	24.08	7.74	4.66	4970	.
K1	6/14/1999	10:00	16.0	1.55	13.0	23.62	7.57	3.52	5030	.
K1	6/14/1999	10:00	16.0	1.55	14.0	23.01	7.39	2.35	5130	.
K1	6/14/1999	10:00	16.0	1.55	15.0	22.42	7.31	1.43	5180	.
K1	6/14/1999	10:00	16.0	1.55	16.0	22.06	7.26	0.89	5210	.
K2	6/14/1999	10:51	14.5	0.97	0.0	25.21	8.10	7.95	4810	1934.000
K2	6/14/1999	10:51	14.5	0.97	1.0	25.21	8.10	7.50	4810	563.300
K2	6/14/1999	10:51	14.5	0.97	2.0	25.22	8.10	7.50	4810	110.200
K2	6/14/1999	10:51	14.5	0.97	3.0	25.21	8.10	7.39	4820	80.190
K2	6/14/1999	10:51	14.5	0.97	4.0	25.21	8.10	7.37	4820	37.090
K2	6/14/1999	10:51	14.5	0.97	5.0	25.19	8.10	7.31	4820	16.530
K2	6/14/1999	10:51	14.5	0.97	6.0	25.19	8.10	7.31	4820	.
K2	6/14/1999	10:51	14.5	0.97	7.0	25.19	8.10	7.29	4820	.
K2	6/14/1999	10:51	14.5	0.97	8.0	25.19	8.09	7.29	4820	.
K2	6/14/1999	10:51	14.5	0.97	9.0	25.17	8.08	7.17	4830	.
K2	6/14/1999	10:51	14.5	0.97	10.0	24.45	7.87	5.64	4910	.
K2	6/14/1999	10:51	14.5	0.97	11.0	23.92	7.68	4.35	4990	.
K2	6/14/1999	10:51	14.5	0.97	12.0	22.99	7.41	2.18	5120	.
K2	6/14/1999	10:51	14.5	0.97	13.0	22.56	7.32	1.33	5170	.
K2	6/14/1999	10:51	14.5	0.97	14.0	22.2	7.25	0.83	5200	.

Lake Kemp Physicochemical Profiles: 14 June 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K3	6/14/1999	11:29	11.4	0.71	0.0	25.28	8.09	7.24	4570	2143.000
K3	6/14/1999	11:29	11.4	0.71	1.0	25.26	8.09	7.20	4570	621.200
K3	6/14/1999	11:29	11.4	0.71	2.0	25.24	8.09	7.15	4580	192.800
K3	6/14/1999	11:29	11.4	0.71	3.0	25.22	8.08	7.10	4590	43.060
K3	6/14/1999	11:29	11.4	0.71	4.0	25.19	8.08	7.05	4570	9.686
K3	6/14/1999	11:29	11.4	0.71	5.0	25.17	8.08	7.03	4580	.
K3	6/14/1999	11:29	11.4	0.71	6.0	25.17	8.08	6.99	4580	.
K3	6/14/1999	11:29	11.4	0.71	7.0	25.17	8.07	6.97	4580	.
K3	6/14/1999	11:29	11.4	0.71	8.0	25.15	8.06	6.92	4590	.
K3	6/14/1999	11:29	11.4	0.71	9.0	24.52	7.77	5.17	4640	.
K3	6/14/1999	11:29	11.4	0.71	10.0	24.26	7.60	3.52	4840	.
K3	6/14/1999	11:29	11.4	0.71	11.0	23.99	7.56	3.20	4910	.
K4	6/14/1999	11:58	8.5	0.40	0.0	25.62	8.17	7.79	4470	2078.000
K4	6/14/1999	11:58	8.5	0.40	1.0	25.62	8.17	7.70	4470	277.700
K4	6/14/1999	11:58	8.5	0.40	2.0	25.62	8.17	7.64	4490	39.240
K4	6/14/1999	11:58	8.5	0.40	3.0	25.52	8.17	7.51	4490	6.434
K4	6/14/1999	11:58	8.5	0.40	4.0	25.48	8.17	7.34	4490	.
K4	6/14/1999	11:58	8.5	0.40	5.0	25.43	8.17	6.95	4500	.
K4	6/14/1999	11:58	8.5	0.40	6.0	25.35	8.17	7.19	4500	.
K4	6/14/1999	11:58	8.5	0.40	7.0	25.34	8.17	7.21	4490	.
K4	6/14/1999	11:58	8.5	0.40	8.0	25.24	8.17	7.28	4500	.
K5	6/14/1999	12:36	5.5	0.34	0.0	25.65	8.20	7.79	4440	2115.000
K5	6/14/1999	12:36	5.5	0.34	1.0	25.62	8.20	7.74	4460	91.220
K5	6/14/1999	12:36	5.5	0.34	2.0	25.58	8.19	7.70	4460	10.470
K5	6/14/1999	12:36	5.5	0.34	3.0	25.52	8.19	7.66	4450	1.047
K5	6/14/1999	12:36	5.5	0.34	4.0	25.5	8.18	7.62	4450	.
K5	6/14/1999	12:36	5.5	0.34	5.0	25.34	8.17	7.34	4460	.
K6	6/14/1999	12:49	3.1	0.26	0.0	25.63	8.20	8.05	4430	2314.000
K6	6/14/1999	12:49	3.1	0.26	1.0	25.63	8.20	7.93	4440	59.920
K6	6/14/1999	12:49	3.1	0.26	2.0	25.6	8.20	7.89	4440	7.646
K6	6/14/1999	12:49	3.1	0.26	3.0	25.5	8.19	7.76	4430	0.581

Lake Kemp Physicochemical Profiles: 30 June 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	6/30/1999	9:50	14.2	1.40	0.0	26.96	8.17	7.55	4820	161.300
K 1	6/30/1999	9:50	14.2	1.40	1.0	26.96	8.17	7.56	4830	49.140
K 1	6/30/1999	9:50	14.2	1.40	2.0	26.96	8.17	7.55	4830	20.010
K 1	6/30/1999	9:50	14.2	1.40	3.0	26.94	8.17	7.51	4830	9.741
K 1	6/30/1999	9:50	14.2	1.40	4.0	26.84	8.14	7.28	4850	5.050
K 1	6/30/1999	9:50	14.2	1.40	5.0	26.80	8.13	7.21	4840	2.535
K 1	6/30/1999	9:50	14.2	1.40	6.0	26.77	8.12	7.06	4840	1.234
K 1	6/30/1999	9:50	14.2	1.40	7.0	26.69	8.11	7.03	4840	.
K 1	6/30/1999	9:50	14.2	1.40	8.0	26.67	8.10	6.97	4850	.
K 1	6/30/1999	9:50	14.2	1.40	9.0	26.22	8.02	5.98	4890	.
K 1	6/30/1999	9:50	14.2	1.40	10.0	25.80	7.92	5.57	4910	.
K 1	6/30/1999	9:50	14.2	1.40	11.0	25.54	7.84	5.04	4920	.
K 1	6/30/1999	9:50	14.2	1.40	12.0	25.00	7.66	3.62	4960	.
K 1	6/30/1999	9:50	14.2	1.40	13.0	24.61	7.51	2.63	4990	.
K 1	6/30/1999	9:50	14.2	1.40	14.0	24.32	7.43	1.91	5030	.
K 2	6/30/1999	10:25	14.3	1.16	0.0	27.21	8.16	7.40	4750	41.540
K 2	6/30/1999	10:25	14.3	1.16	1.0	27.23	8.16	7.32	4750	10.410
K 2	6/30/1999	10:25	14.3	1.16	2.0	27.21	8.16	7.28	4750	5.605
K 2	6/30/1999	10:25	14.3	1.16	3.0	27.21	8.16	7.17	4750	2.191
K 2	6/30/1999	10:25	14.3	1.16	4.0	27.15	8.15	7.09	4750	1.230
K 2	6/30/1999	10:25	14.3	1.16	5.0	27.07	8.15	7.15	4740	0.576
K 2	6/30/1999	10:25	14.3	1.16	6.0	26.90	8.14	7.10	4750	0.311
K 2	6/30/1999	10:25	14.3	1.16	7.0	26.86	8.12	6.91	4770	.
K 2	6/30/1999	10:25	14.3	1.16	8.0	26.82	8.10	6.77	4780	.
K 2	6/30/1999	10:25	14.3	1.16	9.0	26.77	8.09	6.64	4800	.
K 2	6/30/1999	10:25	14.3	1.16	10.0	26.56	8.03	6.26	4820	.
K 2	6/30/1999	10:25	14.3	1.16	11.0	25.37	7.70	3.88	4920	.
K 2	6/30/1999	10:25	14.3	1.16	12.0	24.48	7.43	2.00	4990	.
K 2	6/30/1999	10:25	14.3	1.16	13.0	24.36	7.39	1.82	5110	.
K 2	6/30/1999	10:25	14.3	1.16	14.0	23.93	7.30	0.73	5770	.

Lake Kemp Physicochemical Profiles: 30 June 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	6/30/1999	11:15	11.5	0.93	0.0	27.26	8.14	7.40	4640	621.800
K 3	6/30/1999	11:15	11.5	0.93	1.0	27.26	8.14	7.22	4660	262.200
K 3	6/30/1999	11:15	11.5	0.93	2.0	27.26	8.14	7.14	4660	47.750
K 3	6/30/1999	11:15	11.5	0.93	3.0	27.28	8.15	7.10	4660	67.190
K 3	6/30/1999	11:15	11.5	0.93	4.0	27.28	8.14	7.05	4660	6.796
K 3	6/30/1999	11:15	11.5	0.93	5.0	27.28	8.14	7.03	4660	2.397
K 3	6/30/1999	11:15	11.5	0.93	6.0	27.26	8.14	7.01	4670	.
K 3	6/30/1999	11:15	11.5	0.93	7.0	27.28	8.14	7.00	4660	.
K 3	6/30/1999	11:15	11.5	0.93	8.0	27.26	8.14	6.96	4660	.
K 3	6/30/1999	11:15	11.5	0.93	9.0	27.28	8.14	6.97	4660	.
K 3	6/30/1999	11:15	11.5	0.93	10.0	27.26	8.14	6.92	4670	.
K 3	6/30/1999	11:15	11.5	0.93	11.0	27.26	8.14	6.92	4670	.
K 4	6/30/1999	11:51	8.3	0.62	0.0	26.98	8.16	7.24	4480	831.400
K 4	6/30/1999	11:51	8.3	0.62	1.0	26.98	8.16	7.13	4490	116.000
K 4	6/30/1999	11:51	8.3	0.62	2.0	26.96	8.16	7.02	4490	26.230
K 4	6/30/1999	11:51	8.3	0.62	3.0	26.96	8.16	6.99	4480	12.130
K 4	6/30/1999	11:51	8.3	0.62	4.0	26.96	8.14	6.95	4500	4.070
K 4	6/30/1999	11:51	8.3	0.62	5.0	26.88	8.13	6.37	4590	.
K 4	6/30/1999	11:51	8.3	0.62	6.0	26.60	8.03	5.77	4650	.
K 4	6/30/1999	11:51	8.3	0.62	7.0	25.93	7.89	4.68	4810	.
K 4	6/30/1999	11:51	8.3	0.62	8.0	25.97	7.82	3.82	4800	.
K 5	6/30/1999	12:21	5.9	0.60	0.0	27.09	8.18	7.00	4340	1581.000
K 5	6/30/1999	12:21	5.9	0.60	1.0	27.11	8.18	7.02	4340	200.600
K 5	6/30/1999	12:21	5.9	0.60	2.0	27.07	8.18	6.92	4350	37.240
K 5	6/30/1999	12:21	5.9	0.60	3.0	27.03	8.17	6.90	4360	8.854
K 5	6/30/1999	12:21	5.9	0.60	4.0	27.01	8.17	6.86	4370	2.064
K 5	6/30/1999	12:21	5.9	0.60	5.0	26.94	8.15	6.45	4390	.
K 5	6/30/1999	12:21	5.9	0.60	5.5	26.35	8.01	4.86	4600	.
K 6	6/30/1999	12:33	3.0	0.44	0.0	27.00	8.17	7.10	4470	2070.000
K 6	6/30/1999	12:33	3.0	0.44	1.0	27.00	8.17	7.00	4470	81.620
K 6	6/30/1999	12:33	3.0	0.44	2.0	26.98	8.17	6.97	4470	10.660
K 6	6/30/1999	12:33	3.0	0.44	3.0	26.96	8.17	6.94	4470	1.484

Lake Kemp Physicochemical Profiles: 14 July 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	7/14/1999	13:27	14.2	1.20	0.0	27.82	8.25	8.25	4740	2416.000
K 1	7/14/1999	13:27	14.2	1.20	1.0	27.80	8.25	8.19	4740	1082.000
K 1	7/14/1999	13:27	14.2	1.20	2.0	27.78	8.25	8.06	4750	328.700
K 1	7/14/1999	13:27	14.2	1.20	3.0	27.75	8.25	8.06	4760	198.900
K 1	7/14/1999	13:27	14.2	1.20	4.0	27.76	8.25	8.06	4750	98.850
K 1	7/14/1999	13:27	14.2	1.20	5.0	27.73	8.24	8.03	4750	36.300
K 1	7/14/1999	13:27	14.2	1.20	6.0	27.63	8.23	7.95	4750	8.159
K 1	7/14/1999	13:27	14.2	1.20	7.0	27.46	8.21	7.77	4760	.
K 1	7/14/1999	13:27	14.2	1.20	8.0	27.42	8.20	7.72	4760	.
K 1	7/14/1999	13:27	14.2	1.20	9.0	27.05	8.05	6.05	4780	.
K 1	7/14/1999	13:27	14.2	1.20	10.0	26.65	7.84	4.86	4800	.
K 1	7/14/1999	13:27	14.2	1.20	11.0	26.29	7.63	3.45	4830	.
K 1	7/14/1999	13:27	14.2	1.20	12.0	26.08	7.50	2.31	4840	.
K 1	7/14/1999	13:27	14.2	1.20	13.0	25.52	7.38	1.06	4890	.
K 1	7/14/1999	13:27	14.2	1.20	14.0	24.85	7.29	0.31	4950	.
K 2	7/14/1999	14:22	14.5	1.12	0.0	28.04	8.23	8.08	4710	1559.000
K 2	7/14/1999	14:22	14.5	1.12	1.0	28.04	8.23	8.02	4710	727.300
K 2	7/14/1999	14:22	14.5	1.12	2.0	28.02	8.23	7.97	4700	366.700
K 2	7/14/1999	14:22	14.5	1.12	3.0	28.00	8.23	7.99	4700	178.800
K 2	7/14/1999	14:22	14.5	1.12	4.0	27.96	8.23	7.94	4710	77.820
K 2	7/14/1999	14:22	14.5	1.12	5.0	27.94	8.23	7.80	4710	43.710
K 2	7/14/1999	14:22	14.5	1.12	6.0	27.86	8.20	7.71	4730	24.540
K 2	7/14/1999	14:22	14.5	1.12	7.0	27.65	8.17	7.45	4740	12.450
K 2	7/14/1999	14:22	14.5	1.12	8.0	27.63	8.17	7.50	4740	.
K 2	7/14/1999	14:22	14.5	1.12	9.0	27.49	8.15	7.25	4750	.
K 2	7/14/1999	14:22	14.5	1.12	10.0	27.32	8.08	6.35	4760	.
K 2	7/14/1999	14:22	14.5	1.12	11.0	26.58	7.86	5.43	4810	.
K 2	7/14/1999	14:22	14.5	1.12	12.0	26.50	7.85	5.25	4800	.
K 2	7/14/1999	14:22	14.5	1.12	13.0	26.33	7.40	1.48	4860	.
K 2	7/14/1999	14:22	14.5	1.12	14.0	25.54	7.29	0.66	4860	.

Lake Kemp Physicochemical Profiles: 14 July 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	7/14/1999	15:00	11.4	0.73	0.0	27.53	8.15	7.65	4660	511.700
K 3	7/14/1999	15:00	11.4	0.73	1.0	27.53	8.15	7.57	4660	125.000
K 3	7/14/1999	15:00	11.4	0.73	2.0	27.51	8.15	7.53	4660	38.620
K 3	7/14/1999	15:00	11.4	0.73	3.0	27.51	8.15	7.48	4670	14.790
K 3	7/14/1999	15:00	11.4	0.73	4.0	27.48	8.15	7.41	4660	6.714
K 3	7/14/1999	15:00	11.4	0.73	5.0	27.42	8.14	7.31	4680	2.737
K 3	7/14/1999	15:00	11.4	0.73	6.0	27.34	8.13	7.20	4670	.
K 3	7/14/1999	15:00	11.4	0.73	7.0	27.30	8.12	7.11	4670	.
K 3	7/14/1999	15:00	11.4	0.73	8.0	27.26	8.11	7.01	4670	.
K 3	7/14/1999	15:00	11.4	0.73	9.0	26.75	7.96	6.98	4680	.
K 3	7/14/1999	15:00	11.4	0.73	10.0	26.63	7.98	6.11	4700	.
K 3	7/14/1999	15:00	11.4	0.73	11.0	26.60	7.86	5.25	4690	.
K 4	7/14/1999	15:34	8.6	0.63	0.0	27.48	8.17	7.75	4680	1973.000
K 4	7/14/1999	15:34	8.6	0.63	1.0	27.46	8.16	7.58	4680	539.500
K 4	7/14/1999	15:34	8.6	0.63	2.0	27.46	8.16	7.54	4680	163.500
K 4	7/14/1999	15:34	8.6	0.63	3.0	27.36	8.15	7.37	4690	64.430
K 4	7/14/1999	15:34	8.6	0.63	4.0	27.26	8.12	7.19	4680	20.790
K 4	7/14/1999	15:34	8.6	0.63	5.0	27.15	8.10	6.92	4680	.
K 4	7/14/1999	15:34	8.6	0.63	6.0	26.65	7.89	5.35	4700	.
K 4	7/14/1999	15:34	8.6	0.63	7.0	26.56	7.76	4.47	4710	.
K 4	7/14/1999	15:34	8.6	0.63	8.0	26.52	7.70	3.99	4710	.
K 5	7/14/1999	16:05	5.8	0.63	0.0	27.36	8.15	7.43	4670	2233.000
K 5	7/14/1999	16:05	5.8	0.63	1.0	27.36	8.15	7.34	4670	450.700
K 5	7/14/1999	16:05	5.8	0.63	2.0	27.34	8.15	7.25	4680	100.400
K 5	7/14/1999	16:05	5.8	0.63	3.0	27.28	8.14	7.13	4680	26.300
K 5	7/14/1999	16:05	5.8	0.63	4.0	27.21	8.12	6.93	4680	7.278
K 5	7/14/1999	16:05	5.8	0.63	5.0	26.79	7.96	5.17	4720	.
K 6	7/14/1999	16:16	3.2	0.32	0.0	27.38	8.15	7.53	4670	771.600
K 6	7/14/1999	16:16	3.2	0.32	1.0	27.36	8.14	7.33	4670	94.530
K 6	7/14/1999	16:16	3.2	0.32	2.0	27.36	8.14	7.24	4680	15.230
K 6	7/14/1999	16:16	3.2	0.32	3.0	27.26	8.14	7.12	4680	1.672

Lake Kemp Physicochemical Profiles: 31 July 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	7/31/1999	11:00	14.4	1.40	0.0	27.28	8.01	7.06	4920	.
K 1	7/31/1999	11:00	14.4	1.40	1.0	27.26	8.03	6.91	4910	.
K 1	7/31/1999	11:00	14.4	1.40	2.0	27.24	8.04	6.84	4920	.
K 1	7/31/1999	11:00	14.4	1.40	3.0	27.21	8.04	6.83	4910	.
K 1	7/31/1999	11:00	14.4	1.40	4.0	27.19	8.05	6.78	4920	.
K 1	7/31/1999	11:00	14.4	1.40	5.0	27.17	8.04	6.80	4920	.
K 1	7/31/1999	11:00	14.4	1.40	6.0	27.15	8.04	6.79	4920	.
K 1	7/31/1999	11:00	14.4	1.40	7.0	27.15	8.04	6.74	4920	.
K 1	7/31/1999	11:00	14.4	1.40	8.0	27.13	8.04	6.71	4930	.
K 1	7/31/1999	11:00	14.4	1.40	9.0	27.13	8.03	6.69	4920	.
K 1	7/31/1999	11:00	14.4	1.40	10.0	27.09	8.02	6.62	4930	.
K 1	7/31/1999	11:00	14.4	1.40	11.0	26.75	7.78	3.92	4940	.
K 1	7/31/1999	11:00	14.4	1.40	12.0	26.25	7.35	1.40	4940	.
K 1	7/31/1999	11:00	14.4	1.40	13.0	25.99	7.22	0.29	4930	.
K 1	7/31/1999	11:00	14.4	1.40	14.0	25.71	7.18	0.18	4960	.
K 2	7/31/1999	11:45	13.7	1.06	0.0	28.39	8.09	7.14	4900	.
K 2	7/31/1999	11:45	13.7	1.06	1.0	28.33	8.10	7.08	4910	.
K 2	7/31/1999	11:45	13.7	1.06	2.0	28.25	8.10	7.01	4920	.
K 2	7/31/1999	11:45	13.7	1.06	3.0	28.17	8.08	6.92	4920	.
K 2	7/31/1999	11:45	13.7	1.06	4.0	28.13	8.07	6.77	4930	.
K 2	7/31/1999	11:45	13.7	1.06	5.0	28.00	8.05	6.60	4920	.
K 2	7/31/1999	11:45	13.7	1.06	6.0	27.76	8.03	6.47	4920	.
K 2	7/31/1999	11:45	13.7	1.06	7.0	27.46	8.07	6.79	4920	.
K 2	7/31/1999	11:45	13.7	1.06	8.0	27.32	8.06	6.73	4930	.
K 2	7/31/1999	11:45	13.7	1.06	9.0	27.15	8.00	6.37	4920	.
K 2	7/31/1999	11:45	13.7	1.06	10.0	27.01	7.87	5.38	4920	.
K 2	7/31/1999	11:45	13.7	1.06	11.0	26.48	7.44	2.08	4920	.
K 2	7/31/1999	11:45	13.7	1.06	12.0	26.08	7.27	0.52	4930	.
K 2	7/31/1999	11:45	13.7	1.06	13.0	25.73	7.20	0.21	4950	.
K 2	7/31/1999	11:45	13.7	1.06	13.5	25.32	7.14	0.17	4970	.

Lake Kemp Physicochemical Profiles: 31 July 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	7/31/1999	12:18	10.6	1.03	0.0	28.58	8.07	7.07	4930	.
K 3	7/31/1999	12:18	10.6	1.03	1.0	28.37	8.08	7.05	4950	.
K 3	7/31/1999	12:18	10.6	1.03	2.0	28.21	8.06	6.84	4950	.
K 3	7/31/1999	12:18	10.6	1.03	3.0	28.11	8.05	6.74	4950	.
K 3	7/31/1999	12:18	10.6	1.03	4.0	28.04	8.04	6.58	4950	.
K 3	7/31/1999	12:18	10.6	1.03	5.0	27.92	8.00	6.26	4950	.
K 3	7/31/1999	12:18	10.6	1.03	6.0	27.88	8.01	6.34	4950	.
K 3	7/31/1999	12:18	10.6	1.03	7.0	27.84	8.02	6.44	4960	.
K 3	7/31/1999	12:18	10.6	1.03	8.0	27.67	7.98	6.23	4970	.
K 3	7/31/1999	12:18	10.6	1.03	9.0	27.55	8.01	6.37	4960	.
K 3	7/31/1999	12:18	10.6	1.03	10.0	27.46	7.96	5.85	4970	.
K 3	7/31/1999	12:18	10.6	1.03	10.5	27.07	7.69	3.65	4950	.
K 4	7/31/1999	12:43	8.0	0.65	0.0	27.94	7.96	6.35	4960	.
K 4	7/31/1999	12:43	8.0	0.65	1.0	27.78	7.96	6.25	4970	.
K 4	7/31/1999	12:43	8.0	0.65	2.0	27.51	7.97	6.25	4980	.
K 4	7/31/1999	12:43	8.0	0.65	3.0	27.38	7.97	6.24	5000	.
K 4	7/31/1999	12:43	8.0	0.65	4.0	27.30	7.96	6.16	5000	.
K 4	7/31/1999	12:43	8.0	0.65	5.0	27.28	7.95	6.06	5000	.
K 4	7/31/1999	12:43	8.0	0.65	6.0	27.05	7.89	5.65	4980	.
K 4	7/31/1999	12:43	8.0	0.65	7.0	26.94	7.89	5.76	4970	.
K 4	7/31/1999	12:43	8.0	0.65	7.5	26.65	7.90	5.66	4990	.
K 5	7/31/1999	13:14	5.0	0.75	0.0	28.06	8.03	6.80	5050	.
K 5	7/31/1999	13:14	5.0	0.75	1.0	27.80	8.03	6.85	5060	.
K 5	7/31/1999	13:14	5.0	0.75	2.0	27.44	8.04	6.86	5100	.
K 5	7/31/1999	13:14	5.0	0.75	3.0	27.11	8.00	6.60	5070	.
K 5	7/31/1999	13:14	5.0	0.75	4.0	26.96	7.97	6.45	5060	.
K 5	7/31/1999	13:14	5.0	0.75	5.0	26.86	7.95	6.30	5050	.
K 6	7/31/1999	13:25	2.3	0.34	0.0	28.21	8.02	7.06	5050	.
K 6	7/31/1999	13:25	2.3	0.34	1.0	27.40	8.00	6.64	5070	.
K 6	7/31/1999	13:25	2.3	0.34	2.0	26.96	7.90	5.70	5060	.

Lake Kemp Physicochemical Profiles: 22 August 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	8/22/1999	9:55	15.2	1.36	0.0	27.53	7.91	6.46	4970	1284.000
K 1	8/22/1999	9:55	15.2	1.36	1.0	27.44	7.93	6.40	4800	409.600
K 1	8/22/1999	9:55	15.2	1.36	2.0	27.44	7.93	6.27	4800	188.900
K 1	8/22/1999	9:55	15.2	1.36	3.0	27.42	7.91	6.04	4790	85.980
K 1	8/22/1999	9:55	15.2	1.36	4.0	27.40	7.87	5.79	4790	32.900
K 1	8/22/1999	9:55	15.2	1.36	5.0	27.38	7.86	5.69	4790	16.600
K 1	8/22/1999	9:55	15.2	1.36	6.0	27.38	7.85	5.62	4790	8.764
K 1	8/22/1999	9:55	15.2	1.36	7.0	27.38	7.85	5.65	4790	.
K 1	8/22/1999	9:55	15.2	1.36	8.0	27.36	7.84	5.57	4790	.
K 1	8/22/1999	9:55	15.2	1.36	9.0	27.30	7.79	5.16	4780	.
K 1	8/22/1999	9:55	15.2	1.36	10.0	27.11	7.40	2.23	4760	.
K 1	8/22/1999	9:55	15.2	1.36	11.0	27.01	7.27	1.27	4760	.
K 1	8/22/1999	9:55	15.2	1.36	12.0	26.86	7.19	0.30	4750	.
K 1	8/22/1999	9:55	15.2	1.36	13.0	26.50	7.14	0.17	4760	.
K 1	8/22/1999	9:55	15.2	1.36	14.0	25.78	7.01	0.15	4740	.
K 1	8/22/1999	9:55	15.2	1.36	15.0	25.48	7.01	0.14	4760	.
K 2	8/22/1999	10:30	13.0	1.16	0.0	27.90	8.08	7.73	4810	1344.000
K 2	8/22/1999	10:30	13.0	1.16	1.0	27.80	8.09	7.52	4810	518.800
K 2	8/22/1999	10:30	13.0	1.16	2.0	27.76	8.08	7.37	4820	220.500
K 2	8/22/1999	10:30	13.0	1.16	3.0	27.75	8.07	7.25	4820	92.670
K 2	8/22/1999	10:30	13.0	1.16	4.0	27.71	8.06	7.13	4820	45.310
K 2	8/22/1999	10:30	13.0	1.16	5.0	27.67	8.05	7.06	4820	22.770
K 2	8/22/1999	10:30	13.0	1.16	6.0	27.65	8.02	6.83	4830	10.750
K 2	8/22/1999	10:30	13.0	1.16	7.0	27.63	7.96	6.42	4820	.
K 2	8/22/1999	10:30	13.0	1.16	8.0	27.61	7.90	6.02	4820	.
K 2	8/22/1999	10:30	13.0	1.16	9.0	27.49	7.70	4.05	4800	.
K 2	8/22/1999	10:30	13.0	1.16	10.0	27.28	7.48	2.85	4800	.
K 2	8/22/1999	10:30	13.0	1.16	11.0	27.09	7.34	1.65	4790	.
K 2	8/22/1999	10:30	13.0	1.16	12.0	26.73	7.26	0.82	4780	.
K 2	8/22/1999	10:30	13.0	1.16	13.0	26.37	7.14	0.19	4780	.

Lake Kemp Physicochemical Profiles: 22 August 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	8/22/1999	10:52	10.4	0.88	0.0	28.76	8.10	7.49	4850	1837.000
K 3	8/22/1999	10:52	10.4	0.88	1.0	28.29	8.09	7.36	4840	601.200
K 3	8/22/1999	10:52	10.4	0.88	2.0	28.23	8.08	7.27	4840	196.300
K 3	8/22/1999	10:52	10.4	0.88	3.0	28.17	8.07	7.09	4850	70.560
K 3	8/22/1999	10:52	10.4	0.88	4.0	28.15	8.05	6.98	4840	30.100
K 3	8/22/1999	10:52	10.4	0.88	5.0	28.13	8.03	6.84	4840	12.870
K 3	8/22/1999	10:52	10.4	0.88	6.0	28.11	8.01	6.64	4850	.
K 3	8/22/1999	10:52	10.4	0.88	7.0	28.11	8.01	6.63	4850	.
K 3	8/22/1999	10:52	10.4	0.88	8.0	28.04	7.93	5.88	4850	.
K 3	8/22/1999	10:52	10.4	0.88	9.0	27.73	7.71	3.94	4870	.
K 3	8/22/1999	10:52	10.4	0.88	10.0	27.51	7.60	3.14	4870	.
K 4	8/22/1999	11:15	7.4	0.73	0.0	28.25	8.08	7.25	4890	1707.000
K 4	8/22/1999	11:15	7.4	0.73	1.0	28.19	8.08	7.19	4900	550.500
K 4	8/22/1999	11:15	7.4	0.73	2.0	28.04	8.08	7.15	4900	156.300
K 4	8/22/1999	11:15	7.4	0.73	3.0	27.92	8.05	6.93	4900	51.010
K 4	8/22/1999	11:15	7.4	0.73	4.0	27.88	8.03	6.76	4910	17.000
K 4	8/22/1999	11:15	7.4	0.73	5.0	27.84	8.03	6.73	4910	5.646
K 4	8/22/1999	11:15	7.4	0.73	6.0	27.82	8.03	6.72	4910	.
K 4	8/22/1999	11:15	7.4	0.73	7.0	27.69	8.03	6.65	4940	.
K 5	8/22/1999	11:35	4.7	0.71	0.0	28.36	8.11	7.44	4960	2071.000
K 5	8/22/1999	11:35	4.7	0.71	1.0	28.35	8.12	7.38	4960	376.200
K 5	8/22/1999	11:35	4.7	0.71	2.0	28.13	8.10	7.30	4970	90.600
K 5	8/22/1999	11:35	4.7	0.71	3.0	28.02	8.08	7.06	4970	23.000
K 5	8/22/1999	11:35	4.7	0.71	4.0	27.82	8.08	7.00	4980	8.134
K 5	8/22/1999	11:35	4.7	0.71	4.5	27.24	8.03	6.42	5050	.
K 6	8/22/1999	11:45	2.1	0.26	0.0	28.04	8.06	7.05	4970	1542.000
K 6	8/22/1999	11:45	2.1	0.26	1.0	27.69	8.05	6.70	4990	147.200
K 6	8/22/1999	11:45	2.1	0.26	2.0	27.53	8.01	6.59	4980	4.602

Lake Kemp Physicochemical Profiles: 26 September 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	9/26/1999	10:15	11.3	1.08	0.0	22.47	8.12	7.43	4940	1471.000
K 1	9/26/1999	10:15	11.3	1.08	1.0	22.47	8.12	7.35	4950	396.500
K 1	9/26/1999	10:15	11.3	1.08	2.0	22.45	8.12	7.31	4950	124.300
K 1	9/26/1999	10:15	11.3	1.08	3.0	22.41	8.11	7.21	4950	48.130
K 1	9/26/1999	10:15	11.3	1.08	4.0	22.42	8.11	7.18	4940	14.730
K 1	9/26/1999	10:15	11.3	1.08	5.0	22.39	8.10	7.11	4940	6.572
K 1	9/26/1999	10:15	11.3	1.08	6.0	22.38	8.10	7.10	4940	2.526
K 1	9/26/1999	10:15	11.3	1.08	7.0	22.36	8.09	7.02	4950	0.399
K 1	9/26/1999	10:15	11.3	1.08	8.0	22.31	8.07	6.81	4950	.
K 1	9/26/1999	10:15	11.3	1.08	9.0	22.22	8.05	6.53	4960	.
K 1	9/26/1999	10:15	11.3	1.08	10.0	22.15	8.06	6.50	4960	.
K 1	9/26/1999	10:15	11.3	1.08	11.0	22.15	8.06	6.46	4960	.
K 2	9/26/1999	10:55	12.1	1.16	0.0	22.25	8.15	7.86	4940	1449.000
K 2	9/26/1999	10:55	12.1	1.16	1.0	22.47	8.15	7.67	4950	515.600
K 2	9/26/1999	10:55	12.1	1.16	2.0	22.45	8.15	7.57	4950	152.100
K 2	9/26/1999	10:55	12.1	1.16	3.0	22.43	8.15	7.53	4950	53.860
K 2	9/26/1999	10:55	12.1	1.16	4.0	22.37	8.14	7.42	4950	26.240
K 2	9/26/1999	10:55	12.1	1.16	5.0	22.36	8.13	7.35	4960	17.160
K 2	9/26/1999	10:55	12.1	1.16	6.0	22.31	8.12	7.28	4950	7.677
K 2	9/26/1999	10:55	12.1	1.16	7.0	22.26	8.11	7.04	4960	1.435
K 2	9/26/1999	10:55	12.1	1.16	8.0	22.21	8.10	6.87	4970	0.614
K 2	9/26/1999	10:55	12.1	1.16	9.0	22.17	8.09	6.69	4960	1.911
K 2	9/26/1999	10:55	12.1	1.16	10.0	22.06	8.08	6.56	4960	.
K 2	9/26/1999	10:55	12.1	1.16	11.0	21.93	8.07	6.44	4980	.

Lake Kemp Physicochemical Profiles: 26 September 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	9/26/1999	11:04	8.9	0.67	0.0	22.60	8.20	8.26	4970	1627.000
K 3	9/26/1999	11:04	8.9	0.67	1.0	22.55	8.20	8.17	4970	608.800
K 3	9/26/1999	11:04	8.9	0.67	2.0	22.54	8.20	8.14	4970	190.500
K 3	9/26/1999	11:04	8.9	0.67	3.0	22.50	8.20	8.09	4970	70.020
K 3	9/26/1999	11:04	8.9	0.67	4.0	22.51	8.20	8.05	4970	29.850
K 3	9/26/1999	11:04	8.9	0.67	5.0	22.45	8.20	8.03	4970	12.970
K 3	9/26/1999	11:04	8.9	0.67	6.0	22.17	8.15	7.57	4980	5.335
K 3	9/26/1999	11:04	8.9	0.67	7.0	21.85	8.10	7.16	4990	1.366
K 3	9/26/1999	11:04	8.9	0.67	8.0	21.72	8.08	7.07	5010	0.353
K 3	9/26/1999	11:04	8.9	0.67	8.5	21.68	8.08	7.03	5010	.
K 4	9/26/1999	12:05	6.6	0.66	0.0	22.28	8.20	8.70	5010	1674.000
K 4	9/26/1999	12:05	6.6	0.66	1.0	22.23	8.20	8.36	5010	462.400
K 4	9/26/1999	12:05	6.6	0.66	2.0	22.10	8.19	8.16	5010	160.300
K 4	9/26/1999	12:05	6.6	0.66	3.0	21.97	8.18	7.99	5000	57.120
K 4	9/26/1999	12:05	6.6	0.66	4.0	21.70	8.14	7.65	5010	19.950
K 4	9/26/1999	12:05	6.6	0.66	5.0	21.37	8.13	7.51	5030	6.219
K 4	9/26/1999	12:05	6.6	0.66	6.0	21.05	8.08	7.09	5090	1.343
K 5	9/26/1999	12:40	3.7	0.54	0.0	22.13	8.20	8.12	5060	1341.000
K 5	9/26/1999	12:40	3.7	0.54	1.0	22.08	8.20	8.11	5060	386.200
K 5	9/26/1999	12:40	3.7	0.54	2.0	21.90	8.19	8.06	5070	79.470
K 5	9/26/1999	12:40	3.7	0.54	3.0	21.46	8.15	7.72	5080	13.980
K 5	9/26/1999	12:40	3.7	0.54	3.5	21.41	8.14	7.53	5080	2.972
K 6	9/26/1999	13:00	1.1	0.32	0.0	22.10	8.15	7.81	5070	1492.000
K 6	9/26/1999	13:00	1.1	0.32	1.0	21.97	8.15	7.72	5070	46.610

Lake Kemp Physicochemical Profiles: 27 October 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	10/27/1999	13:45	13.0	0.91	0.0	17.14	7.92	10.04	5050	1474.000
K 1	10/27/1999	13:45	13.0	0.91	1.0	17.14	7.91	8.55	5050	376.600
K 1	10/27/1999	13:45	13.0	0.91	2.0	17.16	7.92	8.34	5050	121.200
K 1	10/27/1999	13:45	13.0	0.91	3.0	17.14	7.92	8.22	5050	53.600
K 1	10/27/1999	13:45	13.0	0.91	4.0	17.14	7.93	8.22	5060	22.040
K 1	10/27/1999	13:45	13.0	0.91	5.0	17.14	7.93	8.20	5060	9.772
K 1	10/27/1999	13:45	13.0	0.91	6.0	17.14	7.98	8.18	5060	4.544
K 1	10/27/1999	13:45	13.0	0.91	7.0	17.14	7.93	8.15	5060	1.688
K 1	10/27/1999	13:45	13.0	0.91	8.0	17.14	7.93	8.10	5050	0.905
K 1	10/27/1999	13:45	13.0	0.91	9.0	17.14	7.93	8.08	5060	0.514
K 1	10/27/1999	13:45	13.0	0.91	10.0	17.14	7.93	8.05	5070	0.130
K 1	10/27/1999	13:45	13.0	0.91	11.0	17.12	7.92	8.00	5060	0.030
K 1	10/27/1999	13:45	13.0	0.91	12.0	17.07	7.89	7.80	5060	.
K 2	10/27/1999	14:31	12.1	0.85	0.0	17.51	8.02	9.18	5020	803.400
K 2	10/27/1999	14:31	12.1	0.85	1.0	17.51	8.02	8.70	5050	281.400
K 2	10/27/1999	14:31	12.1	0.85	2.0	17.51	8.02	8.64	5050	169.400
K 2	10/27/1999	14:31	12.1	0.85	3.0	17.51	8.02	8.61	5050	62.560
K 2	10/27/1999	14:31	12.1	0.85	4.0	17.51	8.02	8.60	5060	22.630
K 2	10/27/1999	14:31	12.1	0.85	5.0	17.51	8.02	8.57	5050	9.506
K 2	10/27/1999	14:31	12.1	0.85	6.0	17.48	8.00	8.51	5050	4.287
K 2	10/27/1999	14:31	12.1	0.85	7.0	17.48	8.02	8.51	5060	1.497
K 2	10/27/1999	14:31	12.1	0.85	8.0	17.45	8.01	8.50	5070	0.859
K 2	10/27/1999	14:31	12.1	0.85	9.0	17.40	8.01	8.49	5070	.
K 2	10/27/1999	14:31	12.1	0.85	10.0	17.34	8.01	8.45	5070	.
K 2	10/27/1999	14:31	12.1	0.85	11.0	17.26	8.00	8.44	5060	.
K 2	10/27/1999	14:31	12.1	0.85	11.5	17.23	8.00	8.38	5070	.

Lake Kemp Physicochemical Profiles: 27 October 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	10/27/1999	15:02	7.1	0.54	0.0	17.23	8.00	8.82	5060	869.500
K 3	10/27/1999	15:02	7.1	0.54	1.0	17.23	8.01	8.76	5080	162.400
K 3	10/27/1999	15:02	7.1	0.54	2.0	17.23	8.02	8.73	5080	43.670
K 3	10/27/1999	15:02	7.1	0.54	3.0	17.23	8.02	8.69	5080	14.670
K 3	10/27/1999	15:02	7.1	0.54	4.0	17.23	8.02	8.68	5080	4.076
K 3	10/27/1999	15:02	7.1	0.54	5.0	17.23	8.02	8.60	5070	2.556
K 3	10/27/1999	15:02	7.1	0.54	6.0	17.19	8.01	8.64	5080	1.389
K 3	10/27/1999	15:02	7.1	0.54	7.0	17.19	8.01	8.55	5080	0.069
K 4	10/27/1999	15:26	6.6	0.47	0.0	16.94	8.01	8.74	5110	1150.000
K 4	10/27/1999	15:26	6.6	0.47	1.0	16.92	8.01	8.65	5110	144.700
K 4	10/27/1999	15:26	6.6	0.47	2.0	16.94	8.01	8.59	5100	29.630
K 4	10/27/1999	15:26	6.6	0.47	3.0	16.92	8.01	8.55	5110	7.217
K 4	10/27/1999	15:26	6.6	0.47	4.0	16.92	8.01	8.53	5110	1.212
K 4	10/27/1999	15:26	6.6	0.47	5.0	16.90	8.01	8.50	5110	0.253
K 4	10/27/1999	15:26	6.6	0.47	6.0	16.90	8.01	8.48	5110	.
K 5	10/27/1999	16:20	2.9	0.51	0.0	17.06	8.04	8.63	5180	.
K 5	10/27/1999	16:20	2.9	0.51	1.0	17.04	8.04	8.62	5190	.
K 5	10/27/1999	16:20	2.9	0.51	2.0	17.04	8.04	8.59	5200	.
K 5	10/27/1999	16:20	2.9	0.51	2.5	17.02	8.04	8.58	5180	.
K 6	10/27/1999	15:49	0.7	0.23	0.0	16.89	8.03	8.87	5160	1227.700
K 6	10/27/1999	15:49	0.7	0.23	0.5	16.89	8.04	8.75	5180	182.100

Lake Kemp Physicochemical Profiles: 17 November 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	11/17/1999	13:40	12.5	1.24	0.0	16.77	8.15	9.24	5340	1114.000
K 1	11/17/1999	13:40	12.5	1.24	1.0	16.77	8.16	9.24	5350	437.500
K 1	11/17/1999	13:40	12.5	1.24	2.0	16.75	8.16	9.23	5360	173.500
K 1	11/17/1999	13:40	12.5	1.24	3.0	16.75	8.16	9.22	5350	77.670
K 1	11/17/1999	13:40	12.5	1.24	4.0	16.74	8.16	9.23	5360	33.460
K 1	11/17/1999	13:40	12.5	1.24	5.0	16.75	8.17	9.20	5370	17.040
K 1	11/17/1999	13:40	12.5	1.24	6.0	16.74	8.17	9.17	5370	8.698
K 1	11/17/1999	13:40	12.5	1.24	7.0	16.74	8.17	9.18	5410	4.505
K 1	11/17/1999	13:40	12.5	1.24	8.0	16.74	8.17	9.16	5410	2.510
K 1	11/17/1999	13:40	12.5	1.24	9.0	16.74	8.17	9.10	5410	1.328
K 1	11/17/1999	13:40	12.5	1.24	10.0	16.74	8.17	9.13	5410	0.883
K 1	11/17/1999	13:40	12.5	1.24	11.0	16.72	8.17	9.08	5420	.
K 1	11/17/1999	13:40	12.5	1.24	12.0	16.70	8.16	9.07	5420	.
K 1	11/17/1999	13:40	12.5	1.24	12.5	15.91	7.91	7.36	5410	.
K 2	11/17/1999	14:25	11.2	1.06	0.0	16.90	8.15	9.22	5420	984.700
K 2	11/17/1999	14:25	11.2	1.06	1.0	16.90	8.16	9.17	5420	231.700
K 2	11/17/1999	14:25	11.2	1.06	2.0	16.90	8.16	9.13	5420	100.200
K 2	11/17/1999	14:25	11.2	1.06	3.0	16.90	8.16	9.04	5410	29.120
K 2	11/17/1999	14:25	11.2	1.06	4.0	16.90	8.16	9.03	5410	13.320
K 2	11/17/1999	14:25	11.2	1.06	5.0	16.89	8.16	9.02	5410	6.279
K 2	11/17/1999	14:25	11.2	1.06	6.0	16.89	8.16	8.94	5420	2.840
K 2	11/17/1999	14:25	11.2	1.06	7.0	16.84	8.14	8.86	5420	1.274
K 2	11/17/1999	14:25	11.2	1.06	8.0	16.79	8.13	8.75	5410	0.982
K 2	11/17/1999	14:25	11.2	1.06	9.0	16.74	8.12	8.62	5420	0.883
K 2	11/17/1999	14:25	11.2	1.06	10.0	16.72	8.13	8.58	5420	.
K 2	11/17/1999	14:25	11.2	1.06	11.0	15.96	7.94	7.38	5430	.

Lake Kemp Physicochemical Profiles: 17 November 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	11/17/1999	14:55	8.5	0.67	0.0	16.79	8.16	9.15	5430	901.100
K 3	11/17/1999	14:55	8.5	0.67	1.0	16.77	8.16	9.12	5420	193.400
K 3	11/17/1999	14:55	8.5	0.67	2.0	16.77	8.16	9.04	5440	53.420
K 3	11/17/1999	14:55	8.5	0.67	3.0	16.77	8.16	9.02	5450	16.150
K 3	11/17/1999	14:55	8.5	0.67	4.0	16.77	8.16	9.01	5420	5.665
K 3	11/17/1999	14:55	8.5	0.67	5.0	16.77	8.16	9.00	5430	2.064
K 3	11/17/1999	14:55	8.5	0.67	6.0	16.75	8.17	8.96	5420	0.778
K 3	11/17/1999	14:55	8.5	0.67	7.0	16.70	8.14	8.95	5430	0.107
K 3	11/17/1999	14:55	8.5	0.67	8.0	16.31	8.00	8.26	5440	0.003
K 4	11/17/1999	15:20	0.5	0.52	0.0	16.72	8.14	8.75	5510	911.100
K 4	11/17/1999	15:20	0.5	0.52	1.0	16.72	8.14	8.75	5500	76.830
K 4	11/17/1999	15:20	0.5	0.52	2.0	16.72	8.13	8.71	5500	15.330
K 4	11/17/1999	15:20	0.5	0.52	3.0	16.70	8.12	8.66	5520	3.975
K 4	11/17/1999	15:20	0.5	0.52	4.0	16.68	8.12	8.60	5520	0.667
K 4	11/17/1999	15:20	0.5	0.52	5.0	16.68	8.12	8.56	5510	0.035
K 5	11/17/1999	15:50	2.5	0.34	0.0	16.90	8.16	8.90	5560	512.700
K 5	11/17/1999	15:50	2.5	0.34	1.0	16.89	8.16	8.84	5540	42.230
K 5	11/17/1999	15:50	2.5	0.34	2.0	16.87	8.15	8.76	5560	4.606
K 6	11/17/1999	16:05	1.5	0.26	0.0	17.04	8.19	9.12	5570	496.100
K 6	11/17/1999	16:05	1.5	0.26	1.0	17.06	8.19	9.01	5580	51.820

Lake Kemp Physicochemical Profiles: 20 December 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	12/20/1999	10:30	13.3	0.89	0.0	8.64	8.02	11.13	4960	593.600
K 1	12/20/1999	10:30	13.3	0.89	1.0	8.66	8.07	11.13	4970	115.600
K 1	12/20/1999	10:30	13.3	0.89	2.0	8.62	8.08	11.02	4970	43.370
K 1	12/20/1999	10:30	13.3	0.89	3.0	8.64	8.09	10.96	4960	16.960
K 1	12/20/1999	10:30	13.3	0.89	4.0	8.61	8.09	10.98	4960	8.116
K 1	12/20/1999	10:30	13.3	0.89	5.0	8.58	8.09	10.92	4960	3.322
K 1	12/20/1999	10:30	13.3	0.89	6.0	8.51	8.10	10.80	4970	1.427
K 1	12/20/1999	10:30	13.3	0.89	7.0	8.46	8.10	10.88	4970	0.667
K 1	12/20/1999	10:30	13.3	0.89	8.0	8.43	8.10	10.86	4970	.
K 1	12/20/1999	10:30	13.3	0.89	9.0	8.39	8.10	10.85	4970	.
K 1	12/20/1999	10:30	13.3	0.89	10.0	8.38	8.10	10.85	4970	.
K 1	12/20/1999	10:30	13.3	0.89	11.0	8.30	8.11	10.89	4970	.
K 1	12/20/1999	10:30	13.3	0.89	12.0	8.26	8.10	10.89	4980	.
K 1	12/20/1999	10:30	13.3	0.89	13.0	8.25	8.10	10.89	4970	.
K 2	12/20/1999	11:06	11.5	0.93	0.0	8.49	8.11	11.36	4950	609.200
K 2	12/20/1999	11:06	11.5	0.93	1.0	8.49	8.11	11.30	4960	128.600
K 2	12/20/1999	11:06	11.5	0.93	2.0	8.49	8.12	11.25	4960	30.090
K 2	12/20/1999	11:06	11.5	0.93	3.0	8.48	8.12	11.25	4960	12.770
K 2	12/20/1999	11:06	11.5	0.93	4.0	8.48	8.12	11.20	4960	5.056
K 2	12/20/1999	11:06	11.5	0.93	5.0	8.48	8.13	11.20	4960	2.531
K 2	12/20/1999	11:06	11.5	0.93	6.0	8.46	8.13	11.17	4960	0.019
K 2	12/20/1999	11:06	11.5	0.93	7.0	8.38	8.13	11.14	4960	.
K 2	12/20/1999	11:06	11.5	0.93	8.0	8.33	8.13	11.13	4970	.
K 2	12/20/1999	11:06	11.5	0.93	9.0	8.28	8.13	11.09	4970	.
K 2	12/20/1999	11:06	11.5	0.93	10.0	8.23	8.13	11.12	4970	.
K 2	12/20/1999	11:06	11.5	0.93	11.0	8.23	8.13	11.12	4970	.

Lake Kemp Physicochemical Profiles: 20 December 1999

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	12/20/1999	11:48	6.8	0.67	0.0	7.70	8.13	11.72	4980	405.800
K 3	12/20/1999	11:48	6.8	0.67	1.0	7.70	8.13	11.63	5000	43073.000
K 3	12/20/1999	11:48	6.8	0.67	2.0	7.70	8.13	11.56	4990	17.920
K 3	12/20/1999	11:48	6.8	0.67	3.0	7.70	8.13	11.52	5000	2.980
K 3	12/20/1999	11:48	6.8	0.67	4.0	7.70	8.13	11.50	5000	1.012
K 3	12/20/1999	11:48	6.8	0.67	5.0	7.70	8.13	11.50	5010	0.222
K 3	12/20/1999	11:48	6.8	0.67	6.0	7.70	8.13	11.47	5000	.
K 4	12/20/1999	12:21	5.2	0.36	0.0	6.96	7.99	12.16	5060	236.700
K 4	12/20/1999	12:21	5.2	0.36	1.0	6.96	7.99	12.07	5070	12.740
K 4	12/20/1999	12:21	5.2	0.36	2.0	6.96	7.99	12.02	5080	1.519
K 4	12/20/1999	12:21	5.2	0.36	3.0	6.96	8.04	12.01	5080	0.306
K 4	12/20/1999	12:21	5.2	0.36	4.0	6.96	8.04	11.97	5080	.
K 4	12/20/1999	12:21	5.2	0.36	5.0	6.95	8.06	11.94	5080	.
K 5	12/20/1999	13:00	3.1	0.31	0.0	6.43	7.95	12.43	5200	176.700
K 5	12/20/1999	13:00	3.1	0.31	1.0	6.43	8.03	12.33	5200	7.904
K 5	12/20/1999	13:00	3.1	0.31	2.0	6.43	8.04	12.26	5190	0.498
K 5	12/20/1999	13:00	3.1	0.31	3.0	6.43	8.05	12.22	5240	0.098
K 6	12/20/1999	13:25	0.3	0.2	0.0	6.47	7.68	12.67	5050	104.900
K 6	12/20/1999	13:25	0.3	0.2	0.3	6.47	7.76	12.62	5140	0.962

Lake Kemp Physicochemical Profiles: 1 January 2000

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 1	1/20/2000	11:20	12.5	0.97	0.0	8.59	7.96	10.82	5300	1132.000
K 1	1/20/2000	11:20	12.5	0.97	1.0	8.56	7.99	10.70	5310	359.500
K 1	1/20/2000	11:20	12.5	0.97	2.0	8.54	8.01	10.66	5310	126.600
K 1	1/20/2000	11:20	12.5	0.97	3.0	8.53	8.02	10.67	5320	47.020
K 1	1/20/2000	11:20	12.5	0.97	4.0	8.51	8.03	10.64	5320	16.540
K 1	1/20/2000	11:20	12.5	0.97	5.0	8.49	8.03	10.55	5320	7.611
K 1	1/20/2000	11:20	12.5	0.97	6.0	8.48	8.04	10.55	5330	3.299
K 1	1/20/2000	11:20	12.5	0.97	7.0	8.48	8.04	10.56	5330	1.288
K 1	1/20/2000	11:20	12.5	0.97	8.0	8.46	8.04	10.53	5330	0.333
K 1	1/20/2000	11:20	12.5	0.97	9.0	8.46	8.05	10.50	5330	.
K 1	1/20/2000	11:20	12.5	0.97	10.0	8.46	8.05	10.50	5330	.
K 1	1/20/2000	11:20	12.5	0.97	11.0	8.41	8.04	10.43	5330	.
K 1	1/20/2000	11:20	12.5	0.97	12.0	8.23	8.00	10.08	5330	.
K 1	1/20/2000	11:20	12.5	0.97	12.5	8.21	7.98	9.52	5330	.
K 2	1/20/2000	11:50	11.7	0.77	0.0	8.64	8.04	10.62	5330	1254.000
K 2	1/20/2000	11:50	11.7	0.77	1.0	8.54	8.05	10.56	5320	430.300
K 2	1/20/2000	11:50	11.7	0.77	2.0	8.51	8.06	10.52	5340	161.000
K 2	1/20/2000	11:50	11.7	0.77	3.0	8.49	8.06	10.49	5330	23.970
K 2	1/20/2000	11:50	11.7	0.77	4.0	8.48	8.06	10.50	5330	6.659
K 2	1/20/2000	11:50	11.7	0.77	5.0	8.48	8.06	10.46	5330	2.452
K 2	1/20/2000	11:50	11.7	0.77	6.0	8.48	8.07	10.44	5340	0.928
K 2	1/20/2000	11:50	11.7	0.77	7.0	8.46	8.07	10.39	5350	0.230
K 2	1/20/2000	11:50	11.7	0.77	8.0	8.43	8.11	10.40	5350	.
K 2	1/20/2000	11:50	11.7	0.77	9.0	8.41	8.11	10.37	5340	.
K 2	1/20/2000	11:50	11.7	0.77	10.0	8.39	8.10	10.33	5350	.
K 2	1/20/2000	11:50	11.7	0.77	11.0	8.43	8.10	10.25	5350	.
K 2	1/20/2000	11:50	11.7	0.77	11.5	8.44	8.10	10.20	3540	.

Lake Kemp Physicochemical Profiles: 1 January 2000

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K 3	1/20/2000	12:30	8.6	0.58	0.0	8.95	8.12	10.89	5360	1285.000
K 3	1/20/2000	12:30	8.6	0.58	1.0	8.94	8.13	10.82	5370	102.600
K 3	1/20/2000	12:30	8.6	0.58	2.0	8.87	8.13	10.77	5380	52.980
K 3	1/20/2000	12:30	8.6	0.58	3.0	8.81	8.13	10.61	5390	15.140
K 3	1/20/2000	12:30	8.6	0.58	4.0	8.79	8.13	10.62	5390	6.780
K 3	1/20/2000	12:30	8.6	0.58	5.0	8.79	8.13	10.63	5380	2.985
K 3	1/20/2000	12:30	8.6	0.58	6.0	8.81	8.13	10.56	5390	0.898
K 3	1/20/2000	12:30	8.6	0.58	7.0	8.81	8.13	10.55	5390	0.138
K 3	1/20/2000	12:30	8.6	0.58	8.0	8.79	8.13	10.53	5390	.
K 3	1/20/2000	12:30	8.6	0.58	8.5	8.81	8.13	10.48	5400	.
K 4	1/20/2000	12:55	5.5	0.51	0.0	9.45	8.16	10.77	5470	1132.000
K 4	1/20/2000	12:55	5.5	0.51	1.0	9.35	8.16	10.71	5550	133.300
K 4	1/20/2000	12:55	5.5	0.51	2.0	9.23	8.16	10.68	5540	23.470
K 4	1/20/2000	12:55	5.5	0.51	3.0	9.12	8.16	10.67	5540	3.882
K 4	1/20/2000	12:55	5.5	0.51	4.0	9.10	8.16	10.62	5550	0.637
K 4	1/20/2000	12:55	5.5	0.51	5.0	9.12	8.16	10.55	5550	.
K 4	1/20/2000	12:55	5.5	0.51	5.5	9.13	8.16	10.50	5550	.
K 5	1/20/2000	13:20	3.3	0.32	0.0	9.56	8.19	10.76	5620	1251.000
K 5	1/20/2000	13:20	3.3	0.32	1.0	9.50	8.19	10.69	5640	90.020
K 5	1/20/2000	13:20	3.3	0.32	2.0	9.36	8.20	10.65	5700	9.385
K 5	1/20/2000	13:20	3.3	0.32	3.0	8.76	8.19	10.53	5780	0.636
K 6	1/20/2000	13:30	1.0	0.26	0.0	9.63	8.21	11.50	5600	860.100
K 6	1/20/2000	13:30	1.0	0.26	1.0	9.68	8.28	11.48	5630	59.230

Lake Kemp Physicochemical Profiles: 2 March 2000

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K1	3/2/2000	9:00	14.0	0.95	0.0	11.92	8.15	10.76	5480	.
K1	3/2/2000	9:00	14.0	0.95	1.0	11.91	8.27	10.58	5490	.
K1	3/2/2000	9:00	14.0	0.95	2.0	11.89	8.30	10.59	5490	.
K1	3/2/2000	9:00	14.0	0.95	3.0	11.88	8.30	10.52	5490	.
K1	3/2/2000	9:00	14.0	0.95	4.0	11.88	8.31	10.46	5490	.
K1	3/2/2000	9:00	14.0	0.95	5.0	11.88	8.31	10.47	5500	.
K1	3/2/2000	9:00	14.0	0.95	6.0	11.86	8.31	10.39	5500	.
K1	3/2/2000	9:00	14.0	0.95	7.0	11.84	8.32	10.28	5500	.
K1	3/2/2000	9:00	14.0	0.95	8.0	11.84	8.32	10.33	5500	.
K1	3/2/2000	9:00	14.0	0.95	9.0	11.84	8.32	10.26	5500	.
K1	3/2/2000	9:00	14.0	0.95	10.0	11.83	8.32	10.24	5500	.
K1	3/2/2000	9:00	14.0	0.95	11.0	11.83	8.32	10.19	5500	.
K1	3/2/2000	9:00	14.0	0.95	12.0	11.83	8.32	10.20	5500	.
K1	3/2/2000	9:00	14.0	0.95	13.0	11.81	8.32	10.23	5500	.
K1	3/2/2000	9:00	14.0	0.95	14.0	11.79	8.32	10.22	5510	.
K2	3/2/2000	12:20	11.0	0.67	0.0	12.34	8.36	10.76	5490	1741.000
K2	3/2/2000	12:20	11.0	0.67	1.0	12.29	8.35	10.68	5500	937.000
K2	3/2/2000	12:20	11.0	0.67	2.0	12.25	8.36	10.63	5500	497.900
K2	3/2/2000	12:20	11.0	0.67	3.0	12.20	8.35	10.63	5510	406.000
K2	3/2/2000	12:20	11.0	0.67	4.0	12.19	8.35	10.59	5510	379.500
K2	3/2/2000	12:20	11.0	0.67	5.0	12.16	8.35	10.56	5510	353.800
K2	3/2/2000	12:20	11.0	0.67	6.0	12.14	8.35	10.55	5510	165.200
K2	3/2/2000	12:20	11.0	0.67	7.0	12.12	8.35	10.52	5500	87.550
K2	3/2/2000	12:20	11.0	0.67	8.0	12.12	8.35	10.51	5510	19.630
K2	3/2/2000	12:20	11.0	0.67	9.0	12.12	8.35	10.51	5510	.
K2	3/2/2000	12:20	11.0	0.67	10.0	12.12	8.36	10.48	5510	.
K2	3/2/2000	12:20	11.0	0.67	11.0	12.11	8.35	10.48	5510	.
K3	3/2/2000	13:20	9.2	0.48	0.0	13.03	8.36	10.71	5580	1752.000
K3	3/2/2000	13:20	9.2	0.48	1.0	13.01	8.37	10.58	5580	260.800
K3	3/2/2000	13:20	9.2	0.48	2.0	12.98	8.37	10.47	5580	65.080
K3	3/2/2000	13:20	9.2	0.48	3.0	13.00	8.37	10.44	5580	19.070
K3	3/2/2000	13:20	9.2	0.48	4.0	12.98	8.37	10.42	5590	10.420
K3	3/2/2000	13:20	9.2	0.48	5.0	12.96	8.38	10.38	5590	8.464

Lake Kemp Physicochemical Profiles: 2 March 2000

Station	Date	Time	Maximum Depth (m)	Secchi Depth (m)	Sample Depth (m)	Temp (C)	pH	DO (ppm)	Conductivity (uS/cm)	Light (microeinsteins)
K3	3/2/2000	13:20	9.2	0.48	6.0	12.95	8.37	10.39	5580	1.483
K3	3/2/2000	13:20	9.2	0.48	7.0	12.93	8.37	10.36	5580	.
K3	3/2/2000	13:20	9.2	0.48	8.0	12.93	8.38	10.32	5580	.
K3	3/2/2000	13:20	9.2	0.48	9.0	12.91	8.37	10.33	5590	.
K4	3/2/2000	11:16	6.8	0.52	0.0	13.01	8.36	11.01	5780	994.500
K4	3/2/2000	11:16	6.8	0.52	1.0	13.00	8.37	10.50	5780	96.920
K4	3/2/2000	11:16	6.8	0.52	2.0	13.00	8.37	10.40	5780	16.730
K4	3/2/2000	11:16	6.8	0.52	3.0	12.98	8.37	10.34	5790	5.250
K4	3/2/2000	11:16	6.8	0.52	4.0	13.00	8.38	10.22	5780	3.868
K4	3/2/2000	11:16	6.8	0.52	5.0	13.00	8.38	10.20	5790	0.934
K4	3/2/2000	11:16	6.8	0.52	6.0	12.86	8.38	10.13	5800	.
K5	3/2/2000	12:03	3.5	0.40	0.0	13.51	8.42	11.86	5970	1026.800
K5	3/2/2000	12:03	3.5	0.40	1.0	12.49	8.41	10.89	5970	144.400
K5	3/2/2000	12:03	3.5	0.40	2.0	13.48	8.41	10.64	5960	31.440
K5	3/2/2000	12:03	3.5	0.40	3.0	13.48	8.41	10.51	5960	18.280
K5	3/2/2000	12:03	3.5	0.40	3.5	13.46	8.41	10.43	5990	0.947
K6	3/2/2000	12:30	1.0	0.26	0.0	13.99	8.42	10.41	5940	1441.000
K6	3/2/2000	12:30	1.0	0.26	1.0	13.94	8.41	10.34	5920	132.600

APPENDIX D

Laboratory Results for Field Blank Samples

Appendix D: Laboratory Results for Field Blank Samples

Date	NO2 (mg/l)	NO3 (mg/l)	TKN (mg/l)	Total P (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	Cl (mg/l)	SO4 (mg/l)	PO4 (mg/l)	Hardness (mg/l CaCO3)
06/14/1999	<0.01	<0.04	<8.3	0.20	<1.00	<0.50	<1.00	<0.50	1.10	0.87	<0.010	<5.0
06/30/1999	<0.01	<0.04	<8.3	<0.02	<0.50	1.10	2.00	1.90	1.90	1.10	0.011	4.5
07/14/1999	<0.01	0.05	<8.3	<0.10	<1.00	<1.00	1.50	1.60	1.30	0.80	0.029	<7.0
07/31/1999	<0.01	0.14	<8.3	<0.10	<1.00	2.30	1.60	2.20	1.40	0.79	0.028	9.5
08/22/1999	<0.01	<0.04	<8.3	<0.10	<0.50	0.67	2.20	2.00	1.30	0.71	0.104	<5.0
09/26/1999	<0.01	<0.04	<8.3	<0.10	2.70	2.90	2.00	1.80	1.60	1.20	0.037	19.0
11/17/1999	<0.01	<0.04	<8.3	<0.20	0.72	0.49	2.60	2.20	1.20	1.00	0.030	3.8
01/20/2000	<0.01	<0.04	<8.3	<0.20	2.10	1.80	12.00	7.60	1.30	0.97	<0.040	13.0
03/03/2000	<0.01	<0.04	<8.3	<0.10	<0.50	<0.50	<0.50	<0.50	1.40	0.71	<0.040	<3.0