LAKE GILES

REPORT ON LIMNOLOGICAL CONDITIONS IN 1992

Robert E. Moeller
Craig E. Williamson

POCONO COMPARATIVE LAKES PROGRAM

Lehigh University

Department of Earth and Environmental Sciences
31 Williams Drive
Lehigh University
Bethlehem, Pennsylvania 18015

12 April 1993

<A Copy of This Report is Available on Loan Through the Lehigh University Library System>

Moeller, R. E. and C. E. Williamson. 1993. Lake Giles: Report on Limnological Conditions in 1992. Unpublished Report to the Blooming Grove Hunting and Fishing Club. Department of Earth and Environmental Sciences, Lehigh University, 12 April 1993.

INTRODUCTION

Personnel from Lehigh University visited Lake Giles on 15 dates throughout 1992 as part of a routine monitoring program of three lakes. These lakes were selected to span a trophic gradient, Lake Giles occupying the unproductive ("oligotrophic") end of the gradient. Similar reports will be submitted to the owners of Lake Waynewood, a nutrient-rich ("eutrophic") lake potentially affected by homes and agricultural practices within its drainage basin, and Lake Lacawac, a well protected lake of intermediate productivity ("mesotrophic"). Because Lake Lacawac has been little disturbed throughout its recent history, and is currently preserved as part of the Lacawac Sanctuary, it serves as a valuable reference lake for the region.

The monitoring of these lakes in the Pocono region of northeastern Pennsylvania is a key component of Lehigh's Pocono Comparative Lakes Program (PCLP). This program aims to better understand the natural functioning of lakes, differences in lakes that arise through natural or man-made differences in their watersheds, and long-term trends that may be occurring in northeastern Pennsylvania. Through the cooperation of lake owners, scientists from Lehigh and other institutions are obtaining basic information that provides objective documentation of current lake conditions as well as a context for more intensive studies. Financial support from the Andrew W. Mellon Foundation has made these studies possible.

1992 was the fifth consecutive year of the monitoring program, and the fifth year for summer sampling. This is the third year that winter and spring data were obtained. The present report summarizes conditions in Lake Giles over the full twelve-month period for 1992. The format closely follows that of the previous three years. Physical/chemical data are presented as tables for each date, and are summarized in figures. The following parameters were measured: **TEMPERATURE**, **LIGHT PENETRATION**, **SECCHI DEPTH**, **DISSOLVED OXYGEN**, **ALKALINITY**, **pH**, and algal **CHLOROPHYLL-a**. **ZOOPLANKTON DATA** are presented as graphs that give the concentration (number of individuals per liter) averaged over the entire water column.

During 1992 more detailed chemical sampling of the water column has been continued for most of the components analyzed by Dr. Jonathan Cole and Dr. Nina Caraco (Institute of Ecosystem Studies, New York Botanical Garden, Millbrook, NY) and reported in the 1990 Report. Giles was sampled at 5-6 depths on 5 dates (in February, April, July, September and November). Analyses at the Institute of Ecosystem Studies are underway on these and the 1991 samples. This sampling program ended with a collection in February, 1993 (giving 10 year-round samplings over a two-year period), and we hope to report all results at one time in the near future.

This report includes a bathymetric map of Lake Giles based on a survey by Dr. Richard Weismann and Robert Schultz in July 1990, from which bathymetric and hypsographic curves have been plotted (**APPENDIX I**).

The Lacawac Sanctuary plays a major role in this program as the field laboratory and summer residence for the investigators. We especially appreciate the interest and cheerful assistance of its curator, Sally Jones. We wish to thank the members and management at the Blooming Grove Hunting and Fishing Club, and most particularly Ken Ersbak, for encouraging the inclusion of Lake Giles in this study of regional limnology.

1992 METHODS AND RESULTS

Data included in this report are extracted from an electronic database maintained at Lehigh University by Dr. Craig Williamson. The field sampling, laboratory analyses, and computer data entry were supervised by Dr. Robert Moeller and Gina Novak. Gina Novak, Timothy Vail, and Brian Sharer carried out most of the field sampling and laboratory analyses. Tim Vail counted macrozooplankton samples. Natasha Vinogradova counted microzooplankton. Gina Novak managed all aspects of the computer database including data entry, data analysis, and printing of zooplankton graphs. Dr. Bruce Hargreaves has continued to oversee maintenance of the computerized database, which he and Scott Carpenter developed. Natasha Vinogradova and Brian Sharer checked the zooplankton data entries. Brian Sharer analyzed chlorophyll samples. Alkalinity and pH were determined by Gina Novak and Tim Vail. Gina entered the physical/chemical data, which Robert Moeller checked and abstracted as tables and graphs.

Although efforts have been made to assure the accuracy of data included in the database, and compiled in this report, we cannot guarantee complete accuracy and do not claim specific levels of accuracy or precision. The data have been collected as part of a lake characterization program and may not be suitable for uses not envisioned by the investigators. A brief description of sampling and analytical techniques is included here; a more complete description has been prepared for later distribution.

Information acquired through the Pocono Comparative Lakes Program is to be shared among scientists desiring to make broad comparative studies or considering research projects in these lakes. Inquiries to examine or use the data are invited. Of course, the primary right to publish extensive extracts from the database, or from this unpublished report to the lake owners, resides with the PCLP cooperating investigators and students who generated the data. As of April, 1993, most of the existing information is accessible through the software program Reflex™ (version 2, Borland International, copyright 1989) running on IBM PC-type microcomputers.

SAMPLING PROGRAM

On each sampling occasion, Lake Giles was visited twice, once during the day (the nominal date) and again after dark (sometimes the previous night). The night-time visit was required for zooplankton sampling. Usually, other parameters were measured, and samples were collected, during the day. Sampling was carried out at a fixed station (site "A") near the deepest part of the lake (about 23 meters or 75 feet). The thermal stratification existing on any date dictated the depths from which other samples were collected **(Figure 1)**. The lake was sampled twice monthly when surficial water temperature stayed above 20°C, (June through September), then once monthly during cooler times.

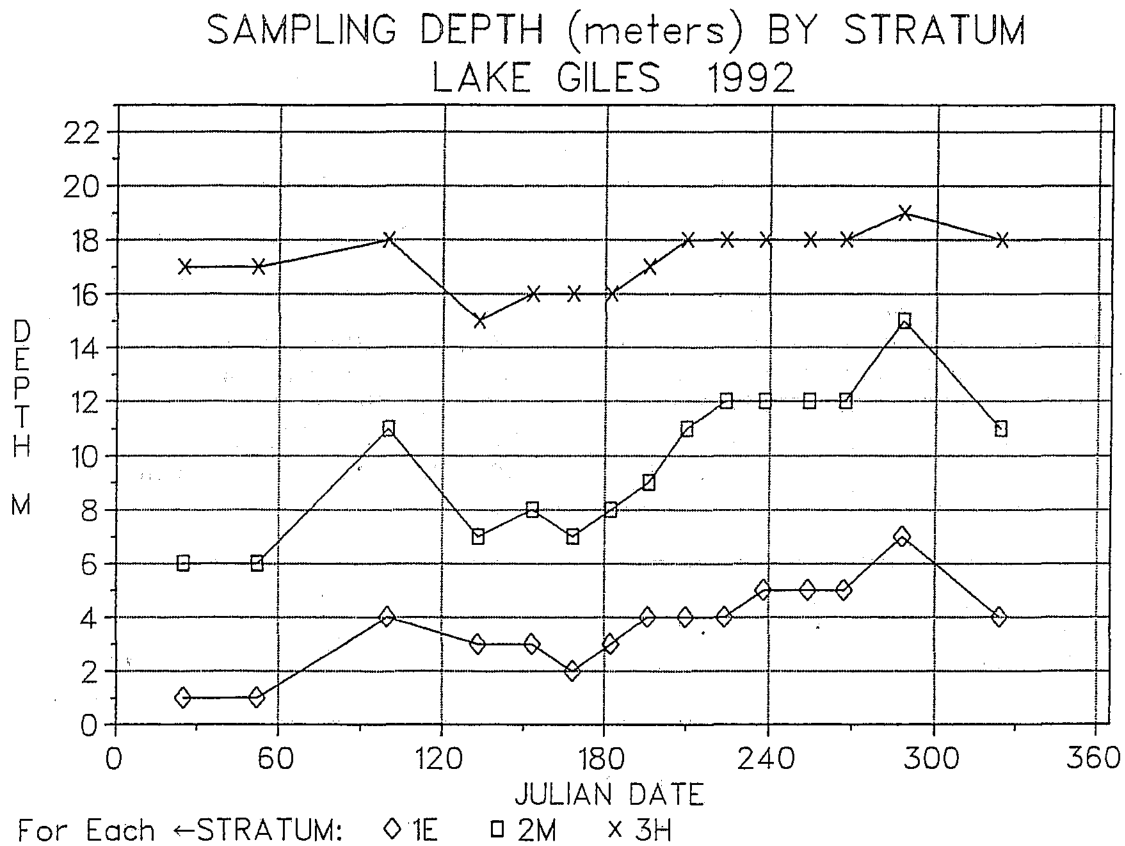


Figure 1. Depths of "EPI", "META", and "HYPO" samples from Lake Giles, 1992.

Sampling depths were selected by the field sampling crew based on the temperature profile on each date (see text for discussion).

TEMPERATURE AND PHYSICAL STRATIFICATION

Temperature was measured at 1-metre intervals with the thermister of a YSI™ oxygen meter, in degrees Celsius. Accuracy should be within 1 degree. (This is **Method #10**.)

Figure 2 shows the thermal stratification that develops during late spring and summer, then breaks down in the autumn. On day 25 (25 January) the lake was ice-covered, and displayed a weak "reverse stratification". After ice-out (sometime in late March) the water column briefly circulated from top to bottom during "spring turnover", as evident in the isothermal 4°C water column on day 100 (9 April). By day 182 (30 June) the surface water was warmed to 19°C. The water column was strongly stratified, consisting of: an upper warm water layer circulating in contact with the atmosphere (the **EPILIMNION**, 0-6 metres, temperature 18-19°C); an intermediate layer of rapid temperature decrease with depth (the **METALIMNION**, 6-11 metres, temperature changing >1°C per metre); and a deep layer of cold water (the **HYPOLIMNION**, 11-23 metres, temperature 5.5-9°C). Lake Gile's transparency allows appreciable absorptive heating of the deeper part of the water column, creating a broad metalimnion which grades smoothly into the hypolimnion.

The usual course of thermal stratification is that of slow, gradual thickening of an epilimnion during the summer. By day 267 (23 September) Lake Giles' epilimnion extended to 10 meters. As the lake cooled during the autumn, the epilimnion thickened more rapidly until the lakewater was circulating from top to bottom. This period of full circulation, or "fall turnover", was in progress by day 324 (19 November). The lake was not sampled in December because of poor ice conditions. In fact the lake surface was not completely ice-covered until about mid-January 1993, when the water had cooled to less than 3°C. Bad ice conditions also had prevented sampling in March.

The temperature pattern in the lake is controlled by climate, and will differ only slightly from year to year. Two major variables are the durations of winter ice-cover (ca. 8-10 weeks in 1991-92) and the completeness of spring turnover. Spring turnover was complete in 1992 and probably lasted at least 2 weeks. Although winter 1991-92 was relatively warm, accounting for the late date of first complete ice cover, air temperatures during March through December were close to the long-term means (**Figure 10**). As a result, the lake was somewhat cooler than in 1991, an especially warm year. The maximal midsummer epilimnial temperature (ca. 22°C) was only slightly lower than in 1991 (23-24°C), but was attained later in the summer and prevailed throughout a shallower epilimnion. **Figure 3** presents the detailed trends of water temperature at three fixed depths (2,11,21 metres) for comparison with other years.

Water samples for **pH**, **alkalinity**, **chlorophyll**, **algae**, and **total phosphorus** were collected from mid-depths of the three layers when thermal stratification was well developed. During turnover periods, the lake was divided into three equal layers. Under ice-cover (e.g. 25 January), the topmost layer was 0-1m, and the remaining depths were divided at the Secchi depth (see **SECCHI DEPTH** below).

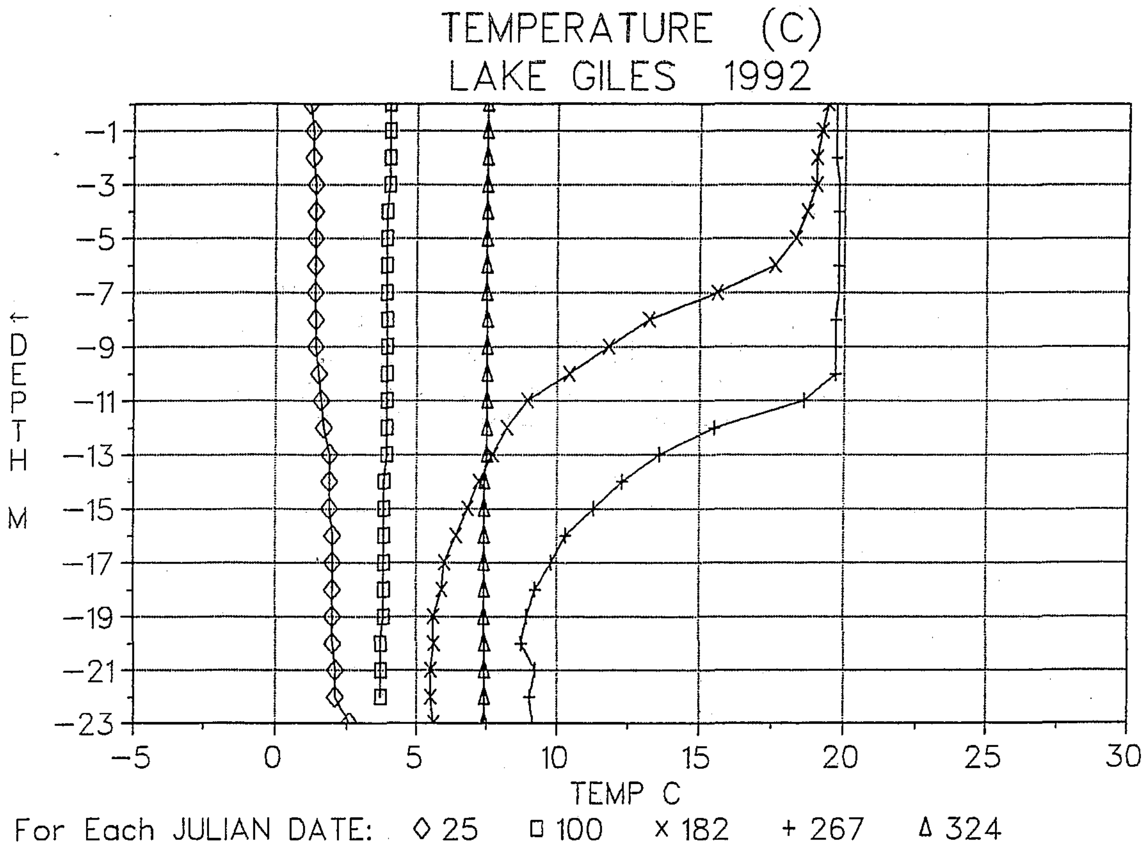


Figure 2. Temperature profiles in Lake Giles, 1992.

Values (°C) are plotted for five dates: **25 January** (day 25 --winter ice cover), **9 April** (day 100 --immediately following spring turnover), **30 June** (day 182 --midsummer stratification), **23 September** (day 267 --late stratification), and **19 November** (day 324 --fall turnover).

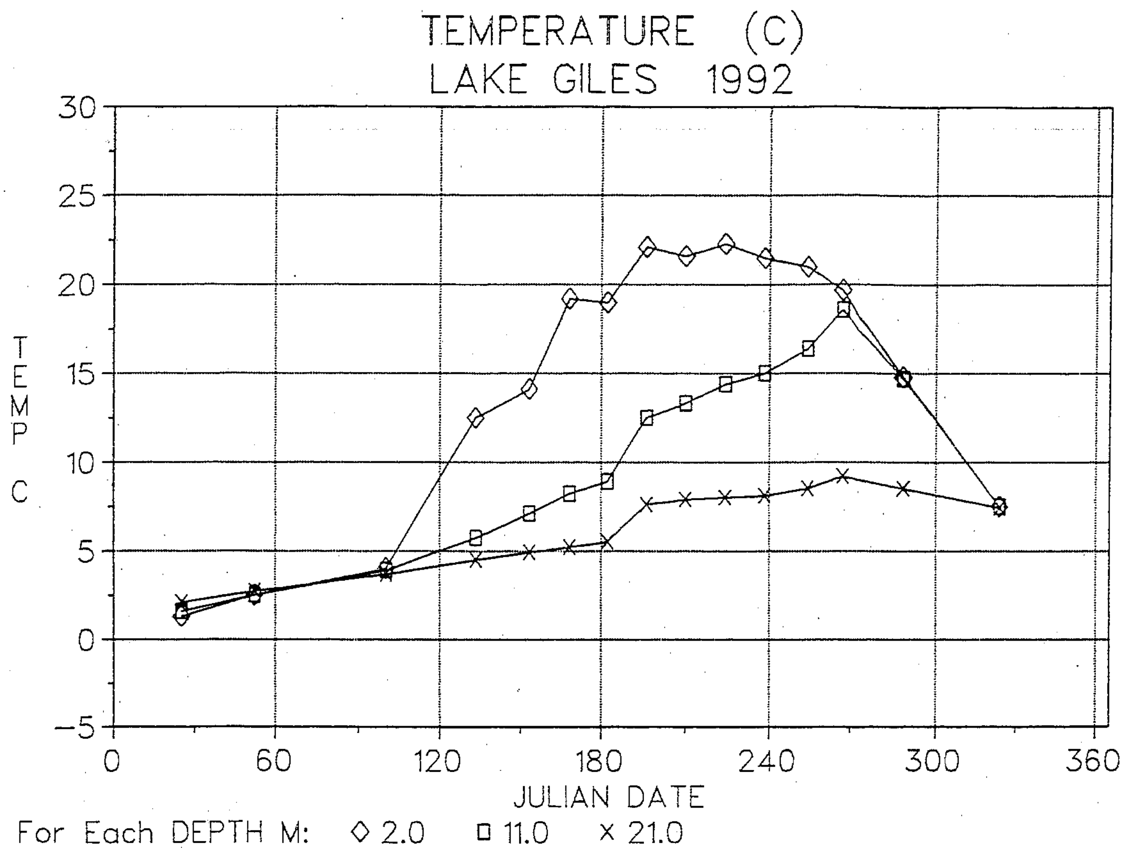


Figure 3. Temperature trends within Lake Giles, 1992.

Values (°C) are plotted for three fixed depths.

LIGHT PENETRATION

Light intensity at 1-meter intervals was calculated as a percentage of the light just below the lake surface (10 cm). Since 1988, three slightly different methods have been used to construct a 0-12 m profile of light penetration; method #12 (numbers correspond to codes from data tables) was used exclusively in 1990:

Method 12. Two sensors, mounted 1-m apart on a common line, electronically computed the ratio of light intensities between the nominal depth and the depth above it. The percentage penetration profile was constructed from these ratios. The sensors are Licor™ submersible flat-plate sensors filtered to give a quantum response to photosynthetically available radiation ("PAR"). Units are microeinsteins per meter square per second (μEinstein/m^2.sec).

Light penetration is plotted on a logarithmic scale for five dates **(Figure 4)**. During the summer, depths above 10 m (i.e. all of the epilimnion) received at least 5-10% of the light penetrating the lake surface. The metalimnion received 1-5% of surface light, enough for moderate rates of algal growth. Enough light reached the deepest waters to allow slow growth of low-light adapted algae. Transparency was only slightly reduced during spring and fall.

SECCHI DEPTH

Secchi depth is the depth, in metres, at which a white-and-black quartered disk 20 cm in diameter just ceases to be visible to an observer lowering it from a boat. It is a measure of water transparency. We observed the Secchi disk with a small glass-bottomed viewing box to reduce glare from the lake surface.

Secchi transparency was typically greater than 10 metres **(Figure 5)**. The spring-summer-fall oscillation was less pronounced than in 1990, because of smaller spring algal populations. Transparency was 13-16 m during summer, as in 1989-91, with the clearest conditions prevailing during the latter part of July.

OXYGEN CONTENT OF THE LAKEWATER

Dissolved oxygen was measured polarographically using a YSI™ submersible temperature-compensating oxygen meter. The meter was calibrated in air to 100% saturation immediately before use in the lake. The effect of Lake Giles' elevation above sea-level (1404 feet) was not taken into account when calibrating the meter, so all compiled values are roughly 5% too high. Units are mg O_2 per liter. (This is **Method #10.**) Values from 14 July were unusual: although plausible near the surface, they dropped steadily through the deeper water column--a pattern never seen in Giles before. We suspect a malfunctioning meter not noted by the field sampling crew.

Oxygen was not appreciably depleted during the relatively short winter ice cover. Late freeze-up (mid-January) and lack of snow cover (allowing light for algal photosynthesis deep into the water column) reinforced Gile's inherently low winter deep-water oxygen consumption. Oxygen concentration was set at atmospheric saturation during spring turnover, when the lake was still cold. During summer stratification, oxygen was slowly consumed within the hypolimnion, and lost from the warming epilimnion via outgassing to

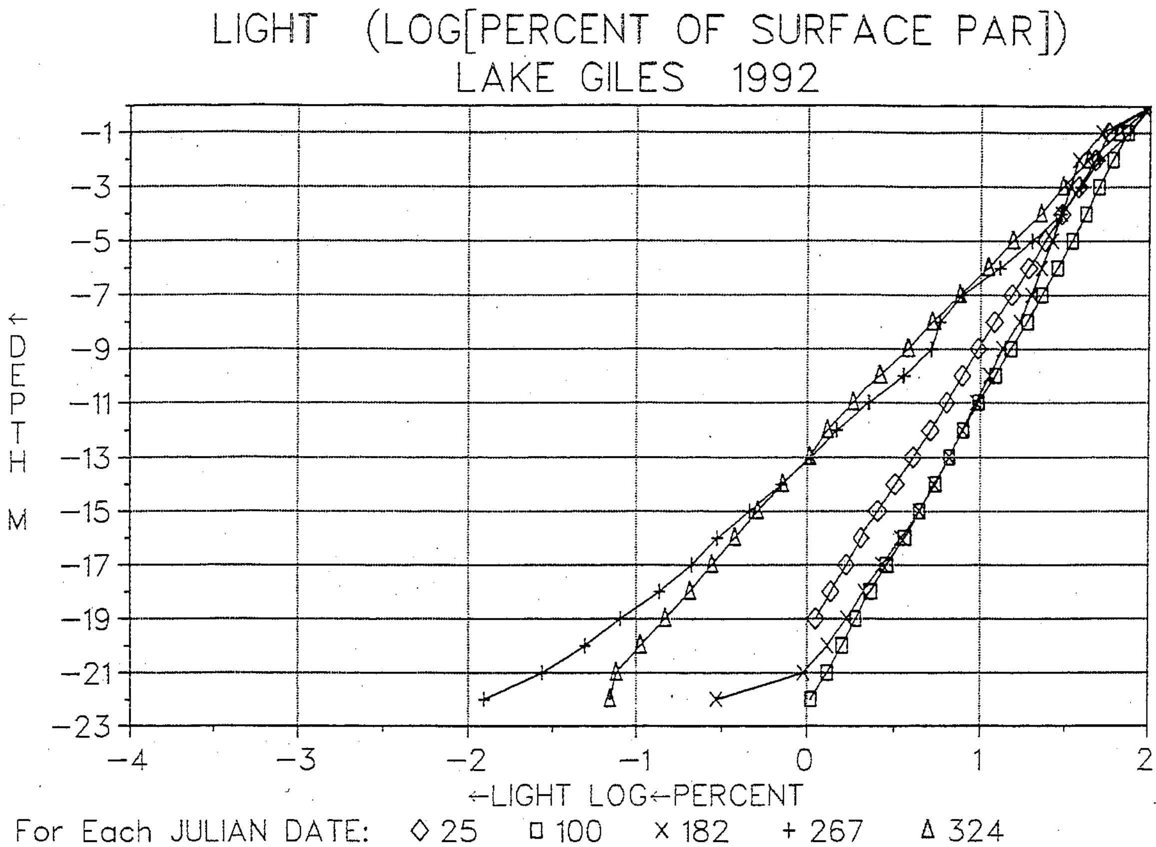


Figure 4. Light penetration in Lake Giles, 1992.

Values are percentages of the light at 0.1 m depth and are graphed on a logarithmic scale (i.e. 100% ="2", 10% ="1", 1% ="0", etc.) for five dates: **25 January** (day 25 --winter ice cover), **9 April** (day 100 --immediately following spring turnover), **30 June** (day 182 --midsummer stratification), **23 September** (day 267 --late stratification), and **19 November** (day 324 --fall turnover).

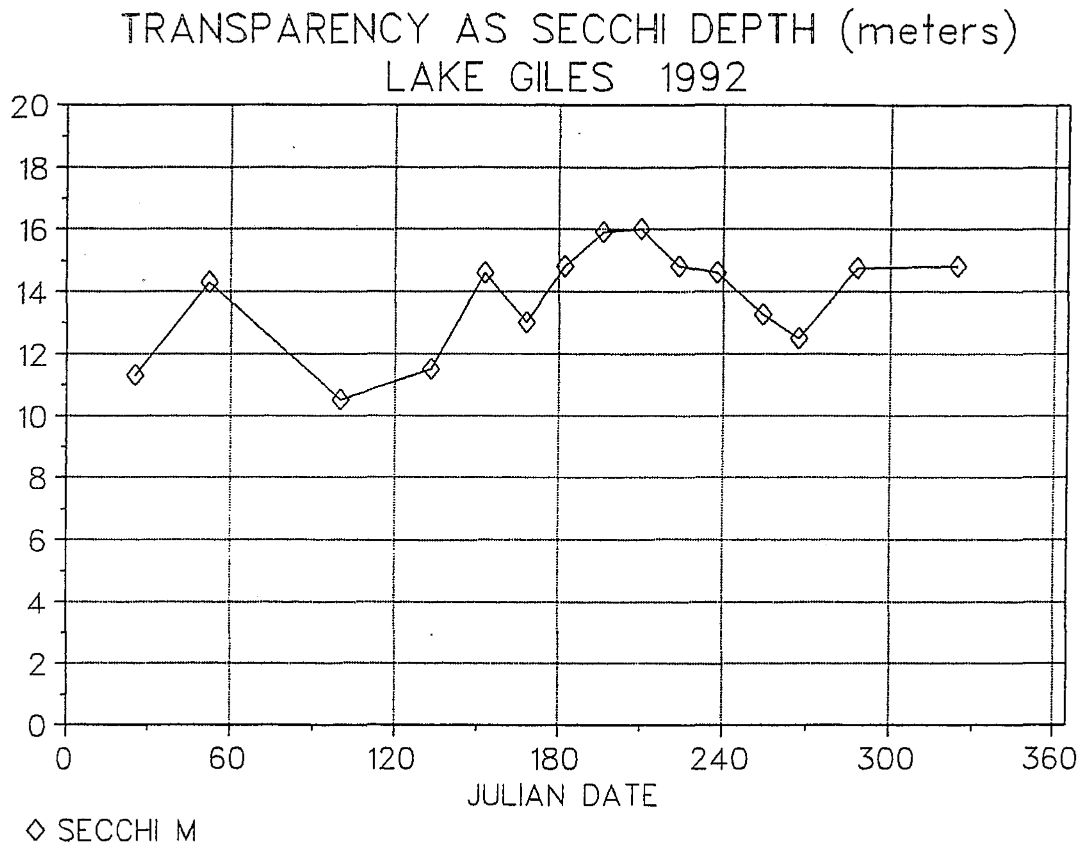


Figure 5. Transparency in Lake Giles, 1992.

Values plotted are the Secchi depths, in meters.

the atmosphere. These processes created the metalimnetic oxygen maximum that persisted throughout the summer (**Figure 6**). Oxygen was maintained at concentrations greater than 2 mg/L, except for the bottommost meter of the lake in late summer.

ALKALINITY AND pH

Alkalinity is a measure of the acid neutralizing, or buffering capacity. Alkalinity was determined by potentiometric titration of a 100-ml sample using 0.01 N sulfuric acid as titrant and monitoring pH change with an Orion™ model SA250 pH meter and Ross™ epoxy-body combination electrode. Titration points between pH 4.4 and 3.7 were plotted, after Gran transformation, to give alkalinity in microequivalents per liter (μeq./L). (This is **Method #11**.) Alkalinity was analyzed monthly, on alternate sampling dates during summer.

Samples for alkalinity and pH were taken from duplicate water collections (acrylic plastic Van Dorn bottle) at three depths, designated "**E**" (epilimnion), "**M**" (metalimnion), and "**H**" (hypolimnion). Selection of these depths is described in the section **TEMPERATURE AND THERMAL STRATIFICATION**. Samples were stored in air-tight polypropylene bottles for up to 24 hr (refrigerated) before analysis. Samples were warmed to room temperature before analysis. The pH meter and electrode described above were calibrated with commercial high ionic strength buffers. The pH was measured in 50-ml aliquots of sample, usually with gentle mixing. The following variant of the method was employed on all dates on 1992:

Method 12. As above, with 0.5 ml salt solution (Orion™ pHisa™ solution) added to increase ionic strength. Usually, this had little or no effect on the sample (pH change <0.1 unit). Also, a quality assurance protocol was followed, verifying electrode performance in distilled water and the stability of calibration.

Trends of pH are plotted for each layer in **Figure 7**. In the absence of intense biological activity, the pH of Lake Giles would be about 5.3-5.4 with an alkalinity of ca. -5 μeq./L (**Figure 8**), judging from values in late spring and late autumn. Seasonal pH's have been remarkably consistent for the four years we have measured them. These values represent a lake without bicarbonate buffering. There was a modest within-lake generation of alkalinity in the hypolimnion during late summer and early fall; the metabolic processes responsible for this increase in alkalinity were probably located at the sediment surface.

It is remarkable that pH is so consistent, both seasonally and year-to-year during our study. Since the lakewater has negligible buffering capacity itself, this means that there is a stable geochemical control of lake pH, probably within the watershed soils and subsoils. Even the relatively dry conditions of 1991 and winter 1991-92, compared to more normal conditions in the bracketing years, were not associated with a change in pH of epilimnial waters. There does seem to be a very subtle multi-year fluctuation or trend in upper water-column alkalinity, with 1992 levels staying within a low range of -5 to -10 ueq/L, compared to a more common range of 0 to -5 ueq/L in 1989-1991. A difference of this small magnitude, however, is at the limit of resolution by our Gran titrations.

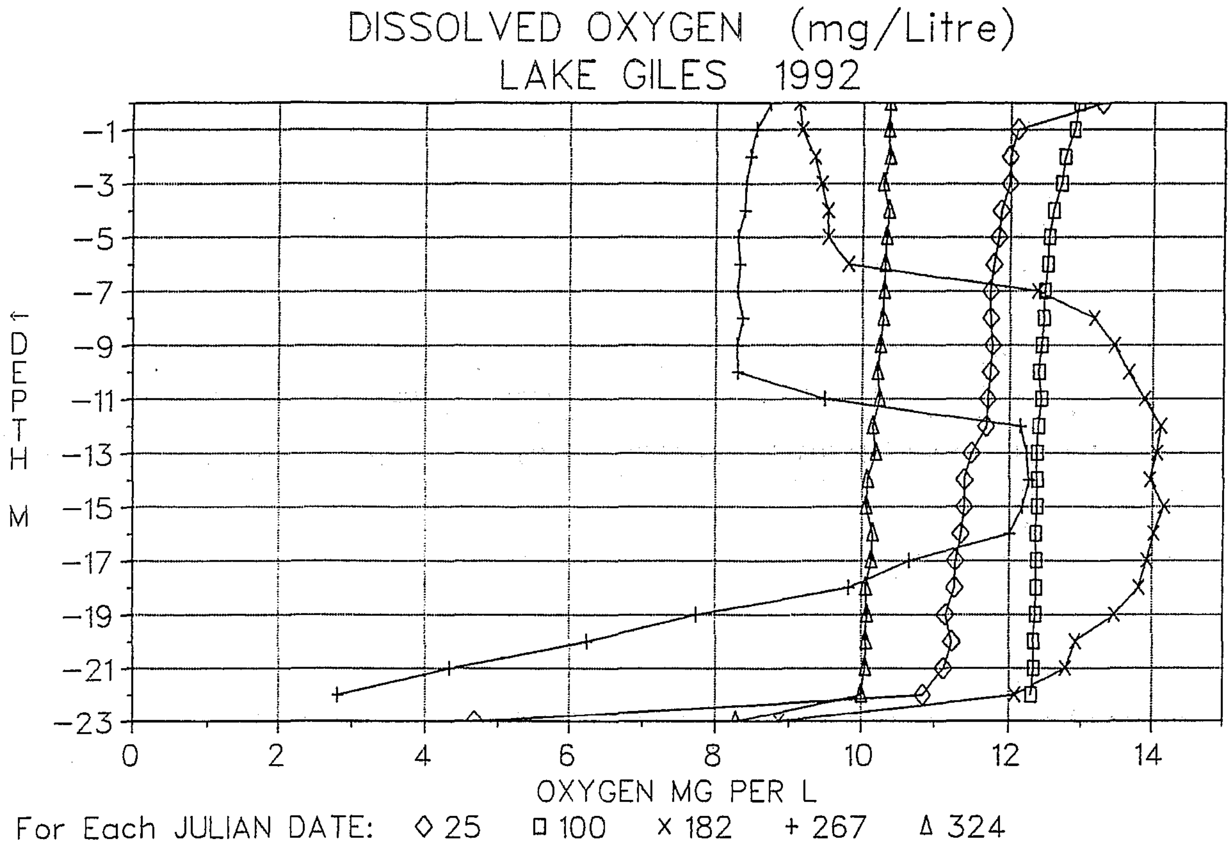


Figure 6. Dissolved oxygen in Lake Giles, 1992.

Values (mg oxygen per liter) are plotted for five dates: **25 January** (day 25 --winter ice cover), **9 April** (day 100 --immediately following spring turnover), **30 June** (day 182 --midsummer stratification), **23 September** (day 267 --late stratification), and **19 November** (day 324 --fall turnover).

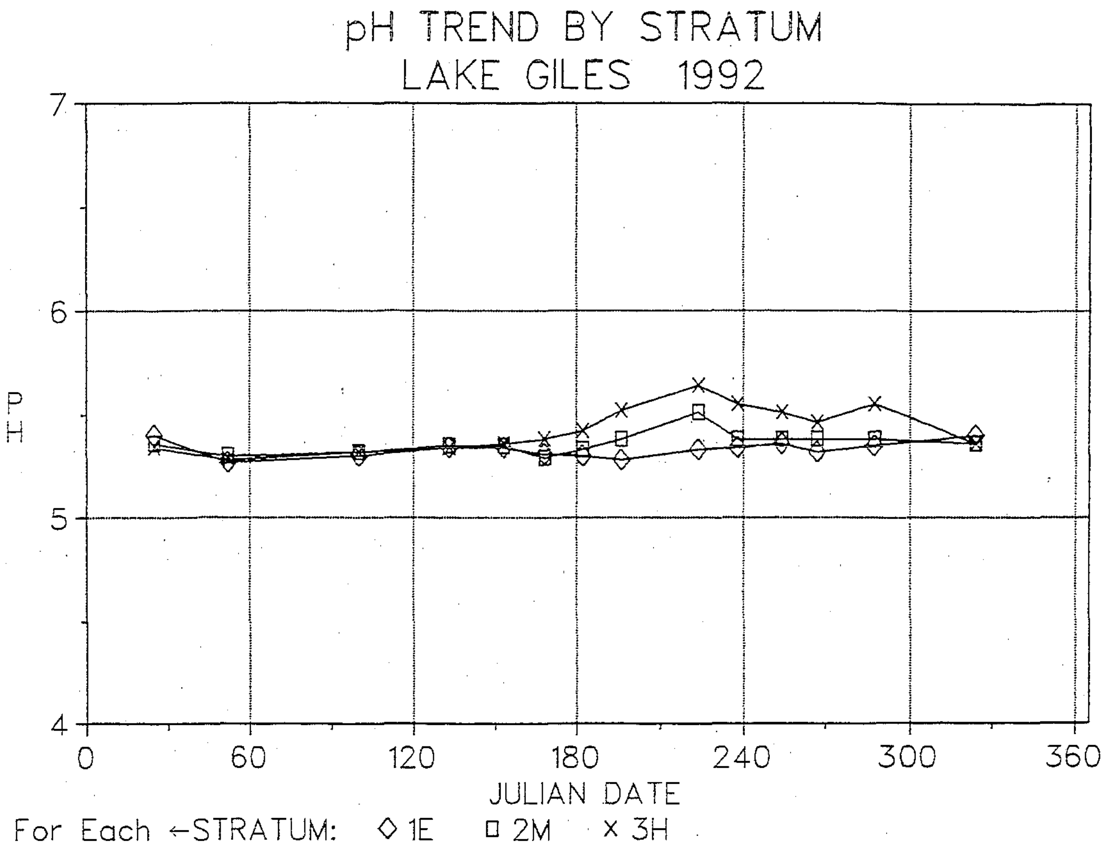


Figure 7. Trends of pH in Lake Giles, 1992.

Values are plotted for the mid-depths of the three layers, Epilimnion (**1E**), Metalimnion (**2M**), and Hypolimnion (**3H**). In autumn and winter, when these layers are not developed, samples are collected as described in **RESULTS AND METHODS**.

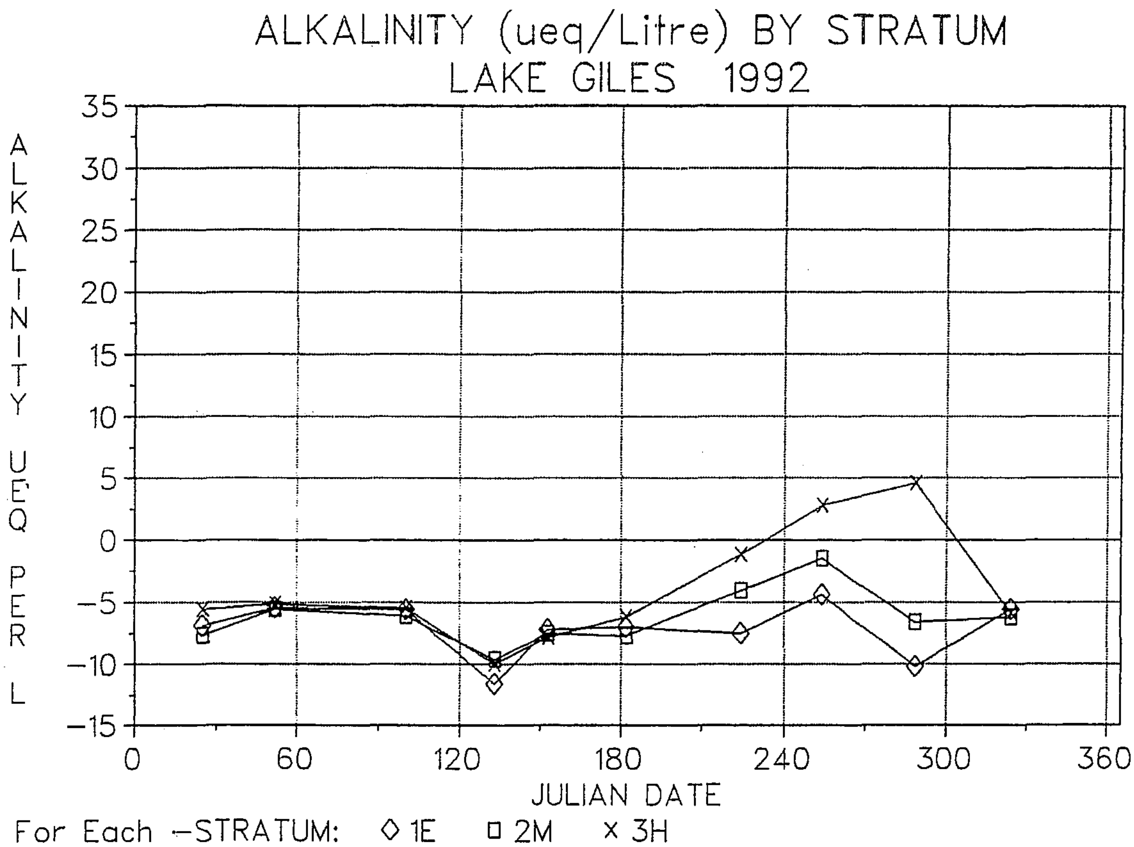


Figure 8. Trends of Alkalinity in Lake Giles, 1992.

Values are plotted for the mid-depths of the three layers, Epilimnion (**1E**), Metalimnion (**2M**), and Hypolimnion (**3H**). In autumn and winter, when these layers are not developed, samples are collected as described in **RESULTS AND METHODS**.

ALGAL CHLOROPHYLL-a

Chlorophyll-a is a measure of algal mass, since all algae contain this pigment. It is a widely used parameter for comparisons of lake trophic conditions.

Chlorophyll samples came from the same Van Dorn collections used for pH and alkalinity. Samples were stored in 1-L polyethylene bottles for 2-24 hr (refrigerated in darkness) before being filtered (0.5 L onto Gelman™ A/E filters) and frozen. Two samples were analyzed from each depth: a whole-water sample (for total chlorophyll-a) and a sample fractionated with a 22-um nitex net. Often the sum of fractions was less than the total. This sum was only treated as a replicate for total chlorophyll-a if it was greater than or equal to 85% of the whole sample. The percentage of chlorophyll passing the 22um net (percent of the summed fractions) is presented in the data tables (**CHLAC P**). **Method 12** was used for all chlorophyll extractions:

Method 12. Intact filters were extracted overnight at 2-4°C, in darkness, in 12 ml of a 5:1 (vol/vol) mixture of 90% basic acetone and methanol. Extracts were centrifuged and read in a Sequoia-Turner™ model 112 fluorometer equipped with F4T5/B lamp, red-sensitive photomultiplier, 5-60 excitation filter and 2-64 emission filter. The meter was calibrated with dilutions of pure chlorophyll-a or chlorophyll-a,b extracts from higher plants; these were assayed first by standard spectrophotometric techniques. Each sample was reread after acidification (to 0.03 N) to allow correction for pheopigments. We verified that chlorophyll behaves virtually the same in the mixed solvent as in 90% acetone alone, and that the extractions gave similar results. Two values are presented: Chlorophyll-a corrected for pheopigments (**CHLAC** in data tables and **Figure 9**) and Chlorophyll-a including pheopigments (**CHLASUM** in data tables).

In Lake Giles there was a distinct seasonal pattern of chlorophyll-a (**Figure 9**). Winter values were low (less than 1 ug/L), unlike the winter peaks reached in 1990 and 1991 (3-9 ug/L). Spring values increased slightly but remained lower than in 1990 (6-9 ug/L) and 1991 (1-2 ug/L). The spring maximal algal biomass was succeeded by very low chlorophyll-a concentrations, especially in the epilimnion and the metalimnion (0.5 ug/L or less). This drop in algal populations is possibly related to intense grazing by rapidly increasing zooplankton populations, especially *Daphnia catawba*, and is the most consistent feature of the seasonal chlorophyll-a trend. Epilimnial concentrations remained below 1 ug/L throughout most of the summer. During summer stratification, higher concentrations of algae were present in the metalimnion and the hypolimnion than in the near-surface waters. Levels during fall overturn were ca. 1 ug/L in 1992, as in 1989-1991.

The most remarkable features of the chlorophyll-a trends in Lake Giles are the peak levels of more than 3 ug/L--throughout all or most of the water column--reached below the ice in 1990 and 1991. The absence of this peak in 1992, when the ice was thin and not covered by snow, and of shorter than usual duration, might reflect reduction in water column stability or, possibly, the generally dry conditions of summer 1991 and winter 1992.

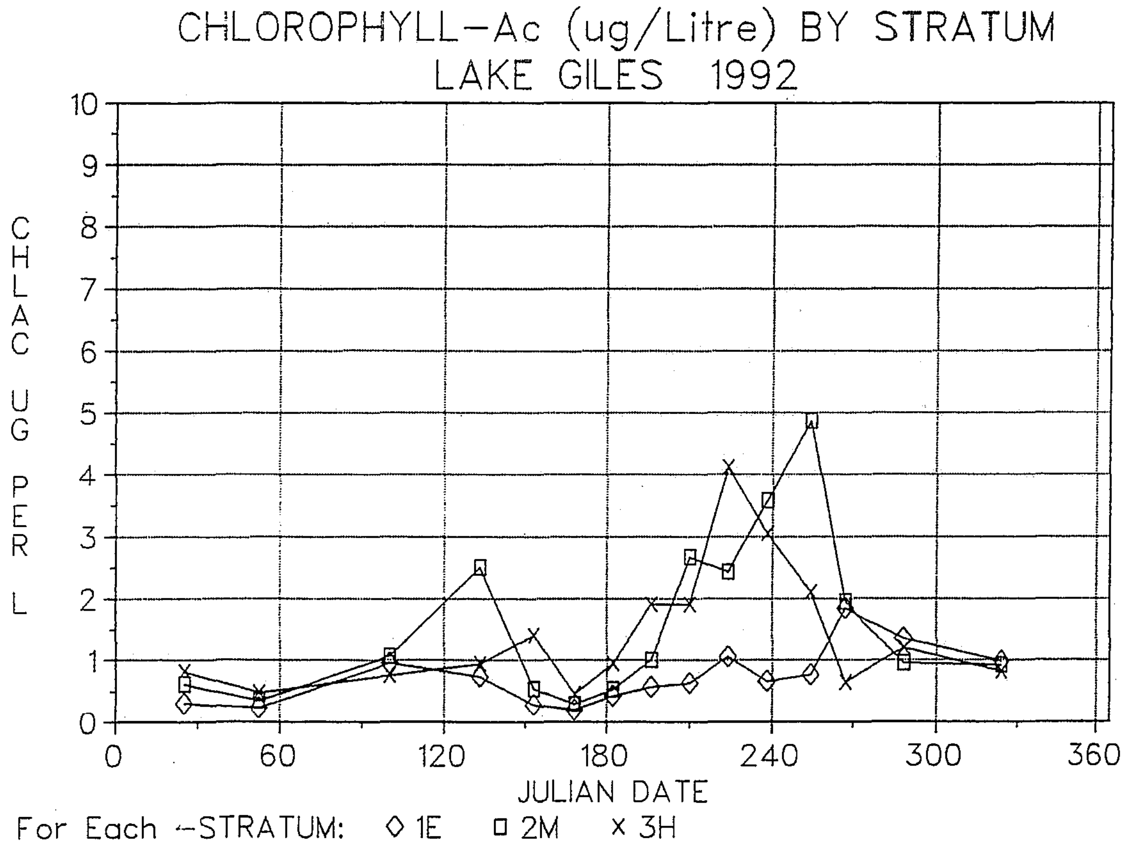


Figure 9. Trends of Chlorophyll-a in Lake Giles, 1992.

Values are plotted for the mid-depths of the three layers, Epilimnion (**1E**), Metalimnion (**2M**), and Hypolimnion (**3H**). In autumn and winter, when these layers are not developed, samples are collected as described in **RESULTS AND METHODS**. Chlorophyll-a values are corrected for pheopigments.

ZOOPLANKTON

Zooplankton receive a major emphasis in the PCLP program. These animals represent the key link between algal primary producers and fish populations. The intensity of grazing by herbivorous zooplankton strongly affects the kind of algae that dominate, and potentially can control (i.e. reduce) algal populations even in the face of abundant nutrient supply. Consequently the kinds and abundances of zooplankton have important implications for the perceived recreational quality of a lake.

Zooplankton were sampled at day and night, but only the nighttime data are presented here. Some species avoid the water column during the day. Zooplankton were collected with closing-style plankton nets that could be pulled through part of the water column open, collecting animals, then closed and pulled the rest of the way to the surface. In this way the water column was sampled as the three layers defined by temperature. In the present report, data are calculated as mean concentrations (numbers of individuals per liter) over the entire 23-m water column. Details of the depth-distributions, and daily patterns of vertical movement, are still being analyzed.

Two sizes of nets were used: a 30-cm diameter net with a mesh of 202 μm, for some macrozooplankton; and a 15-cm diameter Wisconsin-style net with a 48-μm mesh for microzooplankton as well as other macrozooplankton. These were mounted side-by-side in "bongo" configuration. Microzooplankton includes mainly rotifers, but some copepods and small Cladocera also were counted from these samples. Our counting strategy was somewhat different in 1991-92 from that used in 1989 or 1990, with *Chaoborus* and some copepods (e.g. cyclopoid males and copepodids) being counted from the 48-μm sample that had been counted from 202-μm samples in 1989-90 samples. This change was made to increase collection efficiency of forms (e.g. small instar *Chaoborus*, copepodids, male copepods, etc.) that were going through the 202-μm mesh net. Collections were duplicated for each depth range. Mean values are presented.

Seasonal trends in abundance are presented as a series of graphs for the most frequently encountered zooplankton, identified to genus and sometimes to species (**Figures 11-29**). **Table 1** lists the zooplankton identified to date. Several points can be highlighted:

(1) The herbivorous zooplankton were dominated by the cladoceran *Daphnia* (ca. 2-6/L in summer) and the calanoid copepod *Diaptomus minutus* (ca. 4-10 adults/L in summer). Another cladoceran, *Diaphanosoma*, was present at up to 2/L during late summer and early autumn. An additional calanoid, *Diaptomus spatulocrenatus*, was present in low numbers throughout most of the year, increasing to 4/L in fall and winter.

(2) Rotifers were present at low concentrations throughout the year (10-100/L). In 1991 they were generally less abundant than in previous years. This was especially true during the winter-spring peak (only ca. 40/L), for which the relative abundance of rotifers corresponded with that of algal chlorophyll-a (1990 > > 1991 > 1992). Rotifers decreased to minima in late spring and early fall (ca. 10-20/L). Individual species showed pronounced seasonality, but this was not always consistent among years. *Polyarthra* was the most common throughout the year, except for a pulse of *Gastropus* in early summer. The Giles rotifer assemblage is distinctly less diverse than those in the other PCLP lakes.

Table 1. Zooplankton species recorded from open-water samples in Lake Giles 1988-1992. Seasons of especially high or low abundance in 1992 are indicated

	Taxon	Seasonal Abundance in 1992 High	Low
Diptera			
**	*Chaoborus punctipennis*	Su	[F,W]
Cyclopoid Copepoda			
**	*Cyclops scutifer*		[F,W]
	Orthocyclops modestus (rare)		
Calanoid Copepoda			
	Diaptomus spp.		
**	*D. minutus*	late F,W,Sp	
*	*D. spatulocrenatus*	F,W	[Sp]
Cladocera			
	Chydorus sp. (rare)		
**	*Daphnia* spp.	late Sp	[late W]
	D. catawba		
*	*Diaphanosoma* sp.	late Su	[F,W,Sp]
	Leptodora kindtii		
	Polyphemus pediculus		
Rotifera			
*	*Ascomorpha* spp.	Su	[F,W,Sp]
	Collotheca spp. (rare)		
*	*Conochilus* spp.	Su	[W]
	Euchlanis parva (rare)		
**	*Gastropus* spp.	early Su	[W,Sp,F]
	G. hyptopus (?)		
	G. stylifer		
	Kellicottia sp. (rare)		
	K. longispina		
	K. bostonensis		
	Keratella spp.		
	K. hiemalis		
**	*K. taurocephala*	W,Sp,Su	[F]
	Lecane spp. (rare)		
	L. flexilis		
	L. ligona		
	L. luna		
	L. mira		
	L. tenuiseta		

Continued next page

Table 1. Zooplankton in Lake Giles, 1992 (continued).

	Taxon	Seasonal Abundance in 1992 High	Low
	Monommata spp. (rare)		
	Monostyla spp (rare)		
	M. copeis		
	Ploesoma spp. (rare)		
**	*Polyarthra* spp. ("large")	Sp,Su	[late Sp]
*	*Synchaeta* spp.	Su	
	Testudinella spp. (rare)		
	T. parva		
	Trichocerca spp. (rare)		
	T. multicrinis		
	T. pusilla		
	T. similis		

Abbreviations for seasons of maximal or [minimal] abundance:
W (winter), Sp (spring), Su (summer), F (fall).

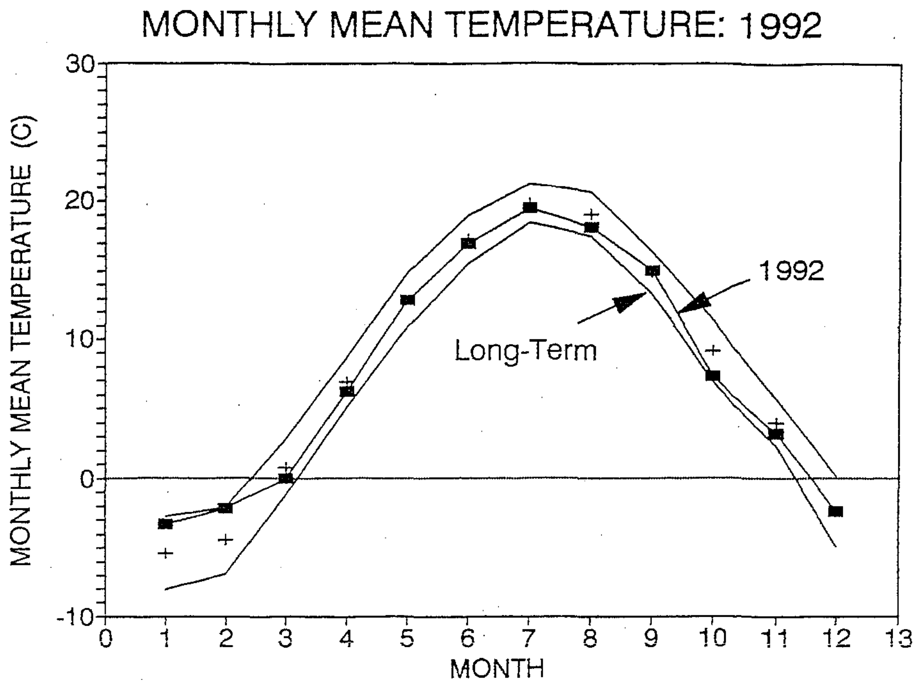
** Dominant species included in Figures.
* Other species included in Figures.

(3) Predatory macrozooplankton included *Cyclops scutifer*, which was a late spring and early summer species (adults at 0.5-1/L in May through July) and *Chaoborus punctipennis*, which was caught erratically at 0.05-0.35/L from June through August. Both of these predators were somewhat less common than in preceding years, perhaps a result of lower rotifer density.

(4) Unlike rotifers, the main herbivorous macrozooplankton have been at similar densities each year, even in the winter-spring period when chlorophyll-a concentrations have differed so much. *Daphnia catawba* and *Diaptomus minutus* have shown very similar seasonal patterns each year (again, unlike some of the common rotifers), and these patterns are similar to each other. Both populations are high in the spring, which is an important period of reproduction, and adults of both become less common during the summer. *Diaptomus*, however, remains abundant as copepodids during the summer. Adults of both species overwinter at intermediate densities, with little or no reproduction.

CLIMATE IN 1992

Weather data were again obtained from NOAA for the cooperator's station at Hawley, PA (ca. 20 km NW of Lake Giles). The monthly mean temperatures (monthly means of daily means) are plotted along with total monthly rainfall for 1992 versus the average of the last 31 years (**Figure 10**). After a relatively warm, dry winter, 1992 was a pretty normal year--in other words, distinctly cooler and wetter than 1991.



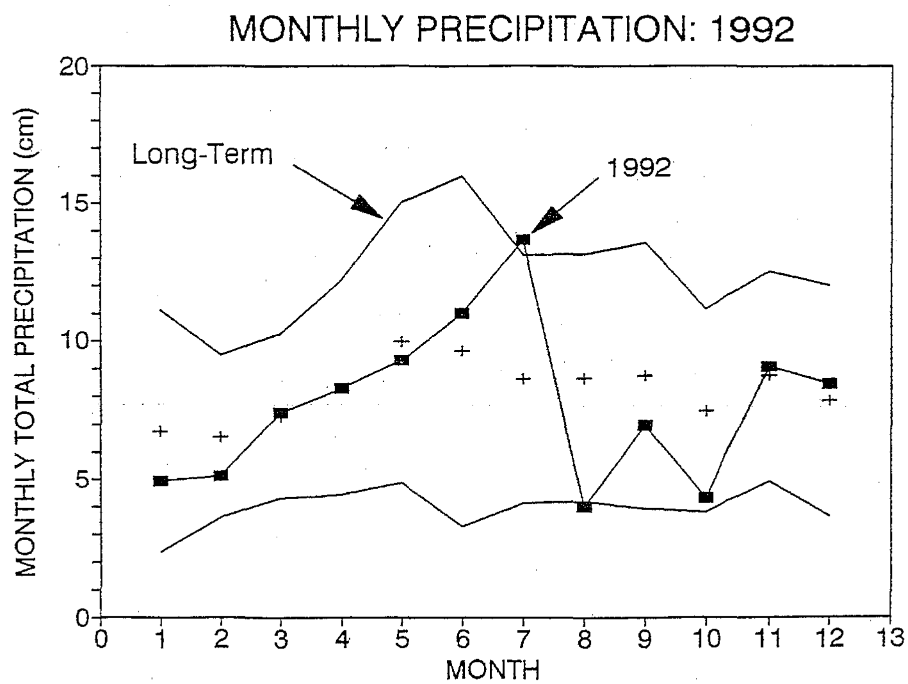


Figure 10. Monthly climate in 1992 compared to the 31-year averages.

(Top) Mean temperature (degrees Celsius). **(Bottom)** Monthly mean prcipitation (cm rain or thawed snow). Data are from the NOAA cooperator's station at Hawley, PA. Long-term values (+) are enclosed in an envelope defined by one standard deviation of the monthly values.

ZOOPLANKTON GRAPHS

The following graphs present water-column mean nighttime concentrations of the common zooplankton at the main sampling station. Each data point is calculated by weighting concentrations in the three layers (EPI, META, HYPO) on each date by the relative thickness of the layer at the station, which is in the deepest part of the lake. Two replicate samples were taken in quick succession.

The electronic database contains the component concentrations within the three layers, separate counts for the two replicates, and similarly complete data from the comparable daytime sampling.

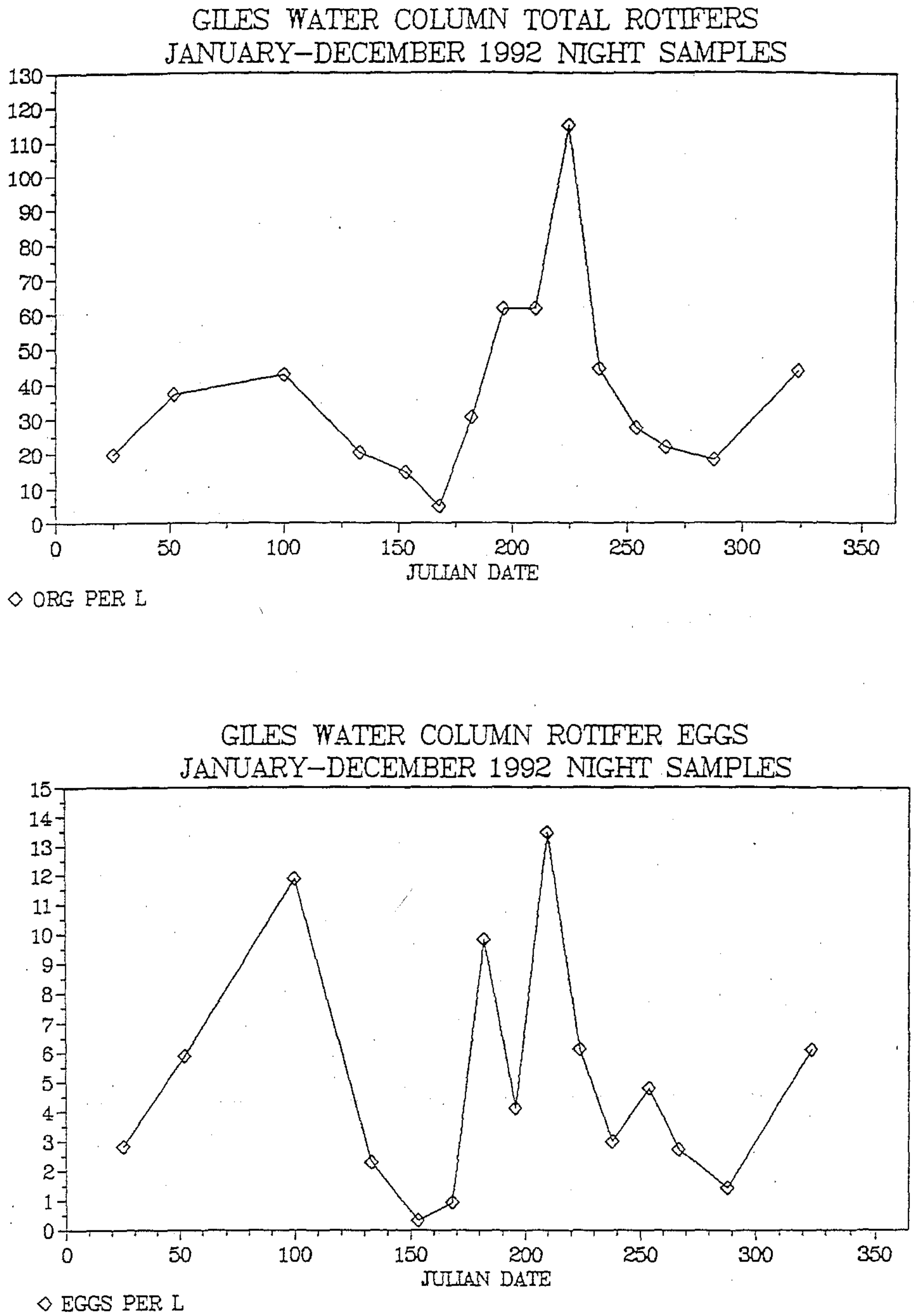
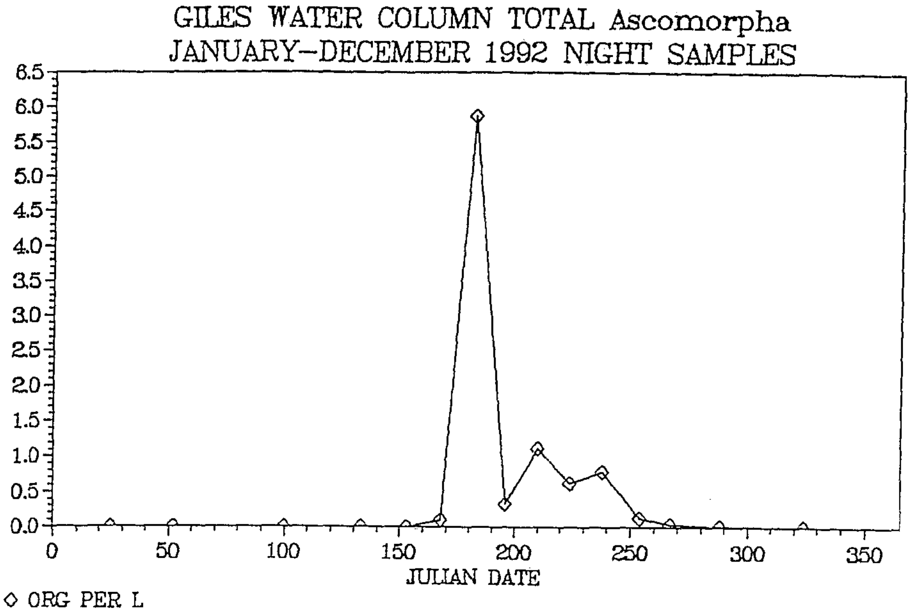


Figure 11. Rotifers in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** Rotifer eggs per liter.



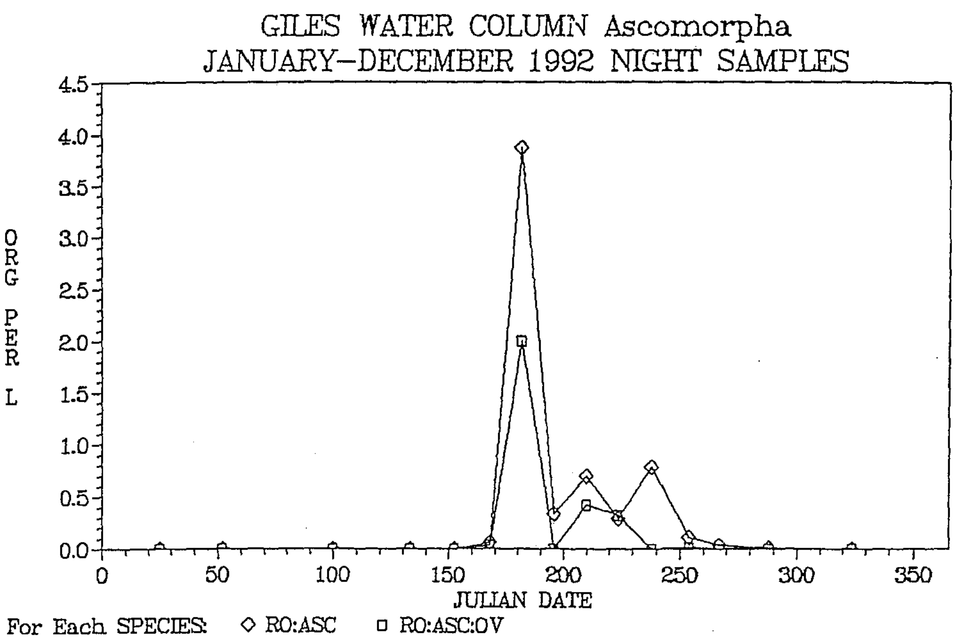
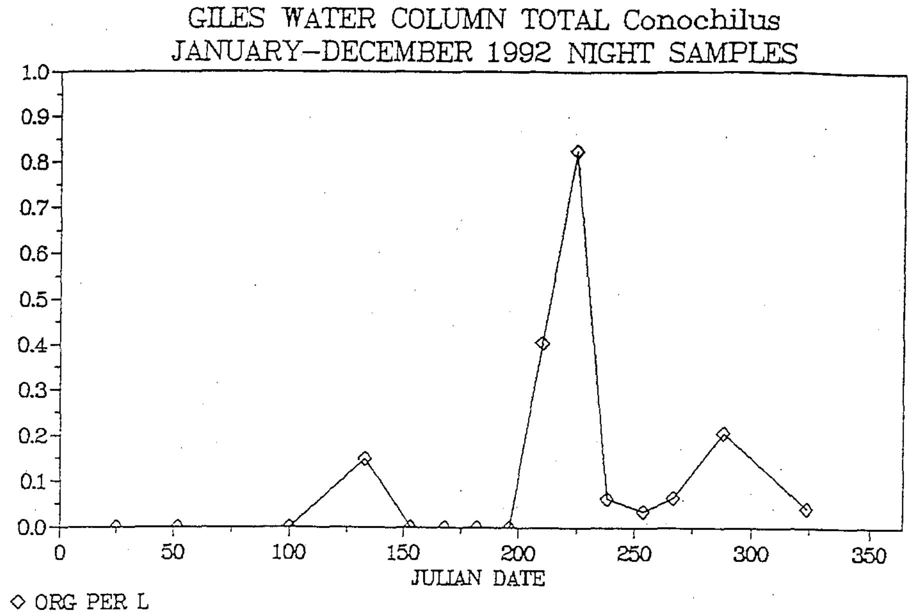


Figure 12. The rotifer *Ascomorpha* spp. in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** all species. **(Bottom)** *Ascomorpha* by species: **ASC** undifferentiated species, **OV** *A. ovalis*.



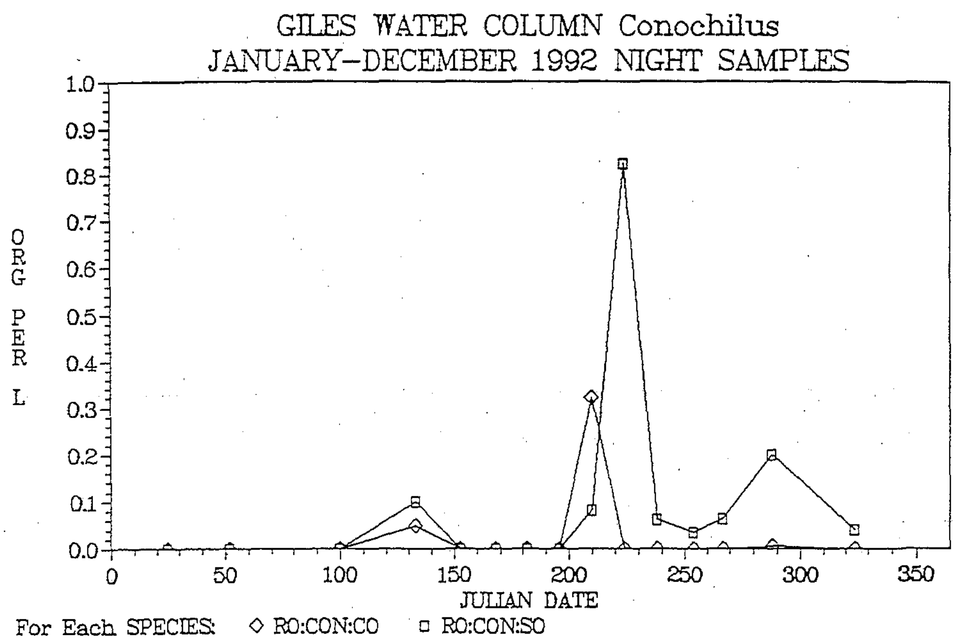
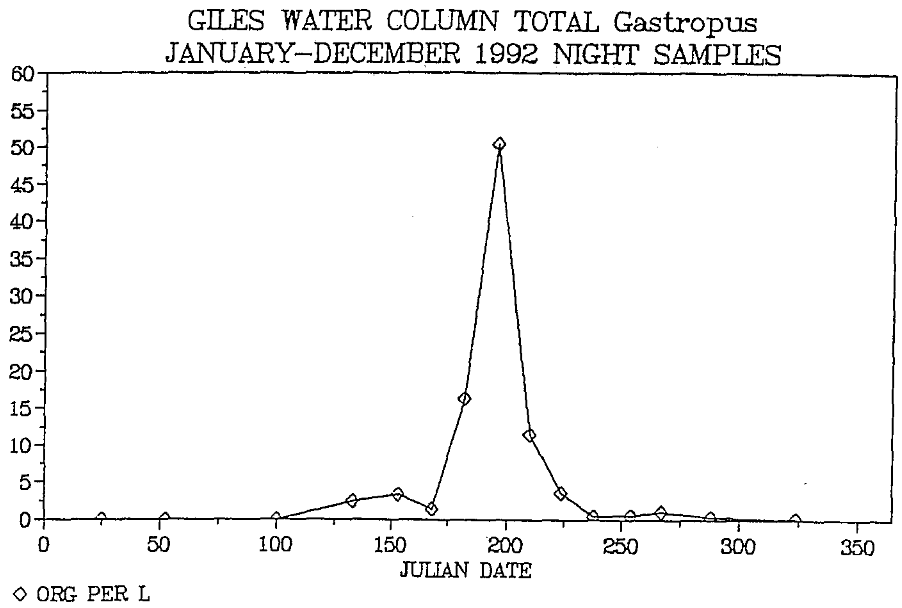


Figure 13. The rotifer *Conochilus* spp. in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** all forms. **(Bottom)** by forms: **CO** colonial, **(SO)** solitary.



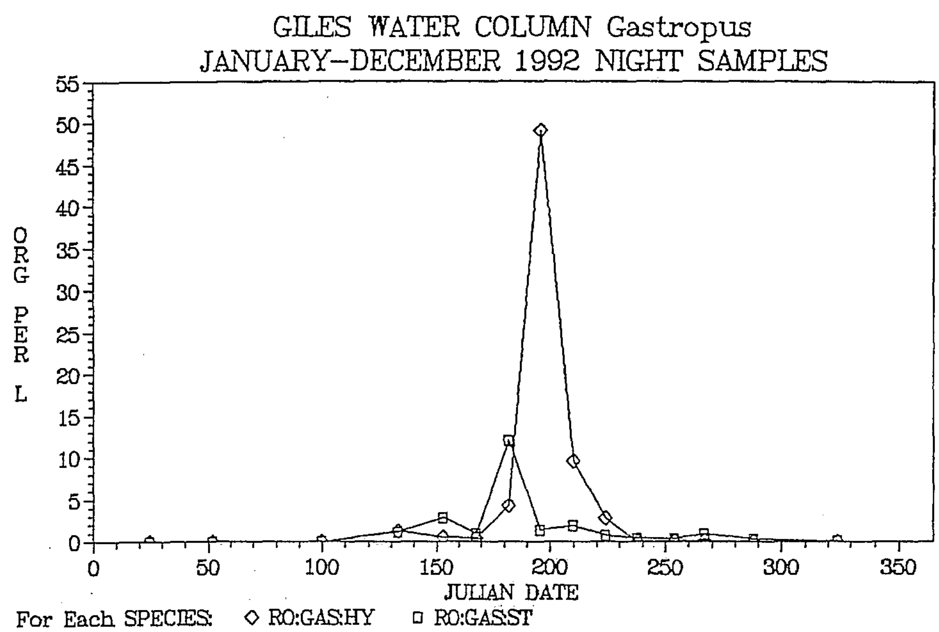
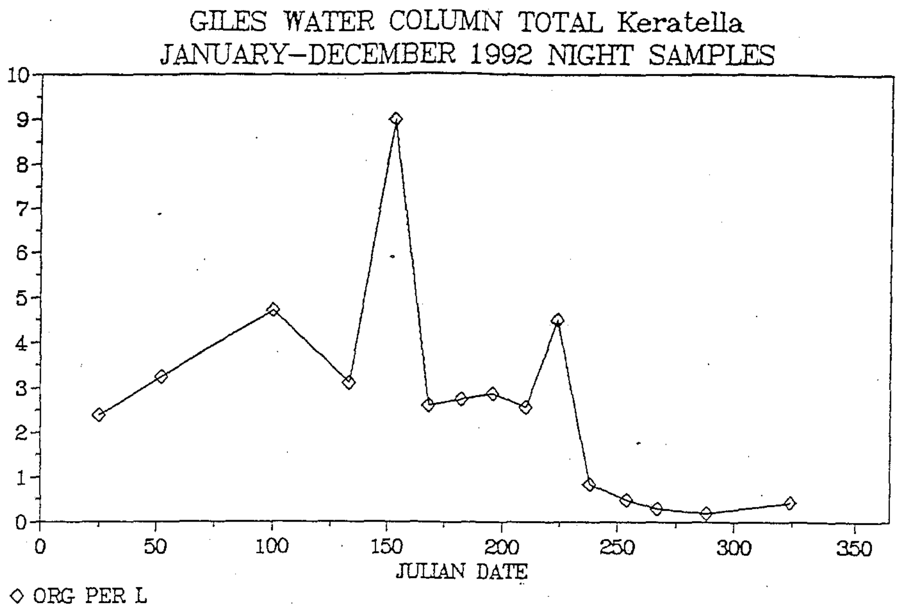


Figure 14. The rotifer *Gastropus* in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** all species. **(Bottom)** *Gastropus* by species: **HY** *G. hyptopus*, **ST** *G. stylifer*.



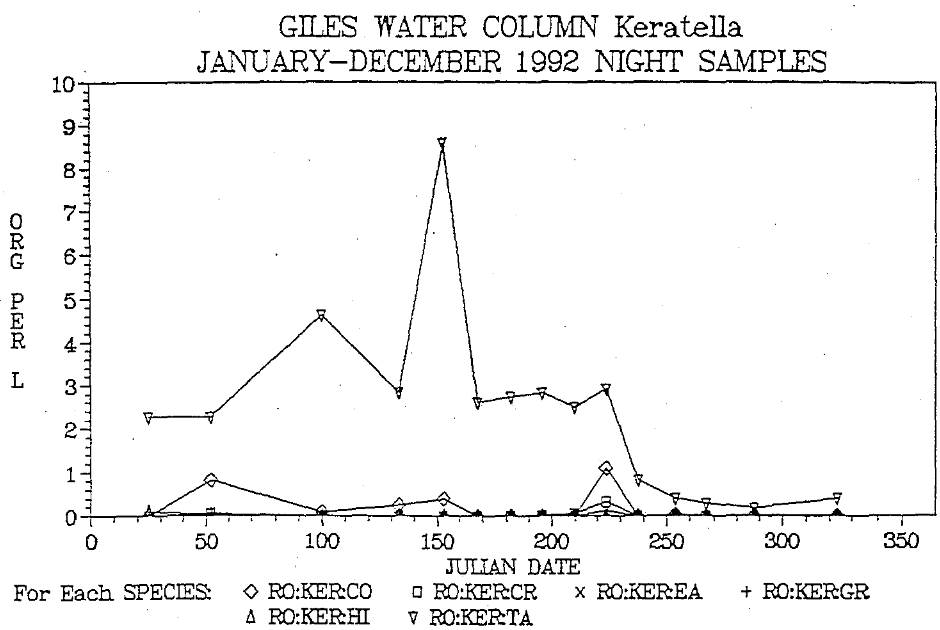
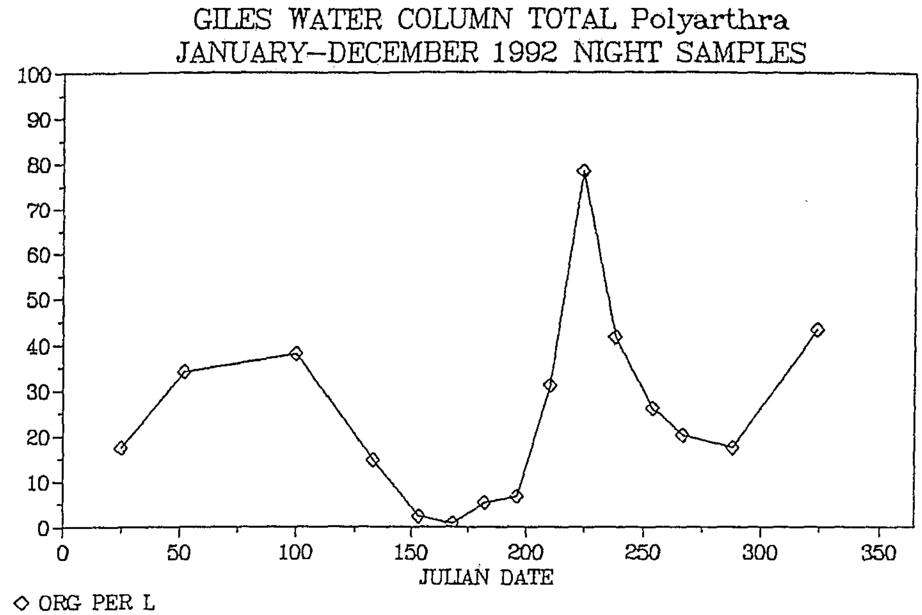


Figure 15. The rotifer *Keratella* spp. in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** *Keratella* by species: **CO** *K. cochlearis*, **CR** *K. crassa*, **EA** *K. earlinae*, **GR** *K. gracilenta*, **HI** *K. hiemalis*, **TA** *K. taurocephala*.



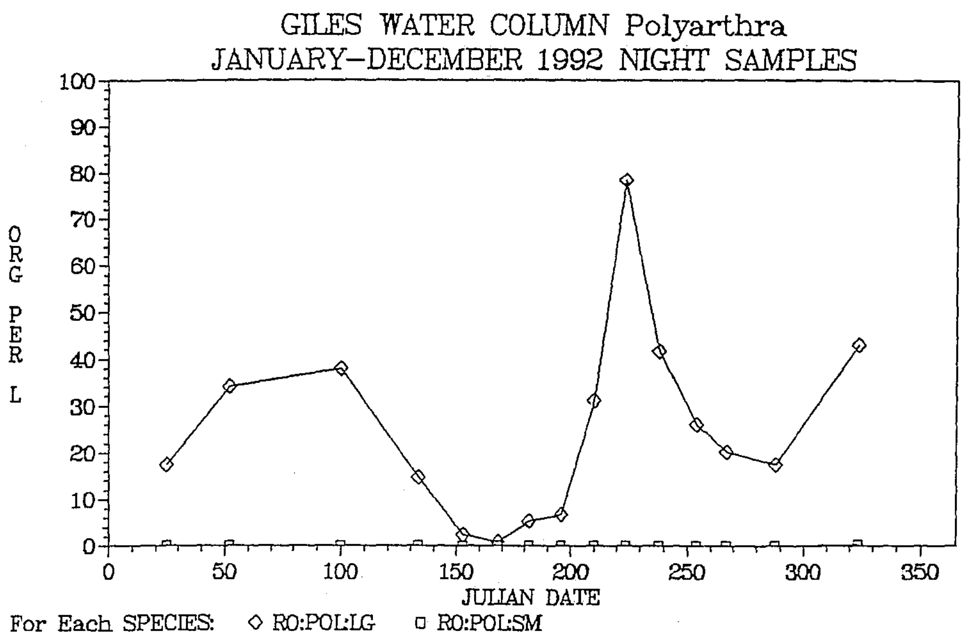


Figure 16. The rotifer *Polyarthra* spp. in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** *Polyarthra* by size classes: **LG** large and **SM** small.

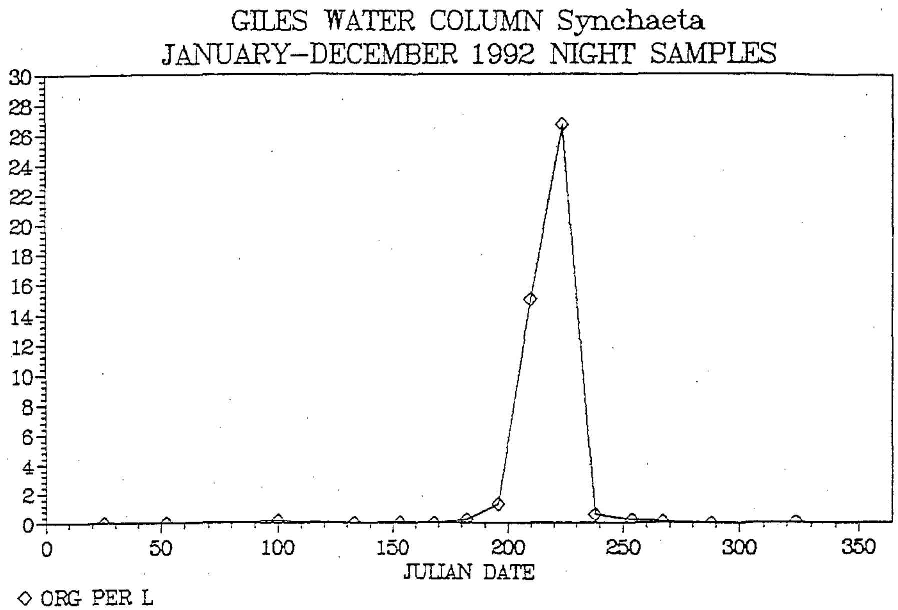


Figure 17. The rotifer *Synchaeta* spp. in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean.

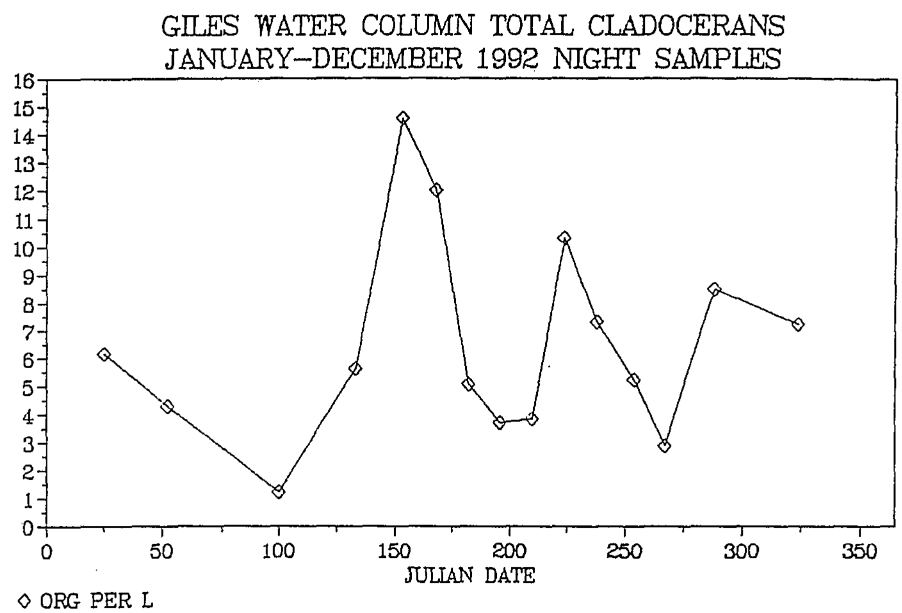
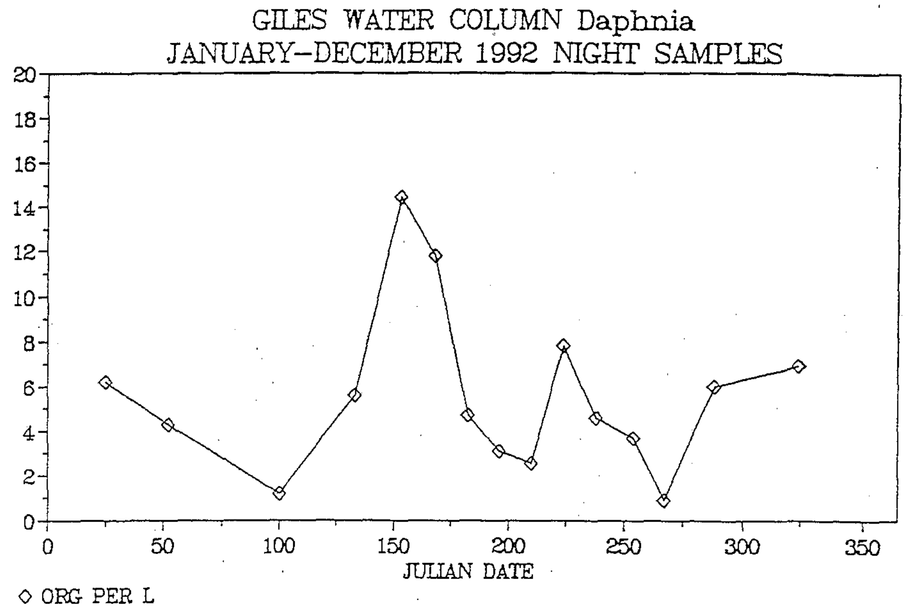


Figure 18. Cladocera in Lake Giles, 1992.

Nighttime net collections (202μm) from three depths have been combined to give a water column mean.



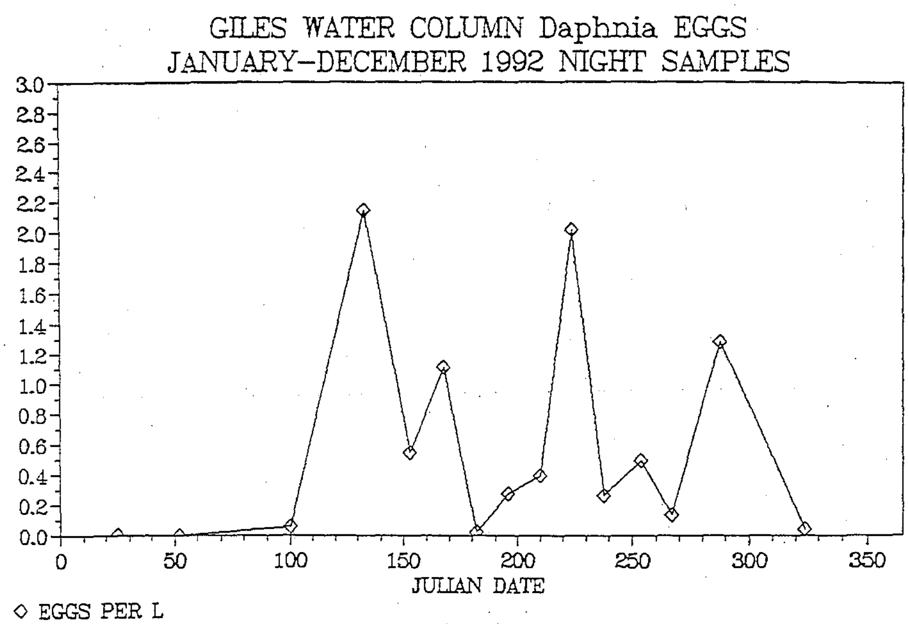
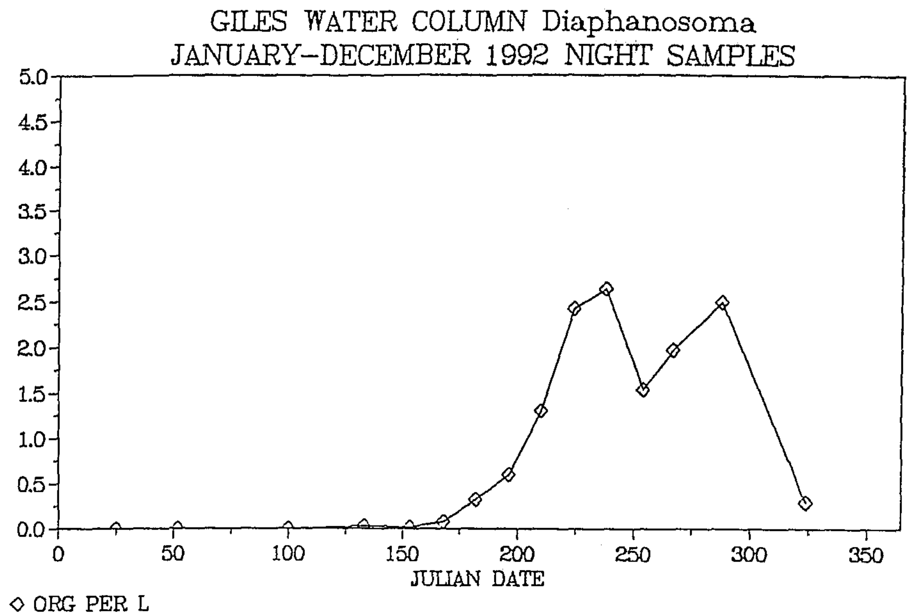


Figure 19. The cladoceran *Daphnia* spp. in Lake Giles, 1992.

Nighttime net collections (202μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** Total eggs per liter.



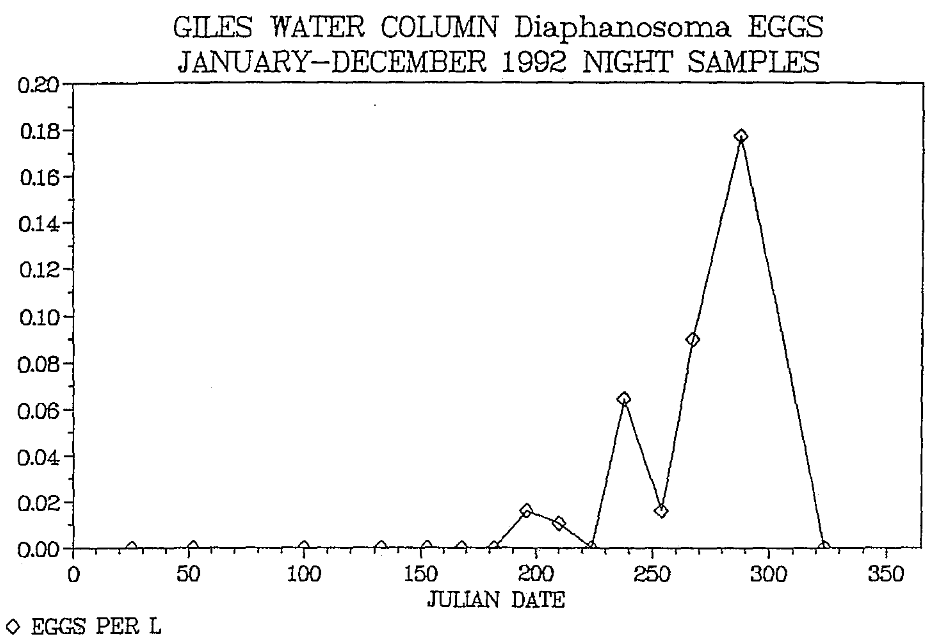


Figure 20. The cladoceran *Diaphanosoma* spp. in Lake Giles, 1992.

Nighttime net collections (202μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** Total eggs per liter.

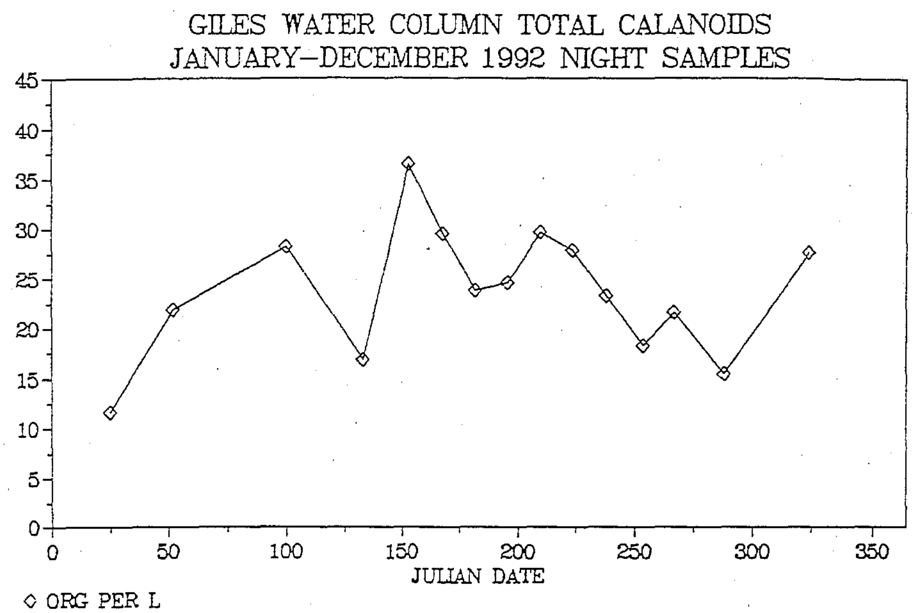


Figure 21. Calanoid copepods in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean.

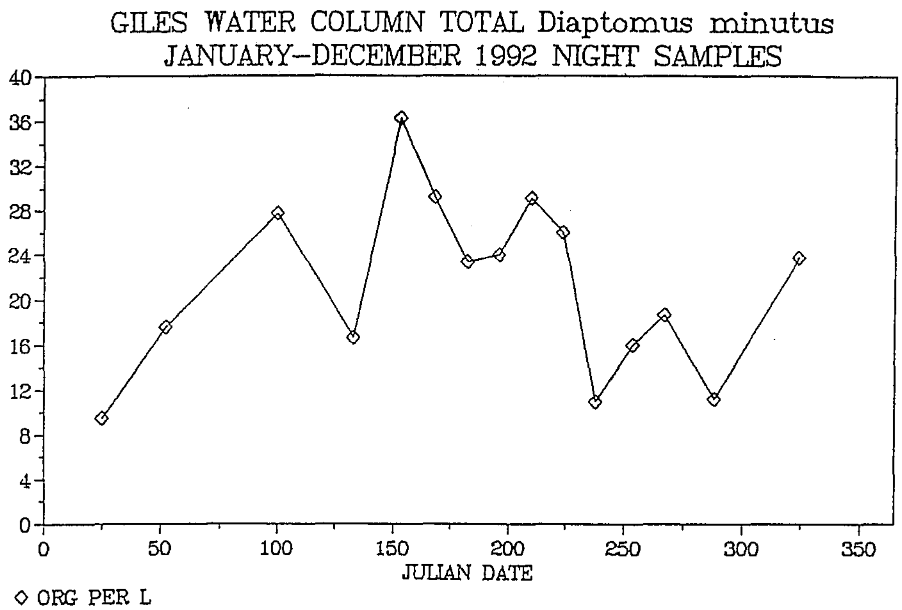
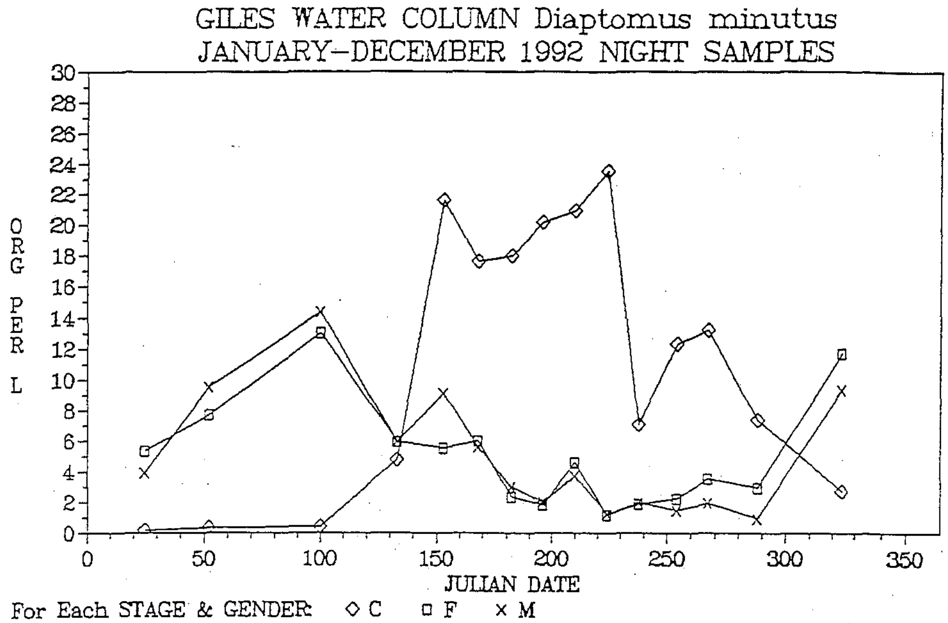


Figure 22. The calanoid copepod *Diaptomus minutus* in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. Concentrations are total individuals per liter (excluding nauplii).



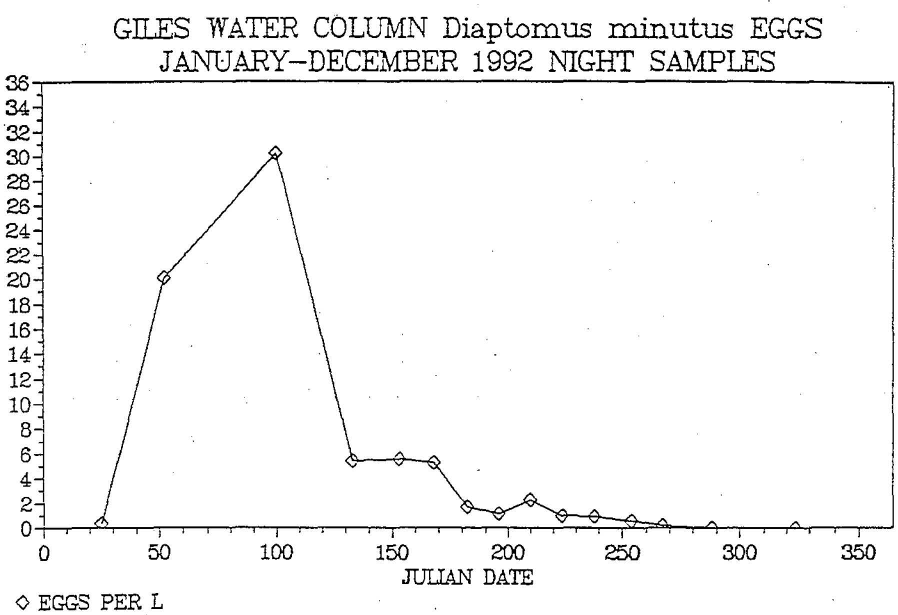


Figure 23. The calanoid copepod *Diaptomus minutus* in Lake Giles, 1992, by stage and gender.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Adults (males and females separately) and copepodids. **(Bottom)** *D. minutus* eggs per liter.

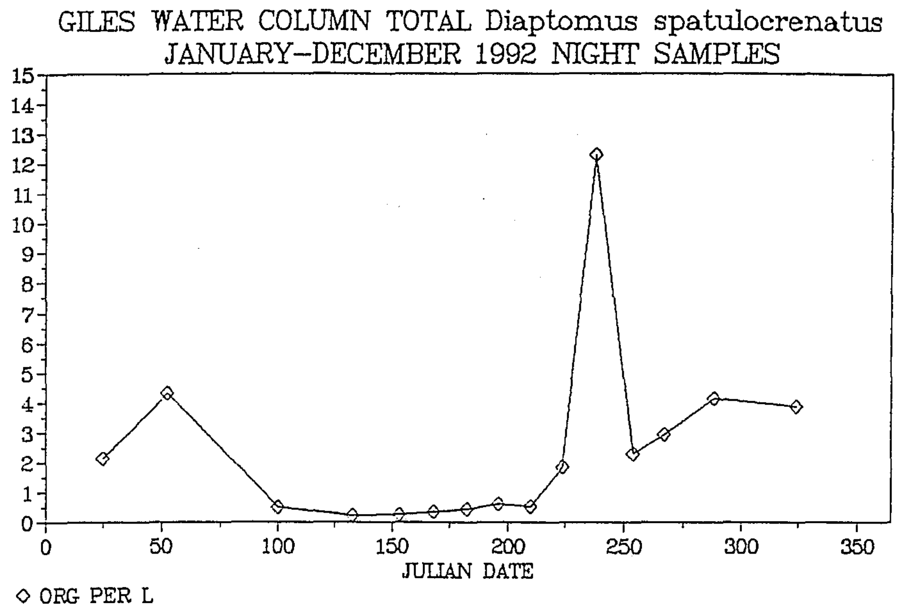
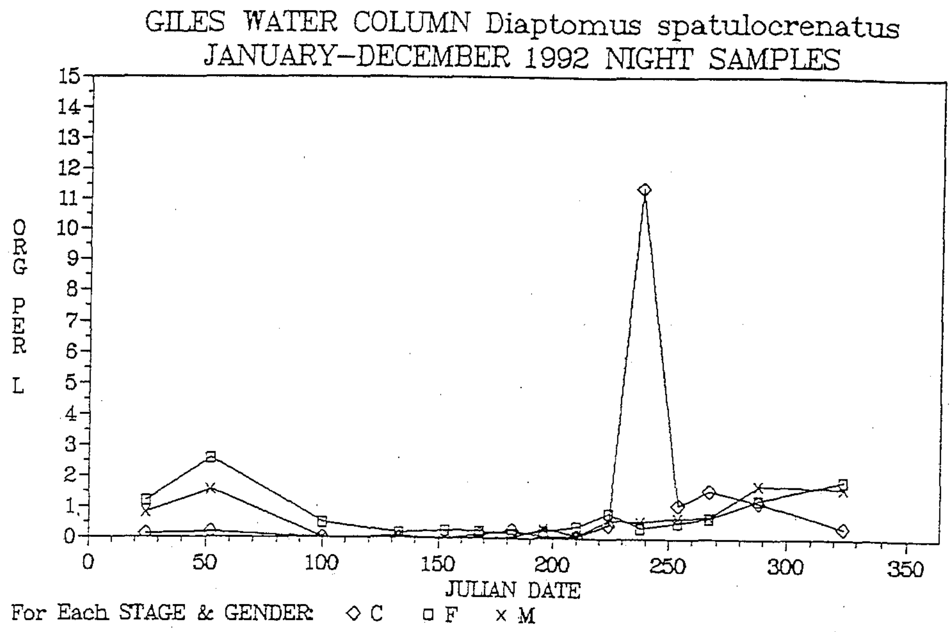


Figure 24. The calanoid copepod *Diaptomus spatulocrenatus* in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. Concentrations are total individuals per liter (excluding nauplii).



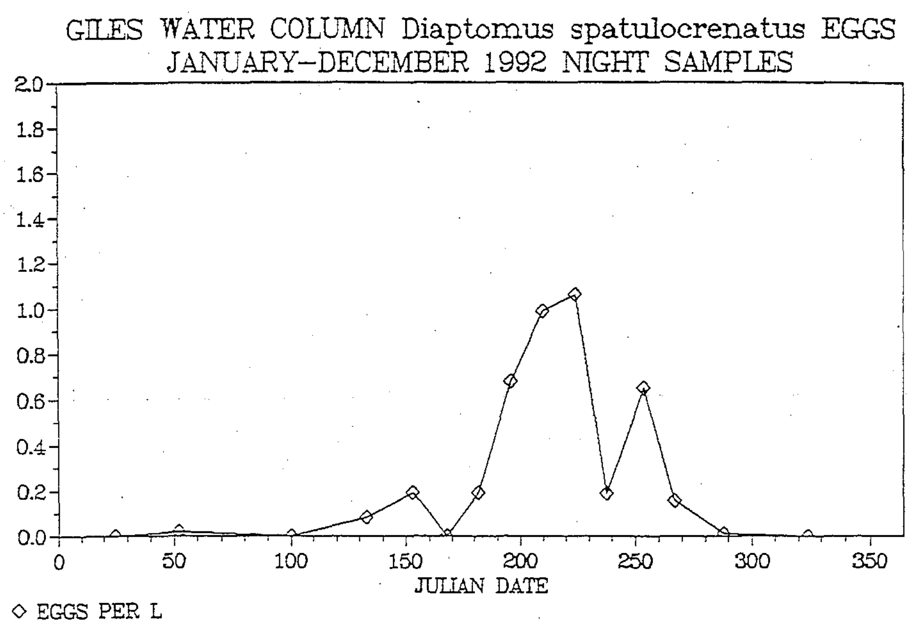


Figure 25. The calanoid copepod *Diaptomus spatulocrenatus* in Lake Giles, 1992, by stage and gender.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Adults (males and females separately) and copepodids. **(Bottom)** *D. spatulocrenatus* eggs per liter.

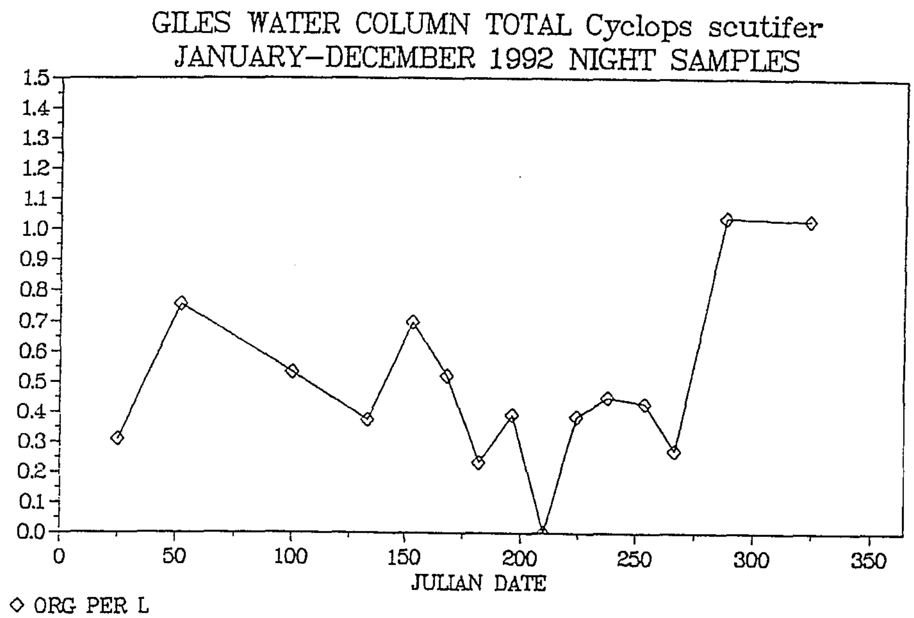
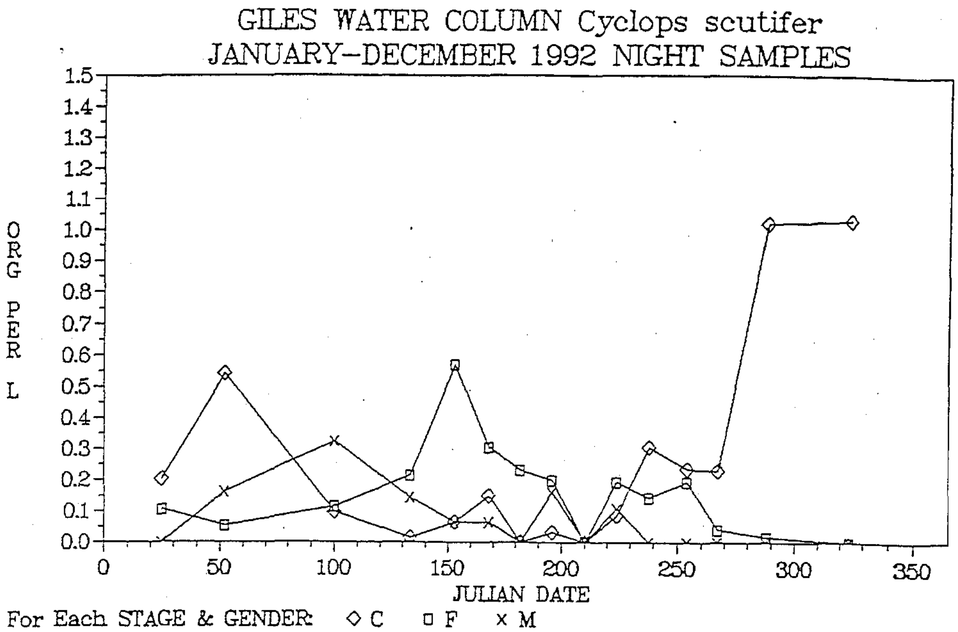


Figure 26. The cyclopoid copepod *Cyclops scutifer* in Lake Giles, 1992.

Nighttime net collections from three depths have been combined to give a water column mean. Total individuals per liter, excluding nauplii. Adult females were collected with a 202μm net, males and copepodids with the 48μm net.



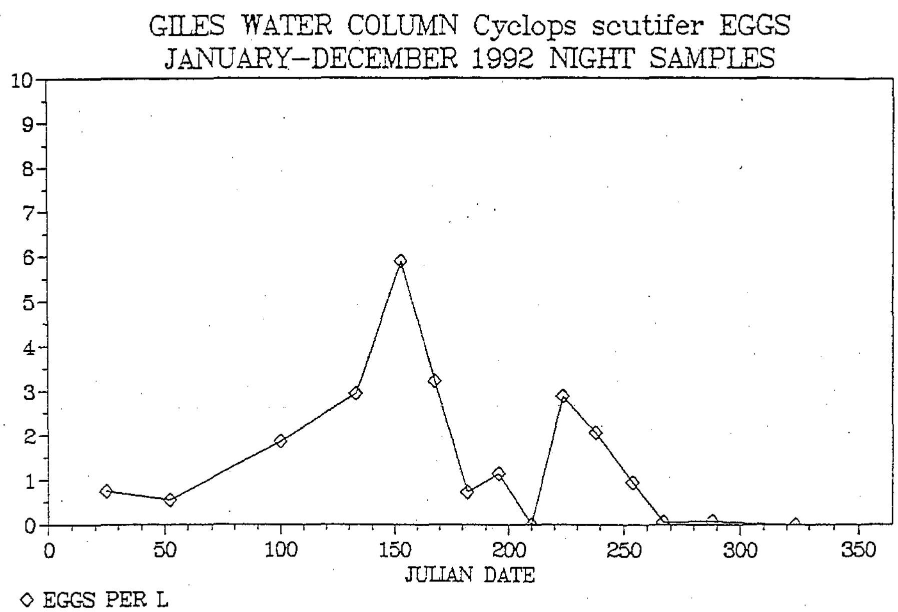


Figure 27. The cyclopoid copepod *Cyclops scutifer* in Lake Giles, 1992, by stage and gender.

Nighttime net collections from three depths have been combined to give a water column mean. **(Top)** Adults (males and females separately) and copepodids. Adult females were collected with a 202μm net, males and copepodids with the 48μm net. **(Bottom)** *C. scutifer* eggs per liter.

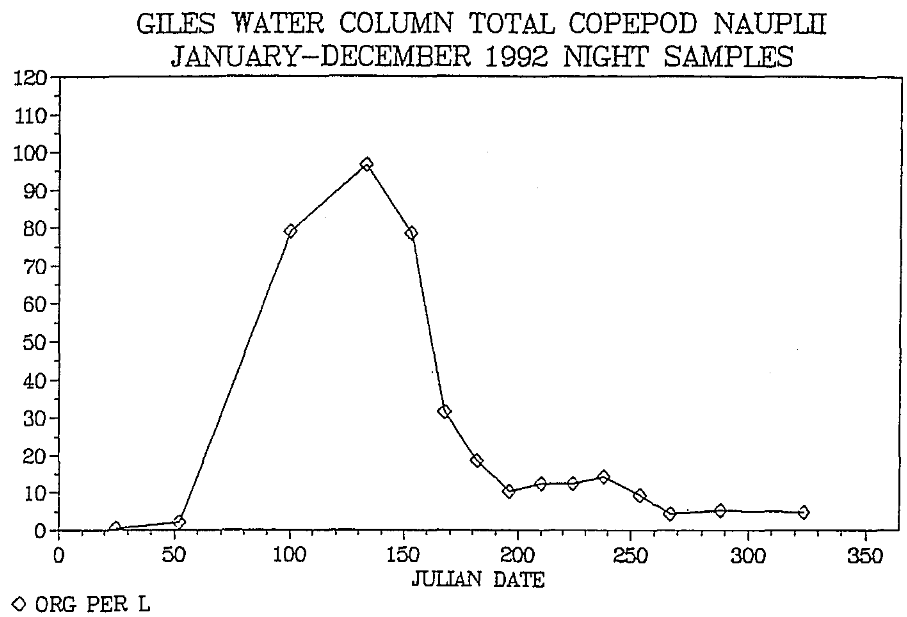


Figure 28. Total copepod nauplii in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. Nauplii of calanoid and cyclopoid species were not differentiated.

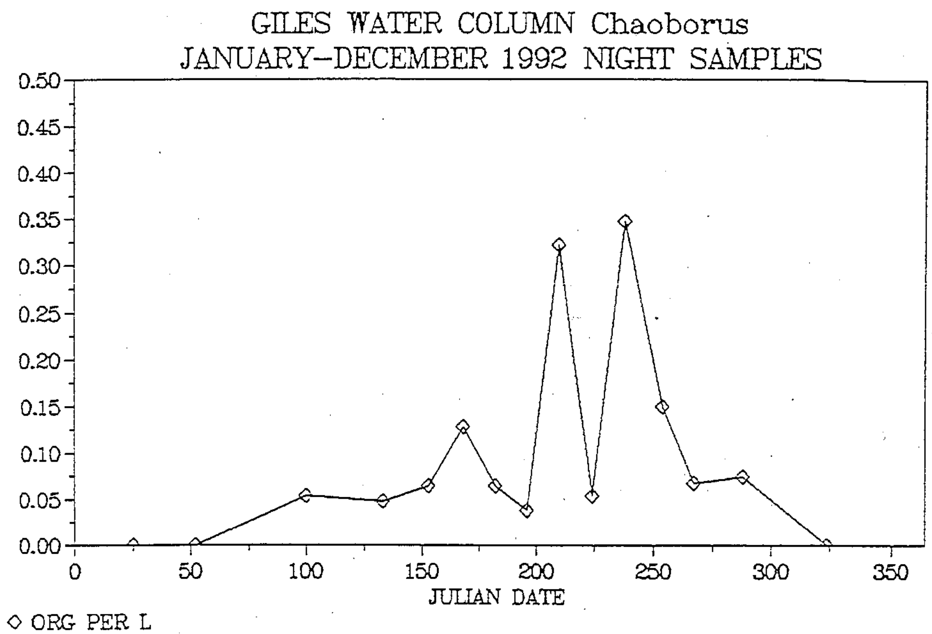


Figure 29. The dipteran *Chaoborus* spp. in Lake Giles, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean.

EXPLANATION OF DATA TABLES

The following 15 tables present the physical/chemical information acquired on each date in 1992. The headings, abbreviations, and analytical units are explained here.

DATE OF SAMPLE: Date of the daytime visit, as month/day/year.

JULIAN DATE: Day of the year, from 1-365.

TIME: Approximate mid-time of sampling, 24-hr clock in decimal format (e.g. 1:30 PM is "13.50").

SECCHI M: Secchi depth in metres (m).

WEATHER: Brief comments on weather, especially cloudiness.

PERSONNEL: Initials of sampling crew (see names below).

TMETHOD: Temperature method #10 (see **METHODS AND RESULTS**).

LMETHOD: Light method #12 (see **METHODS AND RESULTS**).

AMETHOD: Alkalinity method #11 (see **METHODS AND RESULTS**).

OMETHOD: Oxygen method #10 (see **METHODS AND RESULTS**).

PHMETHOD: pH method #12 (see **METHODS AND RESULTS**).

CAMETHOD: Chlorophyll-a method #12 (see **METHODS AND RESULTS**).

COMMENTS: Notes on unusual procedures, also ice thickness.

DATE OF: Date of sample (month/day/year).

JULIAN: Julian date.

STRA: Stratum or layer: **S** (air above surface), **E** (epilimnion), **M**(metalimnion), **H** (hypolimnion).

REP: Replicate (1 or 2); Replicates were usually analyzed for pH, alkalinity, chlorophyll--other data are merely repeated on rep 2 line for convenience in graphing.

DEPTH: Depth of sample (metres); **-1** for air above surface.

TEMP C: Temperature in degrees Celsius (°C).

OXYGEN: Dissolved oxygen (mg per litre--not corrected for elevation).

OFLAG:	Error flag for oxygen
LIGHT PC:	Light as percent of intensity at 0.1-m depth.
pH:	pH.
ALKAL:	Alkalinity as microequivalents per litre (μeq/L).
CHLAC:	Chlorophyll-a, corrected for pheopigments (μg/L).
CHLASUM:	Chlorophyll-a, including pheopigments (μg/L).
CHLAC P:	Percentage of CHLAC passing 22-μm net.

Names of Sampling Personnel:

KHA	Kurt Andersson
SKM	Shannon McGinnis
JM	Jeanette Miller
REM	Robert Moeller
EMN	Gina Novak
SR	Stan Rose
JSS	Jennifer Seva
BKS	Brian Sharer
ET	Elaine
TLV	Tim Vail
NKW	Narissa Willever

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 1/25/92 JULIAN DATE: 25 TIME: 15.42

SECCHI M: 11.3 WEATHER: Slight overcast

PERSONNEL: EMN TLV

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: 20 cm ice cover (no snow)--No ice cover until 1 week ago

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
1/25/92	25	S	1	-1.0	0.5								
1/25/92	25		1	0.0	1.2	13.28		100.0000					
1/25/92	25	E	1	1.0	1.3	12.09		56.0538	5.44	-8	0.31	0.49	
1/25/92	25	E	2	1.0	1.3	12.09		56.0538	5.35	-6	0.30	0.51	93.30
1/25/92	25		1	2.0	1.3	11.98		46.7505					
1/25/92	25		1	3.0	1.4	11.98		37.2811					
1/25/92	25		1	4.0	1.4	11.86		29.5179					
1/25/92	25		1	5.0	1.4	11.84		23.5578					
1/25/92	25	M	1	6.0	1.4	11.77		18.9067	5.37	-8	0.61	0.98	
1/25/92	25	M	2	6.0	1.4	11.77		18.9067	5.36	-7	0.52	0.77	92.30
1/25/92	25		1	7.0	1.4	11.73		15.1133					
1/25/92	25		1	8.0	1.4	11.73		12.1100					
1/25/92	25		1	9.0	1.4	11.76		9.7191					
1/25/92	25		1	10.0	1.5	11.73		7.7940					
1/25/92	25		1	11.0	1.6	11.69		6.2502					
1/25/92	25		1	12.0	1.7	11.68		4.9802					
1/25/92	25		1	13.0	1.9	11.48		3.9810					
1/25/92	25		1	14.0	1.9	11.38		3.1950					
1/25/92	25		1	15.0	1.9	11.38		2.5746					
1/25/92	25		1	16.0	2.0	11.34		2.0813					
1/25/92	25	H	1	17.0	2.0	11.27		1.6894	5.34	-5	0.82	1.18	
1/25/92	25	H	2	17.0	2.0	11.27		1.6894	5.35	-6	0.56	0.83	94.60
1/25/92	25		1	18.0	2.0	11.26		1.3723					
1/25/92	25		1	19.0	2.0	11.14		1.1175					
1/25/92	25		1	20.0	2.0	11.22							
1/25/92	25		1	21.0	2.1	11.12							
1/25/92	25		1	22.0	2.1	10.83							
1/25/92	25		1	23.0	2.6	4.68							

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 2/21/92 JULIAN DATE: 52 TIME: 15.50

SECCHI M: 14.3 WEATHER: Sunny

PERSONNEL: REM TLV

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: 25 cm ice cover--heavily candled; no snow

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
2/21/92	52	S	1	-1.0	8.1								
2/21/92	52		1	0.0	2.1	12.42		100.0000					
2/21/92	52	E	1	1.0	2.5	12.25		39.2200	5.28	-5	0.22	0.34	
2/21/92	52	E	2	1.0	2.5	12.25		39.2200	5.26	-6	0.24	0.36	91.70
2/21/92	52		1	2.0	2.5	12.16		31.3700					
2/21/92	52		1	3.0	2.5	12.12		25.0200					
2/21/92	52		1	4.0	2.5	12.09		19.5900					
2/21/92	52		1	5.0	2.5	12.03		15.0000					
2/21/92	52	M	1	6.0	2.5	11.97		11.7900	5.31	-6	0.39	0.62	
2/21/92	52	M	2	6.0	2.5	11.97		11.7900	5.29	-5	0.30	0.46	90.00
2/21/92	52		1	7.0	2.5	11.96		9.5600					
2/21/92	52		1	8.0	2.5	11.90		7.5970					
2/21/92	52		1	9.0	2.5	11.91		5.9720					
2/21/92	52		1	10.0	2.5	11.86		4.7700					
2/21/92	52		1	11.0	2.5	11.87		3.7620					
2/21/92	52		1	12.0	2.5	11.87		3.0610					
2/21/92	52		1	13.0	2.5	11.84		2.4260					
2/21/92	52		1	14.0	2.5	11.81		1.9300					
2/21/92	52		1	15.0	2.5	11.76		1.5730					
2/21/92	52		1	16.0	2.5	11.63		1.2570					
2/21/92	52	H	1	17.0	2.5	11.52		0.9990	5.29	-6	0.48	0.73	
2/21/92	52	H	2	17.0	2.5	11.52		0.9990	5.28	-4	0.36	0.62	80.60
2/21/92	52		1	18.0	2.6	11.36		0.8000					
2/21/92	52		1	19.0	2.7	11.02		0.6360					
2/21/92	52		1	20.0	2.7	11.03		0.5090					
2/21/92	52		1	21.0	2.7	10.32		0.4080					
2/21/92	52		1	22.0	2.9	10.02		0.3210					
2/21/92	52		1	23.0	3.2								

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 4/09/92 JULIAN DATE: 100 TIME: 11.33

SECCHI M: 10.5 WEATHER: Mostly overcast

PERSONNEL: EMN TLV BKS

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: No March sampling (treacherous ice); ice out late March

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
4/09/92	100	S	1	-1.0	9.0								
4/09/92	100		1	0.0	4.0	12.94		100.0000					
4/09/92	100		1	1.0	4.0	12.88		73.7463					
4/09/92	100		1	2.0	4.0	12.73		59.2340					
4/09/92	100		1	3.0	4.0	12.69		48.7924					
4/09/92	100	E	1	4.0	3.9	12.58		41.1750	5.30	-6	0.95	0.95	
4/09/92	100	E	2	4.0	3.9	12.58		41.1750	5.31	-5	0.78	0.79	71.80
4/09/92	100		1	5.0	3.9	12.53		34.0571					
4/09/92	100		1	6.0	3.9	12.51		27.9845					
4/09/92	100		1	7.0	3.9	12.48		22.5318					
4/09/92	100		1	8.0	3.9	12.46		18.5906					
4/09/92	100		1	9.0	3.9	12.43		14.8487					
4/09/92	100		1	10.0	3.9	12.40		12.2111					
4/09/92	100	M	1	11.0	3.9	12.43		9.7145	5.32	-8	1.07	1.07	
4/09/92	100	M	2	11.0	3.9	12.43		9.7145	5.31	-5	0.63	0.70	87.30
4/09/92	100		1	12.0	3.9	12.40		7.8469					
4/09/92	100		1	13.0	3.9	12.38		6.4744					
4/09/92	100		1	14.0	3.8	12.38		5.3199					
4/09/92	100		1	15.0	3.8	12.38		4.3181					
4/09/92	100		1	16.0	3.8	12.36		3.5628					
4/09/92	100		1	17.0	3.8	12.37		2.8709					
4/09/92	100	H	1	18.0	3.8	12.37		2.3707	5.33	-4	0.75	0.84	
4/09/92	100	H	2	18.0	3.8	12.37		2.3707	5.32	-7	0.53	0.62	84.90
4/09/92	100		1	19.0	3.8	12.36		1.9368					
4/09/92	100		1	20.0	3.7	12.33		1.5915					
4/09/92	100		1	21.0	3.7	12.33		1.2971					
4/09/92	100		1	22.0	3.7	12.30		1.0376					

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 5/12/92 JULIAN DATE: 133 TIME: 11.83

SECCHI M: 11.5 WEATHER: Sunny, breezy

PERSONNEL: TLV BKS

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS:

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
5/12/92	133	S	1	-1.0	24.2								
5/12/92	133		1	0.0	13.2	10.84		100.0000					
5/12/92	133		1	1.0	12.8	10.80		74.2390					
5/12/92	133		1	2.0	12.5	10.83		56.0718					
5/12/92	133	E	1	3.0	12.2	11.00		44.9293	5.37	1	0.73	0.80	
5/12/92	133	E	2	3.0	12.2	11.00		44.9293	5.32	-13	0.52	0.58	42.30
5/12/92	133		1	4.0	11.7	11.12		38.9336					
5/12/92	133		1	5.0	11.2	11.32		33.1914					
5/12/92	133		1	6.0	9.5	12.40		26.7242					
5/12/92	133	M	1	7.0	8.0	12.93		19.9285	5.35	-10	2.50	2.50	
5/12/92	133	M	2	7.0	8.0	12.93		19.9285	5.35	-9	1.89	1.89	36.00
5/12/92	133		1	8.0	7.4	13.05		15.1663					
5/12/92	133		1	9.0	6.4	13.16		12.1040					
5/12/92	133		1	10.0	6.0	13.16		9.7299					
5/12/92	133		1	11.0	5.7	13.18		7.8152					
5/12/92	133		1	12.0	5.5	13.14		6.3487					
5/12/92	133		1	13.0	5.3	13.13		5.1615					
5/12/92	133		1	14.0	5.1	13.04		4.0997					
5/12/92	133	H	1	15.0	5.0	13.04		3.2615	5.34	-10	0.94	1.17	
5/12/92	133	H	2	15.0	5.0	13.04		3.2615	5.33	-10	0.71	0.90	62.00
5/12/92	133		1	16.0	5.0	13.02		2.5803					
5/12/92	133		1	17.0	4.9	12.96		2.0301					
5/12/92	133		1	18.0	4.8	12.83		1.6385					
5/12/92	133		1	19.0	4.7	12.77		1.3077					
5/12/92	133		1	20.0	4.6	12.49		1.0248					
5/12/92	133		1	21.0	4.5	11.63		0.7889					
5/12/92	133		1	22.0	4.5	11.54		0.5734					
5/12/92	133		1	23.0	4.5		10						

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 6/01/92 JULIAN DATE: 153 TIME: 11.42

SECCHI M: 14.6 WEATHER: Mostly overcast, slight wind

PERSONNEL: EMN TLV KHA

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS:

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
6/01/92	153	S	1	-1.0	15.7								
6/01/92	153		1	0.0	14.2	10.05		100.0000					
6/01/92	153		1	1.0	14.1	9.72		54.8847					
6/01/92	153		1	2.0	14.1	9.72		51.3902					
6/01/92	153	E	1	3.0	14.1	9.62		46.7184	5.30	-6	0.30	0.35	
6/01/92	153	E	2	3.0	14.1	9.62		46.7184	5.37	-8	0.26	0.29	92.00
6/01/92	153		1	4.0	14.1	9.65		41.3803					
6/01/92	153		1	5.0	14.1	9.63		34.8613					
6/01/92	153		1	6.0	13.2	10.26		28.5748					
6/01/92	153		1	7.0	10.9	10.38		23.9320					
6/01/92	153	M	1	8.0	9.5	12.81		20.2814	5.36	-8	0.58	0.73	
6/01/92	153	M	2	8.0	9.5	12.81		20.2814	5.34	-8	0.49	0.65	61.20
6/01/92	153		1	9.0	8.3	12.87		17.0003					
6/01/92	153		1	10.0	7.6	13.03		14.2024					
6/01/92	153		1	11.0	7.1	13.19		11.6318					
6/01/92	153		1	12.0	6.7	13.12		9.6690					
6/01/92	153		1	13.0	6.3	13.24		7.9711					
6/01/92	153		1	14.0	5.9	13.25		6.5768					
6/01/92	153		1	15.0	5.7	13.15		5.4175					
6/01/92	153	H	1	16.0	5.4	13.14		4.4333	5.37	-8	1.41	1.73	
6/01/92	153	H	2	16.0	5.4	13.14		4.4333	5.35	-8	1.15	1.62	78.30
6/01/92	153		1	17.0	5.2	12.98		3.5410					
6/01/92	153		1	18.0	5.1	12.68		2.8579					
6/01/92	153		1	19.0	5.0	12.48		2.2398					
6/01/92	153		1	20.0	4.9	12.19		1.7706					
6/01/92	153		1	21.0	4.9	11.79		1.3952					
6/01/92	153		1	22.0	4.9	11.18		1.0634					
6/01/92	153		1	23.0	4.9	8.24							

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 6/16/92 JULIAN DATE: 168 TIME: 11.17

SECCHI M: 13.0 WEATHER: Sunny

PERSONNEL: EMN TLV SKM

TMETHOD: 10 LMETHOD: 12 AMETHOD:
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: Boat shading at top of light profile? No alkalinities this date.

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
6/16/92	168	S	1	-1.0	18.7								
6/16/92	168		1	0.0	19.3	8.73		100.0000					
6/16/92	168		1	1.0	19.3	8.84		22.6963					
6/16/92	168	E	1	2.0	19.2	8.80		19.2668	5.31		0.20	0.23	
6/16/92	168	E	2	2.0	19.2	8.80		19.2668	5.32		0.13	0.37	92.30
6/16/92	168		1	3.0	19.2	8.79		15.7152					
6/16/92	168		1	4.0	18.6	9.20		14.4707					
6/16/92	168		1	5.0	16.9	9.69		10.1052					
6/16/92	168		1	6.0	15.5	10.26		7.2491					
6/16/92	168	M	1	7.0	13.6	12.23		5.7396	5.29		0.31	0.39	
6/16/92	168	M	2	7.0	13.6	12.23		5.7396	5.29		0.27	0.34	77.80
6/16/92	168		1	8.0	11.5	12.83		4.6437					
6/16/92	168		1	9.0	9.9	13.26		4.0877					
6/16/92	168		1	10.0	8.9	13.27		3.4878					
6/16/92	168		1	11.0	8.2	13.31		2.9334					
6/16/92	168		1	12.0	7.6	13.50		2.4466					
6/16/92	168		1	13.0	6.9	13.62		1.9234					
6/16/92	168		1	14.0	6.4	13.58		1.5637					
6/16/92	168		1	15.0	6.1	13.63		1.3075					
6/16/92	168	H	1	16.0	5.8	13.54		0.9728	5.38		0.46	0.66	
6/16/92	168	H	2	16.0	5.8	13.54		0.9728	5.37		0.31	0.61	87.10
6/16/92	168		1	17.0	5.5	13.48		0.7974					
6/16/92	168		1	18.0	5.4	13.34		0.6349					
6/16/92	168		1	19.0	5.3	13.09		0.4515					
6/16/92	168		1	20.0	5.3	12.76		0.3342					
6/16/92	168		1	21.0	5.2	12.42		0.2433					
6/16/92	168		1	22.0	5.2	11.89		0.1204					
6/16/92	168		1	23.0	5.2	3.31							

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 6/30/92 JULIAN DATE: 182 TIME: 11.25

SECCHI M: 14.8 WEATHER: Overcast, occasional sun, windy (NW)

PERSONNEL: EMN TLV JM

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS:

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
6/30/92	182	S	1	-1.0	26.8								
6/30/92	182		1	0.0	19.4	9.12		100.0000					
6/30/92	182		1	1.0	19.2	9.16		51.0725					
6/30/92	182		1	2.0	19.0	9.33		37.0897					
6/30/92	182	E	1	3.0	19.0	9.43		33.1750	5.30	-8	0.45	0.51	
6/30/92	182	E	2	3.0	19.0	9.43		33.1750	5.30	-6	0.38	0.44	84.20
6/30/92	182		1	4.0	18.7	9.52		29.4105					
6/30/92	182		1	5.0	18.3	9.53		26.0040					
6/30/92	182		1	6.0	17.6	9.80		22.4172					
6/30/92	182		1	7.0	15.6	12.38		19.5272					
6/30/92	182	M	1	8.0	13.2	13.17		16.7472	5.29	-7	0.54	0.64	
6/30/92	182	M	2	8.0	13.2	13.17		16.7472	5.36	-8	0.51	0.62	68.60
6/30/92	182		1	9.0	11.8	13.45		13.4407					
6/30/92	182		1	10.0	10.4	13.66		11.2475					
6/30/92	182		1	11.0	8.9	13.88		9.3263					
6/30/92	182		1	12.0	8.2	14.11		7.7849					
6/30/92	182		1	13.0	7.7	14.06		6.4391					
6/30/92	182		1	14.0	7.2	13.96		5.2436					
6/30/92	182		1	15.0	6.8	14.16		4.3015					
6/30/92	182	H	1	16.0	6.4	14.01		3.4330	5.42	-6	0.94	1.19	
6/30/92	182	H	2	16.0	6.4	14.01		3.4330	5.43	-6	0.47	0.62	76.60
6/30/92	182		1	17.0	6.0	13.92		2.7203					
6/30/92	182		1	18.0	5.9	13.81		2.1589					
6/30/92	182		1	19.0	5.6	13.47		1.6920					
6/30/92	182		1	20.0	5.6	12.91		1.2965					
6/30/92	182		1	21.0	5.5	12.77		0.9498					
6/30/92	182		1	22.0	5.5	12.07		0.2928					
6/30/92	182		1	23.0	5.6	8.86							

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 7/14/92 JULIAN DATE: 196 TIME: 11.00

SECCHI M: 15.9 WEATHER: Sunny, a few clouds

PERSONNEL: TLV BKS JSS

TMETHOD: 10 LMETHOD: 12 AMETHOD:
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: Subsurface O2's dubious--too low. Buoy dragged N to 22m--will replace

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
7/14/92	196	S	1	-1.0	24.1		2						
7/14/92	196		1	0.0	22.3	7.74	2	100.0000					
7/14/92	196		1	1.0	22.2	7.66	2	65.9196					
7/14/92	196		1	2.0	22.1	7.34	2	51.2993					
7/14/92	196		1	3.0	22.1	7.06	2	39.3399					
7/14/92	196	E	1	4.0	22.0	6.77	2	25.9670	5.27		0.61	0.61	
7/14/92	196	E	2	4.0	22.0	6.77	2	25.9670	5.29		0.53	0.53	79.20
7/14/92	196		1	5.0	22.0	6.44	2	22.5017					
7/14/92	196		1	6.0	21.8	6.20	2	18.6581					
7/14/92	196		1	7.0	20.0	6.42	2	14.7846					
7/14/92	196		1	8.0	17.4	7.08	2	12.6256					
7/14/92	196	M	1	9.0	15.7	7.17	2	10.7178	5.38		1.00	1.00	
7/14/92	196	M	2	9.0	15.7	7.17	2	10.7178	5.38		0.79	0.79	87.30
7/14/92	196		1	10.0	13.7	7.20	2	9.4347					
7/14/92	196		1	11.0	12.5	7.18	2	7.8885					
7/14/92	196		1	12.0	11.2	7.11	2	5.6671					
7/14/92	196		1	13.0	10.6	7.06	2	4.7304					
7/14/92	196		1	14.0	9.9	7.03	2	3.6755					
7/14/92	196		1	15.0	9.3	6.93	2	3.0004					
7/14/92	196		1	16.0	8.9	6.85	2	2.4394					
7/14/92	196	H	1	17.0	8.5	6.78	2	1.8273	5.55		1.90	1.90	
7/14/92	196	H	2	17.0	8.5	6.78	2	1.8273	5.49		1.43	1.43	79.00
7/14/92	196		1	18.0	8.3	6.73	2	1.4121					
7/14/92	196		1	19.0	8.0	6.54	2	1.0673					
7/14/92	196		1	20.0	7.7	6.36	2	0.7291					
7/14/92	196		1	21.0	7.6	6.20	2						
7/14/92	196		1	22.0	7.5	5.95	2						

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 7/28/92 JULIAN DATE: 210 TIME: 11.42

SECCHI M: 16.0 WEATHER: Mostly cloudy, windy (E)

PERSONNEL: EMN TLV NKW

TMETHOD: 10 LMETHOD: 12 AMETHOD:
OMETHOD: 10 PHMETHOD: CAMETHOD: 12

COMMENTS: No pH or alkalinities--pH electrode malfunction

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
7/28/92	210	S	1	-1.0	18.2								
7/28/92	210		1	0.0	21.5	8.01		100.0000					
7/28/92	210		1	1.0	21.6	7.79		42.4268					
7/28/92	210		1	2.0	21.6	7.71		28.0230					
7/28/92	210		1	3.0	21.7	7.66		25.6621					
7/28/92	210	E	1	4.0	21.7	7.63		22.7098			0.64	0.66	
7/28/92	210	E	2	4.0	21.7	7.63		22.7098			0.61	0.67	75.40
7/28/92	210		1	5.0	21.7	7.60		19.1806					
7/28/92	210		1	6.0	21.7	7.58		15.7347					
7/28/92	210		1	7.0	21.7	7.55		12.6282					
7/28/92	210		1	8.0	19.7	9.44		9.7969					
7/28/92	210		1	9.0	17.0	10.16		7.7815					
7/28/92	210		1	10.0	15.0	10.79		6.2202					
7/28/92	210	M	1	11.0	13.3	11.13		4.8293			2.85	2.85	
7/28/92	210	M	2	11.0	13.3	11.13		4.8293			2.49	2.70	32.90
7/28/92	210		1	12.0	12.3	11.33		3.7759					
7/28/92	210		1	13.0	11.3	11.46		2.9661					
7/28/92	210		1	14.0	10.6	11.58		2.3411					
7/28/92	210		1	15.0	9.9	11.71		1.8347					
7/28/92	210		1	16.0	9.4	11.75		1.4091					
7/28/92	210		1	17.0	8.9	11.78		1.0659					
7/28/92	210	H	1	18.0	8.5	11.65		0.7866			1.83	1.90	
7/28/92	210	H	2	18.0	8.5	11.65		0.7866			1.96	2.26	49.00
7/28/92	210		1	19.0	8.2	11.46		0.5978					
7/28/92	210		1	20.0	8.0	11.12		0.4347					
7/28/92	210		1	21.0	7.9	10.47		0.3083					
7/28/92	210		1	22.0	7.8	9.25		0.1319					
7/28/92	210		1	23.0	7.8								

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 8/11/92 JULIAN DATE: 224 TIME: 11.83

SECCHI M: 14.8 WEATHER: Partly cloudy, slight wind (NW)

PERSONNEL: EMN TLV ET

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS:

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
8/11/92	224	S	1	-1.0	26.2								
8/11/92	224		1	0.0	22.5	7.71		100.0000					
8/11/92	224		1	1.0	22.4	7.68		65.0195					
8/11/92	224		1	2.0	22.3	7.67		46.8103					
8/11/92	224		1	3.0	22.1	7.70		36.5135					
8/11/92	224	E	1	4.0	22.0	7.79		31.6134	5.32	-9	1.12	1.18	
8/11/92	224	E	2	4.0	22.0	7.79		31.6134	5.34	-6	0.98	1.10	83.70
8/11/92	224		1	5.0	22.0	7.69		23.5745					
8/11/92	224		1	6.0	22.0	7.69		19.1041					
8/11/92	224		1	7.0	21.8	7.70		15.5318					
8/11/92	224		1	8.0	21.5	7.82		12.0215					
8/11/92	224		1	9.0	19.2	11.01		8.9247					
8/11/92	224		1	10.0	16.2	11.60		6.6552					
8/11/92	224		1	11.0	14.4	11.94		5.1392					
8/11/92	224	M	1	12.0	12.9	12.01		3.7403	5.50	-5	2.40	2.61	
8/11/92	224	M	2	12.0	12.9	12.01		3.7403	5.52	-3	2.46	2.53	45.50
8/11/92	224		1	13.0	11.7	12.10		2.9085					
8/11/92	224		1	14.0	10.9	12.08		2.2051					
8/11/92	224		1	15.0	10.0	12.16		1.5852					
8/11/92	224		1	16.0	9.4	12.12		1.1563					
8/11/92	224		1	17.0	8.8	12.00		0.8590					
8/11/92	224	H	1	18.0	8.5	11.43		0.6176	5.67	-2	4.12	4.33	
8/11/92	224	H	2	18.0	8.5	11.43		0.6176	5.61	-1	2.88	3.24	53.10
8/11/92	224		1	19.0	8.3	10.47		0.4109					
8/11/92	224		1	20.0	8.2	9.79		0.2788					
8/11/92	224		1	21.0	8.0	8.50		0.1691					
8/11/92	224		1	22.0	7.9	6.82		0.0699					
8/11/92	224		1	23.0	7.9								

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 8/25/92 JULIAN DATE: 238 TIME: 11.33

SECCHI M: 14.6 WEATHER: Sunny, slight breeze

PERSONNEL: EMN TLV

TMETHOD: 10 LMETHOD: 12 AMETHOD:
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: No alkalinities this date

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
8/25/92	238	S	1	-1.0	26.7								
8/25/92	238		1	0.0	22.1	7.92		100.0000					
8/25/92	238		1	1.0	21.6	7.94		73.9098					
8/25/92	238		1	2.0	21.5	7.83		52.2331					
8/25/92	238		1	3.0	21.4	7.80		43.3830					
8/25/92	238		1	4.0	21.2	7.81		37.3026					
8/25/92	238	E	1	5.0	21.1	7.76		28.9842	5.33		0.70	0.77	
8/25/92	238	E	2	5.0	21.1	7.76		28.9842	5.34		0.62	0.76	79.00
8/25/92	238		1	6.0	21.0	7.76		23.3932					
8/25/92	238		1	7.0	20.9	7.70		19.3652					
8/25/92	238		1	8.0	20.8	7.74		14.6706					
8/25/92	238		1	9.0	20.4	8.01		11.0722					
8/25/92	238		1	10.0	17.8	11.17		7.9713					
8/25/92	238		1	11.0	15.0	11.44		5.8142					
8/25/92	238	M	1	12.0	13.4	11.50		4.4014	5.36		3.58	3.82	
8/25/92	238	M	2	12.0	13.4	11.50		4.4014	5.39		2.77	2.87	60.30
8/25/92	238		1	13.0	12.4	11.54		3.1039					
8/25/92	238		1	14.0	11.2	11.77		2.4713					
8/25/92	238		1	15.0	10.3	11.76		1.9262					
8/25/92	238		1	16.0	9.7	11.68		1.4289					
8/25/92	238		1	17.0	9.4	11.52		0.9965					
8/25/92	238	H	1	18.0	8.8	10.52		0.6586	5.55		3.05	3.69	
8/25/92	238	H	2	18.0	8.8	10.52		0.6586	5.55		2.23	3.22	77.80
8/25/92	238		1	19.0	8.5	10.32		0.4327					
8/25/92	238		1	20.0	8.3	8.99		0.2760					
8/25/92	238		1	21.0	8.1	6.79		0.1579					
8/25/92	238		1	22.0	7.9	3.40		0.0666					
8/25/92	238		1	23.0	7.8								

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 9/10/92 JULIAN DATE: 254 TIME: 10.75

SECCHI M: 13.3 WEATHER: Mostly cloudy, windy (W)

PERSONNEL: TLV SR EMN

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS:

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
9/10/92	254	S	1	-1.0	23.7								
9/10/92	254		1	0.0	21.0	8.66		100.0000					
9/10/92	254		1	1.0	21.0	8.43		55.0055					
9/10/92	254		1	2.0	21.0	8.54		41.1410					
9/10/92	254		1	3.0	21.0	8.57		34.8357					
9/10/92	254		1	4.0	20.9	8.62		30.0049					
9/10/92	254	E	1	5.0	20.8	8.62		24.7975	5.35	-5	0.78	0.86	
9/10/92	254	E	2	5.0	20.8	8.62		24.7975	5.36	-4	0.75	0.84	84.00
9/10/92	254		1	6.0	20.7	8.58		19.5256					
9/10/92	254		1	7.0	20.6	8.56		15.3142					
9/10/92	254		1	8.0	20.5	8.59		11.8991					
9/10/92	254		1	9.0	20.5	8.38		9.1602					
9/10/92	254		1	10.0	19.9	9.13		6.8926					
9/10/92	254		1	11.0	16.4	12.61		4.5586					
9/10/92	254	M	1	12.0	14.5	12.78		3.0310	5.39	-4	4.86	5.21	
9/10/92	254	M	2	12.0	14.5	12.78		3.0310	5.36	1	3.71	3.96	75.20
9/10/92	254		1	13.0	12.9	12.43		2.0563					
9/10/92	254		1	14.0	11.7	12.57		1.4260					
9/10/92	254		1	15.0	10.8	12.66		0.9951					
9/10/92	254		1	16.0	10.2	11.98		0.6978					
9/10/92	254		1	17.0	9.5	11.62		0.4776					
9/10/92	254	H	1	18.0	8.9	10.48		0.3161	5.51	3	2.10	3.25	
9/10/92	254	H	2	18.0	8.9	10.48		0.3161	5.51	3	1.53	2.43	85.00
9/10/92	254		1	19.0	8.7	8.69		0.2032					
9/10/92	254		1	20.0	8.5	8.13		0.1211					
9/10/92	254		1	21.0	8.5	7.74		0.0690					
9/10/92	254		1	22.0	8.4	5.21		0.0317					
9/10/92	254		1	23.0	8.4	1.31							

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 9/23/92 JULIAN DATE: 267 TIME: 12.50

SECCHI M: 12.5 WEATHER: Sunny, very windy

PERSONNEL: EMN

TMETHOD: 10 LMETHOD: 12 AMETHOD:
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS:

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
9/23/92	267	S	1	-1.0	14.7								
9/23/92	267		1	0.0	19.7	8.73		100.0000					
9/23/92	267		1	1.0	19.7	8.55		75.2445					
9/23/92	267		1	2.0	19.7	8.46		49.4055					
9/23/92	267		1	3.0	19.8	8.41		38.3285					
9/23/92	267		1	4.0	19.8	8.39		29.5062					
9/23/92	267	E	1	5.0	19.8	8.30		19.7366	5.33		1.95	1.95	
9/23/92	267	E	2	5.0	19.8	8.30		19.7366	5.32		1.73	1.76	81.50
9/23/92	267		1	6.0	19.8	8.33		12.9931					
9/23/92	267		1	7.0	19.8	8.30		7.7990					
9/23/92	267		1	8.0	19.7	8.36		5.6679					
9/23/92	267		1	9.0	19.7	8.29		5.0606					
9/23/92	267		1	10.0	19.7	8.30		3.5022					
9/23/92	267		1	11.0	18.6	9.49		2.3332					
9/23/92	267	M	1	12.0	15.5	12.15		1.4833	5.40		1.94	1.94	
9/23/92	267	M	2	12.0	15.5	12.15		1.4833	5.37		1.56	1.63	66.00
9/23/92	267		1	13.0	13.6	12.24		1.0542					
9/23/92	267		1	14.0	12.3	12.26		0.6995					
9/23/92	267		1	15.0	11.3	12.17		0.4605					
9/23/92	267		1	16.0	10.3	12.00		0.2969					
9/23/92	267		1	17.0	9.8	10.65		0.2122					
9/23/92	267	H	1	18.0	9.2	9.82		0.1361	5.45		0.62	1.43	
9/23/92	267	H	2	18.0	9.2	9.82		0.1361	5.46		0.66	1.21	80.30
9/23/92	267		1	19.0	8.9	7.73		0.0807					
9/23/92	267		1	20.0	8.7	6.24		0.0495					
9/23/92	267		1	21.0	9.2	4.34		0.0273					
9/23/92	267		1	22.0	9.0	2.81		0.0124					
9/23/92	267		1	23.0	9.1								

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 10/14/92 JULIAN DATE: 288 TIME: 12.00

SECCHI M: 14.8 WEATHER: Rain

PERSONNEL: EMN TLV

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: Chlorophylls thawed overnight in refrig. before extraction

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
10/14/92	288	S	1	-1.0	9.3								
10/14/92	288		1	0.0	14.7	9.34		100.0000					
10/14/92	288		1	1.0	14.8	9.20		42.3370					
10/14/92	288		1	2.0	14.8	9.18		30.5682					
10/14/92	288		1	3.0	14.8	9.12		24.0505					
10/14/92	288		1	4.0	14.8	9.10		18.9973					
10/14/92	288		1	5.0	14.8	9.10		14.4466					
10/14/92	288		1	6.0	14.8	9.18		10.6225					
10/14/92	288	E	1	7.0	14.8	9.12		7.8569	5.37	-9	1.41	1.50	
10/14/92	288	E	2	7.0	14.8	9.12		7.8569	5.33	-11	1.28	1.48	75.00
10/14/92	288		1	8.0	14.8	9.20		5.8590					
10/14/92	288		1	9.0	14.7	9.15		4.3756					
10/14/92	288		1	10.0	14.7	9.21		3.2630					
10/14/92	288		1	11.0	14.7	9.19		2.4350					
10/14/92	288		1	12.0	14.7	9.22		1.8322					
10/14/92	288		1	13.0	14.7	9.21		1.3828					
10/14/92	288		1	14.0	14.6	9.29		1.0312					
10/14/92	288	M	1	15.0	12.8	10.48		0.7435	5.40	-7	0.88	1.04	
10/14/92	288	M	2	15.0	12.8	10.48		0.7435	5.36	-7	1.01	1.22	72.30
10/14/92	288		1	16.0	10.6	11.14		0.5085					
10/14/92	288		1	17.0	10.1	10.48		0.3509					
10/14/92	288		1	18.0	9.4	8.86		0.2392					
10/14/92	288	H	1	19.0	8.9	6.48		0.1569	5.53	4	1.20	1.79	
10/14/92	288	H	2	19.0	8.9	6.48		0.1569	5.57	5	1.03	1.71	93.20
10/14/92	288		1	20.0	8.6	4.70		0.0943					
10/14/92	288		1	21.0	8.5	4.02		0.0500					
10/14/92	288		1	22.0	8.4	2.58		0.0253					

LAKE GILES: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 11/19/92 JULIAN DATE: 324 TIME: 10.53

SECCHI M: 14.8 WEATHER: Sunny

PERSONNEL: TLV BKS EMN

TMETHOD: 10 LMETHOD: 12 AMETHOD: 11
OMETHOD: 10 PHMETHOD: 12 CAMETHOD: 12

COMMENTS: No December samples--lake not completely frozen on 12/30

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
11/19/92	324	S	1	-1.0	6.3								
11/19/92	324		1	0.0	7.5	10.35		100.0000					
11/19/92	324		1	1.0	7.5	10.34		64.9773					
11/19/92	324		1	2.0	7.5	10.35		42.4688					
11/19/92	324		1	3.0	7.5	10.26		30.0133					
11/19/92	324	E	1	4.0	7.5	10.34		22.2485	5.38	-6	0.98	1.32	
11/19/92	324	E	2	4.0	7.5	10.34		22.2485	5.41	-5	0.82	1.19	76.80
11/19/92	324		1	5.0	7.5	10.32		15.3438					
11/19/92	324		1	6.0	7.5	10.30		11.0786					
11/19/92	324		1	7.0	7.5	10.29		7.4805					
11/19/92	324		1	8.0	7.5	10.27		5.1061					
11/19/92	324		1	9.0	7.5	10.24		3.7001					
11/19/92	324		1	10.0	7.5	10.20		2.6260					
11/19/92	324	M	1	11.0	7.5	10.23		1.8428	5.36	-6	0.87	1.21	
11/19/92	324	M	2	11.0	7.5	10.23		1.8428	5.36	-7	0.98	1.24	84.70
11/19/92	324		1	12.0	7.5	10.14		1.3042					
11/19/92	324		1	13.0	7.5	10.18		1.0237					
11/19/92	324		1	14.0	7.4	10.07		0.7119					
11/19/92	324		1	15.0	7.4	10.05		0.5103					
11/19/92	324		1	16.0	7.4	10.14		0.3758					
11/19/92	324		1	17.0	7.4	10.12		0.2788					
11/19/92	324	H	1	18.0	7.4	10.05		0.2062	5.36	-6	0.75	1.14	
11/19/92	324	H	2	18.0	7.4	10.05		0.2062	5.36	-6	0.88	1.32	76.10
11/19/92	324		1	19.0	7.4	10.07		0.1472					
11/19/92	324		1	20.0	7.4	10.05		0.1052					
11/19/92	324		1	21.0	7.4	10.04		0.0759					
11/19/92	324		1	22.0	7.4	9.99		0.0694					
11/19/92	324		1	23.0	7.4	8.28							

APPENDIX I

BATHYMETRY OF LAKE GILES

In 1992, Robert Moeller drafted an updated bathymetric map of Lake Giles, included with this report. Information was derived from three sources: (1) an aerial photograph for lake outline, (2) USGS topographic sheets for scale and north orientation, and (3) a bathymetric survey.

The 24"x24" aerial photograph (Soil Conservation Service, summer circa 1975-1980) was assumed to present an accurate, undistorted image of the lake. This was enlarged xerographically to 15x15 cm (EW x NS) without distortion. The topographic sheets (Pecks Pond 1966 and Rowland 1966 7.5 minute series) provided N-S orientation--transferred to the new map with an accuracy of about ± 1.5 degree--and scale, which was established by measuring ca. 10 shore-to-shore distances on both the topographic map and on the new map.

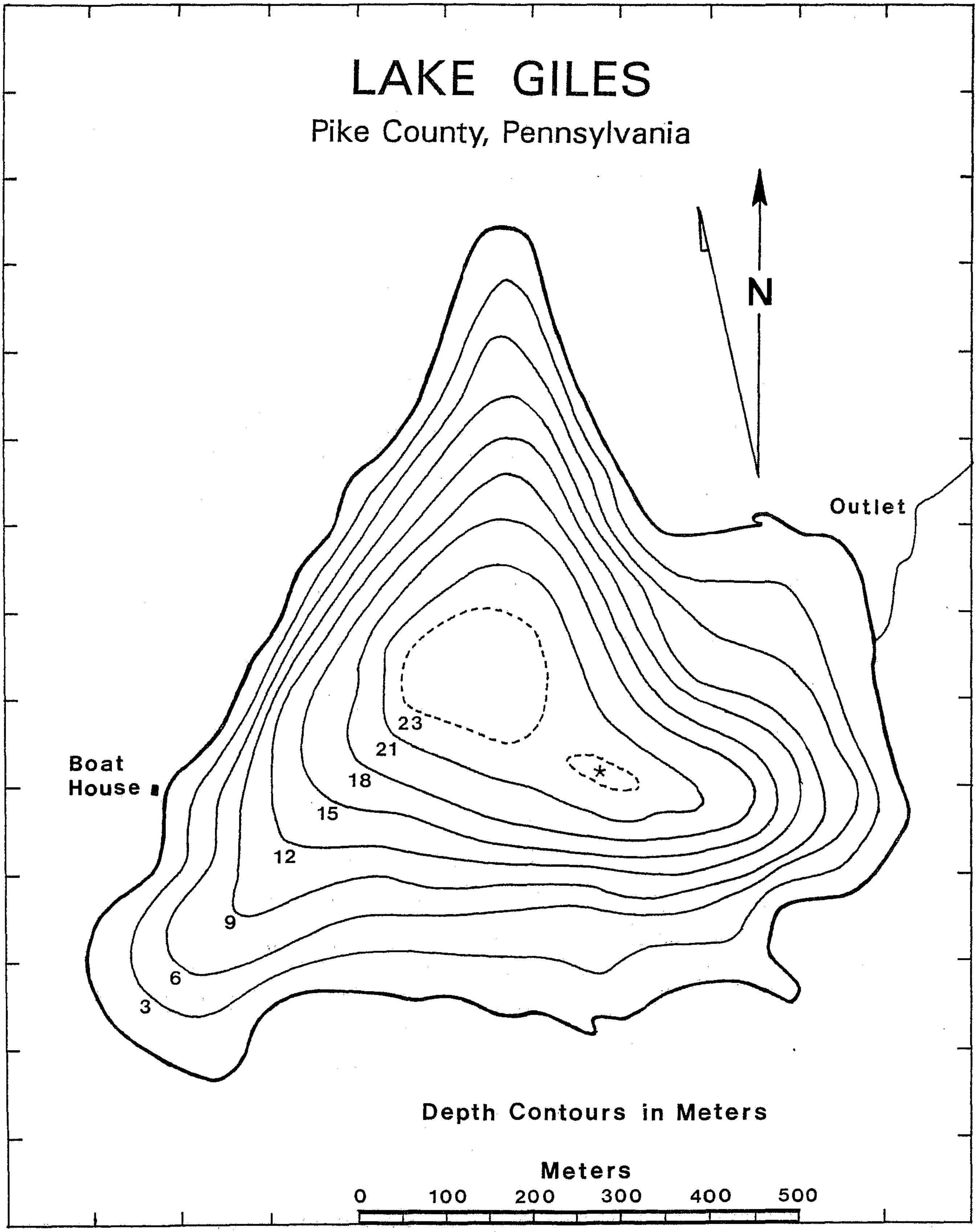
The bathymetric survey by Robert D. Schultz and co-workers, directed by Dr. Richard N. Weisman of Lehigh University, was carried out on 15 July 1990 using shore-based electronic surveying equipment and a sonar depth sounder operated from a boat. Accuracy of the soundings was ca. ± 0.2 m, verified periodically against soundings with a weighted line. The survey included 112 points throughout the basin, plus an additional 32 points within 10 meters of shore to define the outline. The resulting map was modified by Moeller to give the new map by (1) adding shoreline detail and slightly adjusting nearshore contours to correspond to the photo-derived outline, and (2) interpolating metric contours at 3-metre intervals between the original 5-foot intervals.

The scale on the new map is believed correct to within 1% (relative to USGS topographic map). It is well within 1% of the scale of the original map by R. Schultz. Lake area and volume are considered accurate to 2% and 5%, respectively, and area and volume of 3-m contour subsections to ca. 10%

An older map available at the Blooming Grove Hunting and Fishing Club (T.W. Cart 1955-1961) exaggerates the lake's depth in mid-basin by about 10 feet. The maximum depth was found to be about 80 feet (24 metres) in 1990, not 90 feet. The older map displays somewhat greater detail than the new map, and may be more accurate at portraying bottom slope near shore. Aside from the depth scaling, the maps are quite consistent (though the reduced copy of the Cart map used for comparison has been distorted by N-S shortening, probably in repeated photocopying).

No water level datum was established for the present survey, and data are not available for the aerial photograph or earlier maps. They are assumed to be comparable, probably within 0.25 metre and certainly within 0.5 metre. 1990 was a relatively moist summer, without notable drop in lake levels in late summer.

On the next page is the 1992 PCLP map, with a border of 100-metre grid marks to control for distortion in future copying. The routine PCLP sampling station is located with an asterisk. Hypsographic and bathymetric curves (cumulative area and cumulative volume, respectively, versus depth) are plotted on the following page.



POCONO COMPARATIVE LAKES PROGRAM - - - - - - - - - - - - LEHIGH UNIVERSITY - - - - - - - - - - - 1992
Map drawn by R. Moeller from survey data of R. Weisman and R. Schultz

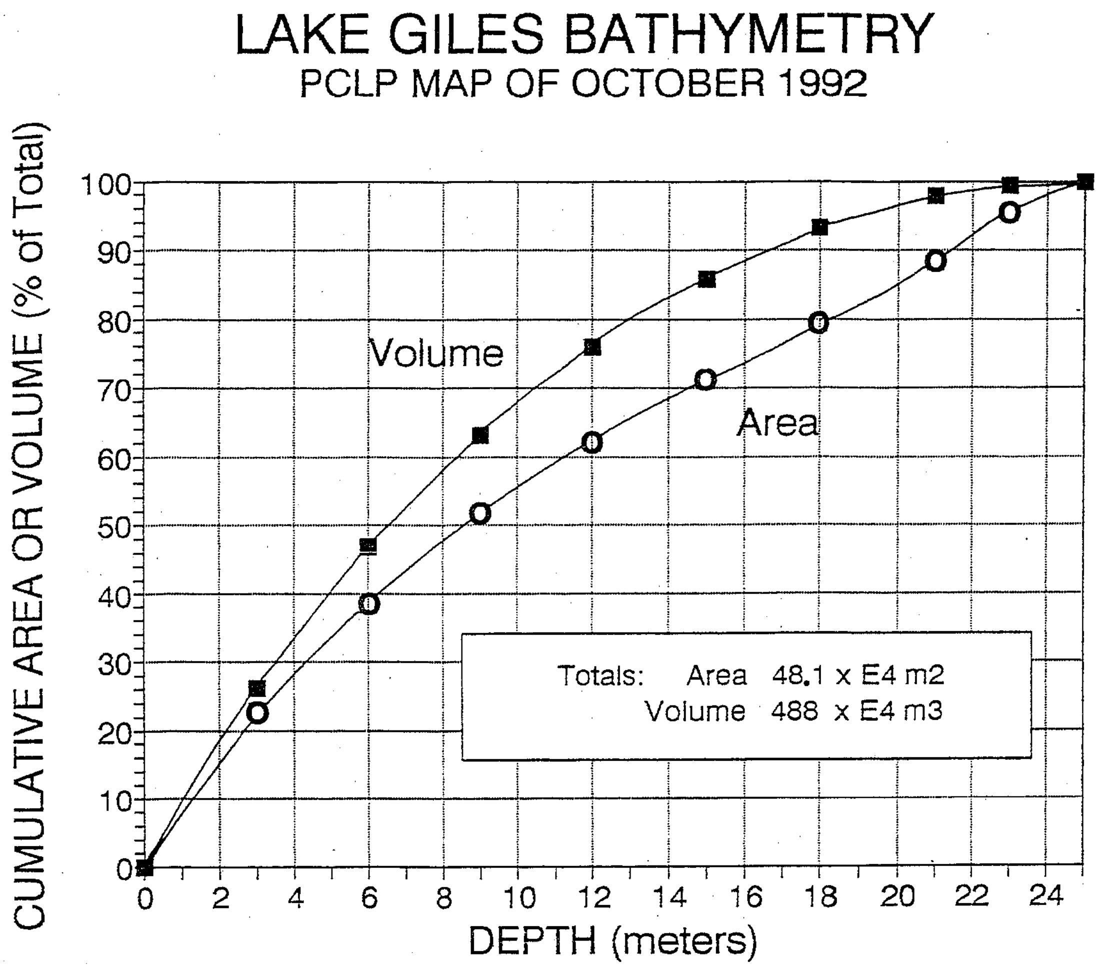


Figure A.1. Hypsographic and bathymetric curves for Lake Giles.

The hypsographic curve ("**Area**") gives the percentage of lake area where the water is less than or equal to the indicated depth. The other bathymetric curve ("**Volume**") gives the percentage of lake volume lying at depths less than or equal to the plotted depth. The total area of Lake Giles is 48.1×10^4 m^2, or 48.1 hectares. The total volume of the lake is 488×10^4 m^2. The mean depth (total volume/total area) is therefore 10.1 metres.