LAKE WAYNEWOOD

REPORT ON LIMNOLOGICAL CONDITIONS IN 1992

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POCONO COMPARATIVE LAKES PROGRAM

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INTRODUCTION

Personnel from Lehigh University visited Lake Waynewood on 16 dates throughout 1992 as part of a routine monitoring program of three lakes. These lakes were selected to span a trophic gradient, Lake Waynewood lying at the nutrient-rich, productive ("eutrophic") end of the gradient. Similar reports will be submitted to the owners of Lake Giles, an acidic, unproductive ("oligotrophic") lake, and Lake Lacawac, a well protected lake of intermediate productivity ("mesotrophic").

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 fourth consecutive year of the monitoring program, and the fourth year for summer sampling. This is the third year that winter and spring data were obtained. The present report summarizes conditions in Lake Waynewood over the full twelve-month period for 1992. 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 was 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. Lake Waynewood 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 Waynewood based on a survey by Dr. Richard Weisman and Robert Schultz in July 1990, from which bathymetric and hypsographic curves have been plotted (**APPENDIX I**).

We wish to thank the Lake Waynewood Association for encouraging this ongoing study at their lake, and especially to acknowledge our regular hosts at Waynewood, the Westpfahl's, Bovard's and Barron's. 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 director, Sally Jones.

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 in samples from January through May, and Paul Stutzman counted samples from June through December. Gina Novak counted microzooplankton in samples from January through April; Natasha Vinogradova counted the samples from May through December. Gina 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 into the database, which Robert Moeller checked and abstracted as tables and graphs for this report.

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 Waynewood 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 12.5 metres or 41 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.

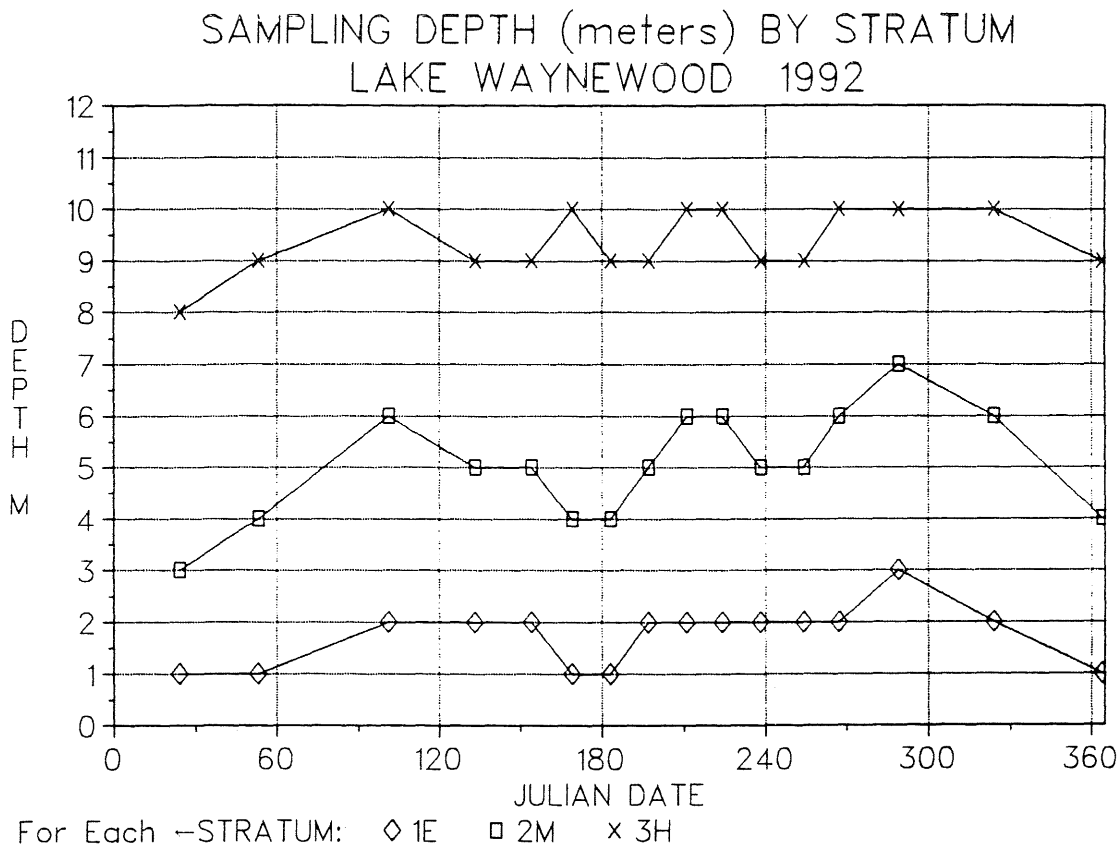


Figure 1. Depths of "EPI", "META", and "HYPO" samples from Lake Waynewood, 1992.

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 24 (24 January) the lake was ice-covered, and displayed a "reverse stratification". After ice-out (ca. mid-March) the water column circulated from top to bottom during "spring turnover", as evident in the essentially isothermal (4-5°C) water column of day 101 (10 April). By day 183 (1 July), heating of the surface waters had produced a strong thermal stratification. This is recognized as the differentiation of the water column into an upper warm water layer which periodically circulated in contact with the atmosphere (the **EPILIMNION**, 0-3 metres, temperature gradient 18-23°C owing to calm weather in preceding days); an intermediate layer of rapid temperature decrease with depth (the **METALIMNION**, 4-7 metres); and a deep layer of cold water (the **HYPOLIMNION**, 7-12+ metres, temperature 5-6°C). By the next sampling date (day 197--15 July), wind-induced mixing had sharpened the distinction between epilimnion and metalimnion, leaving only a small temperature gradient (23-25°C) within the epilimnion.

The usual course of thermal stratification is that of slow, gradual thickening of an epilimnion during the summer. By day 267 (23 September) Lake Waynewood's epilimnion extended to 4 metres. 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 on day 324 (19 November). The lake continued to cool, down to 3°C, until it froze over--sometime before the middle of December. **Figure 3** presents the detailed trends of water temperature at three fixed depths (2,6,10 metres) for comparison with other years.

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. 12 weeks in 1991-92, from 18 December to mid-March) and the completeness of spring turnover. During an especially warm spring, Lake Waynewood might stratify quickly without a thorough mixing of deep and surficial layers, leaving the winter bottom waters incompletely reoxygenated and their nutrients only partially mixed into the surface waters. This might lead to some differences in the biology and chemistry of the summer plankton community. Spring turnover was complete in 1992, however, as it also was in 1990 and 1991.

Although the winter of 1991-92 was relatively warm, air temperatures from March through December returned 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. 24°C) was the same as in earlier years (1989-1991), but was reached a little later in the summer than in 1991, and the epilimnial layer itself was a little thinner.

Water samples for **pH**, **alkalinity**, **chlorophyll**, and **algae** 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. 24 January), the topmost layer was 0-1m, and the remaining depths were divided at the Secchi depth (see **SECCHI DEPTH** below)

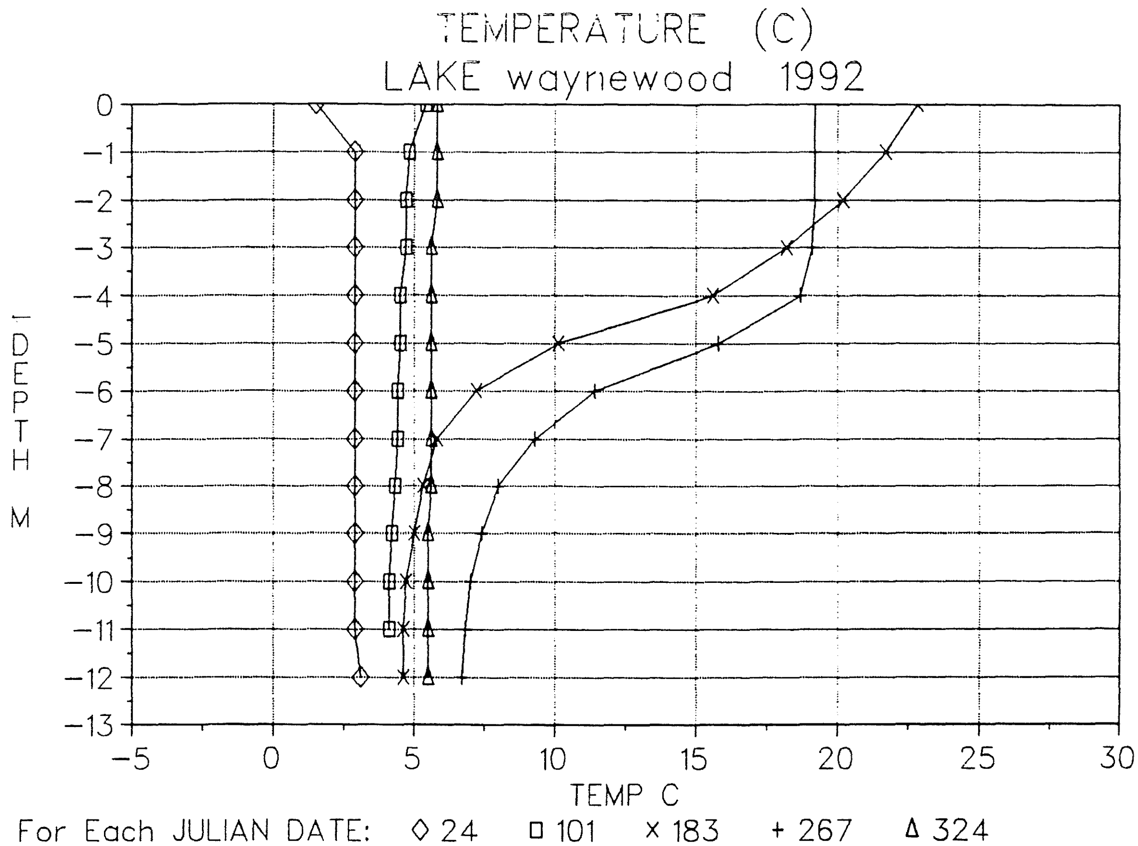


Figure 2. Temperature profiles in Lake Waynewood, 1992.

Values (°C) are plotted for five dates: **24 January** (day 24 --winter ice cover), **10 April** (day 101 --during spring turnover), **1 July** (day 183 --summer stratification), **23 September** (day 267 --late stratification), **19 November** (day 324 --fall turnover).

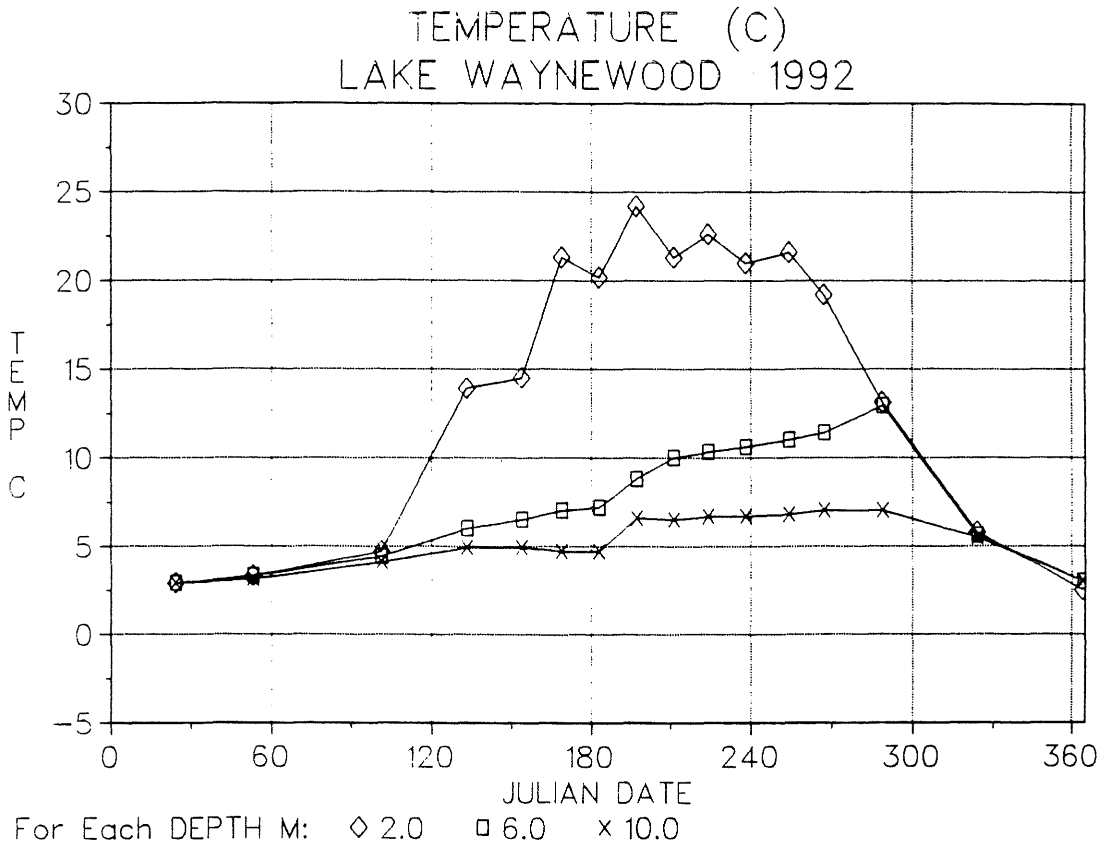


Figure 3. Temperature trends within Lake Waynewood, 1992.

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

LIGHT PENETRATION

Light intensity at 1-metre 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 on all dates in 1992:

Method 12. Two Licor quantum sensors, mounted 1-m apart on a common line, electronically computed the ratio of quantum intensities between the nominal depth and the depth above it. The percentage penetration profile was constructed from these ratios.

Light penetration is plotted on a logarithmic scale for five dates **(Figure 4)**. During the summer, depths above 3.5 m (i.e. all of the epilimnion) usually received at least 5% of the light penetrating the lake surface. The metalimnion received 0.1-5% of surface light, enough for low rates of algal growth. Light penetration decreased in mid-October at a time of increased algal biomass **(see Data Tables)**, but by 19 November light penetration had returned to summer conditions.

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.

The pattern of transparency **(Figure 5)** followed a common pattern in eutrophic lakes. Transparency was greatest during late spring (4-5 metres) as zooplankton grazed down the spring algal populations. During June and July, however, relatively inedible bluegreen algae became established, reducing light penetration. Transparency stayed greater than ca. 2 metres, because these algae remained in the metalimnion and distributed throughout the epilimnion rather than aggregating in the topmost meter. The lake was a little less clear through most of the summer than it was in 1991, but still distinctly clearer than in 1989, a year of high algal populations from July through mid-September.

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 Waynewood's elevation above sea-level (1381 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 litre. (This is **Method #10.**)

Often the meter did not give a true "zero" when dropped into definitely anoxic (oxygen-free) water. Values flagged with error code "4" in the data tables, and plotted at depths greater than 10 metres for day 183 (1 July) and 5 metres on day 267 (23 September) in **Figure 6**, should be treated as true zeros.

During winter ice cover, oxygen became partly depleted, then was recharged during spring turnover. Lake Waynewood tends to be relatively clear during the winter. In

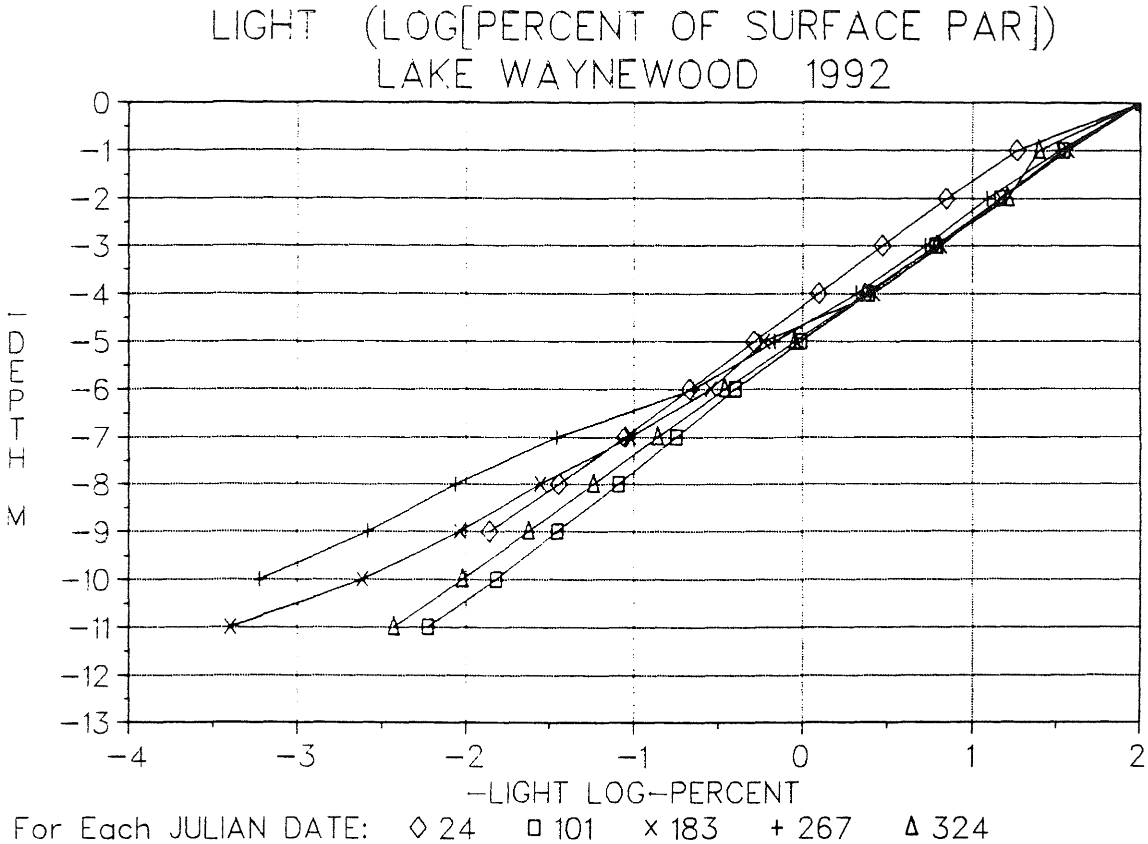


Figure 4. Light penetration in Lake Waynewood, 1992.

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: **24 January** (day 24 --winter ice cover), **10 April** (day 101 --during spring turnover), **1 July** (day 183 --summer stratification), **23 September** (day 267 --late stratification), **19 November** (day 324 --fall turnover).

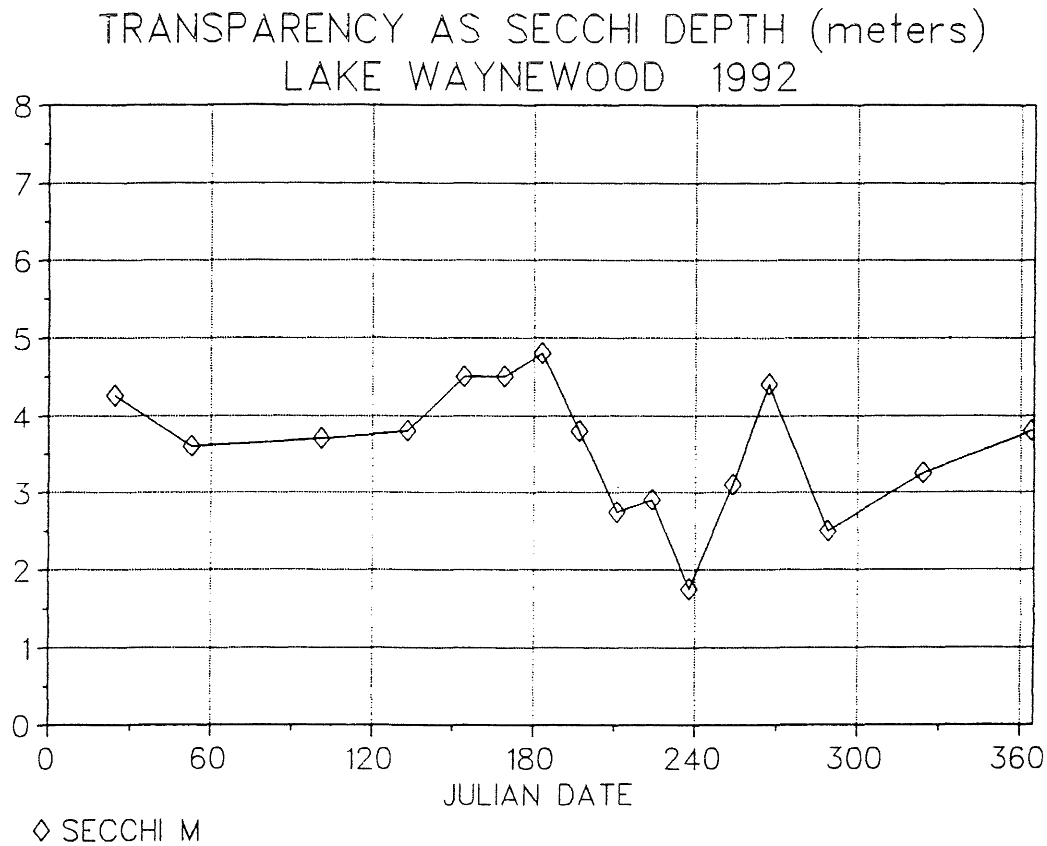


Figure 5. Transparency in Lake Waynewood, 1992.

Values plotted are the Secchi depths, in meters.

combination with little snow cover (as in winter 1991 and 1992), good light penetration helps offset oxygen depletion by supporting moderate levels of algal growth deep into the water column. In any case, at sampling dates in mid-to-late February, oxygen has been depleted below 4 mg/L only in the deepest waters (10-12 metres) during our 3 years of observation.

The onset of thermal stratification in mid-spring marked the onset of rapid depletion of oxygen within the hypolimnion. By day 183 (1 July) the hypolimnion was mostly anoxic, though some oxygen remained within the lower portion of the metalimnion (**Figure 6**). In 1989, 1990, and 1991 oxygen had been completely consumed below 7 metres by this date. Oxygen content of the epilimnion in summer was maintained slightly above atmospheric saturation, at least during the day, by algal photosynthesis (usually oxygen was sampled in late morning or early afternoon). During autumn turnover the water column was progressively recharged with atmospheric oxygen. On day 324 (19 November), halfway through the turnover period, the oxygen content of 11-m water was already ca. 8.8 mg/L, though still not fully saturated with respect to the atmosphere (12.0 mg/L at Waynewood's elevation for 5.5°C).

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 0.100 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 litre (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 with gentle mixing. The following variant of the method was employed on all dates in 1992:

Method 11. 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 Waynewood would be about 6.5-7 with an alkalinity of about 300 μeq/L (**Figure 8**), judging from values in late spring. These values portray a relatively softwater lake.

Algal photosynthesis drove pH above 9 in August. *In situ* epilimnial pH probably reached 10 on some days. (Our water samples were collected about noon--not late afternoon--and were stored several hr before analysis.) Microbial metabolism generated

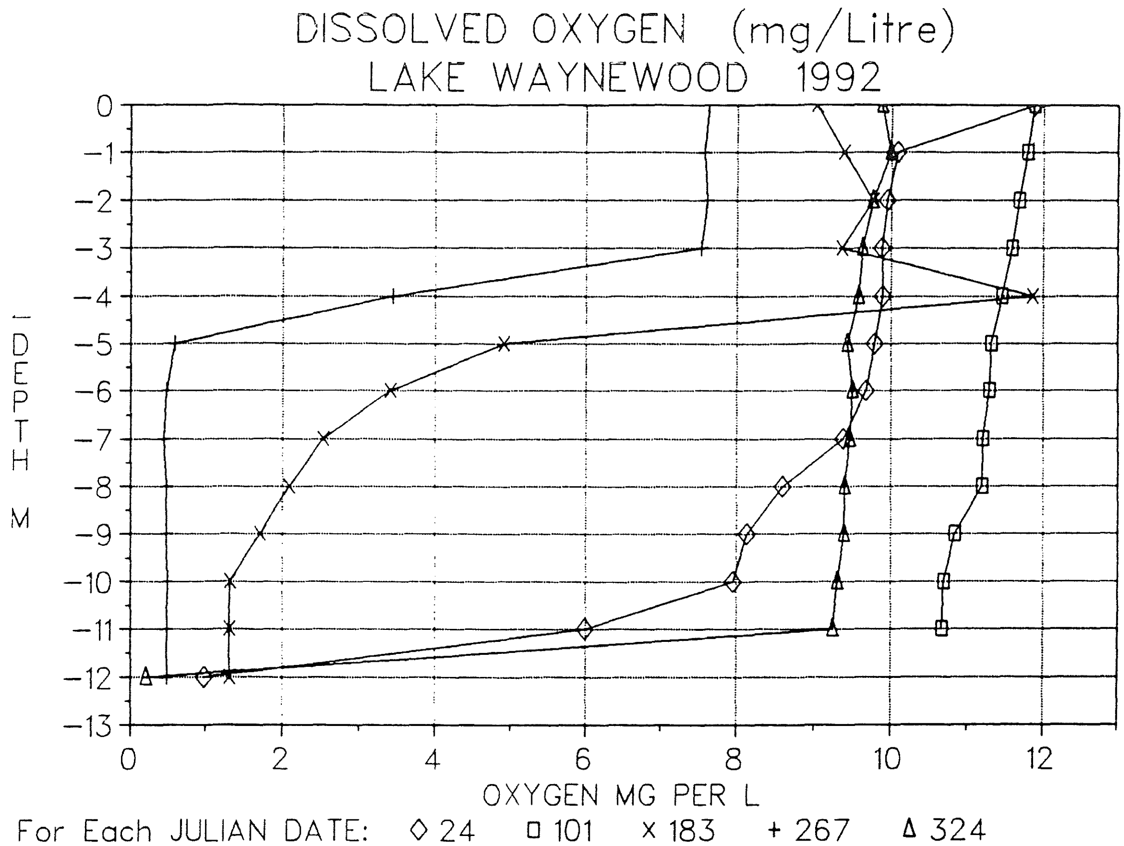


Figure 6. Dissolved oxygen in Lake Waynewood, 1992.

Values (mg oxygen per liter) are plotted for five dates: **24 January** (day 24 --winter ice cover), **10 April** (day 101 --during spring turnover), **1 July** (day 183 --summer stratification), **23 September** (day 267 --late stratification), **19 November** (day 324 --fall turnover). Values less than 0.5 mg/L on day 267 and less than 1.5 mg/L on day 183 should be interpreted as "zero" dissolved oxygen.

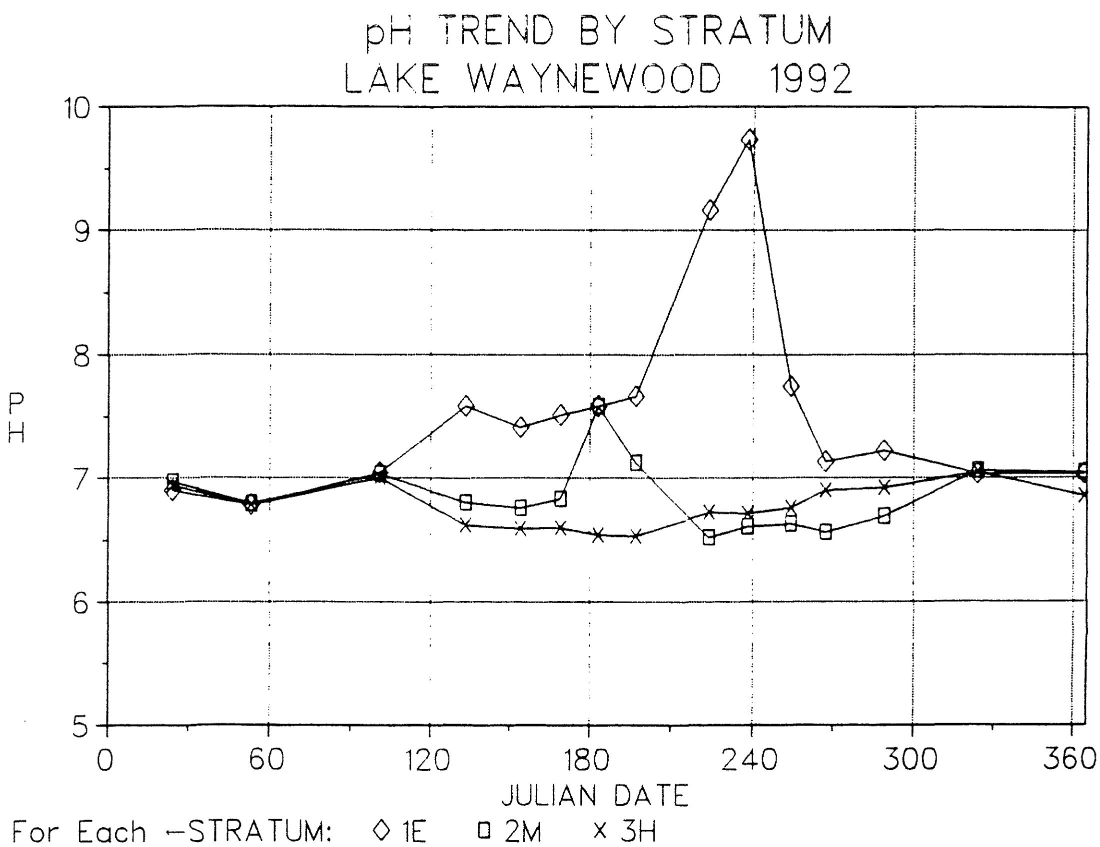


Figure 7. Trends of pH in Lake Waynewood, 1992.

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**.

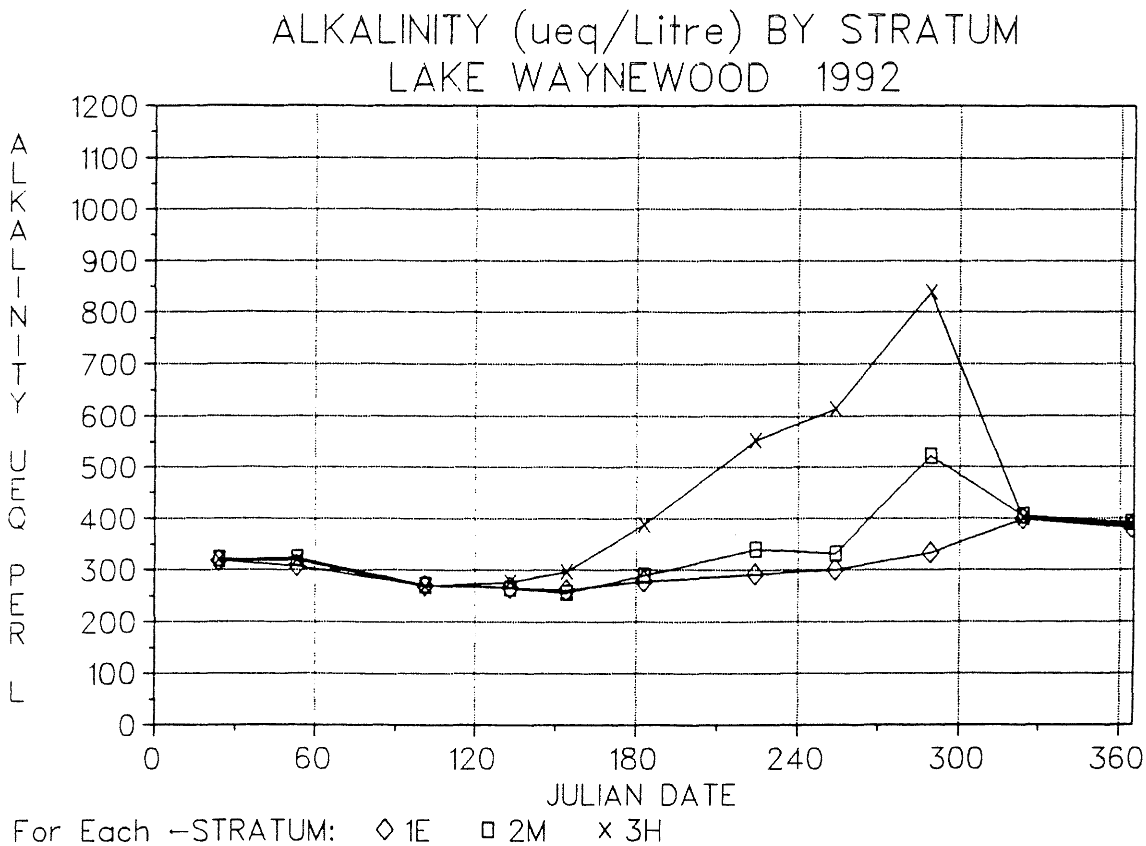


Figure 8. Trends of Alkalinity in Lake Waynewood, 1992.

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 were not developed, samples were collected as described in **RESULTS AND METHODS**.

substantial alkalinity in the anoxic hypolimnion **(Figure 8)**, but this was lost upon reoxidation of the water column during fall turnover and subsequent winter stratification.

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-μm nitex net. Recovery of algae from the fractionated samples was often incomplete.This sum was treated as a replicate for total chlorophyll-a only if it was greater than or equal to 85% of the whole sample. The percentage of chlorophyll passing the 22-μm 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).

Chlorophyll trends in Lake Waynewood (**Figure 9)** display the high summer levels characteristic of a moderately eutrophic lake. In early summer, chlorophyll was much higher in the metalimnion than in the epilimnion, but this pattern reversed itself several times during the summer. Epilimnetic algae were apparently more abundant than in 1991 though less than in 1989.

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

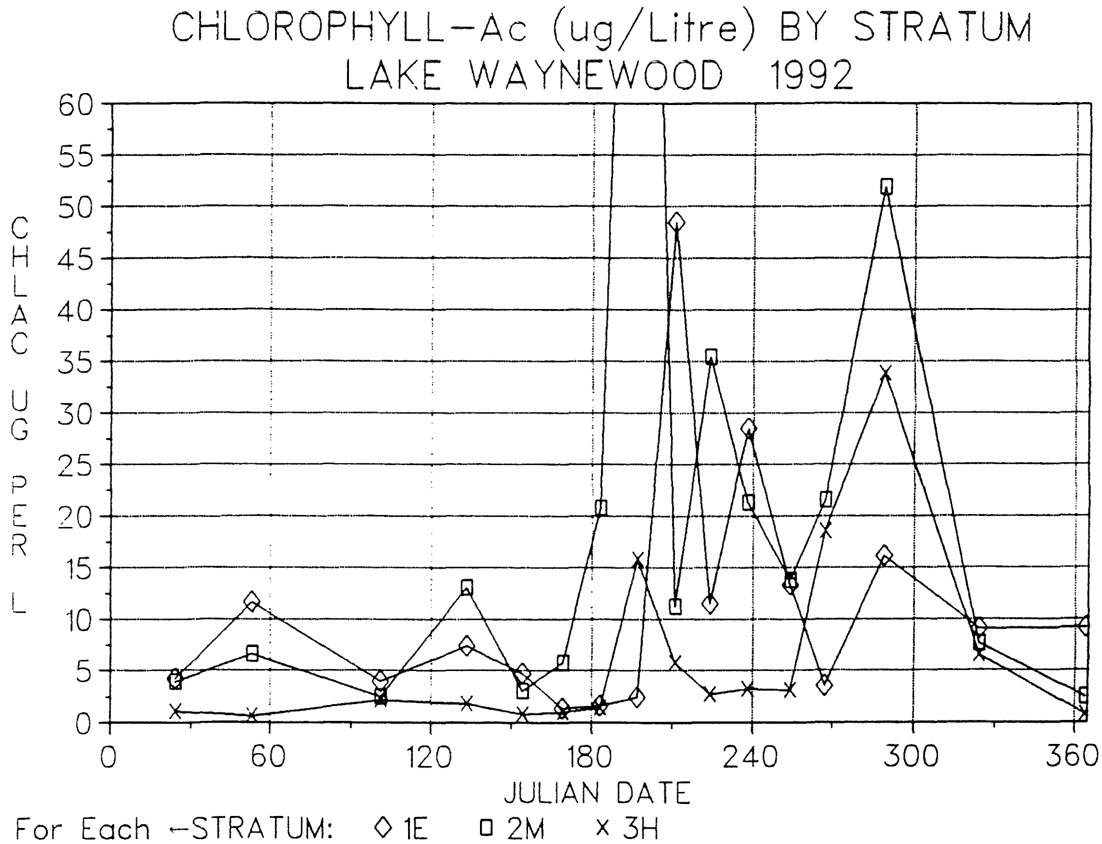


Figure 9. Trends of Chlorophyll-a in Lake Waynewood, 1992.

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 were not developed, samples were collected as described in **RESULTS AND METHODS**. Chlorophyll-a values are corrected for pheopigments. On day 197, metalimnetic chlorophyll reached 144 μg/L.

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 12.5-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 (including *Diaptomus oregonensis*) being counted from the 48-μm sample that had been counted from 202-μm samples in previous years. 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 11-40)**. **Table 1** lists the zooplankton identified to date. Several points can be highlighted about 1992 compared to previous years:

(1) The cladoceran *Daphnia* (several species) was apparently the dominant grazer during spring and fall (5-15/L), but was reduced to lower levels (<2/L) during summer. The calanoid copepod *Diaptomus oregonensis* was relatively common throughout the year (0.5-2 adult females/L), especially during the late summer. *Diaptomus* was at exceptionally low density, however, in May and June this year (<0.2 adult females/L), while *Daphnia* was still relatively abundant, then recovered as *Daphnia* declined in late June through August. These two herbivorous macrozooplankton showed an even stronger inverse relationship in September, when *Daphnia*'s autumn population increase coincided with a drop in adult *Diaptomus*. Both populations overwintered as non-reproducing adults.

(2) The various rotifers displayed pronounced seasonalities, which differed among species. There were also pronounced differences in distribution among the three layers. Densities were quite high: 500-1200/L in summer, which imply densities of twice this in the upper water layers where they mainly occurred. Rotifers were not abundant during the winter and spring of 1992 ($\leq$50/L), repeating the pattern of earlier years. Winter/spring is also a time of relatively few species.

(3) In general hard-bodied rotifers (e.g. *Keratella*, esp. *K. earlinae* instead of *K. cochlearis* in 1992), those with swift escape reactions (e.g. *Polyarthra*), and those forming large colonies (e.g. *Conochilus*) or individual gelatinous tubes (e.g. *Collotheca*) were most common during the summer, perhaps implying heavy predation pressure. Several potential predators were quite common in summer: the large dipteran *Chaoborus* (ca. 0.4/L, as in previous years) and the cyclopoid copepods, especially *Orthocyclops modestus* in September (0.4-1 adult females/L). We had not recorded the *Orthocyclops* in previous years. *Mesocyclops edax*, the main summer cyclopoid in previous years, was uncommon in 1992. In spring *Diacyclops thomasi* (ca. 0.5/L) was present, though at lower concentration than in 1991, and its autumn counterpart, *Tropocyclops prasinus* (5-20 adults/L in previous years) failed completely. 1992 was not a good year for cyclopoid copepods in Lake Waynewood.

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

	Taxon	Seasonal Abundance in 1992 High	Low
Diptera			
**	*Chaoborus* spp.	Su,F	[W]
	C. flavicans		
	C. punctipennis		
Cyclopoid Copepoda			
*	*Diacyclops thomasi*	Sp,F	[W,Su]
	Cyclops scutifer		
	Macrocyclops albidus (rare)		
*	*Mesocyclops edax*		
*	*Orthocyclops modestus*	late Su	[W,Sp]
*	*Tropocyclops prasinus*	W,Sp	[Su,F]
Calanoid Copepoda			
**	*Diaptomus oregonensis*		
Cladocera			
*	*Bosmina*	late Su	[W,Sp]
	Ceriodaphnia spp.		
	Chydorus spp.		
**	*Daphnia* spp.	Sp,F	[W, Su]
	D. pulex/pulicaria		
	D. laevis		
	Diaphanosoma spp.		
	Holopedium gibberum		
	Leptodora kindtii		
Rotifera			
*	*Anuraeopsis* spp.		
	Ascomorpha spp.		
*	*A. ovalis*	Su	[F,W,Sp]
*	*Asplanchna* spp.	Su,F	[W,Sp]
**	*Collotheca* spp.		
*	*C. mutabilis*	late Su	[F,W,Sp]
**	*Conochilus* spp.	Su	[F,W,Sp]
*	*Filinia longiseta*	Su	[F,W,Sp]
	Gastropus spp.		
*	*G. hyptopus*	F	[Su,F,W]
*	*G. stylifer*	F	[Sp,F,W]

continued next page

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

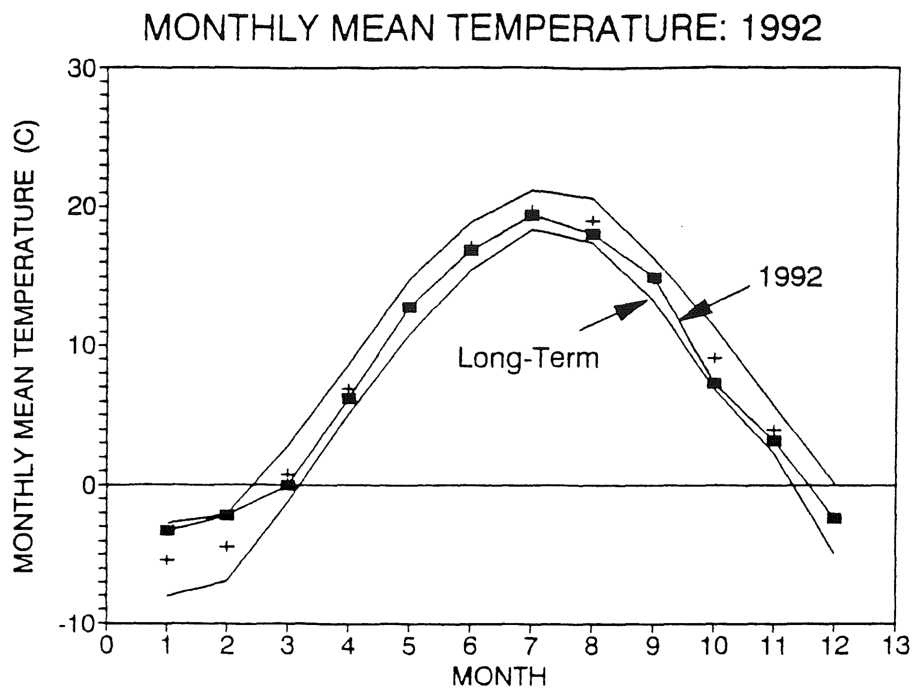
		Seasonal Abundance in 1992	
	Taxon	High	Low
	Kellicottia spp.		
*	*K. bostoniensis*	late Su,F	[W,Sp,early Su]
*	*K. longispina*	F	[W,Sp]
	Keratella spp.		
**	*K. cochlearis*	early Su,F	[W,Sp]
*	*K. crassa*		[W,Sp]
**	*K. earlinae*	Su,F	[W,Sp]
*	*K. hiemalis*	Sp	[late Su,F]
	K. serrulata f. *curvicornis*		
	K. taurocephala		
	Lecane spp.		
	L. luna		
	Monostyla spp.		
	Notholca spp.		
	N. acuminata		
*	*Notommata* spp.	late Su	[F,W,Sp]
	Ploesoma spp.		
*	*P. truncatum*	late Su	[F,W,Sp]
	Polyarthra spp.		
	P. dolichoptera		
	P. euryptera		
	P. remata		
	P. vulgaris		
**	*Polyarthra* ("large")	Su,F	[W,Sp]
**	*Polyarthra* ("small")	Su,F	[W,Sp]
*	*Pompholyx* spp.	early Su,F	[W,Sp]
*	*Synchaeta* spp.	F	[W]
	Trichocerca spp.		
	Trichocerca ("small")		
*	*T. cylindrica*	late Su	[W,Sp]
	T. lophoessa		
*	*T. multicrinus*	Su	[F,W,Sp]
*	*T. rousseleti*		
*	*T. similis*	Su	[F,W,Sp]
	Trichotria spp.		
	Wolga spp.		

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

** Dominant species included in Figures
* Other common species included in Figures

CLIMATE IN 1992

Weather data from Hawley, PA (20 km NE of Lake Waynewood) have been compiled for 1992 and the previous 30 years **(Figure 10)**. These data are from a NOAA cooperator's station. Mean temperature is the monthly mean of daily mean temperatures, whereas precipitation is the monthly total of daily total recorded amounts. 1992 was a pretty normal year overall for both temperature and precipitation, and thus cooler and moister than 1991.



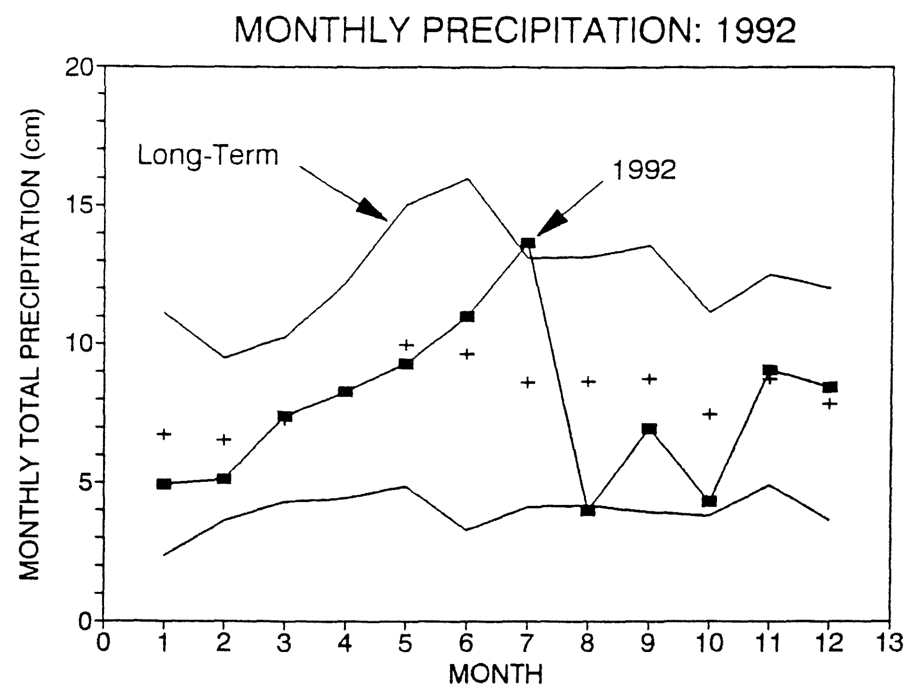


Figure 10. Monthly climate in 1992 compared to the 31-year averages.

(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.

DISCUSSION

Lake Waynewood in 1992 was similar to the lake in preceding years. Transparency and light penetration were not, however, quite as great as in 1991. These data confirm the association of relatively better water quality in 1991 with the low amounts of precipitation received in 1991. Climate in 1992 was close to the long-term norm, and thus cooler and wetter than in 1991.

Chlorophyll reached levels of 10-40 ug/L, as in earlier years. The highest levels were found alternately in the epilimnion and the metalimnon throughout the summer, suggesting shading of metalimnetic populations during epilimnial peaks. This pattern ressembled those of 1989 and 1990. In 1991, the relatively clear summer epilimnion (low epilimnial algal concentrations) permitted high metalimnetic algal populations throughout the summer. Photosynthesis by the higher summer epilimnial algal populations of 1992 again drove late summer pH into the pH 9-10 range, as in 1989 and 1990.

Cooler weather in 1992 slightly retarded epilimnial development as well as hypolimnial deoxygenation during the summer. By late summer, however, the lake was anoxic below the epilimnion, as in prior years, and surface water temperature reached the same summer maximum (ca. 24°C) as in the preceding years.

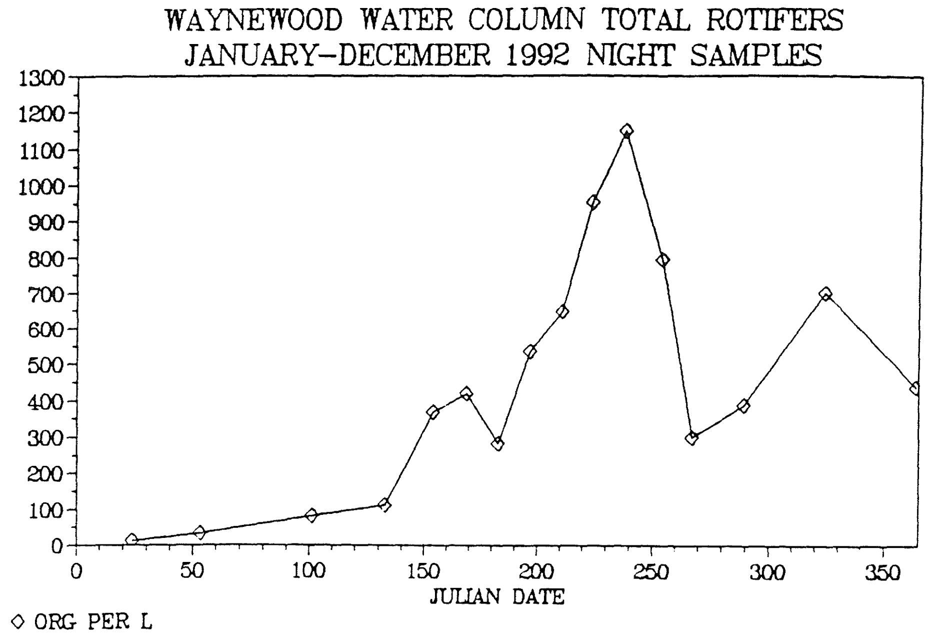
After four summers and three full years of observations, it is clear that there is a reproducible pattern within the zooplankton community. Spring and fall peaks of the herbivorous macrozooplankton bracket an intervening summer period of high rotifer abundance and richness that coincides with highest epilimnetic and/or metalimnetic algal populations. This pattern may reflect suppression of algae by the macrozooplankton, especially *Daphnia*.

Nonetheless, individual species of rotifers and cyclopoid copepods differ greatly in abundance from one year to another, unlike *Daphnia*, *Diaptomus*, and *Chaoborus*, which have been quite consistent. In 1992, several dominant species from prior years were reduced to less important roles: the rotifers *Kellicottia longispina* and *Keratella cochlearis*, and the cyclopoid copepods *Mesocyclops edax* and *Tropocyclops prasinus*. Populations of these last named copepods essentially failed in 1992. *Keratella earlinae* was one of few species to increase substantially. Also, *Orthocyclops modestus* appeared for the first time in our record, and was moderately common in late summer.

ZOOPLANKTON GRAPHS

The following graphs present water-column mean nighttime concentrations of the common zooplankton at the main sampling station. Each data point was 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 was in the deepest part of the lake. Two replicate samples were taken in quick succession.

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



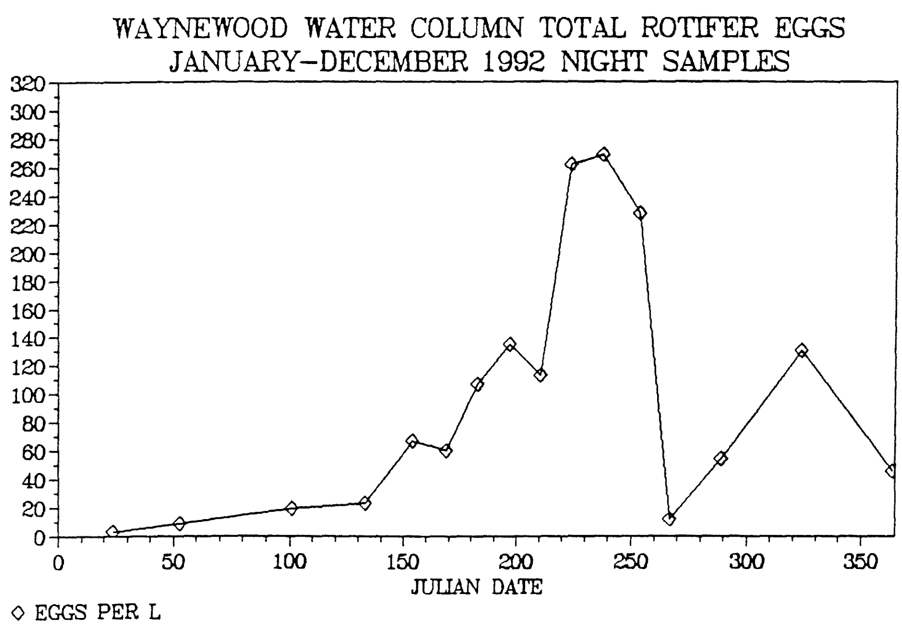


Figure 11. Rotifers in Lake Waynewood, 1992.

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.

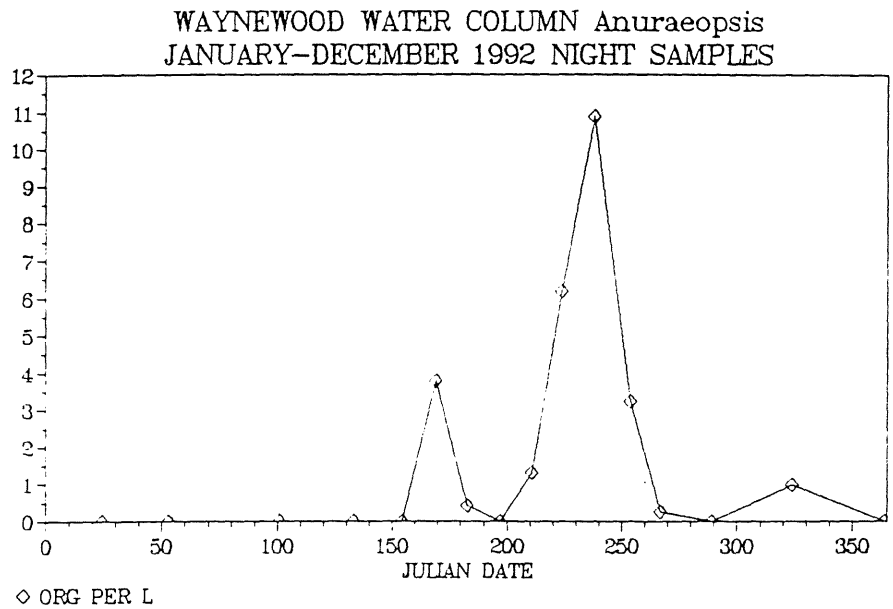
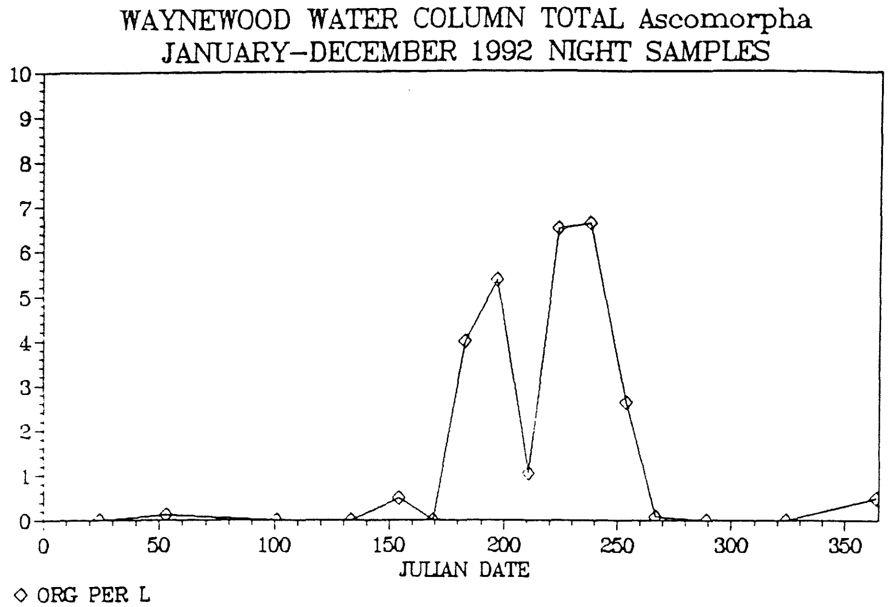


Figure 12. The rotifer *Anuraeopsis* in Lake Waynewood, 1992.

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



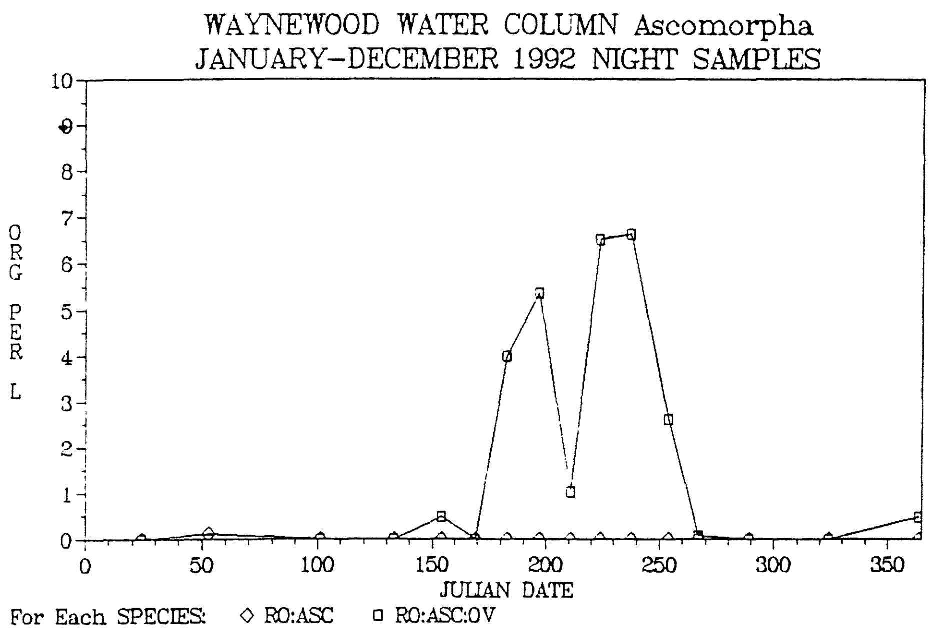


Figure 13. The rotifer *Ascomorpha* in Lake Waynewood, 1992.

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

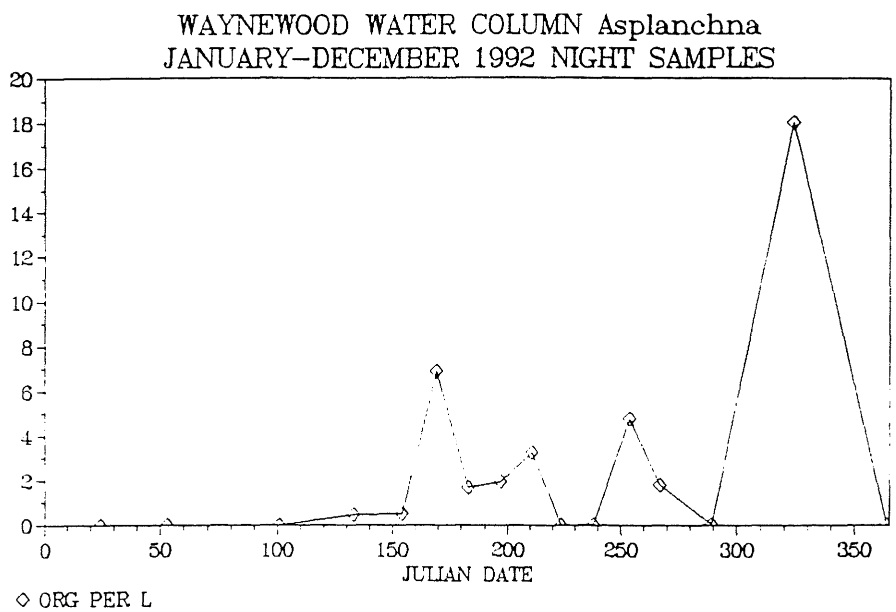
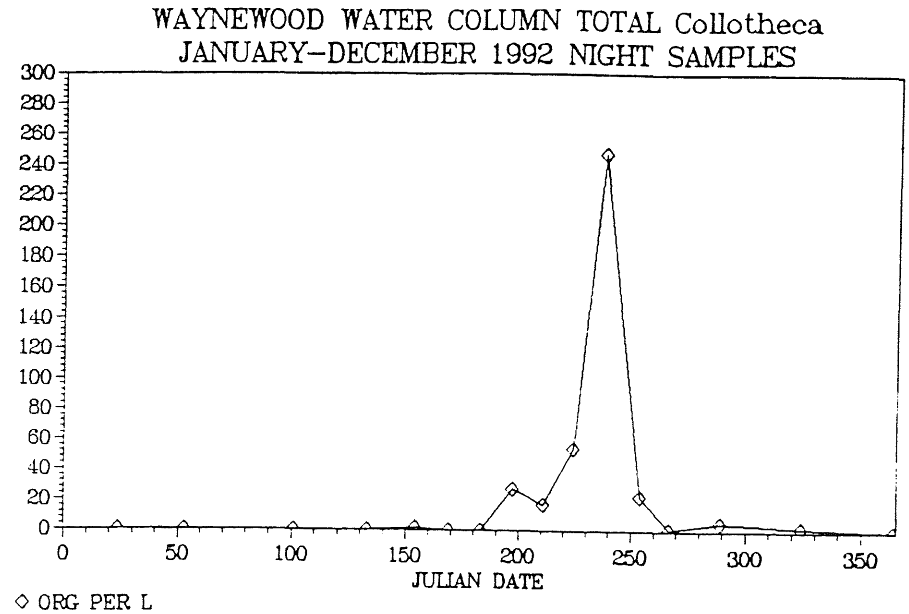


Figure 14. The rotifer *Asplanchna* in Lake Waynewood, 1992.

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



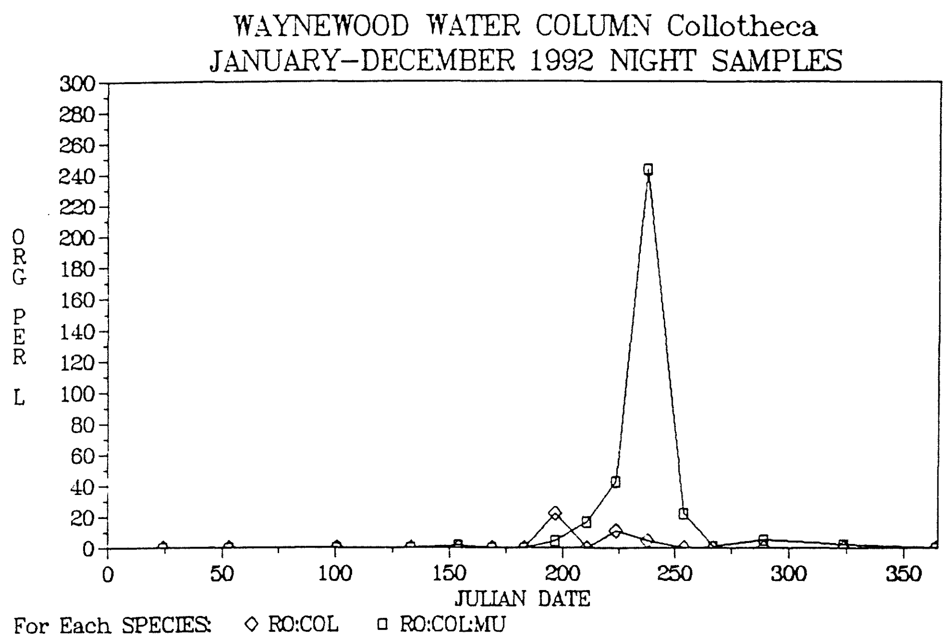
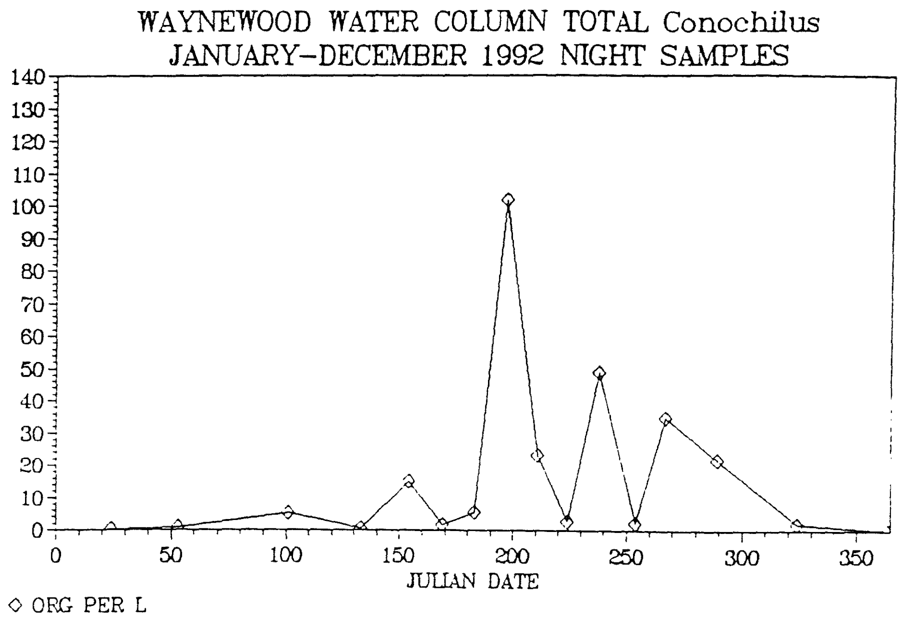


Figure 15. The rotifer *Collotheca* in Lake Waynewood, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals of all species per litre. **(Bottom)** *Collotheca* by species: **COL** undifferentiated species, **MU** *C. mutabilis*.



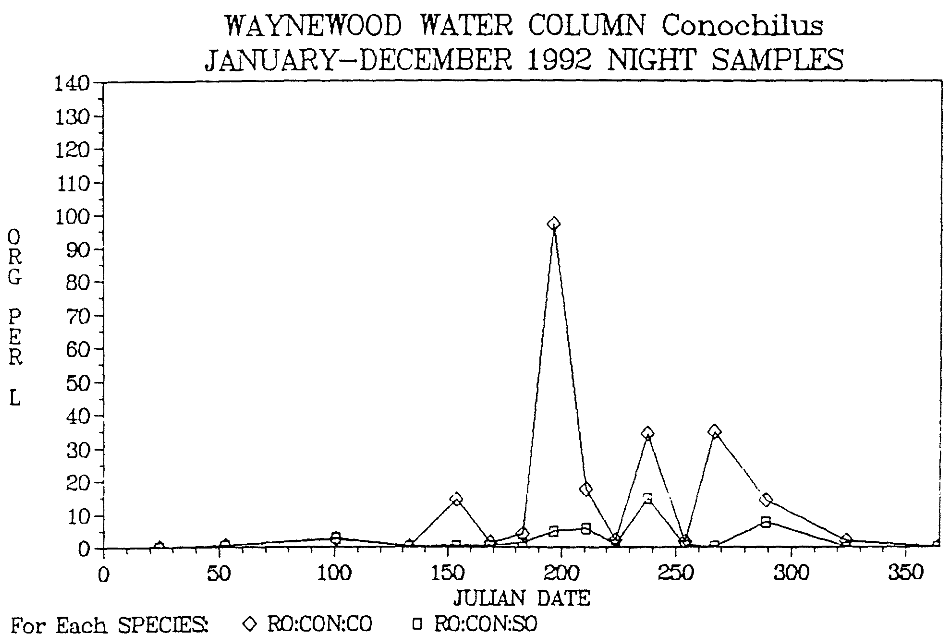


Figure 16. The rotifer *Conochilus* in Lake Waynewood, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals of all species per liter. **(Bottom)** *Conochilus* by group: **CO** colonial spp, **SO** solitary spp.

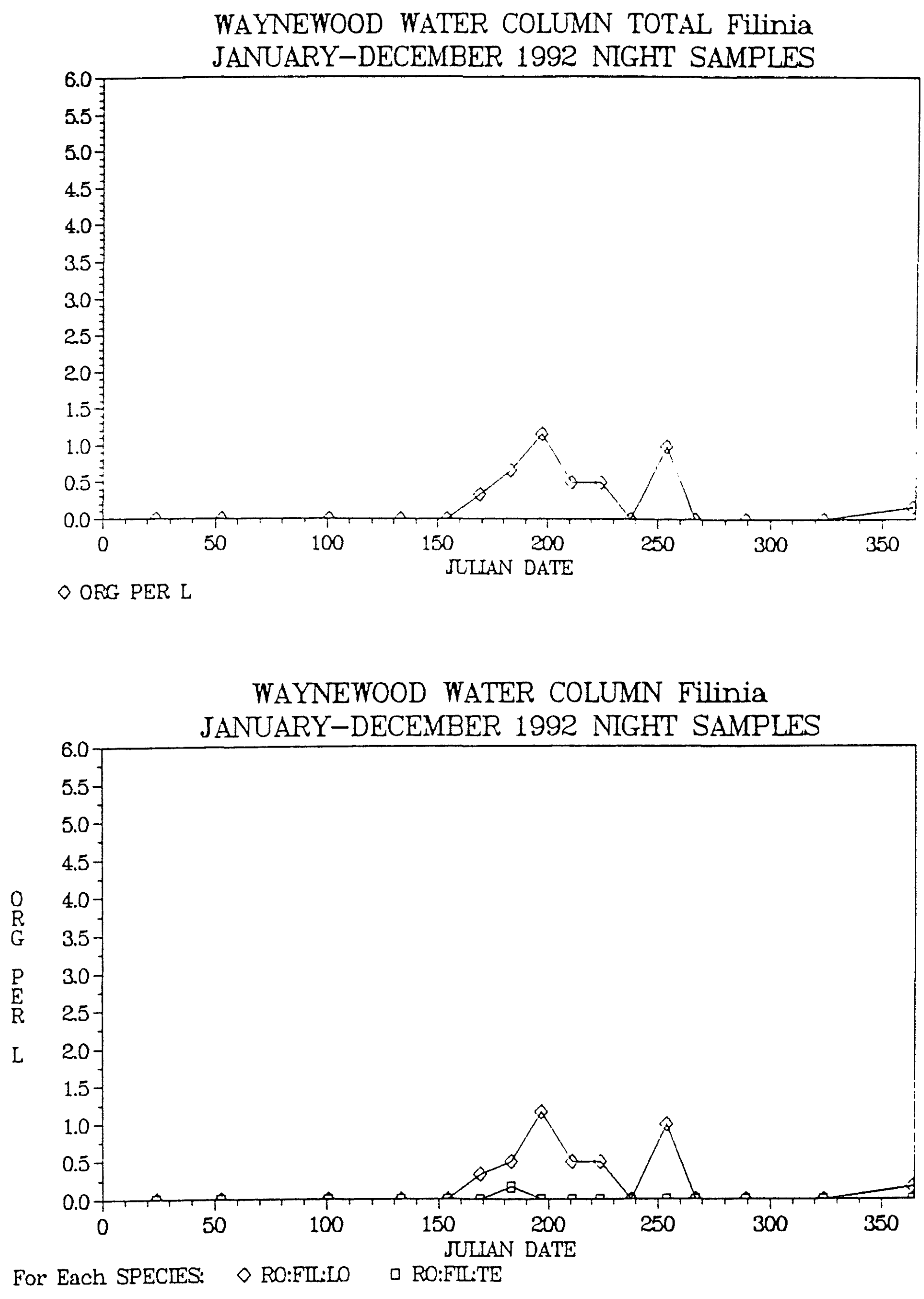
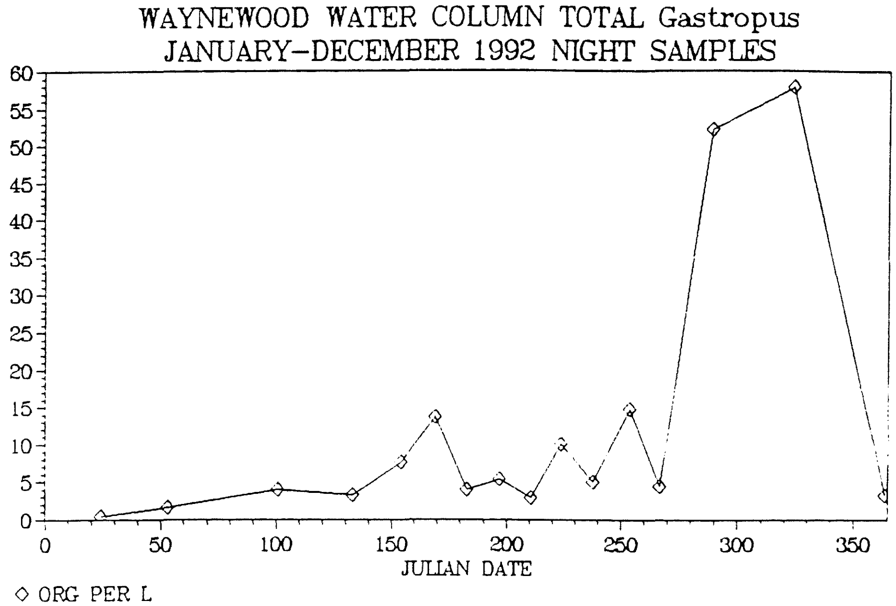


Figure 17. The rotifer *Filinia* in Lake Waynewood, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals of all species per liter. **(Bottom)** *Filinia* by species: **LO** *F. longiseta*, **TE** *F. terminalis*.



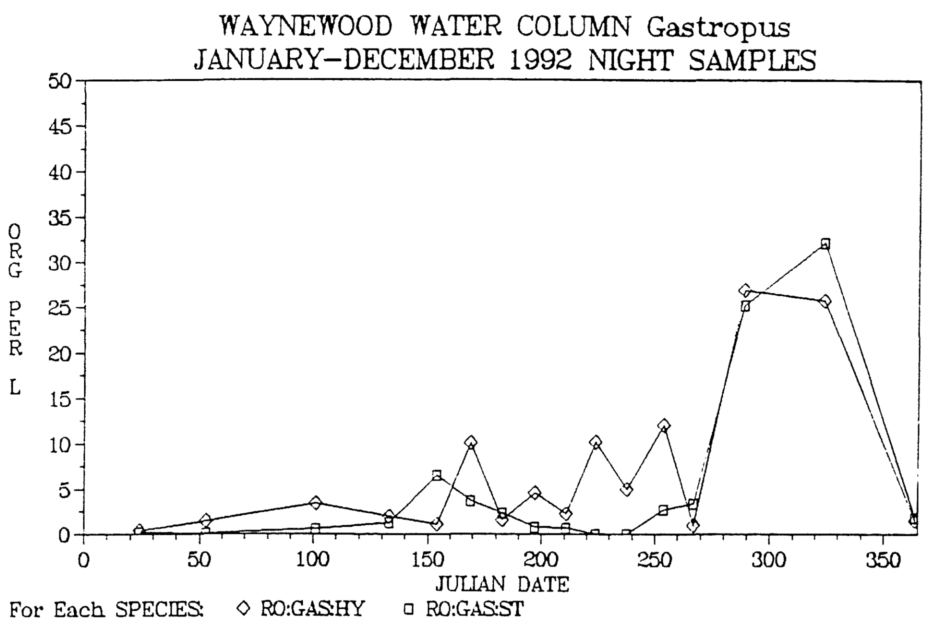
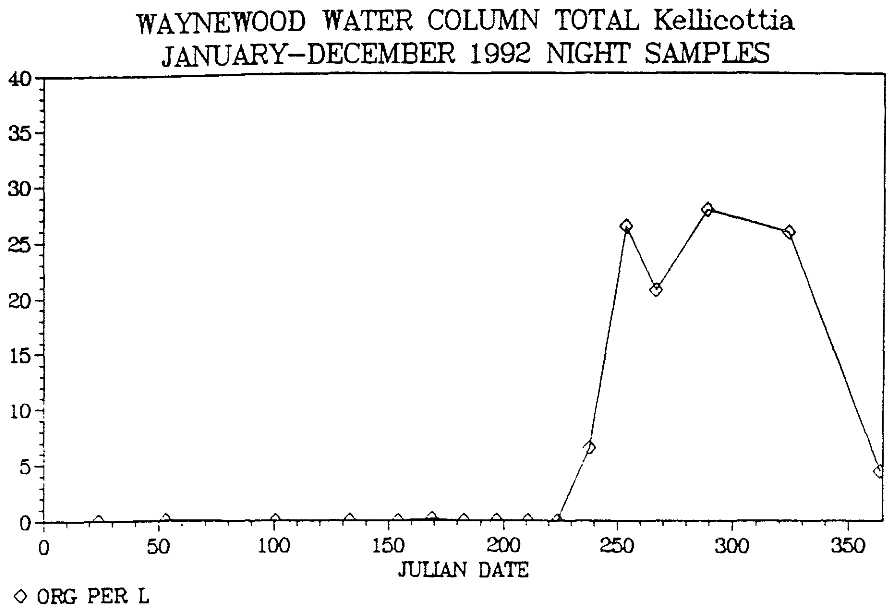


Figure 18. The rotifer *Gastropus* in Lake Waynewood, 1992.

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



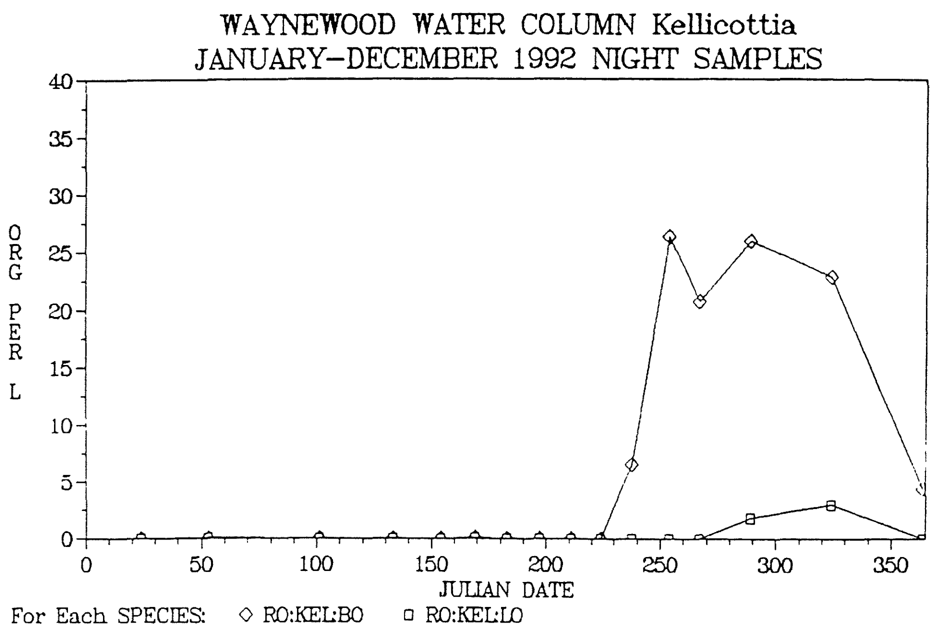


Figure 19. The rotifer *Kellicottia* in Lake Waynewood, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom) BO** *K. bostoniensis* and **LO** *K. longispina*.

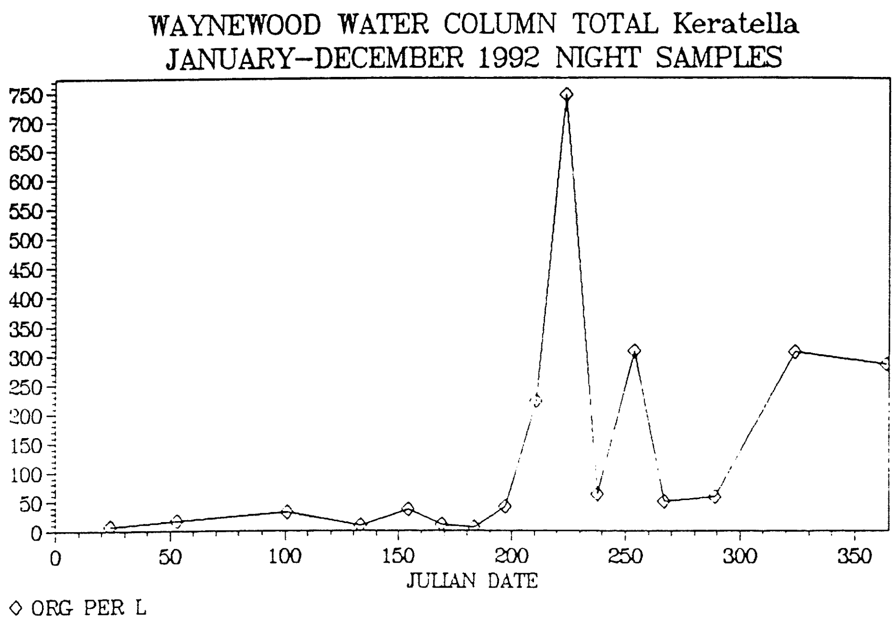
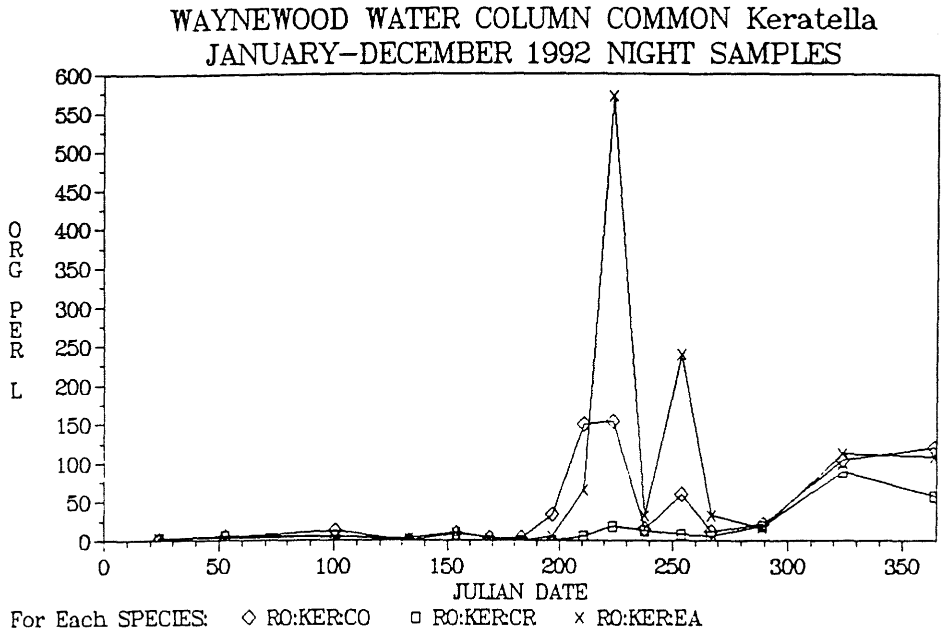


Figure 20. The rotifer *Keratella* in Lake Waynewood, 1992.

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



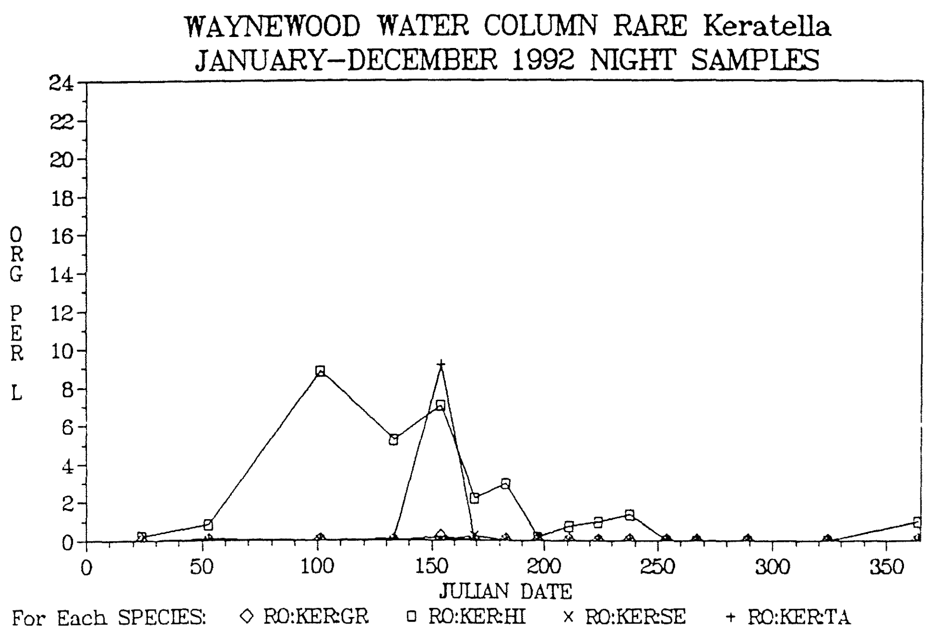


Figure 21. The rotifer *Keratella* (by species) in Lake Waynewood, 1992.

Nighttime net collections (48μm) from three depths have been combined to give a water column mean. **(Top) CO** *K. cochlearis*, **CR** *K. crassa*, and **EA** *K. earlinae*. **(Bottom) GR** *K. gracilenta*, **HI** *K. hiemalis*, **SE** *K. serrulata*, **TA** *K. taurocephala*.

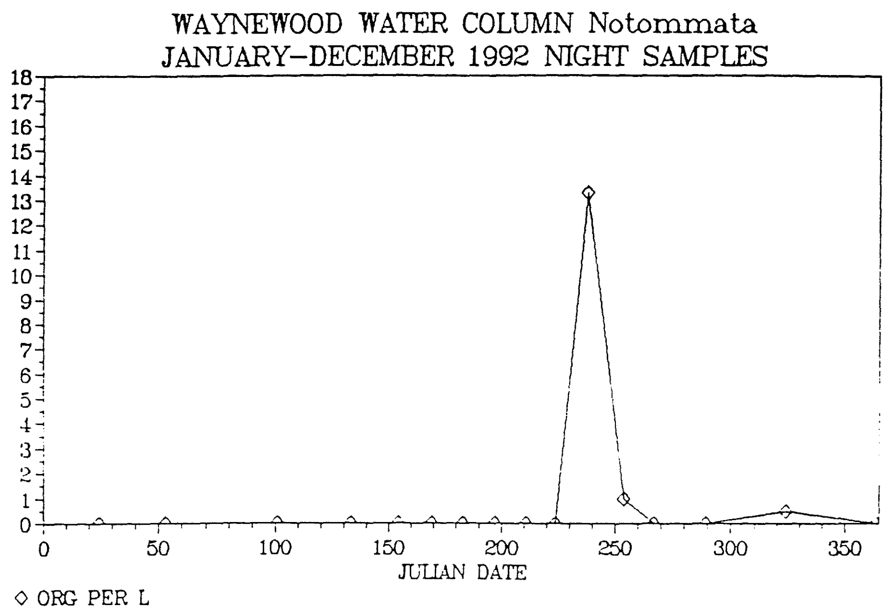


Figure 22. The rotifer *Notommata* in Lake Waynewood, 1992.

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

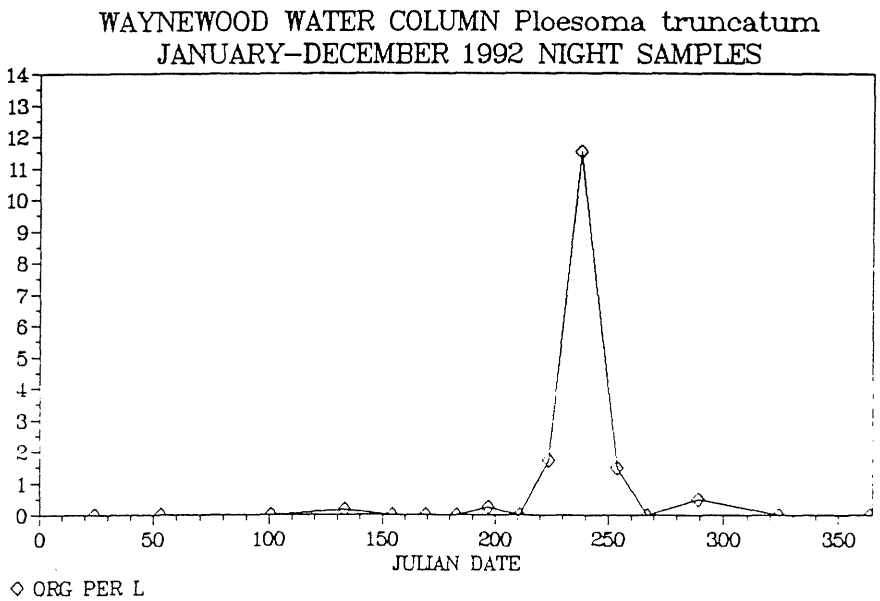
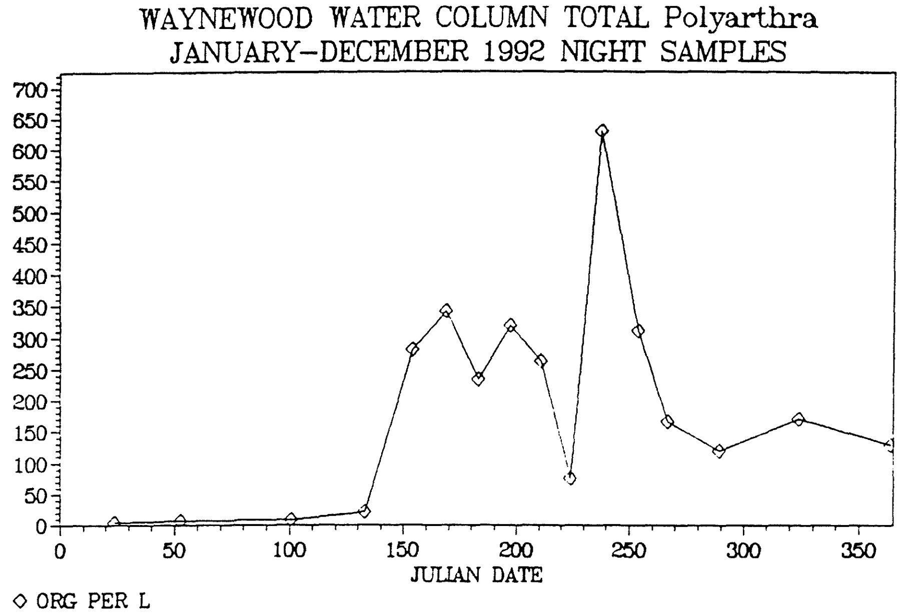


Figure 23. The rotifer *Ploesoma* in Lake Waynewood, 1992.

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



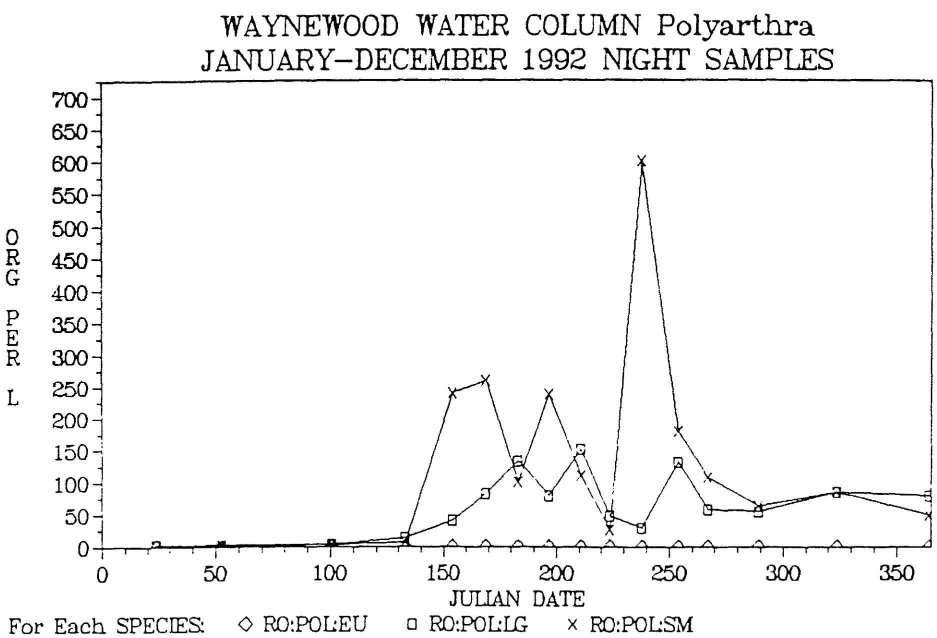


Figure 24. The rotifer *Polyarthra* in Lake Waynewood, 1992.

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

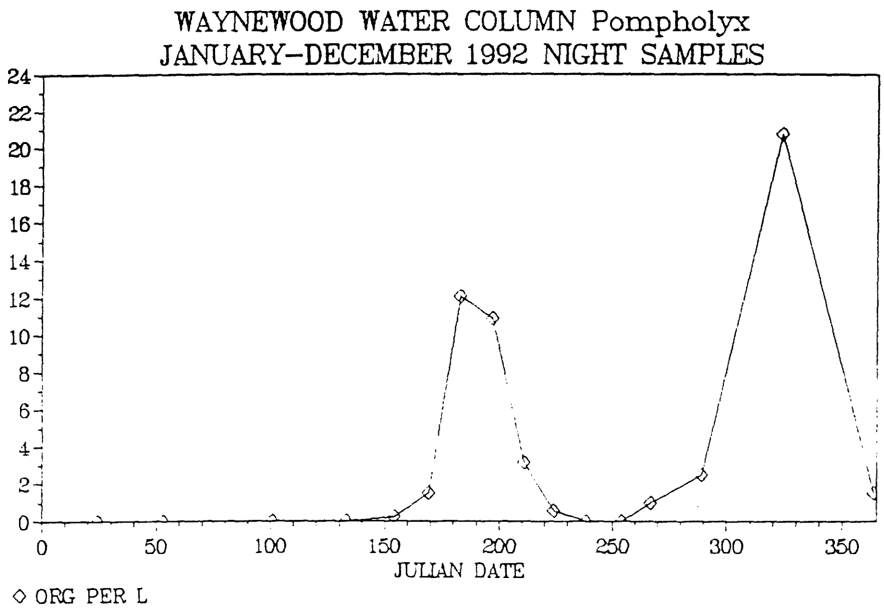


Figure 25. The rotifer *Pompholyx* in Lake Waynewood, 1992.

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

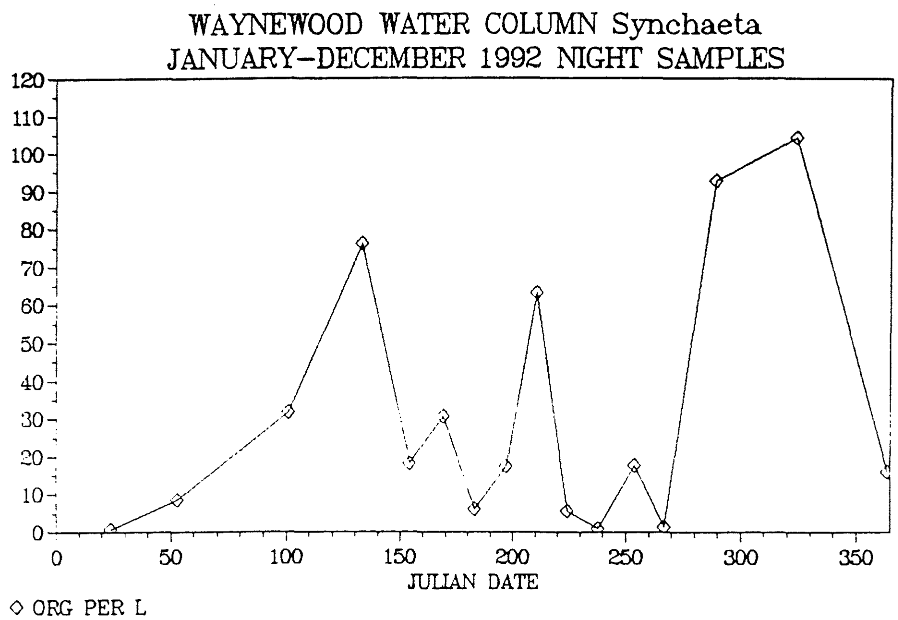
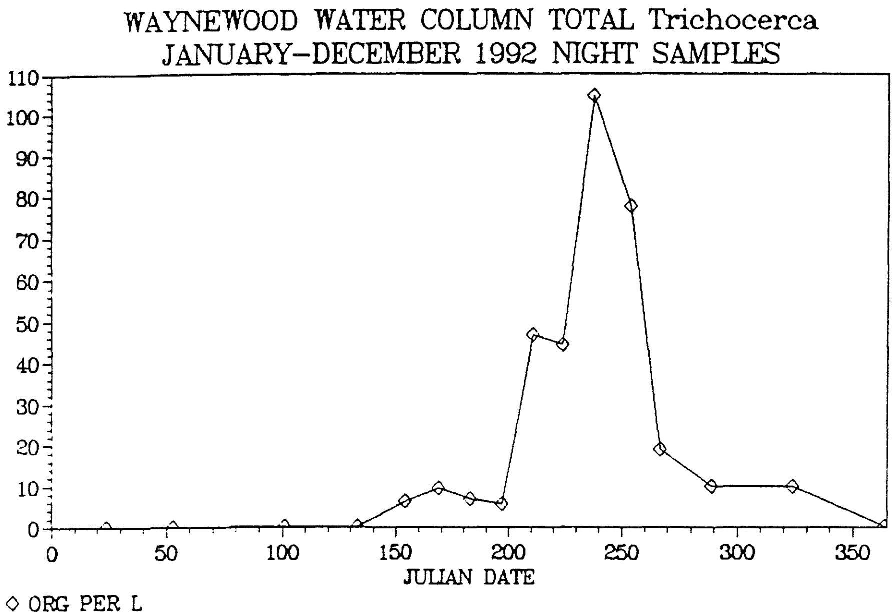


Figure 26. The rotifer *Synchaeta* in Lake Waynewood, 1992.

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



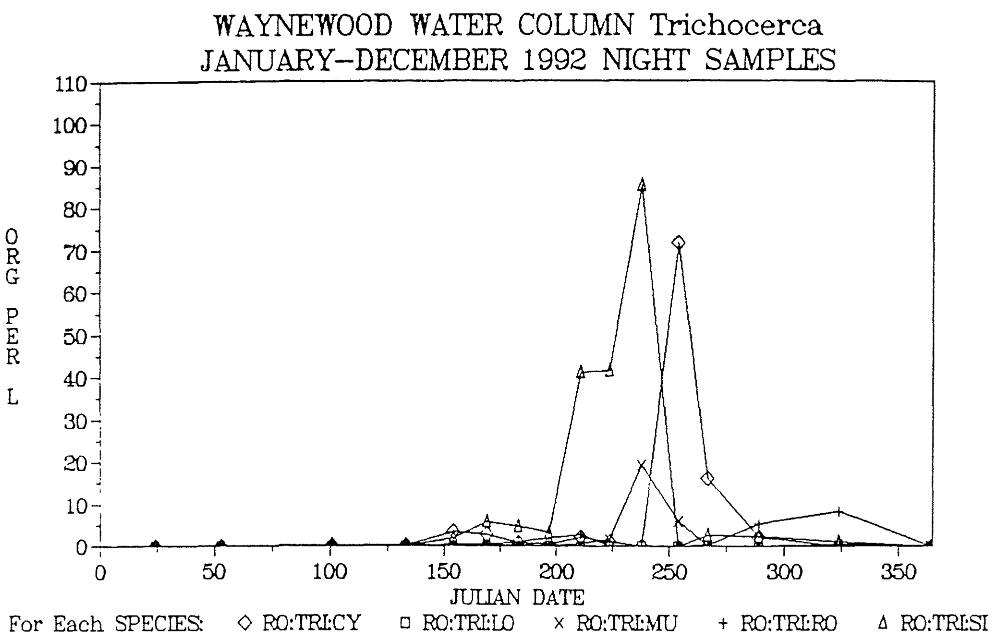


Figure 27. The rotifer *Trichocerca* in Lake Waynewood, 1992.

Nighttime net collections ($48\mu m$) from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** *Trichocerca* by species: **CY** *T. cylindrica*, **LO** *T. lophoessa*, **MU** *T. multicrinus*, **RO** *T. rousseleti* and **SI** *T. similis*.

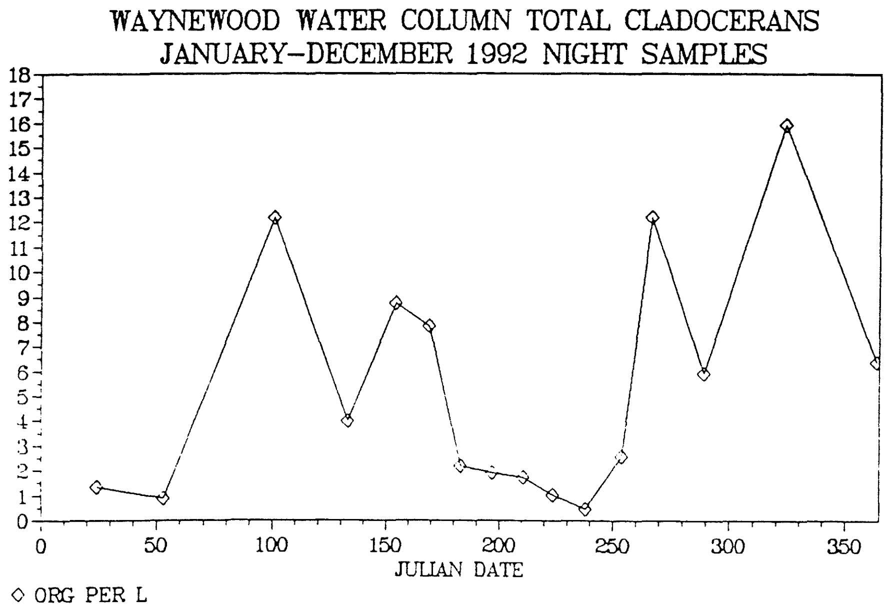
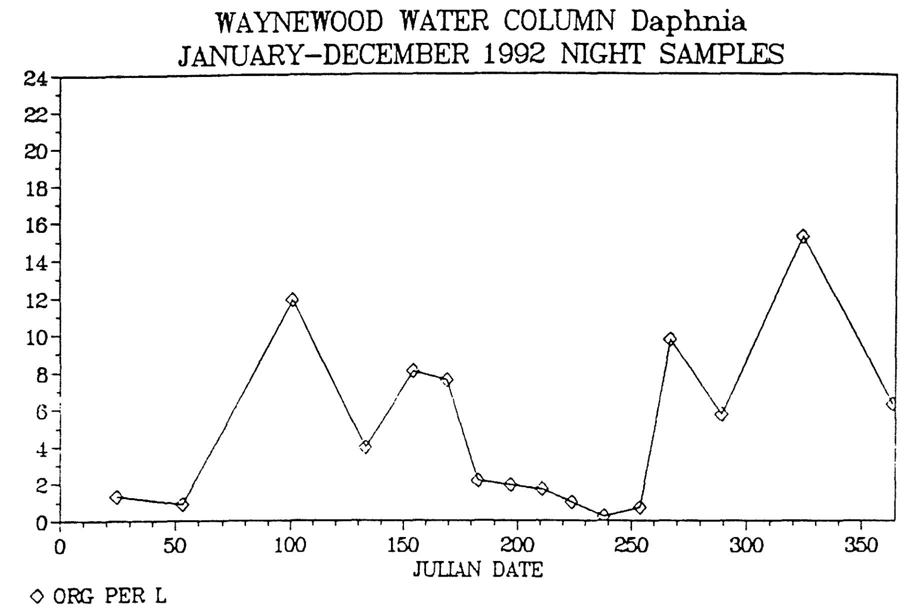


Figure 28. Cladocera in Lake Waynewood, 1992.

Nighttime net collections from three depths have been combined to give a water column mean. Different organisms were counted from the 202μm net (mainly *Daphnia* spp.) and the 48μm net (mainly *Bosmina* spp.).



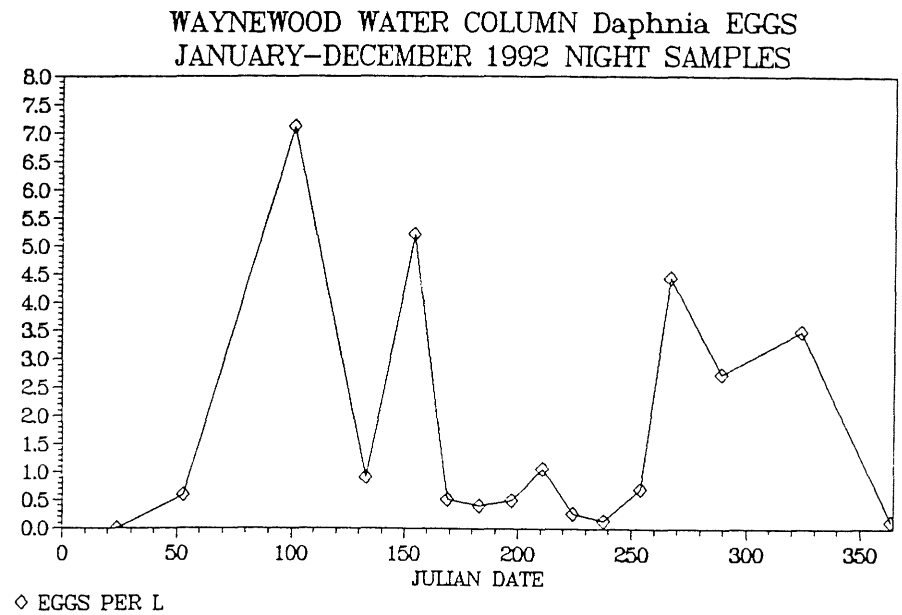
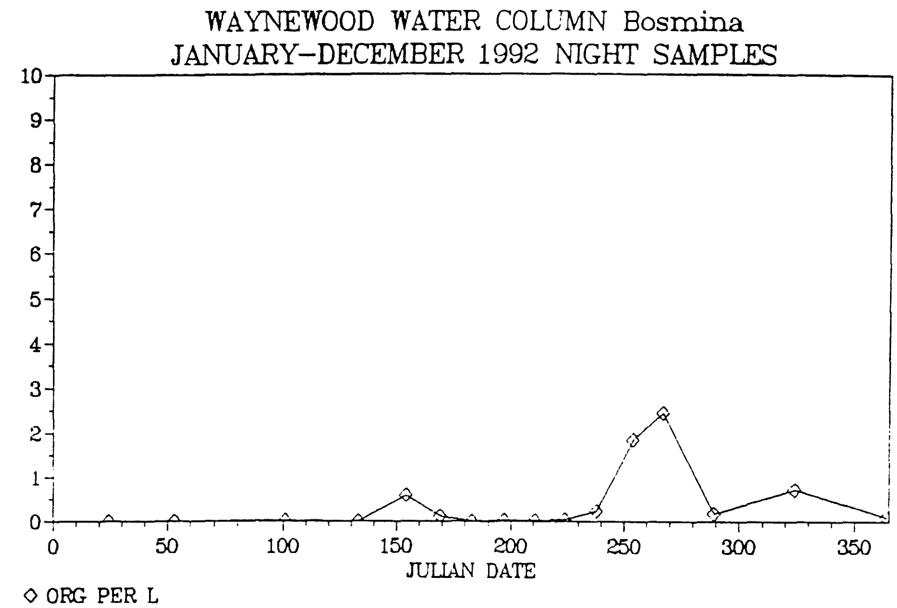


Figure 29. The cladoceran *Daphnia* in Lake Waynewood, 1992.

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



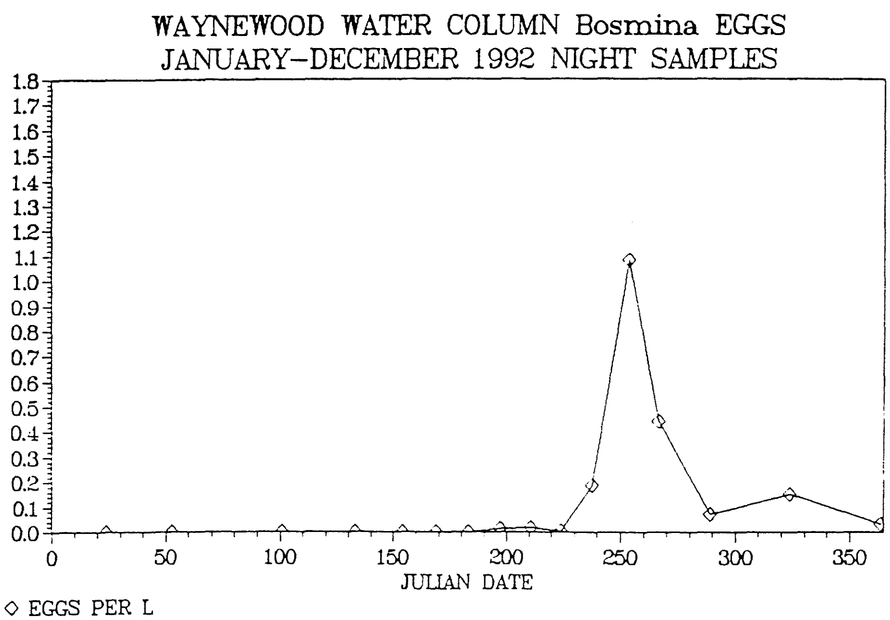


Figure 30. The cladoceran *Bosmina* in Lake Waynewood, 1992.

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

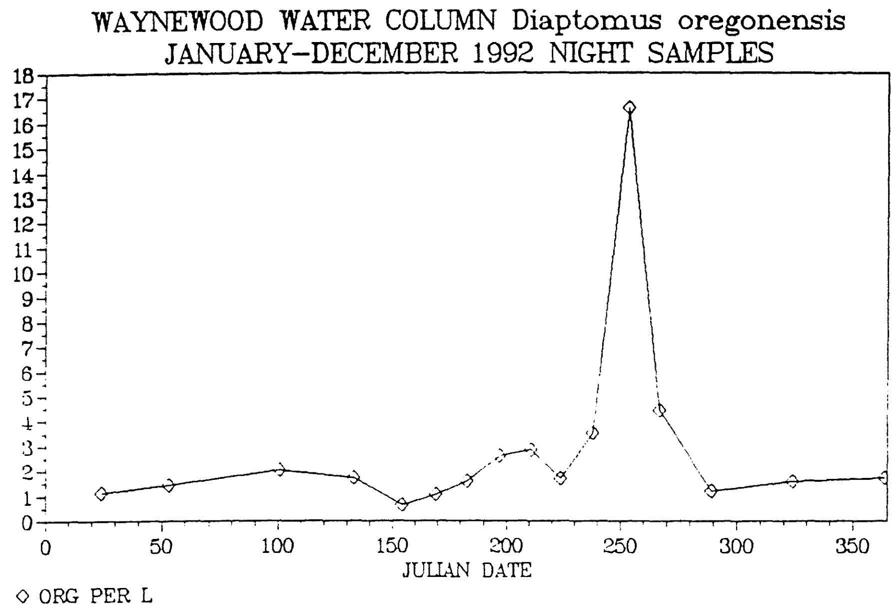
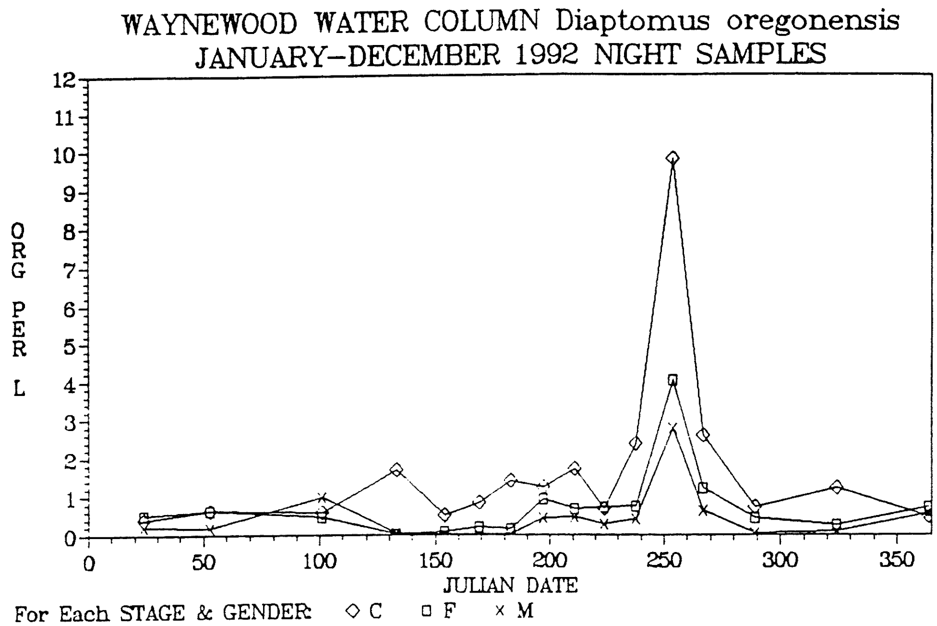


Figure 31. Calanoid copepods (*Diaptomus oregonensis*) in Lake Waynewood, 1992.

Nighttime net collections from three depths have been combined to give a water column mean. Counts of adults and copepodids were all made from the 48μm-net samples.



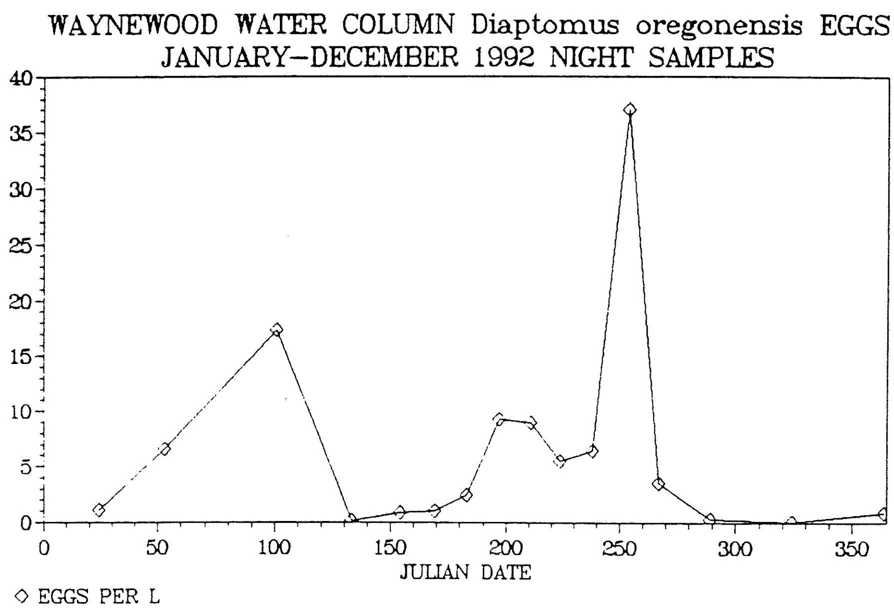
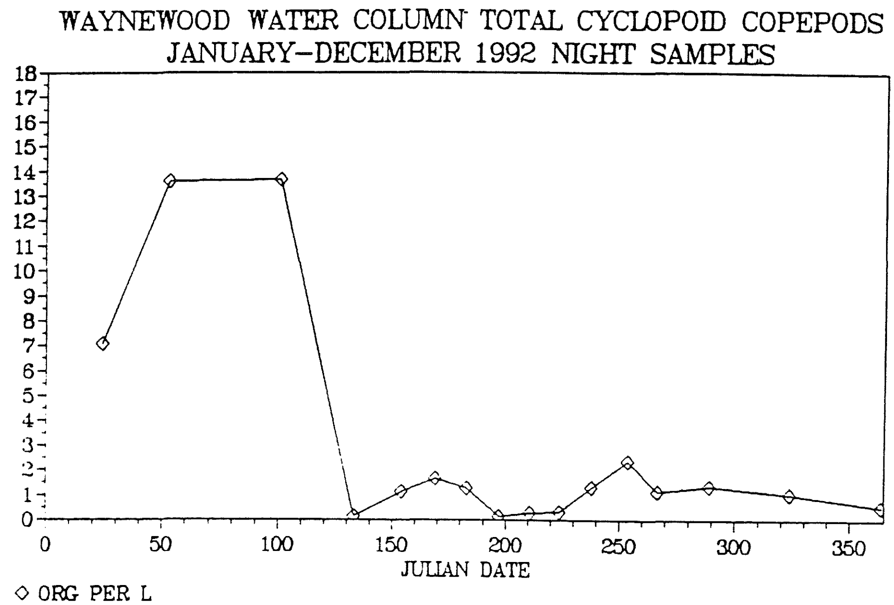


Figure 32. The calanoid copepod *Diaptomus oregonensis* in Lake Waynewood, 1991.

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. oregonensis* eggs per liter.



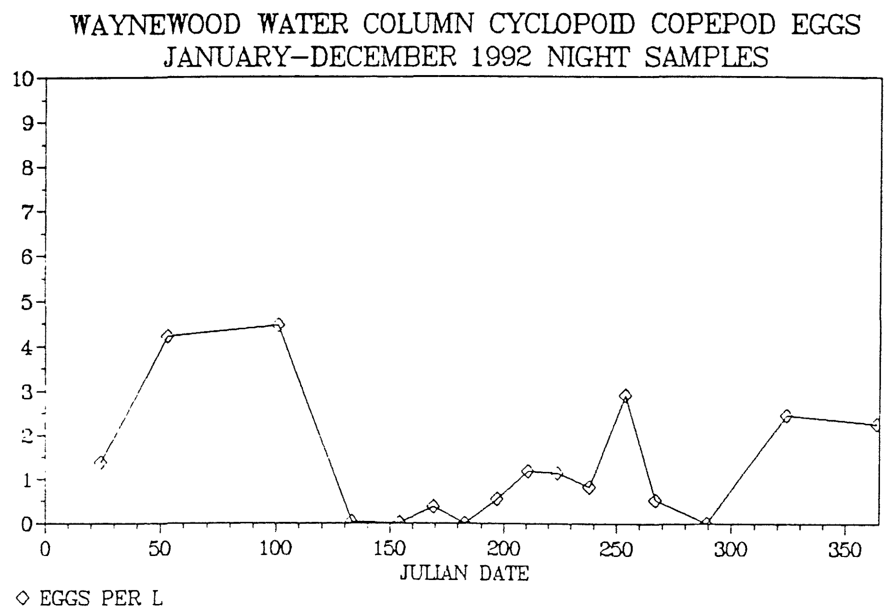
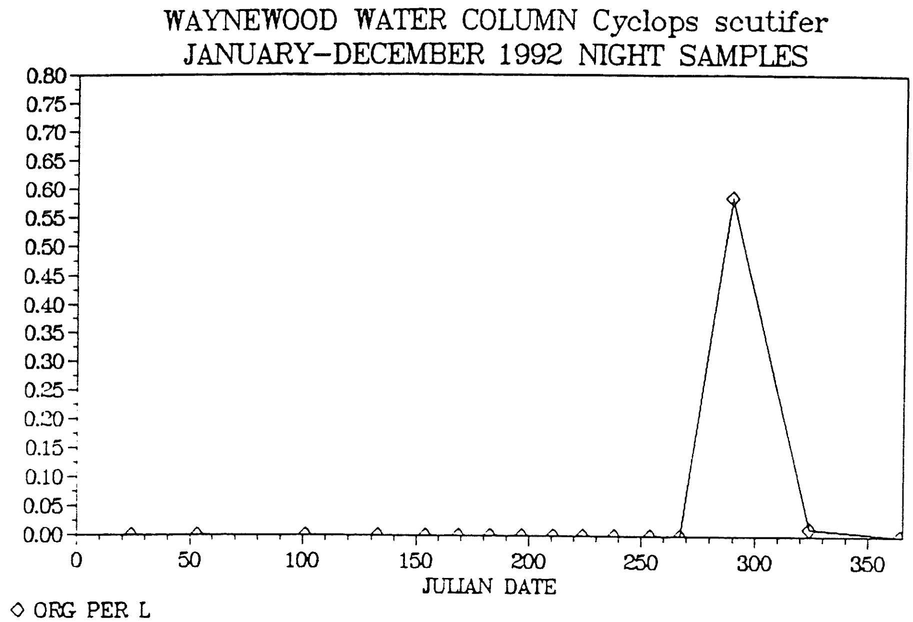


Figure 33. Cyclopoid copepods in Lake Waynewood, 1992.

Nighttime net collections from three depths have been combined to give a water column mean. Several species, collected variously with the 48μm or 202μm net, are included. **(Top)** Total individuals, including copepodids. **(Bottom)** Total cyclopoid eggs.



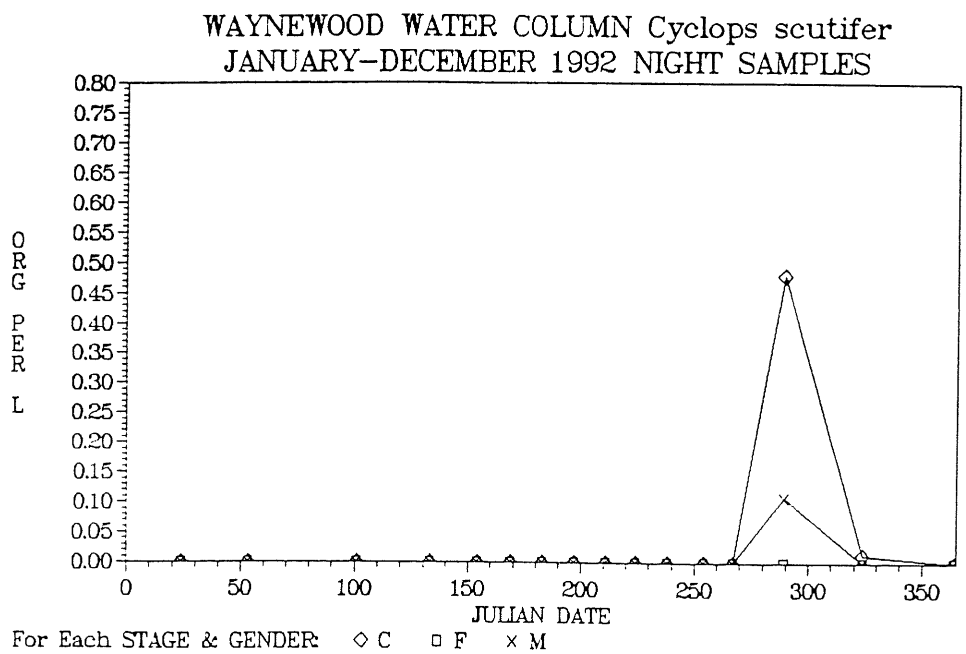
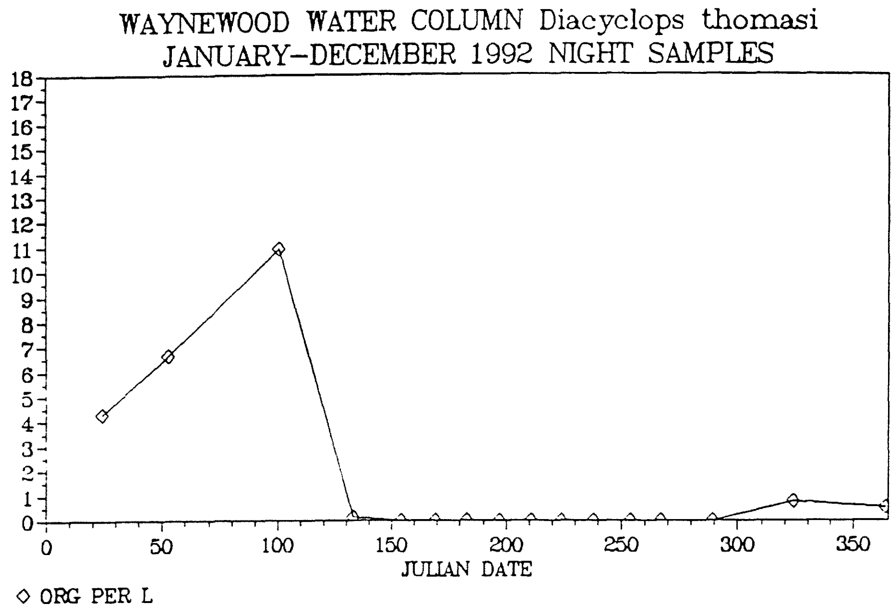


Figure 34. The cyclopoid copepod *Cyclops scutifer* in Lake Waynewood, 1992.

Nighttime net collections from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** Separated into adults (males and females separately) and copepodids. Females were counted from the 202μm samples, males and copepodids from the 48μm samples.



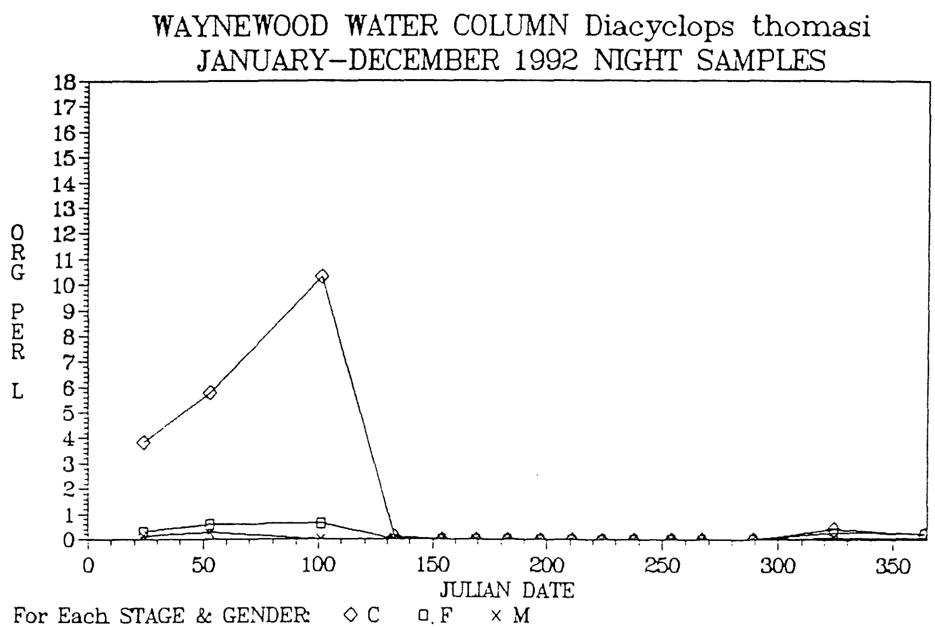


Figure 35. The cyclopoid copepod *Diayclops thomasi* in Lake Waynewood, 1992.

Nighttime net collections from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** Separated into adults (males and females separately) and copepodids. Females were counted from the 202μm samples, males and copepodids from the 48μm samples. This species was referred to *Cyclops bicuspidatus* in the 1990 report.

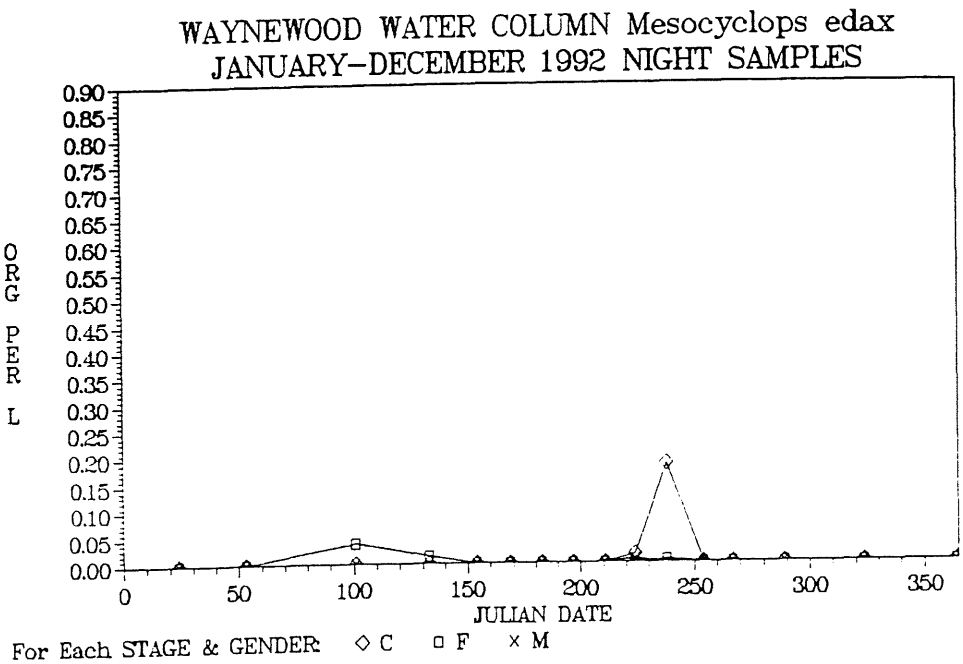
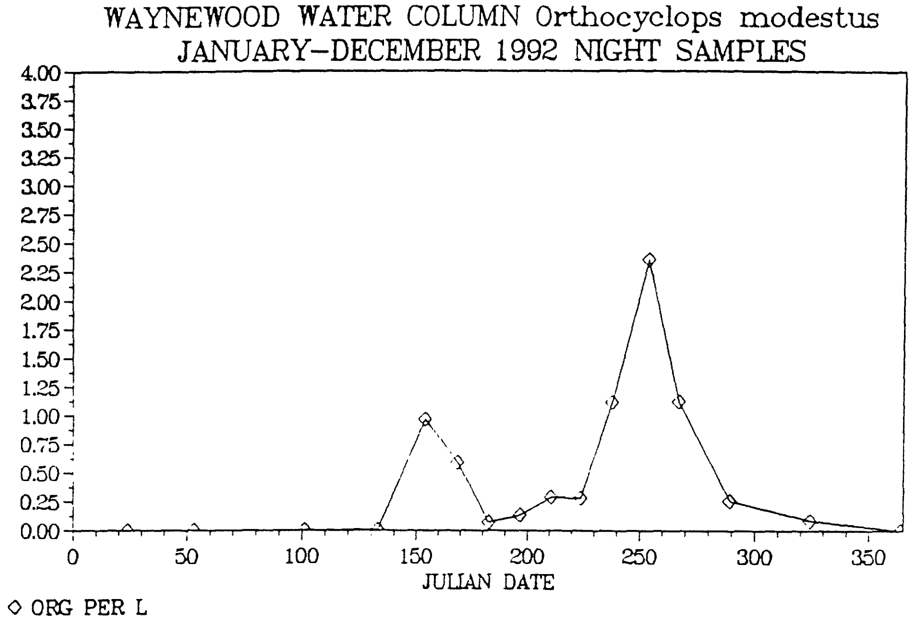


Figure 36. The cyclopoid copepod *Mesocyclops edax* in Lake Waynewood, 1992.

Nighttime net collections from three depths have been combined to give a water column mean, differentiated into adults (males and females separately) and copepodids. Females were counted from the 202μm samples, males and copepodids from the 48μm samples.



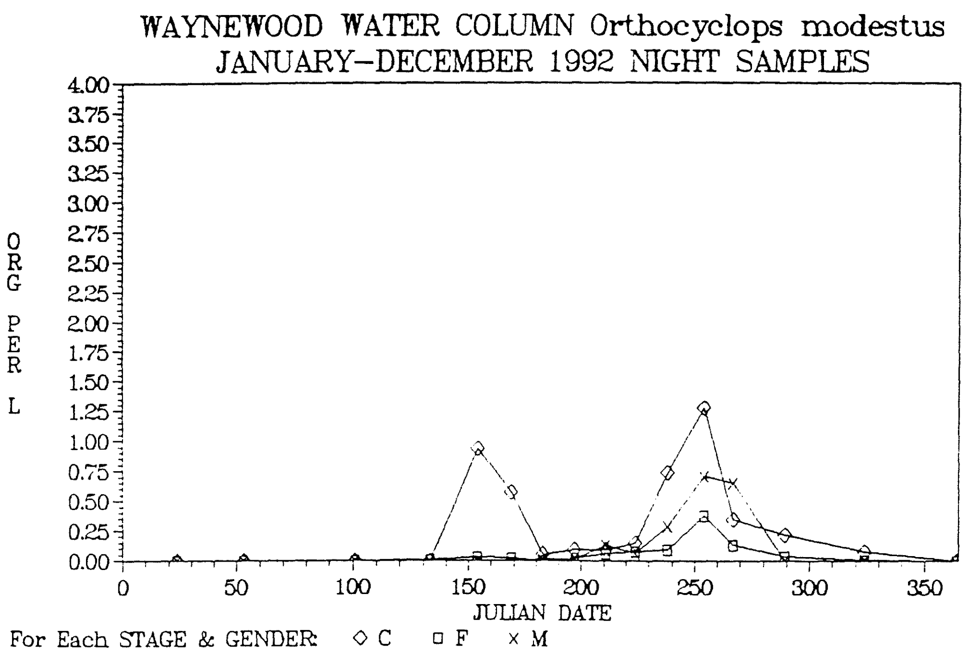
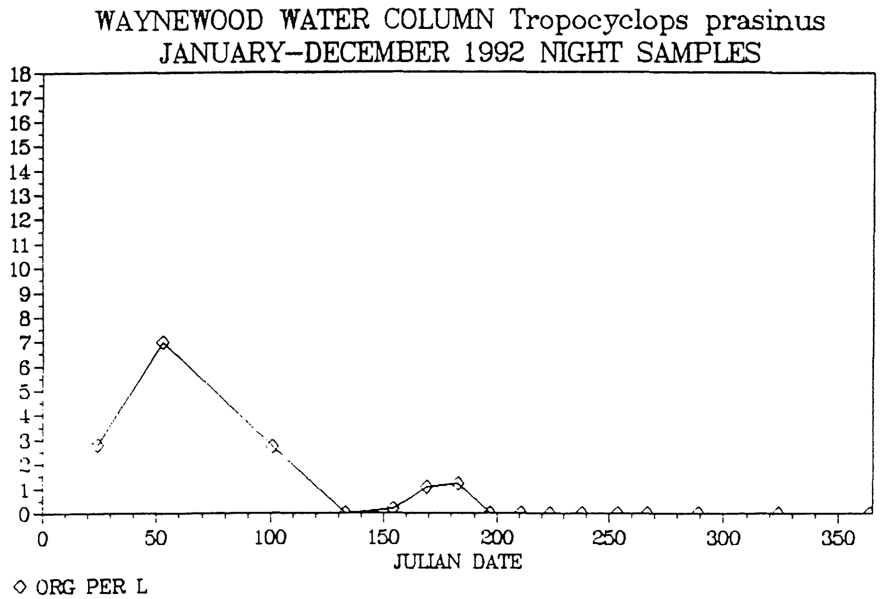


Figure 37. The cyclopoid copepod *Orthocyclops modestus* in Lake Waynewood, 1992.

Nighttime net collections from three depths have been combined to give a water column mean. **(Top)** Total individuals per liter. **(Bottom)** Separated into adults (males and females separately) and copepodids. Females were counted from the 202μm samples, males and copepodids from the 48μm samples.



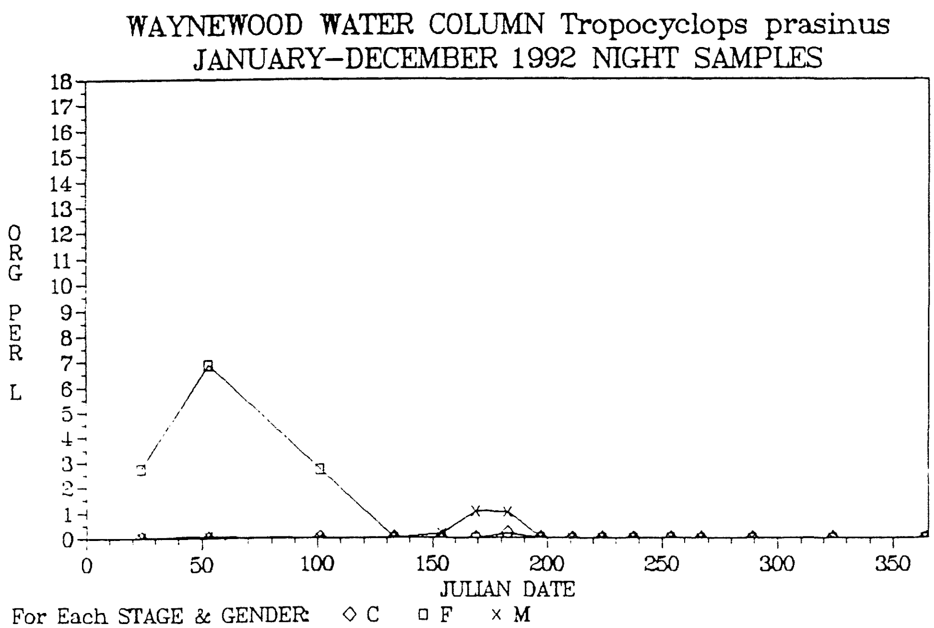


Figure 38. The cyclopoid copepod *Tropocyclops prasinus* in Lake Waynewood, 1992.

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

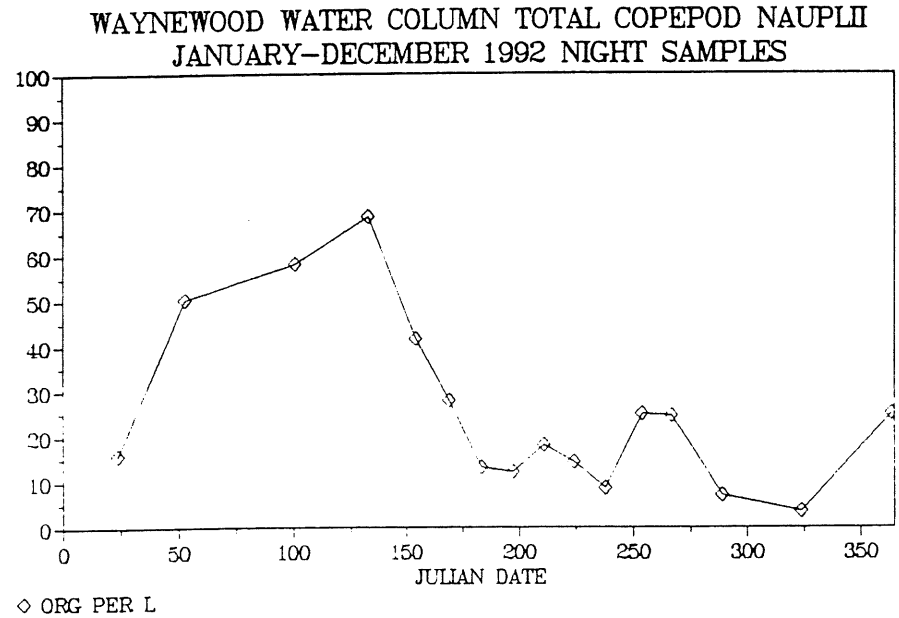


Figure 39. Copepod nauplii in Lake Waynewood, 1992.

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.

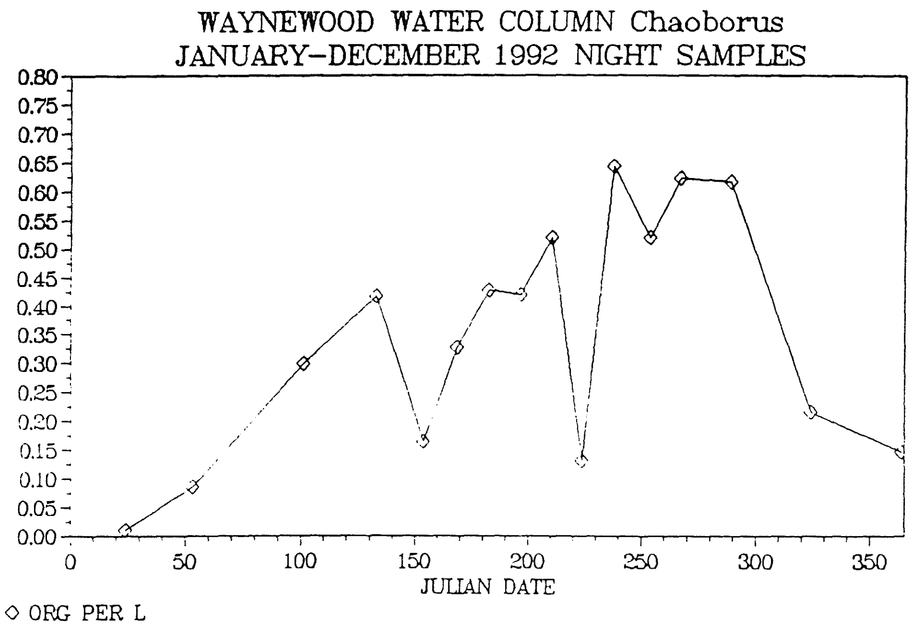


Figure 40. The dipteran *Chaoborus* in Lake Waynewood, 1992.

Nighttime net collections ($48\mu m$) from three depths have been combined to give a water column mean.

EXPLANATION OF DATA TABLES

The following 16 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 start or 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 11 (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; "4" means reported value should be interpreted as a true "zero".
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
CL	Christine Luong
EMN	Gina Novak
BKS	Brian Sharer
JS	Jennifer Seva
TLV	Tim Vail
NKW	Narissa Willever

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 1/24/92 JULIAN DATE: 24 TIME: 14.75

SECCHI M: 4.3 WEATHER: Partly cloudy, windy

PERSONNEL: EMN TLV

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

COMMENTS: 15-17 cm ice, no snow

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
1/24/92	24	S	1	-1.0	4.2								
1/24/92	24		1	0.0	1.5	11.88		100.0000					
1/24/92	24	E	1	1.0	2.9	10.08		18.3554	6.84	313	4.21	4.77	
1/24/92	24	E	2	1.0	2.9	10.08		18.3554	6.95	322	4.29	4.50	70.20
1/24/92	24		1	2.0	2.9	9.95		7.0570					
1/24/92	24	M	1	3.0	2.9	9.88		2.9651	6.97	317	3.77	4.19	
1/24/92	24	M	2	3.0	2.9	9.88		2.9651	6.97	325	4.06	4.39	73.10
1/24/92	24		1	4.0	2.9	9.89		1.2412					
1/24/92	24		1	5.0	2.9	9.79		0.5150					
1/24/92	24		1	6.0	2.9	9.68		0.2157					
1/24/92	24		1	7.0	2.9	9.38		0.0884					
1/24/92	24	H	1	8.0	2.9	8.60		0.0360	6.94	321	1.13	1.77	
1/24/92	24	H	2	8.0	2.9	8.60		0.0360	6.95	316	1.02	1.58	50.00
1/24/92	24		1	9.0	2.9	8.13		0.0139					
1/24/92	24		1	10.0	2.9	7.95							
1/24/92	24		1	11.0	2.9	5.99							
1/24/92	24		1	12.0	3.1	0.98							

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 2/22/92 JULIAN DATE: 53 TIME: 10.50

SECCHI M: 3.6 WEATHER: Overcast

PERSONNEL: EMN TLV REM

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

COMMENTS: 20 cm clear ice, no snow cover

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
2/22/92	53	S	1	-1.0									
2/22/92	53		1	0.0	3.2	10.60		100.0000					
2/22/92	53	E	1	1.0	3.3	10.20		20.2200	6.76	302	11.58	11.58	
2/22/92	53	E	2	1.0	3.3	10.20		20.2200	6.81	312	6.51	6.51	88.00
2/22/92	53		1	2.0	3.3	10.10		8.7700					
2/22/92	53		1	3.0	3.3	10.05		4.3400					
2/22/92	53	M	1	4.0	3.3	10.00		2.2300	6.79	323	6.58	6.58	
2/22/92	53	M	2	4.0	3.3	10.00		2.2300	6.79	321	4.09	4.09	87.00
2/22/92	53		1	5.0	3.3	10.00		1.2800					
2/22/92	53		1	6.0	3.3	10.00							
2/22/92	53		1	7.0	3.3	10.00							
2/22/92	53		1	8.0	3.2	9.85							
2/22/92	53	H	1	9.0	3.2	9.70			6.77	323	0.44	1.19	
2/22/92	53	H	2	9.0	3.2	9.70			6.79	314	0.78	0.93	28.20
2/22/92	53		1	10.0	3.1	9.80							
2/22/92	53		1	11.0	3.1	7.00							

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 4/10/92 JULIAN DATE: 101 TIME: 10.83

SECCHI M: 3.7 WEATHER: Partly cloudy

PERSONNEL: EMN TLV BKS

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

COMMENTS: Ice-out within last week. No March sampling because of bad ice.

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
4/10/92	101	S	1	-1.0	7.2								
4/10/92	101		1	0.0	5.4	11.88		100.0000					
4/10/92	101		1	1.0	4.8	11.79		34.8554					
4/10/92	101	E	1	2.0	4.7	11.68		14.7131	7.00	265	4.05	4.05	
4/10/92	101	E	2	2.0	4.7	11.68		14.7131	7.09	274	3.93	4.04	77.90
4/10/92	101		1	3.0	4.7	11.59		6.0498					
4/10/92	101		1	4.0	4.5	11.45		2.4444					
4/10/92	101		1	5.0	4.5	11.31		0.9719					
4/10/92	101	M	1	6.0	4.4	11.28		0.3980	7.03	275	1.90	1.91	
4/10/92	101	M	2	6.0	4.4	11.28		0.3980	7.03	267	3.01	3.13	57.10
4/10/92	101		1	7.0	4.4	11.20		0.1786					
4/10/92	101		1	8.0	4.3	11.19		0.0806					
4/10/92	101		1	9.0	4.2	10.84		0.0350					
4/10/92	101	H	1	10.0	4.1	10.69		0.0152	7.01	267	1.96	2.32	
4/10/92	101	H	2	10.0	4.1	10.69		0.0152	6.98	270	2.35	2.87	58.30
4/10/92	101		1	11.0	4.1	10.67		0.0059					

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 5/12/92 JULIAN DATE: 133 TIME: 15.00

SECCHI M: 3.8 WEATHER: Sunny

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	29.6								
5/12/92	133		1	0.0	18.0	10.86		100.0000					
5/12/92	133		1	1.0	17.8	10.88		40.0160					
5/12/92	133	E	1	2.0	13.9	12.05		25.4070	7.50	268	7.37	10.06	
5/12/92	133	E	2	2.0	13.9	12.05		25.4070	7.66	264	6.20	9.51	6.30
5/12/92	133		1	3.0	12.5	11.75		11.0321					
5/12/92	133		1	4.0	10.8	11.39		4.2027					
5/12/92	133	M	1	5.0	7.5	10.06		1.6171	6.83	265	13.06	17.61	
5/12/92	133	M	2	5.0	7.5	10.06		1.6171	6.78	263	7.51	13.72	53.70
5/12/92	133		1	6.0	6.0	8.87		0.6902					
5/12/92	133		1	7.0	5.4	8.27		0.2952					
5/12/92	133		1	8.0	5.1	7.46		0.1248					
5/12/92	133	H	1	9.0	5.0	7.58		0.0530	6.63	277	1.24	1.94	
5/12/92	133	H	2	9.0	5.0	7.58		0.0530	6.62	271	2.36	3.56	28.80
5/12/92	133		1	10.0	4.9	7.55		0.0221					
5/12/92	133		1	11.0	4.8	6.44		0.0080					
5/12/92	133		1	12.0	4.7	4.44							

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 6/02/92 JULIAN DATE: 154 TIME: 10.50

SECCHI M: 4.5 WEATHER: Partly sunny, slight wind

PERSONNEL: EMN TLV JS

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
6/02/92	154	S	1	-1.0	15.8								
6/02/92	154		1	0.0	15.0	9.69		100.0000					
6/02/92	154		1	1.0	14.8	9.55		21.2314					
6/02/92	154	E	1	2.0	14.5	9.35		10.2320	7.37	262	4.43	5.69	
6/02/92	154	E	1	2.0	14.5	9.35		10.2320	7.45	259	4.97	7.57	24.70
6/02/92	154		1	3.0	14.3	8.90		5.0255					
6/02/92	154		1	4.0	11.8	8.35		2.0134					
6/02/92	154	M	1	5.0	8.5	6.58		0.9746	6.65	255	3.04	4.14	
6/02/92	154	M	2	5.0	8.5	6.58		0.9746	6.87	256	3.10	4.06	23.50
6/02/92	154		1	6.0	6.5	5.60		0.3934					
6/02/92	154		1	7.0	5.6	5.04		0.1849					
6/02/92	154		1	8.0	5.2	4.71		0.0832					
6/02/92	154	H	1	9.0	5.0	4.35		0.0336	6.58	303	0.42	1.94	
6/02/92	154	H	2	9.0	5.0	4.35		0.0336	6.60	290	1.23	3.89	30.10
6/02/92	154		1	10.0	4.9	3.96		0.0116					
6/02/92	154		1	11.0	4.8	3.15		0.0039					
6/02/92	154		1	12.0	4.7	1.01							

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 6/17/92 JULIAN DATE: 169 TIME: 10.75

SECCHI M: 4.5 WEATHER: Partly cloudy, windy

PERSONNEL: EMN TLV JS

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

COMMENTS: Report of fish kill during past week (sunfish, catfish). We spotted many dead sunfish; no alkalinities

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
6/17/92	169	S	1	-1.0	20.2								
6/17/92	169		1	0.0	21.8	9.51		100.0000					
6/17/92	169	E	1	1.0	21.6	9.46		26.9542	7.51		1.59	2.01	
6/17/92	169	E	2	1.0	21.6	9.46		26.9542	7.51		1.18	1.54	53.40
6/17/92	169		1	2.0	21.3	9.61		11.4455					
6/17/92	169		1	3.0	17.8	11.08		4.5221					
6/17/92	169	M	1	4.0	13.1	8.21		1.9559	6.83		5.79	6.97	
6/17/92	169	M	2	4.0	13.1	8.21		1.9559	6.83		3.51	4.13	40.70
6/17/92	169		1	5.0	9.0	5.78		0.8799					
6/17/92	169		1	6.0	7.0	4.03		0.4034					
6/17/92	169		1	7.0	5.9	4.24		0.1876					
6/17/92	169		1	8.0	5.4	3.02		0.0813					
6/17/92	169		1	9.0	5.0	3.10		0.0322					
6/17/92	169	H	1	10.0	4.7	0.87		0.0100	6.56		0.99	2.07	
6/17/92	169	H	2	10.0	4.7	0.87		0.0100	6.64		1.04	2.15	71.20
6/17/92	169		1	11.0	4.6	0.67	4	0.0019					
6/17/92	169		1	12.0	4.6	0.62	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 7/01/92 JULIAN DATE: 183 TIME: 11.00

SECCHI M: 4.8 WEATHER: Sunny

PERSONNEL: EMN TLV KHA

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

COMMENTS: 02 data suspicious--02 probe not functioning properly

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
7/01/92	183	S	1	-1.0	23.5		10						
7/01/92	183		1	0.0	22.8	9.02	10	100.0000					
7/01/92	183	E	1	1.0	21.7	9.38	10	37.0096	7.53	275	1.78	1.95	
7/01/92	183	E	2	1.0	21.7	9.38	10	37.0096	7.63	281	1.51	1.90	79.50
7/01/92	183		1	2.0	20.2	9.76	10	14.7273					
7/01/92	183		1	3.0	18.2	9.36	10	6.5338					
7/01/92	183	M	1	4.0	15.6	11.86	10	2.6346	7.51	295	20.98	20.98	
7/01/92	183	M	2	4.0	15.6	11.86	10	2.6346	7.64	283	20.54	20.92	67.60
7/01/92	183		1	5.0	10.1	4.91	10	0.5869					
7/01/92	183		1	6.0	7.2	3.41	10	0.2862					
7/01/92	183		1	7.0	5.8	2.53	10	0.0946					
7/01/92	183		1	8.0	5.3	2.09	10	0.0279					
7/01/92	183	H	1	9.0	5.0	1.71	10	0.0092	6.54	376	1.32	2.40	
7/01/92	183	H	2	9.0	5.0	1.71	10	0.0092	6.53	397	1.59	2.49	76.10
7/01/92	183		1	10.0	4.7	1.32	410	0.0024					
7/01/92	183		1	11.0	4.6	1.31	410	0.0004					
7/01/92	183		1	12.0	4.6	1.31	410						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 7/15/92 JULIAN DATE: 197 TIME: 10.67

SECCHI M: 3.8 WEATHER: Mostly sunny, wind (W)

PERSONNEL: TLV BKS NKW

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
7/15/92	197	S	1	-1.0	24.9								
7/15/92	197		1	0.0	24.6	8.69		100.0000					
7/15/92	197		1	1.0	24.6	8.71		38.6997					
7/15/92	197	E	1	2.0	24.2	8.66		16.6737	7.65		2.48	3.25	
7/15/92	197	E	2	2.0	24.2	8.66		16.6737	7.68		2.39	3.36	65.30
7/15/92	197		1	3.0	22.8	8.98		8.1854					
7/15/92	197		1	4.0	18.7	10.18		3.2188					
7/15/92	197	M	1	5.0	13.1	10.81		0.5167	7.52		158.97	158.97	
7/15/92	197	M	2	5.0	13.1	10.81		0.5167	6.72		129.90	136.88	71.30
7/15/92	197		1	6.0	8.8	1.16	4	0.1796					
7/15/92	197		1	7.0	7.8	1.01	4	0.0634					
7/15/92	197		1	8.0	7.5	1.01	4	0.0183					
7/15/92	197	H	1	9.0	6.8	1.04	4	0.0039	6.55		14.99	17.04	
7/15/92	197	H	2	9.0	6.8	1.04	4	0.0039	6.52		16.67	18.17	66.00
7/15/92	197		1	10.0	6.6	1.01	4	0.0005					
7/15/92	197		1	11.0	6.4	1.01	4						
7/15/92	197		1	12.0	6.3	1.01	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 7/29/92 JULIAN DATE: 211 TIME: 10.50

SECCHI M: 2.8 WEATHER: Sunny, wind (W)

PERSONNEL: EMN TLV NKW

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

COMMENTS: No pH or alkalinities--pH electrode malfunction; O2 meter drifting

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
7/29/92	211	S	1	-1.0	18.2		10						
7/29/92	211		1	0.0	21.6	8.34	10	100.0000					
7/29/92	211		1	1.0	21.5	8.24	10	26.2674					
7/29/92	211	E	1	2.0	21.3	8.07	10	7.1147			48.48	48.48	
7/29/92	211	E	2	2.0	21.3	8.07	10	7.1147			33.09	33.69	6.70
7/29/92	211		1	3.0	21.3	7.98	10	1.9654					
7/29/92	211		1	4.0	19.3	7.54	10	0.4669					
7/29/92	211		1	5.0	13.9	4.11	10	0.1354					
7/29/92	211	M	1	6.0	10.0	0.54	4	0.0620			11.21	16.51	
7/29/92	211	M	2	6.0	10.0	0.54	4	0.0620			11.20	16.30	47.10
7/29/92	211		1	7.0	8.3	0.57	4	0.0262					
7/29/92	211		1	8.0	7.2	0.57	4	0.0075					
7/29/92	211		1	9.0	6.7	0.57	4	0.0017					
7/29/92	211	H	1	10.0	6.5	0.57	4	0.0004			5.76	8.22	
7/29/92	211	H	2	10.0	6.5	0.57	1	0.0004			2.94	11.05	85.00
7/29/92	211		1	11.0	6.3	0.57	4						
7/29/92	211		1	12.0	6.3	0.57	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 8/11/92 JULIAN DATE: 224 TIME: 16.08

SECCHI M: 2.9 WEATHER: Overcast

PERSONNEL: EMN TLV CL

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	22.0								
8/11/92	224		1	0.0	23.4	9.38		100.0000					
8/11/92	224		1	1.0	23.4	9.34		21.7912					
8/11/92	224	E	1	2.0	22.6	9.95		6.5420	9.15	298	11.46	11.58	
8/11/92	224	E	2	2.0	22.6	9.95		6.5420	9.17	286	9.12	10.75	72.70
8/11/92	224		1	3.0	22.4	9.82		2.5376					
8/11/92	224		1	4.0	20.9	10.94		0.3866					
8/11/92	224		1	5.0	16.0	2.29		0.0676					
8/11/92	224	M	1	6.0	10.3	1.34	4	0.0334	6.48	352	35.44	41.80	
8/11/92	224	M	2	6.0	10.3	1.34	4	0.0334	6.56	328	29.41	34.73	84.90
8/11/92	224		1	7.0	8.5	1.43	4	0.0167					
8/11/92	224		1	8.0	7.6	1.48	4	0.0087					
8/11/92	224		1	9.0	7.0	1.45	4	0.0034					
8/11/92	224	H	1	10.0	6.7	1.49	4		6.71	569	2.41	5.63	
8/11/92	224	H	2	10.0	6.7	1.49	4		6.74	535	3.09	6.25	36.60
8/11/92	224		1	11.0	6.5	1.51	4						
8/11/92	224		1	12.0	6.4	1.50	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 8/25/92 JULIAN DATE: 238 TIME: 14.83

SECCHI M: 1.8 WEATHER: Sunny, slight breeze

PERSONNEL: EMN TLV

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

COMMENTS: High O2 in hypolimnion reflects interference--probe read 0.01 in anoxic water of Welcome lake; no alkalinitie

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	32.2		10						
8/25/92	238		1	0.0	24.7	10.35	10	100.0000					
8/25/92	238		1	1.0	22.8	11.08	10	22.5938					
8/25/92	238	E	1	2.0	21.0	11.75	10	6.1664	9.71		30.21	30.21	
8/25/92	238	E	2	2.0	21.0	11.75	10	6.1664	9.75		26.77	26.77	2.03
8/25/92	238		1	3.0	20.3	9.39	10	1.5184					
8/25/92	238		1	4.0	19.2	3.42	10	0.3626					
8/25/92	238	M	1	5.0	15.3	0.71	410	0.1228	6.67		21.45	30.88	
8/25/92	238	M	2	5.0	15.3	0.71	410	0.1228	6.55		21.15	26.35	75.90
8/25/92	238		1	6.0	10.6	0.96	410	0.0575					
8/25/92	238		1	7.0	8.3	1.11	410	0.0296					
8/25/92	238		1	8.0	7.4	1.19	410	0.0150					
8/25/92	238	H	1	9.0	6.9	1.21	410	0.0073	6.70		2.99	8.46	
8/25/92	238	H	2	9.0	6.9	1.21	410	0.0073	6.72		3.43	6.85	74.10
8/25/92	238		1	10.0	6.7	1.20	410	0.0033					
8/25/92	238		1	11.0	6.6	1.20	410	0.0012					
8/25/92	238		1	12.0	6.6	1.23	410						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 9/10/92 JULIAN DATE: 254 TIME: 15.67

SECCHI M: 3.1 WEATHER: Partly cloudy, windy (W)

PERSONNEL: TLV 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	25.0								
9/10/92	254		1	0.0	21.7	8.60		100.0000					
9/10/92	254		1	1.0	21.9	8.72		23.6072					
9/10/92	254	E	1	2.0	21.6	8.43		9.8281	7.66	303	13.32	14.86	
9/10/92	254	E	2	2.0	21.6	8.43		9.8281	7.83	298	13.27	13.27	68.20
9/10/92	254		1	3.0	21.3	8.59		4.1804					
9/10/92	254		1	4.0	18.9	2.17		1.6072					
9/10/92	254	M	1	5.0	15.0	0.60		0.5765	6.56	333	12.91	20.21	
9/10/92	254	M	2	5.0	15.0	0.60		0.5765	6.70	330	14.61	18.16	76.40
9/10/92	254		1	6.0	11.0	0.44	4	0.1353					
9/10/92	254		1	7.0	8.1	0.43	4	0.0413					
9/10/92	254		1	8.0	7.3	0.42	4	0.0204					
9/10/92	254	H	1	9.0	7.0	0.41	4	0.0103	6.72	587	2.99	7.89	
9/10/92	254	H	2	9.0	7.0	0.41	4	0.0103	6.80	639	3.24	7.73	87.70
9/10/92	254		1	10.0	6.8	0.28	4	0.0047					
9/10/92	254		1	11.0	6.5	0.26	4	0.0019					
9/10/92	254		1	12.0	6.5	0.24	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 9/23/92 JULIAN DATE: 267 TIME: 16.33

SECCHI M: 4.4 WEATHER: Sunny, windy

PERSONNEL: EMN BKS

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
9/23/92	267	S	1	-1.0	13.6								
9/23/92	267		1	0.0	19.2	7.62		100.0000					
9/23/92	267		1	1.0	19.2	7.57		32.9056					
9/23/92	267	E	1	2.0	19.2	7.61		12.2599	7.12		3.40	3.40	
9/23/92	267	E	2	2.0	19.2	7.61		12.2599	7.14		3.71	3.79	40.40
9/23/92	267		1	3.0	19.1	7.53		5.3258					
9/23/92	267		1	4.0	18.7	3.44		2.0926					
9/23/92	267		1	5.0	15.8	0.58		0.6814					
9/23/92	267	M	1	6.0	11.4	0.47	4	0.2260	6.58		22.11	32.54	
9/23/92	267	M	2	6.0	11.4	0.47	4	0.2260	6.55		21.00	25.03	81.00
9/23/92	267		1	7.0	9.3	0.44	4	0.0350					
9/23/92	267		1	8.0	8.0	0.47	4	0.0087					
9/23/92	267		1	9.0	7.4	0.47	4	0.0026					
9/23/92	267	H	1	10.0	7.0	0.49	4	0.0006	6.87		15.48	19.51	
9/23/92	267	H	2	10.0	7.0	0.49	4	0.0006	6.92		21.68	34.49	97.10
9/23/92	267		1	11.0	6.8	0.48	4						
9/23/92	267		1	12.0	6.7	0.48	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 10/15/92 JULIAN DATE: 289 TIME: 11.08

SECCHI M: 2.5 WEATHER: Sunny, slight breeze

PERSONNEL: EMN TLV

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

COMMENTS: Chlorophyll filters thawed in refrigerator night before extraction

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
10/15/92	289	S	1	-1.0	15.4								
10/15/92	289		1	0.0	13.7	9.56		100.0000					
10/15/92	289		1	1.0	13.2	9.42		21.4777					
10/15/92	289		1	2.0	13.1	9.30		4.6569					
10/15/92	289	E	1	3.0	13.1	9.25		1.1944	7.17	334	16.60	16.60	
10/15/92	289	E	2	3.0	13.1	9.25		1.1944	7.26	331	15.68	16.22	29.10
10/15/92	289		1	4.0	13.1	9.12		0.3340					
10/15/92	289		1	5.0	13.1	8.83		0.1057					
10/15/92	289		1	6.0	12.9	7.28		0.0347					
10/15/92	289	M	1	7.0	10.3	0.64	4	0.0085	6.67	575	52.08	52.08	
10/15/92	289	M	2	7.0	10.3	0.64	4	0.0085	6.71	468	51.64	51.64	76.90
10/15/92	289		1	8.0	8.2	0.68	4	0.0018					
10/15/92	289		1	9.0	7.5	0.70	4	0.0002					
10/15/92	289	H	1	10.0	7.0	0.70	4		6.91	860	34.00	45.60	
10/15/92	289	H	2	10.0	7.0	0.70	4		6.94	819	33.58	45.18	87.10
10/15/92	289		1	11.0	6.9	0.69	4						
10/15/92	289		1	12.0	6.8	0.68	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 11/19/92 JULIAN DATE: 324 TIME: 14.50

SECCHI M: 3.3 WEATHER: Sunny, calm

PERSONNEL: TLV BKS 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
11/19/92	324	S	1	-1.0	5.0								
11/19/92	324		1	0.0	5.8	9.87		100.0000					
11/19/92	324		1	1.0	5.8	9.99		24.8201					
11/19/92	324	E	1	2.0	5.8	9.76		16.2329	7.01	401	8.84	9.38	
11/19/92	324	E	2	2.0	5.8	9.76		16.2329	7.05	394	9.30	9.80	50.00
11/19/92	324		1	3.0	5.6	9.63		6.1628					
11/19/92	324		1	4.0	5.6	9.58		2.3504					
11/19/92	324		1	5.0	5.6	9.43		0.8937					
11/19/92	324	M	1	6.0	5.6	9.50		0.3475	7.07	406	7.10	7.68	
11/19/92	324	M	2	6.0	5.6	9.50		0.3475	7.05	404	8.18	8.42	53.10
11/19/92	324		1	7.0	5.6	9.47		0.1387					
11/19/92	324		1	8.0	5.6	9.40		0.0575					
11/19/92	324		1	9.0	5.5	9.39		0.0238					
11/19/92	324	H	1	10.0	5.5	9.31		0.0095	7.03	393	6.56	7.43	
11/19/92	324	H	2	10.0	5.5	9.31		0.0095	7.07	407	6.49	7.45	36.10
11/19/92	324		1	11.0	5.5	9.25		0.0037					
11/19/92	324		1	12.0	5.5	0.20	4						

LAKE WAYNEWOOD: SUMMARY OF PHYSICAL/CHEMICAL DATA

DATE OF SAMPLE: 12/29/92 JULIAN DATE: 364 TIME: 14.50

SECCHI M: 3.8 WEATHER: Fog, misting rain

PERSONNEL: EMN TLV

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

COMMENTS: 10 cm slush over 12 cm ice

DATE OF	JULIAN	STRA	REP	DEPTH	TEMP C	OXYGEN	OFLAG	LIGHT PC	PH	ALKAL	CHLAC U	CHLASUM	CHLAC P
12/29/92	364	S	1	-1.0	2.0								
12/29/92	364		1	0.0	0.8	14.81		100.0000					
12/29/92	364	E	1	1.0	2.5	11.20		13.2767	7.02	382	9.68	9.97	
12/29/92	364	E	2	1.0	2.5	11.20		13.2767	7.04	381	8.72	8.90	42.00
12/29/92	364		1	2.0	2.5	10.80		3.7858					
12/29/92	364		1	3.0	2.5	10.80		1.4639					
12/29/92	364	M	1	4.0	2.5	10.60		0.6346	7.03	388	2.42	2.77	
12/29/92	364	M	2	4.0	2.5	10.60		0.6346	7.05	394	2.48	2.90	45.20
12/29/92	364		1	5.0	3.0	10.10		0.2838					
12/29/92	364		1	6.0	3.0	9.70		0.1294					
12/29/92	364		1	7.0	3.0	8.70		0.0602					
12/29/92	364		1	8.0	3.0	8.60		0.0274					
12/29/92	364	H	1	9.0	3.0	8.10		0.0114	6.84	383	0.80	1.99	
12/29/92	364	H	2	9.0	3.0	8.10		0.0114	6.86	388	0.79	1.48	43.00
12/29/92	364		1	10.0	3.0	7.70		0.0040					
12/29/92	364		1	11.0	3.1	4.80							
12/29/92	364		1	12.0	3.8	0.60	10						

APPENDIX I

BATHYMETRY OF LAKE WAYNEWOOD

In 1993, Robert Moeller drafted a bathymetric map of Lake Waynewood, 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 1983) was assumed to present an accurate, undistorted image of the lake (7x11 cm). This was enlarged xerographically to 10x16 cm (EW x NS) without distortion. The topographic sheet (Lakeville 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. 8 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 in 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 ca. 62 points throughout the basin, plus an additional 49 points within 10 meters of shore to define the outline. Moeller fitted 2-m contours (by eye) to the plotted distribution of depths, converted to metres. The resulting map was modified by Moeller to give the map presented here by adding shoreline detail and slightly adjusting nearshore contours to correspond to the photo-derived outline.

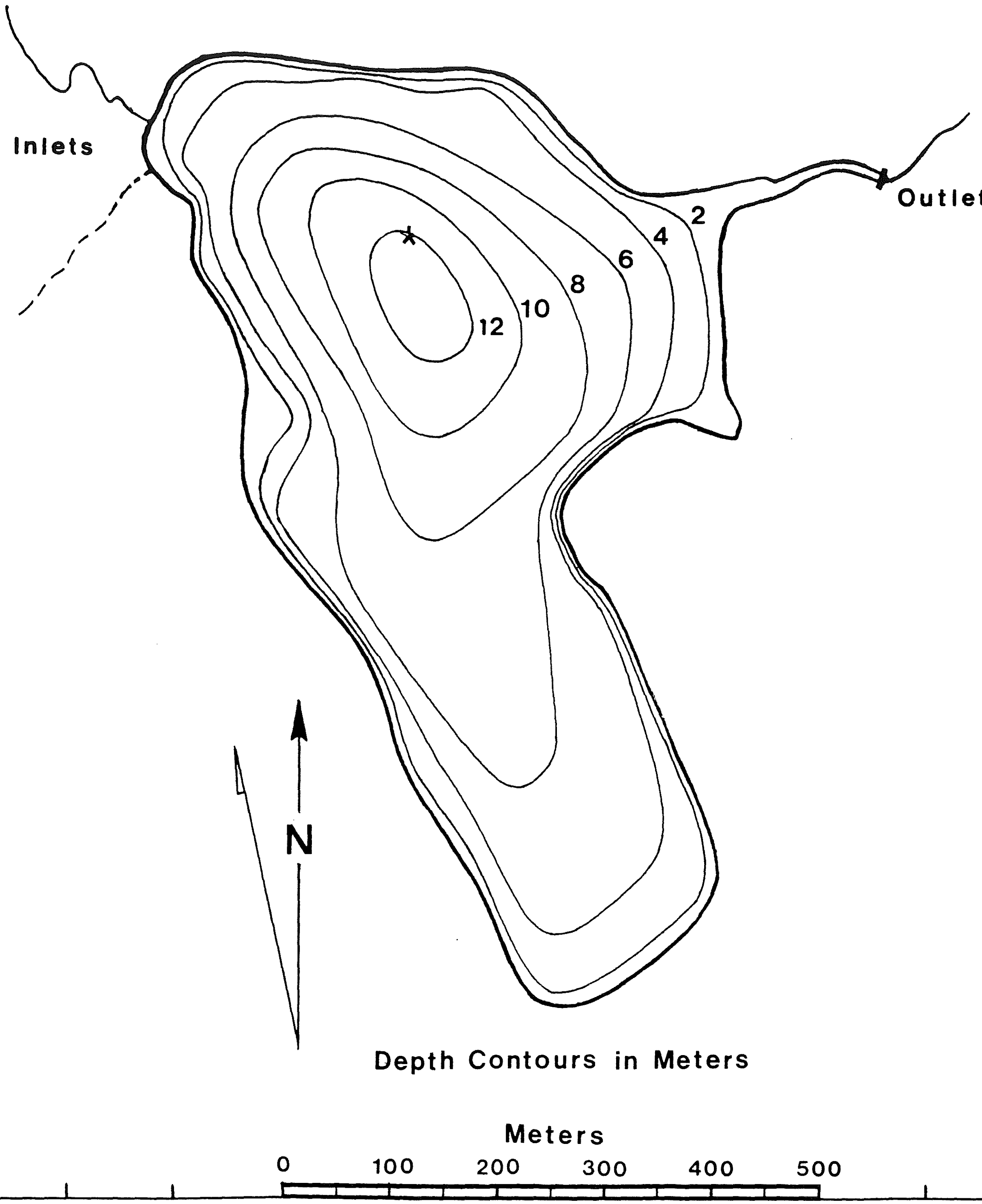
The scale on the new map is believed correct to within 2% (relative to USGS topographic map). It is within 3% of the scale of the revised survey by R. Schultz (R. Weisman, March 1993), which presented some internal imprecision relative to the aerial photograph. Lake area and volume are considered accurate to 4-5%, and area and volume of 2-m contour subsections to ca. 10%

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. A second copy of the map gives approximate location of the soundings.

LAKE WAYNEWOOD

Wayne County, Pennsylvania



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Map drawn by R. Moeller from survey data of R. Weisman and R. Schultz

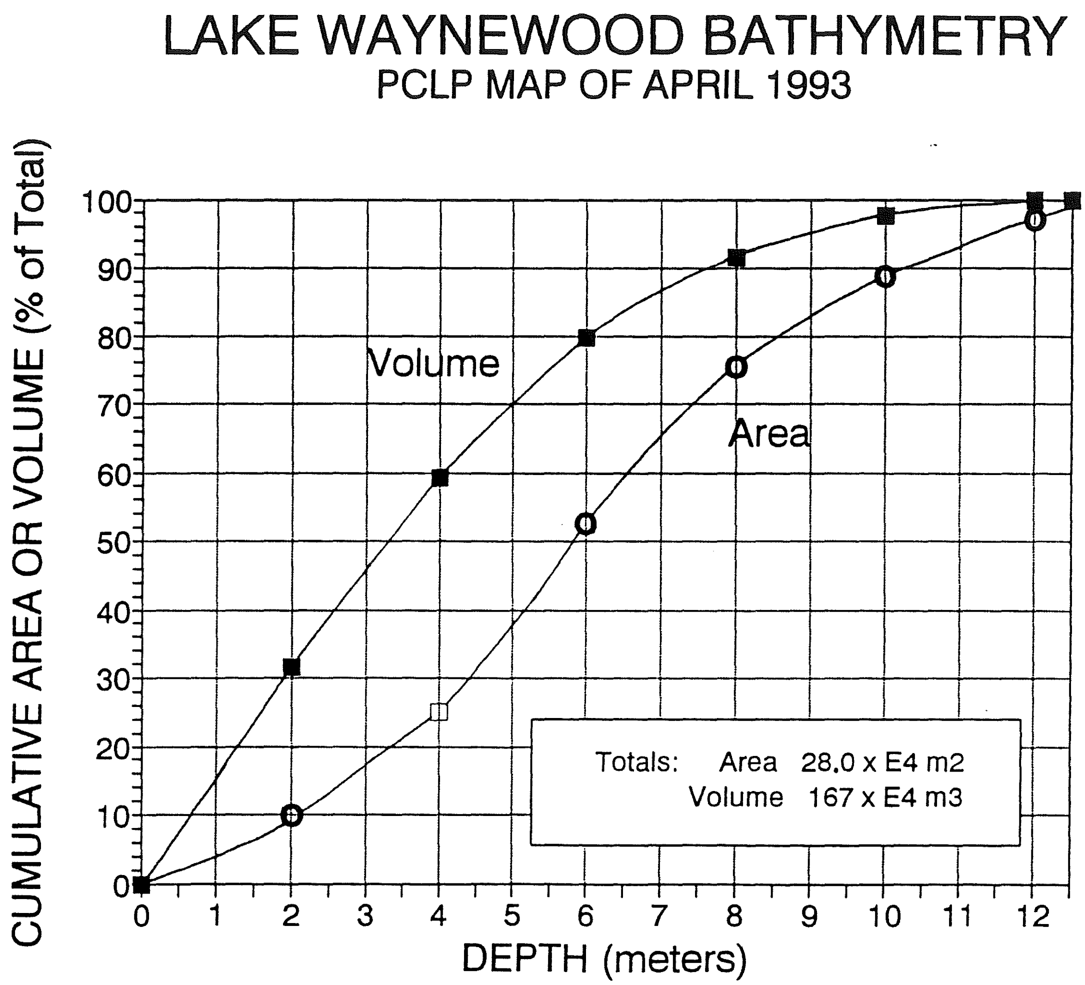

Figure A.1. Hypsographic and bathymetric curves for Lake Waynewood.

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 Waynewood is 28.0×10^4 m^2, or 28.0 hectares. The total volume of the lake is 167×10^4 m^3. The mean depth (total volume/total area) is therefore 6.0 metres.