Newman Lake 2011 Water Quality Monitoring

December 2011

Barry C. Moore
Andrew Child
Benjamin Cross
Brian Lanouette
Amy Martin
Ellen Preece
Megan Skinner

Report to the Newman Lake Flood Control Zone District

Department of Natural Resource Sciences
Washington State University
Pullman, Washington

Introduction

The 2011 Newman Lake annual report is in the form of a research paper, third in a series of peer-reviewed papers submitted to the *Journal of Lake and Reservoir Management (LRM)*. The attached paper has been tentatively accepted, with requested revisions. The first two of the series were published in 2009 as:

Moore, B.C. and Christensen, D. 2009. Newman Lake restoration: A case study Part I: Chemical and biological responses to phosphorus control. *Lake and Reserv. Mgt. Vol. 25(4):337-350.*

Moore, B.C., A.C. Richter and D. Christensen. 2009. Newman Lake restoration: A case study Part II: Microfloc alum injection. *Lake and Reserv. Mgt. Vol. 25(4):351-363.*

Part I provides an overall summary of restoration efforts and results, while the second provides more detailed information on the microfloc alum system. The current report emphasizes operational aspects related to the hypolimnetic oxygenation system. In total, these papers summarize long-term physical, chemical, and biological trends over about four decades of restoration/management at Newman Lake.

Water quality at Newman Lake has greatly improved over the period of monitoring, as demonstrated by clear and unambiguous improvements in nutrient levels, reduced blue-green blooms and representation in the phytoplankton, and by improved transparency. Improving water quality trends are especially evident since 2001, when the oxygenation and alum systems have been operated within their design and environmental ranges. Most recent data for the 2011 monitoring year is attached as the Appendix.

Summary and Recommendations

Total phosphorus concentrations were somewhat higher for the 2011 growing season, although the majority of measurements were within the 20 to 30 µg/l range. As documented in previous reports in the attached paper, internal phosphorus loading has been substantially reduced at Newman. Therefore, it appears that the primary source of annual variability is due to external load, especially related to spring and summer hydrology in the watershed.

In spite of somewhat higher phosphorus, algae communities for 2012 were consistent with species, biovolumes, and trends over the past decade. Green algae and diatoms were dominant, with the holoplanker, *Aulocosierra* (previously identified as *Melosira*), and a small green alga, *Tetradon*, being especially prevalent through much of the summer. This latter form, with a cell volume of only about 40 μm^3, is much smaller

than most of the other green algae species comprising the Newman Lake phytoplankton community. Most other greens at Newman have cell volumes in the 10,000 to 100,000 μm^3 range. This is significant, as prevalence of smaller algae in the phytoplankton assemblage is typically associated with lower lake trophic status. Again, this observation is consistent with the overall water quality trends detailed in the accompanying paper.

For the upcoming year, it is recommended that the alum supply be targeted for use during spring turnover. Because of potential for an additional bloom of algae growth after fall turnover, this should remain the second priority. We recommend that the summer application be ceased unless there is a second mixing after initial stratification, but this has only occurred a few times in all the years of record. For the new alum scheme, it is recommended that alum be applied at approximately the maximum daily rate starting at spring turnover until first sign of stratification. Variable duration of mixing precludes accurate prediction of the exact allocation, but we recommend that the available alum should be used as necessary with only about 10 to 25% holdback for potential use in fall.

This plan would be a slight modification of the past alum application prioritization, which roughly allocated the annual supply into thirds for each of the spring turnover, fall turnover, and summer stratification periods. The change recognizes some budget-driven decrease in alum supply. Observations and measurements also indicate that the oxygenation system to be increasingly effective at maintaining adequate sediment/water interface oxygen concentrations, so that summer hypolimnetic phosphorus accumulation is reduced, necessitating less alum requirement during stratification. With lower summer accumulation, fall turnover will inject less phosphorus into the photic zone, so that fall alum dosing should have less of a stoichiometric burden for phosphorus reduction.

With the suggested alum application scheme, as in past years, it is very important that the hypolimnetic oxygenation system be operated for the full time of stratification and at the maximum oxygen delivery rate. As summarized in the accompanying paper, oxygen delivery rates are critical to internal load control. To make sure that the system remains operational through stratification, maintenance should be performed in the off-season to the extent possible. In-water inspections, which were done more frequently in the past should be resumed, and should be conducted as soon as practical in the spring. Early detection of problems with the cone or manifold would allow for repairs to be accomplished as early as possible, or to be scheduled with minimal impact on summer oxygen input. For 2012, it is suggested that the District consider underwater inspections in both spring and fall. Then, beginning in 2013, subsequent annual inspections should be shifted to the end of the season, so that any necessary maintenance and repairs might be accomplished in late fall, or at least as early as possible in early spring of the following year.

To help identify external loading trends and potential sources, it is recommended that the District reimpliment of volunteer monitoring efforts. These would be similar to those utilized in previous years, but of more limited extent and volunteer time

committments. Grab samples from Thompson Creek for nutrient analyses, along with regular recording of staff gage height are especially important. Samples and readings could be taken at approximately one-week intervals, from the Thompson Creek bridge, which is an established monitoring location in previous studies. District and WSU staff should work on recalibration of the staff gage for a stream-rating curve that will allow for calculation of gage height to stream discharge in the current stream geometry. Coupled with the nutrient analysis, these efforts would again permit construction of phosphorus loading estimates from Thompson Creek, with reasonable extrapolation to other sub-watersheds. The resulting data would permit better analysis of external phosphorus load, as also determination of potential effects of stream inflows on lake alkalinity and pH.

Some pH measurements were low for the 2011 season, but the cause is not clear. Routine quality assurance procedures identified a problem with one of the Hydrolab sondes, but this unit was returned to the factory of correction of the issue, and was not utilized for subsequent measurements at Newman. QA checks before and after each sampling noted proper performance of the pH probes, so data appear to the reliable. Some 2011 alkalinity readings were also low, and the low readings generally corresponded with reduced pH values. The alkalinity readings also were much variable than in past years. Alkalinity reductions do not correspond with timing of alum inputs or dose rate. Indeed, stoichometric calculations indicate alum doses are too low to account for the alkalinity and pH changes, so this should be a special emphasis for the 2012 monitoring. We recommend alkalinity measurements be performed on all inlet samples, as well as currently performed on the lake samples. Particular emphasis should also be placed on pH measurements and associated QA procedures for the upcoming monitoring season to better elucidate pH status of the lake and potential causes, if real, of reduced values.

Lastly, it should be noted that 2012 monitoring will include a more intensive transect survey using hydroacoustics. This will be done in late May or early June, with a primary focus of collecting GIS-referenced bathymetric data for updating the Newman Lake volume estimates. Hydroacoustic data will also be used for basic fish community assessments and to identify large milfoil accumulations in deeper water that may not be detectable from the surface.

Other monitoring and operating procedures for 2012 should be consistent with past practices. As documented in the three peer-reviewed scientific papers addressing Newman Lake restoration over the past three decades, the value of internal phosphorus load control is being manifested with decreased primary productivity and improved water quality. These efforts should be continued, but emphasis on, and new strategies for, watershed nutrient reduction should be sought for protecting future water quality in Newman Lake.

Newman Lake Restoration: A Case Study
Part III. Hypolimnetic oxygenation

Barry C. Moore [1*], Benjamin K. Cross[1], Marc Beutel[2], Stephen Dent[2], Ellen Preece[1], and Mark Swanson[1]

Washington State University, Department of Natural Resource Sciences
P.O. Box 646410 Pullman, WA 99164[2] Washington State University, Department of Civil and Environmental Engineering
P.O. Box 646410 Pullman, WA 99164

[*]*corresponding author*

Moore, B.C., B.K. Cross, M. Beutel, S. Dent, E. Preece, and M. Swanson 2011. Newman Lake Restoration: A Case Study Part III: Hypolimnetic oxygenation. *Lake and Reserv. Manage. Vol. 18(0): 00-00*

ABSTRACT

Since the mid-20th century, oxygen status at the sediment/water interface (SWI) has been implicated in regulating lake internal phosphorus loading (e.g. Mortimer 1941, 1942). In deeper lakes, summer hypolimnetic oxygen depletion may thus play a critical role in phosphorus cycling and lake trophic status. Hypolimnetic aeration (HA) has been utilized for over four decades to prevent development of anoxia, decrease internal phosphorus load, and enhance fisheries. Most recently, interest has shifted to hypolimnetic oxygenation (HO), for potential performance and economic advantages. In Newman Lake, hypolimnetic oxygenation was initiated in 1992, when the first lake application of downflow contact bubble oxygenation (Speece Cone technology) was installed. Oxygenation at Newman has reduced growing season Nürnberg Anoxic Factors (AF) from a range of about 30 to 60 days to less than 10 days. We propose that differences in predicted versus observed AF based on phosphorus may be utilized to assess lake restoration performance. Newman Lake has demonstrated importance of operating the system at full capacity, as lower oxygen delivery rates do not produce proportional hypolimnetic oxygen concentrations, as well as other insights into HO system sizing and design.

Hypolimnetic aeration or oxygenation (HA and HO, respectively) systems have been employed to manage summer internal phosphorus load and/or to restore fish habitat in stratified lakes for over five decades (for example, Mercier and Perret 1949, Bernhardt 1967, Speece 1971, Fast et al. 1973; see reviews in Verner 1984, McQueen and Lean 1986, Beutel and Horne 1999, Cooke et al. 2005, Singleton and Little 2006). The concept of reducing phosphorus load by artificially raising oxygen levels flows from the pioneering work of Mortimer (1941, 1942) in which solubility and distribution of

phosphate-containing iron and manganese compounds were found to be related to biologically mediated redox. Numerous *in situ* and laboratory studies have noted strong correlation between oxygen status at the sediment/water interface (SWI) and phosphorus mobility or release rates (see Beutel et al. 2008a, 2008b, 2007, Beutel 2006 and references therein). In dimictic, eutrophic lakes with significant accumulations of sediment organic matter, hypolimnetic hypoxia or anoxia may develop, which enhances release of phosphorus from sediments. Sequestration of phosphorus in the sediments by overcoming hypolimnetic oxygen depletion, especially at the SWI, without degrading the thermal stratification is a principal water quality justification for artificial aeration or oxygenation.

While there have been recent questions regarding the universality of the phosphorus-oxygen sediment release "paradigm" (Hupner and Lewandowski 2008), there are numerous examples of successful projects in which internal phosphorus and nitrogen loading has been reduced by aeration or oxidation (Beutel and Horne 1999, Cooke et al. 2005, Beutel 2006). Actually, limitations of hypolimnetic aeration or oxidation for internal phosphorus control, such as inadequate sediment iron (Lean et al. 1986), continued high external load (Gachner 1987), failure to achieve oxic SWI (Gachner 1987), high levels of sediment sulfur (Gachner and Muller 2003), system under-sizing or failure to account for induced demand (Gachner and Wehrli 1998, Ashley 1985, Moore et al. 1996) have generally been well-elucidated. If these limitations are avoided, the conclusions of Cooke et al. (2005) that hypolimnetic aeration (or oxygenation can be expected to increase hypolimnetic dissolved oxygen (DO), improve cold-water fish habitat, and reduce hypolimnetic phosphorus accumulation and internal cycling are still compelling.

Study Area and Oxygenation System

Newman Lake is a relatively shallow, dimictic lake (z_{avg} = 5.6 m, z_{max} = 9 m) located in northeastern Washington, approximately 25 km east of Spokane. Typically, stable thermal stratification develops in April, May or June and persists through late August or early September. Osgood Index of Mixing (OI_{mix}) for Newman Lake is 2.5 m/km, indicating increased potential for hypolimnetic water to be mixed into the summer epilimnion and influence same-year primary productivity (Osgood 1988). Details of the lake, watershed, and history of restoration activities are provided in Part I of this series (Moore and Christensen 2009), while aspects of microfloc alum injection in Newman are detailed in Part II (Moore et al. 2009).

Initial Phase I restoration feasibility studies in the early 1970s and from 1985 to 1986 estimated total gross annual phosphorus load exceeded 3000 kg, of which over 80% was likely attributable to internal sources (Funk et al. 1976, Funk and Moore 1988, Moore and Christensen 2009) (see Nurnberg 1998, Nurnberg and LaZerte 2001, and Nurnberg 2009 for discussions of phosphorus budget and loading terminology). Restoration implementation activities included whole-lake alum treatment (September 1988), hypolimnetic oxygenation (installed June 1992), microfloc alum injection (installed April 1997), and various non-point source nutrient reduction projects and actions throughout

the watershed to reduce external load (Funk et al. 1998, Moore and Christensen 2009, Moore et al. 2009).

Multiple approaches for internal load control were pursued because internal loading made a large contribution to the total annual gross phosphorus budget. HA was originally proposed, and peak stratified season oxygen demand was estimated at about 912 kg/day (Funk and Moore 1988). Initial design computations called for a series of four 56 kW (75 hp) full-lift Bernhardt aerators, each with capacity to deliver about 367 kg-O_2/day (total capacities at 224 kW and 1468 kg-O_2/day) (Ashley 1990). However, the design was not deemed feasible due to unacceptable risks and environmental tradeoffs, including high maintenance costs to avoid damage from winter ice, deterioration of aesthetic lake views, loss of recreational opportunities around the aerator cluster, and potential hypolimnetic warming leading to summer destratification or early fall turnover.

A search for alternatives led to selection of downflow contact bubble aeration (DCBA) with oxygen, a technology proposed by Speece (1971) and known as the "Speece Cone" system. In the Speece Cone system, counter-current flows of water and oxygen are created by pumping low DO water from the hypolimnion and oxygen gas into the top of an inverted cone located within the hypolimnion (Figure 1). As water flows downward, buoyant gas bubbles are swept into the cone interior, providing opportunity for gas transfer to the dissolved phase. High DO water is discharged through a side port at the bottom of the cone. Prior to 1992, a Speece cone had been field tested at the Logan Martin reservoir dam in Alabama (Ashley et al. 2008), but Newman Lake was the first *in situ* application of a Speece Cone for lake restoration. Newman Lake is one of the largest and shallowest lakes in which HO has been attempted, and the system was also the first to employ a submerged pump for this application (Ashley et al. 2008). Other innovations at Newman Lake include first use of a discharge manifold with outlet ports to reduce discharge velocities and sediment scouring and first use of on-site pressure swing adsorption (PSA) for on-site oxygen generation (Lawrence 1990, Moore et al. 1996, Ashley et al. 2008).

The Speece cone installed at Newman Lake is 5.5 m high, 2.8 m maximum diameter, and was designed to deliver 1360 kg-O_2/day (~3000 lbs-O_2/day) (Moore and Christensen 2009). It was installed at a depth of about 8.5 m (Figure 1). Oxygen is generated onshore with two PSA units (AirSep Corp. Buffalo, NY). After drying, the oxygen stream is pumped using two 37 kW (50 hp) compressors through buried delivery lines to the cone. Water intake for the cone is located about 1.5 m off of the bottom and is pumped to the cone with a 45 kW (60 hp) submerged, axial flow pump. Oxygenated discharge from the cone is returned to the hypolimnion at approximately the same depth as the intake through fifty 10.1 cm (4 in) exit ports evenly spaced along a 30.5 m (100 ft) long, 0.6 m diameter (2 ft) manifold pipe. As originally envisioned, oxygen delivery rates would be managed by altering pumping hours for each compressor.

Since the Newman Lake HO installation, a much larger, 8,000 kg-O_2/day Speece cone system was installed in 1993 Comanche Reservoir in California (Beutel and Horne 1999), and two 6800 kg-O_2/day cones were installed in Savannah Harbor, Georgia in 2007

(Ashley et al. 2008). Speece cones potentially offer significant economic and performance advantages for lake restoration applications compared to conventional hypolimnetic aeration (Beutel and Horne 1999). In addition, horizontal discharge from the Speece Cone creates a diffusion gradient toward the sediment surface that may better supply oxygen to the SWI for phosphorus sequestration compared to other systems (Moore et al. 1996, Beutel and Horne 1999, Moore 2003, Beutel et al. 2006). McGinnis and Little (1998) published estimates of oxygen transfer in Speece cones based on a discrete-bubble model, but the model conditions are not satisfied in Speece cones, and their results have not been tested. Ashley and coworkers (Ashley 2002, Ashley et al. 2008) evaluated aspects of cone performance in bench scale models, providing preliminary design and operational guidelines, but noted that their test cones could not achieve basic inlet velocities specified by Speece et al. (1990), and thus underestimated likely oxygen transfer efficiencies. Aside from these works, there is little published literature on Speece Cone HO design criteria, modeling, or actual field performance. In this paper, we address the later, and provide data to examine long-term lake response to oxygenation via the Speece Cone system.

Methods

Three sample sites, designated North, Mid-lake, and South stations (see Moore and Christensen 2009) have been utilized at Newman Lake since about 1974. Personnel from Washington State University and from the Spokane County Engineers Office (Spokane, WA) have gathered data though a series of projects directed at various aspects of the lake and watershed. Methodologies are summarized here; detailed descriptions can be found in Moore and Christensen (2009).

In general, all methods have been consistent to preserve data comparability, although changes in instrumentation have been implemented as newer technologies have been developed. Water quality profiles were collected at the three stations at approximately twice-monthly intervals following ice-off in April or May through the stratification season, until October or November. *In-situ* measurements of temperature, DO, conductivity, and pH were made at one-meter intervals using multi-probe instrumentation (Yellow Springs Instruments or Hydrolab Inc.). Samples were collected at the same sites, times, and depths, for laboratory analysis of phosphorus and nitrogen components (total phosphorus-TP, soluble reactive phosphorus-SRP, ammonia, nitrate, and nitrite) and for phytoplankton species composition and enumeration.

Thompson Creek is the only perennial inlet to Newman Lake and was sampled for *in-situ* field parameters and for nitrogen and phosphorus fractions in 1985-1986, 1989-1992, 2000, and from 2002-2006. Other intermittent inlets and the outlet were sampled in 1985-1986, 1990, and 2005-2006. Hydrologic and nutrient budgets could be constructed for those years, based on a mass balance approach (Chapra 1997, Cooke et al. 2005, Nürnberg 2009, Moore and Christensen 2009).

Operation and environmental conditions

After being installed in June 1992, the oxygenation system has been operated each year from initial spring stratification, typically in late April or May, through fall turnover in mid-August or early September. Operation during the first year of installation, 1992, was intermittent. From 1993 through 1996, oxygen in early spring was delivered at approximately 50% capacity, using only one onshore compressor. In those years, both compressors were brought online, usually within the second half of June, as DO in the hypolimnion was observed to decrease. In 1997 this operational protocol was altered, so both compressors were run simultaneously from initiation of summer stratification, usually in May, through fall turnover. The full capacity protocol has been in effect since May 1997, other than for relatively brief shutdowns due to power outages or maintenance problems. In July 2000, the in-lake water pump failed, shutting down both oxygenation for the remainder of that summer, so that 2000 provides an operational "control" year.

Another major environmental event affecting synoptic patterns in the lake occurred during winter/spring of 1996/1997. The Newman watershed was subjected to widespread vegetation damage on November 19th, 1996 during a severe ice storm that subjected most of the northwestern US to very heavy loads of rime ice. Snowfall in the watershed was high that winter, with record accumulations measured at the Quartz Peak Snotel (QUPW1) station at the head of Thompson Creek (National Resource Conservation Service Quartz Peak Snotel data 1997, www.nwrfc.noaa.gov/snow). In April 1997, rainstorms on the warm, ripe snowpack caused sustained flooding. Flows exceeded the 100-yr return period for Thompson Creek (M. Barrentine, Spokane County Engineers Office, unpublished data) and brought extreme levels of sediment load into Newman Lake. It is estimated that sediment impacts dominated stratification and hypolimnetic oxygen patterns in Newman Lake throughout the 1997 to 1999 growing seasons (Moore and Christensen 2009).

Personnel from the Spokane County Engineers Office have maintained records of operating times for the onshore compressors. Estimates of Speece Cone oxygen inputs were constructed from summaries of operation hours (Marianne Barrentine and Jane Anderson, unpublished data, Spokane County Engineers Office). Total oxygen input to the hypolimnion from startup through July oxygen input was estimated by multiplying AirSep daily output capacity (AirSep Corp. Buffalo NY) by the summation of operational hours for each period. Average daily rates were then calculated as the total startup through July oxygen input divided by the total number of days operated. This calculation accounts for periods in which one or both compressors were not operable, either due to management decisions, or for maintenance.

Efficiency adjustments of 80% oxygen transfer through 2007 were made to the daily rates based on approximate oxygen/water ratio curves of Ashley (2002). Lower oxygen transfer efficiency in Speece cone can result from excessive oxygen/water ratios. Loss of efficiency is largely due to coalescence and growth of oxygen bubbles, so that the cone fills up with gas, until a large "burp" is discharged thought the outlet. In Newman Lake, this process was evidenced as a cyclic discharge of excess oxygen gas through a bubble

harvester standpipe at the cone outlet. In 2008, flow rate adjustments that eliminated cyclic burping were accomplished, increasing estimated oxygen transfer efficiency to about 95% based on the Ashley curves (Jane Anderson and Jacob McCann, Spokane County Engineers Office, personal communication).

Measurements in the Newman Lake Speece cone manifold have detected DO in excess of about 40 mg/L, with no significant increases in temperature (Doke et al. 1995, Moore and Christensen 2011, B.C. Moore, unpublished data). Oxygen-supersaturated water is discharged from the manifold ports in a horizontal plane, essentially at the same depth as the inlet. As the cone discharge is isothermal with the surrounding environment, eddy mixing of the plume due to buoyant forces should be minimal. Oxygen diffusion should, in theory, be essentially equal in both upward and downward directions along a vertical plane (Lawrence 1990, Moore et al. 1996). Oxygen dilution due to upward diffusion would be expected to vary with thermocline depth, i.e. with differing distance between the thermocline and plane of discharge. Dilution in the downward direction should be relatively constant, as manifold height above the sediment is fixed. Horizontal discharge of the high oxygen plume, with a diffusion trajectory toward the sediments, has been cited as a potential advantage of Speece Cone systems in maintaining an oxic SWI (Beutel and Horne 1999, Beutel 2003, Moore 2003). Therefore, although only a fraction of oxygen delivered actually reaches the SWI, that fraction should be a relatively constant proportion of total oxygen delivery. We tested this hypothesis by comparing relationships between hypolimnetic oxygen mass with total average daily oxygen delivery with oxygen delivery rates adjusted for variable hypolimnetic volume.

Oxygen mass in the summer hypolimnion was calculated as the sum of total DO within the bottom 3 m strata. Oxygen mass within any stratum is the product of DO concentration times the associated water volume, estimated from hypsographic curves for Newman Lake (Funk and Moore 1988). Using oxygen mass in the bottom 3 m stratum allows for year-to-year comparison in spite of variable total hypolimnetic volume. For most years, Newman Lake thermocline depths drop throughout the summer, so that there is a constant erosion of hypolimnetic volume. Mid to late July data for each year were chosen for this analysis, as this is when deepest thermocline depths are typically observed. For some years, early August data was utilized if appropriate July data were not available. These dates therefore represent thermocline volumes at their seasonal lows, and are also when minimum bottom DO concentrations are typically observed. "DO in bottom 3 m" is essentially a metric for volume-weighted hypolimnetic DO concentration, and as such, is critical for sediment phosphorus retention.

Results

Temperature and oxygen isopleths for 22 stratification seasons for which adequate data are available from 1986 to 2010 are provided in Figure 2. Nürnberg Anoxic Factor (AF) for Newman Lake, for all years in which adequate data are available from 1986 through 2010, are shown in Figure 3 and Table 1 (column 3). AF is a widely accepted index that incorporates areal and temporal oxic status of a lake for each year or stratification season into a single metric (Nürnberg 1995a and b). AF, expressed in days, is calculated as:

$$AF = (SA_a \times T_a)/SA_L$$

where, SA_a, in m^2, is the sediment surface area in contact with DO < 1 mg/L, measured 1 m above the sediment surface; T_a, in days, is duration of anoxia at the SWI; and SA_L is the total lake surface area, in m^2. Typical meso- to eutrophic temperate zone lakes, with periods of summer hypolimnetic DO depletion, display AF values from about 30 to 70 days (Nürnberg 1995a and b). Of particular significance is the fact that AF has been shown to correlate well with independent measures of internal phosphorus load for a wide range of lakes (Nürnberg 1995a, Nürnberg 1998, Nürnberg and LaZerte 2001).

Newman Lake AF in the four pre-oxygenation data years, 1986 and 1989 to 1991, ranged from about 44 to 57 (Figure 3). Initial indications were that AF declined dramatically and immediately after startup of the Speece Cone in June 1992 (Thomas et al. 1994). However, subsequent analysis showed that unusual early summer meteorological conditions, i.e. high winds with air temperature decreases of ~10°C for over three weeks, caused the lake to mix in early July 1992 (Moore and Christensen 2009). Therefore, elevated 1992 mid-July DO concentrations in the lower lake strata, and lower AF of 13 are more likely the result of replenishment with atmospheric oxygen, not with Speece Cone inputs.

For the years immediately following initiation of oxygenation, 1993 to 1996, operational protocol was to start only one compressor as soon as spring stratification was observed, so half the daily oxygen input capacity was utilized. The other compressor was subsequently brought online if bottom DO declined. The basic concept was to economize operating costs by matching oxygen input to demand. AF for the four years from 1993 to 1996 still averaged 43 (Figure 3). Continued summer hypolimnetic anoxia in those years (Figure 2) led to the conclusion that the protocol was inadequate for maintaining oxic SWI (Moore et al. 1996, Moore 2003, Christensen and Moore 2009).

The protocol was amended in 1997, so that full oxygen capacity was employed with the observed onset of stratification. However, as discussed in detail in Part I, April 1997 floods in Thompson Creek brought extremely high sediment load and large volumes of cold (4°C) water that immediately stratified the lake. Throughout 1997, mid-season thermocline depth was very shallow and was unusually stable at about 2.5 m. The hypolimnetic volume of 15.7×10^6 m^3 was the highest noted in 25 years of observation (Table 1). Turbidity in the hypolimnion was also extremely high, with essentially no detectable light penetration and little hypolimnetic warming throughout the 1997 stratification season (Moore and Christensen 2009). It should be noted that planning for the hypolimnetic oxygen requirements were estimated from 1985/1986 data, so that the system was designed for a hypolimnetic volume between about 2.3×10^6 m^3 and 7.8×10^6 m^3 (Ashley 1990, Lawrence 1990). Mid-season thermocline depths for 1998 and 1999 were also shallow, with corresponding hypolimnetic volumes for both years at about 13.6×10^6 m^3. For these 3 years, the ratio of actual to design hypolimnetic volume ranged from 2.7 to 3. AF for 1997 was about 49 days, but improved to 27 and 7 days, respectively, for the following two years. The high AF in 1997, in spite of significant

oxygen input, likely resulted from both volumetric dilution and from high DO demand associated with extreme sediment loads. AF dropped to 7 days in 1999; the decline may be attributable to oxidation of excess demand exerted by the flood-related sediments, but mid-season hypolimnetic volume for that year was still high, at the same level as the previous year.

In 2000, failure of the in-lake pump in early July caused the system to be shutdown for the remainder of the season. Although unfortunate from an operational standpoint, 2000 does provide opportunity as a "control" year for partial operation and for stopping oxygenation at the peak time of hypolimnetic demand. AF in 2000 increased to 30 days, close to the pre-oxygenation values.

After repairs, the HO system was again fully operational in 2001; mid-season thermocline volume was within range of the original design, and AF declined to 3 days. Since 2001, with the full operational protocol in effect, AF has ranged from 0 to 11 days, with AF at 0 days for 5 of the 10 years between 2001 and 2010 (Table 1 and Figure 3). The reduction in hypolimnetic anoxia at the SWI is also apparent in the isopleths, although hypoxic conditions (1 mg/L < DO < 2mg/L) are evident through much of the stratification in some years, particularly 2002 and 2006 (Figure 2).

Discussion

Table 1 also shows total oxygen inputs expressed as daily oxygen input rates (column 5). It is clear that theoretical maximum rate of 1,360 kg/day has not been achieved for any year due to power outages, maintenance, and other factors. Total rates were converted to daily volumetric oxygen input estimates, expressed as $mg/m^3/day$, based on the estimated mid-season hypolimnetic volume (column 6). The calculations were done by dividing total oxygen inputs for those months (column 5) by mid-season hypolimnetic volumes (column 3). As hypolimnetic volume usually declines through the summer, this minimum value is less than the true average, but does serve as a reasonable surrogate for estimating dilution of HO system inputs.

In order to test if DO at the SWI is primarily a function of total loading, which would imply little influence of variable dilution with changing hypolimnetic volume, we examined mid-season oxygen mass in the bottom 3 m versus total oxygen HO system inputs through July and versus oxygen inputs adjusted for variable hypolimnetic volume. Data from various years were tested with a least squares linear regression (Table 2). Overall, only data from 2000 through 2010 provided reasonable correlation between oxygen inputs and hypolimnetic oxygen mass in the bottom 3 m ($r^2 = 0.80$). This implies that there is a threshold mass of oxygen that must be delivered to the hypolimnion to overcome both legacy SOD and "current" DO demand from that year's productivity.

This result certainly corresponds with environmental and operational constraints for the system previously described. Essentially, the Newman Lake system has only been operated at full capacity from startup and within designed environmental ranges since 2001. To summarize: 1992 through 1996 years represent partial system operation; 1997

through 1999 represent very high hypolimnetic volumes and extremely high oxygen demand associated with flood flows and sediments. For 2000, the system was started at full capacity but inputs ended in early July, so this is a good control year for lake response when oxygenation is ceased in early summer. From 2001 through 2010, the system was operated as designed, with variable hypolimnetic volumes, and with minor variations in rates due to temporary maintenance activities. The mass results indicate that the system must be operated at near full capacity to exceed the oxygen demand threshold and thus to achieve adequate hypolimnetic DO.

Induced oxygen demand, in which oxygen requirements for HA and HO exceed demand observed prior to oxygen additions, is well-documented, and must be accounted for in system design (for example, see discussion of Ashley et al. 1987, Cooke et al. 2005). We have suggested that induced demand may be a function of changing sediment bacteria from oxygen-limited growth to substrate-limited growth imposed by breakdown of diffusion gradients as water is moved over the SWI (Moore et al. 1996, Beutel et al. 2006). The fact that volumetric oxygen delivery rates correlate more closely with observed oxygen mass provides support for this contention, and also has important design implications, indicating that a better knowledge of true ranges of annual hypolimnetic volume variation are needed. As most restoration projects typically rely on a few years of pre-treatment data, better models relating lake thermal structure to climate or more years of monitoring are appropriate to better estimate oxygen demand for HO system design.

Changes in internal phosphorus loading are central to evaluating function of the HO system. Figure 4 shows annual volume-weighted total phosphorus (VWTP) from 1985 to 2010, for all years with sufficient data for calculations. Annual average VWTP has been below the restoration target concentration of 20 μg/L for 7 of 10 years between 2001 and 2010. Box plots of VWTP for the whole lake, and for different thermal strata, grouped by treatment intervals were presented in Part I (Moore and Christensen 2009). These clearly show significant reduction in hypolimnetic TP since 2001, compared to all pre-restoration activities, and compared across all treatment groupings. Whole-lake, epilimnetic, and metalimnetic VWTP have also been reduced for all treatment groupings, with the exception of flood years, which reinforce the overwhelming influence of those large flow events on the lake ecology.

Newman Lake is one of the shallowest lakes in which oxygenation has been attempted (Ashley et al. 2008). While shallow lakes present technical challenges for avoiding destratification, these lakes also present greater potential interaction between the summer epilimnion and hypolimnia, due to thermocline erosion, entrainment, and even total breakdown of stratification during unseasonably cold and/or stormy weather (Blanton 1973, Matazara and Cooke 1997, Osgood 1988, Nürnberg 2011). Nürnberg (1995a, 2004) has developed a relationship to predict AF (AF_{pred}) based on average annual volume-weighted TP ($VWTP_{avg}$) and the OI_{mix} is the Osgood Index of Mixing:

$$AF_{pred} = (44.2 \times \log_{10}(VWTP_{avg}) + (0.95 \times OI_{mix}) - 35.4$$

Predicted and observed values for AF are presented in Table 1, columns 8 and 9, respectively, and the difference is presented in column 10. For Newman Lake, observed AF was higher than predicted for all years prior to oxygenation, yet was lower than predicted for all years after oxygenation. The only exception to the latter was for 1997, which, as shown, was unusual for its heavy sedimentation and presumably high oxygen demand.

We suggest that the difference (AF_{obs} - AF_{pred}) provides a measure of restoration efficacy, as lower observed AF implies that phosphorus for that year is less efficient in generating phytoplankton biomass that will in turn increase hypolimnetic oxygen demand and higher AF. The relationship may be especially important for lakes in which phosphorus accumulated in the hypolimnion has greater opportunity to be transported to the epilimnion and thus to influence summer primary productivity for a given year. Although stable summer stratification dominates most summers in Newman Lake, generally there is constant erosion of hypolimnetic volume until about late July or August. Entrainment around the lake edges during storms is also likely an important and frequent process at Newman Lake that may inject hypolimnetic phosphorus into the summer epilimnion where it can contribute directly to primary productivity.

Newman Lake restoration includes both microfloc alum as well as oxygenation, both of which are primary directed at hypolimnion phosphorus. It is conceptually easier to understand how microfloc alum, which we have shown has a water column residence time of about 10 days (Moore et al. 2009), could chemically sequester dissolved phosphorus making it less available for transport into the epilimnion and photic zone. Ultimately, this would be removed from the system by precipitation, but would chemically be detected and reported within the lake total phosphorus content.

It is less intuitive how oxygenation would affect phosphorus availability. Increased oxygen in the upper hypolimnion would enhance breakdown of organic materials derived from primary production in the epilimnion, sestonic oxygen demand. Total hypolimnetic oxygen demand is the sum of sestonic and sediment oxygen demand. With HO, it is likely that sestonic materials are more thoroughly oxidized before they reach the SWI, so that they exert less impact on SWI DO and thus on observed AF. However, AF predicted is calculated on volume-weighted total phosphorus concentration; central to the premise is that internally regenerated phosphorus contributes to annual primary production that in turns exerts oxygen demand at the SWI. Essentially, HO is creating conditions that shift oxidation of organic materials higher in the water column where there is less impact on SWI anoxia. Because oxygenation and microfloc alum injection have essentially been conducted in tandem, it is impossible to separate these potential mechanisms, but the differences in predicted and observed AF implies that less net biologic impact of TP on SWI anoxia. Figure 5 displays bottom 3 m oxygen mass versus the difference in observed minus predicted AF. If internal phosphorus load is related to oxygen content at the SWI, then a trend as depicted in Figure 5 is expected, within the range of yearly variability. The Figure 5 trend line equation implies that total oxygen mass of about 8,600 kg in the bottom 3 m is required for no difference in observed and predicted AF. Interestingly, the

8,600 kg mass corresponds to an average concentration of about 1.5 mg/L in the bottom 3 m of Newman Lake, which is the approximate threshold for an oxic SWI.

Reductions in phytoplankton in general, and in cyanobacteria specifically, were primary goals originally set forth by the community for Newman Lake restoration. Phytoplankton results, which show that both annual (or seasonal) average algae biovolume and peak biovolumes have declined to less than about 5% of their pre-restoration levels, were discussed in Part I. Since initiation of restoration activities, phytoplankton community composition has changed, with increased representation of Chrysophytes, such as *Dinobryon*, and declines in all blue-green forms to less than 1% of total phytoplankton (Moore and Christensen 2009). Therefore, the restoration has been successful in achieving community goals for algae.

Conclusions

In summary, HO at Newman Lake has been able to achieve increased hypolimnetic DO and prevention of anoxia in most years. Performance of the system in this respect is highly dependent on system operation, as hypolimnetic DO mass can best be explained by volumetric oxygen input rates. Partial HO operation has not been successful in avoiding anoxia. Likewise, as in 2000, eliminating oxygenation, even in mid-season, leads to rapid depletion of hypolimnetic DO. Annual climatic variability affects lake heat budgets and thermal structure and strongly influences ability of HO to maintain DO. In years with relatively shallow thermocline depths, high hypolimnetic volumes result in dilution of oxygen inputs, and thus with a lower oxygen delivery rate to the SWI.

Speece Cone HO systems deliver oxygenated effluent such that diffusion gradients are toward the sediment, compared to line-diffuser type systems with diffusion gradients roughly horizontal and parallel to sediments. Line-diffusers presumably induce more hypolimnetic mixing due to buoyant entrainment of colder bottom water in the bubble plume that moves oxygen away from the sediments, at least in zones adjacent to the diffuser line. In terms of evaluating potential differences in efficacy of these systems, Newman Lake provides a case for better understanding of the Speece Cone. The correlation of hypolimnetic DO mass with volumetric input rates and its sensitivity to dilution imply that a controlling factor is simply provision of sufficient oxygen mass to the hypolimnion, not direction of diffusion. The overall system success and observed post-oxygenation distribution of hypolimnetic DO profiles lend credence to the basic Speece Cone design. Line diffusers may be most appropriate in particular morphometric configurations, especially in deeper, V-shaped reservoirs where good successes have been reported (Ganzer et al. 2009a and b). More research on how lake bathymetry may affect distribution of oxygen inputs and delivery to the SWI as well as in-field tests of both types of systems are warranted to provide guidance on system selection.

HO in Newman Lake appears to be a major factor in lower hypolimnetic TP by reducing internal cycling. HO is also is likely a major contributor, along with alum injection and external load controls, in the overall trend of lower whole-lake TP. Average and maximum peak annual phytoplankton biovolumes have decreased, most likely in

response to lower TP availability. Likewise, cyanobacteria representation in the Newman Lake phytoplankton community has been decreased, and significant cyanobacteria blooms have been eliminated.

Newman Lake presents a number of important lessons for design and operation of HO systems. Early season oxygen inputs at low rates were unable to prevent SWI anoxia, further reinforcing the concept of induced oxygen demand. As noted in previous works, methods to better quantify induced demand are needed to provide the most economical match of system size with lake demand, and this remains a design challenge (Moore et al. 1996, Beutel et al. 2007). Likewise, statistical characterization of the range of variability to be expected in hypolimnetic volumes would provide better prediction of actual oxygen dose requirements.

Methods to evaluate the required lifetime of an HO or HA system are needed (Moore et al. 1996, Matinvesi 1996, Ganzer et al. 2009b). In-lake scuba observations of Newman Lake sediments over 20 years have revealed substantial changes in their physical nature and appearance (B.C. Moore, personal observations). Sediments in the deep portions of Newman Lake have high organic matter content (Funk et al. 1976, 1998; Funk and Moore 1988). Observations through the 1980s and early 1990s showed a very diffuse layer of flocculent particles adjacent to the sediment surface. This turbid transition layer from openwater to sediments is somewhat analogous to benthic nepheloid layers described in marine literature. With a few years of oxygenation in Newman Lake, the flocculent layer was no longer observed; indeed, a distinct interface developed at the sediment surface. Within the past 5 years, a "hard-pan" sediment surface has developed. This layer appears to be realcitrant clays left over after SWI organic matter has been oxidized. The presence of flocculent particles with anoxic sediments may provide more surface area for exchange of materials with the openwater. Our observations of changes in Newman Lake SWI coincide with declining AF. We suggest the role of physical changes in sediments with oxygenation and how they may impact phosphorus exchange warrants further investigation.

In conclusion, the Newman Lake Speece cone system has maintained adequate hypolimnetic oxygen levels, but these were only obtained as the system was operated at full capacity and when environmental conditions, particularly hypolimnetic volume, were close to those for which the system was originally sized. Trends in improved performance can likely be attributed to a gradual reduction in legacy sediment oxygen demand. Reductions in external phosphorus load that also have reduced primary productivity and delivery of annual organic matter to the sediments and hypolimnion cannot be excluded. However, this is unlikely, as the majority of external load took place prior to installation of the system (Moore and Christensen 2009). We believe the evidence strongly supports the viability of Speece cone systems with oxygenation for lake restoration applications, but better design, operational, and longevity models, such as are available for line-diffusers (Singleton et al. 2007, Beutel et al. 2007) are needed to economically match system size with environmental requirements. One important implication is that systems with less successful results (i.e. Gachner 1987, 1998; Hupner and Lewandowski 2008)

may be more a function of inadequate system design and operation, rather than a fallacy of the basic relationship between SWI oxygen and nutrient loading.

Literature Cited

Ashley, K.I. 1985. Hypolimnetic aeration: Practical design and application. *Water Res. 19:735-740.*

Ashley, K.I. 1990. *Preliminary design for a hypolimnetic aeration system for Newman Lake*. Report to Washington State University Contract No. 10004, Vancouver, B.C.

Ashley, K.I., S. Hay, and G.H. Scholten 1987. Hypolimnetic aeration: A field test of the empirical sizing method. Water Res. 21(2):223-227.

Ashley, K.I. 2002. Comparative analysis of oxygen transfer in full-lift and downflow bubble contact hypolimnetic aerators. Ph.D. thesis, Civil Engineering Department, The University of British Columbia, Vancouver, B.C.

Ashley, K.I. , D.S. Mavinic, and K.J. Hall 2008. Oxygenation performance of a laboratory-scale Speece Cone hypolimnetic aerator: preliminary assessment. *Can. J. Civil Eng. 35(7):663-675.*

Bernhardt, H. 1967. Aeration of Wahnback Reservoir without changing the temperature profile. *Amer. Water Works Assoc. 9:624-647.*

Beutel, M.W. and A. J. Horne, 1999: A review of the effects of hypolimetic oxygenation on lake and reservoir water quality. *Lake Reservoir Mgt. 15: 285–297.*

Beutel, M.W. 2003. Hypolimnetic anoxia and sediment oxygen demand in California drinking water reservoirs. *Lake Reservoir Mgt.* 19:208-221.

Beutel, M.W. 2006. Inhibition of ammonia release from anoxic profundal sediments in lakes using hypolimnetic oxygenation. *Ecol. Eng. 28:271-279.*

Beutel, M.W., N. Burley, and K.M. Culmer. 2006. Quantifying the effects of water velocity and oxygen on sediment oxygen demand. *Hydrol. Sci. Tech.* 22:15-28.

Beutel, M.W., I. Hannoun, J. Pasek, and K. Bowman Kavanagh. 2007. Hypolimnetic oxygenation pre-design study for a large eutrophic raw water reservoir, San Vicente Reservoir, CA. *ASCE J. Environ. Eng. 133:130-138.*

Beutel, M.W., T.M. Leonard, S.R. Dent, and B.C. Moore. 2008a. Effects of aerobic and anaerobic conditions on P, N, Fe, Mn and Hg accumulation in waters overlaying profundal sediments of an oligo-mesotrophic lake. *Water Res. 42:1953-1962.*

Beutel, M.W., A.J. Horne, W.D. Taylor, R.F. Losee, and R.D. Whitney. 2008b. Effects of oxygen and nitrate on nutrient release from profundal sediments from a large, mesotrophic reservoir, Lake Mathews, California. *Lake Reservoir Mgt. 24:18-29.*

Blanton. J.O. 1973. Vertical entrainment into the epilimnia of stratified lakes. *Limnol. Oceanogr. 18(5):697-704.*

Chapra, S.C. 1997. Surface water-quality modeling. McGraw Hill, Boston, MA. 844 pp.

Cooke, G.D., Welch, E.B., Peterson, S.A., and Nichols, S.A. 2005. *Restoration and management of lakes and reservoirs, 3rd ed.* CRC Press, New York.

Doke, J.L., W.H. Funk, S.T.J. Juul, and B.C. Moore. 1995. Habitat availability and benthic invertebrate population changes following alum treatment and hypolimnetic oxygenation in Newman Lake, WA. *J. Fresh. Biol. 10:87-102.*

Fast, A.W., B. Moss, and R.G. Wetzel. 1973. Effects of artificial aeration on the chemistry and algae of two Michigan lakes. *Water Resources Res. 9:624-647.*

Funk, W.H., H.L. Gibbons, D.A. Morency, P.J. Bennett, R. Marcley, and G.C. Bailey. 1976. Investigation to determine extent and nature of non-point enrichment and hydrology of several recreational lakes of eastern Washington. Part II. Water quality study. State of Washington Water Research Center Report No. 26. Washington State University, Pullman, WA.

Funk, W.H. and B.C. Moore. 1988. Newman Lake restoration feasibility study. State of Washington Water Research Center Report No. 69. Washington State University, Pullman, WA.

Funk, W.H., B.C. Moore, S.K. Burkett and S.T.J. Juul. 1998. Newman Lake Restoration Phase II. State of Washington Water Research Center Report No.87. Washington State University, Pullman, WA.

Gachter, R. 1987. Lake restoration: Why oxygenation and artificial mixing cannot substitute for a decrease in the external P loading. *Schweiz. Z. Hydrol. 49:170-185.*

Gachter, R. and B. Muller. 2003. Why the phosphorus retention of lakes does not necessarily depend on the oxygen supply to their sediment surface. *Limnol. Oceanogr. 48: 929–933.*

Gachter, R. and B. Wehli. 1998. Ten years of artificial mixing and oxygenation: No effect on the internal phosphorus loading of two eutrophic lakes. *Environ. Sci. Tech. 32:3659-3665.*

Gantzer, P.A., L.D. Bryant, J.C. Little. 2009a. Controlling soluble iron and manganese in a water-supply reservoir using hypolimnetic oxygenation. *Water Res. 43:1285-1294.*

Ganzer, P., J. Little, and 2009b. Effect of hypolimnetic oxygenation on oxygen depletion in two water supply reservoirs. *Water Res. 43:1700-1710.*

Hupner, M. and J. Lewandowski. 2008. Review Paper: Oxygen controls the phosphorus release from lake sediments- a long-lasting paradigm in limnology. *Internat. Rev. Hydrobiol. 93(4-5):415-432.*

Lawrence, G. 1990. *Preliminary report on the feasibility of hypolimnetic oxygenation of Newman Lake Aerator Plan.* Report to the Newman Lake Flood Control Zone District, Spokane County Engineers Office, Spokane, WA

Lean, D.R.S., D.J. McQueen, and V.R. Story. 1986. Phosphate transport during hypolimnetic aeration. *Arch. Hydrobiol. 108:269-280.*
Matazara, L.K. and G.D. Cooke. 1997. A test of a morphometric index to test vertical phosphorus transport in lakes. *Lake Reservoir Mgt. 13:328-337.*

Matinvesi, J. 1996. The change in sediment composition during recovery of two Finnish lakes induced by waste water purification and lake oxygenation. *Hydrobiol. 335:193-202.*

McGinnis, D.F. and J.C. Little. 1998. Bubble dynamics and oxygen transfer in a Speece Cone. *Water Sci. Tech. 37(20):285-292.*

McQueen, D.J. and D.R.S. Lean 1986. Hypolimnetic aeration: An overview. *Water Pollution Res. J. Can. 21(2):205-217.*

Mercier, P. and J. Perret 1949. Aeration station of Lake Bret. *Ver. Gas. Wasser-Fachm 29:25.*

Moore, B.C., P.H. Chen, W.H. Funk and D. Yonge. 1996. A model for predicting lake sediment oxygen demand following hypolimnetic aeration. *Water Resour. Res. 32:723-731.*

Moore, B., 2003. Downflow bubble contact aeration technology (Speece Cone) for sediment oxygenation, remediation of contaminated sediments. In: *Proceedings of the Second International Conference on Remediation of Contaminated Sediments*, September 30, 2003.

Moore, B.C. and D. Christensen 2009. Newman Lake restoration: A case study. Part I. Chemical and biological responses to phosphorus control. *Lake Reserv. Manage. 25(4):337–350.*

Moore, B.C., D. Christensen, and A.C. Richter 2009. Newman Lake restoration: A case study. Part II: Microfloc alum injection. *Lake Reserv. Manage. 25(4):351-363.*

Mortimer, C. H. 1941. The exchange of dissolved substances between mud and water in lakes. Part I. The distribution of some physical variables and concentrations of dissolved substances in Esthwaite Water, April 1939-February 1940. Part II. Changes in redox

potential and concentrations of dissolved substances in artificial mud-water systems, subjected to varying degrees of aeration.
J. Ecology 29: 280–329.

Mortimer, C. H. 1942. The exchange of dissolved substances between mud and water in lakes. Part III. The relation of seasonal variables in redox conditions in the mud to the distribution of dissolved substances in Esthwaite Water and Windermere, North basin. Part IV. General discussion. *J. Ecology 30: 147–201.*

Nürnberg, G.K. 1984. The prediction of internal phosphorus load in lakes with anoxic hypolimnia. *Limnol. Oceanogr. 29(1):111-124.*

Nürnberg, G.K. 1995a. Quantifying anoxia in lakes. *Limnol. Oceanogr. 40(6):1100-1111.*

Nürnberg, G.K. 1995b. The anoxic factor, a quantitative measure of anoxia and fish species richness in central Ontario Lakes. *Trans. Am. Fish. Soc. 124:677-686.*

Nürnberg G.K. 1998. Prediction of annual and seasonal phosphorus concentrations in stratified and polymictic lakes. *Limnol. Oceanogr. 43:1544-1552.*

Nürnberg, G.K. 2004. Quantified hypoxia and anoxia in lakes and reservoirs. *Sci. World J. 4:42-54.*

Nürnberg, G.K. 2009. Assessing internal phosphorus load- Problems to be solved. *Lake Reserv. Manage. 25(4):419-432.*

Nürnberg, G.K. 2011. Quantified anoxia in lakes and reservoirs. *Scientific World J. 4:42-54.*

Nürnberg G.K. and B.D. LaZerte. 2001. Predicting lake water quality. pp. 139-163. *In* C. Holdren, W. Jones & J. Taggart (eds.). *Managing lakes and reservoirs.* North American Lake Management Society and the Terrene Institute in cooperation with Office of Water Assessment, Watershed Protection Division, United States Environmental Protection Agency, Madison, WI.

Osgood, R.A. 1988. Lake mixes and internal phosphorus dynamics. *Arch. Hydrobiol. 113:629-638.*

Verner, B. 1984. Long term effect of hypoliomnetic aeration of lakes and reservoirs with special consideration of drinking water quality and preparation costs. In: Taggert, J. and L. Moore, eds. *Lake Reservoir Mgt. Proc. 3rd Ann. Conf. N. Am. Lake Mgt. Soc. USEPA 440/5-84-001:134-138.*

Singleton, V.L. and J.C. Little. 2006. Designing hypolimnetic aeration and oxygenation systems- a review. *Env. Sci. Tech. 40:7512-7520.*

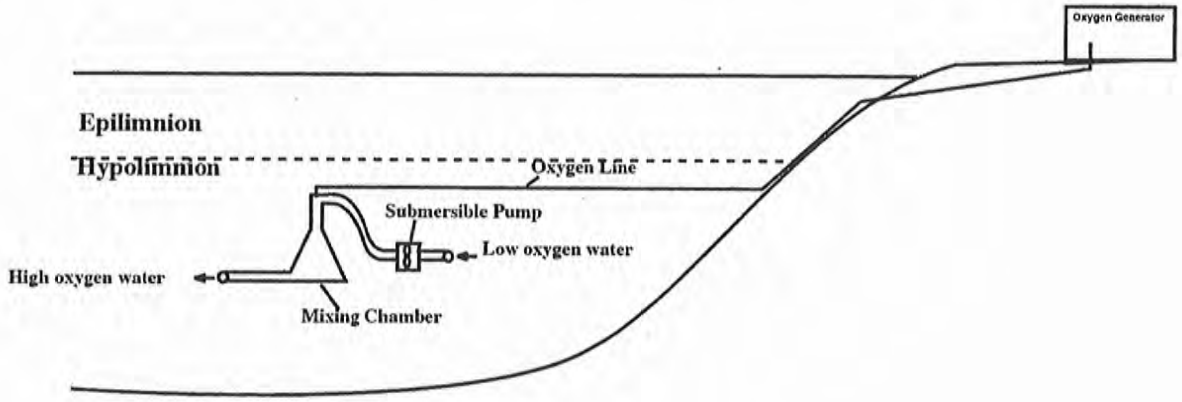
Singleton, V.L., P. Ganzer, and J.C. Little. 2007. Linear bubble plume model for hypolimnetic oxygenation: full-scale validation and sensitivity analysis. *Water Resources Res. 43(2), W02405, doi:10.1029/2005WR004836.*

Speece, R.E. 1971. Hypolimnetic aeration. *J. Amer. Water Works Assoc. 64:6-9.*

Speece, R.E., N. Nirmalakhandan, and G. Tchobanoglous. 1990. Commercial oxygen use in water-quality management. *Water Env. Tech. 2(7):54-61.*

Thomas, J.A., W.H. Funk, B.C. Moore, and W.W. Budd 1994. Short term changes in Newman Lake following hypolimnetic aeration with the Speece Cone. *Lake Reserv. Manage. 5:71-83.*

Figure 1. Diagrammatic view of the Newman Lake downflow contact bubble aerator (Speece Cone) system (no scale).



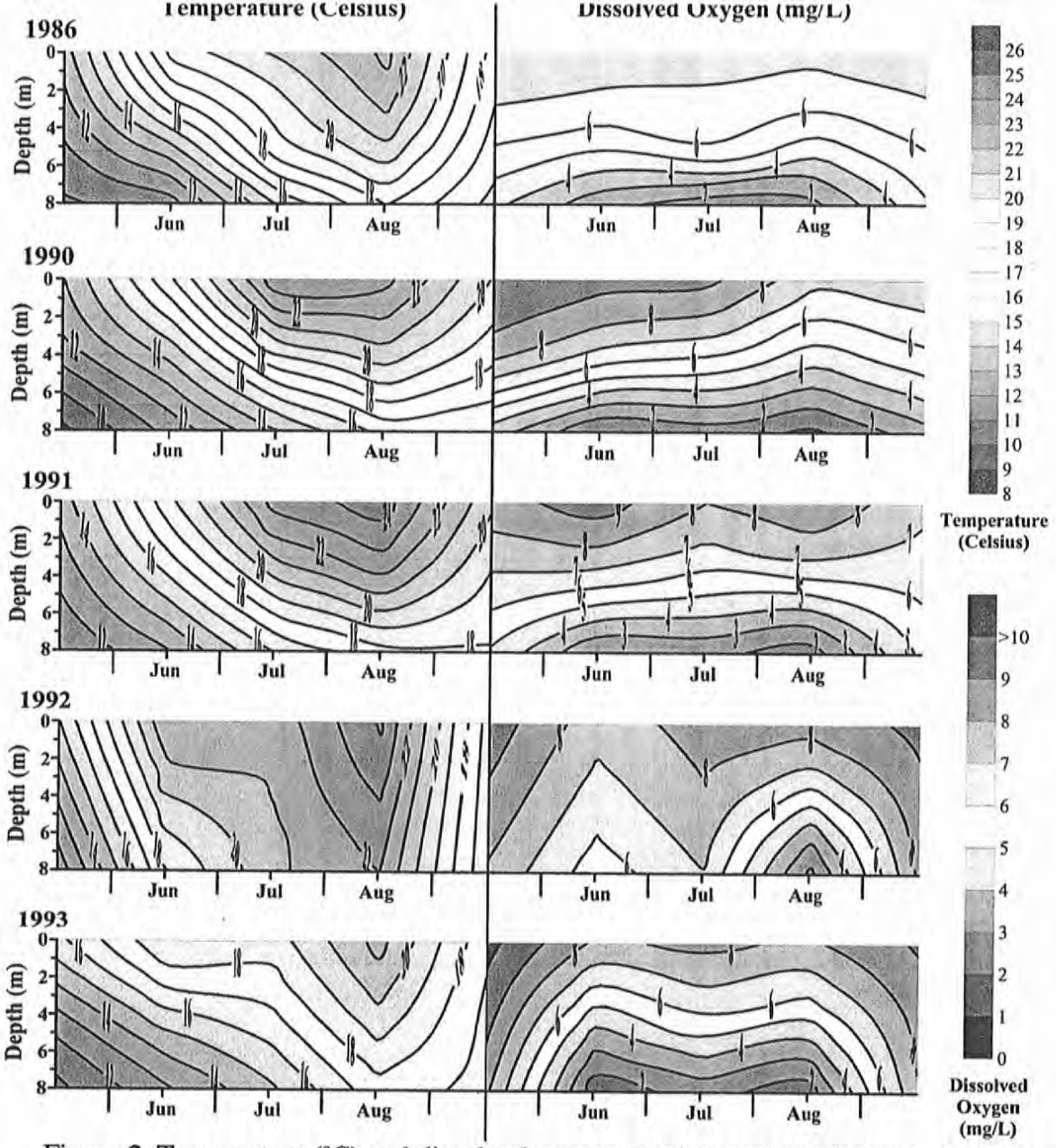
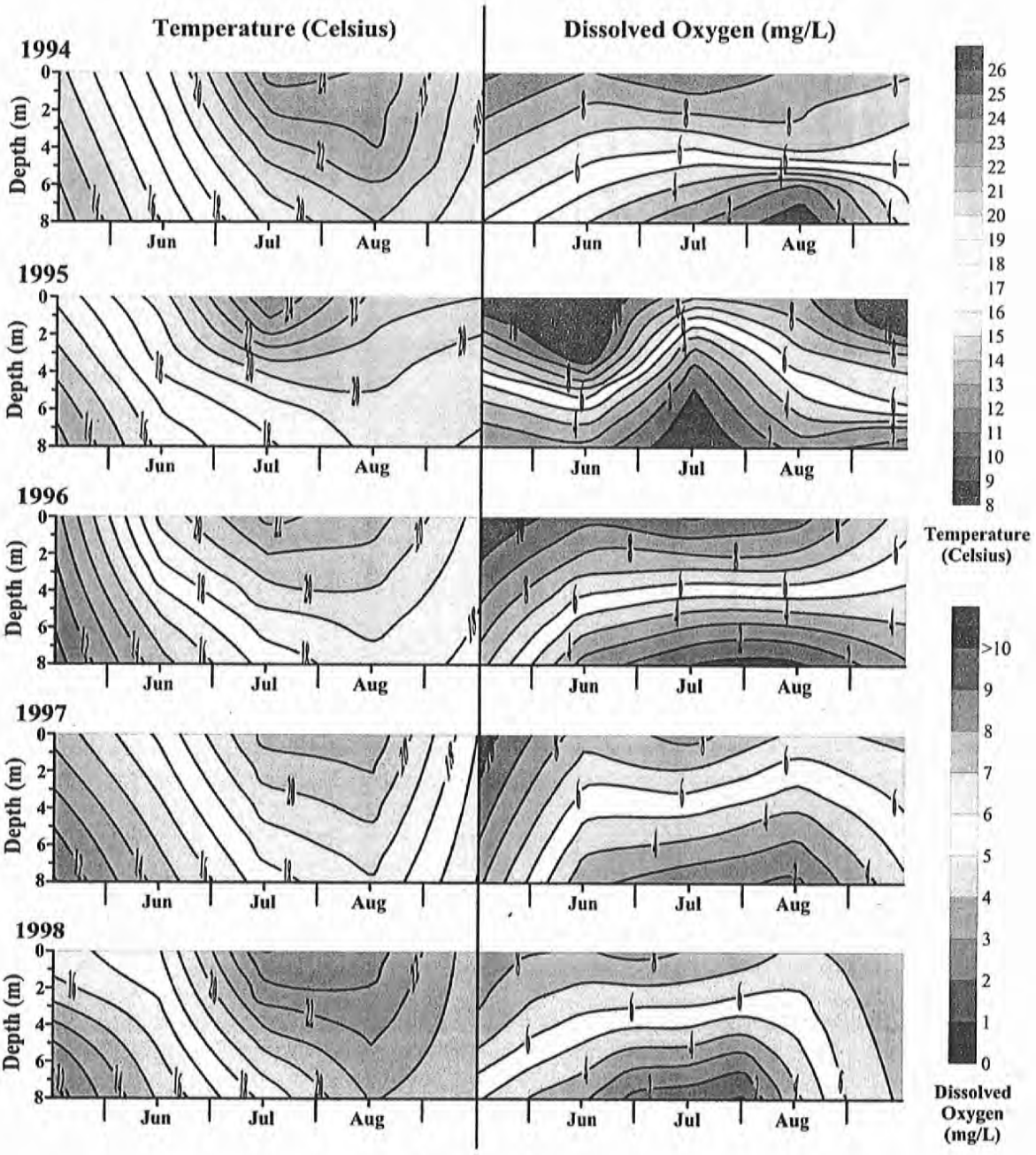
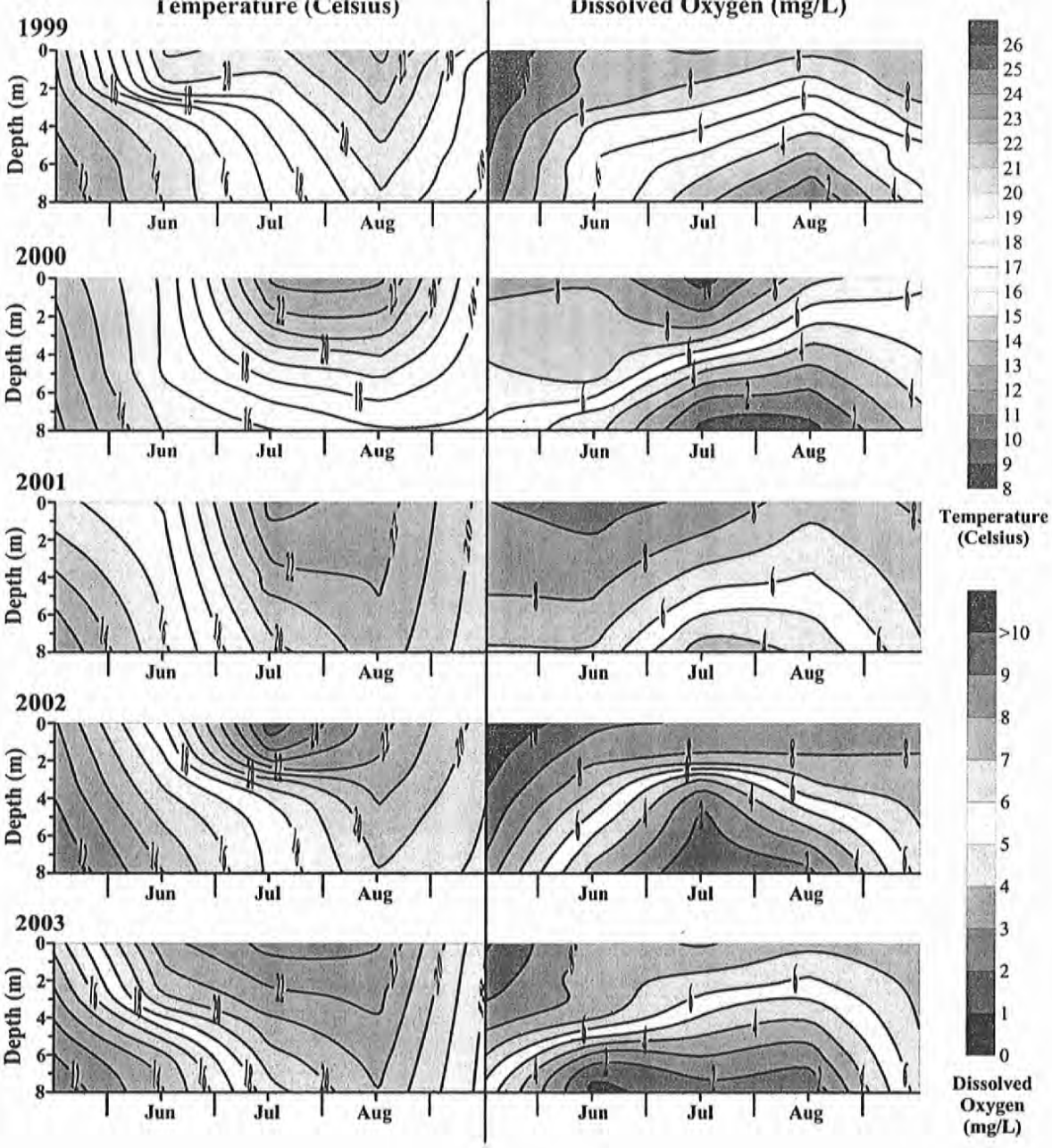
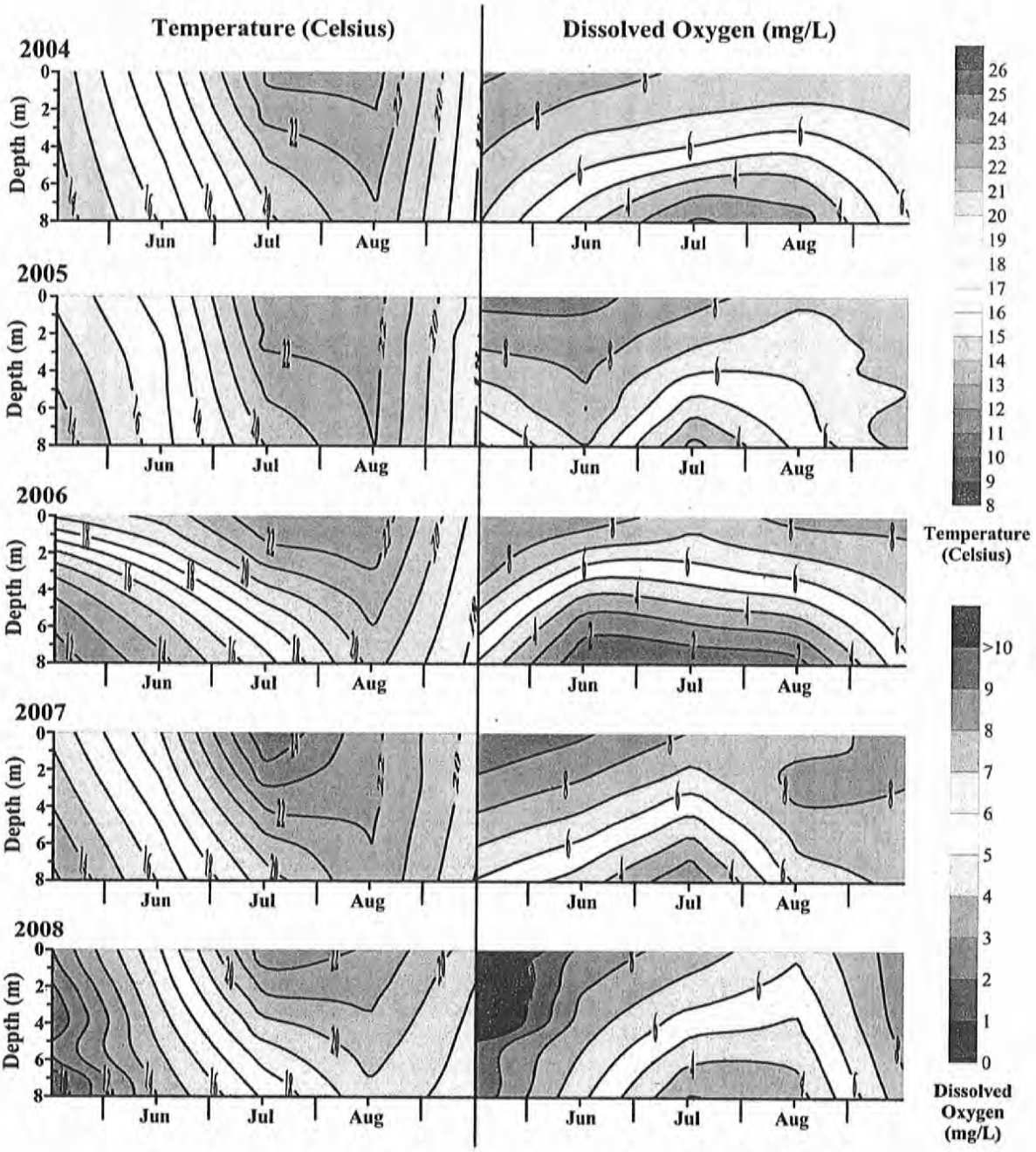


Figure 2. Temperature (°C) and dissolved oxygen (mg/L) isopleths for Newman Lake, 1986 through 2010. All years for which sufficient data are available are included.


Temperature (Celsius)
Dissolved Oxygen (mg/L)
1994
1995
1996
1997
1998
Depth (m)
0
2
4
6
8
Jun
Jul
Aug
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
Temperature (Celsius)
>10
9
8
7
6
5
4
3
2
1
0
Dissolved Oxygen (mg/L)


Temperature (Celsius)
Dissolved Oxygen (mg/L)
1999
2000
2001
2002
2003
Depth (m)
0
2
4
6
8
Jun
Jul
Aug
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
Temperature (Celsius)
>10
9
8
7
6
5
4
3
2
1
0
Dissolved Oxygen (mg/L)


Temperature (Celsius)
Dissolved Oxygen (mg/L)
2004
2005
2006
2007
2008
Depth (m)
0
2
4
6
8
Jun
Jul
Aug
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
Temperature (Celsius)
>10
9
8
7
6
5
4
3
2
1
0
Dissolved Oxygen (mg/L)

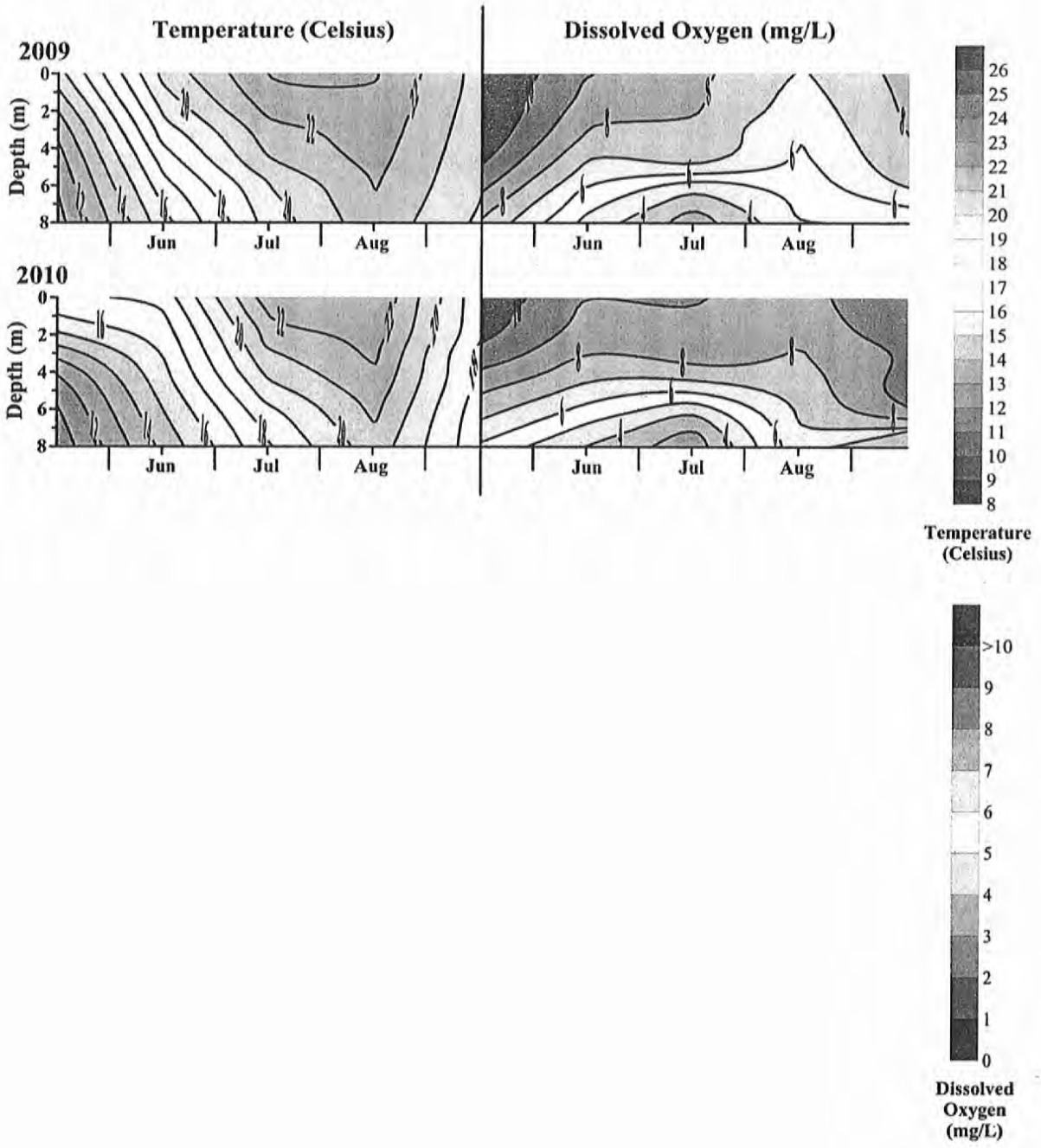

Temperature (Celsius)
Dissolved Oxygen (mg/L)
2009
2010
Depth (m)
0
2
4
6
8
Jun
Jul
Aug
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
Temperature (Celsius)
>10
9
8
7
6
5
4
3
2
1
0
Dissolved Oxygen (mg/L)

Figure 3. Nürnberg anoxic factor (AF), in days, for Newman Lake, 1986 through 2010 (Nürnberg 1995 a and b). All years for which sufficient data are available are included. See text for calculation and operational/environmental details.

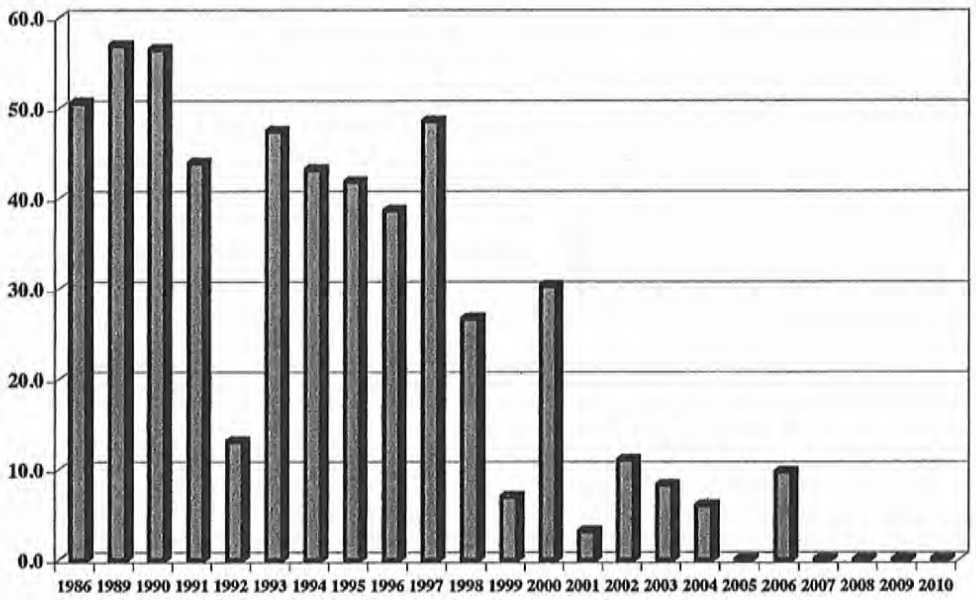


Figure 3. Nürnberg anoxic factor (AF), in days, for Newman Lake, 1986 through 2010 (Nürnberg 1995 a and b). All years for which sufficient data are available are included. See text for calculation and operational/environmental details.

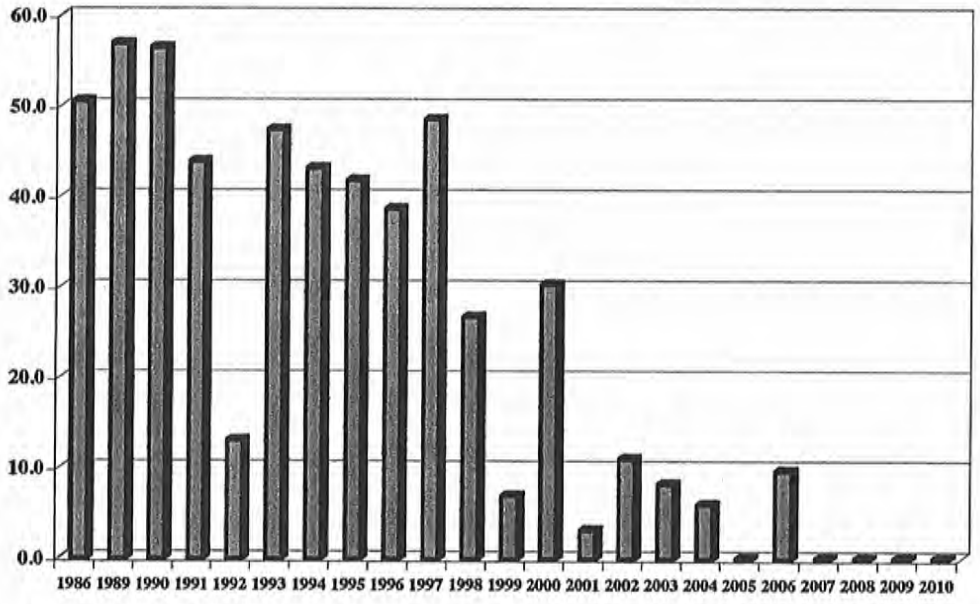


Figure 4. Average annual volume-weighted total phosphorus for Newman Lake, 1985 to 2010. Average annual volume-weighted total phosphorus in Newman Lake. Values in ug/L, as phosphorus. WL alum = whole lake alum treatment; Ox = hypolimnetic oxygenation; 100F = 100 yr flood event; OxOS = system out of service; MF alum = microfloc alum, see text for details.

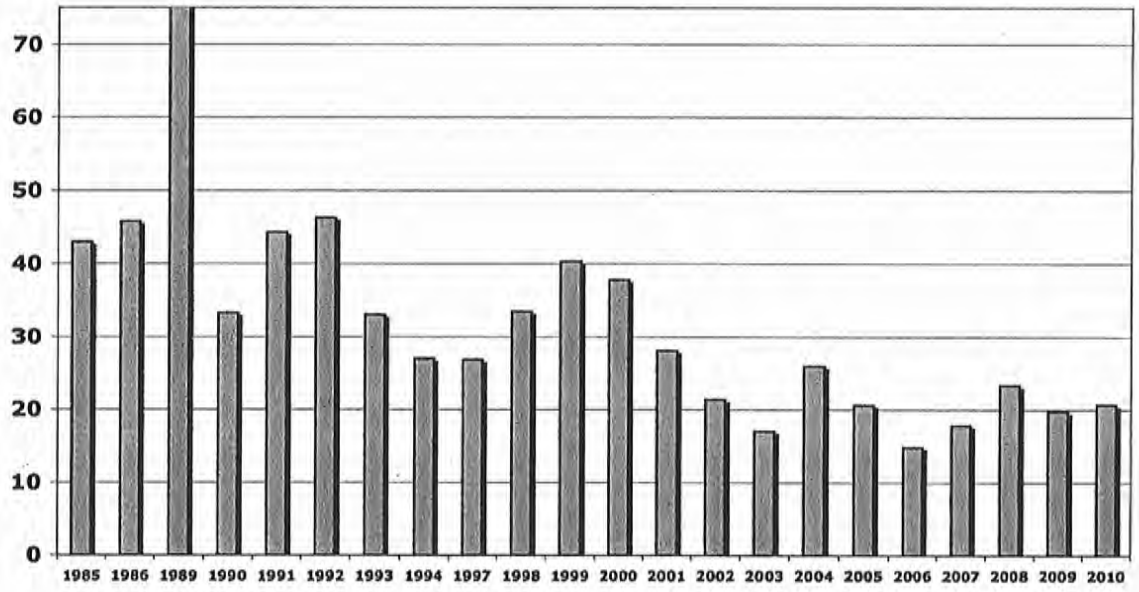
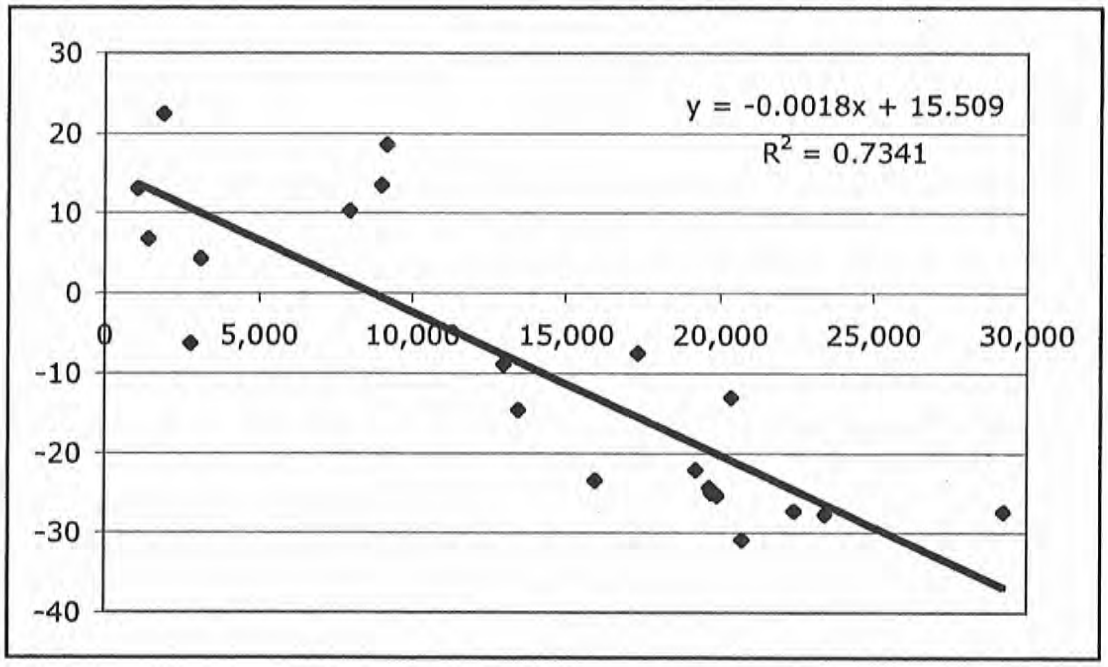


Figure 5. Mid-season hypolimnetic oxygen mass in the bottom 3 m, (kg, x-axis), vs. difference between observed minus predicted Anoxic Factor, in (days, y-axis).



ble 1. Thermocline depths, mid-season hypolimnetic volumes, estimated hypolimnetic oxygen mass, Speece Cone oxygen input rates, seasonal average volume-weighted total osphorus (VWTP), and observed and predicted Nürnberg Anoxic Factors (AF) in Newman Lake, for all years of adequate data, 1974 to 2010. See text for details.

col 1	col 2	col 3	col 4	col 5	col 6	col 7	col 8	col 9	col 10	col 11
	-----	*Mid-season*	-----	*Avg Daily*	*Vol-adj*					
	Thermocline	*Hypolimnetic*	*Bottom*	*Speece Cone Oxygen*	*O2 input*		*AF*	*AF*	*Diff (obs-*	
	Depth	*Volume*	*3 m O2 mass*	*Inputs*	*rate*	*VWTP*	*obs*	*pred*	*pred)*	
Year	*(m)*	*(m3 x 10^6)*	*(kg)*	*(kg)*	*mg/m3/day*	*(ug/L)*	*(days)*	*(days)*	*(days)*	*Notes:*
1974	5.0	6.0	*	*	-	*	*	*	*	pre-oxygenation
1985	4.5	7.8	*	*	-	*	*	*	*	pre-oxygenation
1986	6.5	2.3	7,926	0	-	46	51	40	10	pre-oxygenation
1989	4.5	7.8	1,401	0	-	77	57	50	7	pre-oxygenation, whole lake alum Sept
1990	4.5	7.8	1,880	0	-	33	56	34	22	pre-oxygenation
1991	6.5	2.3	3,076	0	-	44	44	40	4	pre-oxygenation
1992	3.5	11.6	29,244	603	52	46	13	40	-27	oxygenator installed, late June turnover
1993	3.5	11.6	8,964	118	10	33	47	34	13	partial operation at startup
1994	3.5	11.6	1,045	681	59	27	43	30	13	partial operation at startup
1995	3.5	11.6	2,234	682	59	*	42	*	*	partial operation at startup
1996	3.5	11.6	3,203	551	47	*	39	*	*	partial operation at startup
1997	2.5	15.7	9,139	928	59	27	49	30	19	full operation at startup, 30yr flood event, microfl
1998	3.0	13.6	17,328	1,033	76	33	27	34	-8	full operation at startup, flood/sediment influence
1999	3.0	13.6	20,730	1,034	76	40	7	38	-31	full operation at startup, flood/sediment influence
2000	3.5	11.6	2,761	390	34	38	30	37	-6	in-lake pump failure, oxygenator shut down in Ju
2001	4.5	7.8	23,422	1,011	130	28	3	31	-28	full operation at startup
2002	3.0	13.6	13,443	1,029	76	21	11	26	-15	full operation at startup
2003	4.5	7.8	20,361	1,054	135	17	8	21	-13	full operation at startup
2004	3.0	13.6	15,965	846	62	26	6	29	-23	full operation at startup
2005	4.5	7.8	19,718	927	119	21	0	25	-25	full operation at startup
2006	3.5	11.6	12,966	736	63	15	10	19	-9	full operation at startup
2007	3.5	11.6	19,215	1,138	98	18	0	22	-22	full operation at startup
2008	5.0	6.0	22,410	947	158	23	0	27	-27	full operation at startup
2009	4.5	7.8	19,901	888	114	21	0	25	-25	full operation at startup
2010	5.5	8.9	19,654	930	104	20	0	24	-24	full operation at startup

Table 2. Correlation coefficients for linear regression of Bottom 3 m oxygen mass in Newman Lake vs. average Speece Cone total oxygen inputs, and vs. volumetric oxygen inputs from system start through July for various years, 1992 to 2010.

Series: Bottom 3 m oxygen mass vs:	r^2
Total oxygen input (startup through July), all data years 1992 to 2010	0.29
Total oxygen input (startup through July), all data years 2010, except 1992	0.50
Total oxygen input (startup through July), 1997 to 2010	0.66
Total oxygen input (startup through July), 2000 to 2010	0.68
Volumetric oxygen inputs (startup through July), all data years 1992 to 2010	0.39
Volumetric oxygen inputs (startup through July), all data years 2010, except 1992	0.62
Volumetric oxygen inputs (startup through July), 2000 to 2010	0.80

APPENDIX: Data Tables for Newman Lake Water Quality Monitoring 2011

Table 1. Temperature profiles in Newman Lake, 2011. All values are in degrees Celcius.

North Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***
0	9.3	12.9	17.3	18.1	23.6	23.9	23.0	23.5	21.2
1	9.3	12.5	16.6	18.0	21.7	22.8	23.0	22.9	20.5
2	9.3	12.2	16.4	18.0	21.1	21.6	22.7	21.9	20.3
3	9.2	12.0	15.0	17.9	19.9	20.3	21.5	21.4	20.2
4	9.2	11.9	13.5	17.62	17.4	18.8	20.0	20.9	20.2
4.5	-	-	-	-	-	-	-	20.8	-
5	9.1	10.3	12.7	14.2	16.1	17.7	18.7	-	20.1
5.5	-	-	-	-	-	-	-	-	20.1
6	8.3	-	-	-	-	16.8	18.5	-	19.9

Mid Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***
0	9.1	12.7	16.4	17.1	22.9	23.5	23.6	23.5	21.5
1	9.0	12.4	16.2	17.9	21.9	22.5	22.6	22.6	20.9
2	8.9	12.4	15.8	17.7	20.5	21.6	22.2	22.4	20.6
3	8.7	12.1	15.4	16.4	19.4	20.1	21.5	21.9	20.4
4	8.6	12.0	14.0	14.7	18.1	18.6	20.4	21.5	20.4
5	8.4	12.0	13.5	14.3	16.1	17.4	19.6	21.1	20.2
6	8.5	11.7	13.2	14.2	15.3	17.0	18.9	20.6	20.1
7	8.4	11.5	13.0	14.2	15.2	16.9	18.4	20.5	20.0
7.5	-	-	-	-	-	-	-	20.4	-
8	8.3	11.3	12.7	13.8		16.5	18.2	-	20.0
8.5	-	-	-	-	-	-	-	-	19.9
9	8.3	-	-	-	-	16.5	-	-	19.8

South Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***
0	9.7	13.1	16.5	18.1	24.7	24.3	23.6	23.7	21.5
1	9.6	12.2	16.3	18.4	22.5	22.8	23.0	22.4	20.8
2	9.6	11.7	15.3	18.1	21.0	22.1	22.6	22.3	20.6
3	9.6	11.6	14.4	16.3	19.2	20.5	22.2	21.9	20.4
4	9.4	11.5	14.1	15.0	16.8	18.7	20.7	21.1	20.3
4.5	-	-	-	-	-	-	-	-	-
5	9.3	11.4	13.3	14.2	-	17.2	-	20.8	20.1
5.5	-	-	-	-	-	-	-	-	20.1
6	8.4	-	-	-	-	-	-	-	20.1

Table 2. Dissolved oxygen profiles in Newman Lake, 2011. All measurements are in mg/L.

North Station

Depth (m)	*May-03*	*May-18*	*Jun-08*	*Jun-24*	*Jul-06*	*Jul-18*	*Aug-01*	*Aug-25*	*Sep-08*	Sep-22	*Oct-06*
0	10.1	9.9	9.0	8.8	9.0	9.0	8.7	8.9	8.8	9.0	8.2
1	10.1	9.9	9.1	8.8	9.4	9.2	8.9	8.8	8.9	9.0	8.2
2	10.1	9.8	9.1	8.8	9.4	9.4	8.8	7.9	7.5	8.4	8.1
3	10.1	9.8	8.0	8.8	9.2	9.3	8.3	6.1	6.0	8.7	8.1
4	10.0	9.6	6.7	8.5	7.3	7.2	5.2	3.3	4.6	8.7	8.1
4.5	-	-	-	-	-	-	-	2.2	-	-	-
5	9.9	9.1	5.3	3.7	4.7	4.5	1.5	-	3.8	8.3	8.0
5.5	-	-	-	-	-	-	-	-	3.8	-	7.8
6	9.6	-	-	-	-	1.5	0.5	-	2.8	5.4	-

Mid Station

Depth (m)	*May-03*	*May-18*	*Jun-08*	*Jun-24*	*Jul-06*	*Jul-18*	*Aug-01*	*Aug-25*	*Sep-08*	Sep-22	*Oct-06*
0	10.0	9.9	9.1	8.8	9.0	9.0	8.7	8.5	8.7	8.4	8.3
1	10.0	9.9	9.2	8.8	9.2	9.1	8.7	8.6	8.9	8.5	8.3
2	9.9	9.8	9.2	8.7	9.2	8.4	8.7	8.2	8.8	8.5	8.3
3	9.8	9.5	8.8	7.1	9.2	7.3	8.0	7.4	8.3	8.3	8.3
4	9.6	9.4	7.5	4.9	7.9	6.8	6.4	7.3	7.5	8.1	8.3
5	9.5	9.2	6.9	4.0	4.9	3.8	3.8	5.3	6.2	8.1	8.2
6	9.5	8.9	6.3	3.8	1.9	2.6	2.0	1.9	5.4	8.1	8.2
7	9.4	8.5	5.2	3.6	1.8	2.2	0.8	1.4	4.4	8.1	8.2
7.5	-	-	-	-	-	-	-	0.1	-	-	-
8	9.4	7.3	4.1	2.6	-	1.1	0.4	-	4.2	7.7	8.2
8.5	-	-	-	-	-	-	-	-	4.1	-	-
9	9.4	-	-	-	-	0.9	-	-	4.0	-	-

South Station

Depth (m)	*May-03*	*May-18*	*Jun-08*	*Jun-24*	*Jul-06*	*Jul-18*	*Aug-01*	*Aug-25*	*Sep-08*	Sep-22	Oct-06
0	10.0	9.8	9.1	8.8	9.0	9.0	8.7	8.5	9.0	9.0	8.7
1	10.2	9.4	9.1	8.8	9.2	9.2	8.7	8.5	9.1	9.0	8.6
2	10.3	9.0	8.7	8.8	9.3	9.2	8.7	8.2	8.9	8.8	8.6
3	10.2	8.9	8.0	7.5	9.1	9.3	8.6	7.0	8.8	8.5	8.5
4	10.2	8.8	7.7	5.0	6.5	7.4	5.9	4.7	5.7	8.4	8.5
4.5	-	-	-	-	-	-	-	-	-	-	8.6
5	10.1	8.6	5.8	3.5	-	3.3	-	2.7	2.8	8.1	-
5.5	-	-	-	-	-	-	-	-	2.3	-	-
6	8.7	-	-	-	-	-	-	-	1.8	-	-

Table 3. Dissolved oxygen profiles in Newman Lake, 2011. All measurements expressed as percent of saturation.

North Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	***Oct-06***
0	106	100	104	102	118	119	113	117	111	107	91
1	106	99	103	103	117	119	115	112	109	106	91
2	106	98	103	102	117	117	113	99	90	99	91
3	106	96	88	102	112	114	103	75	73	102	91
4	105	95	70	99	85	85	63	39	57	102	90
4.5	-	-	-	-	-	-	-	27	-	-	-
5	103	85	47	40	53	52	18	-	47	95	89
5.5	-	-	-	-	-	-	-	-	46	-	86
6	97	-	-	-	-	17	6	-	34	63	-

Mid Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	***Oct-06***
0	105	99	103	102	116	117	113	111	109	100	94
1	104	98	103	102	116	117	112	110	110	101	93
2	103	97	102	102	113	105	111	104	108	100	93
3	101	94	96	79	111	89	100	93	102	97	93
4	100	92	80	54	92	82	79	92	91	96	93
5	98	91	74	43	54	44	45	66	76	96	93
6	98	87	66	41	21	30	23	23	65	95	93
7	98	82	55	38	20	25	10	17	54	95	92
7.5	-	-	-	-	-	-	-	8	-	-	-
8	97	70	42	27	-	12	5	-	51	90	92
8.5	-	-	-	-	-	-	-	-	52	-	-
9	97	-	-	-	-	10	-	-	48	-	-

South Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	**Oct-06**
0	108	99	103	103	120	119	113	110	113	108	97
1	108	93	103	103	118	118	113	108	112	107	97
2	108	88	96	102	116	117	112	104	110	103	96
3	108	87	87	84	109	114	109	88	107	101	96
4	107	86	83	55	74	88	73	58	70	99	95
4.5	-	-	-	-	-	-	-	-	-	-	96
5	106	83	61	37	-	38	-	32	33	95	-
5.5	-	-	-	-	-	-	-	-	27	-	-
6	90	-	-	-	-	-	-	-	14	-	-

Table 4. Specific conductivity profiles in Newman Lake, 2011. All values in µS/cm².

North Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	***Oct-06***
0	45	47	45	45	46	47	48	49	49	49	48
1	44	46	45	45	46	46	47	49	49	48	47
2	44	46	45	45	46	46	47	49	49	48	48
3	45	46	44	45	45	46	47	49	49	48	48
4	45	46	44	45	46	47	48	49	49	48	48
4.5	-	-	-	-	-	-	-	49	-	-	-
5	45	40	45	45	46	47	49	-	49	48	48
5.5	-	-	-	-	-	-	-	-	48	-	48
6	42	-	-	-	-	49	54	-	49	48	-

Mid Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	***Oct-06***
0	45	47	45	45	46	47	48	49	49	48	49
1	45	46	45	45	46	46	47	49	49	49	49
2	45	47	45	45	46	46	47	49	49	49	49
3	45	47	45	45	45	47	47	49	49	48	49
4	46	48	45	45	46	47	48	49	49	49	49
5	46	47	44	45	46	47	48	49	49	48	49
6	46	48	45	45	47	48	48	50	49	48	49
7	46	48	45	45	47	48	49	49	48	49	48
7.5	-	-	-	-	-	-	-	49	-	-	-
8	46	47	45	45	-	49	50	-	49	49	48
8.5	-	-	-	-	-	-	-	-	49	-	-
9	46	-	-	-	-	50	-	-	49	-	-

South Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	**Oct-06**
0	45	47	45	45	46	47	48	49	49	-	48
1	45	47	45	45	46	47	48	49	49	-	48
2	45	48	44	45	45	46	47	49	49	-	48
3	45	48	44	45	45	46	47	49	49	-	48
4	45	48	45	45	45	47	47	49	49	-	48
4.5	-	-	-	-	-	-	-	-	-	-	48
5	45	47	45	45	-	47	-	49	49	-	-
5.5	-	-	-	-	-	-	-	-	50	-	-
6	45	-	-	-	-	-	-	-	49	-	-

Table 5. Profiles of pH in Newman Lake, 2011. All values as the negative log of the hydrogen ion activity.

North Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	***Oct-06***
0	7.2	7.4	6.9	6.0	6.1	6.8	6.2	6.2	6.4	6.6	6.8
1	7.0	7.3	6.3	6.2	6.2	6.8	6.4	6.2	6.5	6.7	6.7
2	6.9	7.1	6.1	6.1	6.3	6.8	6.4	5.9	6.0	6.6	6.6
3	6.9	7.0	5.8	6.2	6.1	6.4	5.8	5.5	5.7	6.5	6.5
4	6.8	7.0	5.5	6.1	5.6	5.7	5.3	5.1	5.6	6.5	6.3
4.5	-	-	-	-	-	-	-	5.0	-	-	-
5	6.8	6.8	5.2	5.5	5.3	5.4	5.0	-	5.5	6.5	6.2
5.5	-	-	-	-	-	-	-	-	5.4	-	6.2
6	6.7	-	-	-	-	5.2	5.0	-	5.4	6.1	-

Mid Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	***Sep-22***	***Oct-06***
0	6.7	7.6	6.5	6.7	6.4	7.0	6.5	6.6	6.0	7.0	6.8
1	6.6	7.2	6.6	6.4	6.6	7.0	6.5	6.4	6.3	6.8	6.6
2	6.6	6.9	6.5	6.5	6.3	6.3	6.5	6.4	6.3	6.7	6.5
3	6.6	6.7	5.9	6.1	6.3	6.0	6.0	6.1	6.1	6.6	6.3
4	6.5	6.7	5.4	5.5	6.0	5.9	5.6	6.0	5.9	6.5	6.3
5	6.5	6.6	5.2	5.3	5.5	5.4	5.3	5.7	5.7	6.4	6.2
6	6.5	6.6	5.1	5.1	4.9	5.1	5.1	5.3	5.6	6.4	6.2
7	6.4	6.5	4.9	5.1	4.9	5.1	5.0	5.2	5.5	6.3	6.2
7.5	-	-	-	-	-	-	-	5.1	-	-	-
8	6.5	6.4	4.1	5.0	-	5.0	5.0	-	5.4	6.2	6.2
8.5	-	-	-	-	-	-	-	-	5.4	-	-
9	6.4	-	-	-	-	5.0	-	-	5.4	-	-

South Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	**Oct-06**
0	7.6	7.9	6.2	6.2	6.2	6.7	6.1	5.9	6.4	6.5	6.9
1	7.0	7.5	6.4	6.3	6.0	6.8	6.1	5.9	6.5	6.5	6.9
2	6.9	7.1	6.1	6.3	6.0	6.8	6.0	5.8	6.3	6.5	6.8
3	6.8	6.9	5.9	6.1	5.8	6.3	5.9	5.5	6.2	6.4	6.6
4	6.7	6.8	5.7	5.7	5.4	5.7	5.1	5.2	5.7	6.4	6.5
4.5	-	-	-	-	-	-	-	-	-	-	-
5	6.7	6.8	5.9	5.4	-	5.3	-	5.0	5.3	6.2	6.4
5.5	-	-	-	-	-	-	-	-	5.2	-	-
6	6.7	-	-	-	-	-	-	-	5.2	-	-

Table 6. Secchi depths in Newman Lake, 2011. All values are in meters.

	May-03	*May-18*	*Jun-08*	*Jun-24*	*Jul-06*	*Jul-18*	*Aug-01*	*Aug-25*	*Sep-08*	Sep-22	Oct-06
North	1.8	2.0	1.8	2.0	2.5	2.3	-	2.0	1.3	1.5	1.5
Mid	1.8	1.8	1.8	2.0	2.5	2.3	-	1.8	1.5	1.5	1.5
South	1.5	1.8	1.8	2.0	2.5	2.8	-	1.5	1.5	1.5	1.5

Table 7. Total dissolved solids in Newman Lake, 2011. All values derived from conductivity and expressed in mg/L.

North Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	***Oct-06***
0	0.0285	0.0297	0.0285	0.0287	0.0295	0.0297	0.0303	0.0315	0.0311	0.0310	0.0308
1	0.0285	0.0298	0.0285	0.0289	0.0293	0.0297	0.0302	0.0310	0.0311	0.0309	0.0309
2	0.0285	0.0297	0.0286	0.0288	0.0288	0.0295	0.0302	0.0309	0.0314	0.0308	0.0308
3	0.0288	0.0293	0.0285	0.0288	0.0291	0.0295	0.0302	0.0308	0.0313	0.0309	0.0308
4	0.0285	0.0292	0.0285	0.0288	0.0290	0.0298	0.0306	0.0313	0.0312	0.0309	0.0309
4.5	-	-	-	-	-	-	-	0.0309	-	-	-
5	0.0284	0.0255	0.0288	0.0286	0.0292	0.0301	0.0316	-	0.0313	0.0309	0.0308
5.5	-	-	-	-	-	-	-	-	0.0309	-	0.0308
6	0.0271	-	-	-	-	0.0309	0.0342	-	0.0307	0.0307	-

Mid Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	***Oct-06***
0	0.0290	0.0301	0.0287	0.0288	0.0293	0.0297	0.0304	0.0313	0.0313	0.0310	0.0311
1	0.0290	0.0302	0.0289	0.0289	0.0294	0.0296	0.0303	0.0314	0.0313	0.0310	0.0312
2	0.0291	0.0301	0.0286	0.0289	0.0294	0.0294	0.0305	0.0311	0.0315	0.0310	0.0310
3	0.0291	0.0304	0.0283	0.0287	0.0291	0.0298	0.0300	0.0312	0.0309	0.0311	0.0311
4	0.0292	0.0303	0.0285	0.0288	0.0292	0.0299	0.0306	0.0311	0.0309	0.0312	0.0311
5	0.0291	0.0298	0.0285	0.0289	0.0292	0.0303	0.0313	0.0312	0.0315	0.0311	0.0310
6	0.0290	0.0301	0.0285	0.0289	0.0303	0.0303	0.0310	0.0312	0.0312	0.0311	0.0308
7	0.0292	0.0300	0.0286	0.0289	0.0303	0.0307	0.0317	0.0313	0.0312	-	0.0310
7.5	-	-	-	-	-	-	-	0.0314	-	-	-
8	0.0292	0.0304	0.0284	0.0290		0.0313	0.0318	-	0.0313	0.0312	0.0310
8.5	-	-	-	-	-	-	-	-	0.0311	-	-
9	0.0291	-	-	-	-	0.0317	-	-	0.0316	0.0311	-

South Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	**Oct-06**
0	0.0287	0.0302	0.0285	0.0275	0.0295	0.0297	0.0305	0.0314	0.0312	0.0311	0.0308
1	0.0290	0.0303	0.0284	0.0289	0.0294	0.0299	0.0308	0.0313	0.0312	0.0310	0.0308
2	0.0289	0.0303	0.0284	0.0289	0.0291	0.0298	0.0304	0.0309	0.0312	0.0310	0.0308
3	0.0289	0.0301	0.0282	0.0287	0.0289	0.0295	0.0298	0.0313	0.0310	0.0311	0.0308
4	0.0287	0.0302	0.0285	0.0287	0.0291	0.0297	0.0307	0.0313	0.0312	0.0310	0.0308
4.5	-	-	-	-	-	-	-	-	-	-	0.0308
5	0.0289	0.0303	0.0282	0.0288		0.0302		0.0316	0.0313	0.0310	-
5.5	-	-	-	-	-	-	-	-	0.0312	-	-
6	0.0288	-	-	-	-	-	-	-	0.0312	-	-

Table 8. Chlorophyll-a concentrations in Newman Lake, 2011. All values in mg/L.

North Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	**Oct-06**
0	-	4.2	4.1	6.6	3.3	7.8	7.1	3.7	9.0	8.0	44.8
1	-	8.0	7.3	5.0	8.7	11.9	9.6	11.8	19.0	8.0	45.9
2	-	13.8	8.0	8.6	15.3	19.0	12.2	19.6	26.2	8.0	55.0
3	-	12.1	8.0	8.7	20.6	31.8	23.5	19.3	29.6	40.2	55.2
4	-	8.0	10.6	12.2	24.7	48.5	20.7	14.4	33.8	44.5	56.5
4.5	-	-	-	-	-	-	-	14.0	-	-	50.0
5	-	6.6	8.0	14.0	27.7	59.5	14.6	-	32.8	52.2	-
5.5	-	-	-	-	-	-	70.6	-	36.6	-	1.3
6	-	-	-	-	-	62.9	-	-	-	0.4	-

Mid Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	**Oct-06**
0	-	8.0	5.1	3.5	3.1	6.2	5.6	4.5	-	10.0	45.4
1	-	13.1	7.8	6.2	6.0	11.6	8.0	11.4	-	21.0	42.2
2	-	11.0	8.0	8.4	11.8	15.4	11.8	12.5	-	38.6	48.6
3	-	8.0	8.0	13.1	16.3	31.1	8.0	15.4	-	8.0	42.5
4	-	8.0	8.0	15.9	41.4	39.9	27.6	17.7	-	8.0	51.5
5	-	8.8	8.0	14.2	23.4	41.1	15.0	13.5	-	8.0	46.9
6	-	6.5	8.0	13.7	18.9	30.9	7.9	9.3	-	8.0	48.9
7	-	7.1	8.0	14.6	17.2	25.7	8.0	9.1	-	8.0	64.3
7.5	-	-	-	-	-	-	-	8.3	-	-	-
8	-	6.4	21.5	17.6	-	27.9	15.4	-	-	8.0	59.4
9	-	-	-	-	-	0.2	-	-	-	-	-

South Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	**Sep-22**	**Oct-06**
0	-	3.7	4.4	3.3	-	8.5	4.5	5.1	-	11.5	42.3
1	-	8.3	6.9	4.2	5.3	11.6	8.3	9.7	13.8	8.0	51.3
2	-	7.5	6.1	8.5	12.9	14.0	8.0	14.2	26.4	8.0	55.3
3	-	6.0	13.0	19.1	20.4	27.9	8.0	13.2	29.6	8.0	44.0
4	-	6.0	8.0	15.9	27.3	60.2	8.0	12.6	37.6	48.1	55.0
4.5	-	-	-	-	-	-	-	-	-	-	60.5
5	-	271.1	15.3	17.9	-	42.9	-	9.8	32.8	8.0	-
5.5	-	-	-	-	-	-	-	-	45.5	-	-
6	-	-	-	-	-	-	-	-	61.6	-	-

Table 9. Oxidation/reduction potentials (ORP) in Newman Lake, 2011. All values in mV.

North Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	***Sep-22***	***Oct-06***
0	387	400	420	390	460	481	558	479	507	473	432
1	392	421	445	390	462	484	558	485	513	479	441
2	397	432	454	393	465	485	563	496	529	485	451
3	400	437	464	397	467	489	574	505	539	491	462
4	404	442	478	402	473	501	588	516	550	498	470
4.5	-	-	-	-	-	-	-	321	-	-	
5	408	451	489	432	482	507	594	-	555	502	474
5.5	-	-	-	-	-	-	-	-	505	-	413
6	413	-	-	-	-	506	371	-	477	482	-

Mid Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	***Sep-22***	***Oct-06***
0	434	386	481	472	540	537	597	551	-	538	482
1	450	417	482	492	541	544	599	567	-	540	488
2	446	430	476	490	545	519	603	567	-	539	495
3	440	435	488	504	549	544	612	570	-	544	508
4	448	438	499	523	555	553	619	576	-	546	512
5	443	454	508	536	573	566	630	581	-	550	514
6	450	458	513	539	588	576	633	591	-	553	516
7	455	462	519	542	588	598	635	596	-	556	517
7.5	-	-	-	-	-	-	-	599	-	-	
8	456	466	517	546	-	581	630	-	-	558	518
8.5	-	-	-	-	-	-	-	-	-	-	
9	459	-	-	-	-	443	-	-	-		

South Station

Depth (m)	***May-03***	***May-18***	***Jun-08***	***Jun-24***	***Jul-06***	***Jul-18***	***Aug-01***	***Aug-25***	***Sep-08***	***Sep-22***	***Oct-06***
0	378	370	438	388	-	487	434	450	-	521	397
1	390	404	434	390	452	487	441	449	529	526	401
2	396	424	437	392	454	485	446	457	533	525	414
3	403	431	440	399	459	494	451	470	537	527	426
4	406	435	453	416	467	500	473	481	547	529	434
4.5	-	-	-	-	-	-	-	-	-	-	437
5	410	439	463	433		511		487	556	534	-
5.5	-	-	-	-	-	-	-	-	559	-	-
6	395	-	-	-	-	-	-	-	445	-	-

Table 10. Total phosphorus concentrations in Newman Lake, 2011. All values are in mg/L, as phosphorus.

	May-03	May-17	Jun-08	Jun-24	Jul-06	Jul-18	Aug-01	Aug-25	Sep-08	Sep-22	Oct-06
North-top	0.042	0.040	0.031	0.041	0.021	0.036	0.035	0.026	0.031	0.033	0.033
North-mid	0.042	0.051	0.035	0.044	0.033	0.040	0.036	0.030	0.042	0.038	0.033
North-bot	0.036	0.048	0.032	0.044	0.032	0.044	0.047	0.036	0.047	0.060	0.036
Mid-top	0.035	0.041	0.024	0.041	0.028	0.037	0.035	0.030	0.034	0.029	0.023
Mid-mid	0.032	0.045	0.031	0.045	0.030	0.042	0.040	0.028	0.051	0.047	0.034
Mid-bot	0.018	0.045	0.051	0.044	0.037	0.057	0.047	0.017	0.038	0.032	0.032
South-top	0.032	0.038	0.033	0.040	0.025	0.034	0.038	0.022	-	0.028	0.031
South-mid	0.027	0.045	0.031	0.041	0.031	0.037	0.021	0.032	0.034	0.032	0.033
South-bot	0.037	0.044	0.038	0.041	0.033	0.034	0.043	0.029	0.068	0.037	0.032

Table 11. Ortho Phosphate concentrations in Newman Lake, 2011. All values are in mg/L, as phosphorus.

	May-03	May-17	Jun-08	Jun-24	Jul-06	Jul-18	Aug-01	Aug-25	Sep-08	Sep-22	Oct-06
North-top	0.013	0.007	0.012	0.011	0.007	0.008	0.008	0.008	0.007	0.006	0.015
North-mid	0.012	0.010	0.017	0.013	0.007	0.008	0.008	0.009	0.079	0.006	0.025
North-bot	0.007	0.009	0.013	0.010	0.012	0.009	0.009	0.009	0.092	0.006	0.024
Mid-top	0.007	0.007	0.010	0.010	0.009	0.008	0.008	0.007	0.008	0.125	0.010
Mid-mid	0.006	0.007	0.014	0.009	0.012	0.008	0.008	0.007	0.007	0.006	0.018
Mid-bot	0.006	0.007	0.020	0.013	0.008	0.009	0.008	0.010	0.008	0.006	0.011
South-top	0.007	0.010	0.013	0.009	0.007	0.008	0.009	0.008	0.101	0.006	0.050
South-mid	0.006	0.007	0.012	0.008	0.010	0.008	0.008	0.010	0.008	0.051	0.015
South-bot	0.006	0.011	0.010	0.009	0.008	0.008	0.008	0.010	0.013	0.006	0.016

Table 12. Nitrate/nitrite concentrations in Newman Lake, 2011. All values are in mg/L, as nitrogen.

	May-03	May-17	Jun-08	Jun-24	Jul-06	Jul-18	Aug-01	Aug-25	Sep-08	Sep-22	Oct-06
North-top	0.003	<MDL	0.101	<MDL	<MDL	<MDL	<MDL	0.002	0.002	<MDL	0.002
North-mid	0.003	0.002	0.145	<MDL	0.002	<MDL	<MDL	0.003	0.002	0.003	0.006
North-bot	0.006	0.003	0.095	0.002	0.099	<MDL	<MDL	0.066	0.015	0.021	0.008
Mid-top	0.004	0.002	0.084	0.004	0.002	0.002	<MDL	<MDL	0.002	0.002	<MDL
Mid-mid	0.005	0.002	0.110	0.002	0.026	<MDL	<MDL	<MDL	0.006	0.011	<MDL
Mid-bot	0.007	0.005	0.157	0.003	0.046	0.004	0.002	0.106	0.019	<MDL	<MDL
South-top	0.002	<MDL	0.086	<MDL	<MDL	0.004	<MDL	<MDL	0.002	<MDL	0.002
South-mid	0.002	0.004	<MDL	0.002	<MDL	0.002	<MDL	0.050	0.002	<MDL	<MDL
South-bot	0.009	0.004	0.088	<MDL	0.029	0.002	<MDL	0.090	0.212	0.004	<MDL

Table 13. Ammonia nitrogen concentrations in Newman Lake, 2011. All values are in mg/L, as nitrogen.

	May-03	May-17	Jun-08	Jun-24	Jul-06	Jul-18	Aug-01	Aug-25	Sep-08	Sep-22	Oct-06
North-top	0.080	0.012	0.012	0.067	0.057	0.024	0.026	0.141	0.137	0.097	0.015
North-mid	0.083	0.050	0.015	0.086	0.047	0.020	0.019	0.200	0.079	0.119	0.025
North-bot	0.033	0.031	0.016	0.051	0.020	0.029	0.022	0.094	0.092	0.077	0.024
Mid-top	0.045	0.057	0.020	0.074	0.079	0.060	0.008	0.146	0.155	0.125	0.010
Mid-mid	0.037	0.016	0.016	0.025	0.084	0.039	0.011	0.136	0.117	0.054	0.018
Mid-bot	0.029	0.014	0.013	0.067	0.027	0.028	0.011	0.058	0.092	0.028	0.011
South-top	0.044	0.032	0.016	0.054	0.027	0.011	0.018	0.130	0.285	0.097	0.050
South-mid	0.038	0.044	0.014	0.041	0.080	0.019	0.005	0.107	0.129	0.051	0.015
South-bot	0.042	0.037	0.009	0.034	0.022	0.009	0.013	0.024	0.028	0.083	0.016

Table 14. Alkalinity profiles in Newman Lake, 2011. All values are in mg/L, as calcium carbonate.

	May-03	May-17	Jun-08	Jun-24	Jul-06	Jul-18	Aug-01	Aug-25	Sep-08	Sep-22	Oct-06
North-top	10.340	13.565	6.798	14.220	19.941	12.181	15.736	26.717	20.601	17.991	14.438
North-mid	9.786	11.035	10.924	14.518	20.951	15.213	15.469	26.717	15.713	9.314	12.865
North-bot	11.871	14.160	14.912	14.361	23.368	14.575	16.191	26.113	<MDL	18.559	<MDL
Mid-top	8.582	13.869	16.937	11.951	25.466	14.419	13.425	26.126	20.253	11.589	12.939
Mid-mid	12.993	13.765	3.298	13.524	22.647	14.141	14.387	25.897	17.780	16.574	16.047
Mid-bot	11.439	13.184	20.070	13.049	26.048	15.475	16.280	21.421	12.248	17.175	14.665
South-top	15.051	2.921	19.915	13.331	24.153	14.335	14.842	14.597	17.963	<MDL	14.591
South-mid	11.880	14.537	19.608	13.864	24.671	15.030	14.246	14.409	15.588	15.217	13.899
South-bot	8.532	<MDL	20.640	14.319	25.737	16.018	13.828	<MDL	22.742	12.360	15.300

Table 15a. Total nitrogen concentrations in Newman Lake, 2011. All values are in mg/L, as nitrogen.

	May-03	May-17	Jun-08	Jun-24	Jul-06	Jul-18	Aug-01	Aug-25	Sep-08	Sep-22	Oct-16
North-top	0.480	0.360	0.392	0.404	0.280	0.320	0.332	0.412	0.496	0.512	0.432
North-mid	0.484	0.420	0.432	0.392	0.332	0.348	0.344	0.448	0.492	0.512	0.424
North-bot	0.368	0.364	0.372	0.404	0.368	0.412	0.380	0.444	0.488	0.648	0.432
Mid-top	0.408	0.376	0.324	0.396	0.328	0.404	0.332	0.464	0.540	0.496	0.248
Mid-mid	0.428	0.388	0.356	0.336	0.356	0.372	0.368	0.432	0.596	0.564	0.432
Mid-bot	0.276	0.360	0.476	0.356	0.336	0.416	0.372	0.384	0.388	0.432	0.380
South-top	0.400	0.328	0.396	0.368	0.312	0.328	0.360	0.384	-	0.488	0.432
South-mid	0.384	0.384	0.348	0.360	0.344	0.332	0.368	0.388	0.512	0.392	0.428
South-bot	0.456	0.388	0.396	0.340	0.332	0.308	0.396	0.436	0.688	0.520	0.424

Total nitrogen values were calculated from a dilution of the raw digested sample. Diluted 1:3 with deionized water.

Table 15b. Raw values of dilutions (1:3) for total nitrogen calculations in Newman Lake, 2011. All values are in mg/L, as nitrogen.

	May-03	May-17	Jun-08	Jun-24	Jul-06	Jul-18	Aug-01	Aug-25	Sep-08	Sep-22	Oct-06
North-top	0.120	0.090	0.098	0.101	0.070	0.080	0.083	0.103	0.124	0.128	0.108
North-mid	0.121	0.105	0.108	0.098	0.083	0.087	0.086	0.112	0.123	0.128	0.106
North-bot	0.092	0.091	0.093	0.101	0.092	0.103	0.095	0.111	0.122	0.162	0.108
Mid-top	0.102	0.094	0.081	0.099	0.082	0.101	0.083	0.116	0.135	0.124	0.062
Mid-mid	0.107	0.097	0.089	0.084	0.089	0.093	0.092	0.108	0.149	0.141	0.108
Mid-bot	0.069	0.090	0.119	0.089	0.084	0.104	0.093	0.096	0.097	0.108	0.095
South-top	0.100	0.082	0.099	0.092	0.078	0.082	0.090	0.096	-	0.122	0.108
South-mid	0.096	0.096	0.087	0.090	0.086	0.083	0.092	0.097	0.128	0.098	0.107
South-bot	0.114	0.097	0.099	0.085	0.083	0.077	0.099	0.109	0.172	0.130	0.106

APPENDIX: Zooplankton Data for Newman Lake Water Quality Monitoring 2011

Newman Lake Zooplankton Density North Station 2011

5/3/2011 **North**

CLADOCERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Daphnia thorata	0	0	0	0
D. pulex	1	1	1	378
D. galeata mendotae	129	81	105	39,741
Juvenile Daphnia	17	13	15	5,677
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	17	21	19	7,191
D. laevis	0	0	0	0
D. rosea	22	12	17	6,434
Total	**186**	**128**	**157**	**59,423**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	7	2	5	1,703
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**193**	**130**	**162**	**61,126**

COPEPODA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Diacyclops	46	44	45	17,032
Mesocyclops	5	2	4	1,325
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**51**	**46**	**49**	**18,357**
Nauplii	84	91	88	33,118
Total Copepoda	**135**	**137**	**136**	**51,475**

ROTIFERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Keratella cochlearis	92	87	90	33,875
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	241	248	245	92,541
Kellicottia bostonensisos	0	0	0	0
Asplanchna	2	3	3	946
Ascomorpha	0	0	0	0
Polyartha	403	314	359	135,689
Lecane	1	2	2	568
Collotheca	0	0	0	0
Synchaeta	14	20	17	6,434
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**753**	**674**	**714**	**270,052**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

5/18/2011	North			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	24	28	26	10,934
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	4	2	3	1,262
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**28**	**30**	**29**	**12,196**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	5	3	4	1,682
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**33**	**33**	**33**	**13,878**
COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	24	19	22	9,042
Mesocyclops	0	0	0	0
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**24**	**19**	**22**	**9,042**
Nauplii	39	35	37	15,560
Total Copepoda	**63**	**54**	**59**	**24,602**
				0
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	75	69	72	30,279
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	308	315	312	131,000
Kellicottia bostonensisos	2	3	3	1,051
Asplanchna	2	3	3	1,051
Ascomorpha	1	0	1	210
Polyartha	363	342	353	148,242
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	3	4	4	1,472
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	9	11	10	4,205
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**688**	**678**	**755**	**317,511**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	4.5 m	N=Average count
Water column volume	0.30 m3	Vs=Volume of sample (mL)
	297 L	Vf=Volume of lake water filtered (L)
Two tows	594 L	

6/8/2011	North			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	0	0	0
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0		0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**0**	**0**	**0**	**0**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	1	0	1	210
Mesocyclops	0	0	0	0
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**1**	**0**	**1**	**210**
Nauplii	33	48	41	17,032
Total Copepoda	**34**	**48**	**41**	**17,242**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	54	40	47	19,766
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	7	10	9	3,575
Kellicottia bostonensisos	0	0	0	0
Asplanchna	15	8	12	4,836
Ascomorpha	10	5	8	3,154
Polyartha	56	54	55	23,130
Lecane	0	0	0	0
Collotheca	30	37	34	14,088
Synchaeta	168	220	194	81,586
Testudinella patina	0	0	0	0
Trichocerca	0	4	2	841
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**286**	**338**	**359**	**150,975**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	4.5 m	N=Average count
Water column volume	0.30 m3	Vs=Volume of sample (mL)
	297 L	Vf=Volume of lake water filtered (L)
Two tows	594 L	

6/24/2011	North			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	0	0	0
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**0**	**0**	**0**	**0**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	1	0	1	189
Mesocyclops	0	0	0	0
Diaptomus	0	1	1	189
Epsichura	0	0	0	0
Total	**1**	**1**	**1**	**378**
Nauplii	7	2	5	1,703
Total Copepoda	**8**	**3**	**6**	**2,082**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	54	64	0	0
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	11	13	12	4,542
Kellicottia bostonensisos	0	0	0	0
Asplanchna	6	10	8	3,028
Ascomorpha	38	27	33	12,301
Polyartha	6	4	5	1,892
Lecane	3	0	2	568
Collotheca	13	23	18	6,813
Synchaeta	1	3	2	757
Testudinella patina	0	0	0	0
Trichocerca	82	35	59	22,142
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**160**	**115**	**138**	**52,042**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

7/6/2011	North			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	1	1	1	421
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**1**	**1**	**1**	**421**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	0	0	0	0
Mesocyclops	0	0	0	0
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**0**	**0**	**0**	**0**
Nauplii	9	1	5	2,103
Total Copepoda	**9**	**1**	**5**	**2,103**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	4	9	7	2,734
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	8	10	9	3,785
Kellicottia bostonensisos	0	0	0	0
Asplanchna	15	16	16	6,518
Ascomorpha	9	8	9	3,575
Polyartha	0	0	0	0
Lecane	1	0	1	210
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	22	28	25	10,514
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**55**	**62**	**65**	**27,335**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where…..
Water column depth	4.5 m	N=Average count
Water column volume	0.30 m3	Vs=Volume of sample (mL)
	297 L	Vf=Volume of lake water filtered (L)
Two tows	594 L	

7/18/2011	North			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	1	3	2	688
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**1**	**3**	**2**	**688**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	0	0	0	0
Mesocyclops	0	0	0	0
Diaptomus	1	1	1	344
Epsichura	0	0	0	0
Total	**1**	**1**	**1**	**344**
Nauplii	26	48	37	12,731
Total Copepoda	**27**	**49**	**38**	**13,075**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	26	23	25	8,430
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	9	11	10	3,441
Kellicottia bostonensisos	1	2	2	516
Asplanchna	28	57	43	14,623
Ascomorpha	8	4	6	2,064
Polyartha	6	12	9	3,097
Lecane	0	0	0	0
Collotheca	2	4	3	1,032
Synchaeta	3	1	2	688
Testudinella patina	0	0	0	0
Trichocerca	44	26	35	12,043
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**101**	**117**	**134**	**45,935**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.5 m	N=Average count
Water column volume	0.36 m3	Vs=Volume of sample (mL)
	363 L	Vf=Volume of lake water filtered (L)
Two tows	727 L	

8/1/2011	North			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	45	73	59	27,914
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0		0	0
Total Cladocera	**45**	**73**	**59**	**27,914**
COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	2	5	4	1,656
Mesocyclops	0	0	0	0
Diaptomus	1	1	1	473
Epsichura	0	0	0	0
Total	**3**	**6**	**5**	**2,129**
Nauplii	38	41	40	18,688
Total Copepoda	**41**	**47**	**44**	**20,817**
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	67	96	82	38,559
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	21	22	22	10,172
Kellicottia bostonensisos	1	2	2	710
Asplanchna	3	3	3	1,419
Ascomorpha	5	4	5	2,129
Polyartha	20	37	29	13,484
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	22	20	21	9,935
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	20	13	17	7,806
Notholca	0	0	0	0
Total Rotifera	**92**	**101**	**178**	**84,214**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	4.0 m	N=Average count
Water column volume	0.26 m3	Vs=Volume of sample (mL)
	264 L	Vf=Volume of lake water filtered (L)
Two tows	528 L	

8/25/2011 **North**

CLADOCERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	2	2	2	946
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	1	1	237
D. rosea	0	0	0	0
Total	**2**	**3**	**2**	**946**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	0	0	0
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	1	1	237
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**2**	**4**	**3**	**1,183**

COPEPODA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Diacyclops	13	11	12	5,677
Mesocyclops	0	0	0	0
Diaptomus	2	2	2	946
Epsichura	0	0	0	0
Total	**15**	**13**	**14**	**6,624**
Nauplii	29	24	27	12,537
Total Copepoda	**44**	**37**	**41**	**19,161**

ROTIFERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Keratella cochlearis	22	17	20	9,226
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	11	12	12	5,441
Kellicottia bostonensisos	16	12	14	6,624
Asplanchna	1	0	1	237
Ascomorpha	0	0	0	0
Polyartha	28	31	30	13,957
Lecane	0	0	0	0
Collotheca	1	0	1	237
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	1	1	237
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**57**	**56**	**76**	**35,957**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	4.0 m	N=Average count
Water column volume	0.26 m3	Vs=Volume of sample (mL)
	264 L	Vf=Volume of lake water filtered (L)
Two tows	528 L	

9/8/2011 **North**

CLADOCERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	1	0	1	189
D. rosea	0	0	0	0
Total	**1**	**0**	**1**	**189**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	0	0	0
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**1**	**0**	**1**	**189**

COPEPODA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Diacyclops	6	6	6	2,271
Mesocyclops	0	0	0	0
Diaptomus	8	1	5	1,703
Epsichura	0	0	0	0
Total	**14**	**7**	**11**	**3,974**
Nauplii	22	34	28	10,598
Total Copepoda	**36**	**41**	**39**	**14,572**

ROTIFERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Keratella cochlearis	32	38	35	13,247
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	22	23	23	8,516
Kellicottia bostonensisos	57	94	76	28,576
Asplanchna	0	0	0	0
Ascomorpha	3	5	4	1,514
Polyartha	44	36	40	15,140
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	1	1	1	378
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**127**	**159**	**178**	**67,371**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

9/22/2011	North			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	2	4	3	1,135
D. rosea	0	0	0	0
Total	**2**	**4**	**3**	**1,135**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	2	8	5	1,892
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**4**	**12**	**8**	**3,028**
COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	7	4	6	2,082
Mesocyclops	0	0	0	0
Diaptomus	5	5	5	1,892
Epsichura	0	0	0	0
Total	**12**	**9**	**11**	**3,974**
Nauplii	21	24	23	8,516
Total Copepoda	**33**	**33**	**33**	**12,490**
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	9	19	14	5,299
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	124	243	184	69,453
Kellicottia bostonensisos	10	12	11	4,163
Asplanchna	0	0	0	0
Ascomorpha	2	2	2	757
Polyartha	28	22	25	9,462
Lecane	0	0	0	0
Collotheca	3	3	3	1,135
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**167**	**282**	**239**	**90,270**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

10/16/2011 **North**

CLADOCERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	1	2	2	568
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**1**	**2**	**2**	**568**
Alona	0	0	0	0
Chydorus	2	1	2	568
Bosmina	0	0	0	0
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**3**	**3**	**3**	**1,135**

COPEPODA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Diacyclops	0	8	4	1,514
Mesocyclops	0	0	0	0
Diaptomus	1	1	1	378
Epsichura	0	0	0	0
Total	**1**	**9**	**5**	**1,892**
Nauplii	8	15	12	4,353
Total Copepoda	**9**	**24**	**17**	**6,245**

ROTIFERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Keratella cochlearis	14	31	0	0
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	21	16	19	7,002
Kellicottia bostonensisos	8	14	11	4,163
Asplanchna	0	0	0	0
Ascomorpha	0	0	0	0
Polyartha	4	3	4	1,325
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**33**	**33**	**33**	**12,490**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

Newman Lake Zooplankton Density Mid Station 2011

5/3/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	15	17	16	3,364
Juvenile Daphnia	10	2	6	1,262
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	2	1	2	315
D. laevis	3	1	2	421
D. rosea	3	3	2	421
Total	**33**	**24**	**28**	**5,782**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	0	0	0
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**33**	**24**	**28**	**5,782**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	57	105	81	17,032
Mesocyclops	0	2	1	210
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**57**	**107**	**82**	**17,242**
Nauplii	294	0	147	30,910
Total Copepoda	**351**	**107**	**229**	**48,152**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	145	184	0	0
Anuraeopsis	0	0	0	0
Keratella quadrata	7	8	8	1,577
Kellicottia longispina	191	156	174	36,482
Kellicottia bostonensisos	10	11	11	2,208
Asplanchna	9	8	9	1,787
Ascomorpha	0	0	0	0
Polyartha	496	488	492	103,454
Lecane	0	0	0	0
Collotheca	6	3	5	946
Synchaeta	23	23	23	4,836
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**742**	**697**	**720**	**151,291**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	9.0 m	N=Average count
Water column volume	0.59 m3	Vs=Volume of sample (mL)
	594 L	Vf=Volume of lake water filtered (L)
Two tows	1189 L	

5/18/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	23	16	20	5,272
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	9	8	9	2,298
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	1	1	135
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	46	30	38	10,273
D. rosea	0	0	0	0
Total	**78**	**55**	**67**	**17,978**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	8	4	6	1,622
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**86**	**59**	**73**	**19,600**
COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	44	27	36	9,597
Mesocyclops	0	0	0	0
Diaptomus	1	0	1	135
Epsichura	0	0	0	0
Total	**45**	**27**	**36**	**9,733**
Nauplii	116	111	114	30,685
Total Copepoda	**161**	**138**	**150**	**40,417**
				0
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	78	75	77	20,682
Anuraeopsis	0	0	0	0
Keratella quadrata	1	0	1	135
Kellicottia longispina	280	300	290	78,401
Kellicottia bostonensisos	0	0	0	0
Asplanchna	0	2	1	270
Ascomorpha	0	0	0	0
Polyartha	251	284	268	72,319
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	6	7	7	1,757
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**538**	**593**	**642**	**173,565**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	7.0 m	N=Average count
Water column volume	0.46 m3	Vs=Volume of sample (mL)
	462 L	Vf=Volume of lake water filtered (L)
Two tows	925 L	

6/8/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	3	3	3	757
D. schodleri	0	0	0	0
D. retrocurva	3	1	2	505
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**6**	**4**	**5**	**1,262**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	7	5	6	1,514
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0		0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**13**	**9**	**11**	**2,776**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	9	13	11	2,776
Mesocyclops	0	0	0	0
Diaptomus	0	1	1	126
Epsichura	0	0	0	0
Total	**9**	**14**	**12**	**2,902**
Nauplii	172	144	158	39,868
Total Copepoda	**181**	**158**	**170**	**42,769**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	49	35	42	10,598
Anuraeopsis	0	0	0	0
Keratella quadrata	4	0	2	505
Kellicottia longispina	1	6	4	883
Kellicottia bostonensisos	0	2	1	252
Asplanchna	27	19	23	5,804
Ascomorpha	17	4	11	2,649
Polyartha	65	56	61	15,266
Lecane	0	0	0	0
Collotheca	29	27	28	7,065
Synchaeta	178	147	163	41,003
Testudinella patina	0	0	0	0
Trichocerca	0	3	2	378
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**321**	**264**	**335**	**84,403**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	7.5 m	N=Average count
Water column volume	0.50 m3	Vs=Volume of sample (mL)
	495 L	Vf=Volume of lake water filtered (L)
Two tows	991 L	

6/24/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0		0	0
D. pulex	0		0	0
D. galeata mendotae	0		0	0
Juvenile Daphnia	1		1	237
D. schodleri	0		0	0
D. retrocurva	0		0	0
D. pulicaria	0		0	0
D. paruvula	0		0	0
D. ambiqua	0		0	0
D. laevis	0		0	0
D. rosea	0		0	0
Total	**1**		**1**	**237**
Alona	0		0	0
Chydorus	1		1	237
Bosmina	2		2	473
Diaphanosoma	0		0	0
Ceriodaphnia	0		0	0
Holopedium	0		0	0
Leptodora	0		0	0
Sida crystallina	0		0	0
Ostracada	0		0	0
Total Cladocera	**4**		**4**	**946**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	8		8	1,892
Mesocyclops	0		0	0
Diaptomus	0		0	0
Epsichura	0		0	0
Total	**8**		**8**	**1,892**
Nauplii	29		29	6,860
Total Copepoda	**37**		**37**	**8,753**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	67		0	0
Anuraeopsis	0		0	0
Keratella quadrata	0		0	0
Kellicottia longispina	20		20	4,731
Kellicottia bostonensisos	0		0	0
Asplanchna	8		8	1,892
Ascomorpha	69		69	16,322
Polyartha	7		7	1,656
Lecane	0		0	0
Collotheca	10		10	2,366
Synchaeta	2		2	473
Testudinella patina	0		0	0
Trichocerca	82		82	19,398
Filina	0		0	0
Platyias	0		0	0
Conochilus	0		0	0
Conchiloides sp.	0		0	0
Notholca	0		0	0
Total Rotifera	**198**		**198**	**46,838**

Density Formula			
Net diameter	0.29	m	n=NVs/Vf
Net Area	0.07	m2	where…..
Water column depth	8.0	m	N=Average count
Water column volume	0.53	m3	Vs=Volume of sample (mL)
	528	L	Vf=Volume of lake water filtered (L)
Two tows	1057	L	

7/6/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	1	1	135
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**1**	**1**	**135**
Alona	0	0	0	0
Chydorus	0	1	1	135
Bosmina	1	1	1	270
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**1**	**3**	**2**	**541**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	0	1	1	135
Mesocyclops	0	0	0	0
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**0**	**1**	**1**	**135**
Nauplii	7	9	8	2,163
Total Copepoda	**7**	**10**	**9**	**2,298**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	3	8	6	1,487
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	1	4	3	676
Kellicottia bostonensisos	1	0	1	135
Asplanchna	10	11	11	2,839
Ascomorpha	10	14	12	3,244
Polyartha	5	8	7	1,757
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	17	13	15	4,055
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	1	1	1	270
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**45**	**51**	**54**	**14,464**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	7.0 m	N=Average count
Water column volume	0.46 m3	Vs=Volume of sample (mL)
	462 L	Vf=Volume of lake water filtered (L)
Two tows	925 L	

7/18/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	2	0	1	237
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**2**	**0**	**1**	**237**
Alona	0	0	0	0
Chydorus	0	1	1	118
Bosmina	116	102	109	25,785
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**118**	**103**	**111**	**26,139**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	31	41	36	8,516
Mesocyclops	0	0	0	0
Diaptomus	4	2	3	710
Epsichura	0	0	0	0
Total	**35**	**43**	**39**	**9,226**
Nauplii	43	48	46	10,763
Total Copepoda	**78**	**91**	**85**	**19,989**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	46	39	43	10,054
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	2	11	7	1,538
Kellicottia bostonensisos	68	61	65	15,258
Asplanchna	41	54	48	11,236
Ascomorpha	1	2	2	355
Polyartha	7	7	7	1,656
Lecane	0	1	1	118
Collotheca	41	29	35	8,279
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	20	26	23	5,441
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**180**	**191**	**228**	**53,935**

Density Formula			
Net diameter	0.29	m	
Net Area	0.07	m2	n=NVs/Vf
Water column depth	8.0	m	where.....
Water column volume	0.53	m3	N=Average count
	528	L	Vs=Volume of sample (mL)
Two tows	1057	L	Vf=Volume of lake water filtered (L)

8/1/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	2	1	291
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**2**	**1**	**291**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	77	120	99	28,678
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	1	1	146
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0		0	0
Total Cladocera	**77**	**123**	**100**	**29,115**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	15	15	15	4,367
Mesocyclops	0	0	0	0
Diaptomus	3	3	3	873
Epsichura	0	0	0	0
Total	**18**	**18**	**18**	**5,241**
Nauplii	28	24	26	7,570
Total Copepoda	**46**	**42**	**44**	**12,810**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	32	28	30	8,734
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	12	3	8	2,184
Kellicottia bostonensisos	29	29	29	8,443
Asplanchna	0	0	0	0
Ascomorpha	3	1	2	582
Polyartha	21	18	20	5,677
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	3	3	3	873
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	7	2	5	1,310
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**75**	**56**	**96**	**27,804**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	6.5 m	N=Average count
Water column volume	0.43 m3	Vs=Volume of sample (mL)
	429 L	Vf=Volume of lake water filtered (L)
Two tows	859 L	

8/25/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	2	0	1	252
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**2**	**0**	**1**	**252**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	1	1	1	252
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**3**	**1**	**2**	**505**
COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	10	13	12	2,902
Mesocyclops	0	0	0	0
Diaptomus	0	1	1	126
Epsichura	0	0	0	0
Total	**10**	**14**	**12**	**3,028**
Nauplii	27	18	23	5,677
Total Copepoda	**37**	**32**	**35**	**8,705**
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	14	11	13	3,154
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	25	23	24	6,056
Kellicottia bostonensisos	12	29	21	5,173
Asplanchna	0	0	0	0
Ascomorpha	2	0	1	252
Polyartha	7	13	10	2,523
Lecane	0	0	0	0
Collotheca	1	0	1	126
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**47**	**65**	**69**	**17,284**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	7.5 m	N=Average count
Water column volume	0.50 m3	Vs=Volume of sample (mL)
	495 L	Vf=Volume of lake water filtered (L)
Two tows	991 L	

9/8/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	3	2	355
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**0**	**3**	**2**	**355**
COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	8	5	7	1,538
Mesocyclops	0	0	0	0
Diaptomus	1	1	1	237
Epsichura	0	0	0	0
Total	**9**	**6**	**8**	**1,774**
Nauplii	25	41	33	7,806
Total Copepoda	**34**	**47**	**41**	**9,581**
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	28	32	30	7,097
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	97	61	79	18,688
Kellicottia bostonensisos	68	84	76	17,978
Asplanchna	0	0	0	0
Ascomorpha	3	7	5	1,183
Polyartha	78	50	64	15,140
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	2	0	1	237
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**248**	**202**	**255**	**60,322**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	8.0 m	N=Average count
Water column volume	0.53 m3	Vs=Volume of sample (mL)
	528 L	Vf=Volume of lake water filtered (L)
Two tows	1057 L	

9/22/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	2	3	3	676
D. rosea	0	0	0	0
Total	**2**	**3**	**3**	**676**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	11	8	10	2,568
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**13**	**11**	**12**	**3,244**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	10	10	10	2,703
Mesocyclops	0	0	0	0
Diaptomus	1	4	3	676
Epsichura	0	0	0	0
Total	**11**	**14**	**13**	**3,379**
Nauplii	27	18	23	6,083
Total Copepoda	**38**	**32**	**35**	**9,462**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	22	27	25	6,624
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	226	278	252	68,128
Kellicottia bostonensisos	8	15	12	3,109
Asplanchna	0	0	0	0
Ascomorpha	0	4	2	541
Polyartha	29	38	34	9,057
Lecane	0		0	0
Collotheca	5	15	10	2,703
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**268**	**350**	**334**	**90,162**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	7.0 m	N=Average count
Water column volume	0.46 m3	Vs=Volume of sample (mL)
	462 L	Vf=Volume of lake water filtered (L)
Two tows	925 L	

10/16/2011	Mid			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	3	1	2	473
Juvenile Daphnia	1	3	2	473
D. schodleri	0	0	0	0
D. retrocurva	5	3	4	946
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**9**	**7**	**8**	**1,892**
Alona	0	0	0	0
Chydorus	5	4	5	1,065
Bosmina	2	3	3	591
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0		0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**16**	**14**	**15**	**3,548**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	11	7	9	2,129
Mesocyclops	0	0	0	0
Diaptomus	5	4	5	1,065
Epsichura	0	0	0	0
Total	**16**	**11**	**14**	**3,194**
Nauplii	22	25	24	5,559
Total Copepoda	**38**	**36**	**37**	**8,753**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	41	55	0	0
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	32	28	30	7,097
Kellicottia bostonensisos	17	17	17	4,021
Asplanchna	0	0	0	0
Ascomorpha	0	0	0	0
Polyartha	9	12	11	2,484
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**58**	**57**	**58**	**13,602**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	8.0 m	N=Average count
Water column volume	0.53 m3	Vs=Volume of sample (mL)
	528 L	Vf=Volume of lake water filtered (L)
Two tows	1057 L	

Newman Lake Zooplankton Density South Station 2011

5/3/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	14	7	11	3,312
Juvenile Daphnia	14	11	13	3,943
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	2	0	1	315
D. laevis	16	14	15	4,731
D. rosea	6	5	6	1,735
Total	**52**	**37**	**39**	**14,036**
Alona	0	0	0	0
Chydorus	0	1	1	158
Bosmina	1	1	1	315
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**53**	**39**	**41**	**14,509**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	34	43	39	12,143
Mesocyclops	3	3	3	946
Diaptomus	0	1	1	158
Epsichura	0	0	0	0
Total	**37**	**47**	**42**	**13,247**
Nauplii	93	105	99	31,225
Total Copepoda	**130**	**152**	**141**	**44,473**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	166	188	177	55,827
Anuraeopsis	0	0	0	0
Keratella quadrica	0	1	1	158
Kellicottia longispina	308	280	294	92,730
Kellicottia bostonensisos	3	0	2	473
Asplanchna	9	4	7	2,050
Ascomorpha	0	0	0	0
Polyartha	512	483	498	156,916
Lecane	0	0	0	0
Collotheca	8	5	7	2,050
Synchaeta	16	17	17	5,204
Testudinella patina	0	0	0	0
Trichocerca	1	0	1	158
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	1	0	1	158
Total Rotifera	**1,024**	**790**	**824**	**315,724**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	6.0 m	N=Average count
Water column volume	0.40 m3	Vs=Volume of sample (mL)
	396 L	Vf=Volume of lake water filtered (L)
Two tows	793 L	

5/18/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	12	9	11	4,968
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	5	7	6	2,839
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	14	11	13	5,914
D. rosea	0	0	0	0
Total	**31**	**16**	**29**	**13,720**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	3	3	3	1,419
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**34**	**19**	**32**	**15,140**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	26	24	25	11,828
Mesocyclops	0	0	0	0
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**26**	**24**	**25**	**11,828**
Nauplii	120	77	99	46,602
Total Copepoda	**146**	**101**	**124**	**58,429**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	41	29	35	16,559
Anuraeopsis	0	0	0	0
Keratella quadrica	1	0	1	237
Kellicottia longispina	83	122	103	48,494
Kellicottia bostonensisos	9	4	7	3,075
Asplanchna	0	0	0	0
Ascomorpha	0	0	0	0
Polyartha	124	86	105	49,677
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	1	2	2	710
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**218**	**214**	**216**	**102,192**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	4.0 m	N=Average count
Water column volume	0.26 m3	Vs=Volume of sample (mL)
	264 L	Vf=Volume of lake water filtered (L)
Two tows	528 L	

6/8/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	2	4	3	1,135
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**2**	**4**	**3**	**1,135**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	2	2	2	757
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0		0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**4**	**6**	**5**	**1,892**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	6	6	6	2,271
Mesocyclops	0	0	0	0
Diaptomus	1	1	1	378
Epsichura	0	0	0	0
Total	**7**	**7**	**7**	**2,649**
Nauplii	69	82	76	28,576
Total Copepoda	**76**	**89**	**83**	**31,225**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	29	21	25	9,462
Anuraeopsis	0	0	0	0
Keratella quadrica	0	0	0	0
Kellicottia longispina	8	6	7	2,649
Kellicottia bostonensisos	0	1	1	189
Asplanchna	13	10	12	4,353
Ascomorpha	9	5	7	2,649
Polyartha	51	40	46	17,221
Lecane	0	0	0	0
Collotheca	29	24	27	10,030
Synchaeta	58	78	68	25,737
Testudinella patina	0	0	0	0
Trichocerca	4	3	4	1,325
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**172**	**167**	**195**	**73,616**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where…..
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

6/24/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	1	1	210
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**1**	**1**	**210**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	0	0	0
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**0**	**1**	**1**	**210**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	0	0	0	0
Mesocyclops	0	0	0	0
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**0**	**0**	**0**	**0**
Nauplii	9	2	6	2,313
Total Copepoda	**9**	**2**	**6**	**2,313**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	170	156	163	68,549
Anuraeopsis	0	0	0	0
Keratella quadrica	0	0	0	0
Kellicottia longispina	11	14	13	5,257
Kellicottia bostonensisos	0	0	0	0
Asplanchna	3	3	3	1,262
Ascomorpha	23	7	15	6,308
Polyartha	15	10	13	5,257
Lecane	0	0	0	0
Collotheca	18	7	13	5,257
Synchaeta	0	3	2	631
Testudinella patina	0	0	0	0
Trichocerca	29	17	23	9,673
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**99**	**61**	**243**	**102,192**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where…..
Water column depth	4.5 m	N=Average count
Water column volume	0.30 m3	Vs=Volume of sample (mL)
	297 L	Vf=Volume of lake water filtered (L)
Two tows	594 L	

7/6/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	1	0	1	237
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**1**	**0**	**1**	**237**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	0	1	1	237
Mesocyclops	0	0	0	0
Diaptomus	0	0	0	0
Epsichura	0	0	0	0
Total	**0**	**1**	**1**	**237**
Nauplii	3	8	6	2,602
Total Copepoda	**3**	**9**	**6**	**2,839**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	9	9	9	4,258
Anuraeopsis	0	0	0	0
Keratella quadrica	0	0	0	0
Kellicottia longispina	4	6	5	2,366
Kellicottia bostonensisos	0	0	0	0
Asplanchna	9	4	7	3,075
Ascomorpha	13	10	12	5,441
Polyartha	0	0	0	0
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	23	18	21	9,699
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**49**	**38**	**53**	**24,838**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where…..
Water column depth	4.0 m	N=Average count
Water column volume	0.26 m3	Vs=Volume of sample (mL)
	264 L	Vf=Volume of lake water filtered (L)
Two tows	528 L	

7/18/2011 **South**

CLADOCERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**0**	**0**	**0**	**0**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	3	5	4	1,514
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**3**	**5**	**4**	**1,514**

COPEPODA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Diacyclops	2	3	3	946
Mesocyclops	0	0	0	0
Diaptomus	0	1	1	189
Epsichura	0	0	0	0
Total	**2**	**4**	**3**	**1,135**
Nauplii	14	21	18	6,624
Total Copepoda	**16**	**25**	**21**	**7,759**

ROTIFERA	Count 1	Count 2	Average # Zoo	# Zoo/m^3
Keratella cochlearis	27	26	27	10,030
Anuraeopsis	0	0	0	0
Keratella quadrica	0	0	0	0
Kellicottia longispina	8	16	12	4,542
Kellicottia bostonensisos	2	0	1	378
Asplanchna	22	24	23	8,705
Ascomorpha	15	10	13	4,731
Polyartha	1	1	1	378
Lecane	0	0	0	0
Collotheca	2	2	2	757
Synchaeta	7	3	5	1,892
Testudinella patina	0	0	0	0
Trichocerca	37	22	30	11,165
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0		0	0
Notholca	0	0	0	0
Total Rotifera	**94**	**78**	**113**	**42,580**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where…..
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

8/1/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	1	1	237
Juvenile Daphnia	1	1	0	0
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**1**	**2**	**1**	**237**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	205	232	219	103,375
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**206**	**234**	**219**	**103,612**
COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	17	11	14	6,624
Mesocyclops	0	0	0	0
Diaptomus	3	1	2	946
Epsichura	0	0	0	0
Total	**20**	**12**	**16**	**7,570**
Nauplii	40	25	33	15,376
Total Copepoda	**60**	**37**	**49**	**22,946**
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	55	41	48	22,709
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	13	14	14	6,387
Kellicottia bostonensisos	0	1	1	237
Asplanchna	0	0	0	0
Ascomorpha	1	0	1	237
Polyartha	13	13	13	6,150
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	9	9	9	4,258
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	8	4	6	2,839
Notholca	0	0	0	0
Total Rotifera	**44**	**41**	**91**	**42,817**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	4.0 m	N=Average count
Water column volume	0.26 m3	Vs=Volume of sample (mL)
	264 L	Vf=Volume of lake water filtered (L)
Two tows	528 L	

8/25/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	1	1	1	378
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	2	4	3	1,135
D. rosea	0	0	0	0
Total	**3**	**5**	**4**	**1,514**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	0	1	1	189
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**3**	**6**	**5**	**1,703**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	5	10	8	2,839
Mesocyclops	0	0	0	0
Diaptomus	1	1	1	378
Epsichura	0	0	0	0
Total	**6**	**11**	**9**	**3,217**
Nauplii	27	23	25	9,462
Total Copepoda	**33**	**34**	**34**	**12,679**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	0	3	2	568
Anuraeopsis	6	0	3	1,135
Keratella quadrata	0	0	0	0
Kellicottia longispina	18	6	12	4,542
Kellicottia bostonensisos	17	13	15	5,677
Asplanchna	0	0	0	0
Ascomorpha	1	1	1	378
Polyartha	15	12	14	5,110
Lecane	0	0	0	0
Collotheca	2	0	1	378
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**59**	**32**	**47**	**17,789**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

9/8/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	1	0	1	189
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**1**	**0**	**1**	**189**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	1	1	1	378
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**2**	**1**	**2**	**568**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	12	6	9	3,406
Mesocyclops	0	0	0	0
Diaptomus	1	2	2	568
Epsichura	0	0	0	0
Total	**13**	**8**	**11**	**3,974**
Nauplii	32	29	31	11,544
Total Copepoda	**45**	**37**	**41**	**15,518**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	37	21	29	10,976
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	93	115	104	39,363
Kellicottia bostonensisos	40	33	37	13,815
Asplanchna	0	0	0	0
Ascomorpha	4	5	5	1,703
Polyartha	30	40	35	13,247
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	1	1	1	378
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**168**	**194**	**210**	**79,483**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

9/22/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	2	0	1	378
D. schodleri	0	0	0	0
D. retrocurva	0	0	0	0
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	1	1	1	378
D. rosea	0	0	0	0
Total	**3**	**1**	**2**	**757**
Alona	0	0	0	0
Chydorus	0	0	0	0
Bosmina	2	2	2	757
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0	0	0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**5**	**3**	**4**	**1,514**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	6	10	8	3,028
Mesocyclops	0	0	0	0
Diaptomus	3	2	3	946
Epsichura	0	0	0	0
Total	**9**	**12**	**11**	**3,974**
Nauplii	23	29	26	9,841
Total Copepoda	**32**	**41**	**37**	**13,815**

ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	10	21	16	5,867
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	147	142	145	54,692
Kellicottia bostonensisos	4	14	9	3,406
Asplanchna	0	0	0	0
Ascomorpha	0	0	0	0
Polyartha	28	42	35	13,247
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**179**	**198**	**204**	**77,212**

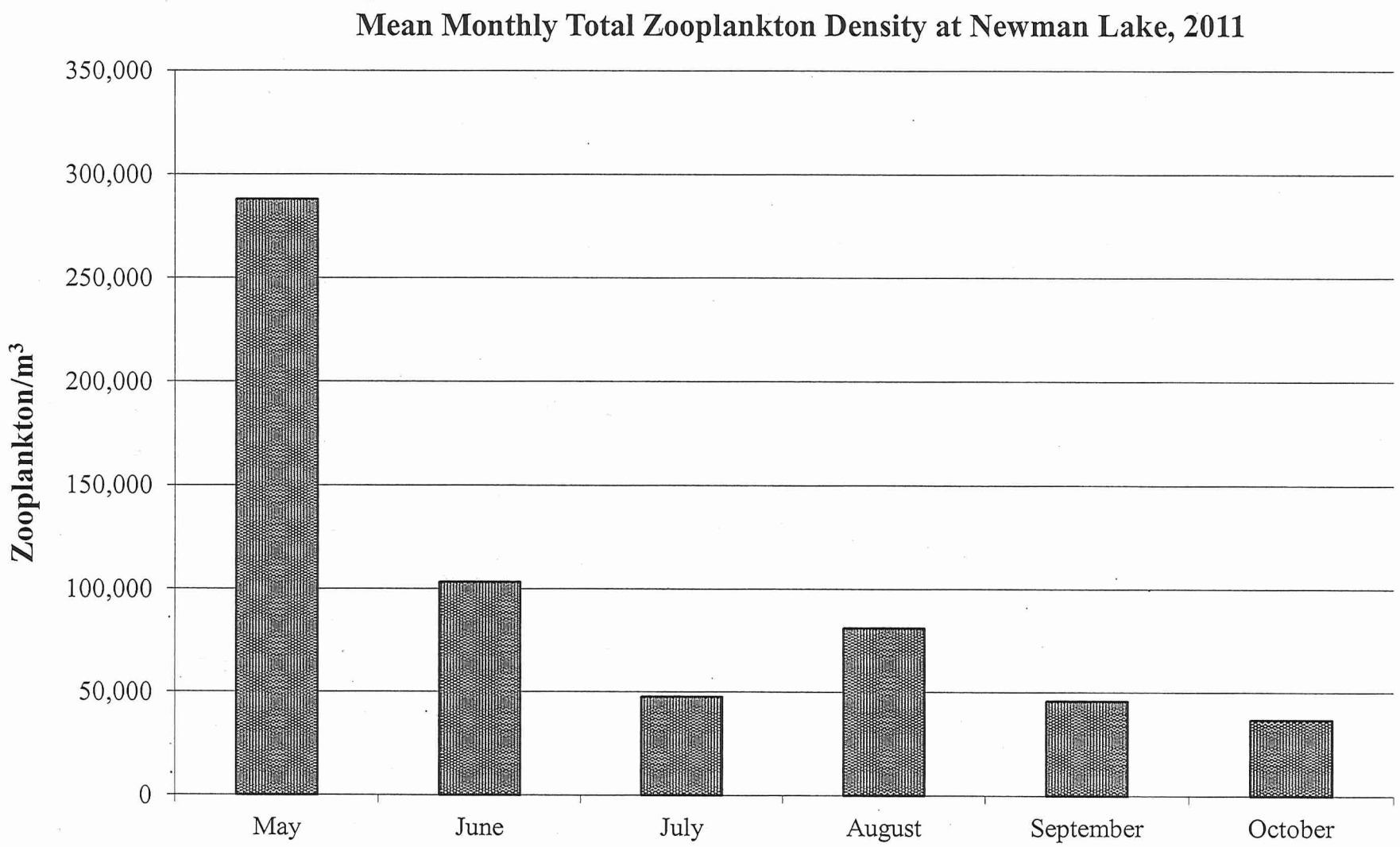
Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where.....
Water column depth	5.0 m	N=Average count
Water column volume	0.33 m3	Vs=Volume of sample (mL)
	330 L	Vf=Volume of lake water filtered (L)
Two tows	661 L	

10/16/2011	South			
CLADOCERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Daphnia thorata	0	0	0	0
D. pulex	0	0	0	0
D. galeata mendotae	0	0	0	0
Juvenile Daphnia	0	0	0	0
D. schodleri	0	0	0	0
D. retrocurva	1	3	2	841
D. pulicaria	0	0	0	0
D. paruvula	0	0	0	0
D. ambiqua	0	0	0	0
D. laevis	0	0	0	0
D. rosea	0	0	0	0
Total	**1**	**3**	**2**	**841**
Alona	0	0	0	0
Chydorus	3	0	2	631
Bosmina	1	0	1	210
Diaphanosoma	0	0	0	0
Ceriodaphnia	0	0	0	0
Holopedium	0	0		0
Leptodora	0	0	0	0
Sida crystallina	0	0	0	0
Ostracada	0	0	0	0
Total Cladocera	**5**	**3**	**4**	**1,682**

COPEPODA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Diacyclops	7	4	6	2,313
Mesocyclops	0	0	0	0
Diaptomus	0	3	2	631
Epsichura	0	0	0	0
Total	**7**	**7**	**7**	**2,944**
Nauplii	11	12	12	4,836
Total Copepoda	**18**	**19**	**19**	**7,780**

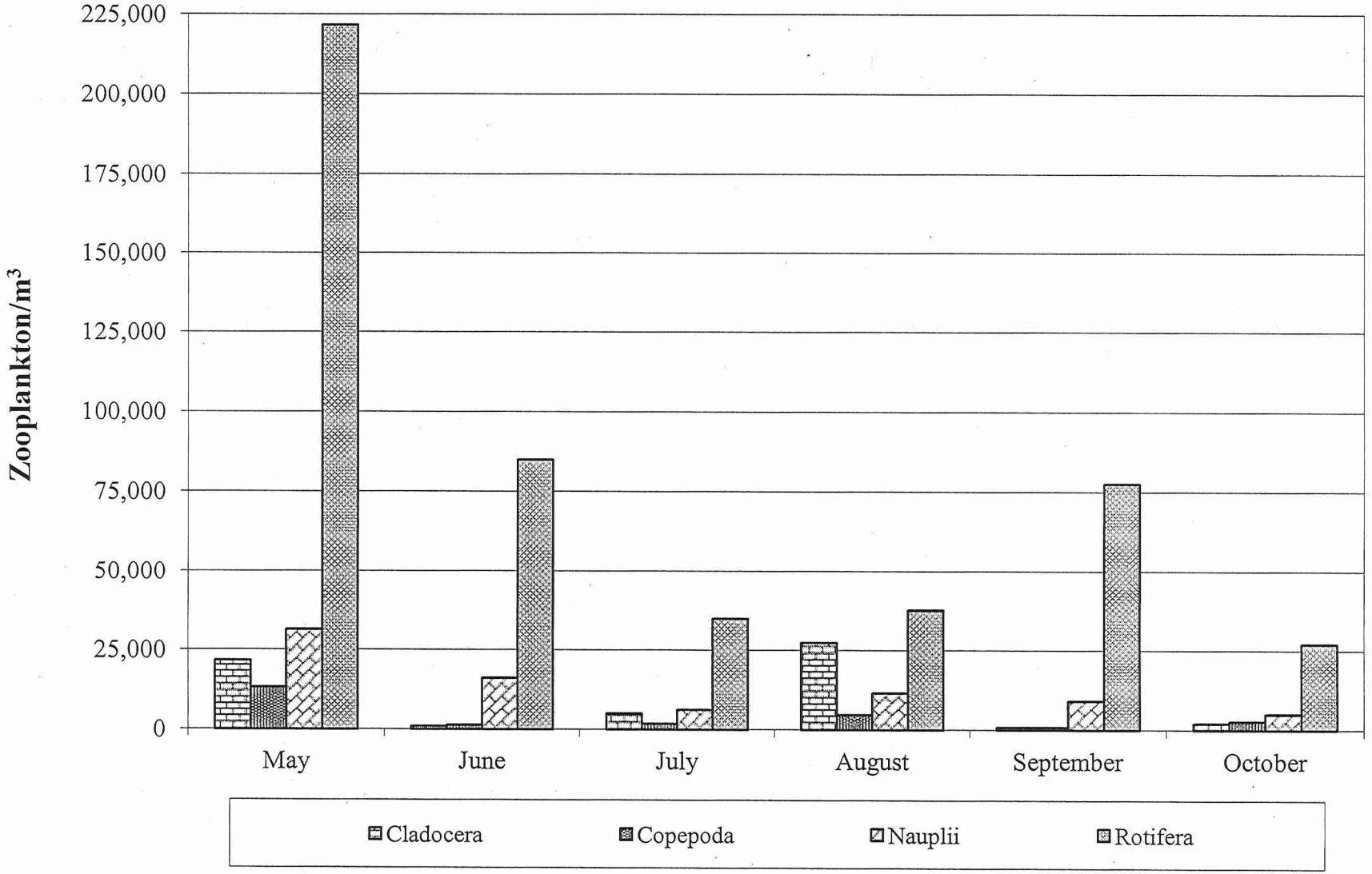
ROTIFERA	**Count 1**	**Count 2**	**Average # Zoo**	**# Zoo/m^3**
Keratella cochlearis	59	53	56	23,550
Anuraeopsis	0	0	0	0
Keratella quadrata	0	0	0	0
Kellicottia longispina	60	64	62	26,074
Kellicottia bostonensisos	8	4	6	2,523
Asplanchna	0	0	0	0
Ascomorpha	1	0	1	210
Polyartha	5	8	7	2,734
Lecane	0	0	0	0
Collotheca	0	0	0	0
Synchaeta	0	0	0	0
Testudinella patina	0	0	0	0
Trichocerca	0	0	0	0
Filina	0	0	0	0
Platyias	0	0	0	0
Conochilus	0	0	0	0
Conchiloides sp.	0	0	0	0
Notholca	0	0	0	0
Total Rotifera	**74**	**76**	**131**	**55,091**

Density Formula		
Net diameter	0.29 m	n=NVs/Vf
Net Area	0.07 m2	where…..
Water column depth	4.5 m	N=Average count
Water column volume	0.30 m3	Vs=Volume of sample (mL)
	297 L	Vf=Volume of lake water filtered (L)
Two tows	594 L	


Mean Monthly Total Zooplankton Density at Newman Lake, 2011
Zooplankton/m3
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
May
June
July
August
September
October

Mean Zooplankton Density by Major Group and Month at Newman, 2011

N, Mid, and S stations average



APPENDIX:
Benthic Invertebrate Data for Newman Lake Water Quality Monitoring 2011

Benthic invertebrate densities in Liberty lake, 2011. All densities are in organisms/m2.

North

	May-03	*May-17*	*Jun-08*	*Jun-24*	*Jul-06*	*Jul-18*	*Aug-01*	*Aug-25*	*Sep-08*	*Sep-22*	*Oct-06*	*Oct-26*
Chironomidae	463	474	216	129	366	602	775	323	215	129	473	818
Oligochate	1,195	603	646	861	602	796	1,076	430	495	43	183	323
Chaoboridae	754	474	388	516	108	22	301	1,140	2,560	1,463	1,334	1,205
Misc.	0	0	0	0	0	0	0	0	0	0	0	0

Mid

	May-03	*May-17*	*Jun-08*	*Jun-24*	*Jul-06*	*Jul-18*	*Aug-01*	*Aug-25*	*Sep-08*	*Sep-22*	*Oct-06*	*Oct-26*
Chironomidae	259	1,012	463	ND	559	1,269	516	516	172	129	161	194
Oligochate	969	549	1,227	ND	861	3,443	1,399	194	237	452	667	882
Chaoboridae	2,066	861	797	ND	0	0	129	968	925	818	1,323	1,829
Misc.	0	0	0	ND	0	0	0	0	0	0	0	0

South

	May-03	*May-17*	*Jun-08*	*Jun-24*	*Jul-06*	*Jul-18*	*Aug-01*	*Aug-25*	*Sep-08*	*Sep-22*	*Oct-06*	*Oct-26*
Chironomidae	334	410	162	387	3,034	387	1,485	452	151	129	32	0
Oligochate	850	108	452	2,152	1,205	818	366	1,635	1,313	247	301	22
Chaoboridae	323	54	183	430	86	0	516	215	344	1,140	280	215
Misc.	0	0	0	0	0	0	129	0	0	0	0	0

Chir. = Chironomidae (midge larvae)
Olig. = Oligochaete worms
Chaob. = Chaoborus (Phantom midges)

clams = Sphaeriidae (Mollusks)
Tri. = Trichoptera (Caddis flies)
Gastro. = Gastropoda (Snails)
Amph. = Amphipoda (Scud)
Ephem. = Ephemeroptera mayfl

Benthic invertebrate average densitiesby month in Liberty lake, 2011. All densities are in organisms/m2.

North

	May	June	July	Aug	Sept	Oct
Chironomidae	469	172	484	549	172	646
Oligochate	899	753	699	753	269	253
Chaoboridae	614	452	65	721	2,012	1,269
Misc.	0	0	0	0	0	0

Mid

	May	June	July	Aug	Sept	Oct
Chironomidae	635	463	914	516	151	178
Oligochate	759	1,227	2,152	796	344	775
Chaoboridae	1,463	797	0	549	871	1,576
Misc.	0	0	0	0	0	0

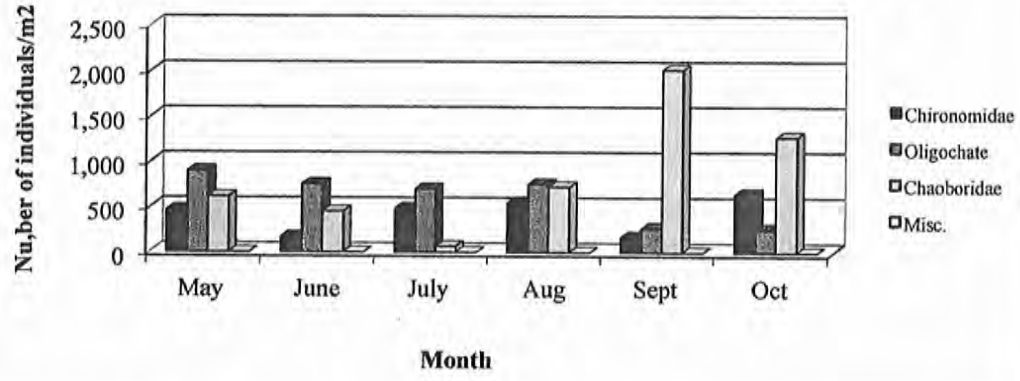
South

	May	June	July	Aug	Sept	Oct
Chironomidae	372	274	1,711	968	140	81
Oligochate	479	1,302	1,011	1,001	780	344
Chaoboridae	189	307	43	366	742	769
Misc.	0	0	0	65	0	0

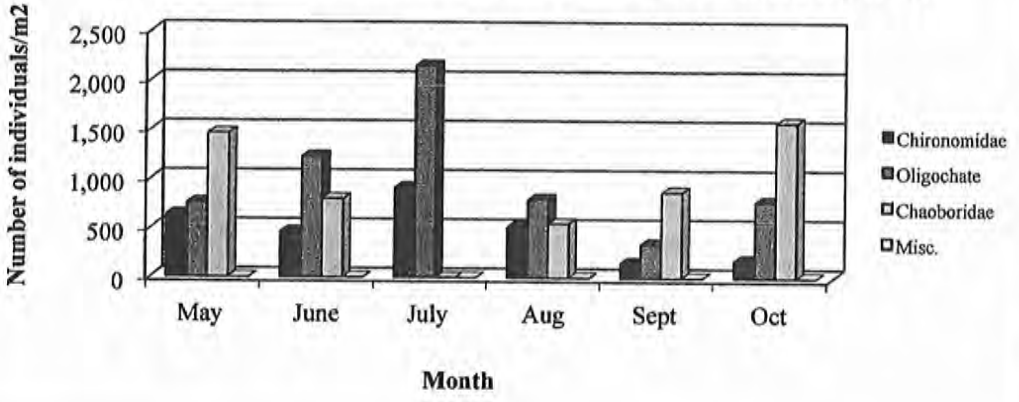
Chir. = Chironomidae (midge larvae)
Olig. = Oligochaete worms
Chaob. = Chaoborus (Phantom midges)

clams = Sphaeriidae (Mollusks)
Tri. = Trichoptera (Caddis flies)
Gastro. = Gastropoda (Snails)
Amph. = Amphipoda (Scud)
Ephem. = Ephemeroptera mayfl

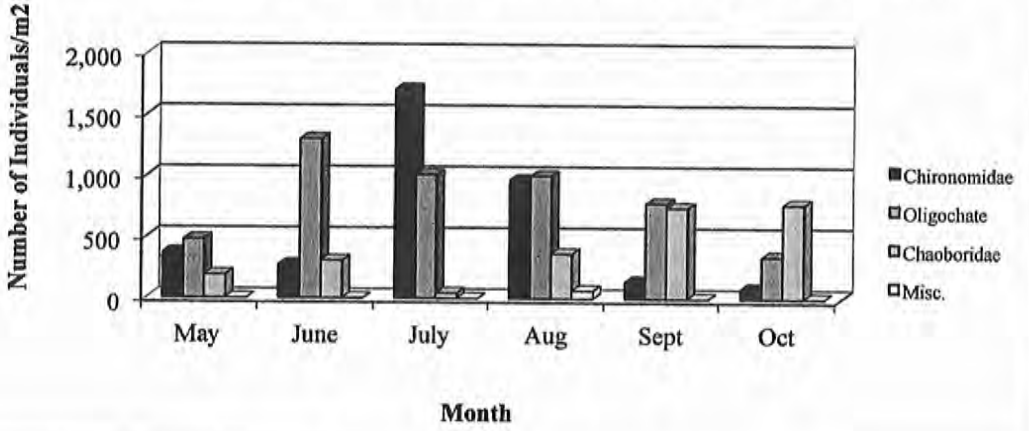
Newman Lake Benthic Invertebrates, 2011 (North Station)



Newman Lake Benthic Invertebrates, 2011 (Mid Station)



Newman Lake Benthic Invertebrates, 2011 (South Station)



Appendix: Newman Lake Phytoplankton 2011

Newman Lake Phytoplankton Biovolume (N-top site)

5/3/11

Top N

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	21		716	f	15,036	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**17,184**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium	1		40,000	v	40,000
Glenodinium			38,485	f	0
Totals					**40,000**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

5/3/11

Top

N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	44		350	w	15,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	2		300	f	600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	26	0.36962	60,000	(1mm), v,w	576,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria			2,540	f	0
Totals					**592,700**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	2	0.13	1,130	(1mm), f	294
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**294**
threads	44		500	e	22,000
All Phyla Totals					***672,178***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11
Top

N

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	8		716	f	5,728	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**10,728**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	5		1,272	f	6,360
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**6,360**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	4		200	f	800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**800**

5/17/11

Top

N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	49		350	w	17,150
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	11		300	f	3,300
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	35	0.03	60,000	(1mm), v,w	63,000
Meridion			160	m	0
Navicula	3		625	j	1,875
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**85,325**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	5	0.012	1,130	(1mm), f	68
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**68**
threads	2		500	e	1,000
All Phyla Totals					***104,281***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Top

Chlorophyta

	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	12		716	f	8,592	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox	7		90,000	m	630,000	
Xanthidium			1,200	f	0	
Totals					**640,024**	

Euglenophyta

	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta

	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta

	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	8		200	f	1,600
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**4,892**

6/8/11

Top

Bacillariophyta	N Number	Length	Cell Volume	Reference	Biovolume
Asterionella	4		350	w	1,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	8		300	f	2,400
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	14	0.236	60,000	(1mm), v,w	198,240
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra	1		50	w	50
Tabellaria	2		2,540	f	5,080
Totals					**297,170**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	1	0.02	1,130	(1mm), f	23
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**23**
threads	5		500	e	2,500
All Phyla Totals					***944,609***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11

Top

N

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	6		716	f	4,296	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox	1		90,000	m	90,000	
Xanthidium			1,200	f	0	
Totals					**100,728**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**1,272**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

6/24/11

Top

N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	6		300	f	1,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	11	0.179	60,000	(1mm), v,w	118,140
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	4		50	w	200
Tabellaria			2,540	f	0
Totals					**120,765**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0.015	100,000	(1mm), w	3,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**3,000**
threads	34		500	e	17,000
All Phyla Totals					***242,765***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

NO SAMPLE

7/6/11

Top

N

	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Chlorophyta						
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**0**	

	Number	Length	Cell Volume	Reference	Biovolume
Euglenophyta					
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

	Number	Length	Cell Volume	Reference	Biovolume
Pyrrhophyta					
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

	Number	Length	Cell Volume	Reference	Biovolume
Chrysophyta					
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

7/6/11

Top

Bacillariophyta	N Number	Length	Cell Volume	Reference	Biovolume
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella			300	f	0
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)			60,000	(1mm), v,w	0
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**0**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***0***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11

Top

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	82		716	f	58,712	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	6		5,000	f	30,000	
Synechocystis			537	e	0	
Tetraodon	14		40	w	560	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**96,238**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

7/18/11

Top

N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	22		350	w	7,700
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	10		300	f	3,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	2		300	f	600
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	8	0.07625	60,000	(1mm), v,w	36,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	8		50	w	400
Tabellaria	8		2,540	f	20,320
Totals					**72,620**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	14	0.27714	1,130	(1mm), f	4,384
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**4,384**
threads	668		500	e	334,000
All Phyla Totals					***507,242***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11

Top

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	2		111	f	222	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	12		716	f	8,592	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Tetraodon	3		40	w	120	
Quadrigula	1		65,000	m	65,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**84,650**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**90,000**

8/1/11

Top

Bacillariophyta	N Number	Length	Cell Volume	Reference	Biovolume
Asterionella	18		350	w	6,300
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	5		300	f	1,500
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	9	0.08444	60,000	(1mm), v,w	45,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	3		2,000	v,w	6,000
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra			50	w	0
Tabellaria	1		2,540	f	2,540
Totals					**151,940**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	39	0.33631	1,130	(1mm), f	14,821
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0.21	100,000	(1mm), w	42,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**56,821**
threads	852		500	e	426,000
All Phyla Totals					***809,411***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11
Top

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	5	0.042	700	f	147	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina	1		1,767	f	1,767	
Gloeocystis	33		716	f	23,628	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias	1		850,000	m	850,000	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	22		716	f	15,752	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	11		5,000	f	55,000	
Synechocystis			537	e	0	
Tetraodon	18		40	w	720	
Quadrigula	1		65,000	m	65,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**1,026,263**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	1		7,775	f	7,775
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**7,775**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	3		200	f	600
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**600**

8/25/11

Top

N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	13		350	w	4,550
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	28		300	f	8,400
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	32	0.04833	60,000	(1mm), v,w	92,800
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**195,750**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	1,172	0.1681	1,130	(1mm), f	222,619
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**222,619**
threads	184		500	e	92,000
All Phyla Totals					***1,545,007***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11

Top

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	18		716	f	12,888	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	4		14,138	f	56,552	
Scenedesmus			255	f	0	
Selenastrum	2		20	m	40	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	20		716	f	14,320	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	7		5,000	f	35,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**118,800**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	2		90,000	w,v	180,000
Totals					**180,000**

9/8/11

Top

N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	8		350	w	2,800
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	20		300	f	6,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	45	0.17857	60,000	(1mm), v,w	482,143
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria			2,540	f	0
Totals					**491,043**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	177	0.18828	1,130	(1mm), f	37,657
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**37,657**
threads	920		500	e	460,000
All Phyla Totals					***1,287,500***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11

Top

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	4		1,000	f	4,000	
Desmidium			700	f	0	
Dictyosphaerium	14		111	f	1,554	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	38		716	f	27,208	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	10		537	e	5,370	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	4		255	f	1,020	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	12		716	f	8,592	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	18		5,000	f	90,000	
Synechocystis			537	e	0	
Tetraodon	58		40	w	2,320	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**140,064**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	146	0.02	100,000	(1mm), e	292,000
Uroglena	2		90,000	w,v	180,000
Totals					**472,000**

9/22/11

Top

Bacillariophyta	N *Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	102		350	w	35,700
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	36		300	f	10,800
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	12		225		2,700
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	396	0.17586	60,000	(1mm), v,w	4,178,483
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	4		2,000	v,w	8,000
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	14		50	w	700
Tabellaria			2,540	f	0
Totals					**4,416,833**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	694	0.04548	1,130	(1mm), f	35,669
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**35,669**
threads			500	e	0
All Phyla Totals					***5,064,566***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11

Top

N

	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Chlorophyta						
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium			700	f	0	
Dictyosphaerium	3		111	f	333	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	11		716	f	7,876	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	1		537	e	537	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	38		716	f	27,208	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	9		5,000	f	45,000	
Synechocystis			537	e	0	
Tetraodon	37		40	w	1,480	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**98,827**	

	Number	Length	Cell Volume	Reference	Biovolume
Euglenophyta					
Euglena	1		7,775	f	7,775
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**7,775**

	Number	Length	Cell Volume	Reference	Biovolume
Pyrrhophyta					
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**1,272**

	Number	Length	Cell Volume	Reference	Biovolume
Chrysophyta					
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**90,000**

10/6/11

Top

N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	51		350	w	17,850
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella			300	f	0
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	4		225		900
Fragilaria	2	0.02	200,000	(1mm), v,w	8,000
Gomphonema	3		300	f	900
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	445	0.09259	60,000	(1mm), v,w	2,472,222
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia	4		7,872	f	31,488
Stephanodiscus	2		2,000	v,w	4,000
Surirella	3		870	j	2,610
Stauroneis	1		90,000	m	90,000
Synedra	3		50	w	150
Tabellaria	1		2,540	f	2,540
Totals					**2,631,735**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	86	0.13286	1,130	(1mm), f	12,911
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**12,911**
threads	3,438		500	e	1,719,000
All Phyla Totals					***4,561,520***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (N-mid site)

5/3/11

Mid

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume
Crucigenia			716		0
Coelastrum			89	f	0
Cosmarium			1,000	f	0
Desmidium	1	0.11	700	f	77
Dictyosphaerium			111	f	0
Euastrum			350,000	m	0
Eudorina			1,767	f	0
Gloeocystis	3		716	f	2,148
Golenkinia			80	f	0
Gonium			32,652	e	0
Mougeotia			1,111	f	0
Micrasterias			850,000	m	0
One-celled small grn			537	e	0
Oocystis			1,000	e	0
Pandorina			4,000	v	0
Pediastrum			14,138	f	0
Scenedesmus			255	f	0
Selenastrum			20	m	0
Sm grn colonies			100,000	(1mm), e	0
Sphaerocystis	3		716	f	2,148
Spirogyra			500,000	(1 mm), m	0
Spondylosium			950,000	(1mm), m	0
Staurastrum			5,000	f	0
Synechocystis			537	e	0
Tetraodon			40	w	0
Quadrigula			65,000	m	0
Volvox			90,000	m	0
Xanthidium			1,200	f	0
Totals					**4,373**

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	1		7,775	f	7,775
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**7,775**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium	3		40,000	v	120,000
Glenodinium			38,485	f	0
Totals					**120,000**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	14		200	f	2,800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**2,800**

5/3/11
Mid

Bacillariophyta	N Number	Length	Cell Volume	Reference	Biovolume
Asterionella	119		350	w	41,650
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	4		300	f	1,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia	1		225		225
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	70	0.44636364	60,000	(1mm), v,w	1,874,727
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**2,009,802**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	156		500	e	78,000
All Phyla Totals					***2,222,750***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Welzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11
Mid

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina	1	0.31	1,767	f	548	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	7		716	f	5,012	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**6,276**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	3		1,272	f	3,816
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**3,816**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	11		200	f	2,200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**2,200**

5/17/11
Mid
N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	5		350	w	1,750
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	6		300	f	1,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	34	0.371	60,000	(1mm), v,w	756,840
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra	5		50	w	250
Tabellaria			2,540	f	0
Totals					**850,640**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***862,932***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Mid

Chlorophyta	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	10		716	f	7,160	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox	6		90,000	m	540,000	
Xanthidium			1,200	f	0	
Totals					**549,308**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	4		200	f	800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**800**

6/8/11
Mid
N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	27		350	w	9,450
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	8		300	f	2,400
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	23	0.193	60,000	(1mm), v,w	266,340
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra			50	w	0
Tabellaria	5		2,540	f	12,700
Totals					**470,890**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	3		500	e	1,500
All Phyla Totals					***1,022,498***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11
Mid

Chlorophyta	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum	1		20	m	20	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	1		716	f	716	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**15,736**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**3,292**

6/24/11
Mid

Bacillariophyta	N Number	Length	Cell Volume	Reference	Biovolume
Asterionella	2		350	w	700
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	10		300	f	3,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	13	0.085	60,000	(1mm), v,w	66,300
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria	2		2,540	f	5,080
Totals					**75,180**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	20		500	e	10,000
All Phyla Totals					***104,208***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11
Mid

Chlorophyta	N Number	Length	Cell Volume	Reference	Biovolume
Crucigenia			716		0
Coelastrum			89	f	0
Cosmarium			1,000	f	0
Desmidium			700	f	0
Dictyosphaerium			111	f	0
Euastrum			350,000	m	0
Eudorina			1,767	f	0
Gloeocystis	2		716	f	1,432
Golenkinia			80	f	0
Gonium			32,652	e	0
Mougeotia			1,111	f	0
Micrasterias			850,000	m	0
One-celled small grn			537	e	0
Oocystis			1,000	e	0
Pandorina			4,000	v	0
Pediastrum			14,138	f	0
Scenedesmus			255	f	0
Selenastrum	1		20	m	20
Sm grn colonies			100,000	(1mm), e	0
Sphaerocystis	2		716	f	1,432
Spirogyra			500,000	(1 mm), m	0
Spondylosium			950,000	(1mm), m	0
Staurastrum	4		5,000	f	20,000
Synechocystis			537	e	0
Tetraodon	4		40	w	160
Quadrigula	1		65,000	m	65,000
Volvox			90,000	m	0
Xanthidium			1,200	f	0
Totals					**88,044**

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	7		200	f	1,400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	2		90,000	w,v	180,000
Totals					**181,400**

7/6/11
Mid
N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	13		350	w	4,550
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	6		300	f	1,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	28	0.0905	60,000	(1mm), v,w	152,040
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**248,390**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	2	0.11	1,130	(1mm), f	249
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**249**
threads	827		500	e	413,500
All Phyla Totals					***931,583***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/1811
Mid
N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	8		5,000	f	40,000	
Synechocystis			537	e	0	
Tetraodon	6		40	w	240	
Quadrigula	4		65,000	m	260,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**307,206**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	220	0.02	100,000	(1mm), e	440,000
Uroglena			90,000	w,v	0
Totals					**440,000**

7/1811
Mid N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	12		350	w	4,200
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	16		300	f	4,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia	2		225		450
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	2		300	f	600
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	22	0.095455	60,000	(1mm), v,w	126,000
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	12		50	w	600
Tabellaria			2,540	f	0
Totals					**136,650**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	24	0.15129	1,130	(1mm), f	4,103
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**4,103**
threads	1,988		500	e	994,000
All Phyla Totals					***1,881,959***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11
Mid

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	1		1,000	f	1,000	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	8		5,000	f	40,000	
Synechocystis			537	e	0	
Tetraodon	3		40	w	120	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**41,836**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	6		200	f	1,200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**1,200**

8/1/11
Mid
N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	6		350	w	2,100
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	7		300	f	2,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	13	0.20230769	60,000	(1mm), v,w	157,800
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	1		870	j	870
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**162,870**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	86	0.07666667	1,130	(1mm), f	7,450
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**7,450**
threads	864		500	e	432,000
All Phyla Totals					***645,356***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11
Mid

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	4		1,000	f	4,000	
Desmidium	8	0.03	700	f	168	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	20		716	f	14,320	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	7		537	e	3,759	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum	23		20	m	460	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	23		5,000	f	115,000	
Synechocystis			537	e	0	
Tetraodon	18		40	w	720	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**138,538**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	4		7,775	f	31,100
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**31,100**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	3		200	f	600
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**90,600**

8/25/11
Mid
N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	89		350	w	31,150
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	37		300	f	11,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	49	0.130909	60,000	(1mm), v,w	384,873
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**427,123**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	979	0.121667	1,130	(1mm), f	134,596
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**134,596**
threads	316		500	e	158,000
All Phyla Totals					***979,957***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11
Mid

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	7		1,000	f	7,000	
Desmidium			700	f	0	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina	1		1,767	f	1,767	
Gloeocystis	11		716	f	7,876	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	4		14,138	f	56,552	
Scenedesmus	2		255	f	510	
Selenastrum	2		20	m	40	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	23		5,000	f	115,000	
Synechocystis			537	e	0	
Tetraodon	80		40	w	3,200	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**192,056**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	2		200	f	400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**90,400**

9/8/11

Mid N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	50		350	w	17,500
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	88		300	f	26,400
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia			225		0
Fragilaria	1	0.02	200,000	(1mm), v,w	4,000
Gomphonema	3		300	f	900
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	598	0.316154	60,000	(1mm), v,w	11,343,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis	5		90,000	m	450,000
Synedra	6		50	w	300
Tabellaria	1		2,540	f	2,540
Totals					**11,847,240**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	225	0.102609	1,130	(1mm), f	26,088
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**26,088**
threads	1,346		500	e	673,000
All Phyla Totals					***12,828,784***

b

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11

Mid

	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Chlorophyta						
Crucigenia	4		716		2,864	
Coelastrum			89	f	0	
Cosmarium	8		1,000	f	8,000	
Desmidium			700	f	0	
Dictyosphaerium	2		111	f	222	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	8		716	f	5,728	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	26		537	e	13,962	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	4		14,138	f	56,552	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	22		716	f	15,752	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	20		5,000	f	100,000	
Synechocystis			537	e	0	
Tetraodon	36		40	w	1,440	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**201,656**	

	Number	Length	Cell Volume	Reference	Biovolume
Euglenophyta					
Euglena	2		7,775	f	15,550
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**15,550**

	Number	Length	Cell Volume	Reference	Biovolume
Pyrrhophyta					
Ceratium	2		50,000	f	100,000
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**100,000**

	Number	Length	Cell Volume	Reference	Biovolume
Chrysophyta					
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	44	0.02	100,000	(1mm), e	88,000
Uroglena			90,000	w,v	0
Totals					**88,000**

9/22/11

Mid N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	72		350	w	25,200
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	50		300	f	15,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia	10		225		2,250
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	640	0.176429	60,000	(1mm), v,w	6,774,857
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	4		50	w	200
Tabellaria			2,540	f	0
Totals					**6,817,507**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	542	0.0592	1,130	(1mm), f	36,258
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**36,258**
threads	2,538		500	e	1,269,000
All Phyla Totals					***8,527,971***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11

Mid

Chlorophyta	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia	1		716		716	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium			700	f	0	
Dictyosphaerium	3		111	f	333	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	11		716	f	7,876	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	1		537	e	537	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	38		716	f	27,208	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	9		5,000	f	45,000	
Synechocystis			537	e	0	
Tetraodon	37					
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**97,347**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	1		7,775	f	7,775
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**7,775**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**90,000**

10/6/11
Mid
N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	51		350	w	17,850
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	34		300	f	10,200
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia	4		225		900
Fragilaria	2	0.02	200,000	(1mm), v,w	8,000
Gomphonema	3		300	f	900
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	445	0.0906452	60,000	(1mm), v,w	2,420,226
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia	4		7,872	f	31,488
Stephanodiscus	2		2,000	v,w	4,000
Surirella	3		870	j	2,610
Stauroneis	1		90,000	m	90,000
Synedra	3		50	w	150
Tabellaria	1		2,540	f	2,540
Totals					**2,589,939**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	86	0.1328571	1,130	(1mm), f	12,911
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**12,911**
threads	3,438		500	e	1,719,000
All Phyla Totals					***4,516,972***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (N-bot site)

5/3/211
Bot
N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	14		716	f	10,024	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox	3		90,000	m	270,000	
Xanthidium			1,200	f	0	
Totals					**281,711**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	2		1,272	f	2,544
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**2,544**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	5		200	f	1,000
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**1,000**

5/3/211
Bot N

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	4		300	f	1,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	353	0.2	60,000	(1mm), v,w	4,490,160
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	14		90,000	m	1,260,000
Synedra	11		50	w	550
Tabellaria			2,540	f	0
Totals					**5,752,535**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	1	0.03	100,000	(1mm), w	3,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**3,000**
threads	22		500	e	11,000
All Phyla Totals					***6,051,790***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11
Bot

Chlorophyta	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	1	0.31	700	f	217	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	4		716	f	2,864	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	9		716	f	6,444	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**39,173**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	10		1,272	f	12,720
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**12,720**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	9		200	f	1,800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**1,800**

5/17/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	14		300	f	4,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	145	0.208	60,000	(1mm), v,w	1,809,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	7		90,000	m	630,000
Synedra	9		50	w	450
Tabellaria	3		2,540	f	7,620
Totals					**2,451,870**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***2,505,563***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Bot

Chlorophyta	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	9		716	f	6,444	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox	2		90,000	m	180,000	
Xanthidium			1,200	f	0	
Totals					**186,444**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	34		200	f	6,800
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**100,092**

6/8/11
Bot **N**

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	3		350	w	1,050
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	13		300	f	3,900
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	59	0.281	60,000	(1mm), v,w	994,740
Meridion			160	m	0
Navicula	5		625	j	3,125
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria	4		2,540	f	10,160
Totals					**1,013,075**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***1,299,611***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11

Bot

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	1		255	f	255	
Selenastrum	1		20	m	20	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**8,139**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium	1		50,000	f	50,000
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**51,272**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

6/24/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	6		350	w	2,100
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	17		300	f	5,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	87	0.227	60,000	(1mm), v,w	1,184,940
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	8		50	w	400
Tabellaria			2,540	f	0
Totals					**1,194,540**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0.07	100,000	(1mm), w	14,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**14,000**
threads	31		500	e	15,500
All Phyla Totals					***1,283,451***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11

Bot N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	3		716	f	2,148	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**3,580**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium	1		50,000	f	50,000
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**50,000**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

7/6/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	10		350	w	3,500
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	6		300	f	1,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	18	0.2445	60,000	(1mm), v,w	264,060
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra	2		50	w	100
Tabellaria	10		2,540	f	25,400
Totals					**384,860**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	2	0.1	1,130	(1mm), f	226
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**226**
threads	86		500	e	43,000
All Phyla Totals					***481,666***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11
Bot

Chlorophyta	N Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	2	0.03	700	f	42	
Dictyosphaerium	8		111	f	888	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	14		716	f	10,024	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	8		537	e	4,296	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	4		14,138	f	56,552	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	6		716	f	4,296	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Tetraodon	16		40	w	640	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**86,738**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	4		7,775	f	31,100
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**31,100**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	54	0.01	100,000	(1mm), e	54,000
Uroglena			90,000	w,v	0
Totals					**54,000**

7/18/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	6		350	w	2,100
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	20		300	f	6,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	2		225		450
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	108	0.2688	60,000	(1mm), v,w	1,741,824
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	4		50	w	200
Tabellaria	10		2,540	f	25,400
Totals					**1,775,974**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	30	0.037	1,130	(1mm), f	1,254
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**1,254**
threads	2,020		500	e	1,010,000
All Phyla Totals					***2,959,066***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11

Bot N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina	1		1,767	f	1,767	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	5		716	f	3,580	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Tetraodon	7		40	w	280	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**17,059**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium	1		40,000	v	40,000
Glenodinium			38,485	f	0
Totals					**40,000**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	8		200	f	1,600
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**4,892**

8/1/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	3		350	w	1,050
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	9		300	f	2,700
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	2		225		450
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	47	0.257	60,000	(1mm), v,w	724,740
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**728,940**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	52	0.0479167	1,130	(1mm), f	2,816
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**2,816**
threads	174		500	e	87,000
All Phyla Totals					***880,707***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11

Bot N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium	2	0.02	700	f	28	
Dictyosphaerium	2		111	f	222	
Euastrum			350,000	m	0	
Eudorina	4		1,767	f	7,068	
Gloeocystis	8		716	f	5,728	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	10		537	e	5,370	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	8		716	f	5,728	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	12		5,000	f	60,000	
Synechocystis			537	e	0	
Tetraodon	14		40	w	560	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**114,980**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	10		200	f	2,000
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	6		90,000	w,v	540,000
Totals					**542,000**

8/25/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	26		350	w	9,100
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	30		300	f	9,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	2		225		450
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	80	0.2	60,000	(1mm), v,w	960,000
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	2		50	w	100
Tabellaria			2,540	f	0
Totals					**1,158,650**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	390	0.0591176	1,130	(1mm), f	26,053
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**26,053**
threads	1,000		500	e	500,000
All Phyla Totals					***2,341,683***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11

Bot

N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	1		1,000	f	1,000	
Desmidium			700	f	0	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	23		716	f	16,468	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	5		14,138	f	70,690	
Scenedesmus	4		255	f	1,020	
Selenastrum	1		20	m	20	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	18		716	f	12,888	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	6		5,000	f	30,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**132,197**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

9/8/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	55		350	w	19,250
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	42		300	f	12,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	625	0.24	60,000	(1mm), v,w	9,000,000
Meridion			160	m	0
Navicula	5		625	j	3,125
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	3		90,000	m	270,000
Synedra	10		50	w	500
Tabellaria	2		2,540	f	5,080
Totals					**9,310,555**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	94	0.0804167	1,130	(1mm), f	8,542
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**8,542**
threads	585		500	e	292,500
All Phyla Totals					***9,743,794***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11

Bot N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia	2		716		1,432	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	12		111	f	1,332	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	4		716	f	2,864	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	16		537	e	8,592	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	6		14,138	f	84,828	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	20		716	f	14,320	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	14		5,000	f	70,000	
Synechocystis			537	e	0	
Tetraodon	44		40	w	1,760	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**187,740**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	2		200	f	400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	2	0.01	100,000	(1mm), e	2,000
Uroglena			90,000	w,v	0
Totals					**2,400**

9/22/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	64		350	w	22,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	106		300	f	31,800
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	28		225		6,300
Fragilaria	14	0.02375	200,000	(1mm), v,w	66,500
Gomphonema	4		300	f	1,200
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	1,494	0.2335484	60,000	(1mm), v,w	20,935,277
Meridion			160	m	0
Navicula	6		625	j	3,750
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis	18		90,000	m	1,620,000
Synedra	10		50	w	500
Tabellaria	10		2,540	f	25,400
Totals					**22,715,577**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	190	0.0377778	1,130	(1mm), f	8,111
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**8,111**
threads	3,770		500	e	1,885,000
All Phyla Totals					***24,798,828***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11

Bot N

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	3		1,000	f	3,000	
Desmidium	2	0.01	700	f	14	
Dictyosphaerium	7		111	f	777	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	17		716	f	12,172	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	4		537	e	2,148	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	3		14,138	f	42,414	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	18		716	f	12,888	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	11		5,000	f	55,000	
Synechocystis			537	e	0	
Tetraodon	33		40	w	1,320	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**129,733**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**90,000**

10/6/11
Bot N

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	33		350	w	11,550
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	37		300	f	11,100
Cymbella	3		225	f	675
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	9		225		2,025
Fragilaria	4	0.025	200,000	(1mm), v,w	20,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	650	0.278	60,000	(1mm), v,w	10,842,000
Meridion			160	m	0
Navicula	3		625	j	1,875
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	1		870	j	870
Stauroneis	6		90,000	m	540,000
Synedra	2		50	w	100
Tabellaria	1		2,540	f	2,540
Totals					**11,432,735**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	160	0.0761538	1,130	(1mm), f	13,769
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**13,769**
threads	3,376		500	e	1,688,000
All Phyla Totals					***13,354,237***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (M-top site)

5/3/11

Top M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	11		716	f	7,876	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**8,592**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	21		350	w	7,350
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella			300	f	0
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	26	0.341	60,000	(1mm), v,w	531,960
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	1		50	w	50
Tabellaria			2,540	f	0
Totals					**539,360**

5/3/11

Top M

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					0
threads	41		500	e	20,500
All Phyla Totals					***568,452***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11
Top

Chlorophyta	M Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	4		250	w	1,000	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium		0.05	700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	6		716	f	4,296	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**6,012**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium	1		50,000	f	50,000
Closterium			1,000	f	0
Elakatothrix	4		1,272	f	5,088
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**55,088**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	81		350	w	28,350
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	9		300	f	2,700
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	7	0.251	60,000	(1mm), v,w	105,420
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	1		50	w	50
Tabellaria			2,540	f	0
Totals					**136,520**

5/17/11

Top M

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					0
threads			500	e	0
All Phyla Totals					***197,620***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Top

Chlorophyta	M Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	7		250	w	1,750	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	41		716	f	29,356	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**48,254**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	29		200	f	5,800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**5,800**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	8		350	w	2,800
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	23		300	f	6,900
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	21	0.393	60,000	(1mm), v,w	495,180
Meridion			160	m	0
Navicula	3		625	j	1,875
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**506,755**

6/8/11

Top	M				
Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	1	0.02	1,130	(1mm), f	23
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					23
threads	1		500	e	500
All Phyla Totals					***561,332***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11
Top

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	1		250	w	250	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**11,793**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	3		350	w	1,050
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	6		300	f	1,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	13	0.189	60,000	(1mm), v,w	147,420
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	3		2,000	v,w	6,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	3		50	w	150
Tabellaria			2,540	f	0
Totals					**156,420**

6/24/11

Top M

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	1	0.1	1,130	(1mm), f	113
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	1	0.03	100,000	(1mm), w	3,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**3,113**
threads	29		500	e	14,500
All Phyla Totals					***185,826***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11
Top

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	3		716	f	2,148	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon	2		40	w	80	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**17,798**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	48		200	f	9,600
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"liny bubbles"			100,000	(1mm), e	0
Uroglena	1		90,000	w,v	90,000
Totals					**99,600**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	4		350	w	1,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	5		300	f	1,500
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	12	0.1942	60,000	(1mm), v,w	139,800
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**142,700**

7/6/11

Top M

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**0**
threads	847		500	e	423,500
All Phyla Totals					***683,598***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11
Top

Chlorophyta	M Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	6		716	f	4,296	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	3		716	f	2,148	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon	2		40	w	80	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**6,635**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	1		7,775	f	7,775
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**7,775**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	280	0.02	100,000	(1mm), e	560,000
Uroglena			90,000	w,v	0
Totals					**560,000**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	1		350	w	350
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	11		300	f	3,300
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	6	0.0183	60,000	(1mm), v,w	6,600
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria			2,540	f	0
Totals					**10,975**

7/18/11

Top	M				
Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	22	0.333	1,130	(1mm), f	8,279
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					8,279
threads	1,114		500	e	557,000
All Phyla Totals					***1,150,664***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11

Top

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**6,432**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	3		300	f	900
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	2	0.795	60,000	(1mm), v,w	95,400
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**96,300**

8/1/11

Top	M				
Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	13	0.6038	1,130	(1mm), f	8,871
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					8,871
threads	59		500	e	29,500
All Phyla Totals					***141,103***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolumé (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11

Top M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium	6	0.0233	700	f	98	
Dictyosphaerium	8		111	f	888	
Euastrum			350,000	m	0	
Eudorina	4		1,767	f	7,068	
Gloeocystis	24		716	f	17,184	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	88		537	e	47,256	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	18		716	f	12,888	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	6		5,000	f	30,000	
Synechocystis			537	e	0	
Tetraodon	54		40	w	2,160	
Quadrigula	8		65,000	m	520,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**639,542**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	4		7,775	f	31,100
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**31,100**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	20		200	f	4,000
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"liny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**4,000**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	56		350	w	19,600
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	40		300	f	12,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	2		225		450
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	66	0.0259	60,000	(1mm), v,w	102,667
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	2		870	j	1,740
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria			2,540	f	0
Totals					**136,557**

8/25/11
Top

Cyanophyta	M Number	Length	Cell Volume	Reference	Biovolume
Anabaena	1,604	0.065	1,130	(1mm), f	117,814
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**117,814**
threads	520		500	e	260,000
All Phyla Totals					***1,189,012***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11
Top

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium	1	0.02	700	f	14	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	21		716	f	15,036	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	3		14,138	f	42,414	
Scenedesmus	1		255	f	255	
Selenastrum	2		20	m	40	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	21		716	f	15,036	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	16		5,000	f	80,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**154,795**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas	3		3,292	f	9,876
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"liny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**9,876**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	30		350	w	10,500
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	25		300	f	7,500
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	81	2.2713	60,000	(1mm), v,w	11,038,680
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	4		50	w	200
Tabellaria			2,540	f	0
Totals					**11,236,880**

9/8/11

Top M

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	214	0.1843	1,130	(1mm), f	44,575
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**44,575**
threads	1,024		500	e	512,000
All Phyla Totals					***11,958,126***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11
Top

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	3		1,000	f	3,000	
Desmidium			700	f	0	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	9		716	f	6,444	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	4		14,138	f	56,552	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	19		716	f	13,604	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	9		5,000	f	45,000	
Synechocystis			537	e	0	
Tetraodon	18		40	w	720	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**125,431**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"liny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	53		350	w	18,550
Cavinula			5,000		0
Cratícula			3,000	m	0
Cyclotella			300	f	0
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	2		225		450
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	1		300	f	300
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	259	0.2497	60,000	(1mm), v,w	3,879,987
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**3,989,287**

9/22/11

Top M

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	1,480	0.031	1,130	(1mm), f	51,900
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**51,900**
threads	1,104		500	e	552,000
All Phyla Totals					***4,718,618***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11

Top M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium			700	f	0	
Dictyosphaerium	16		111	f	1,776	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	19		716	f	13,604	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	13		537	e	6,981	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus	4		255	f	1,020	
Selenastrum			20	m	0	
Sm gm colonies			100,000	(1mm), e	0	
Sphaerocystis	21		716	f	15,036	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	9		5,000	f	45,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**117,227**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	2		7,775	f	15,550
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**15,550**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**1,272**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm bm colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	59		350	w	20,650
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	36		300	f	10,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	7		225		1,575
Fragilaria	3	0.0233	200,000	(1mm), v,w	14,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	905	0.218	60,000	(1mm), v,w	11,837,400
Meridion			160	m	0
Navicula	7		625	j	4,375
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	9		50	w	450
Tabellaria	4		2,540	f	10,160
Totals					**11,903,410**

10/6/11

Top	M				
Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	255	0.0157	1,130	(1mm), f	4,514
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**4,514**
threads	3,858		500	e	1,929,000
All Phyla Totals					***13,970,973***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (M-mid site)

5/3/11
Mid M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	2	0.165	700	f	231	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	5		716	f	3,580	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetradon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**9,066**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**1,272**

5/3/11
Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	95		350	w	33,250
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	3		300	f	900
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	75	0.352	60,000	(1mm), v,w	1,584,000
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria	1		2,540	f	2,540
Totals					**1,620,690**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	80		500	e	40,000
All Phyla Totals					***1,671,028***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11
Mid

Chlorophyta	M Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	7		716	f	5,012	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetradon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**6,444**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	3		1,272	f	3,816
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**3,816**

5/17/11

Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	36		200	f	7,200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**7,200**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	20		350	w	7,000
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	3		300	f	900
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	23	0.273	60,000	(1mm), v,w	376,740
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**474,640**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***492,100***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Mid M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	10		250	w	2,500	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	1	0.05	700	f	35	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	30		716	f	21,480	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**35,957**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

6/8/11
Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	29		200	f	5,800
Gymnodinium			38,485	f	0
Mallomonas	8		3,292	f	26,336
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**32,136**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	12		350	w	4,200
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	22		300	f	6,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	38	0.274	60,000	(1mm), v,w	624,720
Meridion			160	m	0
Navicula	2		625	j	1,250
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	3		50	w	150
Tabellaria			2,540	f	0
Totals					**636,920**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	1	0.02	1,130	(1mm), f	23
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					23
threads			500	e	0
All Phyla Totals					***705,036***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11
Mid

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	4		250	w	1,000	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	4		716	f	2,864	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	6		5,000	f	30,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**48,718**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

6/24/11
Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**3,292**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	16		300	f	4,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	81	0.237	60,000	(1mm), v,w	1,151,820
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	6		90,000	m	540,000
Synedra	13		50	w	650
Tabellaria	1		2,540	f	2,540
Totals					**1,699,810**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	4	0.025	1,130	(1mm), f	113
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0.225	100,000	(1mm), w	45,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**45,113**
threads	35		500	e	17,500
All Phyla Totals					***1,814,433***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11
Mid

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	2		250	w	500	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	2	0.08	700	f	112	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	7		716	f	5,012	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	1		716	f	716	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	5		5,000	f	25,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**31,595**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium	1		50,000	f	50,000
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**51,272**

7/6/11

Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	25		200	f	5,000
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**8,292**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	15		350	w	5,250
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	12		300	f	3,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	15	0.153	60,000	(1mm), v,w	137,700
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	2		50	w	100
Tabellaria	4		2,540	f	10,160
Totals					**336,810**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	15	0.105	1,130	(1mm), f	1,780
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0.025	100,000	(1mm), w	5,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**6,780**
threads			500	e	0
All Phyla Totals					***434,749***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11
Mid

Chlorophyta	M Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	2	0.03	700	f	42	
Dictyosphaerium	2		111	f	222	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	16		716	f	11,456	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	6		5,000	f	30,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	4		40	w	160	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**45,414**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

7/18/11
Mid

M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	2		350	w	700
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	10		300	f	3,000
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	84	0.222	60,000	(1mm), v,w	1,118,880
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	2		50	w	100
Tabellaria	8		2,540	f	20,320
Totals					**1,323,450**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	30	0.125333	1,130	(1mm), f	4,249
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**4,249**
threads	2,880		500	e	1,440,000
All Phyla Totals					***2,813,113***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11
Mid

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	3		716	f	2,148	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**2,864**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

8/1/11
Mid

M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	12		300	f	3,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria	1	0.03	200,000	(1mm), v,w	6,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	15	0.202667	60,000	(1mm), v,w	182,400
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria	1		2,540	f	2,540
Totals					**194,540**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	52	0.072667	1,130	(1mm), f	4,270
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**4,270**
threads	237		500	e	118,500
All Phyla Totals					***320,174***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11
Mid

Chlorophyta	M Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium	18	0.025556	700	f	322	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	18		716	f	12,888	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	30		537	e	16,110	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	12		716	f	8,592	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	12		5,000	f	60,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	30		40	w	1,200	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**101,622**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

8/25/11

Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	12		200	f	2,400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**2,400**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	74		350	w	25,900
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	56		300	f	16,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	4		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	86	0.141786	60,000	(1mm), v,w	731,614
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	10		90,000	m	900,000
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**1,675,214**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	328	0.098788	1,130	(1mm), f	36,615
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0.04	100,000	(1mm), w	8,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**44,615**
threads	1,000		500	e	500,000
All Phyla Totals					***2,323,851***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11
Mid

Chlorophyta	M Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	7		716	f	5,012	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus			255	f	0	
Selenastrum	1		20	m	20	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	14		716	f	10,024	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	5		5,000	f	25,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**68,332**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	2		1,272	f	2,544
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**2,544**

9/8/11
Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					0

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	27		350	w	9,450
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	27		300	f	8,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	289	0.32	60,000	(1mm), v,w	5,548,800
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis	11		90,000	m	990,000
Synedra	1		50	w	50
Tabellaria			2,540	f	0
Totals					**6,558,400**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	283	0.1118519	1,130	(1mm), f	35,769
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	4	0.1775	100,000	(1mm), w	71,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**106,769**
threads	223		500	e	111,500
All Phyla Totals					***6,847,545***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11
Mid

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia			716		0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium	2	0.02	700	f	28	
Dictyosphaerium	14		111	f	1,554	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	40		716	f	28,640	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	38		537	e	20,406	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	6		14,138	f	84,828	
Scenedesmus	4		255	f	1,020	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	4		716	f	2,864	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	48		5,000	f	240,000	
Synechocystis			537	e	0	
Quadrigula	4		65,000	m	260,000	
Tetraodon	56		40	w	2,240	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**647,114**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	4		7,775	f	31,100
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**31,100**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

9/22/11

Mid M

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	190	0.02	100,000	(1mm), e	380,000
Uroglena	2		90,000	w,v	180,000
Totals					**560,000**

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	46		350	w	16,100
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	26		300	f	7,800
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	6		225		1,350
Fragilaria	4	0.025	200,000	(1mm), v,w	20,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	768	0.1624	60,000	(1mm), v,w	7,484,509
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella	4		870	j	3,480
Stauroneis	4		90,000	m	360,000
Synedra	6		50	w	300
Tabellaria	2		2,540	f	5,080
Totals					**7,903,069**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	358	0.0697	1,130	(1mm), f	28,178
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**28,178**
threads	2,192		500	e	1,096,000
All Phyla Totals					***10,265,461***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11

Mid M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Crucigenia	2		716		1,432	
Coelastrum			89	f	0	
Cosmarium	5		1,000	f	5,000	
Desmidium	1	0	700	f	21	
Dictyosphaerium	7		111	f	777	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	12		716	f	8,592	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	3		14,138	f	42,414	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	97		716	f	69,452	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	10		5,000	f	50,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	17		40	w	680	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**177,446**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

10/6/11

Mid	M				
Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	4		90,000	w,v	360,000
Totals					**360,000**

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	49		350	w	17,150
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	57		300	f	17,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	17		225		3,825
Fragilaria	4	0	200,000	(1mm), v,w	16,000
Gomphonema	4		300	f	1,200
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	886	0	60,000	(1mm), v,w	7,237,938
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus	3		2,000	v,w	6,000
Surirella	6		870	j	5,220
Stauroneis	1		90,000	m	90,000
Synedra	4		50	w	200
Tabellaria	3		2,540	f	7,620
Totals					**7,402,878**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	141	0	1,130	(1mm), f	18,625
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**18,625**
threads	1,800		500	e	900,000
All Phyla Totals					***8,858,950***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (M-bot site)

5/3/11
Bottom M

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Crucigenia			716		0
Ankistrodesmus			250	w	0
Coelastrum			89	f	0
Cosmarium	1		1,000	f	1,000
Desmidium			700	f	0
Dictyosphaerium			111	f	0
Euastrum			350,000	m	0
Eudorina			1,767	f	0
Gloeocystis	1		716	f	716
Golenkinia			80	f	0
Gonium			32,652	e	0
Mougeotia			1,111	f	0
Micrasterias			850,000	m	0
One-celled small grn			537	e	0
Oocystis			1,000	e	0
Pandorina			4,000	v	0
Pediastrum			14,138	f	0
Scenedesmus			255	f	0
Selenastrum			20	m	0
Sm grn colonies			100,000	(1mm), e	0
Sphaerocystis	13		716	f	9,308
Spirogyra			500,000	(1 mm), m	0
Spondylosium			950,000	(1mm), m	0
Staurastrum			5,000	f	0
Synechocystis			537	e	0
Quadrigula			65,000	m	0
Tetraodon			40	w	0
Volvox			90,000	m	0
Xanthidium			1,200	f	0
Totals					**11,024**

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	3		1,272	f	3,816
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**3,816**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

Comments:

5/3/11
Bottom M

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	75		350	w	26,250
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	4		300	f	1,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria	1	0.03	200,000	(1mm), v,w	6,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	133	0.2886957	60,000	(1mm), v,w	2,303,791
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	1		870	j	870
Stauroneis	3		90,000	m	270,000
Synedra	8		50	w	400
Tabellaria			2,540	f	0
Totals					**2,608,511**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***2,623,351***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus	3		250	w	750	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	7		716	f	5,012	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**17,910**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**1,272**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	15		200	f	3,000
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**3,000**

5/17/11
Bottom M

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	42		350	w	14,700
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	7		300	f	2,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	89	0	60,000	(1mm), v,w	1,548,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra	6		50	w	300
Tabellaria	16		2,540	f	40,640
Totals					**1,696,340**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***1,718,522***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus	9		250	w	2,250	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus	1		255	f	255	
Selenastrum	1		20	m	20	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	21		716	f	15,036	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**32,415**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	80		200	f	16,000
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**16,000**

6/8/11
Bottom

M

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	19		350	w	6,650
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	17		300	f	5,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria	4	0.028	200,000	(1mm), v,w	22,400
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	328	0.236	60,000	(1mm), v,w	4,644,480
Meridion			160	m	0
Navicula	3		625	j	1,875
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	14		90,000	m	1,260,000
Synedra	20		50	w	1,000
Tabellaria	5		2,540	f	12,700
Totals					**5,954,205**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	3	0.153	100,000	(1mm), w	45,900
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**45,900**
threads			500	e	0
All Phyla Totals					***6,048,520***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus	5		250	w	1,250	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	8		716	f	5,728	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**35,970**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**3,292**

6/24/11
Bottom M

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	4		350	w	1,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	12		300	f	3,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	178	0.263	60,000	(1mm), v,w	2,808,840
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	5		50	w	250
Tabellaria	4		2,540	f	10,160
Totals					**2,824,875**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	1	0.03	100,000	(1mm), w	3,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**3,000**
threads	12		500	e	6,000
All Phyla Totals					***2,873,137***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11
Bottom

M

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**13,119**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

7/6/11
Bottom

M

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	5		350	w	1,750
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	6		300	f	1,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	112	0.23	60,000	(1mm), v,w	1,545,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	4		90,000	m	360,000
Synedra	15		50	w	750
Tabellaria			2,540	f	0
Totals					**1,909,900**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	4	0.21	1,130	(1mm), f	949
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	3	0.02	100,000	(1mm), w	6,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**6,949**
threads	97		500	e	48,500
All Phyla Totals					***1,978,468***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia	2		716		1,432	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	8		111	f	888	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	10		716	f	7,160	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	8		14,138	f	113,104	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	8		5,000	f	40,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	2		40	w	80	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**162,664**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	2		200	f	400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	2		90,000	w,v	180,000
Totals					**180,400**

7/18/11
Bottom

M

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	40		350	w	14,000
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella			300	f	0
Cymbella	10		225	f	2,250
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	36		225		8,100
Fragilaria	12	0.045	200,000	(1mm), v,w	108,000
Gomphonema	2		300	f	600
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	1,224	0.3267857	60,000	(1mm), v,w	23,999,143
Meridion			160	m	0
Navicula	2		625	j	1,250
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	10		90,000	m	900,000
Synedra	26		50	w	1,300
Tabellaria	10		2,540	f	25,400
Totals					**25,060,043**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	6	0.06	1,130	(1mm), f	407
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**407**
threads	1,696		500	e	848,000
All Phyla Totals					***26,251,514***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus	1		255	f	255	
Selenastrum	3		20	m	60	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	1		716	f	716	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**39,307**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	1		200	f	200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**200**

8/1/11
Bottom

M

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	3		350	w	1,050
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	7		300	f	2,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria	4	0.025	200,000	(1mm), v,w	20,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	93	0.2396667	60,000	(1mm), v,w	1,337,340
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**1,360,490**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	12	0.1233333	1,130	(1mm), f	1,672
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**1,672**
threads	8		500	e	4,000
All Phyla Totals					***1,405,669***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia	1		716		716	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	2		1,000	f	2,000	
Desmidium	1	0.03	700	f	21	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	8		716	f	5,728	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	12		537	e	6,444	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus	1		255	f	255	
Selenastrum	1		20	m	20	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	5		716	f	3,580	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	8		5,000	f	40,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	11		40	w	440	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**72,737**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	2		90,000	w,v	180,000
Totals					**180,000**

8/25/11
Bottom

M

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	18		300	f	5,400
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	10		225		2,250
Fragilaria	6	0.015	200,000	(1mm), v,w	18,000
Gomphonema	1		300	f	300
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	154	0.1848276	60,000	(1mm), v,w	1,707,807
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	1		870	j	870
Stauroneis	2		90,000	m	180,000
Synedra	3		50	w	150
Tabellaria			2,540	f	0
Totals					**1,915,402**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	65	0.0965385	1,130	(1mm), f	7,091
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**7,091**
threads	134		500	e	67,000
All Phyla Totals					***2,242,230***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11
Bottom

M

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	1		1,000	f	1,000	
Desmidium			700	f	0	
Dictyosphaerium	1		111	f	111	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	5		716	f	3,580	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	4		14,138	f	56,552	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies	18		100,000	(1mm), e	0	
Sphaerocystis	20		716	f	14,320	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	33		40	w	1,320	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**76,883**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	6		90,000	w,v	540,000
Totals					**540,000**

9/8/11
Bottom
M

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	33		350	w	11,550
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	82		300	f	24,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	11		225		2,475
Fragilaria	4	0.0225	200,000	(1mm), v,w	18,000
Gomphonema	3		300	f	900
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	803	0.32	60,000	(1mm), v,w	15,417,600
Meridion			160	m	0
Navicula	5		625	j	3,125
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis	1		90,000	m	90,000
Synedra	1		50	w	50
Tabellaria			2,540	f	0
Totals					**15,572,300**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	254	0.076	1,130	(1mm), f	21,814
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**21,814**
threads	786		500	e	393,000
All Phyla Totals					***16,603,997***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia	2		716		1,432	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	6		111	f	666	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	20		716	f	14,320	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	2		537	e	1,074	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	14		716	f	10,024	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	12		5,000	f	60,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	28		40	w	1,120	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**119,524**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	10	0.02	100,000	(1mm), e	20,000
Uroglena			90,000	w,v	0
Totals					**20,000**

9/22/11
Bottom

M

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	44		350	w	15,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	42		300	f	12,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	34		225		7,650
Fragilaria	16	0.02	200,000	(1mm), v,w	64,000
Gomphonema	6		300	f	1,800
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	1,298	0.1964865	60,000	(1mm), v,w	15,302,368
Meridion			160	m	0
Navicula	6		625	j	3,750
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	2		870	j	1,740
Stauroneis	8		90,000	m	720,000
Synedra	8		50	w	400
Tabellaria	2		2,540	f	5,080
Totals					**16,134,788**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	72	0.0512593	1,130	(1mm), f	4,170
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**4,170**
threads	2,774		500	e	1,387,000
All Phyla Totals					***17,665,482***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11
Bottom

M

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia	2		716		1,432	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	4		1,000	f	4,000	
Desmidium			700	f	0	
Dictyosphaerium	6		111	f	666	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	24		716	f	17,184	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	19		537	e	10,203	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	3		14,138	f	42,414	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	20		716	f	14,320	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	24		40	w	960	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**105,002**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

10/6/11
Bottom

M

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	24		350	w	8,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	34		300	f	10,200
Cymbella	5		225	f	1,125
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	23		225		5,175
Fragilaria	10	0.025	200,000	(1mm), v,w	50,000
Gomphonema	5		300	f	1,500
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	789	0.1242857	60,000	(1mm), v,w	5,883,686
Meridion			160	m	0
Navicula	2		625	j	1,250
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	3		90,000	m	270,000
Synedra	3		50	w	150
Tabellaria	7		2,540	f	17,780
Totals					**6,249,266**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	179	0	1,130	(1mm), f	11,669
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria	1	0.02	30,000	(1mm), v	600
Single cell with sheath			540	e	0
Totals					**12,269**
threads	3,664		500	e	1,832,000
All Phyla Totals					***8,198,537***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (S-top site)

5/3/11

Top S

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Ankistrodesmus	2		250	w	500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	7		716	f	5,012	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**22,199**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

5/3/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	154		350	w	53,900
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	4		300	f	1,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	66	0.278	60,000	(1mm), v,w	1,100,880
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	1		50	w	50
Tabellaria	2		2,540	f	5,080
Totals					**1,163,110**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	163		500	e	81,500
All Phyla Totals					***#REF!***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11

Top S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	2		250	w	500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	12		716	f	8,592	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**26,240**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	8		1,272	f	10,176
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**10,176**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	37		200	f	7,400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**7,400**

5/17/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	6		300	f	1,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	9	0.304	60,000	(1mm), v,w	164,160
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria			2,540	f	0
Totals					**166,060**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	1		500	e	500
All Phyla Totals					***210,376***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Top

S

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Ankistrodesmus	14		250	w	3,500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	42		716	f	30,072	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	5		5,000	f	25,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**58,572**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium	1		50,000	f	50,000
Closterium			1,000	f	0
Elakatothrix	1		1,272	f	1,272
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**51,272**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	38		200	f	7,600
Gymnodinium			38,485	f	0
Mallomonas	2		3,292	f	6,584
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**14,184**

6/8/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	9		350	w	3,150
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	17		300	f	5,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	22	0.225	60,000	(1mm), v,w	297,000
Meridion			160	m	0
Navicula	3		625	j	1,875
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	1		50	w	50
Tabellaria			2,540	f	0
Totals					**307,175**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***431,203***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Microtaenium 1

6/24/11
Top

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus	2		250	w	500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	1		537	e	537	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	4		716	f	2,864	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**24,471**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	2		7,775	f	15,550
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**15,550**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

6/24/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	1		350	w	350
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	12		300	f	3,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	18	0.288	60,000	(1mm), v,w	311,040
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	3		2,000	v,w	6,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria	2		2,540	f	5,080
Totals					**326,170**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	3	0.037	100,000	(1mm), w	11,100
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**11,100**
threads	90		500	e	45,000
All Phyla Totals					***422,291***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11
Top
S

	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Chlorophyta						
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	1		1,000	f	1,000	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	1		40	w	40	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**1,756**	

	Number	Length	Cell Volume	Reference	Biovolume
Euglenophyta					
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

	Number	Length	Cell Volume	Reference	Biovolume
Pyrrhophyta					
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

	Number	Length	Cell Volume	Reference	Biovolume
Chrysophyta					
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

7/6/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	7		300	f	2,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	6	0.11167	60,000	(1mm), v,w	40,200
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria	10		2,540	f	25,400
Totals					**67,700**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	3	0.01667	1,130	(1mm), f	57
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**57**
threads	326		500	e	163,000
All Phyla Totals					***232,513***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium.: measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11

Top

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	2		537	e	1,074	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	4		14,138	f	56,552	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	4		716	f	2,864	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**71,922**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium	2		40,000	v	80,000
Glenodinium			38,485	f	0
Totals					**80,000**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	2		90,000	w,v	180,000
Totals					**180,000**

7/18/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	16		350	w	5,600
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	24		300	f	7,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	16	0.3275	60,000	(1mm), v,w	314,400
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	16		2,000	v,w	32,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**359,200**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	10	0.164	1,130	(1mm), f	1,853
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**1,853**
threads	1,110		500	e	555,000
All Phyla Totals					***1,247,975***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11

Top

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	3,500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina	2		1,767	f	3,534	
Gloeocystis	5		716	f	3,580	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	1		716	f	716	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	3		40	w	120	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**17,950**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	370	0.02	100,000	(1mm), e	740,000
Uroglena			90,000	w,v	0
Totals					**740,000**

8/1/11

Top

S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	11		300	f	3,300
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	8	0	60,000	(1mm), v,w	6,400
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**11,700**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	72	0.32529	1,130	(1mm), f	26,466
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**26,466**
threads	456		500	e	228,000
All Phyla Totals					***1,024,116***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11
Top

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume
Ankistrodesmus			250	w	3,500
Coelastrum			89	f	0
Cosmarium	2		1,000	f	2,000
Desmidium			700	f	0
Dictyosphaerium			111	f	0
Euastrum			350,000	m	0
Eudorina	2		1,767	f	3,534
Gloeocystis	15		716	f	10,740
Golenkinia			80	f	0
Gonium			32,652	e	0
Mougeotia			1,111	f	0
Micrasterias			850,000	m	0
One-celled small grn			537	e	0
Oocystis			1,000	e	0
Pandorina			4,000	v	0
Pediastrum			14,138	f	0
Scenedesmus			255	f	0
Selenastrum			20	m	0
Sm grn colonies			100,000	(1mm), e	0
Sphaerocystis	14		716	f	10,024
Spirogyra			500,000	(1 mm), m	0
Spondylosium			950,000	(1mm), m	0
Staurastrum	14		5,000	f	70,000
Synechocystis			537	e	0
Quadrigula	1		65,000	m	65,000
Tetraodon	24		40	w	960
Volvox			90,000	m	0
Xanthidium			1,200	f	0
Totals					**162,258**

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	4		200	f	800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**800**

8/25/11

Top

S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	41		350	w	14,350
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	19		300	f	5,700
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	16	0	60,000	(1mm), v,w	20,267
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	20		90,000	m	1,800,000
Synedra	1		50	w	50
Tabellaria			2,540	f	0
Totals					**1,840,367**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	1,182	0	1,130	(1mm), f	115,757
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	1	0.02	100,000	(1mm), w	2,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**117,757**
threads	230		500	e	115,000
All Phyla Totals					***2,236,182***

agmenellum

2

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11
Top

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	3,500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	1	0.04	700	f	28	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	19		716	f	13,604	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus			255	f	0	
Selenastrum	3		20	m	60	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	32		716	f	22,912	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	8		5,000	f	40,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon			40	w	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**90,742**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium	1		40,000	v	40,000
Glenodinium			38,485	f	0
Totals					**40,000**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	8		200	f	1,600
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**4,892**

9/8/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	12		350	w	4,200
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	22		300	f	6,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	86	0	60,000	(1mm), v,w	1,482,166
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	1		2,000	v,w	2,000
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	10		50	w	500
Tabellaria			2,540	f	0
Totals					**1,675,466**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	221	0	1,130	(1mm), f	36,251
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**36,251**
threads	1,010		500	e	505,000
All Phyla Totals					***2,352,351***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11
Top

S

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Ankistrodesmus			250	w	3,500	
Coelastrum			89	f	0	
Cosmarium	10		1,000	f	10,000	
Desmidium	2	0.03	700	f	42	
Dictyosphaerium	26		111	f	2,886	
Euastrum			350,000	m	0	
Eudorina	6		1,767	f	10,602	
Gloeocystis	40		716	f	28,640	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	2		537	e	1,074	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	22		716	f	15,752	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	20		5,000	f	100,000	
Synechocystis			537	e	0	
Quadrigula	14		65,000	m	910,000	
Tetraodon	58		40	w	2,320	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**1,109,592**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	286	0.02	100,000	(1mm), e	572,000
Uroglena			90,000	w,v	0
Totals					**572,000**

9/22/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	30		350	w	10,500
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	46		300	f	13,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	4		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	301	0.28	60,000	(1mm), v,w	5,056,800
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	4		2,000	v,w	8,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	16		50	w	800
Tabellaria			2,540	f	0
Totals					**5,090,800**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	671	0.08677	1,130	(1mm), f	65,795
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**65,795**
threads	3,182		500	e	1,591,000
All Phyla Totals					***8,429,187***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11
Top

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Ankistrodesmus			250	w	3,500	
Coelastrum			89	f	0	
Cosmarium	6		1,000	f	6,000	
Desmidium			700	f	0	
Dictyosphaerium	12		111	f	1,332	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	12		716	f	8,592	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	2		537	e	1,074	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus			255	f	0	
Selenastrum	6		20	m	120	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	4		716	f	2,864	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	12		5,000	f	60,000	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Tetraodon	24		40	w	960	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**109,218**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	2		200	f	400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	6	0.02	100,000	(1mm), e	12,000
Uroglena			90,000	w,v	0
Totals					**12,400**

10/6/11

Top S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	28		350	w	9,800
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	22		300	f	6,600
Cymbella	4		225	f	900
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	10		225		2,250
Fragilaria	4	0.02	200,000	(1mm), v,w	16,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	460	0.13967	60,000	(1mm), v,w	3,854,800
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	2		870	j	1,740
Stauroneis	2		90,000	m	180,000
Synedra	8		50	w	400
Tabellaria	4		2,540	f	10,160
Totals					**4,082,650**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	100		1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	3,582		500	e	1,791,000
All Phyla Totals					***5,995,268***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (S-mid site)

5/3/11

Mid **S**

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	12		716	f	8,592	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**8,592**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

5/3/11
Mid S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	80		350	w	28,000
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	4		300	f	1,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	92	0.3808333	60,000	(1mm), v,w	2,102,200
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	2		50	w	100
Tabellaria			2,540	f	0
Totals					**2,135,500**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	4	0.07	1,130	(1mm), f	316
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**316**
threads			500	e	0
All Phyla Totals					***2,144,408***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11
Mid

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments.
Crucigenia			716		0	
Ankistrodesmus	1		250	w	250	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	8		716	f	5,728	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Tetraodon			.40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**26,298**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	9		1,272	f	11,448
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**11,448**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	4		200	f	800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**800**

5/17/11
Mid S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	37		350	w	12,950
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	12		300	f	3,600
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	52	0.24375	60,000	(1mm), v,w	760,500
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	3		50	w	150
Tabellaria			2,540	f	0
Totals					**957,200**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***995,746***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Mid

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus	8		250	w	2,000	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	28		716	f	20,048	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**37,048**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	76		200	f	15,200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**15,200**

6/8/11
Mid
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	40		350	w	14,000
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	27		300	f	8,100
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	29	0.213	60,000	(1mm), v,w	370,620
Meridion			160	m	0
Navicula	2		625	j	1,250
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria	7		2,540	f	17,780
Totals					**411,750**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	1	0.02	1,130	(1mm), f	23
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**23**
threads			500	e	0
All Phyla Totals					***464,021***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11
Mid

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus	1		250	w	250	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	1		255	f	255	
Selenastrum	2		20	m	40	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	4		716	f	2,864	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**9,841**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	1		200	f	200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**200**

6/24/11
Mid S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	4		300	f	1,200
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	9	0.131	60,000	(1mm), v,w	70,740
Meridion			160	m	0
Navicula	3		625	j	1,875
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria	5		2,540	f	12,700
Totals					**86,515**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	5	0.054	1,130	(1mm), f	305
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	1	0.02	100,000	(1mm), w	2,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**2,305**
threads	92		500	e	46,000
All Phyla Totals					***144,861***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11
Mid

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume
Crucigenia			716		0
Ankistrodesmus	1		250	w	250
Coelastrum			89	f	0
Cosmarium			1,000	f	0
Desmidium			700	f	0
Dictyosphaerium			111	f	0
Euastrum			350,000	m	0
Eudorina			1,767	f	0
Gloeocystis	3		716	f	2,148
Golenkinia			80	f	0
Gonium			32,652	e	0
Mougeotia			1,111	f	0
Micrasterias			850,000	m	0
One-celled small grn			537	e	0
Oocystis			1,000	e	0
Pandorina			4,000	v	0
Pediastrum			14,138	f	0
Scenedesmus			255	f	0
Selenastrum			20	m	0
Sm grn colonies			100,000	(1mm), e	0
Sphaerocystis	8		716	f	5,728
Spirogyra			500,000	(1 mm), m	0
Spondylosium			950,000	(1mm), m	0
Staurastrum	7		5,000	f	35,000
Synechocystis			537	e	0
Tetraodon	1		40	w	40
Quadrigula			65,000	m	0
Volvox			90,000	m	0
Xanthidium			1,200	f	0
Totals					**42,916**

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	1		7,775	f	7,775
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**7,775**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	7		200	f	1,400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**1,400**

7/6/11
Mid
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	5		350	w	1,750
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	3		300	f	900
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	12	0.0633333	60,000	(1mm), v,w	45,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	1		870	j	870
Stauroneis			90,000	m	0
Synedra	3		50	w	150
Tabellaria	1		2,540	f	2,540
Totals					**51,810**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	5	0.166	1,130	(1mm), f	938
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**938**
threads	1,080		500	e	540,000
All Phyla Totals					***644,839***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11
Mid
S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	10		716	f	7,160	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	6		716	f	4,296	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum			5,000	f	0	
Synechocystis			537	e	0	
Tetraodon	14		40	w	560	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**12,016**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	2		7,775	f	15,550
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**15,550**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	2		90,000	w,v	180,000
Totals					**180,000**

7/18/11
Mid

S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	4		350	w	1,400
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	10		300	f	3,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	2		225		450
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	16	0.09	60,000	(1mm), v,w	86,400
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis	2		90,000	m	180,000
Synedra	4		50	w	200
Tabellaria	6		2,540	f	15,240
Totals					**290,690**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	58	0.0835714	1,130	(1mm), f	5,477
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**5,477**
threads	2,300		500	e	1,150,000
All Phyla Totals					***1,653,733***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11
Mid

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	2		111	f	222	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	6		716	f	4,296	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	8		537	e	4,296	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis			716	f	0	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Tetraodon	18		40	w	720	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**47,810**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	2		1,272	f	2,544
Peridinium	2		40,000	v	80,000
Glenodinium			38,485	f	0
Totals					**82,544**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	4		200	f	800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	188	0.02	100,000	(1mm), e	376,000
Uroglena			90,000	w,v	0
Totals					**376,800**

8/1/11
Mid
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	6		350	w	2,100
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	26		300	f	7,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	24	0.0715385	60,000	(1mm), v,w	103,015
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**116,915**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	144	0.0807143	1,130	(1mm), f	13,134
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**13,134**
threads	1,748		500	e	874,000
All Phyla Totals					***1,511,203***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11
Mid

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	4		1,000	f	4,000	
Desmidium	10	0.029	700	f	203	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina	1		1,767	f	1,767	
Gloeocystis	38		716	f	27,208	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum	2		20	m	40	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	20		716	f	14,320	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	13		5,000	f	65,000	
Synechocystis	3		537	e	1,611	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**114,149**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	6		200	f	1,200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**1,200**

8/25/11
Mid
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	63		350	w	22,050
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	16		300	f	4,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	59	0.1138095	60,000	(1mm), v,w	402,886
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis	11		90,000	m	990,000
Synedra			50	w	0
Tabellaria	4		2,540	f	10,160
Totals					**1,433,896**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	413	0.0848	1,130	(1mm), f	39,575
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**39,575**
threads	314		500	e	157,000
All Phyla Totals					***1,745,820***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11

Mid S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	14		1,000	f	14,000	
Desmidium	2	0.03	700	f	42	
Dictyosphaerium	20		111	f	2,220	
Euastrum			350,000	m	0	
Eudorina	10		1,767	f	17,670	
Gloeocystis	48		716	f	34,368	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	34		537	e	18,258	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	10		14,138	f	141,380	
Scenedesmus	2		255	f	510	
Selenastrum	18		20	m	360	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	17		716	f	12,172	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	14		5,000	f	70,000	
Synechocystis			537	e	0	
Tetraodon	94		40	w	3,760	
Quadrigula	4		65,000	m	260,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**574,740**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	4		90,000	w,v	360,000
Totals					**360,000**

9/8/11
Mid
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	60		350	w	21,000
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	56		300	f	16,800
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia			225		0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	420	0.20074	60,000	(1mm), v,w	5,058,667
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**5,100,467**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	616	0.36963	1,130	(1mm), f	257,292
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	4	0.115	100,000	(1mm), w	46,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**303,292**
threads	2,004		500	e	1,002,000
All Phyla Totals					***7,340,498***

Pump broke, no sample

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11
Mid

S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	4		1,000	f	4,000	
Desmidium			700	f	0	
Dictyosphaerium	4		111	f	444	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	38		716	f	27,208	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	32		537	e	17,184	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	10		14,138	f	141,380	
Scenedesmus	10		255	f	2,550	
Selenastrum	8		20	m	160	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	26		716	f	18,616	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	18		5,000	f	90,000	
Synechocystis			537	e	0	
Tetraodon	56		40	w	2,240	
Quadrigula	4		65,000	m	260,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**563,782**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	4		1,272	f	5,088
Peridinium	2		40,000	v	80,000
Glenodinium			38,485	f	0
Totals					**85,088**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	26	0.02	100,000	(1mm), e	52,000
Uroglena	2		90,000	w,v	180,000
Totals					**232,000**

9/22/11
Mid
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	34		350	w	11,900
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	38		300	f	11,400
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	4		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	2		300	f	600
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	690	0.106129	60,000	(1mm), v,w	4,393,742
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	4		90,000	m	360,000
Synedra			50	w	0
Tabellaria	4		2,540	f	10,160
Totals					**4,789,152**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	308	0.076154	1,130	(1mm), f	26,505
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**26,505**
threads	4,160		500	e	2,080,000
All Phyla Totals					***7,776,527***

Number = Number of cells or colonies per mL
Length = Mean length or diameter of filaments or colonies (mm)
Cell Volume = Volume of cell or colony (μm^3)
Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11
Mid
S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume
Crucigenia	6		716		4,296
Ankistrodesmus			250	w	0
Coelastrum			89	f	0
Cosmarium			1,000	f	0
Desmidium			700	f	0
Dictyosphaerium	18		111	f	1,998
Euastrum			350,000	m	0
Eudorina			1,767	f	0
Gloeocystis	26		716	f	18,616
Golenkinia			80	f	0
Gonium			32,652	e	0
Mougeotia			1,111	f	0
Micrasterias			850,000	m	0
One-celled small grn	16		537	e	8,592
Oocystis			1,000	e	0
Pandorina			4,000	v	0
Pediastrum	2		14,138	f	28,276
Scenedesmus	4		255	f	1,020
Selenastrum			20	m	0
Sm grn colonies			100,000	(1mm), e	0
Sphaerocystis	28		716	f	20,048
Spirogyra			500,000	(1 mm), m	0
Spondylosium			950,000	(1mm), m	0
Staurastrum	12		5,000	f	60,000
Synechocystis			537	e	0
Tetraodon	68		40	w	2,720
Quadrigula			65,000	m	0
Volvox			90,000	m	0
Xanthidium			1,200	f	0
Totals					**141,270**

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena	2		7,775	f	15,550
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**15,550**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	6		200	f	1,200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	2	0.02	100,000	(1mm), e	4,000
Uroglena			90,000	w,v	0
Totals					**5,200**

10/6/11

Mid S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	10		350	w	3,500
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella			300	f	0
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	4		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	4		300	f	1,200
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	792	0.1748	60,000	(1mm), v,w	8,306,496
Meridion			160	m	0
Navicula	4		625	j	2,500
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella	4		870	j	3,480
Stauroneis	2		90,000	m	180,000
Synedra	10		50	w	500
Tabellaria	16		2,540	f	40,640
Totals					**8,543,666**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	270	0.10545455	1,130	(1mm), f	32,174
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0.33	100,000	(1mm), w	66,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**98,174**
threads	3,872		500	e	1,936,000
All Phyla Totals					***10,739,860***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

Newman Lake Phytoplankton Biovolume (S-bot site)

5/3/11

Bot S

Chlorophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*	Comments:
Crucigenia			716			
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	1		1,000	f	1,000	
Desmidium	2	0.15	700	f	1,400	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	9		716	f	6,444	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	3		5,000	f	15,000	
Synechocystis			537	e	0	
Tetraodon	2		40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**24,560**	

Euglenophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	1		200	f	200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**200**

5/3/11

Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	256		350	w	89,600
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	10		300	f	3,000
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	14		250		3,500
Fragilaria	6	0.021667	200,000	(1mm), v,w	26,000
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	388	0.192143	60,000	(1mm), v,w	4,473,086
Meridion			160	m	0
Navicula	9		625	j	5,625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	1		870	j	870
Stauroneis			90,000	m	0
Synedra	5		50	w	250
Tabellaria	12		2,540	f	30,480
Totals					**4,632,411**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	2	0.025	1,130	(1mm), f	57
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**57**
threads	483		500	e	241,500
All Phyla Totals					***4,898,727***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

5/17/11

Bot S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716			
Ankistrodesmus	2		250	w	500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	1		716	f	716	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus	1		255	f	255	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	4		716	f	2,864	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Tetraodon			40	w	0	
Synechocystis			537	e	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**23,473**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	8		1,272	f	10,176
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**10,176**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	12		200	f	2,400
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**2,400**

5/17/11

Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	33		350	w	11,550
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	8		300	f	2,400
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Eunotia					
Epithemia			4,000	m	0
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	79	0.225	60,000	(1mm), v,w	1,066,500
Meridion			160	m	0
Navicula	3		625	j	1,875
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	9		50	w	450
Tabellaria	1		2,540	f	2,540
Totals					**1,085,315**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads			500	e	0
All Phyla Totals					***1,121,364***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate
Estimates:
Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/8/11
Bot
S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716			
Ankistrodesmus	6		250	w	1,500	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis			716	f	0	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	8		716	f	5,728	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	5		5,000	f	25,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**32,228**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	29		200	f	5,800
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**9,092**

6/8/11

Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	5		350	w	1,750
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	9		300	f	2,700
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia					
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	123	0.374	60,000	(1mm), v,w	2,760,120
Meridion			160	m	0
Navicula	6		625	j	3,750
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	6		50	w	300
Tabellaria	1		2,540	f	2,540
Totals					**2,771,160**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	7	0.026	1,130	(1mm), f	206
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	9	0.033	100,000	(1mm), w	29,700
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**29,906**
threads			500	e	0
All Phyla Totals					***2,842,386***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

6/24/11

Bot S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716			
Ankistrodesmus	1		250	w	250	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium	1	0.05	700	f	35	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	1		716	f	716	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**27,287**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas	1		3,292	f	3,292
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**3,292**

6/24/11
Bot
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	18		300	f	5,400
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia					
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	92	0.287	60,000	(1mm), v,w	1,584,240
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	1		50	w	50
Tabellaria			2,540	f	0
Totals					**1,590,315**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena			1,130	(1mm), f	0
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**0**
threads	1		500	e	500
All Phyla Totals					***1,621,394***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/6/11
Bot
S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716			
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	2		716	f	1,432	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	2		5,000	f	10,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**13,580**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

7/6/11
Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella			350	w	0
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	11		300	f	3,300
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia					
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	5	0.062	60,000	(1mm), v,w	18,600
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus	2		2,000	v,w	4,000
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra	10		50	w	500
Tabellaria			2,540	f	0
Totals					**26,400**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	4	0.085	1,130	(1mm), f	384
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**384**
threads	280		500	e	140,000
All Phyla Totals					***180,364***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

7/18/11

Bot S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716			
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	2		111	f	222	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	4		716	f	2,864	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	6		716	f	4,296	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	1		5,000	f	5,000	
Synechocystis			537	e	0	
Tetraodon			40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**12,892**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	20	0.02	100,000	(1mm), e	40,000
Uroglena			90,000	w,v	0
Totals					**40,000**

7/18/11
Bot
S

Bacillariophyta	Number	Length	Cell Volume	Reference	Biovolume
Asterionella	16		350	w	5,600
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella			300	f	0
Cymbella	68		225	f	15,300
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	44		225		900
Fragilaria	12	0.018333	200,000	(1mm), v,w	44,000
Gomphonema	16		300	f	4,800
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	774	0.182121	60,000	(1mm), v,w	8,457,709
Meridion			160	m	0
Navicula	8		625	j	5,000
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	22		870	j	19,140
Stauroneis	42		90,000	m	3,780,000
Synedra	10		50	w	500
Tabellaria	20		2,540	f	50,800
Totals					**12,383,749**

Cyanophyta	Number	Length	Cell Volume	Reference	Biovolume
Anabaena	32	0.0575	1,130	(1mm), f	2,079
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**2,079**
threads	3,868		500	e	1,934,000
All Phyla Totals					***14,372,720***

Pump Broke, No sample

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/1/11
Bot
S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716			
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	3		716	f	2,148	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus			255	f	0	
Selenastrum	1		20	m	20	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	15		716	f	10,740	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	6		5,000	f	30,000	
Synechocystis			537	e	0	
Tetraodon	6		40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**71,184**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	1		200	f	200
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**200**

8/1/11

Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	25		350	w	8,750
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	11		300	f	3,300
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	6		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	92	0	60,000	(1mm), v,w	1,232,064
Meridion			160	m	0
Navicula	1		625	j	625
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria	2		2,540	f	5,080
Totals					**1,250,719**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	157	0.18633	1,130	(1mm), f	33,057
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	4	0.35	100,000	(1mm), w	140,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**173,057**
threads	2,800		500	e	1,400,000
All Phyla Totals					***2,895,160***
Rivularia	2				

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

8/25/11
Bot
S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716			
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	1		1,000	f	1,000	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	2		716	f	1,432	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn			537	e	0	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum			14,138	f	0	
Scenedesmus			255	f	0	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	5		716	f	3,580	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	12		5,000	f	60,000	
Synechocystis			537	e	0	
Tetraodon	11		40	w	0	
Quadrigula	1		65,000	m	65,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**131,012**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon	4		200	f	800
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**800**

8/25/11

Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	14		350	w	4,900
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	11		300	f	3,300
Cymbella			225	f	0
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	1		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema			300	f	0
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	40	0	60,000	(1mm), v,w	526,909
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis			90,000	m	0
Synedra			50	w	0
Tabellaria			2,540	f	0
Totals					**536,009**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	91	0.13211	1,130	(1mm), f	13,584
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**13,584**
threads	70		500	e	35,000
All Phyla Totals					***716,405***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/8/11
Bot S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia	24		716		17,184	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	4		1,000	f	4,000	
Desmidium			700	f	0	
Dictyosphaerium			111	f	0	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	6		716	f	4,296	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	2		537	e	1,074	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	12		14,138	f	169,656	
Scenedesmus	4		255	f	1,020	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	22		716	f	15,752	
Spirogyra	2	0	500,000	(1 mm), m	100,000	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	32		5,000	f	160,000	
Synechocystis			537	e	0	
Tetraodon	32		40	w	0	
Quadrigula	2		65,000	m	130,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**585,798**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena	4		90,000	w,v	360,000
Totals					**360,000**

9/8/11
Bot
S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	100		350	w	35,000
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	86		300	f	25,800
Cymbella	22		225	f	4,950
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	112		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	4		300	f	1,200
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	2,856	0	60,000	(1mm), v,w	41,071,123
Meridion			160	m	0
Navicula	18		625	j	11,250
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	14		870	j	12,180
Stauroneis	32		90,000	m	2,880,000
Synedra	18		50	w	900
Tabellaria			2,540	f	0
Totals					**44,043,303**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	170	0	1,130	(1mm), f	13,447
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**13,447**
threads	1,406		500	e	703,000
All Phyla Totals					***45,705,548***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

9/22/11

Bot S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium	16		1,000	f	16,000	
Desmidium			700	f	0	
Dictyosphaerium	4		111	f	444	
Euastrum			350,000	m	0	
Eudorina			1,767	f	0	
Gloeocystis	30		716	f	21,480	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	32		537	e	17,184	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	2		14,138	f	28,276	
Scenedesmus	6		255	f	1,530	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	32		716	f	22,912	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	16		5,000	f	80,000	
Synechocystis			537	e	0	
Tetraodon	46		40	w	0	
Quadrigula			65,000	m	0	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**187,826**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix			1,272	f	0
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**0**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"	4	0.02	100,000	(1mm), e	8,000
Uroglena	4		90,000	w,v	360,000
Totals					**368,000**

9/22/11

Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	68		350	w	23,800
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella	78		300	f	23,400
Cymbella	2		225	f	450
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	28		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	2		300	f	600
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	1,080	0	60,000	(1mm), v,w	13,697,379
Meridion			160	m	0
Navicula	2		625	j	1,250
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella			870	j	0
Stauroneis	6		90,000	m	540,000
Synedra	14		50	w	700
Tabellaria			2,540	f	0
Totals					**14,288,479**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	514	0	1,130	(1mm), f	15,132
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis	2	0	100,000	(1mm), w	80,000
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			540	e	0
Totals					**95,132**
threads	4,644		500	e	2,322,000
All Phyla Totals					***17,261,437***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

10/6/11

Bot S

Chlorophyta	Number	Length	Cell Volume	Reference	Biovolume	Comments:
Crucigenia			716		0	
Ankistrodesmus			250	w	0	
Coelastrum			89	f	0	
Cosmarium			1,000	f	0	
Desmidium			700	f	0	
Dictyosphaerium	6		111	f	666	
Euastrum			350,000	m	0	
Eudorina	1		1,767	f	1,767	
Gloeocystis	11		716	f	7,876	
Golenkinia			80	f	0	
Gonium			32,652	e	0	
Mougeotia			1,111	f	0	
Micrasterias			850,000	m	0	
One-celled small grn	12		537	e	6,444	
Oocystis			1,000	e	0	
Pandorina			4,000	v	0	
Pediastrum	1		14,138	f	14,138	
Scenedesmus	2		255	f	510	
Selenastrum			20	m	0	
Sm grn colonies			100,000	(1mm), e	0	
Sphaerocystis	31		716	f	22,196	
Spirogyra			500,000	(1 mm), m	0	
Spondylosium			950,000	(1mm), m	0	
Staurastrum	9		5,000	f	45,000	
Synechocystis			537	e	0	
Tetraodon	22		40	w	0	
Quadrigula	7		65,000	m	455,000	
Volvox			90,000	m	0	
Xanthidium			1,200	f	0	
Totals					**553,597**	

Euglenophyta	Number	Length	Cell Volume	Reference	Biovolume
Euglena			7,775	f	0
Phacus			26,000	f	0
Trachelomonas			4,771	f	0
Totals					**0**

Pyrrhophyta	Number	Length	Cell Volume	Reference	Biovolume
Ceratium			50,000	f	0
Closterium			1,000	f	0
Elakatothrix	3		1,272	f	3,816
Peridinium			40,000	v	0
Glenodinium			38,485	f	0
Totals					**3,816**

Chrysophyta	Number	Length	Cell Volume	Reference	Biovolume
Chrysosphaerella			4,000	m	0
Cryptomonas			2,600	f	0
Dinobryon			200	f	0
Gymnodinium			38,485	f	0
Mallomonas			3,292	f	0
Sm brn colonies			100,000	(1mm), e	0
Synura			3,068	f	0
"tiny bubbles"			100,000	(1mm), e	0
Uroglena			90,000	w,v	0
Totals					**0**

10/6/11

Bot S

Bacillariophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Asterionella	42		350	w	14,700
Cavinula			5,000		0
Craticula			3,000	m	0
Cyclotella			300	f	0
Cymbella	1		225	f	225
Diatoma			3,506	f	0
Ellerbeckia			300	e	0
Epithemia			4,000	m	0
Eunotia	1		225		900
Fragilaria			200,000	(1mm), v,w	0
Gomphonema	2		300	f	600
Gyrosigma			1,500	m	0
Melosira (Aulacoseira)	388	0	60,000	(1mm), v,w	6,485,143
Meridion			160	m	0
Navicula			625	j	0
Pinnularia			7,872	f	0
Stephanodiscus			2,000	v,w	0
Surirella	2		870	j	1,740
Stauroneis	1		90,000	m	90,000
Synedra	2		50	w	100
Tabellaria	1		2,540	f	2,540
Totals					**6,595,948**

Cyanophyta	*Number*	*Length*	*Cell Volume*	*Reference*	*Biovolume*
Anabaena	143	1	1,130	(1mm), f	83,530
Anacystis			1,130	(1mm), e	0
Aphanizomenon			163	f	0
Aphanocapsa			40	(1mm),w	0
Gleotrichia			382	f	0
Gomphosphaeria			2,000	w	0
Merismopeida			80	(1mm),w	0
Microcystis			100,000	(1mm), w	0
Oscillatoria			30,000	(1mm), v	0
Single cell with sheath			600	e	0
Totals					**83,530**
threads	3,964		500	e	1,982,000
All Phyla Totals					***9,218,890***

Number = Number of cells or colonies per mL

Length = Mean length or diameter of filaments or colonies (mm)

Cell Volume = Volume of cell or colony (μm^3)

Biovolume = BioVolume (μm^3)/mL

w=Wetzel, 1975
f=Funk, 1974
m=measured (Hillebrand, 1999)
j=juul,
v=vollenweider, 1974
e=estimate

Estimates:

Gonium : measurements from Canter-Lund and Lund (1995), Biovolume calculated using equation for prolate spheriod in Hillebrand (1999)

E3 Laboratories Inc.
SS#4, 360 York Rd., Unit 10, Niagara-on-the-Lake, Ontario L0S 1J0
Email: info@e3labs.ca
Tel: (905) 641-9000, Fax: (905) 641-9001

CERTIFICATE OF ANALYSIS

Washington State University
Barry Moore
P.O. Box 64610
Pullman
99164-6
Tel: 509-335-4006 Fax: 509-335-7862
Email: bcmoore@wsu.edu

Work Order No.:2484347
Received : 2011-10-28
PO Number:
Reported: 2011-11-08
Project Name:
Chain of Custody No.: 20813

Client Sample ID	Sample Date	Lab ID	Parameter	Result	Unit	MDL	Date Analyzed	Method
Newman Mid Sediment	2011-10-14	**268462**	Aluminum	29500	mg/Kg	3.3	2011-11-02	EPA 3005
			Barium	134	mg/Kg	0.090	2011-11-02	EPA 3005
			Beryllium	1.22	mg/Kg	0.060	2011-11-02	EPA 3005
			Bismuth	0.96	mg/Kg	0.60	2011-11-02	EPA 3005
			Boron	2.02	mg/Kg	0.35	2011-11-02	EPA 3005
			Cadmium	0.82	mg/Kg	0.15	2011-11-02	EPA 3005
			Calcium	3650	mg/Kg	10	2011-11-02	EPA 3005
			Chromium	12.1	mg/Kg	0.10	2011-11-02	EPA 3005
			Cobalt	5.07	mg/Kg	0.16	2011-11-02	EPA 3005
			Copper	15.2	mg/Kg	0.15	2011-11-02	EPA 3005
			Iron	17200	mg/Kg	10.0	2011-11-02	EPA 3005
			Lead	16.9	mg/Kg	0.41	2011-11-02	EPA 3005
			Lithium	23.6	mg/Kg	0.35	2011-11-02	EPA 3005
			Magnesium	2420	mg/Kg	2.5	2011-11-02	EPA 3005
			Manganese	203	mg/Kg	0.90	2011-11-02	EPA 3005
			Molybdenum	0.54	mg/Kg	0.19	2011-11-02	EPA 3005
			Nickel	9.42	mg/Kg	0.30	2011-11-02	EPA 3005
			Potassium	1760	mg/Kg	12	2011-11-02	EPA 3005
			Silicon	461	mg/Kg	8.0	2011-11-02	EPA 3005
			Silver	<0.21	mg/Kg	0.21	2011-11-02	EPA 3005
			Sodium	197	mg/Kg	0.80	2011-11-02	EPA 3005
			Strontium	55.2	mg/Kg	0.80	2011-11-02	EPA 3005
			Thallium	<1.28	mg/Kg	1.28	2011-11-02	EPA 3005
			Tin	1.33	mg/Kg	0.42	2011-11-02	EPA 3005
			Titanium	747	mg/Kg	0.35	2011-11-02	EPA 3005
			Tungsten	1.95	mg/Kg	0.75	2011-11-02	EPA 3005
			Vanadium	44.1	mg/Kg	1.0	2011-11-02	EPA 3005
			Zinc	69.5	mg/Kg	1.0	2011-11-02	EPA 3005
			Zirconium	10.9	mg/Kg	6.00	2011-11-02	EPA 3005
Newman South Sediment	2011-10-14	**268463**	Aluminum	26900	mg/Kg	3.3	2011-11-02	EPA 3005
			Barium	126	mg/Kg	0.090	2011-11-02	EPA 3005
			Beryllium	1.07	mg/Kg	0.060	2011-11-02	EPA 3005
			Bismuth	0.94	mg/Kg	0.60	2011-11-02	EPA 3005
			Boron	2.42	mg/Kg	0.35	2011-11-02	EPA 3005
			Cadmium	0.86	mg/Kg	0.15	2011-11-02	EPA 3005

Reported by:

Validity unknown

Nilou Ghazi, Ph.D.,P.Eng.
Laboratory Manager

E3 Laboratories Inc.
SS#4, 360 York Rd., Unit 10, Niagara-on-the-Lake, Ontario L0S 1J0
Email: info@e3labs.ca
Tel: (905) 641-9000, Fax: (905) 641-9001

CERTIFICATE OF ANALYSIS

Washington State University
Barry Moore
P.O. Box 64610
Pullman
99164-6
Tel: 509-335-4006 Fax: 509-335-7862
Email: bcmoore@wsu.edu

Work Order No.:2484347
Received : 2011-10-28
PO Number:
Reported: 2011-11-08
Project Name:
Chain of Custody No.: 20813

Client Sample ID	Sample Date	Lab ID	Parameter	Result	Unit	MDL	Date Analyzed	Method
Newman South Sediment	2011-10-14	**268463**	Calcium	4250	mg/Kg	10	2011-11-02	EPA 3005
			Chromium	13.2	mg/Kg	0.10	2011-11-02	EPA 3005
			Cobalt	6.55	mg/Kg	0.16	2011-11-02	EPA 3005
			Copper	17.2	mg/Kg	0.15	2011-11-02	EPA 3005
			Iron	16300	mg/Kg	10.0	2011-11-02	EPA 3005
			Lead	17.8	mg/Kg	0.41	2011-11-02	EPA 3005
			Lithium	21.9	mg/Kg	0.35	2011-11-02	EPA 3005
			Magnesium	2480	mg/Kg	2.5	2011-11-02	EPA 3005
			Manganese	166	mg/Kg	0.90	2011-11-02	EPA 3005
			Molybdenum	0.72	mg/Kg	0.19	2011-11-02	EPA 3005
			Nickel	10.5	mg/Kg	0.30	2011-11-02	EPA 3005
			Potassium	1740	mg/Kg	12	2011-11-02	EPA 3005
			Silicon	458	mg/Kg	8.0	2011-11-02	EPA 3005
			Silver	<0.21	mg/Kg	0.21	2011-11-02	EPA 3005
			Sodium	235	mg/Kg	0.80	2011-11-02	EPA 3005
			Strontium	58.8	mg/Kg	0.80	2011-11-02	EPA 3005
			Thallium	<1.28	mg/Kg	1.28	2011-11-02	EPA 3005
			Tin	1.28	mg/Kg	0.42	2011-11-02	EPA 3005
			Titanium	780	mg/Kg	0.35	2011-11-02	EPA 3005
			Tungsten	2.07	mg/Kg	0.75	2011-11-02	EPA 3005
			Vanadium	37.1	mg/Kg	1.0	2011-11-02	EPA 3005
			Zinc	81.1	mg/Kg	1.0	2011-11-02	EPA 3005
			Zirconium	16.3	mg/Kg	6.00	2011-11-02	EPA 3005
Newmand North Sediment	2011-10-14	**268464**	Aluminum	30600	mg/Kg	3.3	2011-11-02	EPA 3005
			Barium	137	mg/Kg	0.090	2011-11-02	EPA 3005
			Beryllium	1.20	mg/Kg	0.060	2011-11-02	EPA 3005
			Bismuth	1.00	mg/Kg	0.60	2011-11-02	EPA 3005
			Boron	2.57	mg/Kg	0.35	2011-11-02	EPA 3005
			Cadmium	0.97	mg/Kg	0.15	2011-11-02	EPA 3005
			Calcium	4440	mg/Kg	10	2011-11-02	EPA 3005
			Chromium	13.7	mg/Kg	0.10	2011-11-02	EPA 3005
			Cobalt	7.08	mg/Kg	0.16	2011-11-02	EPA 3005
			Copper	17.0	mg/Kg	0.15	2011-11-02	EPA 3005
			Iron	18200	mg/Kg	10.0	2011-11-02	EPA 3005
			Lead	20.2	mg/Kg	0.41	2011-11-02	EPA 3005

Reported by:

Validity unknown

Nilou Ghazi, Ph.D.,P.Eng.
Laboratory Manager

E3 Laboratories Inc.
SS#4, 360 York Rd., Unit 10, Niagara-on-the-Lake, Ontario L0S 1J0
Email: info@e3labs.ca
Tel: (905) 641-9000, Fax: (905) 641-9001

CERTIFICATE OF ANALYSIS

Washington State University
Barry Moore
P.O. Box 64610
Pullman
99164-6
Tel: 509-335-4006 Fax: 509-335-7862
Email: bcmoore@wsu.edu

Work Order No.:2484347
Received : 2011-10-28
PO Number:
Reported: 2011-11-08
Project Name:
Chain of Custody No.: 20813

Client Sample ID	Sample Date	Lab ID	Parameter	Result	Unit	MDL	Date Analyzed	Method
Newmand North Sediment	2011-10-14	**268464**	Lithium	26.4	mg/Kg	0.35	2011-11-02	EPA 3005
			Magnesium	2880	mg/Kg	2.5	2011-11-02	EPA 3005
			Manganese	176	mg/Kg	0.90	2011-11-02	EPA 3005
			Molybdenum	0.57	mg/Kg	0.19	2011-11-02	EPA 3005
			Nickel	10.9	mg/Kg	0.30	2011-11-02	EPA 3005
			Potassium	1920	mg/Kg	12	2011-11-02	EPA 3005
			Silicon	500	mg/Kg	8.0	2011-11-02	EPA 3005
			Silver	<0.21	mg/Kg	0.21	2011-11-02	EPA 3005
			Sodium	240	mg/Kg	0.80	2011-11-02	EPA 3005
			Strontium	64.2	mg/Kg	0.80	2011-11-02	EPA 3005
			Thallium	<1.28	mg/Kg	1.28	2011-11-02	EPA 3005
			Tin	1.55	mg/Kg	0.42	2011-11-02	EPA 3005
			Titanium	878	mg/Kg	0.35	2011-11-02	EPA 3005
			Tungsten	2.02	mg/Kg	0.75	2011-11-02	EPA 3005
			Vanadium	39.0	mg/Kg	1.0	2011-11-02	EPA 3005
			Zinc	90.4	mg/Kg	1.0	2011-11-02	EPA 3005
			Zirconium	16.4	mg/Kg	6.00	2011-11-02	EPA 3005

Reported by:

Nilou Ghazi, Ph.D.,P.Eng.
Laboratory Manager