WATER QUALITY ANALYSIS OF EASTERN KENTUCKY RESERVOIRS

A Thesis
Presented to
the Faculty of the College of Science and Technology
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In partial Fulfillment
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of Master of Science in Biology

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by

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Accepted by the Faculty of the College of Science and Technology, Morehead State University, in partial fulfillment of the requirements for the Master of Science in Biology degree.

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Morehead State University, 1995

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Eight Eastern Kentucky reservoirs were sampled during the 1994 growing season to determine trophic state and ecological processes. We analyzed conductance, alkalinity, iron, sulfate and the following trophic state index (TSI) parameters: Secchi depth (SD), chlorophyll *a* (CHL), total phosphorus (TP), and total nitrogen (TN). TSI results for each parameter showed distinct differences in trophic state among the reservoirs. In each case, TSI(TP) and TSI(TN) > TSI(SD) > TSI(CHL). Each reservoir also showed a typical decrease in TSI from the upper sites to the dam. The use of upper sites in TSI calculations results in misleading TSIs. Mid-reservoir sites appear to show many dam-like characteristics which would make them useful in determining trophic status. We propose a method of sampling site selection that takes more than just the dam area into consideration, yet excludes the extreme upper sites. These findings need to be considered, especially since the Commonwealth of Kentucky uses only dam sites and chlorophyll *a* to classify their lakes and reservoirs.

Planktonic community structure of seven of these reservoirs (all of mesotrophic status) was also analyzed during the 1994 growing season. Shannon-Weiner Diversity index (H') was used to examine any shifts in diversity along the reservoir's longitudinal gradient and to point out any effects of deleterious watershed activity and whole-lake manipulations (fertilization and liming). Phytoplankton and zooplankton diversities were calculated for each site and averaged into an overall diversity for a given reservoir. Phytoplankton diversities, of most reservoirs, appeared to be highest in the Dam and Mid-reservoir sites. Paintsville had the highest overall diversity of phytoplankton (H' = 1.17) and Cranks Creek had the lowest (H' = 0.95). The Upper site at Cranks Creek had the lowest phytoplankton diversity of all sites sampled (H' = 0.81). This could be due to the haphazzard liming and fertilization that this reservoir has incurred over the past decade. The same general trend was found in the zooplankton samples. Upper sites had the lowest diversities in all reservoirs except Paintsville. Carr Fork had the highest H' (0.95) and Cave Run had the lowest (H' = 0.66). The Upper site at Cave Run had the lowest zooplankton diversity of all sites (H' = 0.63). The low diversities in these sites may be a result of the high turbidity from timber harvesting in this watershed.

Accepted by: Brian C. Reeder, Chair

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Table of Contents

List of Tables and Figures

Appendices (following text)

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Chapter 1
Assessing Trophic State in Eastern Kentucky Reservoirs

1.1 Introduction

The history of production-based lake classification schemes dates back to the early 1900's, but it was not until the early 1970's that the term "eutrophic" became a part of everyday language both in the scientific community and among the popular press (Hutchinson 1973). More recently, as a result of Section 314 of the Clean Water Act of 1977, several schemes have been devised to classify lakes based on their trophic state (Carlson 1991). The classification scheme currently used in the Commonwealth of Kentucky (as well as most other states) is a numerical scale based on relationships between chlorophyll *a* (a surrogate for algal biomass), and or Secchi depth (transparency) and/or total phosphorus (limiting algal nutrient) (Carlson 1977). Kratzer and Brezonik (1981) studied some N-limited lakes in Florida that required a TSI equation for total nitrogen.

Although these TSI equations and relationships work rather well in natural lakes, they tend to vary in reservoirs. Trophic state can also be influenced by a multitude of factors including: geology (Jones and Bachman 1978, Ground and Groeger 1994); lake morphometry (Fee 1979, Wetzel 1983, Duarte and Kalff 1989); watershed type and climate (Wetzel 1983, Duarte and Kalff 1989); total nitrogen content (Reuter et al. 1993, Havens in press); total phosphorus content (Dillon and Rigler 1974, Schindler 1977, 1978); and the ratio of nitrogen:phosphorus (Smith 1979, 1982, 1983). An important consideration when using TSIs in reservoirs is that areas upstream from the dam, which tend to be more streamlike, have high non-algal (tripton) turbidity (Canfield and Bachman1981). High turbidity in these upper sites leads to compressed productivity profiles (Grobbelaar 1989) and TSIs that suggest a light limitation (Carlson 1991).

In the mountians of eastern Kentucky, the trophic state of lakes and reservoirs can also be altered through top-down trophic manipulations (when fish stocking is done) (Carpenter et al. 1987), fertilization, and additions of lime. These common management activites can provide misleading water quality indicators when the goal of examining the trophic state of the lake is to provide a water quality indication of the impact of deleterious watershed practices--timber harvesting and mining.

Kentucky is one of the poorest states in the nation, and the Appalachian region of Eastern Kentucky contains the most economically distressed regions of the state. As is common in impoverished areas, there is often little or no waste disposal network, and sewage treatment systems are sometimes inadequate or nonexistent. Waste from industries (such as agriculture and fossil fuel extraction and processing) is widely evident. Our goal was to determine what types of TSI analysis would provide the best indication of watershed and lake water quality in eastern Kentucky lakes to enhance the management of these areas. .

To accomplish this goal, we: 1) analyzed for the four parameters of commonly used TSIs (Secchi depth, chlorophyll *a* , total phosphorus, and total nitrogen); 2) compared TSI results within and between reservoirs to determine ecological processes and possible effects of watershed changes (coal mining and timber harvesting) and whole-lake manipulations (fertilization and liming); 3) assesed iron, sulfate, and alkalinity relationships to determine possible mine drainage problems; and 4) examined intra-lake variations to propose a method of sample site selection that help provide an accurate indication of the water quality in the lakes.

1.2 Materials and Methods

1.2.1 Study Sites

Eastern Kentucky has essentially no natural lakes. This is a mountainous region with uniform geology (Kentucky Coal Field), vegetation (mixed mesophytic forest), and climate (temperate where precipitation exceeds evaporation). Since there are no natural lakes, reservoirs have been constructed to serve a variety of roles such as flood control, drinking water sources, and recreation. These reservoirs, like most impoundments, occupy an intermediate position between rivers and lakes. They consist of an up-reservoir riverine zone, a mid-reservoir transition zone, and a down-reservoir lacustrine zone (Kimmel et al. 1990). Due to this steeply sloping landscape, all reservoirs in this region have a characteristic transitional gradient from the riverine to lacustrine end, serpentine shape, and morphometry with steep sloping banks. As a result, these reservoirs have a fast hydrologic response time and very little littoral development.

We sampled eight Eastern Kentucky reservoirs during the 1994 growing season (May through September). The eight lakes chosen for analysis provide a range of sizes, shapes, ages, and management practices characteristic of the region (Table 1.1). Some of these impoundments, such as Cave Run Lake, are known world-wide for their sport fisheries. Others, such as Yatesville, are relatively new and somewhat understudied.

All eight impoundments are located in the physiographic region of Eastern Kentucky known as the Kentucky Coal Field. The geology of this area is mostly Pennsylvanian with pyrite, sandstone, ironstone, shalestone, limestone, and coal. As a result of this, several Eastern Kentucky reservoirs, especially those in

Table 1.1-Reservoir Locations and Characteristics

Reservoir	County	Basin	Age (yrs)	Area (ha)
Carr Fork	Knott/Perry	Kentucky	19	287
Cave Run	Rowan/Bath	Licking	21	3347
Cranks Creek	Harlan	Upper Cumberland	30	89
Eagle	Rowan	Licking	44	7
Grayson	Carter/Elliot	Big Sandy	26	612
Martin's Fork	Harlan	Upper Cumberland	16	135
Paintsville	Johnson	Big Sandy	11	461
Yatesville	Lawrence	Big Sandy	3	907

the southernmost region of the state, have been heavily impacted by decades of coal extraction and processing.

1.2.2 Limnological Analyses

All lakes were sampled in at least one upper lake site and one dam site a minimum of three times during the 1994 growing season. One or two mid-lake sites were also sampled in the larger reservoirs. This protocol used is the same as that used for all other lakes sampled by the Kentucky Division of Water (DOW 1994).

In the field, we measured Secchi transparency, photic zone depth (99% extinction using a Li-Cor spherical sensor compared to a reference deck cell), and Hydrolab™ Datasonde III vertical profiles of temperature, pH, specific conductance, and dissolved oxygen. Chlorophyll *a* was measured at 1 m increments within the photic zone *in situ* with a Turner Model 10-AU-005 Flurometer (Turner Designs, Sunyvale, CA 1992). Total suspended solids were measured as oven dried 0.45μm filterable material (APHA 1985).

Integrated photic zone samples were transported, on ice, to the lab and analyzed for ecologically important nutrients. Alkalinity was determined by titrating with 0.02 M H_2SO_4 to a pH of 5.0 using bromo-cresol green/methyl red as an indicator (Wetzel and Likens 1991). Iron was measured using a simplified version of the phenanthroline method (Hach 1992), and sulfate concentrations were determined using the simplified $BaCl_2$ Turbidimetric method (Hach 1992). Filtered water samples were analyzed spectrophotometrically for soluble reactive phosphorus using the ascorbic acid method (Murphy and Riley 1962), ammonia using the Nessler method (Jenkins 1967), nitrite using the sulfanilimide method (Barnes and Folkard 1951), and nitrate using the sulanilimide method following a cadmium reduction (Henrikson and Slemer-Olsen 1970). Samples were analyzed for total phosphorus (TP) using the ascorbic acid method following a persulfate digestion in an autoclave (Gales et al. 1966), and total Kjeldhal nitrogen (TKN) using a modified Nessler method follwing a Kjeldhal digestion in a Lachat BD-46 Block Digestor and subsequent distillation (Lachat 1993).

1.2.3 TSI Equations

Mean Secchi depth and nutrient and chlorophyll *a* concentrations were used to calculate the TSIs based on indicies devised by Carlson (1977) and Kratzer and Brezonik (1981). The TSIs from the three sampling periods were then averaged to get the 1994 TSI for a given parameter:

$$\text{Secchi Depth TSI} = 60 - 14.41 \ln Z_{SD}(\text{m}) \quad \text{(Carlson 1977)}$$

$$\text{Chlorophyll TSI} = 9.81 \ln \text{Chla} (\mu g\ l^{-1}) \quad \text{(Carlson 1977)}$$

$$\text{Total Phosphorus TSI} = 14.42 \ln \text{TP}(\mu g\ l^{-1}) + 4.15 \quad \text{(Carlson 1977)}$$

$$\text{Total Nitrogen TSI} = 54.45 + 14.43 \ln \text{TN}(\mu g\ l^{-1}) \quad \text{(Kratzer and Brezonik 1981)}$$

TSI(AVG) was calculated according to Kratzer and Brezonik (1981). TSI(AVG) is a mean of the chemical, physical, and biological properties of the water. The chemical aspect is the TSI for the "limiting" nutrient. Macronutrient limitation was shown by subtracting TSI(TP) from TSI(TN). A positive number would indicate a phosphorus limitation and a negative number would indicate a nitrogen limitation (Kratzer and Brezonik 1981, Havens in press). The biological aspect is the response to the limiting nutrient concentrations--chlorophyll *a* concentrations. The physical aspect of the TSI is the effect that the chlorophyll has on the clarity of the water (Secchi depth). Kratzer and Brezonik (1981) suggests a mean of these three TSIs should provide a more accurate measure of trophic state if there is a macronutrient limitation and allogenic turbidity does not interfere with TSI(SD).

1.3 Results

All mid-reservoir and dam sites displayed a characteristic hypolimnetic oxygen depletion (<1mg l^{-1} DO) which began in July and continued for the remainder of the sampling period. Most up-reservoir sites (ie. Carr Fork, Cave Run, Eagle, and Yatesville) retained their stream-like characteristics and stayed well mixed throughout the growing season.

Alkalinity, conductivity, sulfate, and iron concentrations were assessed to determine any possible effects of geology or mine drainage on productivity. Since this region contains a significant amount of pyritic rock, we need to consider the effects of the by-products of pyrite oxidation on these reservoirs. Alkalinity, conductivity, and sulfate concentrations were highest in Carr Fork and Cranks Creek and lowest in Eagle. Concentrations of iron (ferrous) were highest in Yatesville and lowest in Martin's Fork (Table 1.2). Conductivity correlated well with both sulfate (r=0.923) and alkalinity (r=0.926). Sulfate also displayed a correlation with alkalinity (r=0.746).

Means were calculated for all other nutrients including: soluble reactive phosphorus (SRP), total phosphorus (TP), total Kjeldhal nitrogen (TKN), nitrate (NO_3), nitrate (NO_2), and ammonia (NH_3). These average values are also included in Table 1.3. *All nitrogen species (NO_3, NO_2, NH_3, and organic N) were combined into a total nitrogen value. The means for each of these parameters were then used in calculating the various TSI's for each reservoir (Table 1.4).

Correlation analysis was also used to ascertain relationships among the TSIs as well as between TSIs and non-TSI parameters. Slight relationships were found between TSI(SD)

Table 1.2-1994 means for Alkalinity, Conductivity, Sulfate, Iron, and Total Suspended Solids

Reservoir	Alk. ($mg\ l^{-1} CaCO_3$)	Cond. ($\mu s\ cm^{-1}$)	SO_4 ($mg\ l^{-1}$)	Fe ($mg\ l^{-1}$)	TSS ($mg\ l^{-1}$)
Carr Fork	77.2	442	103	0.04	4.95
Cave Run	31.7	134	34	0.17	8.87
Cranks Creek	18.3	218	84	0.12	5.75
Eagle	6.3	49	9	0.16	1.80
Grayson	18.1	142	46	0.25	11.28
Martin's Fork	18.2	156	43	0.07	3.05
Paintsville	18.0	103	24	0.18	2.58
Yatesville	19.9	153	32	0.39	5.60

Table 1.3 -TSI Parameter Means From 1994 Growing Season

Reservoir	Z_{sd} (m)	Chl*a* ($\mu g\ l^{-1}$)	TP($\mu g\ l^{-1}$)	TN($mg\ l^{-1}$)
Carr Fork	2.67	2.5	32	1.09
Cave Run	1.83	1.9	34	1.01
Cranks Creek	2.34	2.5	34	1.22
Eagle	2.39	2.9	35	1.11
Grayson	1.56	3.9	77	0.87
Martin's Fork	3.51	1.2	38	0.78
Paintsville	3.02	2.7	56	1.14
Yatesville	2.93	3.9	52	0.99

Table 1.4 -Trophic State Index Results

Reservoir	TSI(SD)	TSI(CHL)	TSI(TP)	TSI(TN)	TSI(AVG)
Carr Fork	46	39	53	53	46
Cave Run	49	37	54	53	46
Cranks Creek	48	39	53	55	47
Eagle	48	41	55	51	47
Grayson	54	44	67	53	50
Martin's Fork	42	32	55	52	42
Paintsville	44	40	62	56	47
Yatesville	45	43	60	51	46

* Scale: 0 - 40 Oligotrophic; 41 - 50 Mesotrophic; 51 - 69 Eutrophic; 70 - 100 Hypereutrophic

and TSI(CHL) and between TSI(TP) and TSI(CHL) (r = 0.594 and 0.614 respectively) which demonstrates that, to a degree, the accepted TSI model of Carlson (1977) is working "properly". However, the relationships are not strong enough to neglect other parameters that may be contributing to production. Iron shows a stronger positive correlation with both TSI(CHL) and TSI(TP) (r = 0.683 and 0.624 respectively). This may be a result of internal loading in the oxygen depleted zones. Alkalinity, sulfate, and conductivity appeared to have no significant impact on any of the four TSIs.

Even though the accepted model appears to be working, regression analysis of TSI(SD) versus chlorophyll *a* concentration shows that Secchi depth does not appear to be determined by the amount of chlorophyll in the water (r^2 = 0.23) (Fig. 1.1). However, TSI(SD) versus TSS (Fig. 1.2) yields a much higher r^2 of 0.8. This suggests that nonalgal turbidity is determining light attenuation in these reservoirs.

Spatial comparison shows that chlorophyll concentrations appear to show an increase in concentration from upper to lower in the larger reservoirs. TSS (which is mostly nonalgal turbidity in the upper sites) displays a typical decreasing trend from up-reservoir to down-reservoir. And, as a result of this, Secchi depth in the upper sites is much more shallow and related to TSS than the dam and mid sites which are more determined by

Figure 1.1-Regression of TSI (SD) v. chlorophyll *a*

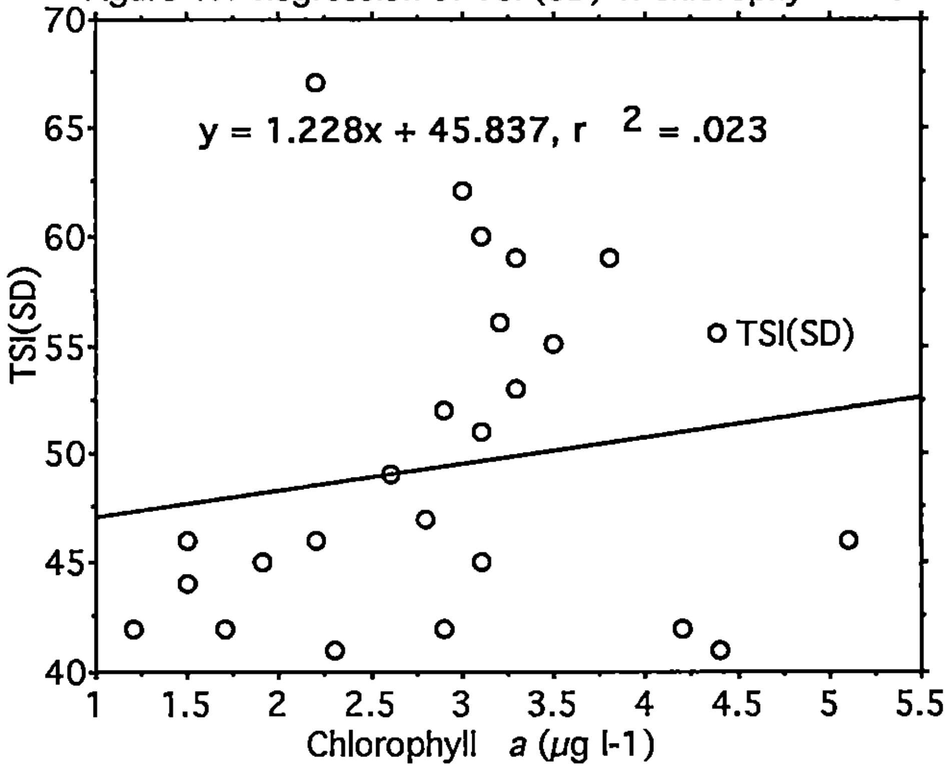
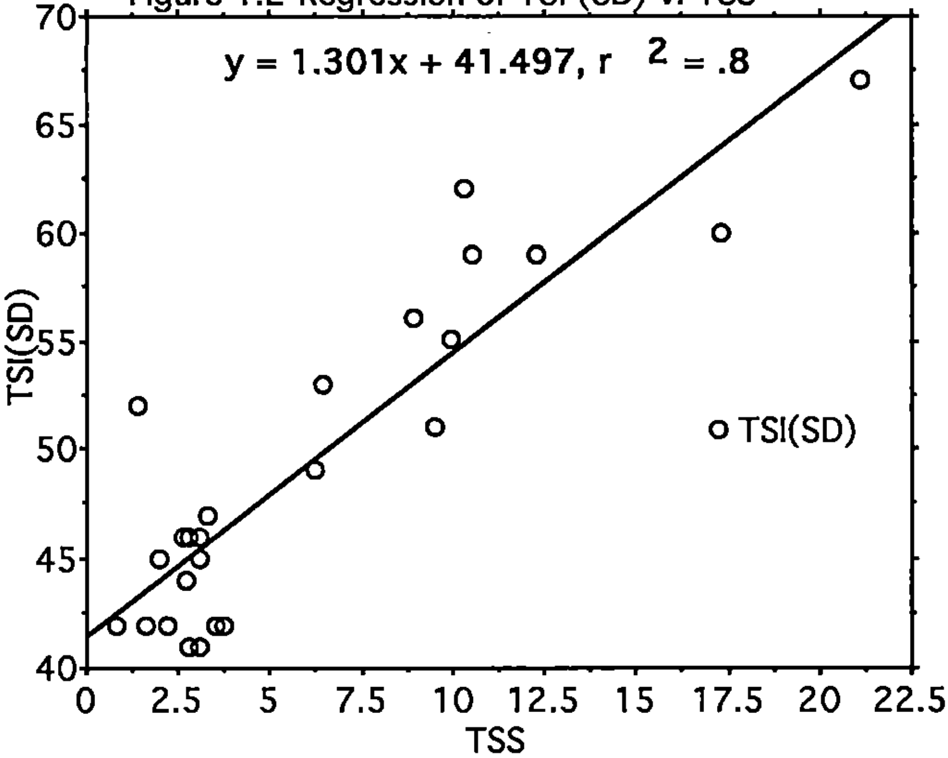


Figure 1.2-Regression of TSI (SD) v. TSS



chlorophyll *a* content. TP and TKN also followed a decreasing trend from upper to dam.

1.4 Discussion

Trophic state results show that the use of any one of the TSI parameters will result in conflicting assessments of eastern Kentucky reservoirs on any given day. According to TSI(AVG) results, all lakes were between 45 and 53 TSI units. Grayson lake had the highest TSI(AVG) of 53. This is interesting because although this was the most productive lake in this survey, Grayson is currently being fertilized to boost its productivity.

Because of the geology and land use practices of this region, we are concerned about the effects of acid mine drainage on our water bodies. There are 3 problems with analyzing simple indicators of mine waste (ie. iron and sulfate concentrations, pH, alkalinity, and conductivity): 1)We are not sure if high iron, sulfate, and conductivity, along with low pH and alkalinity, are the result of runoff from natural sources (in tact Pennsylvanian rock strata) or from mine waste, 2) since all the reservoirs have extraordinarily small surface area:volume ratios, and an abundance of organic material in the bottom, the inevitable bottom anoxia may cause the lake's sediments to release iron and to some extent sulfate, 3) past management practices, such as liming, may disguise the water quality signatures of mine drainage.

Some of the lakes included in this survey (ie. Carr Fork and Cranks Creek) are located in heavily mined areas and have had past pH problems due to the continuous oxidation of an almost endless supply of exposed pyrite (FeS_2). The past influx of sulfuric acid in these reservoirs resulted in an alkalinity drop and a subsequent drop in pH. These impacts decreased production and even led to fish kills. To combat this, lime was used to help offset the problem. Much of this lime use went unmonitored. Although we know, through personal communication, that both Carr Fork and Cranks Creek have been limed in the past decade, we cannot find any data on the application dates or quantities.

This liming appears to have had an impact on some of the chemical and physical aspects of these reservoirs. Sulfate, according to correlation analysis, serves a major role in the specific conductance of eastern Kentucky waters. It also appears to be related to alkalinity. This may be a result of liming in these lakes where mining is common. These lakes were limed when sulfuric acid influx from FeS_2 oxidation was at its peak, therefore sulfate concentrations of these reservoirs would appear to show an increase with alkalinity (or vice versa).

There are two major iron sources and one major sulfate source in eastern Kentucky reservoirs and watersheds. The degree of each depends on the geology and the degree of impact the watershed has had due to mining and mine waste. We assumed that if sulfate concentrations of a reservoir were high in relation to iron then mining was the major source (ie. Carr Fork and Cranks Creek). Conversely, if sulfate concentrations were low in relation to iron then we assumed that the internal loading of iron due to oxygen depletion of the hypolimnion was the significant source (ie. Yatesville, Paintsville, and Eagle).

Local managers have also fertilized Cranks Creek on a regular basis. However, again, no data was kept on the fertilzation scheme. The usual practice was to fertilize to a Secchi depth < 1 m. This was done to rid the shallow areas of emergent macrophytes and to boost whole-lake production. For this reason, it is difficult to assess the impact of this nutrient enrichment as well as the liming that has taken place in the past.

1.4.1 TSI Selection and Use in E. KY Reservoirs

We often have a single site, on a given day, having an oligotrophic rating (most often using chlorophyll *a*) concurrent with a eutrophic rating (usually for total N or P) and perhaps getting a mesotrophic status by yet another indicator (Secchi depth). This situation makes it difficult to make management decisions. The problem of labeling a particular lake's trophic status is confounded when indices are averaged across an entire reservoir, rather than examined only at one site, such as the dam area. If the goal of a trophic state index is to provide an indication of the productivity of a lake ecosystem, and the general environmental quality of a lake and its watershed, it is essential to know how to interpret this conflicting information.

Our TSI results showed a consistent trend where TSI(TP) and TSI(TN) > TSI(SD) > TSI(CHL). Although Carlson (1991) suggests this is characteristic of a light limitating situation, this may not be a completely accurate interpretation of the data. Chlorophyll *a* concentrations in most of these reservoirs appear to increase from the upper sites to the dam sites. This is most likely a result of the compression of productivity profiles by nonalgal turbidity in these turbid, shallow, riverine areas (Grobbelaar 1989). This nonalgal turbidity is creating a light limiting situation in these sites rather than across the entire lake.

For this reason, we propose that the state of Kentucky implement a new method of site selection that includes more areas of the lake in the assessment, yet prevents this upper site turbidity from interfering with the trophic state calculations. Most studies have already addressed this problem but their solution is to measure only "near dam" sites (Kimmel et al. 1990 and Ground and Groeger 1994). These studies give accurate assessments of trophic state, but they are only "near dam" assessments.

Eastern Kentucky reservoirs are generally long and sinuous. To have an assessment of the dam is to have an assessment of a very small portion of the reservoir as a whole. Managers are concerned with the whole watershed. By considering dam sites exclusively, we assess waters that have been cleansed by littoral zones and where sediments have been removed near mid-reservoir areas.

Our study suggests that mid-reservoir sites should be considered as well. These sites generally lack the unusually high nonalgal turbidity of the upper, shallow, riverine sites that would falsely inflate some of the TSI calculations, yet maintain many of the dam site characterisitcs such as hypolimnetic oxygen depletion, noncompressed productivity profiles, and distinct thermal stratification during the growing season. In addition, water quality in the flooded upstream sites provides an indication of runoff from the watershed. From a lake production (trophic) standpoint, the low chlorophyll created by light limitation may not accurately reflect overall lake production. A great deal of allochthonous organic matter (energy) and sediments (with associated nutrients and pollutants) are brought into these areas of a reservoir--although these inputs are usually processed by the ecosystem before they reach the dam. Further, these shallow backwater areas are often popular with anglers and swimmers. Accordingly, we suggest lake trophic assessments should take into account these areas when sampling protocols are being determined.

Our data indicated that Secchi depths should provide the best indication of both how much energy is entering from the watershed, and help assess sediment and nutrient loads in these zones. Therefore, we suggest that the KY Division of Water switch from chlorophyll *a* analysis to Secchi depth. It not only integrates turbidity with chlorophyll in these areas, but when averaged with the dam, it gives a better indication of water quality. We also found that when the nonalgal interference is eliminated, the two parameters [TSI(SD) and TSI(CHL)] are more related. Paired t-test results show that the two TSI's are not significantly different from one another ($p=0.001$) when the upper sites are eliminated. Finally, Secchi measurements are much more cost and time-effective than chlorophyll *a* analysis.

Chapter 2
Planktonic Community Structure in Eastern Kentucky Reservoirs

2.1 Introduction

The abundance and distribution of species in an environment is determined by both biotic and abiotic factors. Past limnological research pertaining to planktonic community structure tended to focus on the importance of abiotic aspects. However, recent evidence supports the idea that biotic interactions are also at work in determining community structure (Carpenter et al. 1985 and Bayne et al. 1994). Some balance between biotic and abiotic processeses must exist--or perhaps there are enven synergistic and/or antagonist effects on the organisms within a lake.

Planktonic community structure of many natural lakes has been determined and quantified since the advent of the microscope. These communities are highly diverse and fluctuate throughout the year (Wetzel 1983 and Marshall and Peters 1989). Hutchinson (1961), in a keystone paper in ecology, adressed the paradox of the high diversity (especially in phytoplankton) in lakes--given a seemingly homogeneous habitat.

Of the multitude of factors that shape phytoplankton communities, competition (Smith 1983), herbivory (Carpenter et al. 1985), nutrient supply (Smith 1979 and 1982 and Dillon and Rigler 1974), season and meteorlogical events (Raschke 1994 and Klarer and Millie 1994), turbidity (Grobbelaar 1989), and pH (Mulholland et al. 1986, Stevenson et al. 1985) are some of the most noted. Because some of these relationships are well developed, some researchers have used photoplankton communities as bioindicators of trophic status (Rosas et al. 1993, Christie and Smol 1993, and Reynolds 1985).

In zooplankton communities, Arnott and Vanni (1991) found that pH and dissolved oxygen, as well as predation by macroinvertebrates (especially *Chaborus americanus* and *Diaptomus leptopus*), were important in determining zooplankton community structure in the absence of predatory fish. When predatory fish were present, Bayne et al. (1994) found that larger zooplankton populations (especially large *Daphnia*) were kept in check. Vanni and Findlay (1990) looked at both the direct and indirect effects of predation on plankton dynamics. They suggested that the alteration of nutrient recycling rates and zooplankton grazing rates by predators had a significant influence on plankton communities. Marzolf (1990) also noted these effects of predation but emphasized the role of competition in determining zooplankton assemblages.

Reserviors do not have the spatial homogeneity of many natural lakes; therefore, in addition to the other factors studied, the planktonic community structure will be determined by the high flow, high nutrient "stream-like" conditions of the upper reaches and flooded tributaries versus the "lake-like" conditions near the dam (with intermediate zones between). The purpose of this study was to:

1) quantitatively assess zooplankton and phytoplankton communities of seven eastern Kentucky reservoirs; and
2) compare community structures between these reservoirs (knowing their trophic state, management history, and impact from mine drainage and timber harvesting).

2.2 Materials and Methods

2.2.1 Study Sites

Seven reserviors representing a range of sizes, ages, management practices located in or near the eastern Kentucky coalfield were analyzed. These reservoirs, like most impoundments, occupy an intermediate position between rivers and lakes. Due to the uniformity of this region, all reservoirs in this region have a characteristic transitional gradient from the riverine to lacustrine end (Kimmel et al. 1990), serpentine shape, and morphometry with steep sloping banks. This unique morphometry not only lacks in structure for fish and zooplankton but also in substrate for periphyton--with little littoral development.

Several reservoirs, especially those in the southernmost region of the state, have been heavily impacted by decades of coal extraction and processing. This has undoubtedly altered the planktonic community makeup in these reservoirs. Unfortunately, even though some of these impoudments are over 30 years old, we have no historical data on planktonic community structure to assess the degree of impact. Details of the sites are provided in section 1.2.1 of this thesis.

2.2.2 Plankton Collection and Enumeration

All lakes were sampled in at least one upper lake site and one dam site a minimum of three times during the 1994 growing season. One or two mid-lake sites were also sampled in the larger reservoirs.

A 30 L Schindler-Patalis plankton trap was used to collect zooplankton within the photic zone (Schindler 1969). Tows were taken at the surface and at one meter intervals within the photic zone. Samples were preserved with neutralized (to about 4% buffered formalin) and stored at 4°C until enumeration. Zooplankton concentrates were homogenized and subsampled with a Hansen-Stempel pipet (Wetzel and Likens 1991). Subsamples were placed in a plankton counting wheel and enumerated under a

30x dissecting scope. Keys for identification included Pennak (1989) and Wetzel and Likens (1991).

Phytoplankton samples were taken from an integrated photic zone sample and stored on ice for transport to the lab. 500 ml samples were then fixed with Lugol's solution and sedimented for at least 24 hours. After sedimentation, approximately 400 ml were drawn off with a weak vacuum, not disturbing the sediment, and the remainder was bottled and stored at 4°C until enumeration. Homogenized phytoplankton samples were concentrated on celullulosic filters (0.45μ) and permanantly mounted using 2-hydroxypropyl methacrylate according to the methodology of Crumpton (1987). Slides were then enumerated with the aid of Hoffman Contrast on a Nikon Labophot-2. All plankton were identified to genus using keys by Prescott (1982) and Prescott (1978).

2.2.3 Calculation of Diversities

Plankton diversities for each site were calculated according to Shannon-Weiner Diversity Index (Zar 1984):

$$H' = - \sum p_i * \log (p_i)$$

$$\text{where } p_i = n_i/N$$

and,

H' = Shannon-Weiner Diversity Index

n_i = number of individuals of a given taxa

N = total number of individuals per site

Site diversities were then averaged into an overall diversity (H') for a given reservoir.

2.3 Results and Discussion

2.3.1 Plankton Community Structure

Genera lists and concentrations for zooplankton and phytoplankton found in these reservoirs are listed in Appendix E and F.

Zooplankton communities of these reservoirs appear to be dominated by copepods and rotifers (especially *Keratella*) during the growing season. Large cladocerans such as *Bosmina* and *Daphnia* were found in all reservoirs but in fewer quantities. Some protozoans (ie. *Difluggia* and *Ceratium*) were also present but in reduced quantities (Figure 2.1).

Phytoplankton community structure was broken down into 5 taxonomic groups: Euglenophyta, Chrysophyta, Chlorophyta, Cyanophyta, and Bacillariophyceae. Figure 2.2 shows the relative percentages of these groups in each reservoir. Carr Fork, Cranks Creek, and Eagle all show a dominance by diatoms (Bacillariophyceae) in relation to the other groups. Yatesville, Paintsville, and Cave Run all show a clear dominance by green algae (Chlorophyta). Martin's Fork displayed a shared dominance of both diatoms and greens. All other groups combined for less than 50% of the total community makeup.

Fig. 2.1-Zooplankton Community Structure of Eastern Kentucky Reservoirs

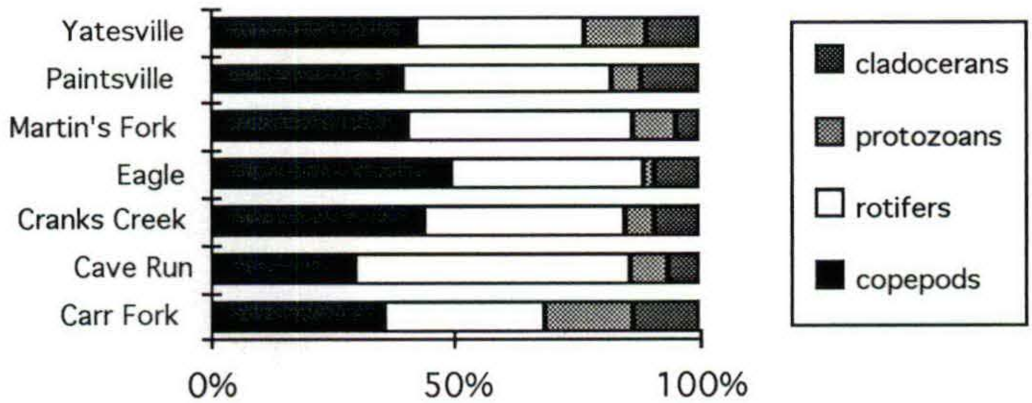
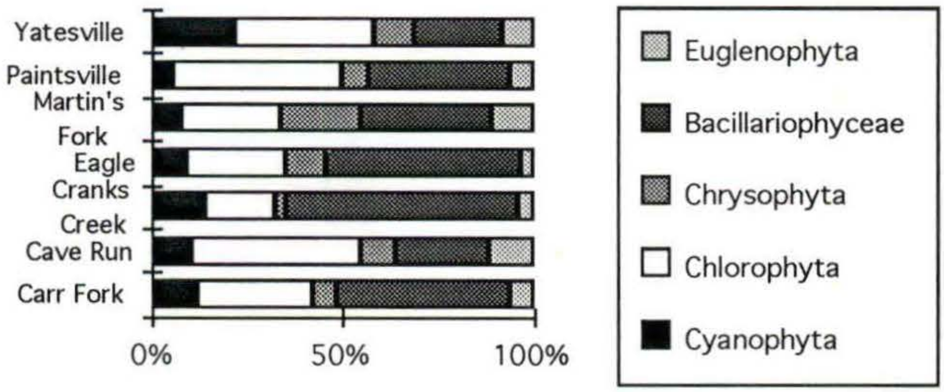


Fig. 2.2-Phytoplankton Community Structure of Eastern Kentucky Reservoirs



2.3.2 Plankton Diversity

Results of phyto- and zooplankton diversity calculations for each site and lake are listed in Table 1. There appeared to be a general trend in both plankton assemblages in many of the reservoirs. Diversities seemed to be highest in the Dam and Mid-reservoir sites and lowest in the Upper sites. However, this did not fit for all reservoirs. In fact, regression anlysis showed that there was no relationship between zooplankton diversity and phytoplankton diversity (r^2=0.2).

Carr Fork had the highest H' for zooplankton and Cave Run had the lowest diversity index (0.96 and 0.66 respectively) of all lakes studied. The upper site of Cave Run had the lowest H' for zooplankton of all other sites studied (H'=0.63). Interestingly, this site also had the highest TSS of all other sites (21.1 mg l^{-1}). The upper site at Yatesville had the second lowest H' for zooplankton and the second highest TSS of all sites (0.64 and 10.3 mg l^{-1} respectively). Both of these watersheds, as well as many others, have been timbered heavily over the past century and this has resulted in a significant increase in turbidity. Although TSS appeared to be related to zooplankton diversity in these sites, correlation analysis of TSS and H' yielded a Pearson's correlation coefficient < 0.1.

Paintsville displayed the highest phytoplankton diversity of all reservoirs (H'=1.17) and Cranks Creek had the lowest (H'=0.95).

Table 2.1-Plankton Diversities by Reservoir and Site

Reservoir	Phytoplankton H'	Zooplankton H'
Carr Fork	**1.10**	**0.96**
Dam	1.11	0.92
Mid	1.15	0.96
Mid	1.06	1.06
Upper	1.06	0.85
Cave Run	**1.05**	**0.66**
Dam	0.99	0.69
Mid	1.14	0.65
Upper	1.02	0.63
Cranks Creek	**0.95**	**0.72**
Dam	1.08	0.78
Upper	0.81	0.65
Eagle	**1.07**	**0.69**
Dam	1.12	0.70
Upper	1.01	0.67
Martin's Fork	**1.00**	**0.69**
Dam	1.02	0.70
Upper	0.97	0.67
Paintsville	**1.17**	**0.77**
Dam	1.17	0.74
Mid	1.16	0.78
Upper	1.16	0.75
Upper	1.18	0.79
Yatesville	**1.13**	**0.78**
Dam	1.14	0.84
Mid	1.15	0.86
Upper	1.10	0.64

The upper site at Paintsville was the most diverse of all sites at 1.18. The upper site at Cranks Creek had the lowest H' (0.81). This could be due, in part, to the haphazzard fertilization and liming that has taken place here in the past decade (see first article).

In reservoirs, we would expect to see the highest diversity of plankton in the down-reservoir (dam sites) areas. This would be a result of a mixing of riverine and lacustrine species. We did not see this distinct trend. One explanation may be the turnover rate of these reservoirs. In this region, precipitation is usually highest during the growing season which would result in high turnover. This "washing out" could prevent lacustrine communities from establishing and diversifying. Deleterious watershed activities (mining and timber harvesting) may also prevent these communities from establishing and diversifying thus resulting in a low plankton diversity.

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APPENDIX A

1994 PROFILES OF TEMPERATURE, DISSOLVED OXYGEN, pH, CONDUCTIVITY, TOTAL DISSOLVED SOLIDS, AND CHLOROPHYLL *a*

Carr Fork 6/8/94

Dam Site 11:50 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	24.68	8.08	348	0.223	7.96	0.8
1	24.41	8.13	349	0.223	7.98	0.8
2	24.28	8.1	348	0.223	7.91	0.9
3	22.34	8.09	335	0.214	8.85	0.9
4	20.58	7.94	340	0.217	9.54	1
5	18.8	7.9	344	0.22	9.41	1.2
6	17.46	7.76	340	0.218	8.53	2
7	16	7.11	329	0.211	5.77	2
8	14.91	7	317	0.203	4.71	2
9	14.25	6.96	318	0.203	4.31	
10	13.97	6.95	321	0.206	4.44	
11	13.58	6.94	320	0.205	4.78	
12	13.21	6.93	319	0.204	4.13	
13	12.89	6.93	317	0.203	4.22	
14	12.36	6.9	318	0.204	3.71	
15	11.98	-	320	0.204	3.4	

Site 20005 1:04 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	26.55	8.12	444	0.285	6.64	2.3
1	25.76	8.12	445	0.286	6.32	3
1.5	25.75	8.1	443	0.283	6.8	3.5

Site 20014 1:42PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	26.16	8.75	458	0.293	8.53	2
1	25.3	8.75	462	0.296	8.56	1.5
2	24.91	8.7	495	0.317	8.65	1.1
3	22.99	8.56	540	0.346	9.25	1
4	20.45	7.92	486	0.311	6.38	1.1
5	18.77	7.21	469	0.3	3.37	2

6	16.77	7.02	427	0.274	0.76	1.8
7	15.66	6.94	397	0.254	0.36	

Site 21001	2:19 PM					
Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	25.75	8.57	392	0.251	8.2	1
1	25.1	8.57	391	0.25	8.22	0.9
2	24.7	8.53	390	0.249	8.6	0.8
3	22.37	8.62	432	0.276	10.1	0.9
4	20.69	8.32	443	0.284	9.42	0.9
5	19.15	8.05	422	0.27	8.86	1.2
6	17.22	7.33	373	0.239	6.6	2.1
7	15.65	7.06	351	0.225	4.62	1.6
8	14.6	6.96	314	0.201	4.28	1.8
9	14.12	6.91	297	0.19	4.31	2.1
10	13.84	6.87	296	0.188	4.04	
11	13.66	6.84	332	0.212	2.91	
12	13.41	6.82	333	0.213	2.75	
13	13.11	6.81	345	0.22	1.43	

Carr Fork 7/9/94

Dam Site	11:32 AM					
Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	28.4	8.9	415	0.266	7.4	1.4
1	28.5	8.9	415	0.266	7.3	1.4
2	28.4	8.9	416	0.266	7.2	1.4
3	28.3	8.9	415	0.265	7.7	1.5
4	25.8	8.8	387	0.248	8.8	1.9
5	23.1	8.6	373	0.238	9.2	1.5
6	19.9	8.1	357	0.228	7.8	1.5
7	17.5	7.7	343	0.219	6.3	2
8	15.5	7.2	314	0.201	2.5	
9	14.7	7.1	311	0.199	1.8	
10	14	7.1	319	0.205	1.6	
11	13.6	7.2	324	0.207	1.6	
12	13	7.2	325	0.208	1.5	
13	12.6	7.2	328	0.21	1.2	
14	12.2	7.1	330	0.211	0.7	

15	11.8	7.2	334	0.214	0.2	

Site 20005	12:33PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (µs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (µg l-1)**
0	28.7	8.5	538	0.344	6.1	2.3
1	28.6	8.5	539	0.345	5.8	2.4
2	28.1	8.2	552	0.353	5.4	2.7
2.5	26.5	8	653	0.418	4.6	

Site 20014	1:08 PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (µs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (µg l-1)**
0	28.8	9	520	0.333	7.4	3.4
1	28.7	9	520	0.333	7.3	3.3
2	28.6	9	520	0.333	6.6	3.2
3	27.7	8.6	554	0.354	5	4.1
4	26.2	7.8	580	0.371	1.4	3.4
5	24.4	7.6	561	0.359	0.1	3.8
6	21.1	7.5	516	0.331	0.1	3.7
7	18.5	7.4	479	0.307	0.1	
8	16.2	7.4	432	0.277	0.1	
8.8	15.3	7.4	409	0.262	0.1	

Site 21001	1:46 PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (µs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (µg l-1)**
0	28.8	9	461	0.295	7	2
1	28.8	9	461	0.295	7	2
2	28.7	9	461	0.295	7	2.1
3	28.5	9	465	0.297	7	2.2
4	25.8	8.5	508	0.325	5.7	3.3
5	24.3	8.1	496	0.318	4.7	3.6
6	19.9	7.5	445	0.285	4	5.5
7	18.5	7.3	395	0.253	2	4.8
8	16.2	7.2	353	0.226	1.1	4.7
9	14.7	7.1	314	0.201	1.2	
10	14.1	7.1	313	0.2	0.6	
11	13.5	7.2	326	0.209	0.3	

12	13.2	7.2	328	0.21	0.1
13	12.8	7.2	340	0.218	0.1
14	12.3	7.2	355	0.277	0.1

Carr Fork 8/20/94

Site 20005 4:05 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28.51	8.6	536	0.345	7.66	4.1
1	28.05	8.5	536	0.345	7.18	
2	26.88	8.1	539	0.345	6.43	

Site 20014 4:23 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	27.74	8.8	543	0.347	7.78	2.9
1	27.57	8.8	543	0.347	7.64	
2	26.85	8.7	543	0.347	6.69	
3	26.51	8.4	538	0.344	5.76	
4	26.27	8.3	536	0.343	5.25	
5	25.99	8	536	0.343	4.19	
6	25.15	7.7	529	0.338	3.44	
7	23.42	7.4	510	0.327	1.38	
8	21.4	7.4	513	0.328	0.73	

Site 21001 4:43 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	27.63	8.6	515	0.33	7.18	2.2
1	27.38	8.6	518	0.331	7.18	
2	27.13	8.6	519	0.332	7.24	
3	26.88	8.6	520	0.333	7.2	
4	26.81	8.6	521	0.333	7.21	
5	26.3	8.5	530	0.339	6.41	
6	25.05	7.9	588	0.375	4.54	
7	23.17	7.2	504	0.323	0.16	
8	18.95	7.1	412	0.264	0.08	
9	16.17	7	344	0.22	0.1	

10	14.65	7	329	0.211	0.13
11	13.92	7	333	0.213	0.17
12	13.33	7.1	338	0.217	0.25
13	13.12	7.1	354	0.226	0.31
14	12.68	7.2	354	0.226	0.49

Dam Site	5:05 PM					
Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	27.7	8.5	448		8.6	2.2
1	27.4	8.5	443		8.8	
2	27.1	8.5	438		8.8	
3	27	8.5	435		8.7	
4	26.7	8.4	438		8.5	
5	26	7.7	434		6.6	
6	25.2	7.4	423		4.9	
7	22.6	7	378		3.4	
8	19.2	6.7	309		0.9	
9	16.6	6.6	273		0.6	
10	15.3	6.5	268		0.5	
11	14.3	6.5	268		0.4	
12	13.8	6.5	274		0.4	
13	13.2	6.6	271		0.4	
14	12.6	6.6	276		0.4	
15	12.2	6.6	274		0.4	

Cave Run 9/7/93

Dam Site	3:10 P.M.			
Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	DO (mg l-1)
0	27.51	8.03	0.1465	7.45
1	27.5	8.07	0.1464	7.46
2	27.4	8.1	0.1465	7.52
3	27.19	8.1	0.1464	7.4
4	27.15	8.06	0.1461	7.5
5	27.11	8.05	0.1463	7.48
6	25.31	7.34	0.1471	3.51
7	23.82	7.05	0.1444	0.72
8	21.85	6.97	0.1469	0.27
9	19.96	6.92	0.1361	0.24
10	18.5	6.89	0.1315	0.2

11	16.77	6.87	0.1297	0.18
12	15.45	6.89	0.129	0.15
13	13.91	6.94	0.1363	0.14
bottom	13.35	6.94	0.1405	0.14

Cave Run 9/8/93

Mid Site	3:30 P.M.			
Depth (m)	Temp. (deg. C)	**pH**	**Cond. (μs cm-1)**	**DO (mg l-1)**
0	28.58	8.45	0.00495	7.98
1	27.4	8.61	0.149	7.55
2	27.19	8.58	0.15	7.57
3	27.07	8.43	0.149	7.01
4	27	8.36	0.149	6.53
5	26.92	8.19	0.152	6.24
6	26.74	7.86	0.152	5.75
7	24.5	7.14	0.159	0.33
8	22.6	6.99	0.154	0.19
9	20.81	6.96	0.1437	0.14
10	19.27	6.98	0.1493	0.13

Cave Run 3/19/94

Mid Site	2:15 P.M.				
Depth (m)	Temp. (deg. C)	**pH**	**Cond. (μs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**
0	6.99	6.89	69	0.04	11.09
1	6.63	6.92	68	0.04	11.99
2	6.6	6.96	68	0.04	11.83
3	6.36	6.99	69	0.04	11.27
4	6.38	7	69	0.04	11.09
5	6.35	7	69	0.04	10.8
6	6.33	7	69	0.04	10.6
7	6.32	7	69	0.04	10.5
8	6.27	7	69	0.04	10.27
9	6.27	7	69	0.04	10.31
10	6.12	7	71.9	0.05	10.43
11	6.05	7	73.1	0.05	10.42
12	5.94	7	75.4	0.05	10.4
13	5.92	7.03	76.6	0.05	10.38
14	5.84	7.03	78.5	0.05	10.07

Cave Run 4/18/94

Dam Site	2:20 P.M.			
Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	DO (mg l-1)
0	13.4	7.01	128	10.2
1	13	7	123	11.2
2	12.3	7.14	121	10
3	11.9	7.1	116	9.9
4	11.8	7.07	113	9.8
5	11.6	7.06	112	9.8
6	11.6	7.04	108	9.7
7	11.5	6.98	106	9.8
8	11.3	6.99	104	9.7
9	11.2	6.99	100	8.2
10	11.1	6.96	99.8	9.6
11	11	6.94	97.7	9.7
12	11	6.92	96.9	9.5
13	10.8	6.89	95	9.5
14	10.5	6.83	95.3	9.4
15	9.6	6.83	93.7	9.5

Mid Site	3:05 PM			
Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	DO (mg l-1)
0	13.6	7.06	121	10.5
1	13.6	7.09	114	10.4
2	12.4	7.07	113	10.2
3	12.2	7.08	111	9.8
4	12	7.06	106	10.4
5	11.4	7.04	108	9.8
6	11.2	7	104	10
7	11.1	7	103	9.9
8	10.9	6.99	99.8	10.1
9	10.8	6.97	98.2	9.9
10	10.4	6.93	97.7	10
11	10.3	6.92	95.6	9.9
12	10.3	6.93	94.4	9.7

Cave Run 5/5/94

Dam Site 10:00 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	16.4	7.5	113	0.073	9.2	1.1
1	16.06	7.45	113	0.073	8.9	1.6
2	15.96	7.4	113	0.073	8.9	1.6
3	15.9	7.3	113	0.073	8.9	1.1
4	15.9	7.25	113	0.073	8.6	2.1
5	15.9	7.2	113	0.073	8.5	0.2
6	15.4	7.1	113	0.073	8.2	0.2
7	14.07	7.04	115	0.074	7.9	
8	13.4	7.04	113	0.072	7.95	
9	12.95	7.04	112	0.072	8.1	
10	12.3	7.03	113	0.073	7.9	
11	11.4	7.04	111	0.071	8	
12	10.98	7.04	112	0.072	7.6	
13	10.44	7.06	111	0.071	7.94	

Mid Site 11:30 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	18.07	7.32	127	0.0814	8.61	1.6
1	16.35	7.33	126	0.0807	8.62	4
2	16.03	7.33	126	0.0804	8.73	0
3	15.9	7.31	126	0.0803	8.64	4.5
4	15.85	7.27	125	0.0802	8.58	3
5	15.76	7.19	125	0.0797	8.51	1.1
6	15.51	7.01	125	0.0799	7.37	0.2
7	14.37	6.8	128	0.0818	6.74	
8	13.61	6.79	126	0.0808	6.51	
9	11.93	6.82	123	0.0785	6.98	
10	11.16	6.8	122	0.0777	6.98	
11	10.35	6.76	121	0.0775	6.36	
12	9.89	6.74	119	0.0764	5.88	
13	9.71	6.73	120	0.0764	5.52	
13.5	9.46	6.72	118	0.0757	4.11	

Upper Site 11:25 A.M.

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)

0	15.1	6.8	149	0.096	6.7	1.1
1	14.95	6.8	149	0.096	6.4	0.8
2	14.8	6.8	149	0.096	6.5	
3	14.7	6.8	150	0.096	6.4	
4	14.6	6.8	152	0.097	6.5	
5	14.55	6.8	152	0.097	6.4	
6	14.55	6.8	153	0.098	6.5	
7	14.55	6.8	153	0.098	6.41	
8	14.55	6.84	153	0.098	6.6	

Cave Run 8/2/94

Dam Site	4:56PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (µs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (µg l-1)**
0	28.37	7.79	131.9	0.0844	7.79	0.5
1	28.31	7.78	131.8	0.0843	7.74	0.5
2	27.65	7.84	131.5	0.0841	7.84	0.6
3	27.5	7.8	139.6	0.0842	7.76	0.5
4	27.28	7.81	131.9	0.0844	7.85	0.6
5	26.81	7.69	132	0.0844	7.711	0.7
6	24.44	7.58	129.8	0.0825	9.411	11.1
7	20.22	7.38	123.9	0.0793	9.99	3.1
8	17.5	6.62	121.3	0.0776	5.7	3.5
9	15.5	6.41	119.4	0.0764	2.04	3.7
10	14.2	6.37	119.9	0.0766	0.82	2.6
11	13.3	6.38	121.5	0.0777	0.41	
12	12.9	6.4	124.5	0.0798	0.54	

Upper Site	3:36PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (µs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (µg l-1)**
0	29.3	8.2	237	0.151	8	2.3
1	26.7	7.9	236	0.151	7.8	4.6
2	26.2	7.1	244	0.156	4	2.9
3	25.1	6.9	268	0.172	1.6	
4	23.8	6.8	263	0.169	1.3	
5	23.2	6.8	254	0.163	1.3	
6	22.9	6.8	254	0.162	1.2	
7	22.9	6.8	254	0.162	1	
8	22.8	6.8	256	0.164	0.4	
9	20.9	6.9	255	0.227	0	

Mid Site 6:28PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28	8.2	138.9	0.0889	7.9	0.4
1	28	8.2	138.9	0.0889	7.9	0.4
2	27.8	8.2	138.4	0.0885	8	0.4
3	27.5	8.2	138	0.0883	7.8	0.5
4	27.2	8.1	138.7	0.0887	7.6	0.5
5	26.8	7.8	137.3	0.0879	7	0.6
6	24.6	6.8	175	0.112	2.6	1.1
7	19.3	6.5	173	0.111	0.15	2.5
8	17.5	6.5	149	0.0955	0	
9	15.8	6.7	155	0.099	0	
10	14.4	6.9	174	0.112	0	
11	13.8	6.9	181	0.116	0	
12	13.4	7	186	0.119	0	

Cranks Creek 6/9/94

Dam Site 7:18 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	24.87	8.46	234	0.15	8.6	2.4
1	24.82	8.45	234	0.15	8.62	2.5
2	23.24	6.93	234	0.15	8.68	2
3	17.88	6.66	204	0.131	8.94	1.7
4	13.89	6.38	163	0.105	7.58	
5	11.26	6.25	139.5	0.0893	6.57	
6	10.26	6.25	129.1	0.0827	7.02	
7	9.82	6.22	126.6	0.081	7.09	
8	9.66	6.21	113.7	0.0729	6.52	
9	9.57	6.2	111	0.071	6.33	
10	9.46	6.19	110	0.0704	6.36	
11	9.46	6.18	106.8	0.0684	5.53	
12	9.56	6.16	100.3	0.0642	5.22	
13	9.54	6.13	92.9	0.0627	4.75	
14	9.52	6.18	97.1	0.0622	4.33	
15	9.51		98.5	0.063	3.89	
16	9.38		101.3	0.0648	3.28	
17	9.36		102.2	0.0654	3.05	
18	9.18		104.3	0.067	1.58	

Upper Site 8:24 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	25.42	9.15	337	0.216	10.93	8
1	25.45	9.14	370	0.231	10	7.8
2	23.16	6.75	445	0.285	6.33	2.5
3	18.61	6.57	307	0.197	5.63	1.6
4	14.55	6.42	243	0.155	3.2	
5	12.27	6.3	180	0.115	3.69	

Cranks Creek 7/8/94

Dam Site 3:30 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	27.9	7.2	269	0.172	6	0.7
1	27.8	7.2	269	0.172	5.9	0.7
2	27.3	6.9	258	0.165	6.5	1.1
3	23	6.7	228	0.146	6.5	1.4
4	18.4	6.6	194	0.124	6.1	1.4
5	14.7	6.5	151	0.097	5.7	1.2
6	11.5	6.5	129.2	0.0827	5.3	2
7	10.2	6.5	120.1	0.0769	5.1	
8	9.8	6.5	114.2	0.0731	4.8	
9	9.5	6.5	112	0.0717	4.5	
10	9.5	6.5	109.6	0.0702	4.2	
11	9.5	6.5	104	0.0665	4	
12	9.5	6.5	100.3	0.0642	3.6	
13	9.4	6.5	99.7	0.0638	2.8	
14	9.3	6.4	104.4	0.0668	1.7	
15	9.2	6.4	107.5	0.0688	0.9	
16	9.2	6.4	108.2	0.0692	0.8	
17	9.2	6.5	109.8	0.0702	0.5	
18	9.4	6.5	112.8	0.0772	0.32	

Upper Site 4:00 P.M.

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28	7.1	287	0.184	5.5	0.7
1	28	7.1	288	0.184	5.5	0.7
2	27.7	7	323	0.207	5.5	0.9
3	23.5	6.9	295	0.189	3	1.3

4	18.1	6.7	217	0.137	2.3	3.1
4.5	14.7	6.7	173	0.11	1.7	

Cranks Creek 7/8/94

Dam Site 12:01 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	26.03	7.3	281	0.18	6.52	2.2
1	25.88	7.3	280	0.179	6.5	
2	25.82	7.3	280	0.179	6.57	
3	25.73	7.2	280	0.179	6.52	
4	23.22	6.6	251	0.161	5.73	
5	19.33	6.4	169	0.108	5.93	
6	14.18	6.4	131.4	0.0843	5.3	
7	11.31	6.3	121.6	0.0778	4.6	
8	10.18	6.3	117.1	0.0749	4.46	
9	9.75	6.3	113.2	0.0724	4.49	
10	9.52	6.3	110.6	0.0707	3.55	
11	9.44	6.3	104.6	0.067	3.56	
12	9.36	6.3	102.1	0.0654	2.7	
13	9.25	6.3	106.8	0.0684	0.52	
14	9.17	6.3	111.1	0.0711	0.08	
15	9.14	9.3	112.7	0.0721	0.09	
16	9.12	6.3	113.9	0.0729	0.12	
17	9.1	6.3	114.6	0.0734	0.2	
18	9.02	6.4	118.5	0.0759	0.36	

Upper Site 12:35 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	26.62	7.2	303	0.194	6.53	2.9
1	26.41	7.2	303	0.194	6.46	
2	26.05	7.1	299	0.191	6.39	
3	25.35	7	319	0.204	6.22	
4	23.68	7	332	0.212	5.99	
5	21.04	6.7	294	0.188	3.49	
6	14.21	6.5	167	0.107	0.34	

Eagle Lake 3/17/94

Dam Site

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	8.22	7.49	45	0.2	11.32
1	8.22	7.28	45	0.29	11.3
2	7.27	7.22	45	0.29	11.43
3	7.1	7.18	45	0.29	11.91
4	6.99	7.14	45	0.29	12.12
5	6.83	7.06	45	0.29	12.3
6	6.65	7.01	45.5	0.29	12.41
7	6.53	6.95	45.7	0.29	12.02
8	5.95	6.91	43.8	0.28	12.21
9	5.64	6.86	44	0.28	11.44

Upper Site

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	8.51	6.71	48	0.031	10.31
1	7.65	6.69	46	0.029	10.61

Eagle Lake 5/23/94

Upper Site 2:30 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	22.4	6.7	49	0.031	8.4
1	20.2	6.5	48	0.031	8.4
2	18.8	6.4	49	0.031	7.9
3	16.4	6.4	48.3	0.031	7.4

Dam Site 3:30 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	25	6.4	49	0.031	8.3
1	20.3	6.3	48	0.031	8.6
2	18	6.2	47	0.03	8.7
3	16.2	6.1	45	0.029	8
4	14.8	6	44	0.028	7
5	14.2	6	42	0.027	6.9
6	13.8	6	43	0.027	6.8
7	13	5.9	44	0.028	6.3
8	12.2	6	46.3	0.0296	5.2

9	11.6	6.1	47.2	0.03	5.3	
10	10.5	6.1	50.4	0.032	2.1	
11	9.37	6.2	57	0.036	1.9	

Eagle Lake 8/1/94

Upper Site 2:32 P.M.

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28.2	7.2	50.2	0.0321	7.34	1.7
1	26.9	7.6	50.2	0.0321	8.67	1.9
1.5	26.7	8.3	50.4	0.0323	9.6	

Dam Site 4:00PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28.5	6.9	50.5	0.0323	7.2	1.6
1	26.8	6.9	50	0.032	7.9	2
2	26.2	6.8	49.6	0.0317	8	2.7
3	25.6	6.6	49.1	0.0314	7.3	1.4
4	23.6	6.1	44.2	0.0283	6.6	4
5	19.3	6.1	46.1	0.0295	7	3.5
6	16.2	6	45.8	0.0293	4.8	3.7
7	13.9	6	48.3	0.0309	0	
8	12.6	6	52.5	0.0336	1	
9	11.5	6.1	57.2	0.0366	0	
10	10.7	6.3	63.8	0.0408	0	
11	10.2	6.4	74.6	0.0477	0	
11.7	10	6.45	82.5	0.0528	0	

Martin's Fork 6/9/94

Dam Site 10:38 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	25.03	7.74	144.5	0.925	7.68	0.6
1	25.01	7.73	144.5	0.923	7.6	0.6
2	24.81	7.48	143.3	0.917	7.62	0.6
3	22.75	7.38	145.7	0.931	8.06	0.8
4	21.24	7.43	153	0.098	8.91	1
5	19.71	7.04	148.2	0.0947	7.33	2.1

6	18.42	6.73	135.1	0.0866	5.84	1.1
7	17.52	6.65	123.5	0.0803	5.4	0.8
8	16.81	6.58	117.7	0.0753	5.17	

Upper Site 11:44 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	25.03	7.73	145.7	0.0932	7.4	1.2
1	25.03	7.8	145.6	0.0932	7.59	1.1
2	24.96	7.78	146	0.0934	7.44	1.1
3	23.21	7.45	141.2	0.0904	7.68	1.1
4	21.34	6.96	118.8	0.0758	6.33	1.5
5	19.32	6.64	128.6	0.0822	5.42	1.1
6	18.11	6.49	121	0.0774	3.28	1.2
7	17.24	6.49	118.6	0.076	2.74	

Martin's Fork 7/8/94

Dam Site 1:45PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28.71	8.18	157	0.101	6.5	0.5
1	28.71	8.17	157	0.101	6.3	0.5
2	28.69	8.1	157	0.101	6.4	0.5
3	28.67	8.08	157	0.101	6.1	0.5
4	28.49	7.84	156	0.1	6.9	0.6
5	26.27	7.14	176	0.112	4.8	0.5

Upper Site 2:20 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28.51	8.3	157	0.101	6.7	0.5
1	28.51	8.3	157	0.101	6.8	0.5
2	28.47	8.18	156	0.1	6.4	0.5
3	27.5	7.49	147	0.099	6.5	1
4	26.2	7.2	133	0.117	5.9	0.7
5	25.37	6.9	155	0.099	3.4	0.6
6	23.43	6.8	157	0.101	1.7	1
6.5	23.43	6.8	154	0.099	0.9	

Martin's Fork 8/20/94

Dam Site	10:49 AM					
Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	26.74	7.6	177	0.113	6.62	0.9
1	26.72	7.6	177	0.113	6.57	
2	26.67	7.6	177	0.113	6.46	
3	26.61	7.5	177	0.113	6.4	
4	26.56	7.3	176	0.113	6.09	
5	26.2	7	178	0.114	4.3	
6	25.52	6.9	177	0.114	3.62	
7	24.73	6.8	186	0.119	2.24	
8	23.46	6.9	163	0.104	2.87	
9	22.17	6.9	163	0.104	1.33	
10	19.19	7	199	0.128	0.34	

Upper Site	11:10 AM					
Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	26.63	7.8	175	0.112	6.74	1
1	26.61	7.8	175	0.112	6.69	
2	25.56	7.8	175	0.112	6.76	
3	26.54	7.8	175	0.112	6.81	
4	26.52	7.8	175	0.112	6.83	
5	26.23	7.6	169	0.109	7.05	
6	25.35	7.5	157	0.1	7.92	

Paintsville 3/23/94

Dam Site	3:36PM				
Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	11.2	6.9	87	0.056	10.8
1	9.8	6.8	87	0.056	10.6
2	8.3	6.8	86	0.055	10.4
3	7.7	6.8	86	0.055	10.5
4	7.5	6.8	86	0.055	10.5
5	7.4	6.8	86	0.055	10.6
6	7.2	6.8	86	0.055	10.4
7	7	6.8	86	0.055	10.5
8	6.7	6.8	86	0.055	10.5

9	6.7	6.7	86	0.055	10.4
10	6.6	6.7	86	0.055	10.3
11	6.5	6.7	86	0.055	10.2
12	6.5	6.7	86	0.055	10.2
13	6.5	6.7	86	0.055	10.1
14	6.4	6.7	86	0.055	10
15	6.2	6.7	86	0.055	9.9
16	6	6.7	87	0.056	9.9
17	5.8	6.7	87	0.056	10
18	5.7	6.7	88	0.056	9.6
19	5.6	6.7	88	0.056	9.6
20	5.5	6.7	90	0.057	9.5
21	5.3	6.7	89	0.057	9.4
22	5.3	6.7	90	0.057	9.3
23	5.3	6.7	90	0.057	9.1
24	5.33	6.8	90	0.058	9.1

Site 20007 5:53PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	10.1	6.8	101	0.065	10.2
1	9.5	6.8	99	0.064	10.2
2	9.2	6.8	97	0.062	10.2
3	7.3	6.7	83	0.053	10.3
4	6.4	6.7	77	0.049	10
5	6.3	6.7	74	0.048	10.2
6	6.2	6.7	72	0.046	10.2
7	6.1	6.7	71	0.045	10.2
8	6.1	6.7	71	0.046	10.1
9	6.1	6.7	71	0.045	9.8
10	6	6.7	71	0.045	9.5
11	6	6.7	70	0.045	9.5
12	6	6.7	70	0.045	9.1
13	6	6.7	71	0.045	8.6

Site 20006 6:12 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	10	6.8	99	0.064	10.2
1	9	6.8	95	0.061	10.1

2	8.8	6.7	95	0.061	10.2
3	8.5	6.7	93	0.06	10
4	6.9	6.7	82	0.053	10
5	6.3	6.7	76	0.049	10.1
6	6.2	6.7	73	0.047	10
7	6.1	6.7	71	0.046	9.7
8	6.1	6.7	71	0.046	10.2
9	6.1	6.7	71	0.045	10.2
10	6	6.7	71	0.045	10
11	5.9	6.7	70	0.044	9.8
12	5.9	6.7	69	0.044	9.8

Site 20008

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	11.3	6.7	107	0.069	10
1	10.8	6.7	106	0.068	9.7
2	8.5	6.7	107	0.067	9.5
3	7	6.6	95	0.061	9.8
4	6.7	6.6	88	0.056	10
5	6.5	6.6	84	0.054	10
6	6.3	6.7	79	0.05	9.9
7	6.23	6.7	77	0.05	9.8
8	6.15	6.7	76	0.049	9.7
9	6.1	6.7	75	0.048	9.6
10	6	6.7	73	0.047	9.3
11	6	6.7	72	0.046	8.9
12	6	6.7	72	0.046	8.7

Paintsville 6/7/94

Dam Site 3:36PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	25.65	7.23	85.9	0.055	9.2	0.6
1	25.13	7.59	85.7	0.0548	9.3	0.8
2	24.12	7.83	85.1	0.0543	9.81	2.1
3	21.16	8.05	83.4	0.0535	11.31	3.5
4	18.48	7.39	83.8	0.0537	11.33	4.7
5	16.35	6.48	86	0.0549	9.74	3.7
6	15.01	6.25	89.6	0.0574	7.56	2.5
7	14.2	6.16	93.8	0.06	6.3	1.6

8	13.72	6.15	95.5	0.061	6.31	1.9
9	13.21	6.14	97	0.0621	6.15	
10	12.85	6.14	96.9	0.062	6.51	
11	12.47	6.15	96	0.0615	6.64	
12	12.06	6.12	96.4	0.0617	6.3	
13	11.36	6.09	94.4	0.0604	6.54	
14	10.23	6.08	88.1	0.0564	7.21	
15	9.15		81.9	0.0525	7.86	
16	8.69		80.8	0.0517	8.24	
17	8.35		80.2	0.0513	8.38	
18	8.02		80.5	0.0515	8.08	
19	7.65		80.6	0.0516	7.84	
20	7.38		80.4	0.0514	7.97	
21	7.22		80.6	0.0515	6.81	
22	6.88		81.5	0.052	6.53	
23	6.73		81.5	0.0522	6.01	
24	6.69		83.7	0.0534	5.58	

Site 20006	12:09PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (μs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (μg l-1)**
0	25.64	7.41	95.6	0.0613	9.11	0.8
1	24.37	7.47	95.1	0.0609	9.06	1
2	23.55	7.75	95.9	0.0614	9.56	1.1
3	21.66	7.68	100.7	0.0644	10.32	1.6
4	18.89	7.03	113.2	0.0722	8.35	0.7
5	16.54	6.33	110	0.0704	5.65	1.5
6	15.1	6.23	103.1	0.0659	5.37	1.6
7	14.29	6.18	97.7	0.0625	5.44	1.8
8	13.61	6.14	90.1	0.0577	5.6	
9	13.33	6.11	87.2	0.0558	5.62	
10	13	6.08	84.9	0.0544	5.51	
11	12.62	6.11	86.9	0.0559	6.73	

Site 20007	9:37 AM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (μs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (μg l-1)**
0	24.1	7.28	102.2	0.0654	9.11	0.8
1	23.77	7.32	101.8	0.0652	9.21	1
2	23.37	7.46	97.6	0.0625	9.66	1.7

3	21.41	7.51	109	0.0697	10.19	3
4	19.87	6.8	117.5	0.0751	8.85	2.3
5	17.68	6.53	124	0.0794	5.12	1.7
6	15.68	6.41	113.2	0.075	3.99	1.6
7	14.27	6.28	108.3	0.0693	3.95	1.6
8	13.68	6.28	103.6	0.0663	3.91	
9	13.23	6.24	103.6	0.0664	3.35	
10	12.82	6.23	103.7	0.0663	2.74	
11	12.56	6.23	104.7	0.067	1.96	
12	12.11	6.2	106	0.068	1.03	
13	11.62	6.18	107.1	0.0684	0.44	

Site 20008	10:45 AM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (μs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (μg l-1)**
0	24.42	7.4	102.6	0.0657	9.04	0.8
1	23.93	7.51	103.1	0.066	9.2	0.9
2	23.23	7.75	102.3	0.0654	9.82	1.1
3	21.62	7.75	108.4	0.0695	10.03	3.2
4	19.84	6.82	119.6	0.0765	7.52	1.6
5	17.68	6.46	127.9	0.0819	4.23	1.1
6	15.62	6.31	119.5	0.0767	3.7	1.2
7	14.27	6.32	107.2	0.0687	4.08	
8	13.64	6.25	104.1	0.0667	3.6	
9	13.24	6.22	103.3	0.0661	3.48	
10	12.92	6.2	102.3	0.0655	3.09	
11	12.56	6.16	107.4	0.0687	1.76	
12	12.27	6.14	107.6	0.0687	1.19	
13	11.9	6.2	108.8	0.0696	2.08	

Paintsville 7/9/94

Dam Site	5:38PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (μs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (μg l-1)**
0	29.2	7.9	87.1	0.0557	6.6	0.6
1	29.2	7.9	87.1	0.0557	6.2	1.1
2	29.2	8	87.1	0.0557	6.2	1.5
3	26.9	8.7	86.8	0.0554	8.6	4.1
4	24.3	8.8	87.2	0.0559	9.8	5.3
5	21.3	8	87.3	0.056	9.4	7
6	17.3	6.8	89.1	0.057	6.6	7.5

7	15.3	6.7	93.1	0.0596	4.7	7.2
8	14.1	6.7	94.6	0.0606	4.2	6.7
9	13.4	6.5	97.2	0.0622	3.9	6.2
10	12.8	6.5	96.8	0.062	3.9	
11	12.3	6.5	97.6	0.0625	3.7	
12	11.7	6.5	97.5	0.0624	3.5	
13	10.9	6.5	95.2	0.0609	3.8	
14	9.8	6.4	87.8	0.0562	4.6	
15	9.3	6.5	83.9	0.0537	5.3	
16	8.7	6.5	82.3	0.0527	5.4	
17	8.2	6.5	81.6	0.0522	5.4	
18	8	6.4	81.2	0.0519	5.5	
19	7.6	6.4	81.3	0.052	5.3	
20	7.4	6.4	81.2	0.052	5	
21	7.1	6.4	82.1	0.0526	4.7	
22	7	6.4	83.3	0.0533	3.5	
23	6.9	6.4	82.8	0.053	3.7	
24	6.8	6.4	83.5	0.0534	3.2	
25	6.7	6.4	84.1	0.0538	2.7	
26	6.7	6.4	89.6	0.0574	0.8	
27	6.7	6.5	92.7	0.0593	0	
28	6.7	6.6	96.8	0.0619	0	
29	6.7	6.6	100	0.064	0	

Site 20007	10:45AM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (μs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (μg l-1)**
0	28.6	7.4	104.2	0.0667	5.8	2
1	28.5	7.4	104.2	0.0667	5.7	1.9
2	28.3	7.4	104.5	0.0669	5.8	1.9
3	28.1	7.3	119.9	0.0767	6	2.1
4	24.5	6.8	139.9	0.0895	1.7	2.7
5	19.8	6.7	125.7	0.0804	1	2
6	17	6.6	126.4	0.0809	0.1	2.2
7	15.4	6.6	122.1	0.0781	0.1	
8	14.4	6.6	126.3	0.0808	0.1	
9	13.6	6.6	129.3	0.0829	0.1	

Site 20008	11:15AM					
Depth	**Temp.**	**pH**	**Cond.**	**TDS**	**DO**	**chl a**

(m)	(deg. C)		(µs cm-1)	(mg l-1)	(mg l-1)	(µg l-1)
0	28.7	7.4	104.3	0.0668	6	1.8
1	28.5	7.4	103.7	0.0664	5.8	1.2
2	28.4	7.4	104.1	0.0666	5.8	1.5
3	28.3	7.3	105.9	0.0678	5.6	1.8
4	24.2	6.8	138.6	0.0887	1.6	2.3
5	19.4	6.7	127	0.0813	0.2	2.6
6	16.5	6.7	126.4	0.0809	0.1	3.1
7	15.3	6.7	123.1	0.0788	0.1	
8	14.3	6.7	126.1	0.0807	0.1	
9	13.7	6.7	127.2	0.0814	0.1	
10	13.3	6.7	131.9	0.0844	0.1	
10.8	13.1	6.7	138.6	0.0887	0.1	

Site 20006 12:25 P.M.

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	28.8	7.4	95.5	0.0611	6.3	1.6
1	28.7	7.4	95.4	0.0611	5.9	1.6
2	28.6	7.4	95	0.0608	5.6	2.2
3	27.7	7.1	107.9	0.0691	6	2.3
4	24	7.1	125.7	0.0804	6	7.6
5	19.2	6.8	109.8	0.0703	5.6	7.2
6	17.1	6.6	105.2	0.0673	2.6	7.1
7	15.2	6.5	100.3	0.0642	1.5	6.7
8	14	6.5	97	0.062	1.2	
9	13.3	6.5	93.2	0.0597	1.2	
10	12.8	6.5	92.2	0.059	0.8	
11	12.5	6.5	96.5	0.0618	0.1	
12	12.2	6.5	100.1	0.0641	0.1	

Paintsville 8/9/94

Dam Site 11:01AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (µg l-1)
0	27.6	7.6	88	0.0563	7.6	0.6
1	26.8	7.7	88.1	0.0564	7.6	0.6
2	26.7	7.6	88	0.0563	7.5	0.6
3	26.5	7.5	87.8	0.0562	7.4	0.6
4	26	7.4	87.8	0.0562	7.8	0.8

5	21.9	6.8	89.7	0.0574	7.8	1.2
6	19.8	6.6	90.7	0.058	5.9	1.6
7	16.9	6.4	93.4	0.0598	4.3	2.9
8	14.9	6.4	96.1	0.0615	3.5	3
9	13.9	6.3	97	0.0621	3.4	2.8
10	13	6.3	97.7	0.0625	3.3	2.3
11	12.3	6.3	97.7	0.0625	3	
12	11.9	6.3	96.5	0.0618	2.5	
13	11.2	6.3	94.7	0.0606	2.7	
14	10.3	6.3	91	0.0582	3.6	
15	9	6.3	83.8	0.0536	5.1	
16	8.6	6.3	82.3	0.0526	5.4	
17	8.3	6.3	81.7	0.0523	5.7	
18	7.8	6.3	81.5	0.0521	5.7	
19	7.6	6.3	81.9	0.0524	5	
20	7.4	6.2	82	0.0525	4.6	
21	7.2	6.2	82.4	0.0527	4.2	
22	7	6.2	83.2	0.0532	3.3	
23	6.9	6.2	84.5	0.0541	2.4	
24	6.9	6.3	86.1	0.0551	1.4	
25	6.8	6.3	91.4	0.0585	0.2	

Site 20006	1:17PM					
Depth (m)	**Temp. (deg. C)**	**pH**	**Cond. (µs cm-1)**	**TDS (mg l-1)**	**DO (mg l-1)**	**chl a (µg l-1)**
0	28.8	7.6	107	0.0685	7.3	1.3
1	26.3	7.6	106.4	0.068	7.5	2.4
2	26.6	7.5	106.4	0.068	7.2	2.8
3	26.5	7.4	106.4	0.068	7	3.5
4	25.8	6.9	123.7	0.0794	4.8	5.3
5	23.8	6.7	157	0.101	0.6	6.3
6	19.9	6.3	118.2	0.0757	0	4.9
7	17	6.3	111.6	0.0714	0	
8	15.1	6.3	105.4	0.0674	0	
9	13.9	6.3	101.7	0.0651	0	
10	13.4	6.4	104.2	0.0667	0	
11	12.9	6.5	107.1	0.0686	0	
12	12.6	6.5	111.8	0.0716	0	

Site 20007	12:12PM					
Depth	**Temp.**	**pH**	**Cond.**	**TDS**	**DO**	**chl a**

(m)	(deg. C)		(μs cm-1)	(mg l-1)	(mg l-1)	(μg l-1)
0	27.3	7.6	111	0.0711	7.4	0.7
1	26.5	7.6	110.6	0.0708	7.4	1.8
2	26.3	7.6	111.1	0.0711	7.5	2.1
3	26.2	7.4	110.8	0.0709	7.1	2
4	25.6	7	127.9	0.0819	4.7	2.5
5	23.8	6.8	153	0.098	2.6	3.4
6	20.3	6.6	157	0.101	0	6.4
7	17.2	6.6	151	0.097	0	
8	15.2	6.7	150	0.096	0	
9	14.3	6.7	144.9	0.0928	0	
10	13.6	6.7	151	0.097	0	
11	13.1	6.8	159	0.102	0	
12	12.7	6.8	164	0.105	0	
13	11.9	6.9	170	0.109	0	
13.6	11.6	6.9	174	0.112	0	

Site 20008	12:51PM					
Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	27.6	7.6	111.2	0.0712	7.8	1.8
1	26.4	7.6	111	0.071	7.6	2.2
2	26.2	7.5	110.6	0.0708	7.2	3.4
3	26.1	7.3	111.1	0.0711	6.5	4
4	25.6	6.8	116.5	0.0764	4.4	4.8
5	23.6	6.6	153	0.098	0	6
6	20.2	6.6	155	0.099	0	8.6
7	17.2	6.6	151	0.097	0	
8	15.3	6.6	150	0.096	0	
9	14.2	6.7	149	0.095	0	
10	13.4	6.8	157	0.101	0	
11	12.9	6.8	160	0.103	0	
12	12.3	6.8	168	0.107	0	
13	11.9	6.9	173	0.111	0	
13.5	11.8	6.9	174	0.112	0	

Yatesville 3/22/94

Dam Site	11:00 AM				
Depth	Temp.	pH	Cond.	TDS	DO

(m)	(deg. C)		(µs cm-1)	(mg l-1)	(mg l-1)
0	10.3	6.9	92	0.06	10.4
1	9.2	6.9	92	0.06	10.2
2	8.4	6.9	92	0.06	10.1
3	7.97	6.9	88	0.06	9.9
4	7.6	6.9	92	0.06	10.2
5	7.37	6.9	91	0.06	10.2
6	7	6.89	89	0.06	10
7	6.86	6.91	88	0.06	10.22
7.5	6.86	6.92	88	0.06	10.06

Yatesville 3/23/94

Dam Site 11:34 AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	12.5	6.6	94	0.06	10.4
1	9.7	6.6	93	0.06	10.2
2	9	6.6	92	0.059	10.4
3	8.3	6.6	89	0.057	10.3
4	8	6.6	90	0.058	10.2
5	7.7	6.6	91	0.058	10.2
6	7.3	6.6	91	0.058	10.3
7	7.1	6.6	90	0.058	10.7
7.5	7.1	6.6	91	0.058	10.1

Mid Site 12:22AM

Depth (m)	Temp. (deg. C)	pH	Cond. (µs cm-1)	TDS (mg l-1)	DO (mg l-1)
0	10.6	6.7	171	0.11	9.7
1	10.2	6.7	171	0.11	9.6
2	9.4	6.7	166	0.11	9.8
3	8.7	6.7	164	0.11	9.8
3.3	8.5	6.7	162	0.1	9.3

Upper Site 1:25 AM

depth	temp	pH	conductance	tds	DO
0	11	6.7	136	0.087	9.7
1	10.5	6.7	145	0.093	9.6
2	10.2	6.7	145	0.093	9.6

3	10.1	6.7	144.5	0.093	9.9	
4	10.1	6.8	145	0.093	9.9	

Yatesville 6/6/94

Dam Site 9:35AM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	24.35	7.13	130.1	0.0833	7.24	1
1	24.15	7.17	130.3	0.0834	7.16	1
2	24.06	7.16	130.2	0.0833	7.22	1
3	22.2	7.26	129	0.0825	8.54	1.1
4	18.31	6.86	129.2	0.0827	8.15	1.5
5	16.45	6.47	127.6	0.0817	5.65	1.9
6	15.03	6.36	121.2	0.0776	3.42	2.1
7	14.11	6.33	114.9	0.0736	3.18	1.9
8	13.7	6.32	111.5	0.0713	2.95	
9	13.44	6.33	110.9	0.071	2.41	
10	13.08	6.35	107.5	0.0688	1.9	
11	12.31	6.4	118.8	0.0764	1.5	

Mid Site 10:51AM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	24.57	7.07	126.8	0.0812	7.19	0.7
1	24.59	7.04	126.9	0.0812	7.11	0.7
2	24.39	7.06	126	0.0807	7.21	0.8
3	21.75	7.28	120.2	0.0771	8.84	1.2
4	18.19	6.55	117.8	0.0754	5.75	3
5	16.12	6.09	122.4	0.0779	2.55	2.8
6	15.08	6.05	130	0.0834	1.74	1.6

Upper Site 12:06PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	25.55	7.11	157	0.1	7.29	1.9
1	24.8	7.09	157	0.1	7.15	3.5
2	21.45	6.69	185	0.119	5.02	3.8
3	20.03	6.63	240	0.156	5.05	3.1
4	18.44	6.59	276	0.177	4.77	
5	17.3	6.52	287	0.184	3.94	

6	16.23	6.5	295	0.188	2.36	

Yatesville 7/10/94

Dam Site 2:26 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	29.5	7.6	135.3	0.0866	6.2	5.2
1	29.4	7.6	135.3	0.0866	6.3	6.1
2	29.4	7.6	135.1	0.0865	6	6.7
3	28.8	7.6	134.7	0.0862	6.2	7
4	24.9	7.6	130.4	0.0834	8.6	8.4
5	19.1	7.5	123.4	0.0788	9.2	9.1
6	16.8	7	118.8	0.0761	8.6	12.3
7	14.9	6.6	115.1	0.0737	1.7	10
8	13.9	6.6	113.5	0.0727	0.2	14.8
9	13.02	6.6	117.9	0.0755	0.1	10.2
10	12.7	6.6	122.3	0.0783	0.1	
10.8	12.6	6.6	125	0.08	0.1	

Mid Site 3:15 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	29.1	7.6	129.3	0.0827	6.4	2.1
1	29.1	7.6	129.2	0.0827	6.4	2.3
2	28.7	7.6	129.1	0.0826	6.1	2.5
3	28.5	7.5	129	0.0825	6.5	4.5
4	23.8	7.2	144.7	0.0926	7.9	8.5
5	19.9	6.7	158	0.107	3	7.2
6	16.9	6.6	143.2	0.0916	0.3	7.7
7	15.5	6.7	142	0.0909	0.1	11.2
8	14	6.9	165	0.105	0.1	22.4
8.9	13.5	6.9	170	0.109	0.1	

Upper Site 4:12 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	29.7	7.6	171	0.11	6.5	3.3
1	29.3	7.5	171	0.109	6.1	3.5
2	27.7	7.1	170	0.109	4.8	3.4
3	24.5	6.8	244	0.156	0.1	
4	22.1	7	299	0.191	0.1	

5	18.5	7.1	319	0.204	0.1	
6	17.1	7.2	327	0.209	0.1	

Yatesville 8/8/94

Dam Site 2:21PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	27.7	7.5	134.9	0.0863	7.9	0.8
1	27.3	7.5	134.6	0.0862	7.4	0.8
2	26.6	7.5	134.4	0.0886	7.3	0.7
3	26.4	7.5	134.5	0.0861	7.3	2.6
4	25.9	7.5	134.1	0.0859	7.6	1.4
5	23.6	7.2	124.3	0.0796	10.2	4.7
6	18.4	6.4	118.1	0.0756	3.8	5.5
7	15.9	6.3	117	0.0794	0.8	5.3
8	13.9	6.4	117.6	0.0752	0.1	
9	13	6.5	122.3	0.0783	0.1	
10	12.7	6.6	131.5	0.0841	0.1	
11	12.1	6.8	145.4	0.0933	0.1	
12	10.8	7.16	302	0.199	0.1	

Mid Site 5:08PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	27.8	7.3	139.4	0.0892	7.4	0.3
1	27.7	7.2	139	0.089	7.4	0.5
2	26.7	7.2	136	0.0871	7.3	0.7
3	26.5	7.2	135.6	0.0868	7	0.9
4	26	7	136.5	0.0874	6.5	1.9
5	23.3	°6.5	222	0.142	0.9	5.4
6	18.1	6.4	143	0.0915	0.1	15
7	15.8	6.6	174	0.112	0.1	
8	14.5	6.7	197	0.126	0.1	
8.7	13.9	6.9	230	0.147	0.1	

Upper Site 6:00 PM

Depth (m)	Temp. (deg. C)	pH	Cond. (μs cm-1)	TDS (mg l-1)	DO (mg l-1)	chl a (μg l-1)
0	29.4	7.6	170	0.109	8.2	1.7
1	26.6	7.2	164	0.105	7.4	3.9
2	24.8	6.8	172	0.11	4.1	2.3

3	24.1	6.8	190	0.122	3.6
4	23.5	6.8	225	0.144	2.9
5	22.6	6.7	245	0.157	1.3
5.7	22.5	6.7	213	0.137	1

APPENDIX B

1994 NUTRIENT (SRP, NH_3, NO_3, NO_2, SO_4, AND Fe) VALUES FOR ALL SITES AND RESERVOIRS

Carr Fork

6/8/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.03	0.03	1.1	0.008	95	0
20005	0.03	0.04	0	0.005	108	0.03
20014	0.07	0.11	0	0.016	117	0
21001	0	0.05	0.3	0.017	104	0.01
Means	0.0325	0.0575	0.35	0.0115	106	0.01

7/9/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.04	0.17	0	0.001	86	0
20005	0.02	0.09	0	0.002	101	0.11
20014	0.01	0.37	0	0.001	102	0.07
21001	0.01	0.12	0	0.001	94	0
Means	0.02	0.1875	0	0.00125	95.75	0.045

8/16/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0.17	0	0.001	95	0.02
20005	0.01	0.25	0	0.001	108	0.12
20014	0.01	0.3	0	0	117	0.09
21001	0.02	0.21	0	0.001	104	0.03
Means	0.0125	0.2325	0	0.00075	106	0.065
Mean	**0.0217**	**0.1592**	**0.1167**	**0.0045**	**102.58**	**0.04**
stdev	**0.019**	**0.1074**	**0.3215**	**0.006**	**9.2683**	**0.0453**

Cave Run

5/5/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.1	0.08	0.1	0.003	29	0.01
Mid	0.019	0.11	0.1	0.002	29	0.02
Upper	0.014	0.15	0.3	0.007	41	0.68

Means	0.04433	0.11333	0.16667	0.004	33	0.23667

8/3/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0.05	0	0	26	0.03
Mid	0.02	0.09	0	0	30	0.04
Upper	0.02	0.17	0	0	44	0.32
Means	0.01667	0.10333	0	0	33.3333	0.13

9/1/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0.14	0	0.001	30	0.02
Mid	0.01	0.05	0	0.001	31	0.03
Upper	0.02	0.23	0.1	0.002	48	0.38
Means	0.01333	0.14	0.03333	0.00133	36.3333	0.14333

Mean	**0.0248**	**0.1189**	**0.0667**	**0.0018**	**34.222**	**0.17**
stdev	**0.0286**	**0.0595**	**0.1**	**0.0022**	**7.9022**	**0.2381**

Cranks Creek

6/9/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.03	0.07	0.4	0.002	72	0
Upper	0	0.1	0.3	0.003	112	0.07
Means	0.015	0.085	0.35	0.0025	92	0.035

7/8/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0.11	0.7	0.003	58	0.11
Upper	0.02	0.2	0.4	0.005	75	0.27
Means	0.015	0.155	0.55	0.004	66.5	0.19

8/17/20						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)

Dam	0.02	0.13	0.2	0.002	82	0.14
Upper	0.03	0.23	0.1	0.001	105	0.13
Means	0.025	0.18	0.15	0.0015	93.5	0.135
Mean	**0.0183**	**0.14**	**0.35**	**0.0027**	**84**	**0.12**
stdev	**0.0117**	**0.062**	**0.2074**	**0.0014**	**20.64**	**0.0894**

Eagle

3/17/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.08	0.1	1.6	0.004	8	0.15
Upper	0.09	0.08	1.2	0.004	10	0.16
Means	0.085	0.09	1.4	0.004	9	0.155

6/29/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.02	0.08	0.1	0.003	12	0.15
Upper	0.02	0.07	0	0.002	10	0.19
Means	0.02	0.075	0.05	0.0025	11	0.17

8/1/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0.07	0.1	0	6	0.15
Upper	0.01	0.1	0.1	0	5	0.16
Means	0.01	0.085	0.1	0	5.5	0.155
Mean	**0.0383**	**0.0833**	**0.5167**	**0.0022**	**8.5**	**0.16**
stdev	**0.0366**	**0.0137**	**0.6969**	**0.0018**	**2.6646**	**0.0155**

Martin's Fork

6/9/94

site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0	0	0	0.001	64	0
Upper	0.04	0.03	0.2	0.002	38	0.05
Means	0.02	0.015	0.1	0.0015	51	0.025

7/8/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0.04	0.05	0.001	30	0
Upper	0.01	0.13	0	0.001	33	0.15
Means	0.01	0.085	0.025	0.001	31.5	0.075

8/17/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0.16	0	0.001	47	0.05
Upper	0.01	0.1	0	0	49	0.15
Means	0.01	0.13	0	0.0005	48	0.1
Mean	**0.0133**	**0.0767**	**0.0417**	**0.001**	**43.5**	**0.0667**
stdev	**0.0137**	**0.0628**	**0.0801**	**0.0006**	**12.534**	**0.0683**

Paintsville

3/23/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.04	0.14	2.3	0.01	31	0.6
20006	0.04	0.1	1.6	0.008	27	0.59
20007	0.04	0.08	1.5	0.006	26	0.59
20008	0.05	0.12	1.7	0.007	33	0.54
Means	0.0425	0.11	1.775	0.00775	29.25	0.58

6/7/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)
Dam	0.01	0	0.7	0.012	35	0
20006	0.03	0.03	0.6	0.007	29	0.09
20007	0.01	0.02	1.3	0.001	27	0.08
20008	0.01	0.01	0.8	0.001	30	0.14
Means	0.015	0.015	0.85	0.00525	30.25	0.0775

7/10/94						
site	SRP (mg l-1)	NH3 (mg l-1)	NO3 (mg l-1)	NO2 (mg l-1)	SO4 (mg l-1)	Fe (mg l-1)

APPENDIX D

1994 TSI (SD, CHL, TP, AND TN) RESULTS FROM ALL SITES AND RESERVOIRS

Carr Fork

6/8/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	1.3	4.67	16	1.846
21001	1.3	5.71	30	1.333
20005	3	1.52	9	1.011
20014	1.5	2.82	16	1.023
mean	**1.775**	**3.68**	**17.75**	**1.30325**
TSI=	**36.22898**	**41.22503**	**45.64785**	**58.27195**

7/9/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	1.6	2.7	33	0.699
21001	3.4	2.81	0	0.632
20005	2.5	1.42	15	1.048
20014	3.6	2.1	52	1.395
mean	**2.775**	**2.2575**	**25**	**0.9435**
TSI=	**40.61258**	**48.26654**	**50.58894**	**53.61077**

8/20/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	2.2	3	65	0.887
21001	2.2	2.92	20	0.961
20005	4.1	0.89	35	1.224
20014	2.9	1.5	95	0.982
mean	**2.85**	**2.0775**	**53.75**	**1.0135**
TSI=	**40.8742**	**49.46391**	**61.6323**	**54.6435**

Cave Run

5/5/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	1.1	2.5	5	0.71
Mid	2.1	2.2	17	0.855
Upper	1	0.46	37	1.123
mean	**1.4**	**1.72**	**19.66667**	**0.896**
TSI=	**33.90079**	**52.18511**	**47.12718**	**52.86537**

8/2/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	2.5	2.98	0	0.715

Mid	3.3	3.73	7	0.721
Upper	0.8	0.72	94	1.52
mean	**2.2**	**2.476667**	**33.66667**	**0.985333**
TSI=	**38.33477**	**46.93138**	**54.88286**	**54.23679**

9/1/94

Site	**Chl(μg/l)**	**Zsd (m)**	**TP (μg/L)**	**TN (mg/L)**
Dam	2.6	3.3	20	1.063
Mid	2.2	2.88	48	1.075
Upper	1.1	0.72	82	1.288
mean	**1.966667**	2.3	50	1.142
TSI=	**37.2349**	**47.99778**	**60.58894**	**56.36603**

Cranks Creek

6/9/94

Site	**Chl(μg/l)**	**Zsd (m)**	**TP (μg/L)**	**TN (mg/L)**
Dam	2.2	1.95	7	0.486
Upper	5	1.2	17	0.838
mean	**3.6**	**1.575**	**12**	**0.662**
TSI=	**43.16596**	**53.45418**	**40**	**48.49777**

7/8/94

Site	**Chl(μg/l)**	**Zsd (m)**	**TP (μg/L)**	**TN (mg/L)**
Dam	1.2	2.52	19	1.803
Upper	1.3	1.88	52	1.612
mean	**1.25**	**2.2**	**35.5**	**1.7075**
TSI=	**32.78904**	**48.63833**	**55.64785**	**62.17049**

8/20/94

Site	**Chl(μg/l)**	**Zsd (m)**	**TP (μg/L)**	**TN (mg/L)**
Dam	2.2	4.02	49	1.2002
Upper	2.9	2.49	62	1.355
mean	**2.55**	**3.255**	**55.5**	**1.2776**
TSI=	**39.78308**	**42.99343**	**62.09453**	**57.98511**

Eagle

3/19/94

Site	**Chl(μg/l)**	**Zsd (m)**	**TP (μg/L)**	**TN (mg/L)**
Dam		2.09	36	2.032
Upper		?	33	1.637
mean		**2.09**	**34.5**	**1.8345**
TSI=		**49.37747**	**55.23562**	**63.20572**

5/23/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	3	1.7	12	0.369
Upper	4	?	70	0.48
mean	**3.5**	**1.7**	**41**	**0.4245**
TSI=	**42.8896**	**52.35365**	**57.7259**	**42.08575**

6/29/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	2.7	3.39	30	1.023
Upper	1.8	?	29	1.087
mean	**2.25**	**3.39**	**29.5**	**1.055**
TSI=	**38.55523**	**42.40784**	**52.97681**	**55.22259**

Martin's Fork

6/9/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	1	4.57	19	0.066
Upper	1.2	3.65	22	0.343
mean	**1.1**	**4.11**	**20.5**	**0.2045**
TSI=	**31.53499**	**39.63257**	**47.7259**	**31.54689**

7/8/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	0.5	3.6	38	1.03
Upper	2.7	2.7	38	1.197
mean	**1.6**	**3.15**	**38**	**1.1135**
TSI=	**35.21074**	**43.46593**	**56.62965**	**56.00134**

8/20/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	0.9	4.02	49	1.014
Upper	1	2.49	62	1.005
mean	**0.95**	**3.255**	**55.5**	**1.0095**
TSI=	**30.09681**	**42.99343**	**62.09453**	**54.58644**

Paintsville

6/6/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	2.4	3.7	79	1.378
20006	1.3	2.82	75	0.771
20007	1.7	3.63	86	1.987
20008	1.4	2.58	79	1.338

mean	1.7	3.1825	79.75	1.3685
TSI=	35.80546	43.31802	67.3245	58.97691

7/9/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	4.7	3.28	33	0.958
20006	4.5	3.09	24	1.155
20007	2.1	3.15	45	1.046
20008	2	2.58	45	0.96
mean	3.325	3.025	36.75	1.02975
TSI=	42.38642	44.04941	56.1471	54.87303

8/9/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	1.5	3.82	34	0.841
20006	3.8	2.84	27	0.967
20007	2.7	2.33	88	1.089
20008	4.4	2.38	62	1.208
mean	3.1	2.8425	52.75	1.02625
TSI=	41.69905	44.9461	61.36137	54.8239

Yatesville

6/6/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	1.4	3.34	100	1.197
Mid	1.5	2.65	44	1.309
Upper	3.1	1.25	54	0.701
mean	2	2.413333	66	1.069
TSI=	37.39977	47.30466	64.59432	55.41282

7/10/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	9	3.22	32	0.235
Mid	7.6	4.31	2	0.912
Upper	3.4	0.76	58	0.517
mean	6.666667	2.763333	30.66667	0.554667
TSI=	49.21075	45.35313	53.53637	45.94513

8/8/94

Site	Chl(μg/l)	Zsd (m)	TP (μg/L)	TN (mg/L)
Dam	2.7	4.47	31	1.195
Mid	3.5	3.63	84	1.482
Upper	2.6	2.72	63	1.325

mean	2.933333	3.606667	59.33333	1.334
TSI=	41.15693	41.51508	63.05808	58.60847

APPENDIX E

1994 ZOOPLANKTON DATA

Carr Fork Zooplankton
7/9/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
copepid	2	5	200	7	0.381
nauplii	27	5	200	7	5.143
Keratella	57	5	200	7	10.86
Polyarthra	13	5	200	7	2.476
Ceratium	22	5	200	7	4.19
Asplancha	49	5	200	7	9.333

site- 20005

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
copepid	3	5	150	2	1.5
nauplii	42	5	150	2	21
Keratella	21	5	150	2	10.5
Polyarthra	2	5	150	2	1
Ceratium	3	5	150	2	1.5
Asplancha	13	5	150	2	6.5

site- 20014

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
copepid	6	5	180	6	1.2
nauplii	55	5	180	6	11
Keratella	42	5	180	6	8.4
Polyarthra	26	5	180	6	5.2
Ceratium	12	5	180	6	2.4
Asplancha	39	5	180	6	7.8
Difluggia	4	5	180	6	0.8

site- 21001

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	2	5	160	8	0.267
copepid	6	5	160	8	0.8
nauplii	37	5	160	8	4.933
Keratella	54	5	160	8	7.2

Polyarthra	8	5	160	8	1.067
Ceratium	3	5	160	8	0.4
Asplancha	27	5	160	8	3.6
Bosmina	13	5	160	8	1.733

6/8/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	41	2.5	180	8	12.3
calanoids	27	2.5	180	8	8.1
copepid	16	2.5	180	8	4.8
nauplii	43	2.5	180	8	12.9
Keratella	11	2.5	180	8	3.3
Ceratium	43	2.5	180	8	12.9
Daphnia	28	2.5	180	8	8.4
Bosmina	12	2.5	180	8	3.6

site- 20005

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	53	2.5	190	2	67.13
calanoids	12	2.5	190	2	15.2
copepid	8	2.5	190	2	10.13
nauplii	27	2.5	190	2	34.2
Keratella	4	2.5	190	2	5.067
Ceratium	57	2.5	190	2	72.2
Daphnia	6	2.5	190	2	7.6
Bosmina	67	2.5	190	2	84.87

site- 20014

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	74	2.5	180	6	29.6
calanoids	33	2.5	180	6	13.2
copepid	18	2.5	180	6	7.2
nauplii	33	2.5	180	6	13.2
Keratella	26	2.5	180	6	10.4
Ceratium	33	2.5	180	6	13.2
Asplancha	4	2.5	180	6	1.6
Daphnia	63	2.5	180	6	25.2
Bosmina	33	2.5	180	6	13.2

site-
21001

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	92	2.5	170	9	23.17
calanoids	43	2.5	170	9	10.83
copepid	32	2.5	170	9	8.059
nauplii	68	2.5	170	9	17.13
Keratella	23	2.5	170	9	5.793
Ceratium	32	2.5	170	9	8.059
Daphnia	45	2.5	170	9	11.33
Bosmina	37	2.5	170	9	9.319

8/16/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	2	2.5	210	5	1.12
calanoids	7	2.5	210	5	3.92
copepid	4	2.5	210	5	2.24
nauplii	28	2.5	210	5	15.68
Keratella	54	2.5	210	5	30.24
Polyarthra	22	2.5	210	5	12.32
Ceratium	42	2.5	210	5	23.52
Daphnia	16	2.5	210	5	8.96
Bosmina	14	2.5	210	5	7.84

site-
20005

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
copepid	2	2.5	200	1	5.333
nauplii	32	2.5	200	1	85.33
Keratella	31	2.5	200	1	82.67
Polyarthra	37	2.5	200	1	98.67
Ceratium	28	2.5	200	1	74.67
Asplancha	13	2.5	200	1	34.67

site-
20014

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
copepid	1	2.5	200	6	0.444

nauplii	17	2.5	200	6	7.556
Keratella	42	2.5	200	6	18.67
Polyarthra	32	2.5	200	6	14.22
Ceratium	33	2.5	200	6	14.67
Asplancha	36	2.5	200	6	16
Bosmina	1	2.5	200	6	0.444

site- 21001

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
calanoid	12	2.5	220	8	4.4
copepid	16	2.5	220	8	5.867
nauplii	39	2.5	220	8	14.3
Keratella	34	2.5	220	8	12.47
Polyarthra	23	2.5	220	8	8.433
Ceratium	28	2.5	220	8	10.27
Asplancha	32	2.5	220	8	11.73

Cave Run Zooplankton 5/5/94

site- Dam

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
cyclopoids	-7	10	55	3	0.428
calanoids	-3	10	55	3	0.183
copepid	-2	10	55	3	0.122
nauplii	-7	10	55	3	0.428
Keratella	-11	10	55	3	0.672
Asplancha	4	10	55	3	0.244
Daphnia	-2	10	55	3	0.122
Bosmina	-13	10	55	3	0.794
Bythotrphes	1	10	55	3	0.061

site- Mid

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
cyclopoids	1	10	125	2	0.208
calanoids	2	10	125	2	0.417
nauplii	4	10	125	2	0.833
Keratella	1	10	125	2	0.208
Bosmina	2	10	125	2	0.417

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
nauplii	3	10	120	1	1.2
Keratella	1	10	120	1	0.4
Ceratium	3	10	120	1	1.2
Bosmina	12	10	120	1	4.8

7/1/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	2	2.5	160	10	0.427
copepid	3	2.5	160	10	0.64
nauplii	7	2.5	160	10	1.493
Keratella	140	2.5	160	10	29.87
Rotataria	18	2.5	160	10	3.84

site- Mid

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	3	2.5	235	7	1.343
calanoids	11	2.5	235	7	4.924
copepid	6	2.5	235	7	2.686
nauplii	23	2.5	235	7	10.3
Keratella	135	2.5	235	7	60.43
Ceratium	33	2.5	235	7	14.77
Daphnia	3	2.5	235	7	1.343
Bosmina	7	2.5	235	7	3.133
Bythotrphes	8	2.5	235	7	3.581

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	1	2.5	155	2	1.033
calanoids	4	2.5	155	2	4.133
copepid	5	2.5	155	2	5.167
nauplii	18	2.5	155	2	18.6
Keratella	94	2.5	155	2	97.13
Ceratium	5	2.5	155	2	5.167
Daphnia	2	2.5	155	2	2.067
Bosmina	5	2.5	155	2	5.167
Bythotrphes	1	2.5	155	2	1.033

9/1/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	6	1.25	215	9	3.822
calanoids	18	1.25	215	9	11.47
copepid	8	1.25	215	9	5.096
nauplii	53	1.25	215	9	33.76
Keratella	113	1.25	215	9	71.99
Ceratium	26	1.25	215	9	16.56
Bosmina	2	1.25	215	9	1.274
Bythotrphes	1	1.25	215	9	0.637

site- Mid

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	5	2.5	250	7	2.381
calanoids	23	2.5	250	7	10.95
copepid	8	2.5	250	7	3.81
nauplii	52	2.5	250	7	24.76
Keratella	133	2.5	250	7	63.33
Ceratium	32	2.5	250	7	15.24
Daphnia	7	2.5	250	7	3.333
Bosmina	2	2.5	250	7	0.952

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	3	2.5	235	2	4.7
calanoids	18	2.5	235	2	28.2
copepid	6	2.5	235	2	9.4
nauplii	24	2.5	235	2	37.6
Keratella	70	2.5	235	2	109.7
Ceratium	4	2.5	235	2	6.267
Daphnia	12	2.5	235	2	18.8
Bosmina	1	2.5	235	2	1.567

Cranks Creek Zooplankton
6/9/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	8	2.5	150	3	5.333
calanoids	12	2.5	150	3	8
copepid	9	2.5	150	3	6

nauplii	27	2.5	150	3	18
Keratella	33	2.5	150	3	22
Asplancha	11	2.5	150	3	7.333
Daphnia	2	2.5	150	3	1.333
Bosmina	6	2.5	150	3	4

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
calanoids	4	5	160	3	1.422
copepid	6	5	160	3	2.133
nauplii	53	5	160	3	18.84
Keratella	52	5	160	3	18.49
Asplancha	8	5	160	3	2.844

7/8/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	36	2.5	205	6	16.4
calanoids	24	2.5	205	6	10.93
copepid	7	2.5	205	6	3.189
nauplii	84	2.5	205	6	38.27
Keratella	59	2.5	205	6	26.88
Ceratium	13	2.5	205	6	5.922
Bosmina	8	2.5	205	6	3.644

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	25	2.5	140	4	11.67
calanoids	8	2.5	140	4	3.733
copepid	7	2.5	140	4	3.267
nauplii	59	2.5	140	4	27.53
Keratella	95	2.5	140	4	44.33
Ceratium	7	2.5	140	4	3.267
Daphnia	1	2.5	140	4	0.467
Bosmina	9	2.5	140	4	4.2

8/16/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	19	2.5	200	4	12.67

calanoids	3	2.5	200	4	2
copepid	7	2.5	200	4	4.667
nauplii	48	2.5	200	4	32
Keratella	92	2.5	200	4	61.33
Ceratium	27	2.5	200	4	18
Daphnia	3	2.5	200	4	2
Bosmina	28	2.5	200	4	18.67

site- Upper

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
cyclopoids	8	2.5	200	4	5.333
copepid	2	2.5	200	4	1.333
nauplii	42	2.5	200	4	28
Keratella	92	2.5	200	4	61.33
Ceratium	12	2.5	200	4	8
Daphnia	22	2.5	200	4	14.67
Bosmina	8	2.5	200	4	5.333

Eagle Lake Zooplankton
6/29/94

site- Dam

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
copepid	2	5	65	2	0.433
nauplii	3	5	65	2	0.65
Keratella	11	5	65	2	2.383
Ceratium	4	5	65	2	0.867
Daphnia	3	5	65	2	0.65

site- Upper

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
cyclopoids	1	5	109	2	0.363
copepid	2	5	109	2	0.727
nauplii	5	5	109	2	1.817
Keratella	11	5	109	2	3.997
Ceratium	6	5	109	2	2.18
Difluggia	2	5	109	2	0.727

8/1/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
calanoids	4	2.5	170	6	1.511
copepid	17	2.5	170	6	6.422
nauplii	37	2.5	170	6	13.98
Keratella	68	2.5	170	6	25.69
Rotataria	3	2.5	170	6	1.133
Ceratium	2	2.5	170	6	0.756
Bosmina	22	2.5	170	6	8.311

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	17	2.5	250	2	28.33
calanoids	3	2.5	250	2	5
copepid	12	2.5	250	2	20
nauplii	68	2.5	250	2	113.3
Keratella	72	2.5	250	2	120
Ceratium	2	2.5	250	2	3.333
Daphnia	12	2.5	250	2	20
Bosmina	4	2.5	250	2	6.667

Martin's Fork Zooplankton
6/9/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	12	2.5	205	7	4.686
calanoids	17	2.5	205	7	6.638
nauplii	48	2.5	205	7	18.74
Keratella	43	2.5	205	7	16.79
Ceratium	3	2.5	205	7	1.171
Daphnia	12	2.5	205	7	4.686

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	15	2.5	200	6	6.667
calanoids	18	2.5	200	6	8
copepid	8	2.5	200	6	3.556
nauplii	33	2.5	200	6	14.67
Keratella	51	2.5	200	6	22.67
Ceratium	7	2.5	200	6	3.111
Daphnia	9	2.5	200	6	4

7/8/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	18	2.5	165	5	7.92
calanoids	3	2.5	165	5	1.32
copepid	8	2.5	165	5	3.52
nauplii	33	2.5	165	5	14.52
Keratella	110	2.5	165	5	48.4
Ceratium	37	2.5	165	5	16.28

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	6	5	200	5	1.6
calanoids	2	5	200	5	0.533
nauplii	22	5	200	5	5.867
Keratella	220	5	200	5	58.67
Ceratium	8	5	200	5	2.133
Daphnia	1	5	200	5	0.267

8/16/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	38	2.5	245	4	31.03
calanoids	13	2.5	245	4	10.62
copepid	13	2.5	245	4	10.62
nauplii	42	2.5	245	4	34.3
Keratella	83	2.5	245	4	67.78
Ceratium	12	2.5	245	4	9.8
Daphnia	22	2.5	245	4	17.97

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	22	2.5	225	4	16.5
calanoids	3	2.5	225	4	2.25
copepid	4	2.5	225	4	3
nauplii	40	2.5	225	4	30
Keratella	72	2.5	225	4	54
Ceratium	23	2.5	225	4	17.25
Daphnia	2	2.5	225	4	1.5

Difluggia	2	2.5	225	4	1.5

Paintsville Zooplankton
3/23/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	6	5	63	3	0.84
copepids	19	5	63	3	2.66
nauplii	27	5	63	3	3.78
Keratella	6	5	63	3	0.84
Ceratium	1	5	63	3	0.14
Difluggia	1	5	63	3	0.14

site-
20006

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
nauplii	3	5	88	3	0.587
Keratella	1	5	88	3	0.196
Ceratium	1	5	88	3	0.196

site-
20007

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
copepids	1	10	110	3	0.122
nauplii	2	10	110	3	0.244
Keratella	1	10	110	3	0.122
Bosmina	1	10	110	3	0.122

6/6/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	7	2.5	200	9	2.074
calanoids	41	2.5	200	9	12.15
copepids	16	2.5	200	9	4.741
nauplii	39	2.5	200	9	11.56
Keratella	78	2.5	200	9	23.11
Ceratium	3	2.5	200	9	0.889
Daphnia	11	2.5	200	9	3.259
Bosmina	23	2.5	200	9	6.815

site-20006

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	13	2.5	235	6	6.789
calanoids	41	2.5	235	6	21.41
copepids	3	2.5	235	6	1.567
nauplii	47	2.5	235	6	24.54
Keratella	68	2.5	235	6	35.51
Ceratium	8	2.5	235	6	4.178
Daphnia	47	2.5	235	6	24.54
Bosmina	22	2.5	235	6	11.49

site-20007

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	11	2.5	210	7	4.4
calanoids	38	2.5	210	7	15.2
copepids	4	2.5	210	7	1.6
nauplii	38	2.5	210	7	15.2
Keratella	52	2.5	210	7	20.8
Asplancha	1	2.5	210	7	0.4
Ceratium	13	2.5	210	7	5.2
Daphnia	3	2.5	210	7	1.2
Bosmina	16	2.5	210	7	6.4

site-20008

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	21	2.5	165	6	7.7
calanoids	32	2.5	165	6	11.73
copepids	16	2.5	165	6	5.867
nauplii	56	2.5	165	6	20.53
Keratella	38	2.5	165	6	13.93
Ceratium	23	2.5	165	6	8.433
Daphnia	32	2.5	165	6	11.73
Bosmina	13	2.5	165	6	4.767

7/9/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	42	2.5	160	9	9.956
calanoids	18	2.5	160	9	4.267
copepids	2	2.5	160	9	0.474
nauplii	48	2.5	160	9	11.38
Keratella	88	2.5	160	9	20.86
Ceratium	12	2.5	160	9	2.844
Daphnia	23	2.5	160	9	5.452
Bosmina	8	2.5	160	9	1.896

site-20006

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	23	2.5	200	7	8.762
calanoids	5	2.5	200	7	1.905
copepids	3	2.5	200	7	1.143
nauplii	43	2.5	200	7	16.38
Keratella	102	2.5	200	7	38.86
Ceratium	16	2.5	200	7	6.095
Daphnia	3	2.5	200	7	1.143
Bosmina	1	2.5	200	7	0.381

site-20007

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	52	2.5	140	6	16.18
calanoids	29	2.5	140	6	9.022
copepids	17	2.5	140	6	5.289
nauplii	58	2.5	140	6	18.04
Keratella	90	2.5	140	6	28
Asplancha	6	2.5	140	6	1.867
Ceratium	17	2.5	140	6	5.289
Daphnia	28	2.5	140	6	8.711
Bosmina	17	2.5	140	6	5.289

site-20008

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	39	2.5	155	6	13.43
calanoids	21	2.5	155	6	7.233
copepids	12	2.5	155	6	4.133

nauplii	72	2.5	155	6	24.8
Keratella	95	2.5	155	6	32.72
Ceratium	23	2.5	155	6	7.922
Daphnia	27	2.5	155	6	9.3
Bosmina	12	2.5	155	6	4.133

8/9/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	12	2.5	235	5	7.52
calanoids	6	2.5	235	5	3.76
copepids	2	2.5	235	5	1.253
nauplii	17	2.5	235	5	10.65
Keratella	88	2.5	235	5	55.15
Rotataria	2	2.5	235	5	1.253
Ceratium	8	2.5	235	5	5.013
Daphnia	7	2.5	235	5	4.387
Bosmina	6	2.5	235	5	3.76

site- 20006

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	11	2.5	245	3	11.98
calanoids	15	2.5	245	3	16.33
copepids	7	2.5	245	3	7.622
nauplii	36	2.5	245	3	39.2
Keratella	92	2.5	245	3	100.2
Asplancha	2	2.5	245	3	2.178
Rotataria	7	2.5	245	3	7.622
Ceratium	6	2.5	245	3	6.533
Daphnia	2	2.5	245	3	2.178
Bosmina	11	2.5	245	3	11.98

site- 20007

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	13	2.5	240	6	6.933
calanoids	2	2.5	240	6	1.067
copepids	3	2.5	240	6	1.6
nauplii	37	2.5	240	6	19.73
Keratella	133	2.5	240	6	70.93

Rotataria	1	2.5	240	6	0.533
Ceratium	17	2.5	240	6	9.067
Daphnia	13	2.5	240	6	6.933
Bosmina	9	2.5	240	6	4.8

site- 20008

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	15	2.5	240	5	9.6
calanoids	7	2.5	240	5	4.48
copepids	6	2.5	240	5	3.84
nauplii	32	2.5	240	5	20.48
Keratella	112	2.5	240	5	71.68
Asplancha	1	2.5	240	5	0.64
Ceratium	13	2.5	240	5	8.32
Daphnia	7	2.5	240	5	4.48
Bosmina	3	2.5	240	5	1.92

Yatesville Zooplankton 3/23/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	5	5	69	2	1.15
calanoids	1	5	69	2	0.23
copepids	7	5	69	2	1.61
nauplii	36	5	69	2	8.28
Keratella	50	5	69	2	11.5
Ceratium	1	5	69	2	0.23
Rotataria	1	5	69	2	0.23

site- Mid

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	2	5	60	2	0.4
copepids	3	5	60	2	0.6
nauplii	9	5	60	2	1.8
Keratella	1	5	60	2	0.2
Rotataria	6	5	60	2	1.2

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
nauplii	3	5	98	2	0.98
Keratella	2	5	98	2	0.653
Bosmina	1	5	98	2	0.327

6/6/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	27	2.5	170	7	8.743
calanoids	68	2.5	170	7	22.02
copepids	23	2.5	170	7	7.448
nauplii	52	2.5	170	7	16.84
Keratella	56	2.5	170	7	18.13
Ceratium	38	2.5	170	7	12.3
Asplancha	2	2.5	170	7	0.648
Daphnia	7	2.5	170	7	2.267
Bosmina	12	2.5	170	7	3.886

site- Mid

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	11	2.5	185	6	4.522
calanoids	26	2.5	185	6	10.69
copepids	4	2.5	185	6	1.644
nauplii	41	2.5	185	6	16.86
Keratella	3	2.5	185	6	1.233
Ceratium	26	2.5	185	6	10.69
Daphnia	1	2.5	185	6	0.411
Bosmina	3	2.5	185	6	1.233

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	23	2.5	125	3	12.78
calanoids	40	2.5	125	3	22.22
copepids	4	2.5	125	3	2.222
nauplii	25	2.5	125	3	13.89
Keratella	35	2.5	125	3	19.44
Ceratium	8	2.5	125	3	4.444
Daphnia	43	2.5	125	3	23.89
Bosmina	11	2.5	125	3	6.111

7/10/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	4	2.5	115	9	0.681
calanoids	6	2.5	115	9	1.022
copepids	2	2.5	115	9	0.341
nauplii	29	2.5	115	9	4.941
Keratella	2	2.5	115	9	0.341
Ceratium	28	2.5	115	9	4.77
Daphnia	6	2.5	115	9	1.022
Bosmina	3	2.5	115	9	0.511

site- Mid

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
calanoids	1	2	220	8	0.458
copepids	6	2	220	8	2.75
nauplii	23	2	220	8	10.54
Brachionus	5	2	220	8	2.292
Ceratium	28	2	220	8	12.83
Daphnia	18	2	220	8	8.25
Bosmina	7	2	220	8	3.208

site- Upper

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	2	2	220	2	3.667
calanoids	3	2	220	2	5.5
copepids	5	2	220	2	9.167
nauplii	67	2	220	2	122.8
Keratella	135	2	220	2	247.5
Brachionus	5	2	220	2	9.167
Ceratium	8	2	220	2	14.67
Daphnia	6	2	220	2	11

8/8/94

site- Dam

Organism	#	vol.(ml)	tot.vol.(ml)	# of tows	# l-1
cyclopoids	23	2	195	4	18.69
calanoids	25	2	195	4	20.31
copepids	3	2	195	4	2.438
nauplii	11	2	195	4	8.938

Keratella	61	2	195	4	49.56
Ceratium	29	2	195	4	23.56
Daphnia	14	2	195	4	11.38
Bosmina	9	2	195	4	7.313

site- Mid

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
cyclopoids	45	2.5	200	3	40
calanoids	37	2.5	200	3	32.89
copepids	13	2.5	200	3	11.56
nauplii	60	2.5	200	3	53.33
Keratella	58	2.5	200	3	51.56
Ceratium	77	2.5	200	3	68.44
Daphnia	31	2.5	200	3	27.56
Bosmina	22	2.5	200	3	19.56

site- Upper

Organism	**#**	**vol.(ml)**	**tot.vol.(ml)**	**# of tows**	**# l-1**
cyclopoids	14	2.5	120	3	7.467
calanoids	1	2.5	120	3	0.533
nauplii	19	2.5	120	3	10.13
Keratella	24	2.5	120	3	12.8
Brachionus	5	2.5	120	3	2.667
Ceratium	4	2.5	120	3	2.133
Bosmina	2	2.5	120	3	1.067

APPENDIX F

1994 PHYTOPLANKTON DATA

Carr Fork Phytoplankton

6/8/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	3	5	95	500	114
Ankistrodesmus	2	5	95	500	76
Arthrodesmus	2	5	95	500	76
Asterionella	18	5	95	500	684
Chlamydomonas	3	5	95	500	114
Closteriopsis	3	5	95	500	114
Cyclotella	12	5	95	500	456
Dinobryan	2	5	95	500	76
Microcystis	3	5	95	500	114
Stephanodiscus	34	5	95	500	1292
Trachelomonas	6	5	95	500	228

site- 20005

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	4	5	95	500	152
Closteriopsis	6	5	95	500	228
Cyclotella	6	5	95	500	228
Dinobryan	3	5	95	500	114
Gloeotrichia	3	5	95	500	114
Oscillatoria	2	5	95	500	76
Stephanodiscus	3	5	95	500	114
Suriella	11	5	95	500	418

site- 20014

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	2	5	95	500	76
Ankistrodesmus	6	5	95	500	228
Asterionella	3	5	95	500	114
Chlamydomonas	1	5	95	500	38
Closteriopsis	9	5	95	500	342
Cyclotella	11	5	95	500	418
Diatomella	2	5	95	500	76
Gloeotrichia	1	5	95	500	38
Microcystis	2	5	95	500	76

Navicula	7	5	95	500	266
Oscillatoria	2	5	95	500	76
Stephanodiscus	8	5	95	500	304

site- 21001

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	2	5	95	500	76
Ankistrodesmus	1	5	95	500	38
Asterionella	26	5	95	500	988
Chlamydomonas	6	5	95	500	228
Cyclotella	37	5	95	500	1406
Dinobryan	1	5	95	500	38
Stephanodiscus	18	5	95	500	684
Trachelomonas	4	5	95	500	152

7/9/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	7	5	95	500	266
Chlamydomonas	3	5	95	500	114
Cyclotella	18	5	95	500	684
Dinobryan	1	5	95	500	38
Eudorina	12	5	95	500	456
Euglena	3	5	95	500	114
Gloeotrichia	1	5	95	500	38
Microcystis	8	5	95	500	304
Navicula	2	5	95	500	76
Oedogonium	6	5	95	500	228
Stephanodiscus	6	5	95	500	228
Synedra	7	5	95	500	266
Trachelomonas	3	5	95	500	114

site- 20005

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	11	5	95	500	418
Closteriopsis	7	5	95	500	266
Cyclotella	10	5	95	500	380
Dinobryan	1	5	95	500	38
Microcystis	7	5	95	500	266

Navicula	6	5	95	500	228
Oedogonium	2	5	95	500	76
Synedra	3	5	95	500	114

site- 20014

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	12	5	95	500	456
Chlamydomonas	2	5	95	500	76
Closteriopsis	13	5	95	500	494
Cyclotella	16	5	95	500	608
Dactylococcopsis	2	5	95	500	76
Euglena	2	5	95	500	76
Gloeotrichia	3	5	95	500	114
Navicula	6	5	95	500	228
Pinnularia	1	5	95	500	38
Synedra	1	5	95	500	38

site- 21001

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	1	5	90	500	36
Ankistrodesmus	8	5	90	500	288
Chlamydomonas	4	5	90	500	144
Cyclotella	22	5	90	500	792
Diatomella	3	5	90	500	108
Eudorina	2	5	90	500	72
Euglena	1	5	90	500	36
Microcystis	4	5	90	500	144
Navicula	10	5	90	500	360
Oscillatoria	3	5	90	500	108
Pandorina	3	5	90	500	108
Stephanodiscus	2	5	90	500	72
Trachelomonas	3	5	90	500	108
Ulothrix	6	5	90	500	216

8/16/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Asterionella	6	5	85	500	204
Bacillaria	6	5	85	500	204

Closteriopsis	7	5	85	500	238
Cyclotella	32	5	85	500	1088
Dinobryan	1	5	85	500	34
Eudorina	3	5	85	500	102
Euglena	3	5	85	500	102
Mallomonas	1	5	85	500	34
Microcystis	11	5	85	500	374
Oscillatoria	7	5	85	500	238
Spirogyra	4	5	85	500	136
Stephanodiscus	13	5	85	500	442
Synedra	3	5	85	500	102
Trachelomonas	7	5	85	500	238
Trachelomonas B	6	5	85	500	204

site- 20005

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Bacillaria	1	5	95	500	38
Closteriopsis	23	5	95	500	874
Cyclotella	9	5	95	500	342
Eudorina	7	5	95	500	266
Mallomonas	4	5	95	500	152
Microcystis	3	5	95	500	114
Oscillatoria	2	5	95	500	76
Synedra	1	5	95	500	38
Trachelomonas	8	5	95	500	304

site- 20014

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	3	5	90	500	108
Ankistrodesmus	8	5	90	500	288
Asterionella	1	5	90	500	36
Closteriopsis	17	5	90	500	612
Cyclotella	13	5	90	500	468
Dinobryan	5	5	90	500	180
Eudorina	7	5	90	500	252
Mallomonas	12	5	90	500	432
Pandorina	2	5	90	500	72
Scenedesmus	2	5	90	500	72
Spirogyra	32	5	90	500	1152

site- 21001

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	2	5	100	500	80
Chlamydomonas	2	5	100	500	80
Closteriopsis	28	5	100	500	1120
Cyclotella	3	5	100	500	120
Eudorina	11	5	100	500	440
Mallomonas	20	5	100	500	800
Microcystis	1	5	100	500	40
Oscillatoria	5	5	100	500	200
Oedogonium	7	5	100	500	280
Pandorina	3	5	100	500	120
Pleodorina	13	5	100	500	520
Scytonema	3	5	100	500	120
Stephanodiscus	2	5	100	500	80
Synedra	3	5	100	500	120
Trachelomonas	9	5	100	500	360

Cave Run Zooplankton

5/5/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	71	5	95	500	2698
Chlorella	27	5	95	500	1026
Dinobryon	57	5	95	500	2166
Euglena	44	5	95	500	1672
Oedogonium	10	5	95	500	380
Pandorina	13	5	95	500	494
Trachleonomas	7	5	95	500	266
Ulothrix	3	5	95	500	114

site- Mid

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	28	5	90	500	1008
Chlorella	47	5	90	500	1692
Dinobryon	45	5	90	500	1620
Euglena	31	5	90	500	1116
Microcystis	3	5	90	500	108
Oedogonium	1	5	90	500	36
Oscillatoria	2	5	90	500	72

Trachleonomas	7	5	90	500	252

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	24	5	95	500	912
Chlorella	45	5	95	500	1710
Dinobryon	17	5	95	500	646
Euglena	16	5	95	500	608
Fragilaria	23	5	95	500	874
Oedogonium	10	5	95	500	380
Trachleonomas	2	5	95	500	76

7/1/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlorella	48	5	90	500	1728
Dinobryon	9	5	90	500	324
Euglena	13	5	90	500	468
Fragilaria	2	5	90	500	72
Mallomonas	10	5	90	500	360
Oedogonium	2	5	90	500	72
Oocystis	2	5	90	500	72
Oscillatoria	38	5	90	500	1368
Scytonema	16	5	90	500	576
Trachleonomas	3	5	90	500	108

site- Mid

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlorella	39	5	100	500	1560
Closteriopsis	31	5	100	500	1240
Cyclotella	75	5	100	500	3000
Diatomella	12	5	100	500	480
Euglena	7	5	100	500	280
Navicula	24	5	100	500	960
Oedogonium	1	5	100	500	40
Oscillatoria	3	5	100	500	120
Stephanodiscus	53	5	100	500	2120
Surirella	10	5	100	500	400
Synedra	24	5	100	500	960
Trachleonomas	2	5	100	500	80

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	3	5	90	500	108
Chlorella	12	5	90	500	432
Closterium	23	5	90	500	828
Cyclotella	4	5	90	500	144
Euglena	2	5	90	500	72
Fragilaria	83	5	90	500	2988
Navicula	11	5	90	500	396
Oedogonium	15	5	90	500	540
Oscillatoria	28	5	90	500	1008

9/1/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	7	5	85	500	238
Chlorella	20	5	85	500	680
Closteriopsis	1	5	85	500	34
Closterium	4	5	85	500	136
Cyclotella	5	5	85	500	170
Fragilaria	24	5	85	500	816
Navicula	3	5	85	500	102
Oedogonium	2	5	85	500	68
Oscillatoria	21	5	85	500	714
Stephanodiscus	2	5	85	500	68
Ulothrix	2	5	85	500	68

site- Mid

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	8	5	95	500	304
Chlorella	14	5	95	500	532
Closterium	18	5	95	500	684
Cyclotella	14	5	95	500	532
Fragilaria	52	5	95	500	1976
Oedogonium	3	5	95	500	114
Oscillatoria	28	5	95	500	1064
Pandorina	11	5	95	500	418
Trachleomonas	10	5	95	500	380

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	34	5	95	500	1292
Chlorella	30	5	95	500	1140
Closteriopsis	17	5	95	500	646
Cyclotella	4	5	95	500	152
Mallomonas	19	5	95	500	722
Oedogonium	4	5	95	500	152
Pachycladon	11	5	95	500	418
Pandorina	2	5	95	500	76
Stephanodiscus	2	5	95	500	76
Trachleomonas	3	5	95	500	114

Cranks Creek Zooplankton

6/9/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Centronella	2	5	95	500	76
Chlamydomonas	5	5	95	500	190
Closteriopsis	4	5	95	500	152
Cyclotella	6	5	95	500	228
Lyngbya	3	5	95	500	114
Mallomonas	3	5	95	500	114
Microcystis	4	5	95	500	152
Netrium	3	5	95	500	114
Oscillatoria	12	5	95	500	456
Spirogyra	1	5	95	500	38
Surirella	1	5	95	500	38
Trachelomonas	13	5	95	500	494
Ulothrix	2	5	95	500	76

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	8	5	90	500	288
Closteriopsis	45	5	90	500	1620
Cyclotella	61	5	90	500	2196
Dinobryan	4	5	90	500	144
Fragilaria	17	5	90	500	612
Lyngbya	2	5	90	500	72
Stephanodiscus	101	5	90	500	3636
Tribonema	3	5	90	500	108

7/8/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Closteriopsis	12	5	100	500	480
Cyclotella	33	5	100	500	1320
Dinobryan	3	5	100	500	120
Microcystis	3	5	100	500	120
Navicula	22	5	100	500	880
Oscillatoria	11	5	100	500	440
Scytonema	4	5	100	500	160
Spirogyra	2	5	100	500	80
Stephanodiscus	53	5	100	500	2120
Tribonema	1	5	100	500	40
Ulothrix	3	5	100	500	120

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	1	5	85	500	34
Ankistrodesmus	3	5	85	500	102
Closteriopsis	13	5	85	500	442
Cyclotella	26	5	85	500	884
Fragilaria	2	5	85	500	68
Lyngbya	3	5	85	500	102
Microcystis	5	5	85	500	170
Navicula	2	5	85	500	68
Oscillatoria	11	5	85	500	374
Stephanodiscus	7	5	85	500	238
Trachelomonas	4	5	85	500	136

8/16/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Ankistrodesmus	1	5	85	500	34
Chroococcus	17	5	85	500	578
Closteriopsis	2	5	85	500	68
Cyclotella	12	5	85	500	408
Eudorina	16	5	85	500	544
Microcystis	4	5	85	500	136
Spirogyra	3	5	85	500	102

Stephanodiscus	6	5	85	500	204
Surirella	2	5	85	500	68
Trachelomonas	7	5	85	500	238

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Achnathes	3	5	90	500	108
Ankistrodesmus	1	5	90	500	36
Closteriopsis	13	5	90	500	468
Cyclotella	22	5	90	500	792
Dinobryan	3	5	90	500	108
Gloeotrichia	2	5	90	500	72
Spirogyra	2	5	90	500	72
Stephanodiscus	8	5	90	500	288
Ulothrix	3	5	90	500	108

Eagle Lake Phytoplankton
6/29/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	6	5	100	500	240
Chlamydomonas	22	5	100	500	880
Closteriopsis	10	5	100	500	400
Closterium	4	5	100	500	160
Cyclotella	16	5	100	500	640
Diatomella	7	5	100	500	280
Eudorina	11	5	100	500	440
Euglena	4	5	100	500	160
Mallomonas	11	5	100	500	440
Microcystis	6	5	100	500	240
Navicula	4	5	100	500	160
Oscillatoria	7	5	100	500	280
Pachycladon	2	5	100	500	80
Stephanodiscus	42	5	100	500	1680
Tribonema	21	5	100	500	840
Trachleomonas	7	5	100	500	280

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Actinella	7	5	90	500	252

Chlamydomonas	9	5	90	500	324
Closteriopsis	22	5	90	500	792
Closterium	13	5	90	500	468
Cyclotella	3	5	90	500	108
Diatomella	17	5	90	500	612
Microcystis	5	5	90	500	180
Navicula	37	5	90	500	1332
Oscillatoria	2	5	90	500	72
Pachycladon	1	5	90	500	36
Stephanodiscus	1	5	90	500	36
Tribonema	9	5	90	500	324

8/1/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Actinella	6	5	95	500	228
Bumilleriopsis	3	5	95	500	114
Chlamydomonas	19	5	95	500	722
Closteriopsis	11	5	95	500	418
Cyclotella	2	5	95	500	76
Gloeotrichia	4	5	95	500	152
Microcystis	13	5	95	500	494
Navicula	1	5	95	500	38
Pachycladon	2	5	95	500	76
Stephanodiscus	4	5	95	500	152
Tribonema	12	5	95	500	456

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Actinella	10	5	95	500	380
Bumilleriopsis	7	5	95	500	266
Chlamydomonas	30	5	95	500	1140
Closteriopsis	6	5	95	500	228
Closterium	4	5	95	500	152
Cyclotella	17	5	95	500	646
Diatomella	18	5	95	500	684
Microcystis	10	5	95	500	380
Navicula	24	5	95	500	912
Spirogyra	3	5	95	500	114
Stephanodiscus	63	5	95	500	2394
Tracleomonas	8	5	95	500	304
Tribonema	1	5	95	500	38

Martin's Fork Phytoplankton

6/9/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	19	5	90	500	684
Cyclotella	4	5	90	500	144
Cylindrotheca	5	5	90	500	180
Diatomella	15	5	90	500	540
Dinobryan	43	5	90	500	1548
Euglena	21	5	90	500	756
Mallomonas	2	5	90	500	72
Microcystis	1	5	90	500	36
Navicula	9	5	90	500	324
Oscillatoria	1	5	90	500	36
Pandorina	1	5	90	500	36
Stephanodiscus	18	5	90	500	648
Trachleomonas	10	5	90	500	360

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	26	5	90	500	936
Closteriopsis	24	5	90	500	864
Cyclotella	17	5	90	500	612
Dinobryan	80	5	90	500	2880
Microcystis	22	5	90	500	792
Navicula	5	5	90	500	180
Oscillatoria	2	5	90	500	72
Spirogyra	1	5	90	500	36
Stephanodiscus	44	5	90	500	1584
Trachleomonas	16	5	90	500	576
Tribonema	1	5	90	500	36

7/8/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	5	5	95	500	190
Chlamydomonas	21	5	95	500	798
Closteriopsis	9	5	95	500	342
Closterium	3	5	95	500	114

Cyclotella	11	5	95	500	418
Diatomella	4	5	95	500	152
Dinobryan	23	5	95	500	874
Euglena	1	5	95	500	38
Gloeotrichia	5	5	95	500	190
Oscillatoria	2	5	95	500	76
Stephanodiscus	28	5	95	500	1064
Trachleomonas	5	5	95	500	190

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	1	5	85	500	34
Chlamydomonas	12	5	85	500	408
Closterium	4	5	85	500	136
Cyclotella	16	5	85	500	544
Diatomella	9	5	85	500	306
Dinobryan	13	5	85	500	442
Mallomonas	1	5	85	500	34
Navicula	1	5	85	500	34
Scytonema	1	5	85	500	34
Stephanodiscus	30	5	85	500	1020
Trachleomonas	3	5	85	500	102

8/16/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Botrycoccus	6	5	90	500	216
Chlamydomonas	41	5	90	500	1476
Closterium	1	5	90	500	36
Cyclotella	1	5	90	500	36
Diatomella	4	5	90	500	144
Dinobryan	13	5	90	500	468
Euglena	3	5	90	500	108
Microcystis	14	5	90	500	504
Navicula	3	5	90	500	108
Stephanodiscus	2	5	90	500	72
Trachleomonas	12	5	90	500	432

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	13	5	95	500	494

Cyclotella	5	5	95	500	190
Diatomella	10	5	95	500	380
Eudorina	2	5	95	500	76
Euglena	1	5	95	500	38
Mallomonas	1	5	95	500	38
Navicula	2	5	95	500	76
Oscillatoria	1	5	95	500	38
Pandorina	7	5	95	500	266
Stephanodiscus	3	5	95	500	114
Trachleomonas	10	5	95	500	380
Ulothrix	1	5	95	500	38

Paintsville Zooplankton

6/6/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Bumilleriopsis	2	5	95	500	76
Chlamydomonas	24	5	95	500	912
Chlorella	37	5	95	500	1406
Chroococcus	7	5	95	500	266
Closteriopsis	18	5	95	500	684
Cyclotella	38	5	95	500	1444
Eudorina	4	5	95	500	152
Mastogloia	15	5	95	500	570
Navicula	11	5	95	500	418
Oedogonium	2	5	95	500	76
Oscillatoria	11	5	95	500	418
Pediastrum	3	5	95	500	114
Staurastrum	23	5	95	500	874
Stephanodiscus	45	5	95	500	1710

site- 20006

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	34	5	90	500	1224
Chlorella	65	5	90	500	2340
Closterium	29	5	90	500	1044
Cyclotella	13	5	90	500	468
Diatomella	22	5	90	500	792
Euglena	13	5	90	500	468
Oedogonium	10	5	90	500	360
Spirogyra	7	5	90	500	252

Staurastrum	26	5	90	500	936
StaurastrumB	19	5	90	500	684
Stephanodiscus	31	5	90	500	1116
Trachleomonas	6	5	90	500	216

site- 20007

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	23	5	95	500	874
Chlorella	29	5	95	500	1102
Closterium	3	5	95	500	114
Cyclotella	49	5	95	500	1862
Cylindrotheca	19	5	95	500	722
Diatomella	10	5	95	500	380
Microcystis	15	5	95	500	570
Navicula	7	5	95	500	266
Oedogonium	8	5	95	500	304
Staurastrum	46	5	95	500	1748
StaurastrumB	13	5	95	500	494
Stephanodiscus	38	5	95	500	1444
Trachleomonas	28	5	95	500	1064

site- 20008

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	39	5	90	500	1404
Chlorella	30	5	90	500	1080
Cyclotella	8	5	90	500	288
Cylindrotheca	53	5	90	500	1908
Diatomella	14	5	90	500	504
Euglena	26	5	90	500	936
Microcystis	2	5	90	500	72
Navicula	7	5	90	500	252
Oedogonium	8	5	90	500	288
Pandorina	6	5	90	500	216
Staurastrum	27	5	90	500	972
StaurastrumB	4	5	90	500	144
Stephanodiscus	20	5	90	500	720
Trachleomonas	3	5	90	500	108

7/9/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l

Chlamydomonas	20	5	90	500	720
Chlorella	35	5	90	500	1260
Chroococcus	10	5	90	500	360
Closterium	24	5	90	500	864
Diatomella	43	5	90	500	1548
Mastogloia	41	5	90	500	1476
Navicula	19	5	90	500	684
Oedogonium	14	5	90	500	504
Oscillatoria	11	5	90	500	396
Pandorina	4	5	90	500	144
Staurastrum	16	5	90	500	576
Stephanodiscus	4	5	90	500	144
Ulothrix	2	5	90	500	72

site- 20006

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	22	5	100	500	880
Chlorella	8	5	100	500	320
Closteriopsis	11	5	100	500	440
Closterium	19	5	100	500	760
Cyclotella	2	5	100	500	80
Diatomella	12	5	100	500	480
Mastogloia	47	5	100	500	1880
Microcystis	5	5	100	500	200
Navicula	20	5	100	500	800
Oedogonium	9	5	100	500	360
Oscillatoria	19	5	100	500	760
Stephanodiscus	30	5	100	500	1200
Trachleomonas	3	5	100	500	120

site- 20007

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	29	5	95	500	1102
Chlorella	28	5	95	500	1064
Closterium	9	5	95	500	342
Euglena	2	5	95	500	76
Fragilaria	36	5	95	500	1368
Mastogloia	37	5	95	500	1406
Microcystis	5	5	95	500	190
Oedogonium	7	5	95	500	266
Pandorina	7	5	95	500	266
Stephanodiscus	11	5	95	500	418

Trachleomonas	3	5	95	500	114

site- 20008

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	20	5	95	500	760
Chlorella	26	5	95	500	988
Closteriopsis	24	5	95	500	912
Closterium	26	5	95	500	988
Cyclotella	8	5	95	500	304
Fragilaria	22	5	95	500	836
Mastogloia	23	5	95	500	874
Microcystis	5	5	95	500	190
Oedogonium	4	5	95	500	152
Staurastrum	6	5	95	500	228
Stephanodiscus	46	5	95	500	1748
Tabellaria	13	5	95	500	494

8/9/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	13	5	85	500	442
Chlorella	24	5	85	500	816
Chroococcus	9	5	85	500	306
Closterium	23	5	85	500	782
Cyclotella	15	5	85	500	510
Diatomella	28	5	85	500	952
Dinobryon	61	5	85	500	2074
Mastogloia	4	5	85	500	136
Oedogonium	18	5	85	500	612
Oocystis	8	5	85	500	272
Oscillatoria	23	5	85	500	782
Pandorina	6	5	85	500	204
Spirogyra	7	5	85	500	238
Stephanodiscus	47	5	85	500	1598

site- 20006

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	35	5	85	500	1190
Chlorella	26	5	85	500	884
Closterium	2	5	85	500	68
Cyclotella	7	5	85	500	238

Diatomella	8	5	85	500	272
Dinobryon	15	5	85	500	510
Euglena	4	5	85	500	136
Microcystis	18	5	85	500	612
Navicula	3	5	85	500	102
Oedogonium	13	5	85	500	442
Stephanodiscus	17	5	85	500	578
Tabellaria	9	5	85	500	306
Ulothrix	7	5	85	500	238

site- 20007

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlorella	64	5	95	500	2432
Cyclotella	2	5	95	500	76
Dinobryon	77	5	95	500	2926
Euglena	18	5	95	500	684
Microcystis	9	5	95	500	342
Navicula	11	5	95	500	418
Oedogonium	3	5	95	500	114
Stephanodiscus	13	5	95	500	494
Trachleomonas	22	5	95	500	836
Ulothrix	10	5	95	500	380

site- 20008

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlorella	49	5	90	500	1764
Cyclotella	7	5	90	500	252
Dinobryon	37	5	90	500	1332
Euglena	13	5	90	500	468
Microcystis	8	5	90	500	288
Oedogonium	2	5	90	500	72
Spirogyra	3	5	90	500	108
Stephanodiscus	24	5	90	500	864
Trachleomonas	13	5	90	500	468
Ulothrix	7	5	90	500	252

Yatesville Phytoplankton

6/6/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l

Chlamydomonas	8	5	95	500	304
Chlorella	23	5	95	500	874
Closteriopsis	9	5	95	500	342
Closterium	26	5	95	500	988
Cyclotella	27	5	95	500	1026
Diatomella	23	5	95	500	874
Euglena	20	5	95	500	760
Microcystis	8	5	95	500	304
Navicula	40	5	95	500	1520
Oedogonium	4	5	95	500	152
Pandorina	11	5	95	500	418
Pinnularia	6	5	95	500	228
Stephanodiscus	57	5	95	500	2166

site- Mid

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	28	5	90	500	1008
Chlorella	30	5	90	500	1080
Closteriopsis	21	5	90	500	756
Eudorina	4	5	90	500	144
Euglena	7	5	90	500	252
Fragilaria	21	5	90	500	756
Microcystis	10	5	90	500	360
Navicula	12	5	90	500	432
Oedogonium	6	5	90	500	216
Pinnularia	3	5	90	500	108
Staurastrum	2	5	90	500	72
Stephanodiscus	34	5	90	500	1224
Trachleomonas	4	5	90	500	144

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	24	5	95	500	912
Chlorella	40	5	95	500	1520
Cyclotella	5	5	95	500	190
Euglena	17	5	95	500	646
Microcystis	8	5	95	500	304
Navicula	22	5	95	500	836
Oscillatoria	2	5	95	500	76
Pandorina	5	5	95	500	190
Pinnularia	3	5	95	500	114

Stephanodiscus	27	5	95	500	1026
Trachleomonas	4	5	95	500	152
Ulothrix	3	5	95	500	114

7/10/94

site- Dam

Genus	**#**	**samp.vol.**	**vol.(ml)**	**Total volume**	**#/l**
Anabaena	12	5	100	500	480
Chlamydomonas	37	5	100	500	1480
Chlorella	33	5	100	500	1320
Closterium	24	5	100	500	960
Cyclotella	7	5	100	500	280
Dinobryon	48	5	100	500	1920
Euglena	4	5	100	500	160
Microcystis	13	5	100	500	520
Navicula	29	5	100	500	1160
Staurastrum	15	5	100	500	600
Stephanodiscus	17	5	100	500	680
Trachleomonas	3	5	100	500	120

site- Mid

Genus	**#**	**samp.vol.**	**vol.(ml)**	**Total volume**	**#/l**
Chlamydomonas	15	5	95	500	570
Chlorella	40	5	95	500	1520
Chroococcus	44	5	95	500	1672
Closteriopsis	23	5	95	500	874
Cylindrotheca	29	5	95	500	1102
Dinobryon	35	5	95	500	1330
Euglena	4	5	95	500	152
Merismopedia	48	5	95	500	1824
Navicula	3	5	95	500	114
Oscillatoria	7	5	95	500	266
Spirogyra	17	5	95	500	646
Trachleomonas	8	5	95	500	304

site- Upper

Genus	**#**	**samp.vol.**	**vol.(ml)**	**Total volume**	**#/l**
Anabaena	5	5	80	500	160
Chlorella	72	5	80	500	2304
Chroococcus	15	5	80	500	480

Closteriopsis	25	5	80	500	800
Dinobryon	27	5	80	500	864
Euglena	18	5	80	500	576
Fragilaria	18	5	80	500	576
Merismopedia	31	5	80	500	992
Microcystis	19	5	80	500	608
Oedogonium	14	5	80	500	448
Oscillatoria	2	5	80	500	64
Stephanodiscus	19	5	80	500	608
Trachleomonas	17	5	80	500	544

8/8/94

site- Dam

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	22	5	95	500	836
Chlorella	51	5	95	500	1938
Chroococcus	7	5	95	500	266
Cyclotella	3	5	95	500	114
Euglena	9	5	95	500	342
Fragilaria	8	5	95	500	304
Microcystis	4	5	95	500	152
Oedogonium	4	5	95	500	152
Oscillatoria	11	5	95	500	418
Stephanodiscus	33	5	95	500	1254
Trachleomonas	26	5	95	500	988

site- Mid

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Chlamydomonas	15	5	90	500	540
Chlorella	8	5	90	500	288
Chroococcus	43	5	90	500	1548
Cyclotella	6	5	90	500	216
Diatomella	3	5	90	500	108
Dinobryon	47	5	90	500	1692
Euglena	10	5	90	500	360
Fragilaria	2	5	90	500	72
Merismopedia	28	5	90	500	1008
Microcystis	24	5	90	500	864
Oscillatoria	6	5	90	500	216
Spirogyra	6	5	90	500	216
Stephanodiscus	20	5	90	500	720
Trachleomonas	9	5	90	500	324

site- Upper

Genus	#	samp.vol.	vol.(ml)	Total volume	#/l
Anabaena	8	5	95	500	304
Chlamydomonas	79	5	95	500	3002
Chlorella	35	5	95	500	1330
Chroococcus	68	5	95	500	2584
Closteriopsis	19	5	95	500	722
Dinobryon	54	5	95	500	2052
Euglena	12	5	95	500	456
Fragilaria	8	5	95	500	304
Merismopedia	36	5	95	500	1368
Microcystis	17	5	95	500	646
Oedogonium	2	5	95	500	76
Oscillatoria	3	5	95	500	114
Stephanodiscus	13	5	95	500	494
Trachleomonas	10	5	95	500	380