ALGAL PERIPHYTON BIOASSESSMENT METHODS FOR LAKE ERIE ESTUARIES

Volume I. Metric Development

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by

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1. PREFACE

Regulating agencies and particularly the Ohio Environmental Protection Agency (OEPA) use biological criteria along with chemical and bioassay approaches to assess the quality of Ohio's rivers and streams. Criteria for three indices based on fish and macroinvertebrates (Index of Biologic Integrity, Modified Index of Well Being, and Invertebrate Community Index) have been defined and are used in a biosurvey/ecoregion approach by the OEPA (Ohio EPA 1987a). The basis for this approach is the concept of biologic integrity which is defined as "...the ability of an aquatic system to support and maintain a balanced, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of natural habitats within a region" (Karr and Dudley 1981).

The OEPA made the choice of monitoring fish and macroinvertebrates as sub-community groups because both groups have been widely used in environmental evaluation. There is an abundance of information about their life history, distribution, and environmental tolerance. Development and use of algal metrics to evaluate biologic integrity in freshwater estuaries of northern Ohio complement current efforts with fish and macroinvertebrates.

Incorporation of information from the primary producer component will provide further discrimination in site assessment. For example: 1) the sensitivity and response of the algae are different from the other two groups; 2) fish and macroinvertebrates represent biological functional endpoints, cause and effect relationships might be better understood with the inclusion of the primary producer component, 3) algae may reveal problems which have gone undetected with only the use of fish and macroinvertebrate indices.

The use of algal periphyton in assessment has numerous advantages. First, statistically valid samples with hundreds of species can be collected easily with little impact on the habitat. The high number of resident species may give excellent resolution of water and habitat quality. Second, algae have high turnover rates, so even relatively short-term stresses to the habitat will affect the algal community structure. Third, algae have been proven to be sensitive to organic and inorganic pollutants. Fourth, the global autecologies of many of the common diatom species found in these systems are documented, particularly regarding nutrients and salinity. Five, algal biomonitoring is cost-competitive with the study of other aquatic communities. Sixth, algal periphyton is ubiquitous in aquatic habitats and is present year-round.

Modern algal indices and metrics for water quality assessment, particularly those utilizing diatom periphyton, are used by the United States Geological Survey in the National Water Quality Assessment Program, NWQA (Porter et al. 1993), the states of Kentucky (Kentucky Department for Environmental Protection 1993), Montana (Bahls 1993) and Oklahoma (Oklahoma Conservation Commission 1993), and in several countries in Europe, and have been mandated by the International Joint Commission (1989) for inclusion in the assessment of water quality of the Great Lakes.

In December 1992, John Carroll University in collaboration with the Old Woman Creek National Estuarine Research Reserve received a grant from the Lake Erie Protection Fund to study algal periphyton of four Lake Erie Estuaries (Old Woman Creek, Black, Cuyahoga, and Ashtabula Rivers) for two years. Each estuary was sampled quarterly at two sites, one near the mouth and one in the upper reaches of the estuary. Diatometers were placed in the estuaries for two weeks before collection, at which time the diatometer samples, algal samples from natural substrates, and water chemistry samples were removed. Water chemistry, including nutrient and metals analysis, was determined for each sample. Non-diatom algae were identified, and diatoms identified and quantified. This study showed promise for the use of algal periphyton for assessment of water quality in these systems. The study demonstrated that algal communities in Lake Erie estuaries can suggest short term disturbance, as well as indicate biologic integrity (Sgro and Johansen 1995).

The Lake Erie Protection Fund awarded an additional grant to John Carroll University in collaboration with Old Woman Creek National Estuarine Research Reserve in December 1995 to develop a methodology to assess biologic integrity using algal periphyton in the estuaries of Lake Erie in northern Ohio. The initial study was expanded to include ten systems that would represent a broader range of environmental impacts. The estuaries of the Grand, Chagrin, Vermilion, Huron, Portage, and Maumee rivers were added to the study at this time. Furthermore, the sites were sampled synoptically in June and September for two years to separate climatic effects on the algal community. Several statistical and biometric procedures were used to analyze algal and water chemistry data.

The algal data base compiled constitutes an important baseline that will be useful both for present evaluation of the status of these systems as well as for future biomonitoring and research efforts (Sgro and Johansen 1998a). Several biometric procedures were used to analyze these data and discern relationships among communities, sites and environmental variables. Indices and metrics currently in use in the United States and Europe were tested with these data to determine whether they were appropriate or informative for assessing biologic integrity in Lake Erie estuarine systems. A local database of indicator species was generated and new or modified metrics based on these indicator species were constructed. The metrics finally chosen were selected following the definition of a useful metric according to Barbour et al. (1995). The metrics are "...sensitive to stressors [in these estuaries]; they are able to provide a response that can be discriminated from natural variation; they are environmentally benign to measure in the aquatic environment; they are cost effective to sample, and they are relevant to the biological community under study and to specified program objectives."

It is the purpose of this manual to provide in an easily accessible format information pertaining to the selected algal metrics so researchers can monitor the algae to track the effectiveness of remediation measures and identify emerging problems in the Lake Erie estuaries. Specifically, this manual includes a description of methods for collecting, processing and analyzing periphyton samples; an explanation and evaluation of

metrics for evaluating periphyton communities, and protocols for assessing biologic integrity and aquatic life impairment in the Lake Erie estuaries.

2. INTRODUCTION

The algal rapid bioassessment approach recommended in this manual consists of several metrics associated with two sampling protocols. One protocol is intended for intensive surveys or multiple year sampling and is based on three core metrics (LI, TDI, SSI) that are most sensitive to general pollution and eutrophication. A composite metric, the Erie Diatom Index (EDI) is calculated as the sum of these three core metrics. The second protocol is a convenient survey method that consists of one metric (GDI). The sixth metric is a signature response metric that is sensitive to organic pollutants (TSI). Furthermore, there is a list of indicator species derived from weighted averaging analysis of metals data from these estuaries which can be used to construct a seventh trial signature response metric for toxic metals (MM). Thus we have adopted, modified, or developed seven metrics tailored to evaluating water quality in freshwater estuaries of Lake Erie.

All the metrics that make up the index are based on diatom indicator species. Many other attributes of the diatoms were examined in this study (e.g., species richness, species evenness, shannon diversity, dominance measures, guilds, similarity, developmental abnormalities, and productivity). These were all calculated and regressed against various water chemistry parameters. They were excluded from this manual on algal metrics because they appeared less robust than attributes based on diatom indicator species. Particularly surprising to us was the inapplicability of diversity measures, such as the Shannon Diversity Index, which are so commonly employed in assessment of habitat quality in both aquatic and terrestrial communities with a variety of taxonomic groups. Guilds useful in assessing impacts in running waters (such as percent of *Cymbella+Gomphonema*, and the *Navicula/Nitzschia* ratio) were not effective in the slow moving, highly sedimented estuaries. Because the seven metrics recommended and evaluated in this manual are related to indicator species, this assessment method focuses on population and community parameters. Aspects of individual health, trophic structure, function (productivity), ecosystem and landscape level attributes are only indirectly measured.

Non-diatom algae were also analyzed for in this study, but attributes of non-diatom algae could not be built into a convenient and reliable numeric metric for these systems. The non-diatom algae remain an important aspect of practical local knowledge for the biologist concerned with these systems, but their use in assessing water quality in estuaries is not expected in the recent future.

The five metrics discriminate between systems of good and poor quality. The relationships between the sensitivity of the diatoms used as indicators in this index and general and specific forms of pollution are well characterized (Lange-Bertalot 1976, Rumeau and Coste 1988, Kelly and Whitton 1995). These indicators are being used in

water quality indices in Europe as well as the U.S. Adopting metrics developed for flowing waters from France and England and other parts of the United States for use in freshwater estuaries Ohio assumes strong correlation between these systems and should be done with care. The European indicators were validated with Lake Erie estuary data using conventional statistical and biometric techniques and a knowledge of the ecology of these systems to develop an index for our geographic area.

The metrics vary systematically along ranges of anthropogenic disturbance encountered in the Lake Erie estuaries. Ecological dose-response curves can be constructed for these metrics with water chemistry on the x-axis and the measured metric on the y-axis (Fig. 1). Similar graphs can be constructed for the algal metrics with QHEI (Qualitative Habitat Evaluation Index) (Rankin 1989) scores determined for these systems at sites proximal to the algal study sites (Fig 2). These graphs provide evidence that relationships among the algal metrics, water chemistry and habitat quality exist. The fit in these graphs is not tight, but we suggest that the water chemistry and QHEI scores are not capturing all the human influence affecting algal ecology.

Proper classification of sites is important for the effectiveness of biological monitoring. Systems that are biologically similar and that respond similarly to human impact should be classified together. Karr and Chu (1997) recommend classifying systems before constructing metrics. However, inappropriate levels of classification, too few classes or too many classes can create needless complication on one hand or the loss of important distinctions on the other (Karr and Chu 1997). Reference sites, those areas considered to be a clean, undisturbed reference against which impacted systems can be compared, were not identified for the estuaries in the 1983-1984 Ohio Stream Regionalization Project (Ohio EPA 1987b, 1989) which picked reference sites for Ohio rivers. If the recommendation of Karr and Chu (1997) is to be followed, metrics can be properly established only after identification of the classes and their reference sites. The difficulty in describing classes and the absence of reference conditions in these estuaries is thus problematic in Ohio estuaries.

There are several features of these estuaries that could serve as a basis for classification, for example: ecoregion, drainage basin size, geomorphologic features, urban or agricultural land use, extent of associated wetlands, and channel structure. However, none of these characteristics are necessarily sufficient to be an automatic basis of classification. Some important features are shared by these estuary systems as well: they are all highly disturbed, they are areas of slow moving water and high sediment deposition, they are all confounded by lake water, and there is no algal biota unique to any one of these sites. A Principal Components Analysis of diatom composition did not support classification of the estuaries by ecoregion (Fig. 3). The metrics exhibit a systematic ecological dose-response over the range of detrimental impacts in these systems irrespective of ecoregion or drainage basin size. Yoder and Rankin (1995) recommend formation of metrics over large areas (before classification) because it allows for resolution between regions that would be lacking with separate indices. We followed this recommendation. No unique classes affecting algal response were identified prior to

Figure 1. Scatterplot showing the relationship of the Percent Sensitive Species Index (SSI) and a composite of standardized nutrient scores for nitrite, nitrate, ammonia, and phosphate.

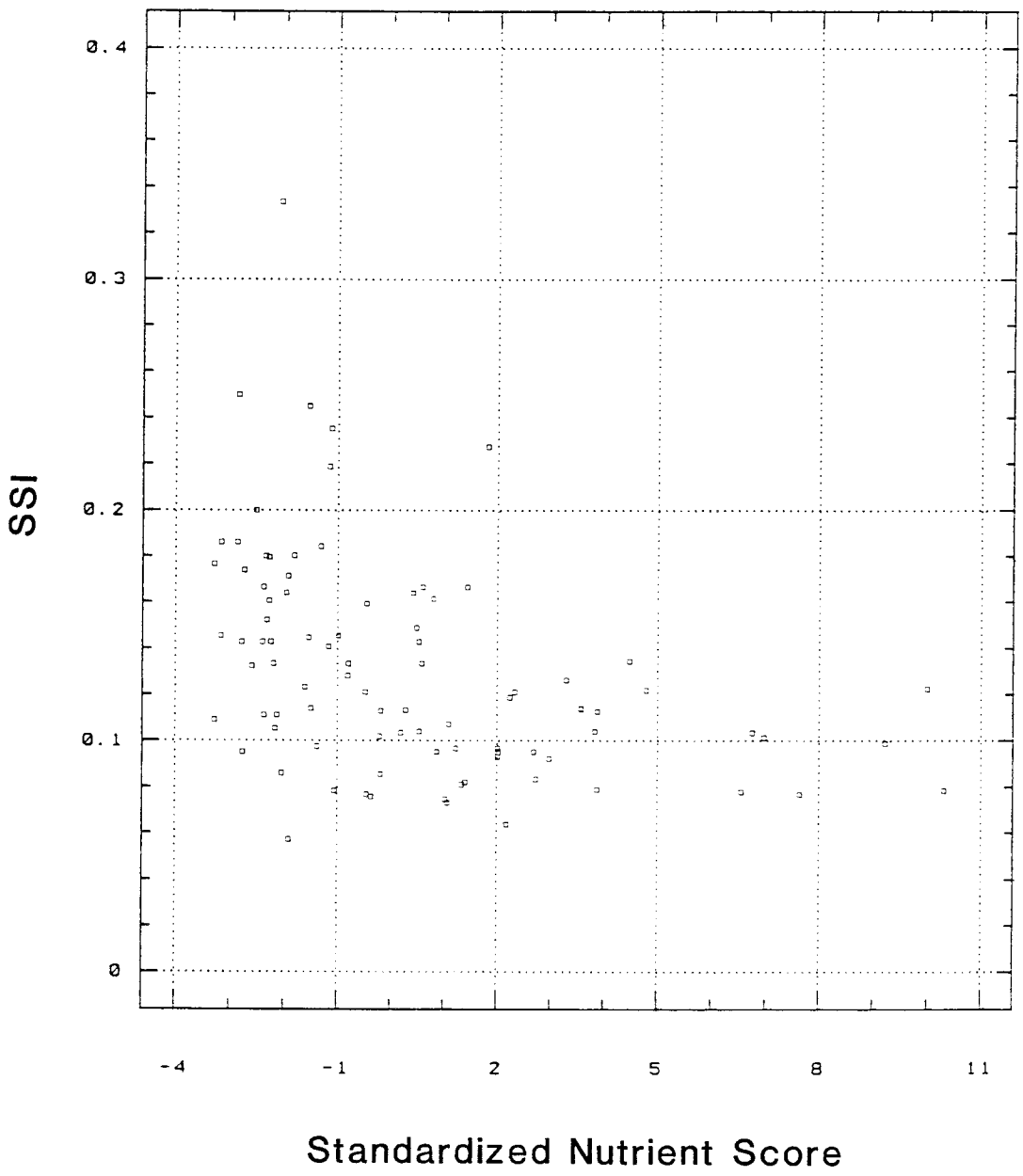


Figure 2. Scatterplot showing the relationship of the Lange-Bertalot Index (LI) and the Qualitative Habitat Evaluation Index (QHEI).

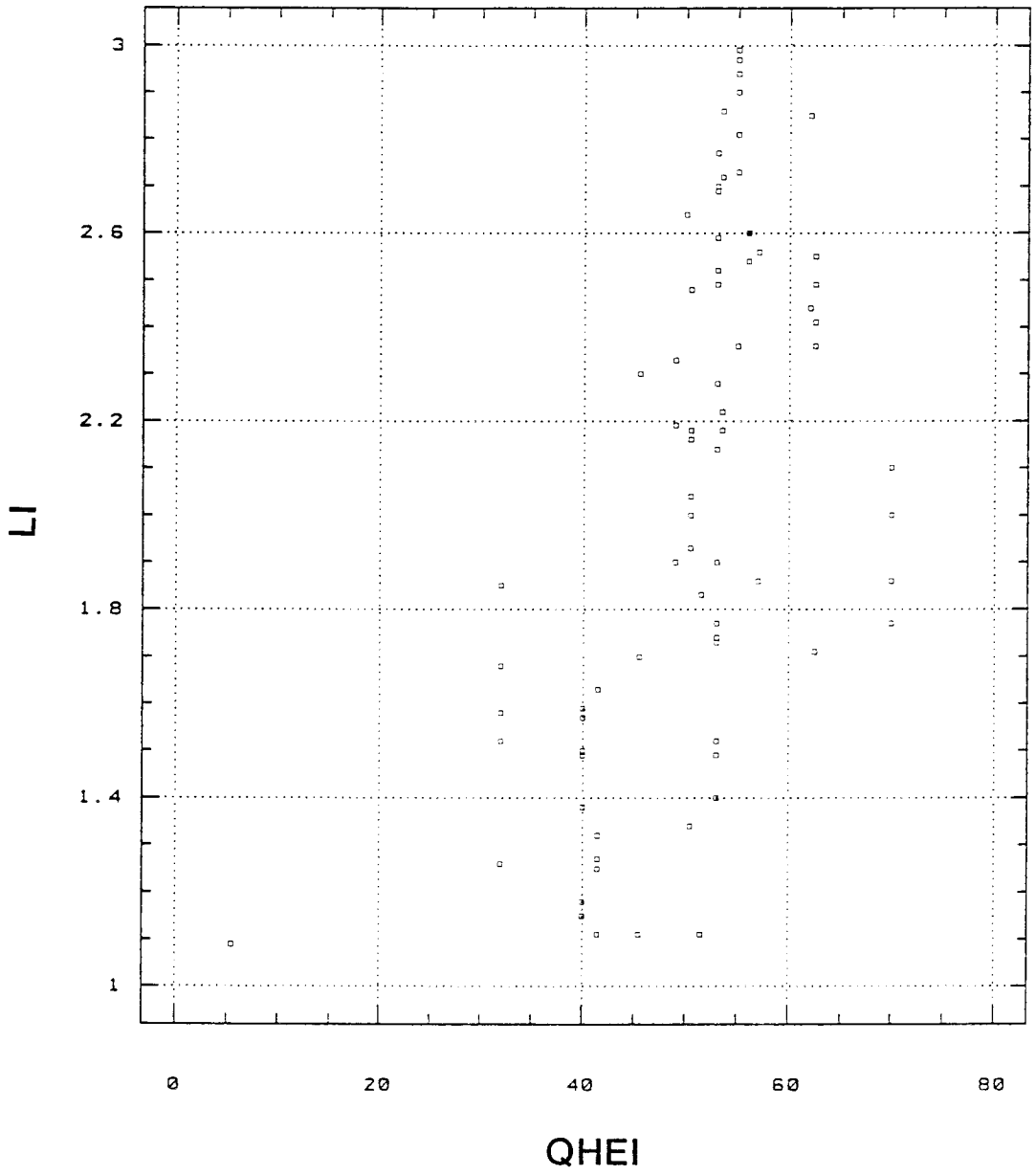
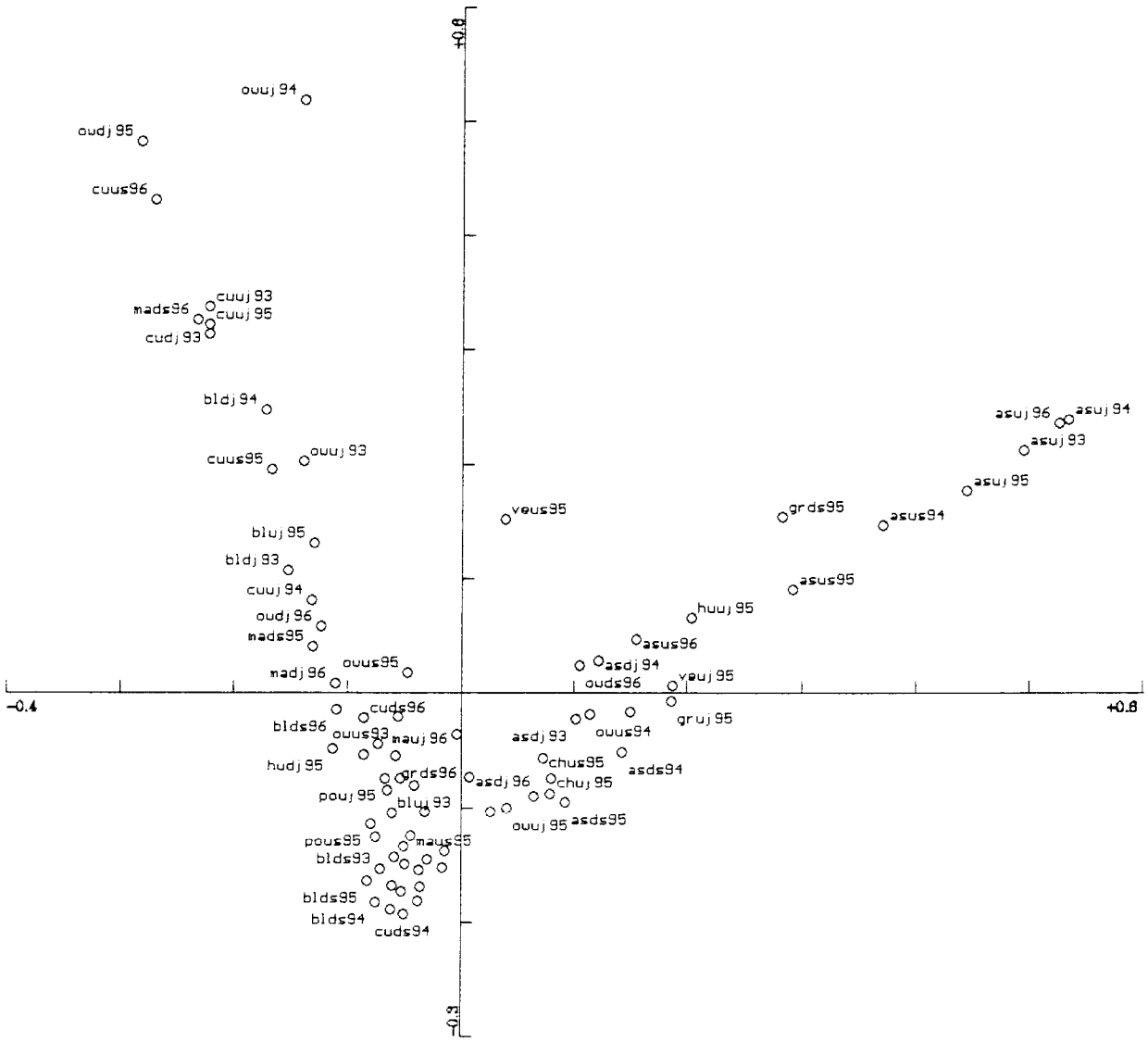


Figure 3. Principal Components Analysis of all samples based the species data set used for CANOCO. It can be seen that the rivers do not cluster by ecoregion, but rather by water quality. The Ashtabula River, Grand River, Chagrin River, Cuyahoga River, and Black River are in the Eastern Ontario Lake Plain Ecoregion. The Vermilion River, Old Woman Creek, and Huron River are in the Eastern Cornbelt Plain Ecoregion. The Portage River and Maumee River are in the Huron-Erie Lake Plain Ecoregion. The site codes consist of the river code (first two letters of the river's name), followed by a letter for site (u=upstream, d=downstream), followed by a letter for month sampled (j=June, s=September), followed by the last two numbers of the year of collection.



development of the estuarine algal index. For this version of the index there is only one class, freshwater estuary. The index is interpretable statewide in the estuaries along the southern shore of Lake Erie. Water quality managers may recognize relevant variation in these systems as the index is used and further analyzed in the future (e.g., an index score of 10 in the Huron-Erie Lake Plain Ecoregion may mean something different from a 10 in the Eastern Ontario Lake Plain Ecoregion).

Statistical validation of the precision and power of the algal index needs to be done if it is to be employed as a regulatory tool. This kind of analysis would also help determine the most appropriate sampling method. Both grab sampling and diatometer sampling were used in the creation of these metrics. The composite EDI scores between the two sampling methods correlated well (Spearman Rank Correlation = 0.7324, $p < 0.0001$). It is not clear, however, how much of the variance between these scores is due to sampling error and how much is due to differences in methodology. Until this question is answered the recommendation is to use diatometers for protocol I and grab samples for protocol II. Diatometers control substrate variability. It is also assumed that the algae collected on the diatometer represents conditions in the system from the time the diatometer was put in place, usually a period of two weeks or less. This kind of short term assessment is a valuable and unique characteristic of algal monitoring. Furthermore, composite grab sampling is sometimes not possible in these systems (e.g., the shipping channel of the Cuyahoga River) and even epidendric sampling (from wood) can be challenging. On the other hand, grab sampling is convenient. It only requires one trip into the field with minimal equipment, and seems appropriate for a rapid bioassessment protocol.

3. METHODS AND PROTOCOLS

3.1 Sampling Natural Substrates

Epidendric samples from logs and sticks can be used for diatom collection in these estuaries. Composite grab samples from a variety of substrates are not possible in the dredged shipping channels. However, logs and sticks seem to be ubiquitous in these systems. There should be reasonable assurance, however, that the wood has been in place for at least a month and has not recently floated to the site from upstream and therefore is not representative of the local flora. Samples can be most economically collected in whirl-pak bags, although water tight polypropylene bottles prevent sample leakage and can be stored more conveniently. Keeping samples on ice until they can be refrigerated is sufficient if the samples will be examined quickly, otherwise an addition of formaldehyde or formalin to give a final concentration of 4% will preserve the samples. Alcohol can also be used to preserve diatoms, although it is a poor preservative for non-diatom algae because of dehydration shrinkage.

3.2 Sampling Artificial Substrates

Although a variety of artificial substrates have been used in past studies, we recommend those devices using glass slides or rods since they are relatively inexpensive, provide numerous replicates, and allow easy removal of lightly attached algae. Plastic diatometers with floats that hold a series of vertical slides are available from a number of biological supply companies. The slides can be removed from the diatometers in the field and placed in whirl-paks. These diatometers work well, but can be expensive and are subject to loss and vandalism.

A very inexpensive diatometer was developed by Bob Lynch (personal communication) utilizing glass rods. These diatometers were used along with glass slide diatometers in the development of this index. Though they were still subject to loss due to natural events, they were seldom if ever vandalized. The diatometers are constructed by mounting two glass rods to a simple copper wire holder with epoxy cement. The diatometer is then hung in the water with nylon cord. The rods can be removed in the field and placed in plastic centrifuge tubes.

Diatometers should be left in the water for approximately two weeks. A shorter time is not sufficient for the development of the algal colony and a longer period subjects the samples to modification by grazers. Care must be taken to place the diatometers uniformly with regard to light and current effects.

3.3 Preparation of Permanent Diatom Slides

Material collected on glass rods can be effectively removed by scrapping the rod into a 150 ml beaker with a tool made from plastic surgical tubing. Glass slides can be scrapped into a 150 ml beaker with a razor blade.

Equipment required for sample preparation includes a fume hood, hotplate, and centrifuge. The hotplate should be set in the fume hood and preheated on high. Fill the 150 ml beaker with 15-20 ml of sample and water. Add approximately 10 ml concentrated nitric acid and place the beaker on the hotplate.

Boil the acidified sample until the liquid volume is approximately 15 ml or less. Add a pinch of potassium dichromate. Boil the sample 5 more minutes and then remove the sample from the heat. Samples should not be allowed to boil down too far or they will begin to spatter. Samples should be watched closely and if spattering begins to occur, the sample should be removed from the heat.

Transfer the sample to a 15 ml disposable centrifuge tube with a tight fitting screw cap. Centrifuge the set of samples and decant the acid into a large beaker for disposal. Fill the centrifuge tube with deionized water, agitate to break up the pellet and centrifuge again. The pellet material should be washed a total of six times in this manner.

Agitate the sample after the final rinsing. Remove the subsample and dilute to a cloudy suspension. Using a pipet, put the diluted sample on to a coverglass. Allow the samples to dry overnight. The next day preheat the hotplate in the fume hood. Place a large drop of Naphrax diatom mountant (available from Northern Biological supplies, 3 Betts Ave., Martlesham Heath, Ipswich IP5 7HR, United Kingdom) on a glass slide. Heat the slide for a few seconds until some toluene boils off (small bubbles appear). Remove the slide from the heat and quickly invert the coverglass with the dried diatom material onto the mountant. Place the slide back on the heat and allow the mountant to boil out to the edges. Remove the slide from the heat and apply pressure to the coverglass with a probe to help the bubbles reabsorb. Label the slide well.

3.4 Identification of Taxa

The taxonomic treatments of Krammer and Lange-Bertalot (1986, 1988, 1991a, 1991b) were relied on extensively for the identification of taxa in the development of these metrics. Patrick and Reimer (1966, 1975) were also consulted. Other sources were consulted for identification of some of the more difficult centric diatoms. Although recently there have been many revisions in diatom taxonomy, particularly at the genus level, this index follows the taxonomy of Krammer and Lange-Bertalot as described in the references mentioned above. It is hoped that the new taxonomic changes will improve the use of diatoms for ecological monitoring and can be incorporated later.

It will be necessary to identify taxa to species level. Therefore, a research grade microscope is required, preferably equipped with Nomarski DIC optics and 100X objectives. The microscope should be equipped with a camera for taking photomicrographs. A small darkroom should be available for the development of these micrographs. Photomicrographs are critical for quality control, as they promote internal consistency and consistency between projects by different investigators. If research grade microscopes and photographic capability are lacking, the GDI in protocol II could still reliably be determined with light microscopes with 100X objectives and bright field, phase, or DIC optics. A floristic guide to assist in diatom study in the estuaries is available (Sgro and Johansen 1998b).

3.5 Data Management

Diatom data can be stored in a spreadsheet or database format. The index and metrics are calculated with simple formulas within the capability of spreadsheet software. However, software packages exist that can store diatom data, calculate indices, and permit management of data. OMNIDIA II (Prygiel 1991) and STARS (Stream Algae Recording System: Kelly and Whitton 1994) are two such programs. Data for the estuarine study was handled by simple software programs written in Turbo Pascal by the John Carroll researchers.

3.6 Protocols

3.6.1 Protocol I

This protocol is intended for intensive surveys or multiple year sampling from June through September. It assesses biologic life impairment by comparing the index score with values derived from all 92 samples studied for the development of this index. Three core metrics are used in this protocol: the Trophic Diatom Index (TDI), the Lange-Bertalot Index (LI), and the Percent Sensitive Species Index (SSI). The index score is the sum of these three metric scores.

Additionally, two response signature metrics are scored: the Percent Tolerant Species Index (TSI), and the Metals Metric (MM). These response signature metrics introduce diagnostic power into the index. The TSI determines the percentage of taxa in the sample that are tolerant of organic pollution, thus giving an indication of the effects of organics in the system. The MM was derived from the 92 samples studied for the development of the index. This metric is based on the percentage of organisms sensitive to or tolerant of general metals pollution in a sample, thereby giving an indication of the effects of toxic metals in the estuaries. It is presented here as a trial metric.

Diatometer samples should be collected for this protocol. Diatom counts to species level should be performed. In the present study 900 valves were counted for each sample from three replicate slides. A lower number of valves could likely be counted (at least 400), although it would be important to count a constant number for consistency in the metric.

3.6.2 Protocol II

This protocol is intended as a quick assessment or survey involving a minimum of time and resources It consists of one metric, the Generic Diatom Index (GDI). As in protocol I, this protocol assesses biologic life impairment by comparing the index score with reference criteria derived from the 20 sites studied for the development of this protocol.

This index is intended for use with epidendric grab samples collected from June through September. A count of 400 valves for each sample was performed in testing this metric in the estuaries, but the reliability of the metric using a 200 valve count should be explored (see Kelly 1997). Taxonomic identification need only be taken to genus level.

4. METRIC DESCRIPTIONS

4.1 Metric 1. Trophic Diatom Index (TDI)

The Trophic Diatom Index is a newly developed index to serve the monitoring needs of the UK Environment Authority under the terms of the Urban Wastewater Treatment Directive of the European Community (Kelly and Whitton 1995). The TDI was designed primarily as an indicator of trophic status of streams impacted by wastewater treatment facilities in the UK

The index was developed by comparing the relationship between concentrations of filterable reactive phosphorous (FRP) with diatom species frequency at 70 "clean" sites in the UK When regressed against FRP values the TDI calculated for these 70 sites showed a strong correlation ($R^2 = 0.63$).

Species sensitivity values were assigned as follows: 1 for species occurring at <0.01 mg/l FRP; 2 for species occurring at >0.01 <0.035 mg/l FRP; 3 for species occurring at >0.035 <0.1 mg/l FRP; 4 for species occurring at >0.1 <0.3 mg/l FRP; and 5 for species occurring at > 0.3 mg/l FRP. Species indicator values were determined by the spread of the species frequency through the range of these sensitivity values (Kelly and Whitton 1995). The index score is calculated by the weighted average equation of Zelinka and Marvin (1961):

$$\text{Index} = \frac{\sum a_j v_j s_j}{\sum a_j v_j},$$

where a = relative abundance of species j in a sample, v = indicator value of species j, and s = pollution sensitivity of species j. The index ranges from 1 (very clean water) to 5 (very polluted water).

The TDI metric was tested on the 10 Lake Erie estuaries listed above (20 sites, 92 samples) between 1992 and 1996. The orthophosphate concentrations of these samples were within the range of the values of the UK sites. The TDI calculated for these estuaries showed a weaker correlation with orthophosphate than the UK sites ($R^2 = 0.155$, $p = 0.00010$, Fig. 4). It correlated with a standardized summed value for nitrite, nitrate, ammonia, phosphate, and conductivity similarly ($R^2 = 0.1864$, $p = 0.00002$, Fig. 5). The metric also showed a weak correlation with QHEI scores from sites proximal to the sites used in the estuarine study ($R^2 = 0.1049$, $p = 0.00407$, Fig. 6).

An examination of these plots (Figs 4, 5) suggests that the index is able to discriminate sites with high nutrient concentrations, but is unable to provide clear resolution at lower nutrient levels. However, we speculate that there are other factors affecting the pollution sensitive indicators in the systems with low measured P and high TDI values (e.g., high organic carbon, low DO, intolerance of toxic materials, etc.).

Figure 4. Regression of the Trophic Diatom Index (TDI) against phosphate (log (x + 1) transformed). $R^2 = 0.155$, $p = 0.00010$. From the scatter, the relationship appears more curvilinear than linear.

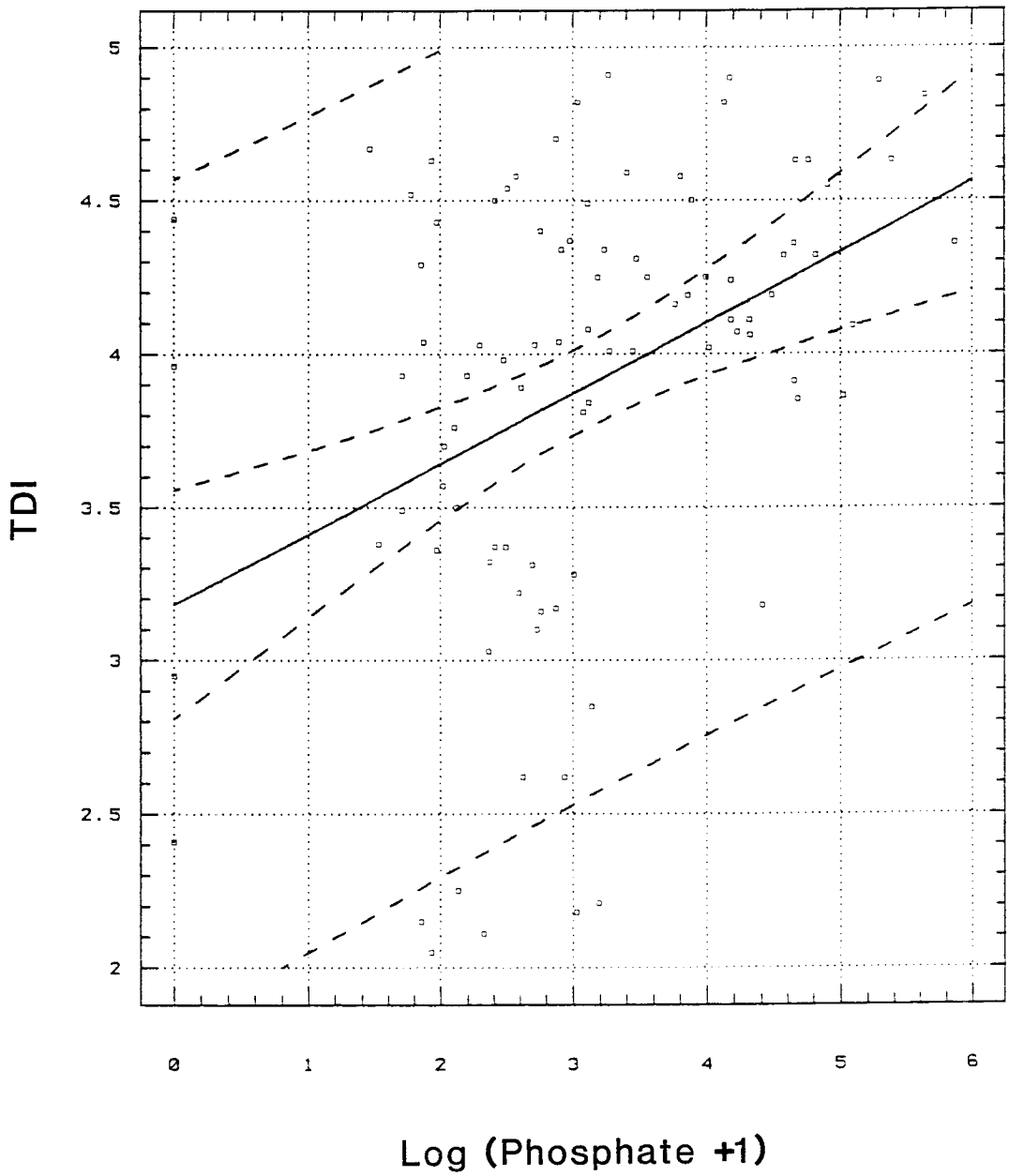


Figure 5. Regression of the Trophic Diatom Index (TDI) against a composite of standardized nutrient scores for nitrite, nitrate, ammonia, and phosphate. $R^2 = 0.1864$, $p = 0.00002$. This relationship appears somewhat curvilinear, with the lower standardized nutrient scores showing considerable scatter with regards to the TDI.

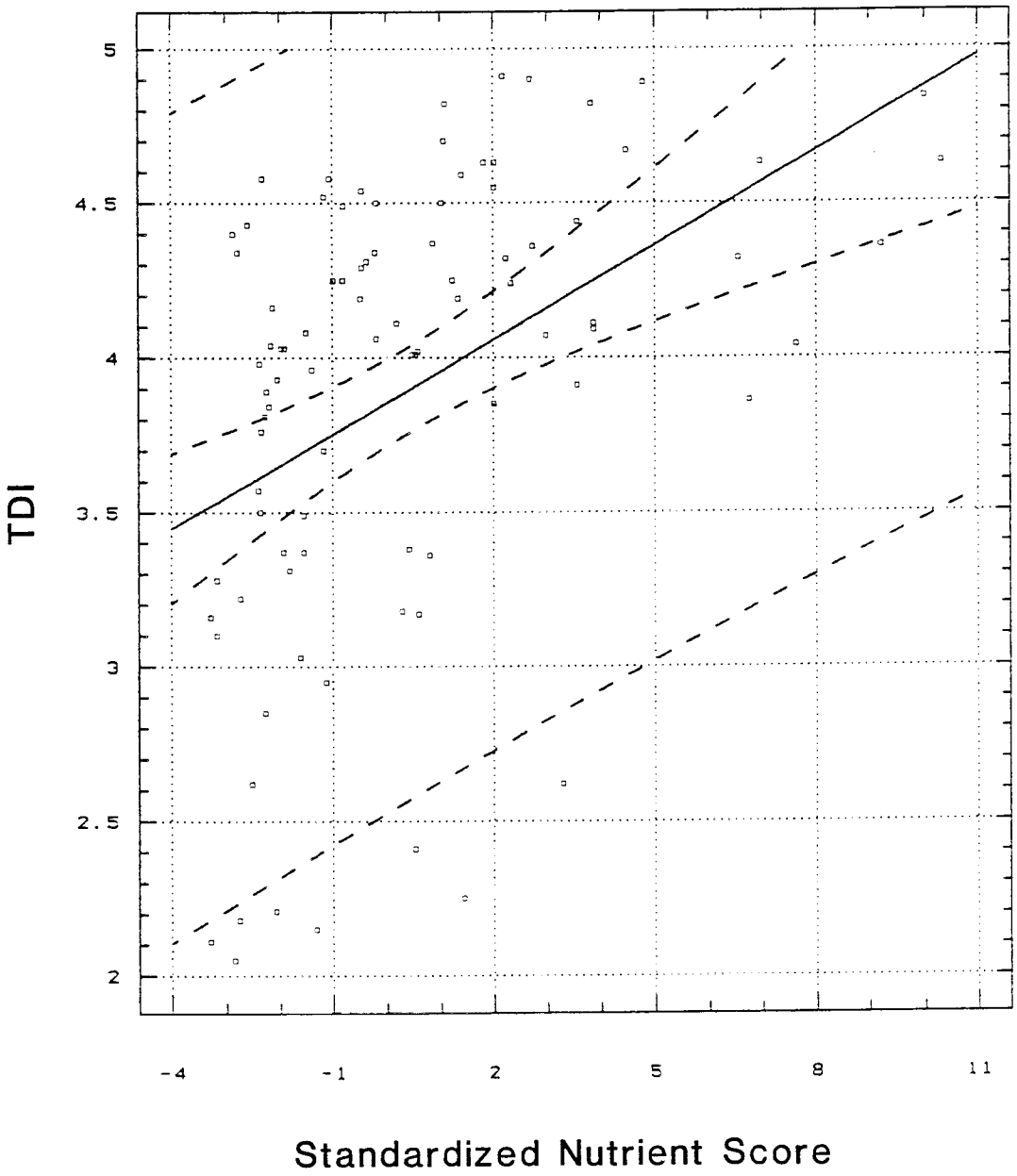


Figure 6. Regression of the Trophic Diatom Index (TDI) against the Qualitative Habitat Evaluation Index (QHEI). $R^2 = 0.1049$, $p = 0.00407$. Again, a curvilinear relationship seems to exist, with considerable scatter of samples with high QHEI scores with regards to the TDI.

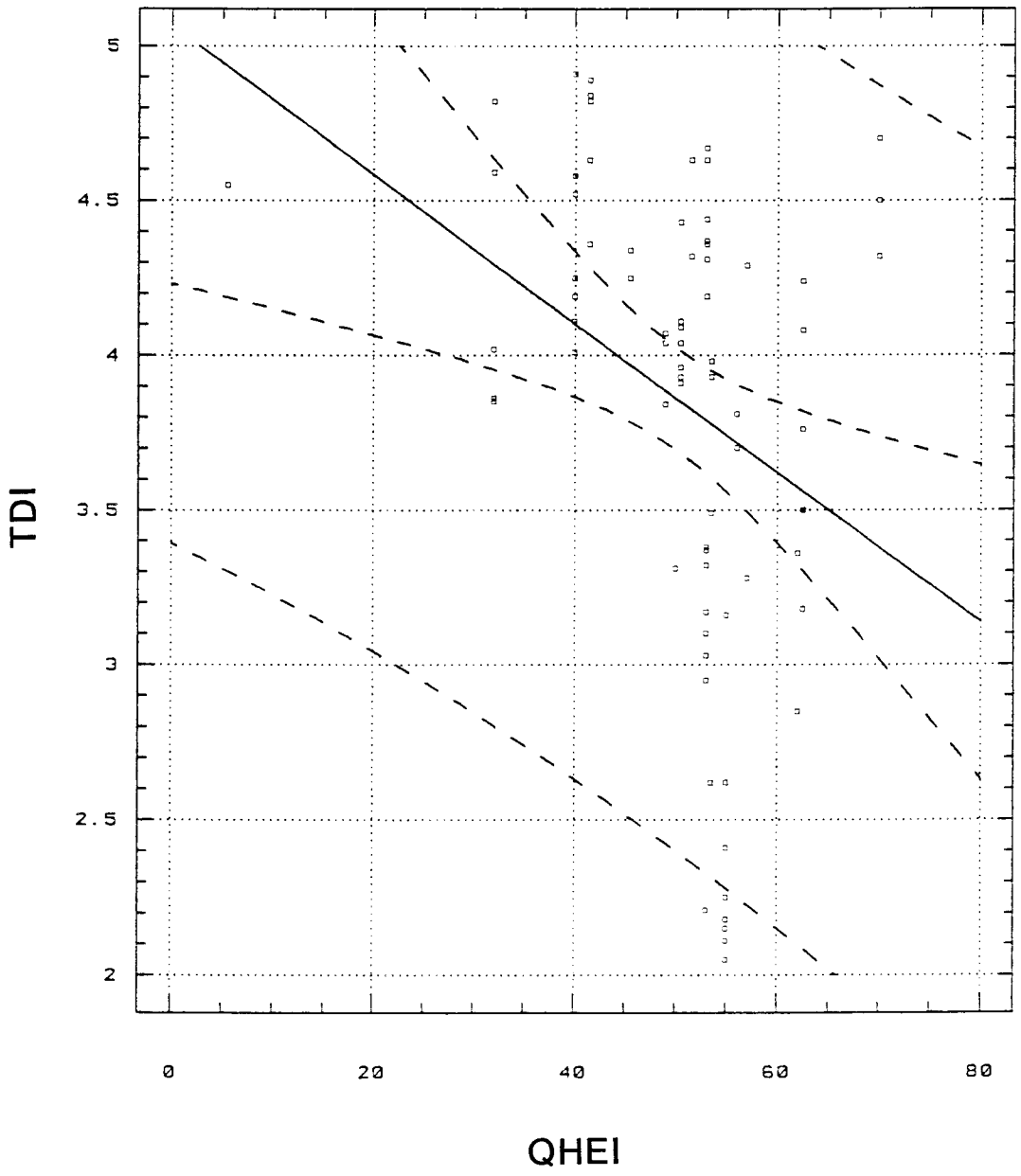
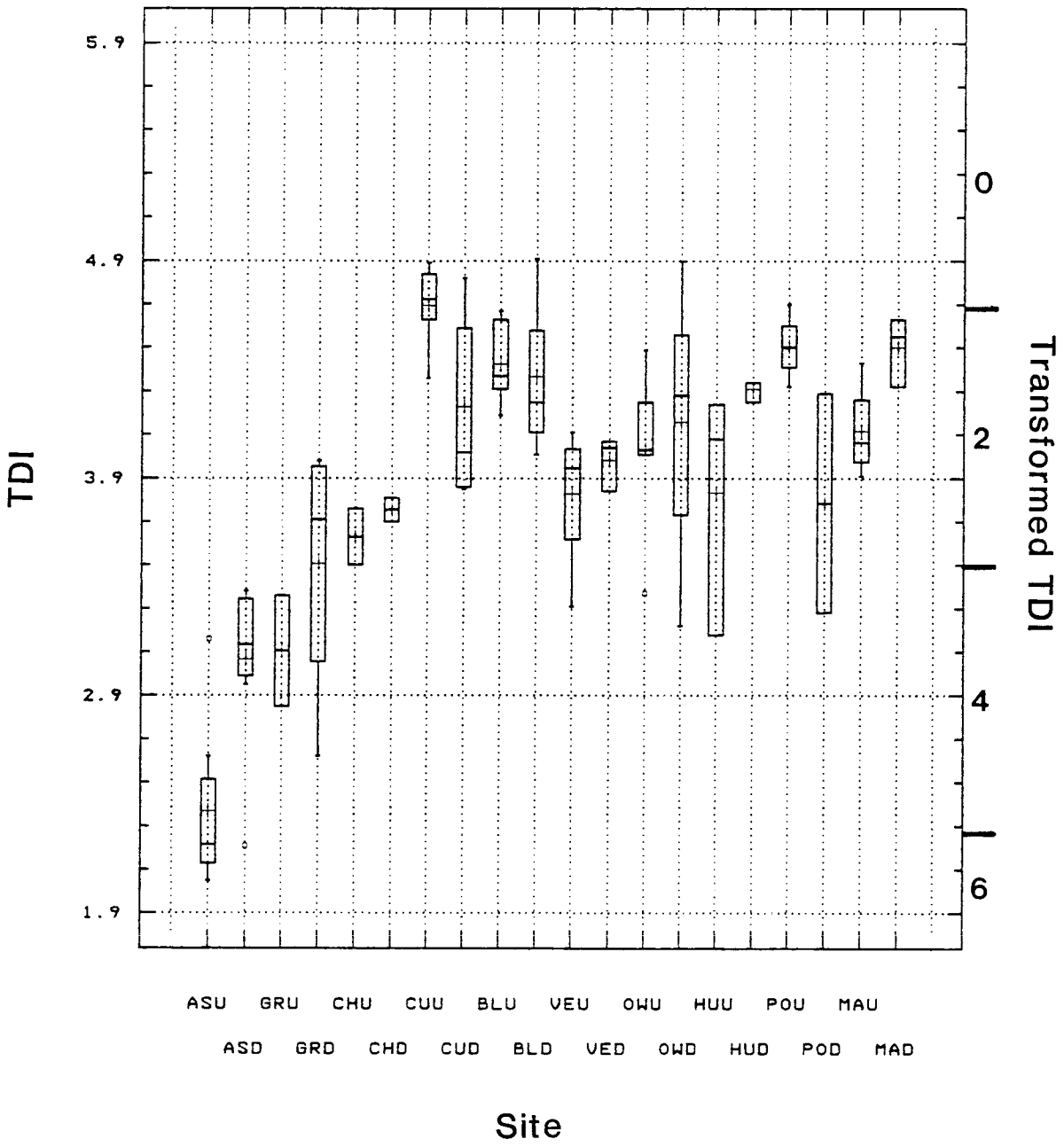


Figure 7. Box-and-Whisker Plot showing the Trophic Diatom Index (TDI) scores for all 20 sites. The suggested transformation categories for Lake Erie estuaries are given on the right margin. These catagories are: 0-2.26 = 6, 2.26-3.48 = 4, 3.48-4.66 = 2, >4.66 = 0. The scale is reversed because the cleanest waters have the lowest TDI scores.



A box-and-whisker plot of the TDI metric values for the estuaries demonstrates variation among sites (Fig. 7). Considering the range of measured nutrient concentrations in these systems and a knowledge of ecological disturbance especially in the Huron-Erie Lake Plain Ecoregion and the Black and Cuyahoga estuarine systems we conclude that the TDI can function to separate good from poor systems in the Lake Erie estuaries. A list of the TDI species and indicator values as used in the estuary study is given in Table 1.

Sensitivity and tolerance values of taxa used in the index can be modified as more information is generated about species autecologies in the estuaries. This would allow the index to become tailored to these systems and presumably provide greater resolution in discriminating conditions between the estuaries.

Table 1. Diatom species with sensitivity value (s) and indicator value (v) for the Trophic Diatom Index based on Kelly and Whitton (1995) and as compiled for the Lake Erie estuaries. "Includes" indicates taxa that for this study receive the same scores as the taxon under which they are listed.

	s	v
Achnanthes lanceolata (Brébisson) Grunow	5	2
includes *A. rostrata* Ostr.		
Achnanthes minutissima Kützing	2	2
includes *A. microcephala* Kützing (Grunow)		
Achnanthes other species	3	1
Amphipleura pellucida (Kützing) Kützing	1	3
Amphora pediculus (Kützing) Grunow	5	2
Amphora other species	5	1
Anomoeoneis vitrea (Grunow) Ross	1	2
Asterionella formosa Hassall	3	1
Aulacoseira Thwaites	2	1
Caloneis Cleve	3	1
Cocconeis pediculus Ehrenberg	4	2
Cocconeis placentula Ehrenberg	3	2
Cocconeis other species	2	2
Cyclostephanos Round	5	1
Cyclotella Kützing ex. Bréb.	5	1
Cymbella affinis Kützing	1	3
Cymbella microcephala Grunow	1	2
Cymbella silesiaca Bleisch	3	2
includes *C. minuta* Hilse ex. Rabh.		
Cymbella sinuata Gregory	4	3
Cymbella large forms	4	2
normally >50 μm includes		
C. caespitosa Kützing Brun.		
C. lanceolata (Ehrenberg) Kirchner		
Cymbella other species	2	1

Denticula Kützing	2	2
Diatoma tenuis Agardh	3	2
Diatoma vulgaris Bory	5	3
Diatoma other species	2	1
Diploneis Ehrenberg	1	1
Epithemia Bréb.	1	2
Eunotia Ehrenberg	1	3
Fragilaria capucina Desmazieres	2	2
Fragilaria pinnata	4	1
Fragilaria vaucheriae (Kützing) Petersen	3	2
Fragilaria other species	2	1
Frustulia Agardh	1	2
Gomphonema angustatum Kützing	1	2
Gomphonema olivaceum (Hornemann) Brébisson	5	2
Gomphonema parvulum Kützing	5	3
Gomphonema other	3	1
Gyrosigma Hassall	5	2
Hantzschia Grunow	5	1
Melosira varians Agardh	4	2
Meridion circulare (Greville) Agardh	2	3
Navicula cryptotenella Lange-Bertalot includes *Navicula menisculus* Schumann	5	2
Navicula gregaria Donkin	5	1
Navicula lanceolata (Agardh) Ehrenberg	5	2
Navicula tripunctata (O.F. Miller) Bory	4	2
Navicula other taxa excluding small species	4	1
Navicula small species <12 μm	5	1
Neidium Pfitzer	2	3
Nitzschia acicularis (Kützing) W. Smith	3	1
Nitzschia amphibia Grunow	4	3
Nitzschia dissipata (Kützing) Grunow	4	2
Nitzschia pusilla Grunow	4	2
Nitzschia other species	4	1
Pinnularia Ehrenberg	1	3
Rhoicosphenia curvata (Kützing) Grunow	4	1
Rhopalodia Müller	1	1
Stauroneis Ehrenberg	5	2
Stephanodiscus Ehrenberg	5	3
Surirella Turp.	3	1
Synedra pulchella (Ralfs) Kützing	2	1
Synedra ulna (Nitzsch) Ehrenberg	3	1
Synedra other species	4	1
Tabellaria Ehrenberg	2	3
Thalassiosira Cleve	4	1

4.2 Metric 2. Lange-Bertalot Index (LI)

Lange-Bertalot (1979) examined the relationship between the ecology of globally abundant freshwater diatoms and water quality characteristics in the Rhine-Main river system in Germany from 1973-1977. The relationship between the saprobic conditions (terminology that roughly equates with BOD) in the Rhine-Main system and the relative abundance of the diatoms was analyzed. Three classes of diatoms were described as a result of this analysis: 1) tolerant of pollution, 2) less tolerant of pollution, and 3) pollution sensitive.

This classification system is used by the Montana Department of Health and Environmental Science as a metric for biologic integrity assessment in Montana streams (Bahls 1993). Some modifications of the classifications have been made as the metric has been used in the Montana streams. It is also being used by the Kentucky Department of Environmental Protection (1993) and the Oklahoma Conservation Commission (1993) on a trial basis.

The Lange-Bertalot classification was tested in the Lake Erie estuaries. The metric was calculated as described in Bahls (1993). The metric score is calculated as an average. Species are assigned an indicator value of 1, 2, or 3 if they are in the Lange-Bertalot classes of tolerant, less tolerant, or sensitive, respectively. Only species assigned a value are used for the calculation. The percentage of organisms in the sample from each class is multiplied by the indicator value of that class and the sum of these 3 products is the metric score.

The LI metric with regression analysis correlated weakly with a standardized summed value for nitrite, nitrate, ammonia, phosphate, and conductivity ($R^2 = 0.1124$, $p = 0.00124$, Fig.8) in the Lake Erie estuaries. It correlated slightly better with orthophosphate ($R^2 = 0.1675$, $p = 0.00005$, Fig. 9). The metric scores also evidenced a correlation with QHEI scores for sites approximate to the sample sites used in the estuarine study ($R^2 = 0.2981$, $p < 0.00001$, Fig. 10).

A box-and-whisker plot for the LI metric is shown in Figure 11. The coefficient of variation (calculated as 100 x standard deviation/mean) among all sites is 27.45, compared to 21.21 for the TDI index. This variability may be a characteristic of the index or it may be reflecting either anthropogenic or natural variation in the systems. At this stage in the development of Protocol 1 we may only speculate. We conclude, however, from an examination of the box-and-whisker plot, that the LI metric is able to discriminate healthy from enriched sites.

We recommend not modifying this metric so it may serve easily as a tool for comparison on a temporal basis for these systems. The species and LI indicator values used in the estuaries study are listed in Table 2.

Figure 8. Regression of the Lange-Bertalot Index (LI) against a composite of standardized nutrient scores for nitrite, nitrate, ammonia, and phosphate. $R^2 = 0.1124$, $p = 0.00124$.

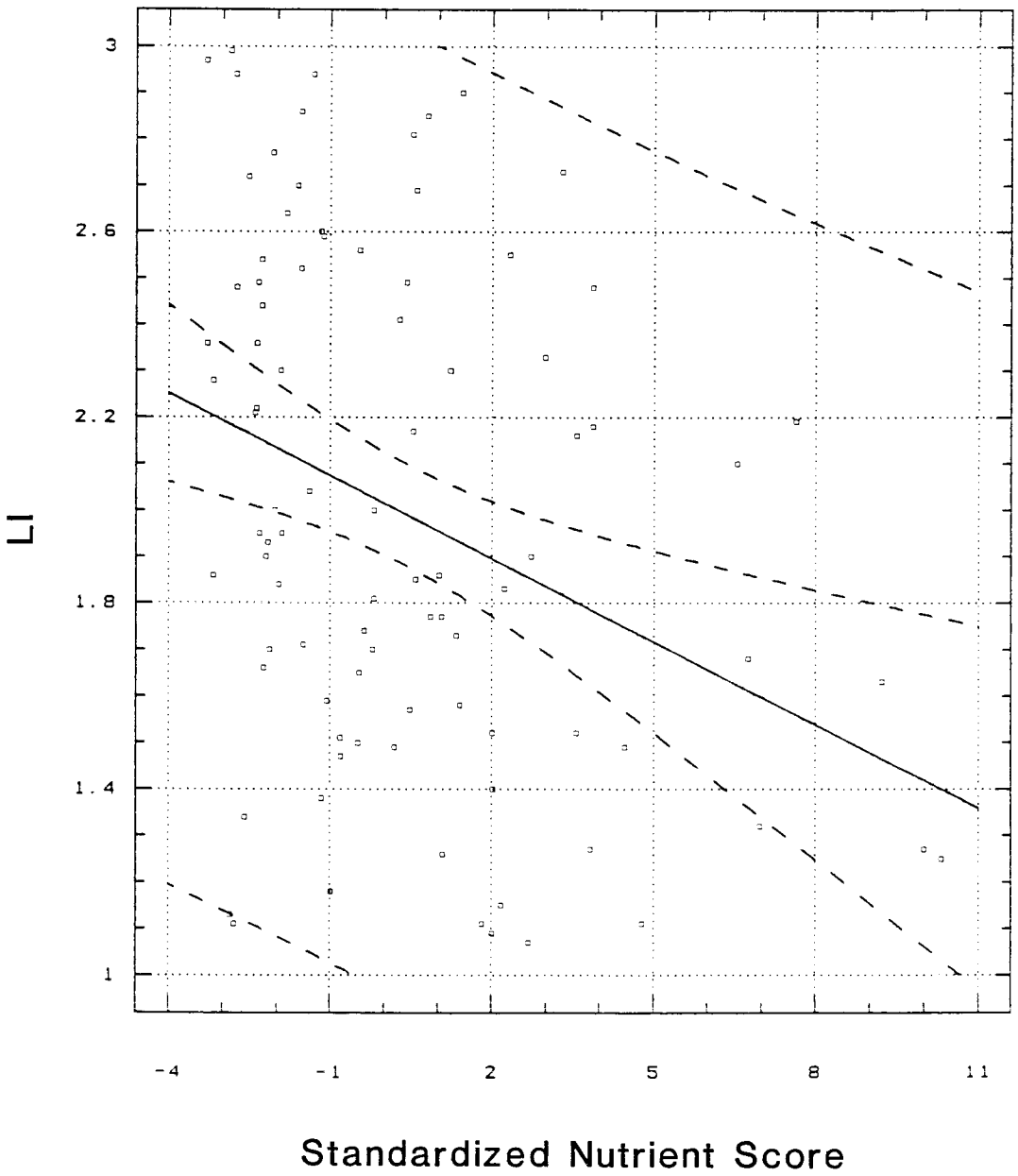


Figure 9. Regression of the Lange-Bertalot Index (LI) against phosphate (log (x+1) transformed). $R^2 = 0.1675$, $p = 0.00005$.

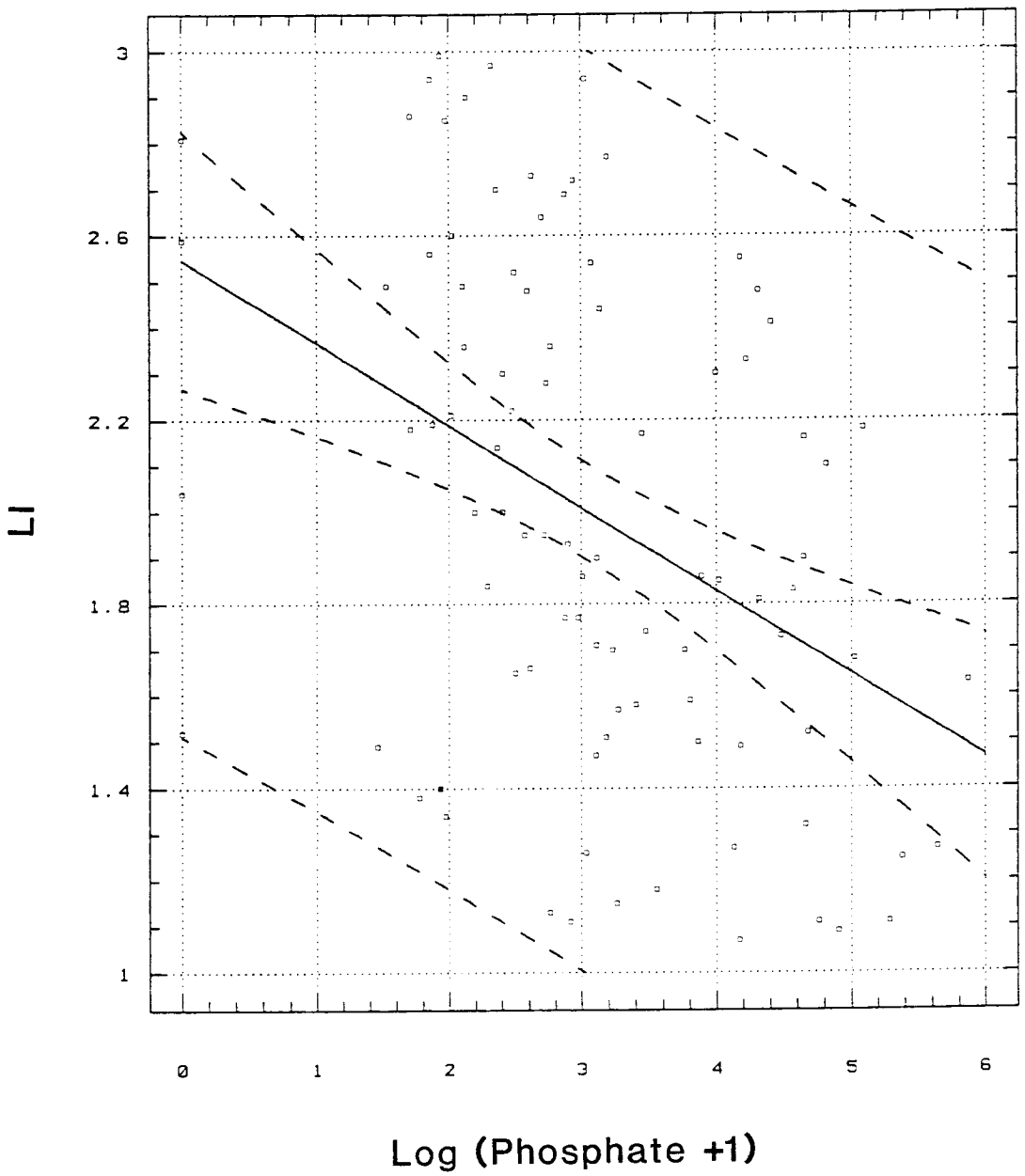


Figure 10. Regression of the Lange-Bertalot Index (LI) against the Qualitative Habitat Evaluation Index (QHEI). $R^2 = 0.2981$, $p < 0.00001$.

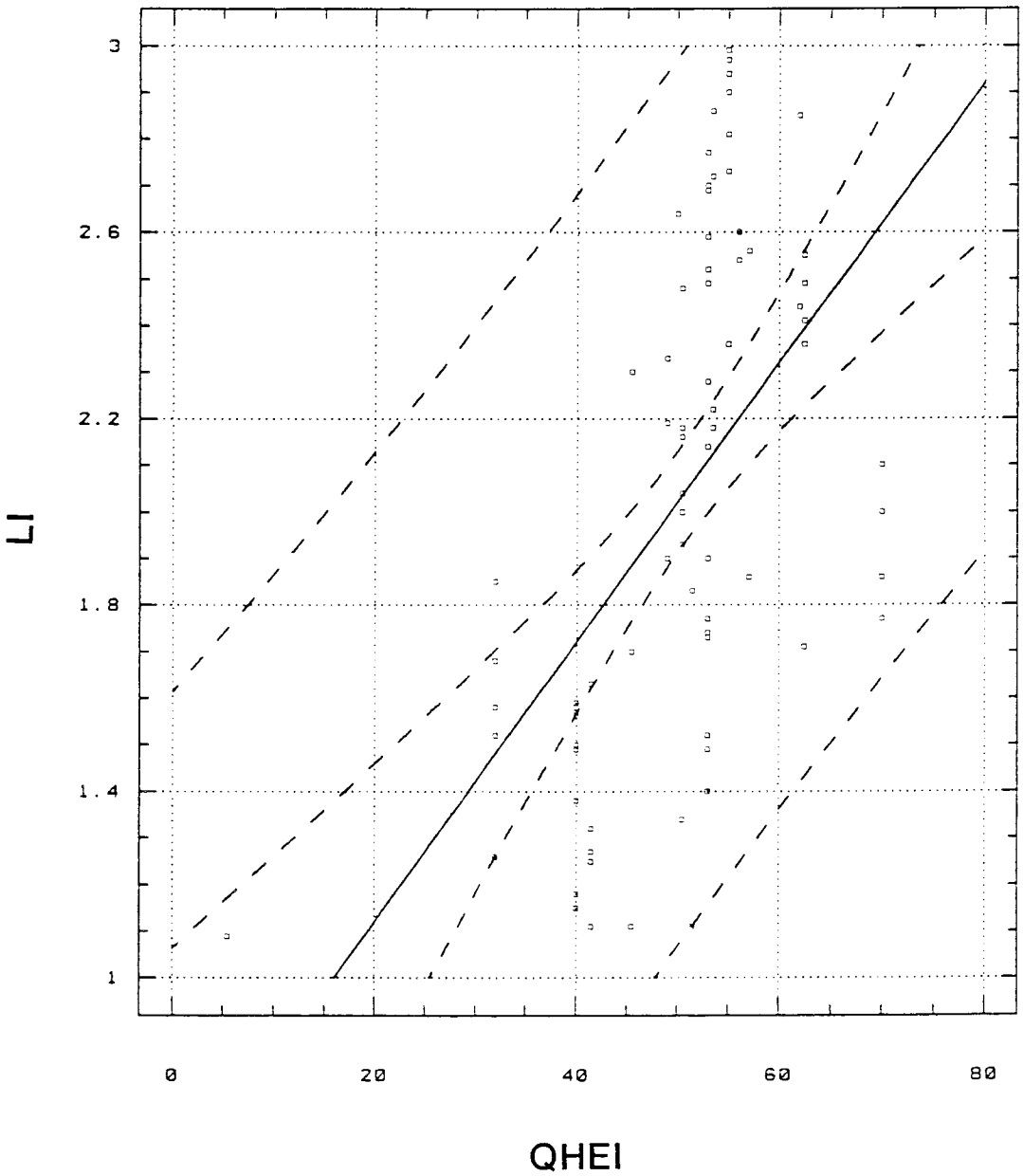


Figure 11. Box-and-Whisker Plot of the Lange-Bertalot Index for all 20 sites. The suggested transformation categories for Lake Erie estuaries are given on the right margin. These categories are: 0-1.22 = 0, 1.22-2.03 = 2, 2.03-2.84 = 4, >2.84 = 6.

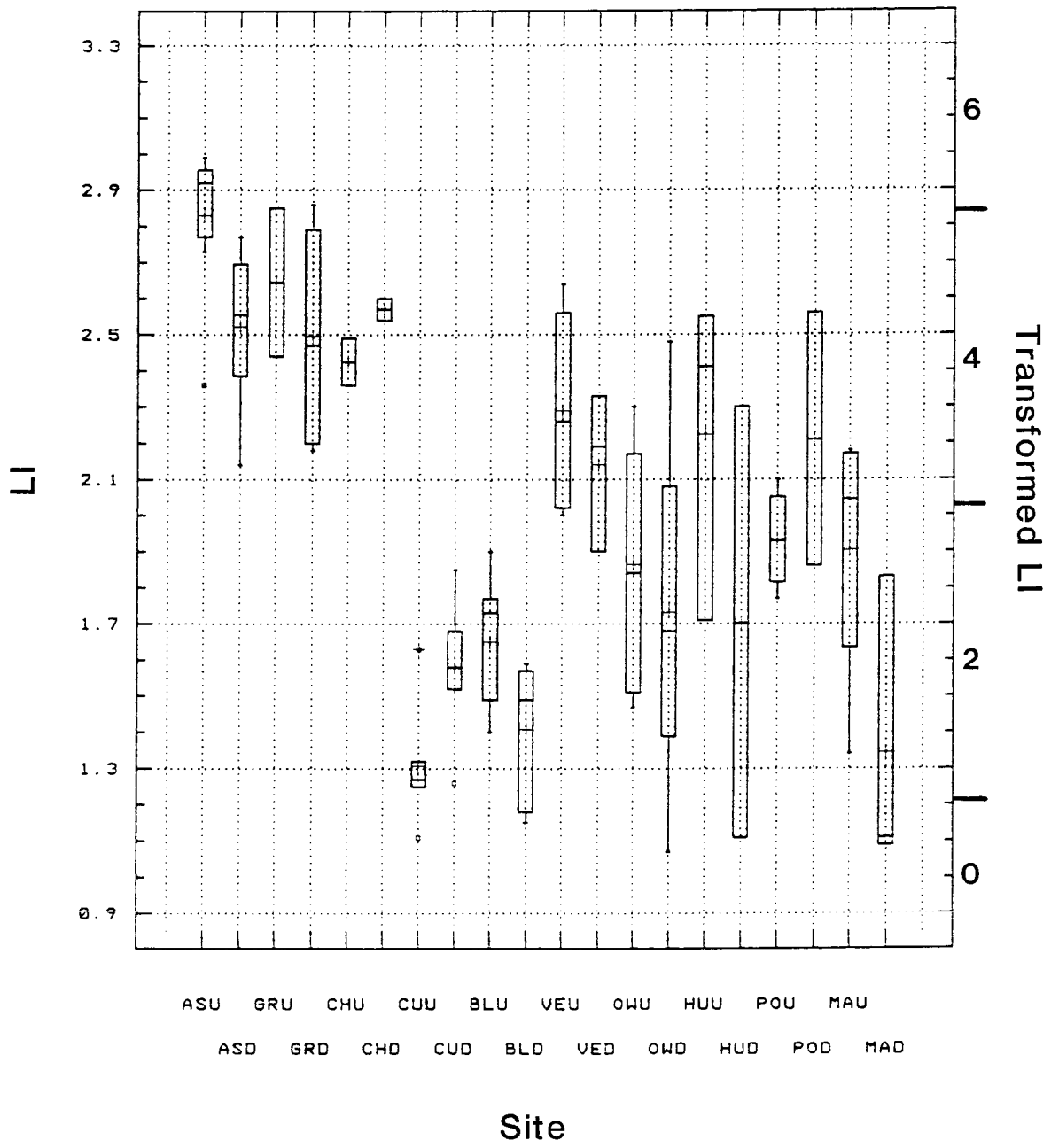


Table 2. Diatom species with sensitivity value (s) for the Lange-Bertalot Index as compiled for the Lake Erie estuaries.

SPECIES	INDEX VALUE
Achnanthes clevei	3.0
Achnanthes hungarica	2.0
Achnanthes lanceolata	2.0
Achnanthes minutissima	3.0
Amphipleura pellucida	3.0
Amphora pediculus	3.0
Amphora veneta	1.0
Caloneis amphisbaena	2.0
Caloneis bacillum	3.0
Cocconeis pediculus	3.0
Cocconeis placentula	3.0
Cymbella affinis	3.0
Cymbella prostrata	3.0
Cymbella sinuata	3.0
Cymbella tumida	3.0
Diatoma vulgaris	3.0
Fragilaria capucina	3.0
Fragilaria vaucheriae	2.0
Frustulia rhomboides	3.0
Frustulia vulgaris	2.0
Gomphonema angustatum	3.0
Gomphonema augur	3.0
Gomphonema olivaceum	3.0
Gomphonema parvulum	1.0
Gomphonema parvulum f. *saprophilum*	1.0
Gomphonema parvulum var. *exilissimum*	1.0
Gomphonema truncatum	3.0
Gyrosigma acuminatum	3.0
Gyrosigma attenuatum	3.0
Melosira varians	2.0
Navicula accomoda	1.0
Navicula atomus	1.0
Navicula atomus var. *permitis*	1.0
Navicula capitata	2.0
Navicula capitatoradiata	2.0
Navicula cincta	2.0
Navicula goeppertiana	1.0
Navicula gregaria	2.0
Navicula halophila	2.0

Table 2. continued.

SPECIES	INDEX VALUE
Navicula lanceolata	2.0
Navicula minima	1.0
Navicula mutica	3.0
Navicula phyllepta	2.0
Navicula pupula	2.0
Navicula pygmaea	2.0
Navicula rhynchocephala	3.0
Navicula saprophila	1.0
Navicula seminulum	1.0
Navicula tripunctata	3.0
Navicula veneta	1.0
Nitzschia acicularis	2.0
Nitzschia amphibia	2.0
Nitzschia apiculata	2.0
Nitzschia clausii	2.0
Nitzschia communis	1.0
Nitzschia dissipata	3.0
Nitzschia filiformis	2.0
Nitzschia fonticola	3.0
Nitzschia frustulum	3.0
Nitzschia hungarica	2.0
Nitzschia levidensis	2.0
Nitzschia linearis	3.0
Nitzschia microcephala	2.0
Nitzschia palea	1.0
Nitzschia paleacea	2.0
Nitzschia recta	3.0
Nitzschia sigma	2.0
Nitzschia sinuata var. *tabellaria*	3.0
Nitzschia sociabilis	3.0
Nitzschia supralitorea	2.0
Pinnularia microstauron var. *brebissonii*	2.0
Rhoicosphenia curvata	3.0
Synedra acus	2.0
Synedra fasciculata	2.0
Synedra parasitica var. *subconstricta*	2.0
Synedra pulchella	2.0
Synedra ulna	1.0

4.3 Metric 3. Percent Sensitive Species Index (SSI)

Percent sensitive species in a sample is used as a metric by the Kentucky Department of Environmental Protection (1993). The metric is calculated as the proportion of sensitive species in total taxa richness in a sample. Species sensitivity is based on Lange-Bertalot's classification.

This metric was tested in the Lake Erie estuaries. However, it was found to be more effective when indicator species based on an analysis of the estuaries' data was substituted for the Lange-Bertalot sensitive species. Weighted average analysis of the estuaries nutrient data (PO_4, NH_2, NO_3, and NO_2) was used to define indicator species for these variables. Only those species with weighted average optima in the lowest 10% of several of these nutrients were chosen as indicators of unpolluted waters. Species possibly sensitive to nutrient enrichment in the estuaries include: *Gomphonema* sp. 4, *Nitzschia intermedia, Nitzschia agnewii, Cocconeis placentula* var. *lineata, Aulacoseira alpigina, Cocconeis placentula, Synedra pulchella, Stephanodiscus delicatus, Nitzschia amphibia, Cyclotella atomus* var. 4, *Cymbella caespitosa, Cymbella affinis, Cymbella silesiaca, Diatoma vulgaris, Thalassiosira psuedonana, Achnanthes minutissima, Cyclotella tholiformis, Navicula pupula, Nitzschia microcephala,* and *Cymbella sinuata.*

This metric differs from the LI, which measures numbers of pollution sensitive organisms in a sample (see above). A sample could conceivably contain one very dominant sensitive species and few others and receive a high LI score, but a low SSI score. Thus, this metric serves more directly as a measure of community rather than population dynamics.

There was a low statistical correlation between the SSI metric scores and orthophosphate and summed standardized nutrient scores (R^2 =0.1358, p = 0.00030, R^2 = 0.1763, p = 0.00004, Figs. 12 and 13, respectively). There was no significant correlation with QHEI scores (p = 0.16273). The diatom community response to nutrient enrichment in these systems may depend on other variables or may not be linear. Yet, the box-and-whisker plot of the metric scores for the estuarine sites indicates that the metric is able to distinguish the less disturbed from the more disturbed sites (Fig. 14). We conclude that this metric is a valuable indicator of disturbance in these systems even though there is no strong statistical correlation with the above surrogate measures of habitat and water quality (see Karr and Chu 1997).

Future modifications of this metric should focus on an analysis of the dose-response curves in these systems. Particularly non-linearity and thresholds of disturbance in the dose-response curves should be analyzed.

Figure 12. Regression of Percent Sensitive Species Index (SSI) against phosphate (log (x+1) transformed). R^2 =0.1358, p = 0.00030.

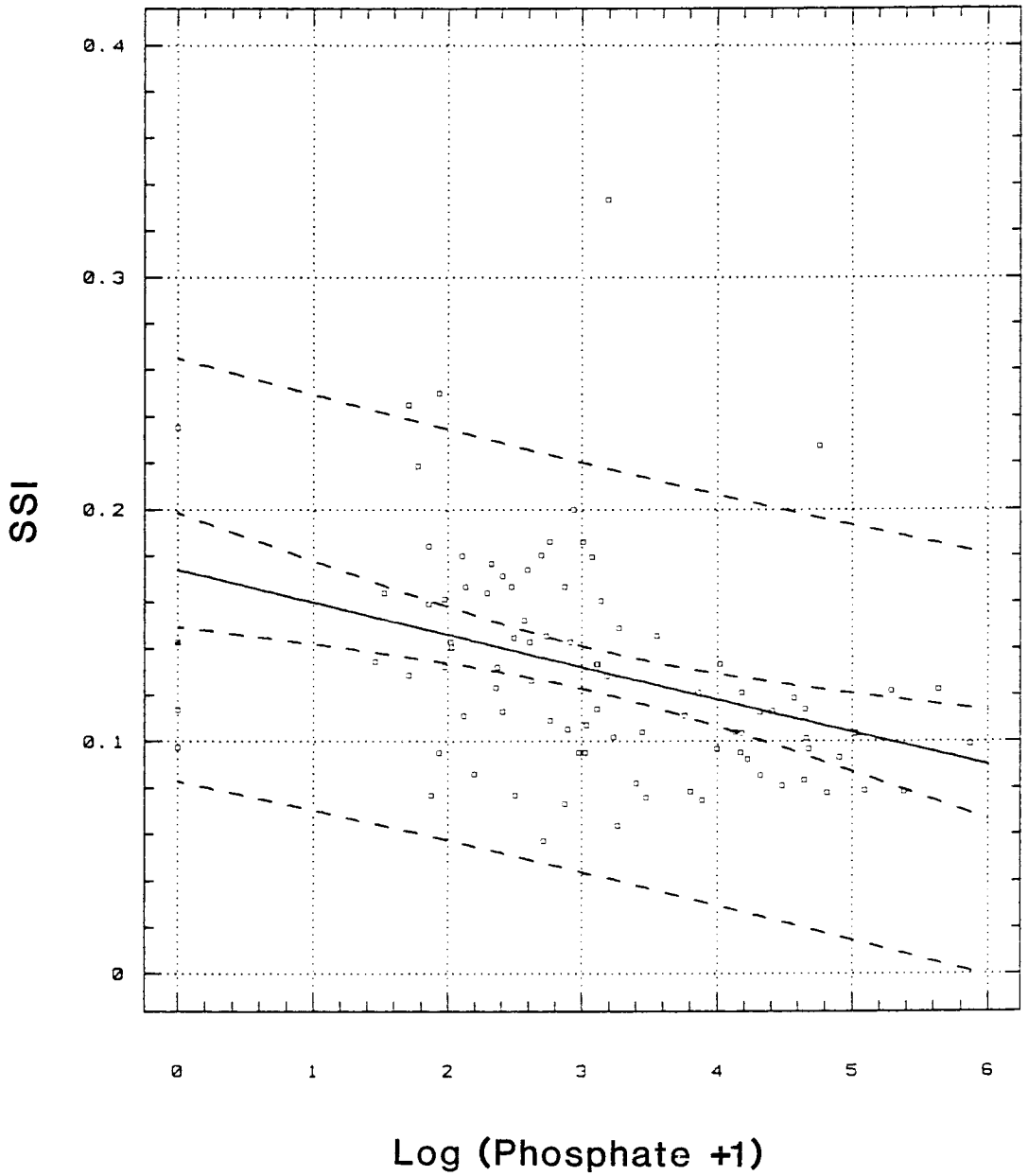


Figure 13. Regression of Percent Sensitive Species Index (SSI) against a composite of standardized nutrient scores for nitrite, nitrate, ammonia, and phosphate. $R^2 = 0.1763$, $p = 0.00004$.

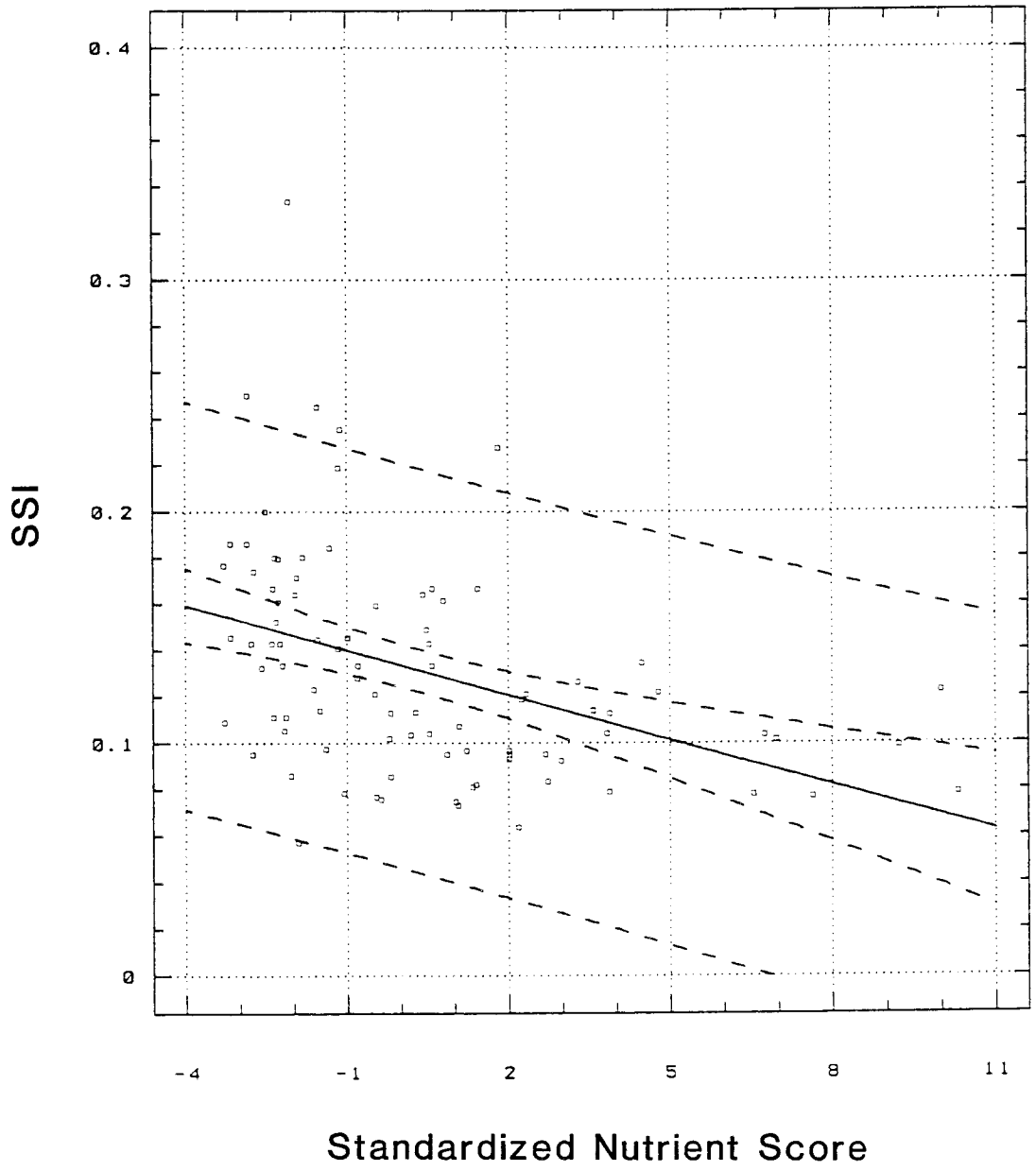
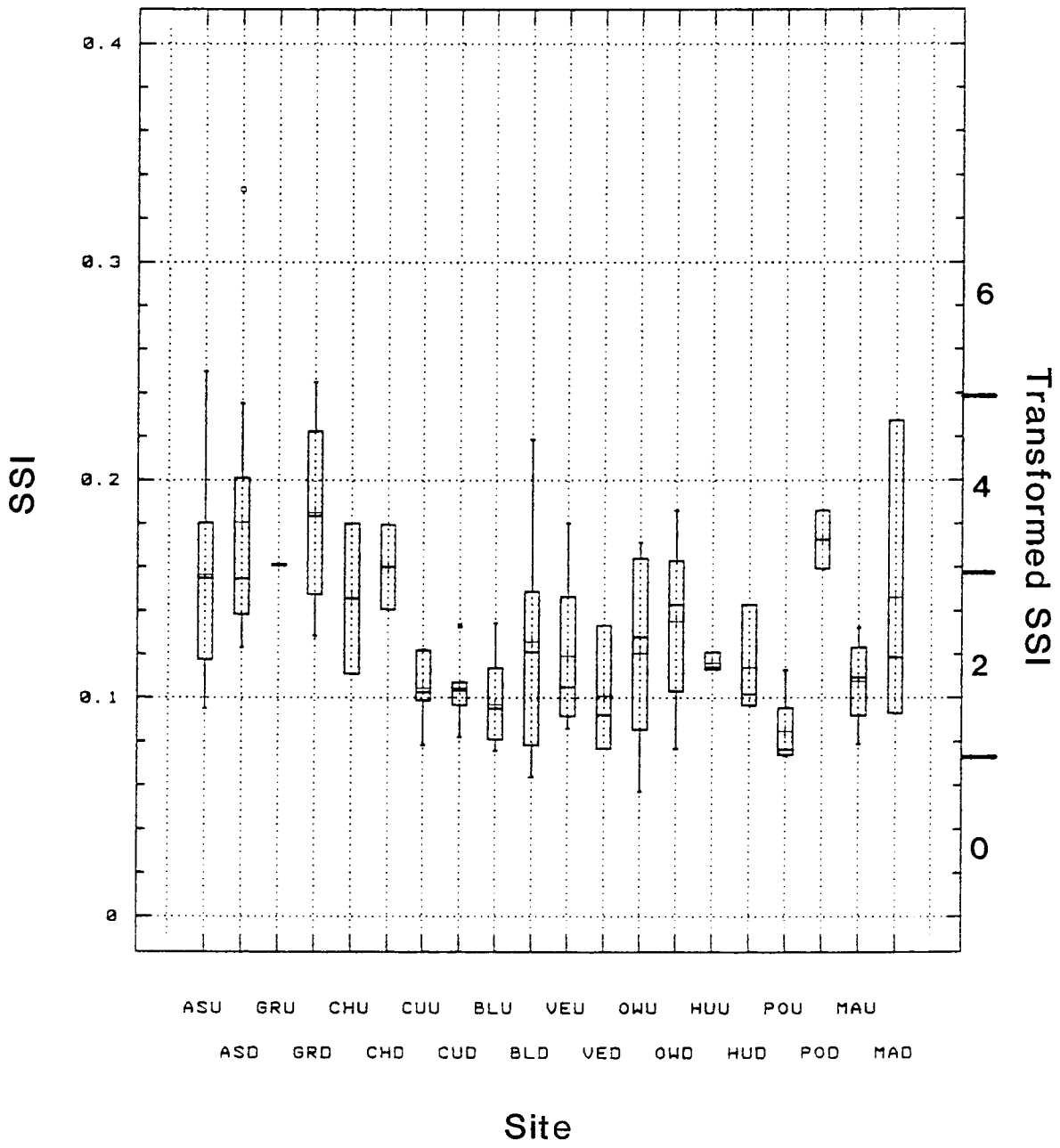


Figure 14. Box-and-Whisker Plot of the Percent Sensitive Species Index (SSI) for all 20 sites. The suggested transformation categories for Lake Erie estuaries are given on the right margin. These catagories are: 0-0.070 = 0, 0.070-0.154 = 2, 0.154-0.237 = 4, >0.237 = 6.



4.4 Metric 4 Percent Tolerant Species (TSI)

The percentage of species tolerant to organic pollution in a sample is used in Europe as a diagnostic feature of the TDI. The metric gives an indication of the amount of eutrophication that is associated with organic pollution. This feature allows the TDI to distinguish between the effects of P concentration and effects of organic pollution (BOD) in an aquatic system (Kelly and Whitton 1995). Interpretation of the organic tolerant species metric according to Kelly and Whitton (1995) is given in Table 3.

The organic tolerant species that were used to calculate the Percent Tolerant Species Index (TSI) for the Lake Erie estuaries are listed in Table 4. Organic pollution data was not collected in the estuaries study so a direct validation of the metric was not possible for the Lake Erie estuaries. A box-and-whisker plot of the TSI scores for Lake Erie estuaries is shown in Figure 15.

The TSI did not significantly correlate with ammonia, which was used as an indication of the presence of nitrogenous organic pollution for these sites. However, given the successful application of this metric in Europe (Kelly and Whitton 1995) and the plausible box-and-whisker plot of the scores for these estuaries, we recommend this metric be used with the understanding that additional validation is necessary. The TSI would provide a valuable signature-response metric for these systems if it can be appropriately validated.

Table 3. Interpretation of TSI indicators according to Kelly and Whitton (1995).

Proportion Tolerant Taxa	Interpretation
<20%	Free of organic pollution
21-40%	Some evidence of organic pollution
41-60%	Organic pollution contributes significantly to eutrophication
>61%	Heavily contaminated with organic pollution

Figure 15. Box-and-Whisker Plot of the Percent Tolerant Species Index (TSI) for all 20 sites.

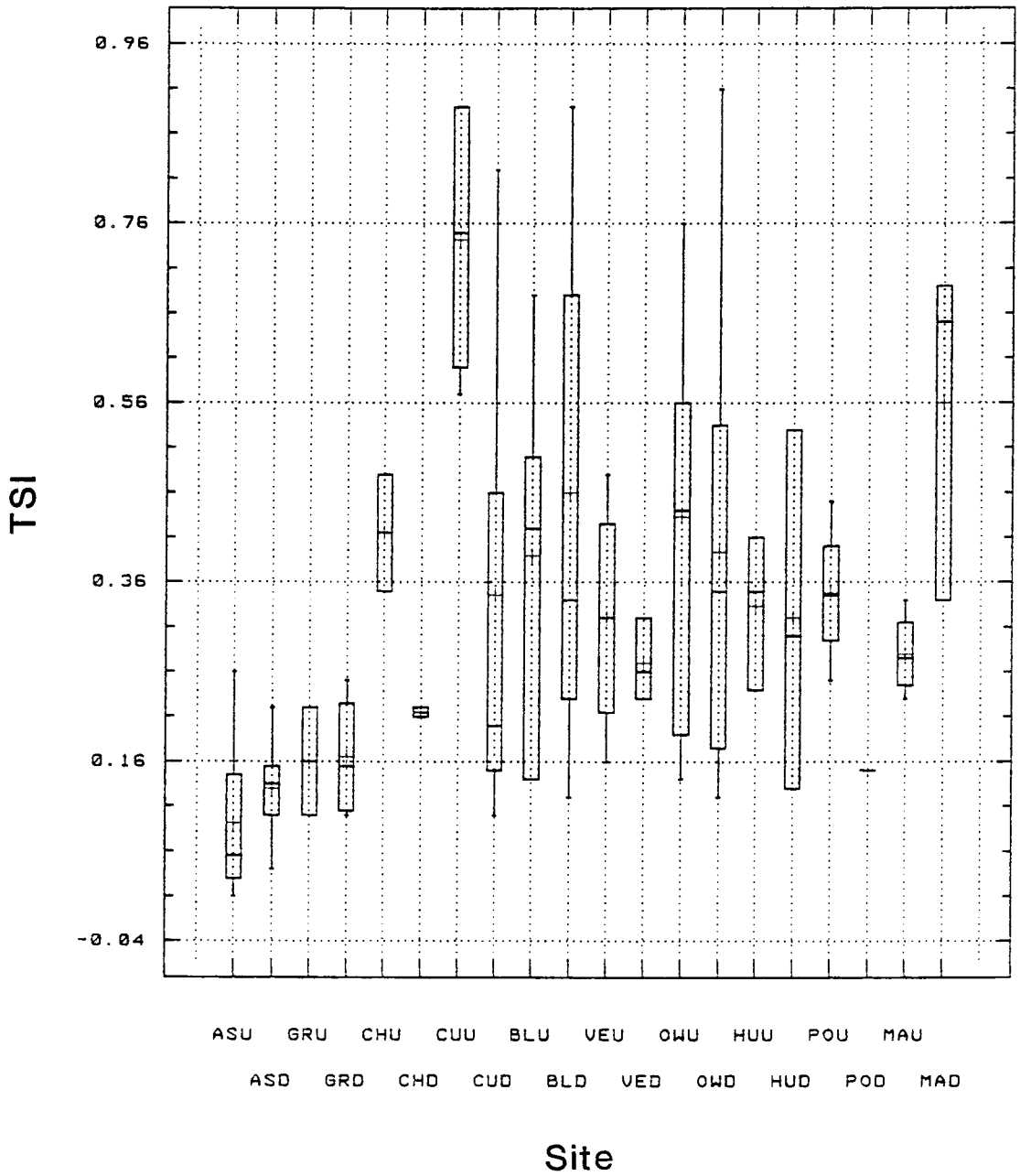


Table 4. Species tolerant to organic pollution as used in the Lake Erie estuaries.

Gomphonema parvulum
Navicula gregaria
Navicula lanceolata
Navicula agrestis
Navicula atomus
Navicula atomus var. *permitis*
Navicula contenta
Navicula fossalis
Navicula indifferens
Navicula lacunolaciniata
Navicula minima
Navicula minuscula
Navicula minuscula var. *muralis*
Navicula pupula
Navicula saprophila
Navicula schroeteri
Navicula seminulum
Navicula subminuscula
Navicula subrotunda
Nitzschia spp.

4.5 Metric 5. Generic Diatom Index (GDI)

The Generic Diatom Index (GDI) is the principle biological measuring tool for routine aquatic assessments used by the l'Agence de l'Eau Artois-Picardie in France. The GDI allows for water quality assessments with investigations being taken only to genus level (Rumeau and Coste 1988). Good results have been obtained from the GDI in France, though it has been found to be imprecise in conditions of very poor water quality (Coste et al. 1991).

The GDI is calculated the same way as the TDI :

$$\text{Index} = \frac{\sum a_j v_j s_j}{\sum a_j v_j},$$

where a = relative abundance of genus j in a sample, v = indicator value, and s = pollution sensitivity of genus j. The index ranges from 1 (very polluted water) to 5 (very clean water) which is the opposite of the TDI. A list of genera with sensitivity and tolerance values is presented in Table 5.

Table 5. Diatom genera with sensitivity value (s) and indicator value (v) for the Generic Diatom Index based on Rumeau and Coste (1988) and as compiled for the Lake Erie estuaries.

	s	v
Achnanthes	5	1
Amphipleura	5	3
Amphora	3	2
Anomoeoneis	5	2
Asterionella	4	1
Caloneis	4	2
Cocconeis	4	1
Cyclotella	3	1
Cymbella	5	1
Denticula	5	3
Diatoma	4	1
Diploneis	5	1
Epithemia	5	2
Eunotia	5	1
Fragilaria	4	1
Frustulia	5	2
Gomphonema	3	2
Gyrosigma	4	3
Hantzschia	1	3
Melosira	3	1
Meridion	5	2
Navicula mutica	1	2
Navicula other	3	1
Neidium	4	3
Nitzschia dissipata	4	2
Nitzschia other	1	1
Pinnularia	4	3
Rhoicosphenia	4	1
Rhopalodia	5	3
Stauroneis	5	2
Stephanodiscus	2	1
Surirella	3	3
Synedra	3	1
Tabellaria	5	1
Thalassiosira	2	3

Figure 16. Regression of the Generic Diatom Index (GDI) against a composite of standardized nutrient scores for nitrite, nitrate, ammonia, and phosphate. R^2 =0.0901, p = 0.00159.

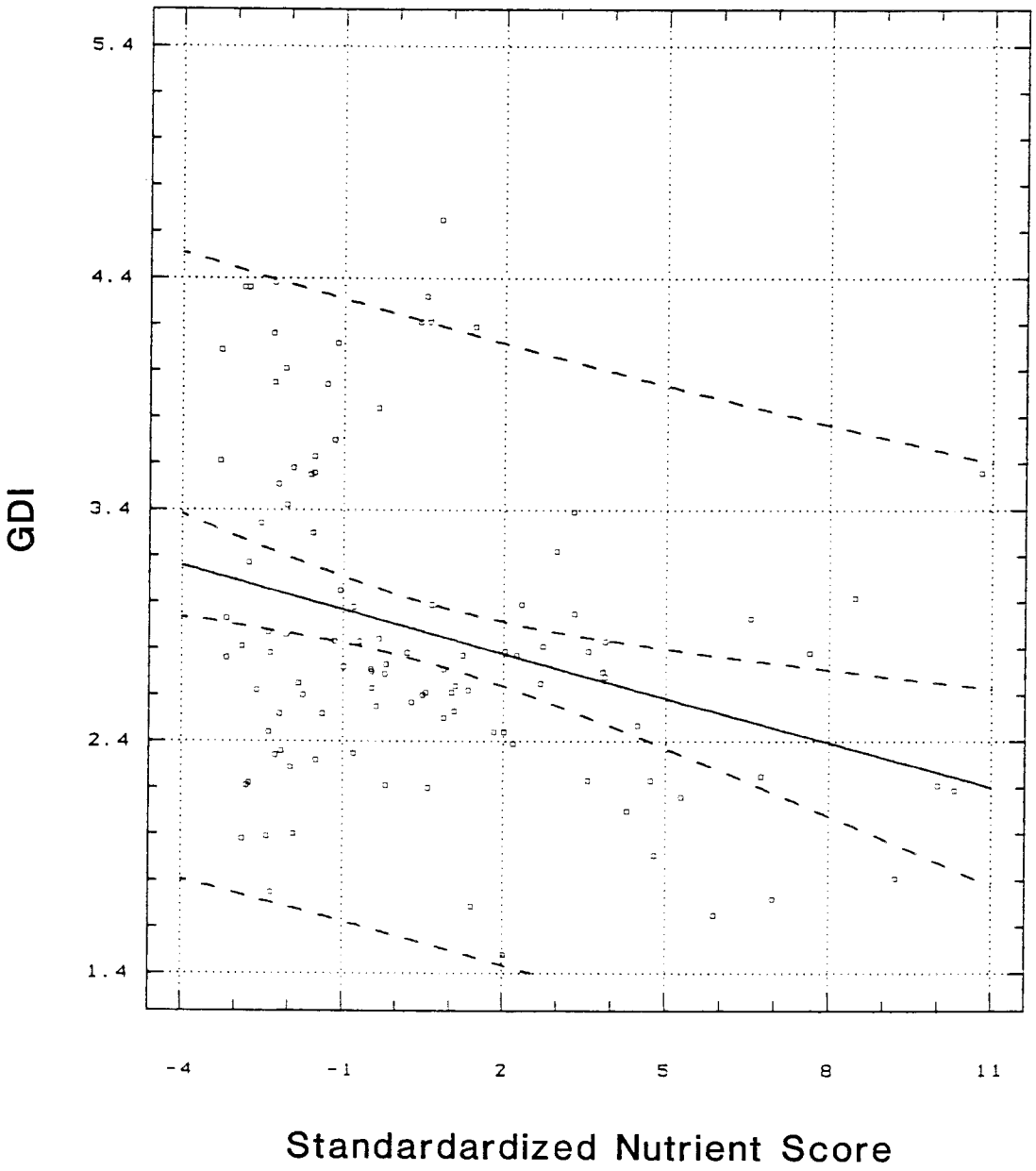


Figure 17. Regression of the Generic Diatom Index (GDI) against phosphate (log (x+1) transformed). $R^2 = 0.1637$, $p < 0.00001$.

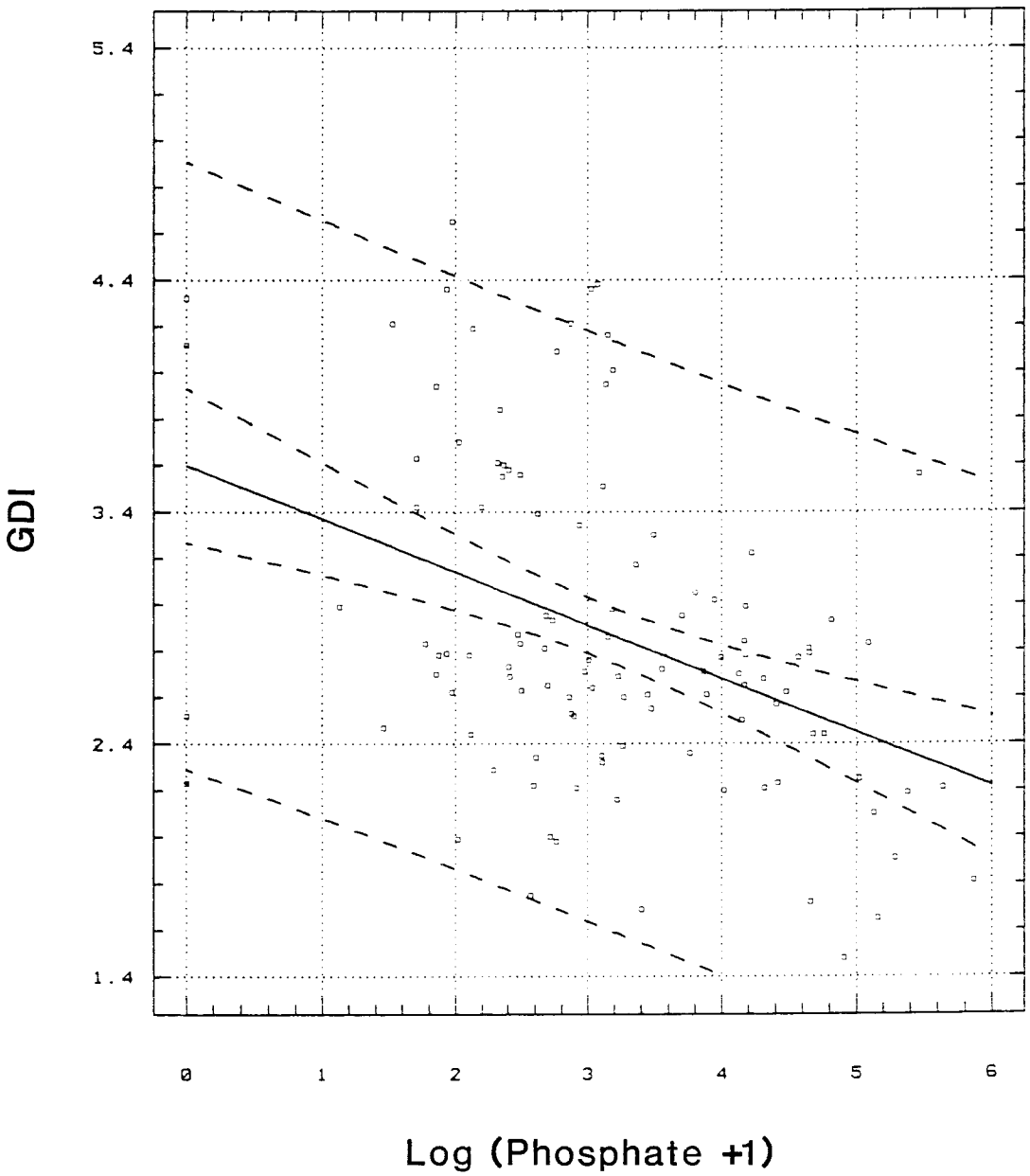


Figure 18. Regression of the Generic Diatom Index (GDI) against the Qualitative Habitat Evaluation Index (QHEI). $R^2 = 0.1928$, $p < 0.00001$.

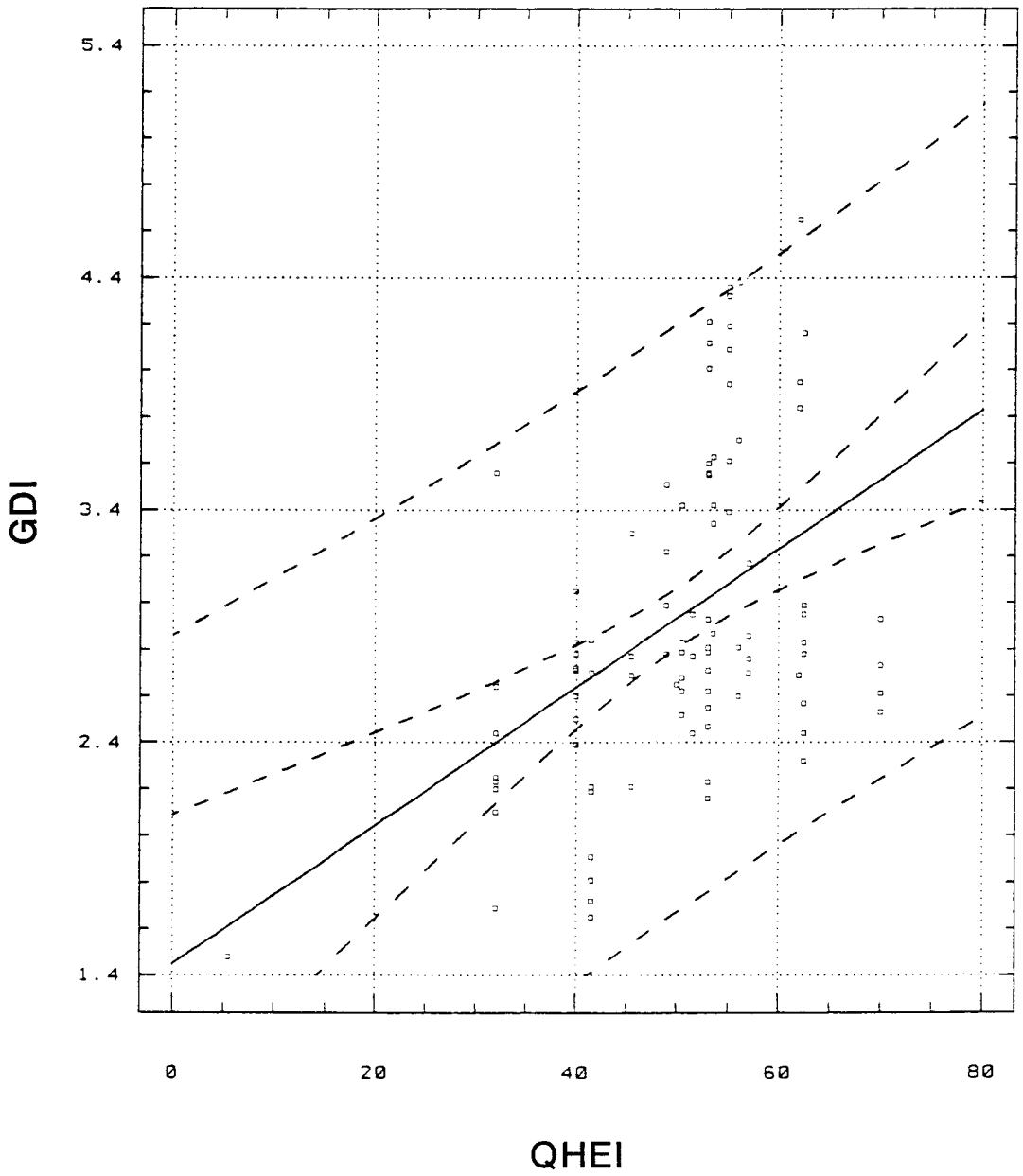
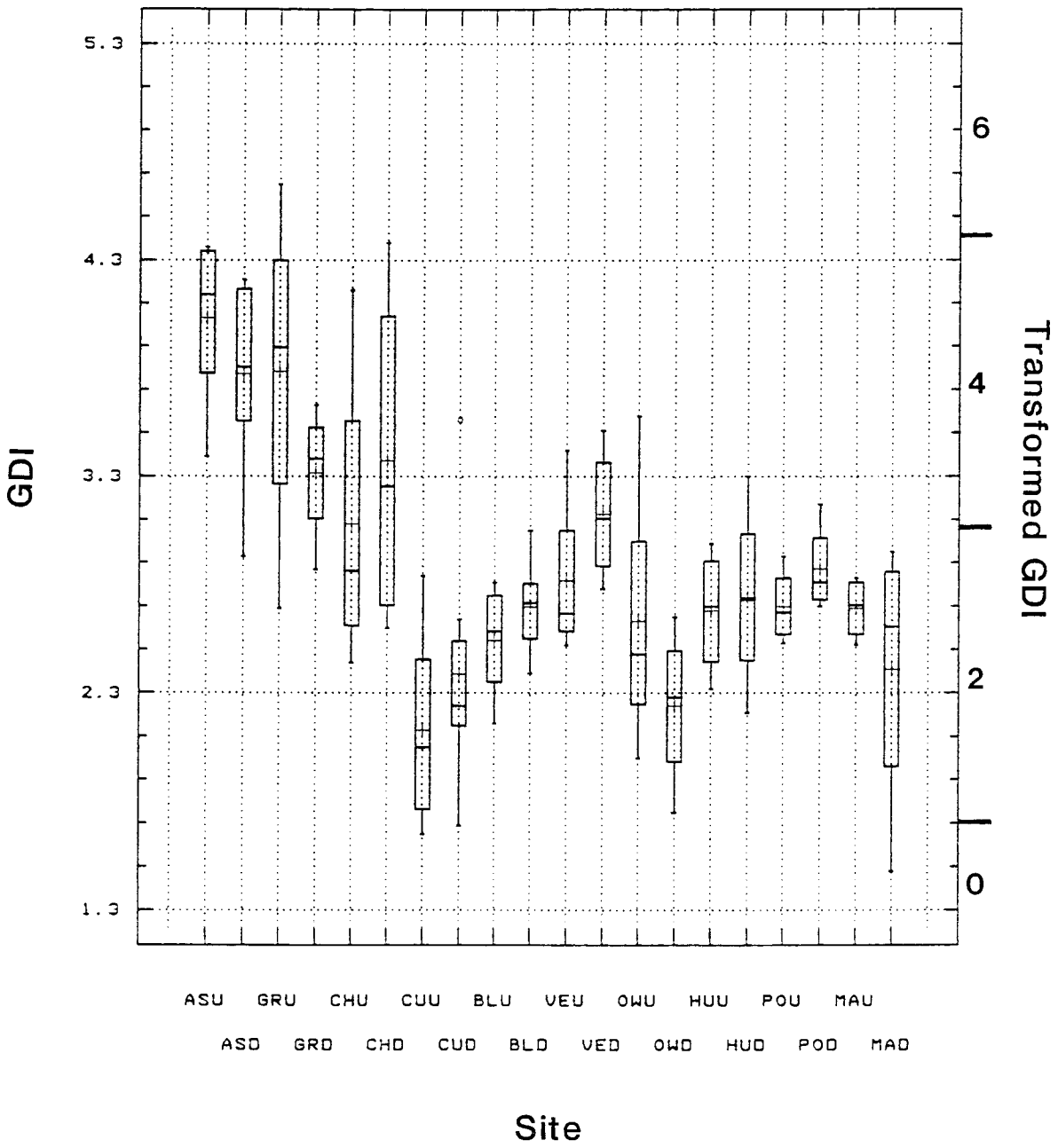


Figure 19. Box-and-Whisker Plot of Generic Diatom Index (GDI) scores for all 20 sites. The suggested transformation categories for Lake Erie estuaries are given on the right margin. These catagories are: 0-1.712 = 0, 1.712-3.065 = 2, 3.065-4.418 = 4, >4.418 = 6.



The GDI was tested in the Lake Erie estuaries. The calculated metric had a coefficient of variation of 24.18 for all sites. The metric correlated weakly with the standardized, summed nutrient value and orthophosphate (R^2 =0.0901, p = 0.00159, R^2 = 0.1637, p < 0.00001, Figs. 16 and 17 respectively). It also correlated with the QHEI scores from approximate site locations (R^2 = 0.1928, p < 0.00001, Fig. 18). It correlated moderately well with the LI from diatometer samples (R = 0.62, p < 0.00001, Spearman Rank Correlation) and the TDI from diatometer samples (R = 0.60, p < 0.00001, Spearman Rank Correlation). The box-and-whisker plot of the GDI metric scores can be seen to separate sites in a way consistent with our interpretations of water quality based on water chemistry and other indicators (Fig. 19). Though correlations with the more technical LI and TDI are not high, the GDI is able to discriminate between good and poor sites.

We recommend that the GDI be used as a convenient method for routine surveys. Sampling and lab time will be approximately half that of using the more technical index with diatometer samples. Furthermore, a criticism of using diatom taxonomic composition for water quality assessments has been the level of expertise necessary for identification to species level. Though a technician could be trained to do this level of identification within a few months of practice, the skill level for the GDI survey would be much lower.

Refinements to the GDI are expected as some genera, particularly *Navicula* and *Nitzschia*, are divided into new genera recommended by diatom systematists. Future refinements of the GDI should also focus on redefining optima and tolerance values for the genera based upon observations in the estuaries.

4.6 Metric 6 Trial Metals Metric (MM)

An indicator species list for metals was generated by weighted average analysis from the estuaries' data. Species optima and tolerance were determined for Se, Cd, Cu, Pb, and Cr. Species possibly sensitive to these metals include: *Cymbella caespitosa, Gomphonema consector, Synedra pulchella, Cymbella tumida, Navicula schroeteri, Gomphonema* sp. 4, *Cocconeis placentula, Cocconeis placentula* var. *lineata, Gomphonema* sp. 7, and *Cymbella affinis*. Species possibly tolerant of these metals include: *Cocconeis pediculus, Cyclotella atomus* var. 4, *Cyclotella cryptica, Cyclostephanos tholiformis, Stephanodiscus delicatus* and *Gomphonema affine*.

A signature response metric for metals pollution was calculated based on these species using the same procedure as used for calculating the LI (see above) except with a value of 1 assigned to the sensitive species and 3 assigned to the tolerant species.

This metric correlated weakly with Cu (R^2 = 0.1807, p = 0.00057), and Pb (R^2 = 0.1117, p =0.00792) (Figs. 20 and 21, respectively), but did not correlate with Cd, Cr or a standardized summed metals value (As, Cd, Cr, Cu, Pb, Ni, Zn). The metric provided

resolution of the sites over time ($F = 3.019$, $p = 0.0004$). A box-and-whisker plot for the metric is presented in Figure 22.

A difficulty in developing this index was the nature of metals pollution in our systems. There were no consistently contaminated sites in the estuaries study, but spikes of metals concentrations would be detected in various samples (see Appendix I). There was no clear gradient of contamination at the sites. Only Cr, of the variables measured, provided a separation of sites over time ($F = 5.166$, $p < 0.00001$). Nevertheless, we recommend this metric be used on a trial basis, as it represents the only metric for metals contamination developed thus far. Additional data, refinements in analysis and calculation may yield a useful metric.

Figure 20. Regression of the metals metric (MM) against copper. $R^2 = 0.1807$.

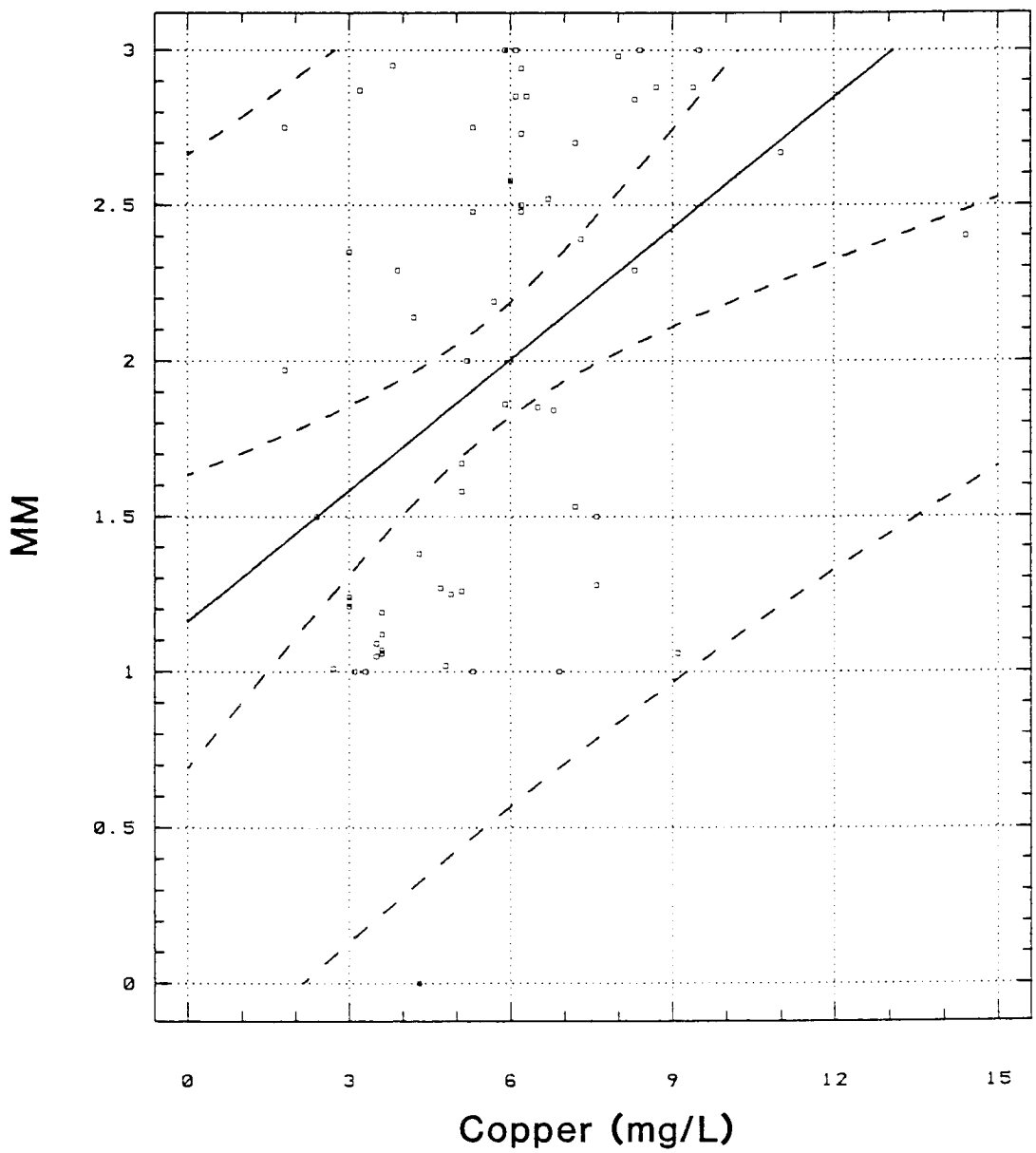


Figure 21. Regression of the metals metric (MM) against lead. $R^2 = 0.1117$, $p = 0.00792$.

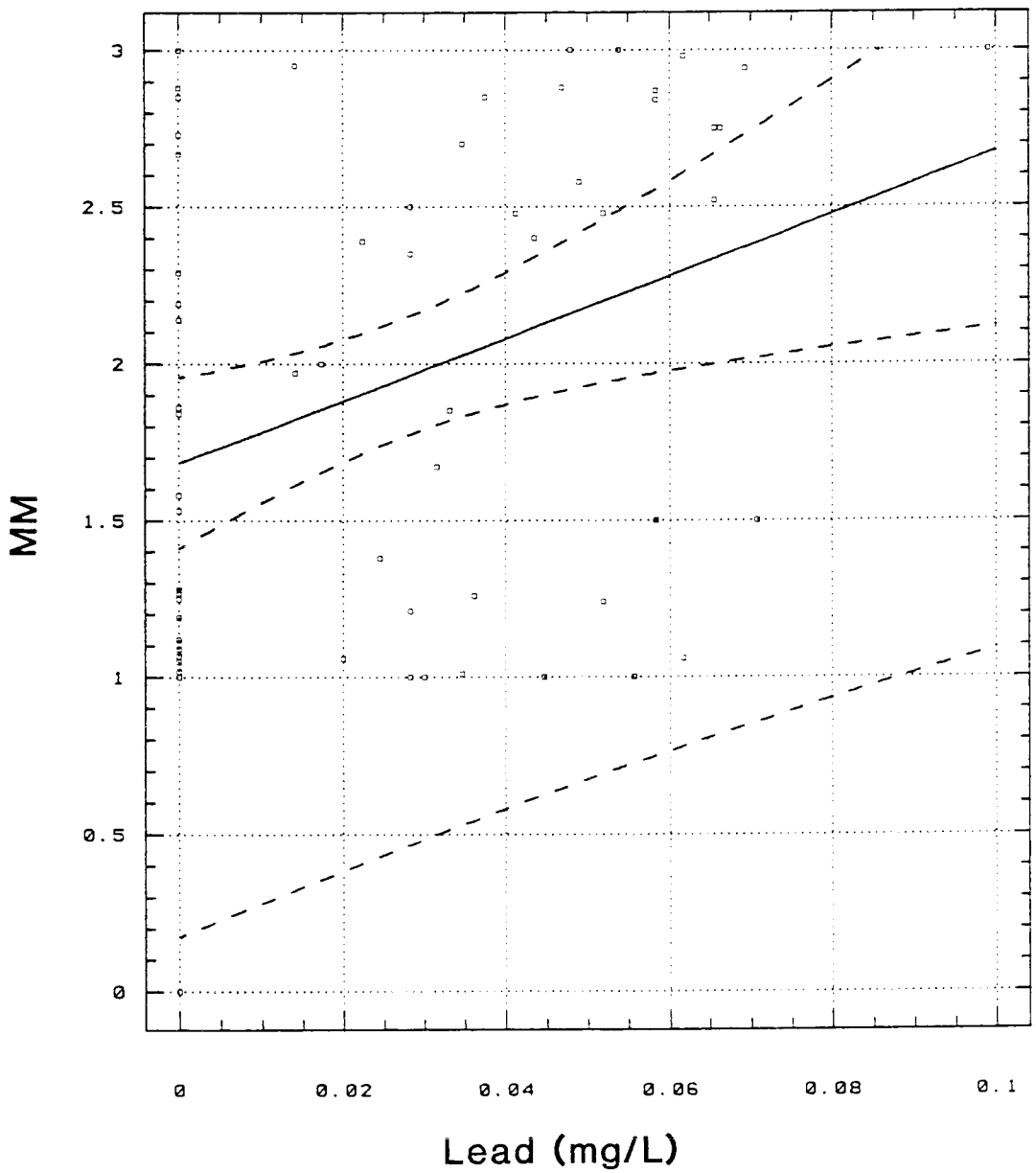
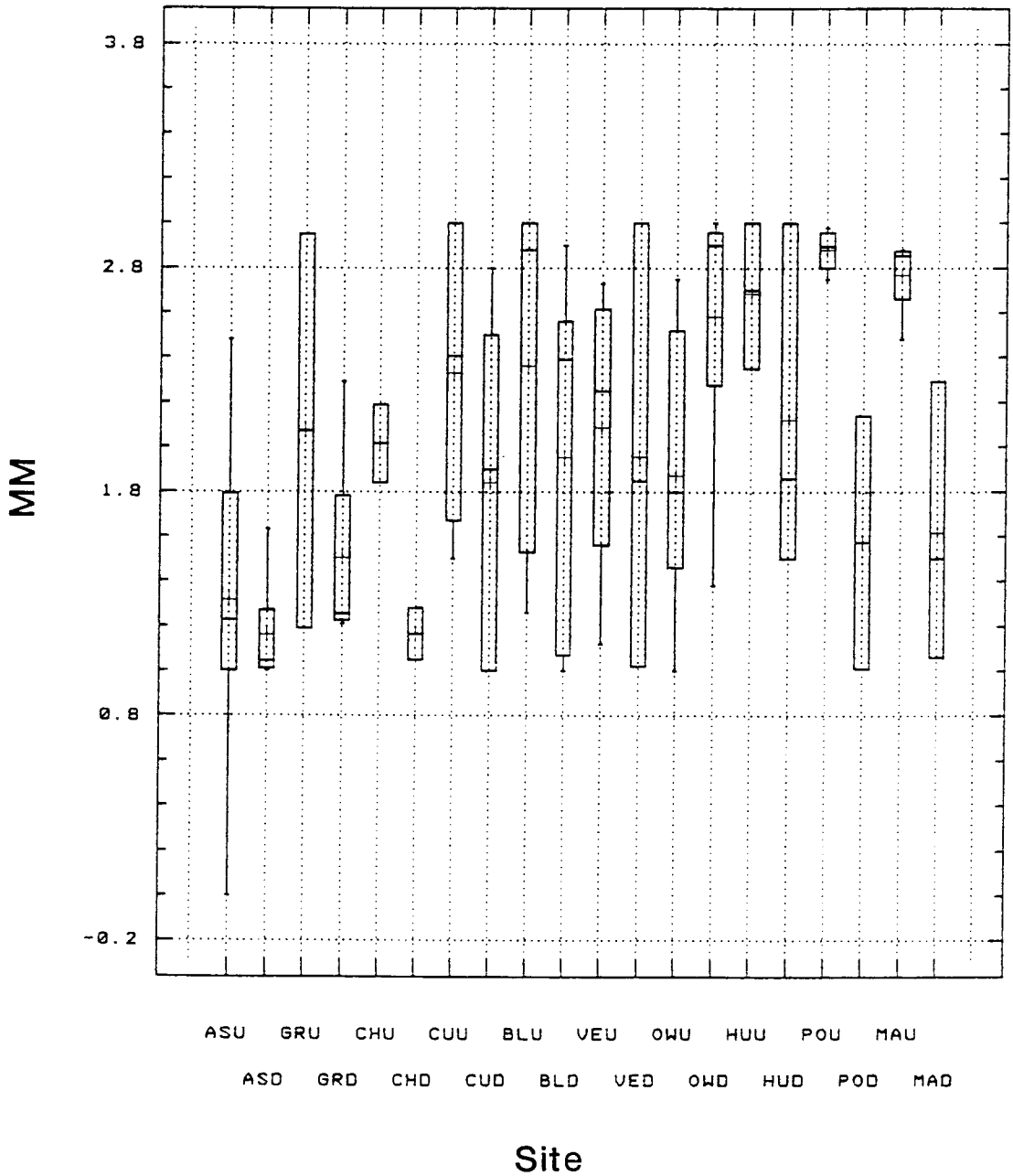


Figure 22. Box-and-Whisker Plot of the Metals Metric (MM) for all 20 sites.



4.7 Metric Calibration and Transformation

To calculate the Erie Diatom Index (EDI), it was necessary first to calibrate each core metric into four water quality classes, and then transform the raw score into standardized scores based on these classes. Calibrating and transforming the algal metrics followed the conceptual approach of Barbour et al. (1995), but was closer to the calibration approach used by Yoder and Rankin (1995) in the Huron-Erie Lake Plane Region. As discussed above, the estuaries are not sorted by class, and reference conditions are based on best conditions among all sites. All three core metrics making up the EDI were transformed to same scale, as was the GDI, such that comparisons between scores are possible.

The metric scores for all samples (1992 - 1996) were used for calibration. For a given metric, the high cutoff score was defined as 95% of the highest score. The low cutoff point was defined by adding 5% of the highest score to the lowest score. A final cutoff was achieved by bisecting the range between the high and low cutoff points. Thus, four classes were defined by the three cutoff points. For example, the high score for the LI in our study was 2.99. Thus, 95% of the score was 2.84, the reference condition cutoff (Fig. 11). The lowest score was 1.07, and thus the low cutoff was 1.22 (Fig. 11), with the middle cutoff consequently at 2.03.

Once each metric was calibrated, the values were transformed such that they all were to similar scales. The four classes defined through calibration were assigned values of 0, 2, 4, and 6, respectively (Figs. 7, 11, 14, 19). Values were reversed for the TDI since the lowest metric scores represent best conditions (Fig. 7). The highest score in the SSI was eliminated as an outlier to provide greater resolution for the metric. Thus values for each metric are transformed into scores ranging from 0 to 6 with a score of 6 being the best possible score a site can obtain for a metric and a score of 0 being the worst possible score.

The index should be conservative given that reference conditions are defined from the "best" scores instead of reference sites. Defining "best" conditions as a range of 5% below the highest score and including a 0 range of 5% above the worst score is reasonably exclusive. It is a more conservative method than scoring based on a percentile ranking of the sites (as in Yoder and Rankin 1995).

The GDI was similarly calibrated and transformed which allows for comparison with the core metrics (Fig. 23). The TSI was interpreted according to Kelly and Whitton (1995) (Table 3), and thus is not calibrated and transformed like the other metrics. The MM was also not calibrated or transformed.

Regulatory underprotection becomes an issue when there are no identified reference sites as in the development of the EDI. However, the quadrisection transformation process at least ensures that the metric scores are controlled by the optimal conditions in the Lake Erie estuaries study.

Figure 23. Box-and-Whisker Plot of calibrated and transformed GDI scores for all 20 sites (transformed scores were 0, 2, 4, or 6). Note that the Cuyahoga and Maumee Rivers were the only systems with zero scores, while the Grand River upstream site was the only site getting a 6 on some sample dates.

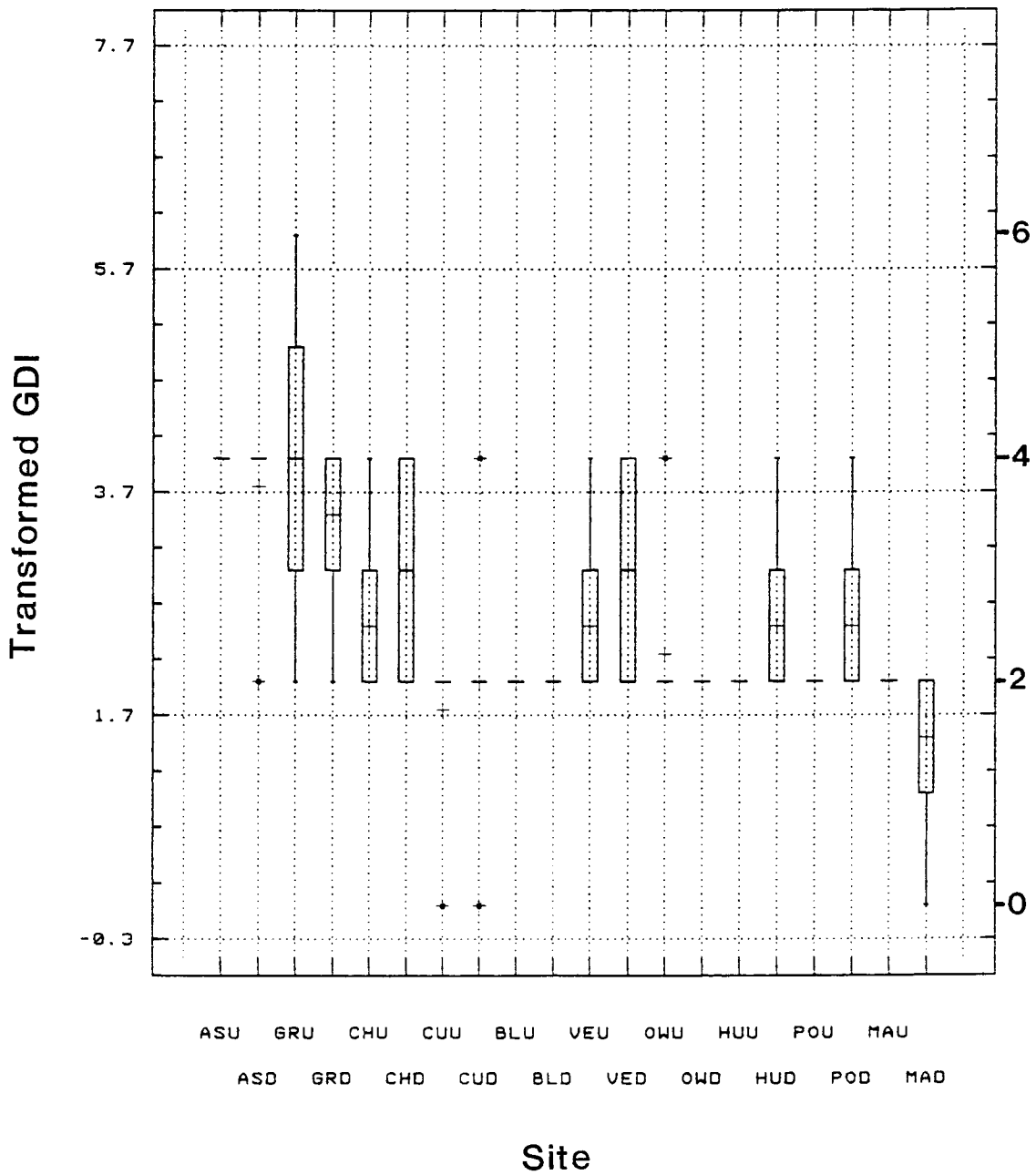
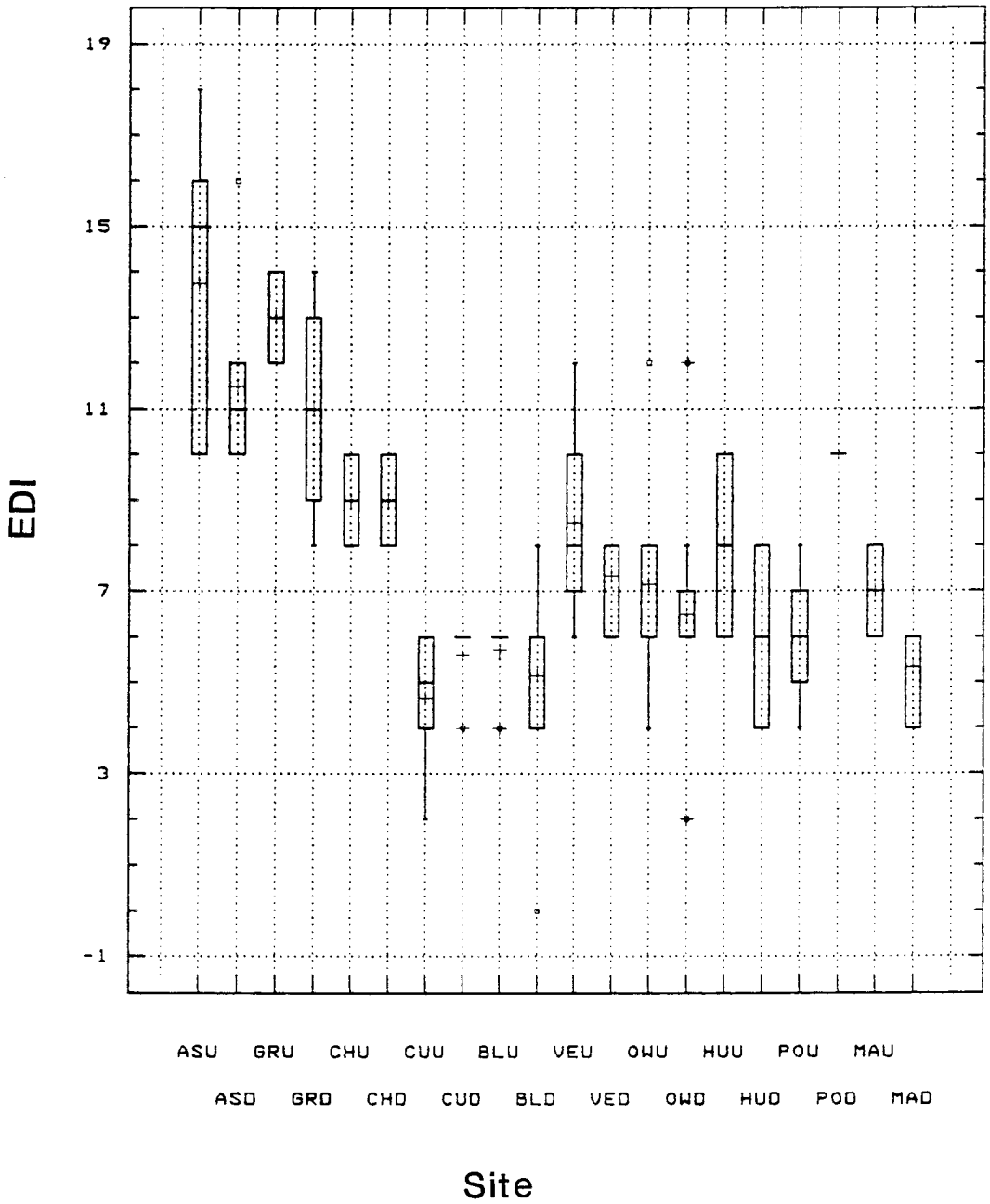


Figure 24. Box-and-Whisker Plot of the Erie Diatom Index (EDI) for all 20 sites. Note the clear delineation of the Ashtabula, Grand, and Chagrin River estuaries as cleaner water systems, the Cuyahoga, Black, and Maumee (down) estuaries as degraded water systems, with other sites falling in between.



5. THE ERIE DIATOM INDEX (EDI)

5.1 EDI Development

The EDI score is calculated by summing the transformed scores of the three core metrics (LI, TDI, and SSI). Since there is only one class, and ecoregions are not considered, the expectations for all the estuaries are the same. The signature-response metrics are calculated and used as diagnostic tools that help determine the nature of the impact to the algal community as measured by the index. A box-and-whisker plot of the index derived from the 92 diatometer samples from the ten estuaries used to compile the index is shown in Figure 24.

5.2 EDI Evaluation

The EDI scores range from 0 to 18 (Fig. 24). The coefficient of variation = 43.2. Based on an examination of the plots of the individual core metrics (Figs. 1,3,4,6, and 7), the index seems most sensitive at higher levels of pollution and so is best at discriminating among impaired systems. This is a useful aspect for water quality managers attempting to set priorities in a situation where all systems are disturbed.

Correlation coefficients were calculated pairwise on the untransformed core metrics to determine interdependence or redundancy. It was arbitrarily decided that a correlation coefficient (R) of > 0.7 or < -0.7 (Spearman Rank Correlation Analysis) was considered high (see Barbour et al. 1992). The results are as follows:

SSI vs. TDI ($R = -0.51$, $p = 0.0000$);
LI vs. TDI ($R = -0.83$, $p = 0.0000$);
SSI vs. LI ($R = 0.39$, $p = 0.0002$).

The TDI and LI correlate highly and may be redundant. However, as discussed above, the TDI is developed to measure P concentration impacts while the LI focuses on saprobic conditions (BOD). The metrics may vary as these conditions vary in the estuaries. Therefore, both measures are left in the index.

The TSI, included here as a signature-response metric, was developed as a part of the TDI to measure the contribution of BOD to eutrophication (see above). This metric was also tested for redundancy with the TDI and LI. The results are as follows:

TSI vs. TDI ($R = 0.74$, $p = 0.0000$);
PTS vs. LI ($R = 0.73$, $p < 0.0001$);

The TSI correlates highly with both metrics. However, there are many differences in the indicators that comprise the TSI and the other two metrics (see Tables 2 and 4). Redundancy of these metrics depends on species composition of the sample that can

possibly vary depending on ecoregion or some other classification not identified in this study. Therefore, the TSI is left in as a signature response metric.

A metric must be able to discriminate between sites to be a useful addition to the index. One way analysis of variance (ANOVA) was performed for each untransformed core metric to determine if the metric could distinguish between sites over time. The results are as follows:

TDI (F-ratio = 14.65, $p < 0.0001$, 95% confidence level);
LI (F-ratio = 11.64, $p < 0.0001$, 95% confidence level);
SSI (F-ratio = 2.32, $p = 0.0055$, 95% confidence level);
GDI (F-ratio = 9.27, $p < 0.0001$, 95% confidence level).

These results suggest that these four metrics can successfully distinguish between sites over time.

An ANOVA was performed for the compiled index (TDI + LI + SSI). The results suggest that the compiled index can also distinguish between sites over time (F-ratio = 8.22, $p < .0001$, 95% confidence level, untransformed data). Results of Fischer's Least Significant Difference multiple range test based on this analysis are given in Table 6. These results illustrate the index's ability to distinguish sites of more impact from sites with less impact.

Stepwise regression was used to determine the relative contribution of the metrics to the total variance between site scores in the index. Stepwise regression uses forward selection to add variables to the model one at a time in order of greatest significance to the model. The best single indicator in the index of the transformed metrics was the TDI ($R^2 = 0.79$, $p < 0.0001$). The R-squared values for the other single metric models included: LI ($R^2 = 0.77$, $p < 0.0001$), and SSI ($R^2 = 0.56$, $p < .00001$). The best two-metric model was the LI and TDI ($R^2 = 0.93$). This means these two metrics alone explain 93% of the variance between sites in the index.

Though the exact weightings of the metrics in the index may change depending on the sample being analyzed, the stepwise regression provides a general assessment of the statistical value of the metrics that comprise the index. Though the SSI contributes little statistically to the model the inclusion of the SSI in the index is important for the reasons discussed above. Future analysis might consider a weighting for the SSI in calculating the index.

The index was regressed against orthophosphate and a summed, standardized nutrient score for the sites (($R^2 = 0.1616$, $p = .00007$, $R^2 = 0.1366$, $p = 0.00034$ respectively) indicating a weak statistical relationship with these variables. It correlated with QHEI scores for sites proximal to the sites sampled in the estuaries study ($R = 0.55$, $p < 0.0001$, Spearman Rank Correlation). The correlation coefficient (R) between the index calculated from diatometer samples and the GDI metric calculated from grab

Table 6. Fischer's LSD multiple range analysis for 92 diatometer samples from 20 sites from 1992-1996 (Number = number of samples, Mean EDI = mean Erie Diatom Index score for all samples).

Site	Number	Mean EDI	Homogeneous Groups
Cuyahoga - U	6	4.6	x
Black - D	7	5.1	xx
Mumaee - D	3	5.3	xxx
Cuyahoga - D	5	5.6	xxxx
Black - U	7	5.7	xxxx
Huron - D	3	6.0	xxxxx
Portage - U	4	6.0	xxxxx
Old Woman Cr. - D	8	6.5	xxxxx
Maumee - U	4	7.0	xxxxxx
Old Woman Cr. - U	7	7.1	xxxxx
Vermilion - D	3	7.3	xxxxxx
Huron - U	3	8.0	xxxxxx
Vermilion - U	4	8.5	xxxxx
Chagrin - U	2	9.0	xxxxxx
Chagrin - D	2	9.0	xxxxxx
Portage - D	2	10.0	xxx
Grand - D	4	11.0	xx
Ashtabula - D	8	11.5	x
Grand - U	2	13.0	xx
Ashtabula - U	8	13.8	x

samples was 0.66 ($p < 0.0001$, Spearman Rank Correlation) which indicates a reasonably good correlation between the survey metric and the more technical composite index.

5.3 EDI Variability

Sources of variability in the index are either the result of sampling error or natural variations resulting from algal patchiness, seasonal and year-to-year changes, and anthropogenic impacts. Replicate slides were examined as well as temporal samples in an effort to understand the effect of this variability on the index.

Ruzicka similarity scores were calculated for three replicate diatometer slides collected at each site for the June 1994 sampling period. The replicate slides were all held

in the same diatometer. The mean of these similarity scores ranged from 40.7% for the Cuyahoga downstream site to 93.7% for the Ashtabula upstream site.

Two replicate slides were randomly selected from the Ashtabula upstream site (site with the highest average index score) and the Cuyahoga upstream site (site with the lowest average index score) from the September 1995 sampling period. Ruzicka similarity scores for the two sets of slides were 46.5% and 26.8%, respectively. Index scores were calculated for each pair of slides based on a 300 valve count. The results are given in Table 7.

Table 7. Metric and index scores for selected sample replicates.

	KI	TDI	SSI	EDI
Ashtabula Slide 1	2.79	2.52	.17	12
Ashtabula Slide 2	2.65	2.89	.16	12
Cuyahoga Slide1	1.26	4.67	.10	4
Cuyahoga Slide 2	1.50	4.32	.08	6

The actual index scores assigned to the Ashtabula and Cuyahoga upstream sites for September 1995 were 10 and 6, respectively, based on a 900 valve count. Despite the low Ruzicka's similarity between the pairs of replicates in this test (46% and 26%), the index values calculated from each pair of slides were substantially alike (83% and 66%). The compositional variability in the replicates at a given site apparently is not reflected in the metrics calculated from the replicates. There are two reasons for this outcome. First, the metrics are based on numerous indicator taxa, which may vary in abundance even in closely associated microhabitats at a single site. However, though specific taxa may vary widely, clean water will have a clean water assemblage, and dirty water will have a pollution-tolerant assemblage. Second, the core metrics are calibrated and transformed as part of the calculation of the EDI, and this procedure dampens the variability in the metric.

The algae respond to short term changes in an aquatic system. For example, water chemistry, including pollution loadings, flow, and turbidity may all change in a day due to a spate and possibly affect the algal community. The samples collected on diatometers integrate effects of water quality over the 2 weeks of algal colonization on the slide, so are indicative of short term conditions in the system. Yet for water quality assessment, the metrics must have some consistency within a system over time and respond in some reliable way to impacts to be of value as indicators.

Temporal variability was examined in each site to begin to understand the consistency of the index. All samples from each site were examined (2 to 8 samples per site that cover a period of 2 to 4 years depending on the site). A coefficient of variation (CV) was calculated for the index scores from each site. The coefficient of variation

provides a measure of the variability of the scores in relation to their mean (standard deviation/mean). A low CV represents a consistent index value. The CV ranged from 0% (Portage River downstream) to 49% (Black River downstream), with more than half the values <25%.

To examine the sources of variation contributing to the Black River downstream score (CV = 49%) the CV's for the three metrics that comprise the index were calculated and are as follows: LI = 68%; TDI = 44%; SSI = 58%. The coefficients of variation for the standardized and summed water chemistry values were generally substantially higher than the those for the algal metric scores. The CV for the Black River downstream site was also the highest CV for the water chemistry values from all sites (CV = 32,529% summed values of nutrients). This demonstrates again how water chemistry is very variable over time, while a metric is more stable and thus potentially more reliable than chemistry if only a few samples can be taken.

The coefficients of variation for the the six sites with the highest EDI scores are <25%, but 4 of 6 sites with lowest index scores have CV values of >25%. A similar pattern exists for the IBI. It was pointed out by Chu and Karr (1997) that this supports the observation that systems disturbed by human impact are less resilient, and hence more variable over time.

6. GDI VALIDATION

A grab validation sample was collected from a downstream site on Arcola Creek estuary in June 1996. A water chemistry sample was collected at the same time. Arcola Creek estuary has relatively undisturbed riparian habitat. However, it receives contamination from upstream sewage and agricultural inputs.

A GDI metric was calculated for this sample (GDI = 2.92). When compared with the other sites sampled in the same month and year, Arcola Creek placed in the middle third with regards to the untransformed GDI. It is also in the middle third of the samples with regard to both phosphate and nitrate levels. This seems to be a placement that is in agreement with what is known about these estuaries. Arcola Creek presently has reaches that perform as Modified Warm Water Habitat, although the Ohio EPA has recommended Arcola Creek be designated as Warm Water Habitat (OEPA 1997). It is impacted by the Madison Village Waste Water Treatment Plant and by nurseries that dewater the stream. Thus, even though its estuary is considered an outstanding natural wetland area, its water quality would be expected to be relatively poor, as the GDI indicates. We conclude that the GDI provides a reasonable assessment of the biologic integrity of Arcola Creek based on the algae and what is known of the water chemistry and ecology of the system.

Table 8. Results of validation grab sample analysis from Arcola Creek from June 1996. Sites are in order of GDI scores for comparison. U = upstream site, D = downstream site.

SITE	GDI	GDI INDEX	PO4 (ug/l)	NO3 (mg/l)
Ashtabula - U	3.61	4	14.9	0.37
Ashtabula - D	3.60	4	14.4	0.44
Grand - D	3.42	4	10.9	0.50
Chagrin - U	3.22	4	22.4	0.57
Vermilion - D	3.02	2	21.5	1.28
Old Woman Cr. - U	2.99	2	74.4	2.55
Huron - U	2.99	2	21.4	1.14
Portage - U	2.95	2	10.1	0.78
Arcola Creek - D	2.92	2	32.0	1.13
Cuyahoga - U	2.84	2	196.7	0.57
Black - U	2.81	2	87.5	4.38
Maumee - U	2.79	2	6.20	0.56
Maumee - D	2.79	2	116.2	2.62
Huron - D	2.77	2	17.4	0.51
Portage - D	2.70	2	19.2	0.61
Grand - U	2.69	2	22.1	0.69
Vermilion - U	2.68	2	8.0	0.78
Old Woman Cr. - D	2.63	2	6.5	0.37
Chagrin - D	2.60	2	20.6	0.61
Black - D	2.50	2	64.5	1.25
Cuyahoga - D	2.20	2	107.1	3.32

7. FUTURE CONSIDERATIONS

This paper provides a basis for using algal periphyton to assess biologic integrity in the estuaries of Lake Erie. Six individual metrics are described, with a recommended composite metric, the EDI, as the best single metric for water quality assessment. Several aspects of the EDI and other metrics remain to be addressed for them to become effective water quality monitoring tools.

First, biocriteria need to be formulated from the index scores that relate the scores to aquatic use designations. There seem to be natural breaks in the index scores that suggest thresholds for biocriteria, for example, an EDI of >10 relates to sites of better quality, while <6 relates to more impaired sites. The relationship of these scores to use designations might best be done by comparison with IBI, ICI, and MIWB scores obtained at the same site and time. An independent evaluation of the overall accuracy of the EDI

might also be done at this time. Subsequently, the EDI could become an additional biologic measure of attainment/non-attainment status of the estuarine reaches of Lake Erie's tributaries.

Second, refinements in the metrics using the weighted average methods we have applied with more complete data, particularly continuous monitoring sonde data collection, would make the metrics more robust. There also needs to be more thorough validation of the metrics, particularly for the signature response metrics, TSI and MM.

Third, there needs to be a better understanding of natural variation in the metrics in order to set biocriteria with more confidence. Variation in the metrics can be a function of spacial differences (between regions, within samples; within reaches), and temporal differences (year to year) (Karr and Chu 1997). A power analysis might be done to determine how reliably the metrics can detect differences in the sites.

Fourth, use of algal metrics should evolve to incorporate additional metrics that more completely reflect the biologic hierarchy, especially metrics that can correlate with landscape level disturbance in the urban environment. The metrics presented here have not been examined with regard to metrics of urban land use, but the correlations with QHEI scores appears promising in this regard.

Issues of quality control, cost, and logistics need to be addressed by any agency employing algal metrics. We would anticipate that the combined use of the EDI, TSI and MM would be competitive with the cost of the ICI assessments. Quality control could be built into the routine application of the metrics and serve as training for the personnel involved (see Kelly 1997). Other logistic questions such as numbers of organisms counted and diatometer vs. grab sampling might be revisited by the agency using the index and these questions resolved in part by considering the resources available. The GDI is a very inexpensive metric to determine. Cost of the EDI, TSI, and MM could be lowered considerably if grab samples were used.

Finally, four of the metrics presented here were developed for assessment of rivers and tested in the Lake Erie estuaries. These metrics could be tested and refined for use in Ohio's streams and wetlands as well. The unique features of diatom indices, particularly short term impact assessment, ubiquitous nature of the diatoms, low impact sampling, and sensitivity to water chemistry parameters, would make their use especially appropriate for monitoring urban streams. Algal metrics could furthermore be useful to Ohio's water quality monitoring program in general.

8. CONCLUSIONS

After extensive study of both the nondiatom algal communities and diatom communities of 10 Lake Erie Estuaries for two years (sampling in June and September), we have concluded that diatoms are an effective and economical way to assess water quality in these estuaries. No metrics using nondiatom algae were modified or developed,

and we suspect this is due to the fact that these algae are difficult to consistently identify to species, and without species identification the indicator information that likely resides in nondiatom algae is lost. Diatoms, with their morphologically detailed frustules, are easier to identify to species and thus more effective in the construction of indices and metrics.

Over thirty diatom metrics were tested and evaluated. Most of these are not discussed in this manuscript because they were not effective, i.e. they showed little relationship to known water quality and assessed water chemistry. Particularly important to note is the failure of Shannon-Wiener Diversity, Species Richness, the *Navicula-Nitzschia* ratio, and the percent *Cymbella-Gomphonema* index. These have been valued by other agencies as metrics in flowing waters, but failed to effectively discriminate and evaluate the freshwater estuaries we studied.

Several indices developed in Europe were tested, and some of these were found to be useful for evaluation of water quality in the estuaries. Based on our data set, some of these indices were modified for use in Lake Erie estuaries. The Lange-Bertalot Index (LI), Trophic Diatom Index (TDI), Percent Sensitive Species Index (SSI), and Percent Tolerant Species Index (TSI) are all recommended for use in Lake Erie Estuaries. A new signature-response metric for metals (MM) was developed from our data set and represents the first metric developed specifically for metals contamination. It is recommended in this report as a trial metric, since it has not been extensively validated as have the other metrics. A rapid assessment protocol requiring less taxonomic expertise was also tested and found effective: the Generic Diatom Index (GDI).

Four of these metrics were calibrated and transformed for use in Lake Erie Estuaries. Water Quality managers who may use these metrics in the future could use the untransformed values for the metrics (particularly for comparison with flowing waters above the estuaries). However, by transforming the metrics based on the calibration performed in this study with 92 different samples, interpretation is made easier. The metrics are then all to the same scale (0-6), with scores of 0 indicating especially poor water quality, and scores of 6 indicating water quality that is quite good relative to the estuaries in the state.

Three of the metrics (LI, TDI, SSI) were used to construct a composite index, the Erie Diatom Index (EDI). This index is simply the sum of the transformed values for each of the three indices, and thus ranges from 0 to 18. This single index is the index we recommend be used when possible, and feel it is on a par with the fish and macroinvertebrate indices (ICI, IBI, MIWB) that are also used to assess water quality.

We recommend two protocols be considered when undertaking water quality assessment with diatoms. One is to use diatometers to collect the diatoms, and use these samples to calculate the LI, TDI, SSI, TSI, MM, and EDI. This protocol requires more labor in sample collection and greater taxonomic expertise. The second protocol utilizes grab samples to calculate the GDI, a rapid assessment protocol that is more economical, less labor-intensive, and less taxonomically demanding. However, all the metrics can be

used with either sampling protocol, and so hybrid protocols may actually be adopted by agencies that wish to incorporate algal metrics into their water quality assessment programs.

Finally, although this study was designed specifically to develop metrics for lake Erie freshwater estuaries, these indices and metrics may be useful in flowing waters in Ohio as well. Interpretation of the metrics will not be possible until reference streams are sampled and assessed, but this study could serve as a good basis from which metrics for flowing waters in Ohio could be developed.

In addtion to this report, we are simultaneously preparing two other reports that will be of interest to readers of this report. The water chemistry and diatom data are reported in Volume II of the final report (Sgro and Johansen 1998a). An illustrated guide to the diatom taxa found in this study and used to calculate the metrics is present in Volume III of the final report (Sgro and Johansen 1998a). This floristic guide is meant to assist those less familiar with diatom taxonomy to study the diatoms of the Lake Erie estuaries and calculate the metrics in this manual (Volume I).

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ALGAL PERIPHYTON BIOASSESSMENT METHODS FOR LAKE ERIE ESTUARIES

Volume II. Documentation of Water Chemistry and Diatom Species Composition for 10 Lake Erie Estuaries

1998

by

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INTRODUCTION

This report serves as an appendix to *Algal Periphyton Bioassessment Methods for Lake Erie Estuaries, Volume I. Metric Development* (Sgro & Johansen 1998a). It is meant to serve several purposes. First, it gives site descriptions for the 20 sites in 10 estuaries that were used to generate the metrics reported in the first volume. Second, the specific methods of sample collection and preparation are given. Third, the water chemistry for all samples used in metric development is reported. Fourth, the diatom species composition of all samples is reported.

The primary reason for assembling this volume is its potential value in water quality monitoring for the 10 freshwater estuaries sampled. With the effort and expense invested to conduct this study to develop metrics, it would be wasteful not to document the sites, methods, chemistry, and diatom composition so that future algal assessments will have a benchmark against which comparisons can be made.

The site descriptions and methods are given in the text, followed by an assessment of the water quality of the 20 Lake Erie estuary sites. The water chemistry for 1993-94 appears in Appendix 1. The water chemistry for 1995-96 is given in Appendix 2. Appendix 3 contains all diatom lists generated from diatometer samples, while Appendix 4 contains all diatom lists generated from the grab samples. In these species lists, the samples are arranged alphabetically by river, then by date, then by site.

SITE DESCRIPTIONS

Each estuary had two sample sites, one near the mouth where lake influence was strongest, and one near the top of the estuary where overdeepening first occurs. Choice of sites was heavily dependent upon availability of access from land. Below are brief descriptions of the sites along with latitude and longitude. Maps indicate position of each site.

Ashtabula River, upstream site. Fig. 1.
41°52'59.10" N latitude, 80°47'42.21" W longitude.
This site was on the west bank of the river on the property of Northcoast Marina. This marina has subsequently closed. Diatometers were hung from the downstream corner of boat wall.

Ashtabula River, downstream site. Fig. 1.
41°54'8.01" N latitude, 80°47'52.21" W longitude.
This site was on the property of the Coast Gaurd Station. They gave permission to hang the diatometers from their pier.

Black River, upstream site. Fig. 2.
41°27'19.00" N latitude, 82°08'2.83" W longitude.

This is the site of an old landfill. The sample site is on the northwest side of the river just downstream of a small island in the river.

Black River, downstream site. Fig. 2.
41°28'14.12" N latitude, 82°10'40.63" W longitude.
This site is on the property of the Coast Gaurd Station. We hung diatometers from the pier, and sampled logs close to the shore behind the pier.

Chagrin River, upstream site. Fig. 3.
41°39'44.94" N latitude, 81°25'20.29" W longitude.
This site was on the east side of the river near a ballpark.

Chagrin River, downstream site. Fig. 3.
41°40'31.62" N latitude, 81°26'9.18" W longitude.
This site was across the channel from the marina.

Cuyahoga River, upstream site. Fig. 4.
41°28'47.07" N latitude, 81°40'34.30" W longitude.
This site was on the west bank of the river off of West 3rd Street. In the 1993-94 study the diatometers were tied to shore behind the rear parking lot of the Marsulux Corporation. They requested we not conduct environmental studies on their property at the beginning of the 1995-96 sampling, and so we moved one lot upstream where the owners were willing to give us access.

Cuyahoga River, downstream site. Fig. 4.
41°30'0.67" N latitude, 81°42'36.73" W longitude.
This site was on the west bank off of a concrete river channel wall on Whiskey Island. To get to the site it was necessary to drive through the property of Whiskey Island Marina to the cement wall/walkway.

Grand River, upstream site. Fig. 5.
41°44'57.84" N latitude, 81°15'25.88" W longitude.
To get to this site it was necessary to rent a canoe from the boat livery and canoe upstream to where a pipeline crosses the river. We then sampled the southeast shore.

Grand River, downstream site. Fig. 5.
41°45'37.11" N latitude, 81°16'53.59" W longitude.
This site was on Coast Gaurd property near the station.

Huron River, upstream site. Fig. 6.
41°20'2.09" N latitude, 82°34'41.58" W longitude.
On the west bank near a railroad crossing, accessible from Mud Brook Road.

Huron River, downstream site. Fig. 6.
41°23'46.65" N latitude, 82°33'2.67" W longitude.
Accessible by walking out on the tracks to the east bank of the river.

Maumee River, upstream site. Fig. 7B.
41°33'27.46" N latitude, 83°38'52.12" W longitude.
This site is just upstream from the Sewage Disposal outflow off of Front Street.

Maumee River, downstream site. Fig. 7A.
41°41'37.88" N latitude, 83°28'19.18" W longitude.
This site was in the park on the west bank near the Coast Guard Station.

Old Woman Creek, upstream site. Fig. 6.
41°21'54.69" N latitude, 82°30'16.87" W longitude.
This site is just north of Darrow Road on the east bank of Old Woman Creek.

Old Woman Creek, downstream site. Fig. 6.
41°22'54.98" N latitude, 82°30'53.54" W longitude.
To get to this site we would use the canoes belonging to Old Woman Creek National Estuarine Research Reserve. Diatometers were attached to a wooden post driven into the sediments in the main channel south of the bridge.

Portage River, upstream site. Fig. 8B.
41°30'20.18" N latitude, 83°09'19.81" W longitude.
This site is by Oak Harbor Cemetary on the north bank of the river.

Portage River, downstream site. Fig. 8A.
41°30'58.09" N latitude, 82°56'17.58" W longitude.
This site was near the Port Clinton Yacht Club.

Vermilion River, upstream site. Fig. 9.
41°24'32.33" N latitude, 82°20'6.83" W longitude.
This site was off the road down a steep, tree-covered slope, upstream from the trailer park.

Vermilion River, downstream site. Fig. 9.
41°25'31.23" N latitude, 82°21'49.17" W longitude.
This site was on the property of the yacht club in Vermilion. We put in our diatometers off of their pier.

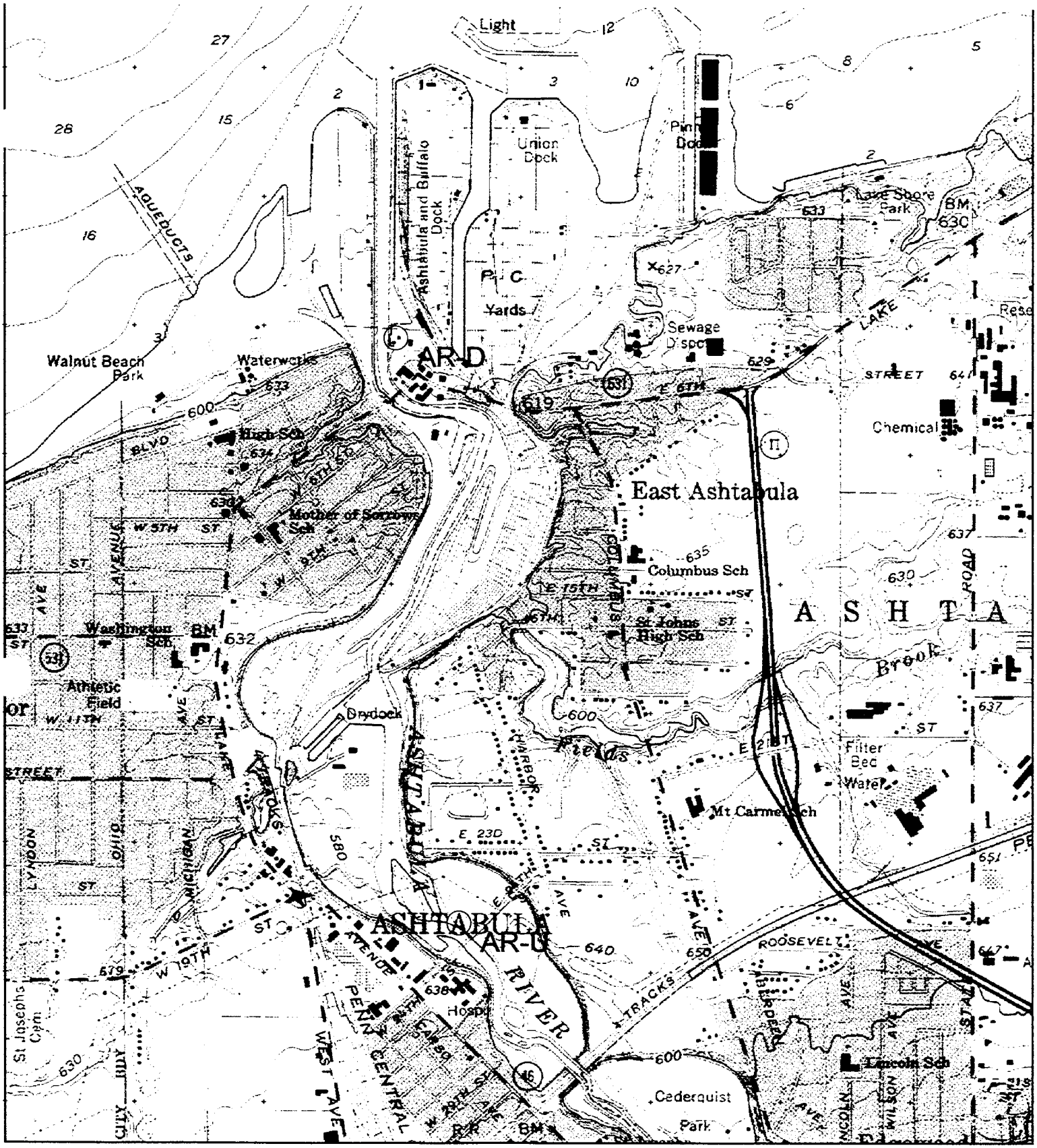


Figure 1. Ashtabula River sites (open circles mark sites). AR-D = downstream site, AR-U = upstream site.

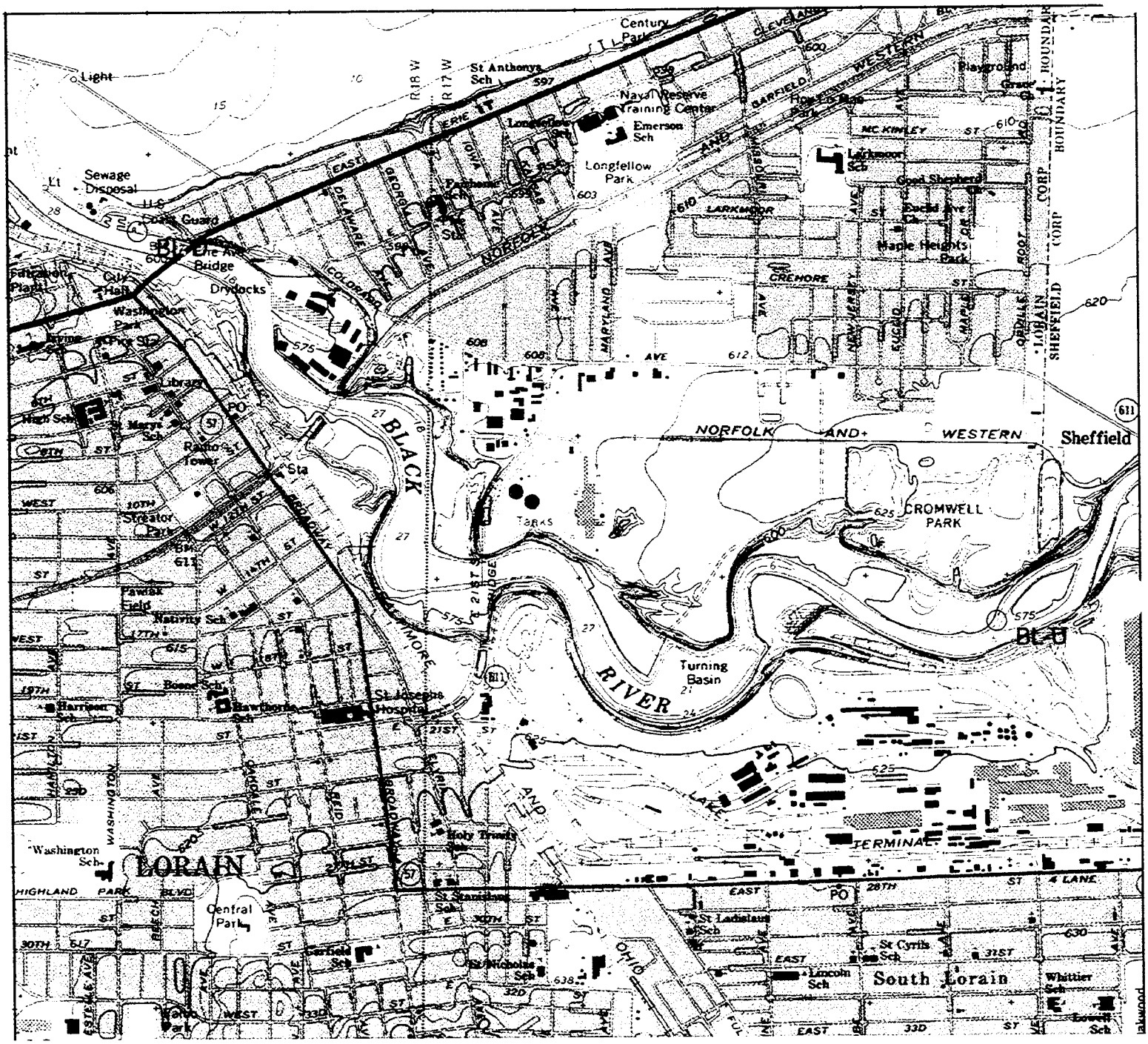


Figure 2. Black River sites (open circles mark sites). BL-D = downstream site, BL-U = upstream site.

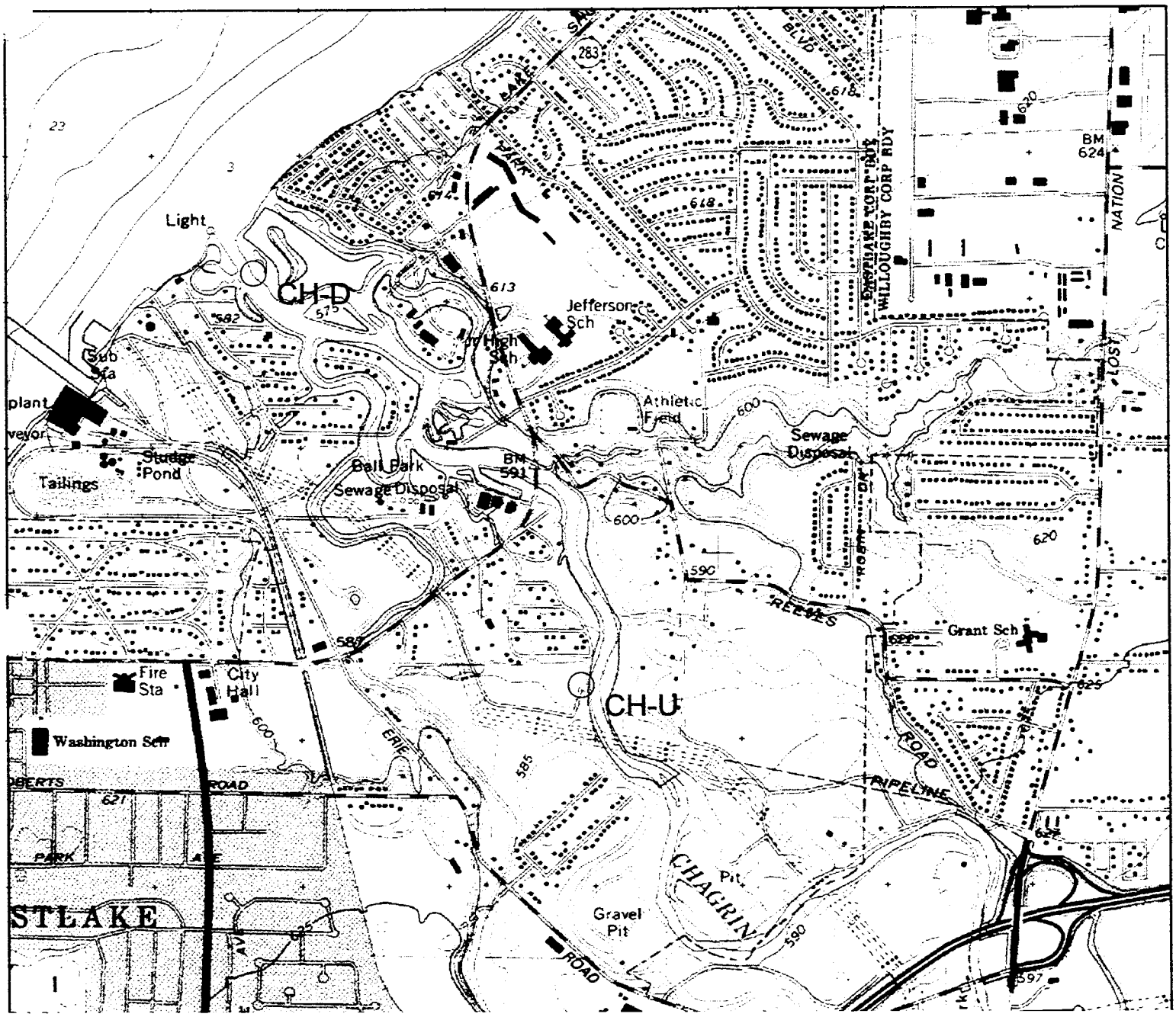


Figure 3. Chagrin River sites (open circles mark sites). CH-D = downstream site, CH-U = upstream site.

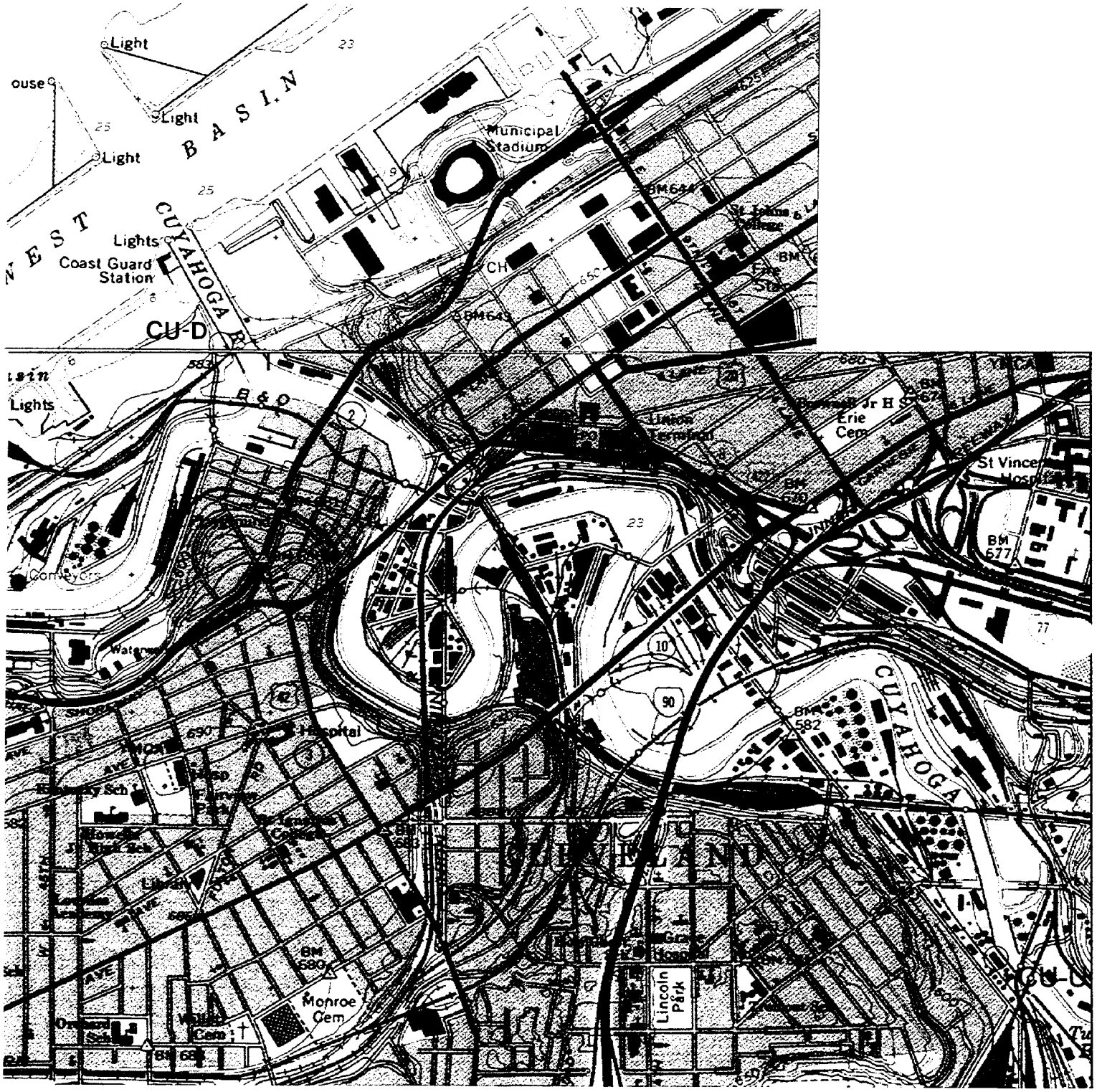


Figure 4. Cuyahoga River sites (open circles mark sites). CU-D = downstream site, CU-U = upstream site.

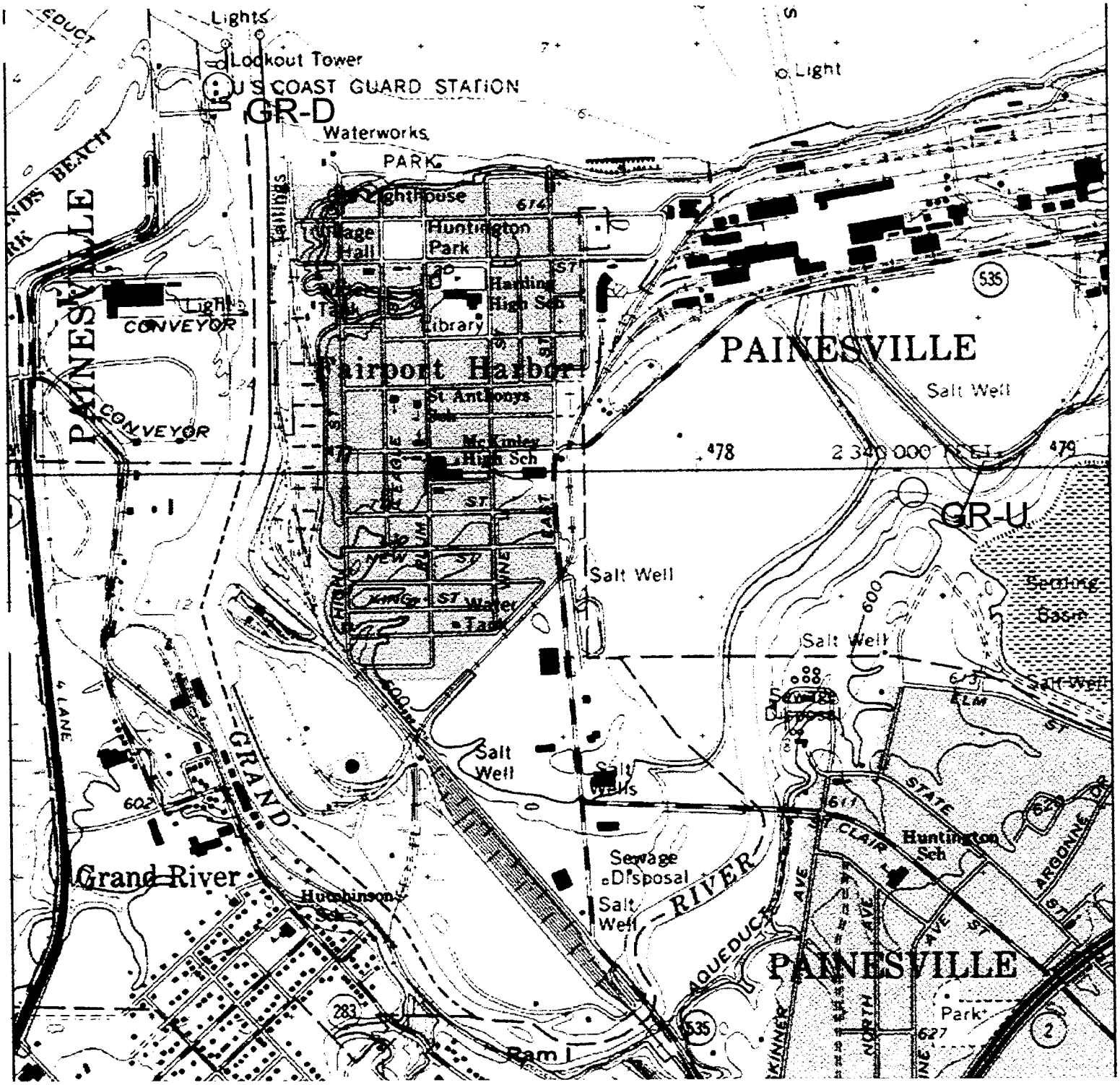


Figure 5. Grand River sites (open circles mark sites). GR-D = downstream site, GR-U = upstream site.

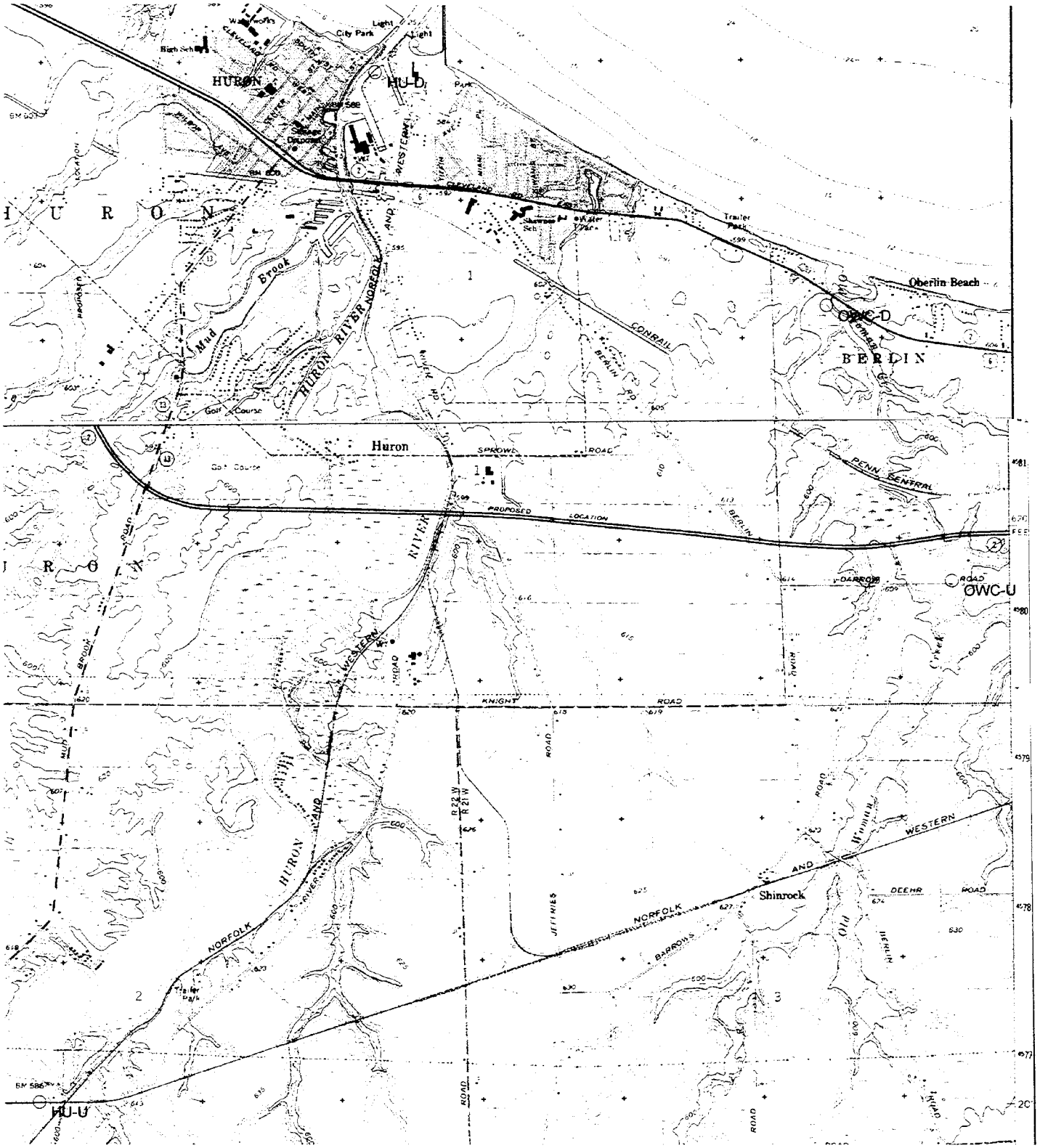
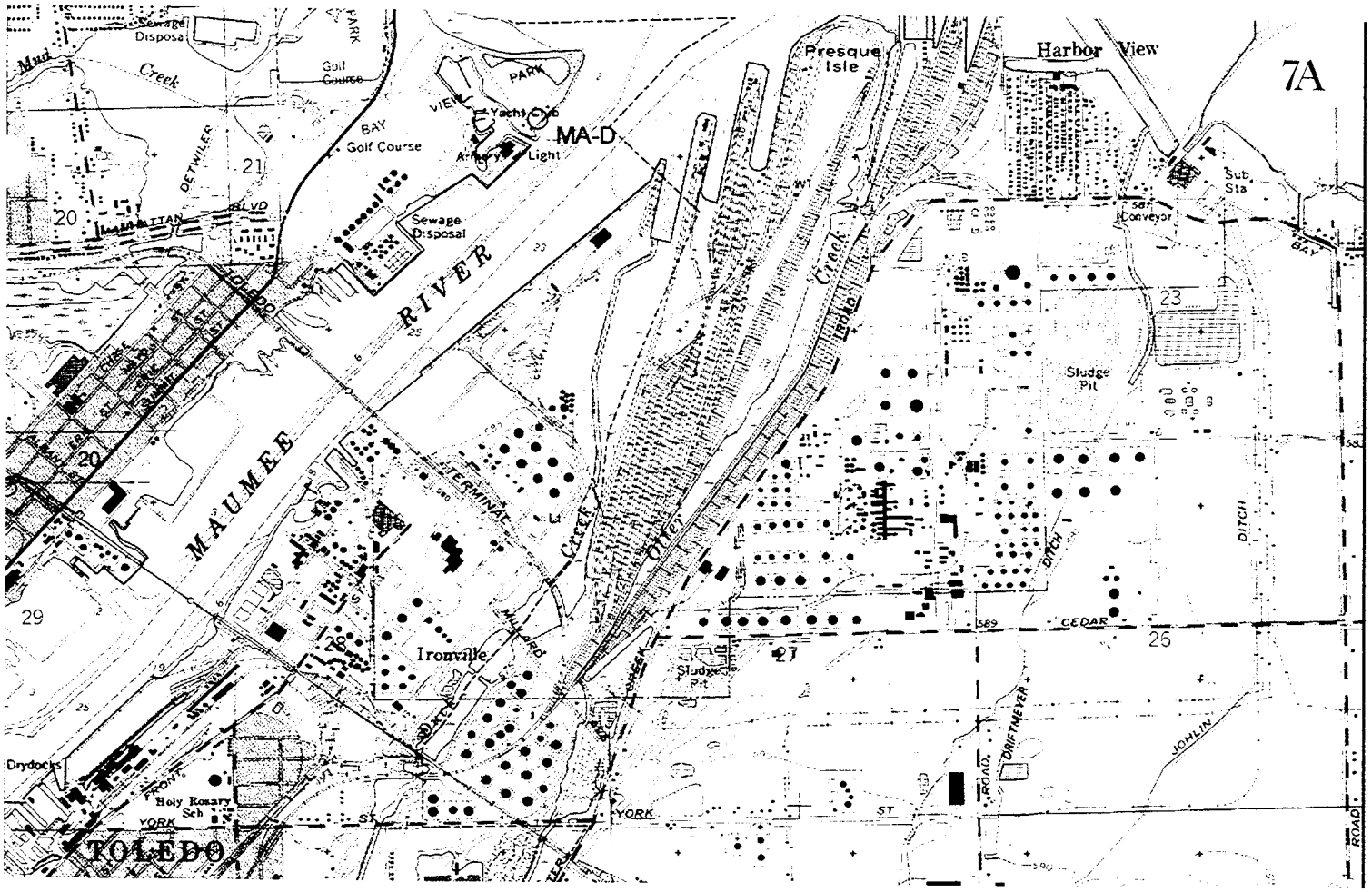


Figure 6. Huron River and Old Woman Creek sites (open circles mark sites). HU-D = Huron downstream site, HU-U = Huron upstream site, OWC-D = Old Woman Creek downstream site, OWC-U = Old Woman Creek upstream site.



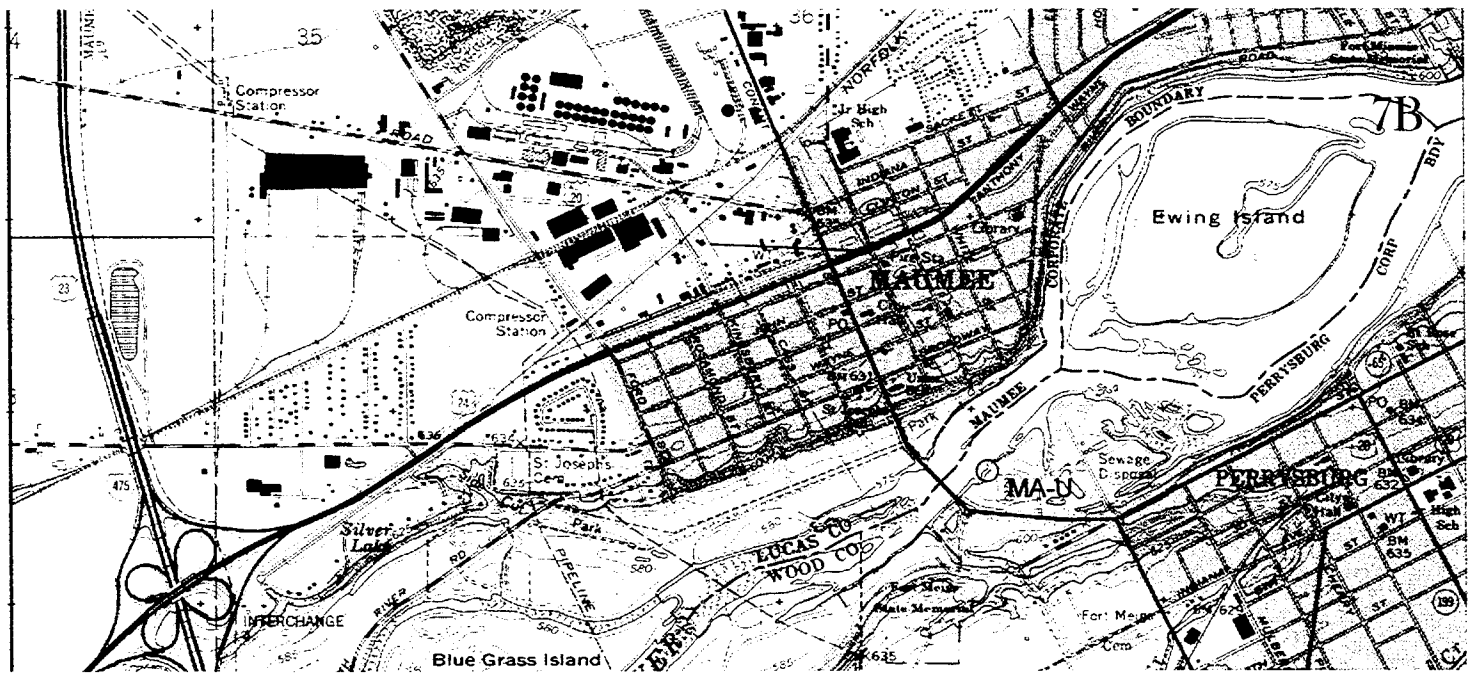


Figure 7. Maumee River sites (open circles mark sites). 7A: MA-D = downstream site. 7B: MA-U = upstream site.

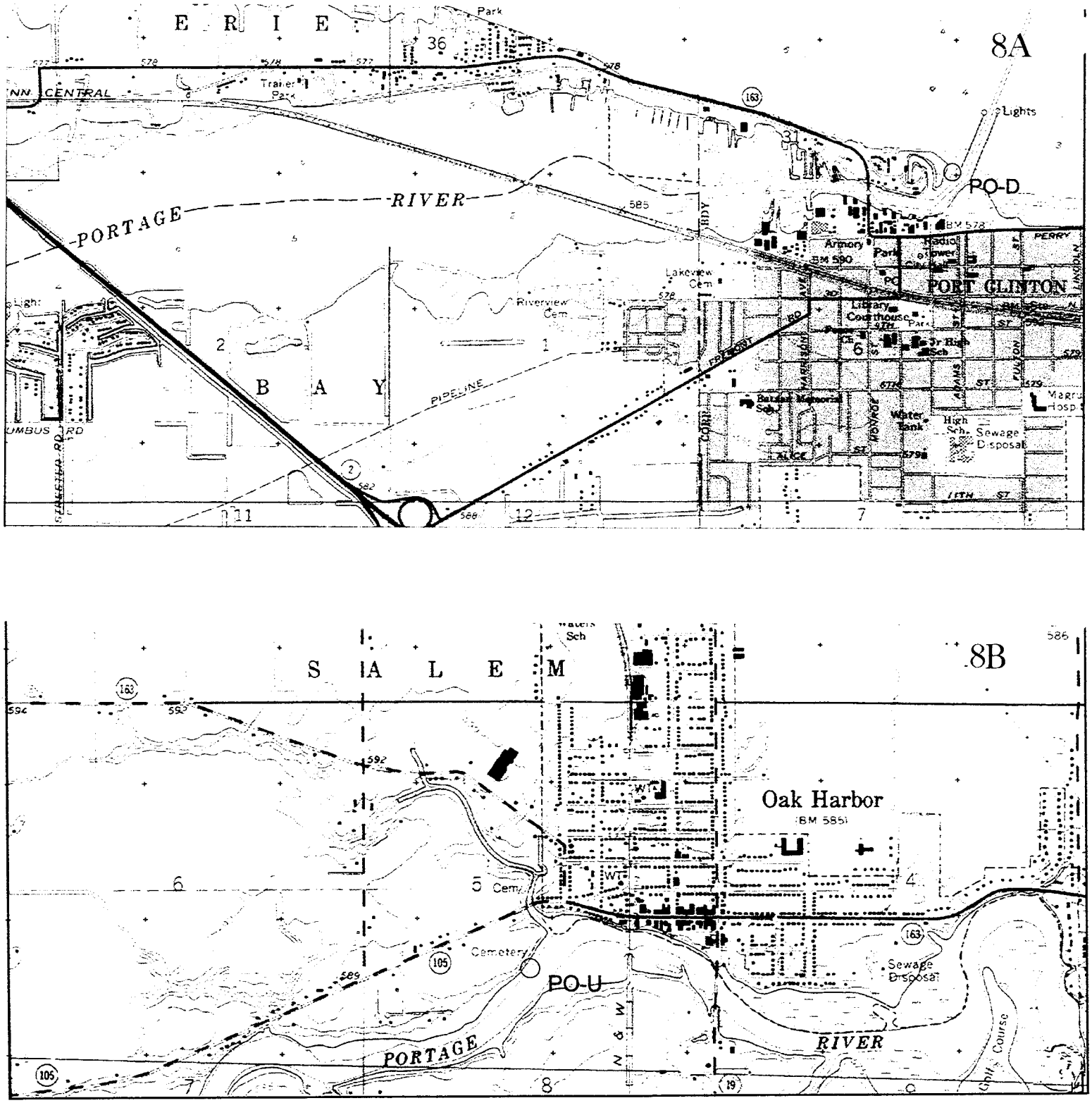


Figure 8. Portage River sites (open circles mark sites). 8A: PO-D = downstream site. 8B: PO-U = upstream site.

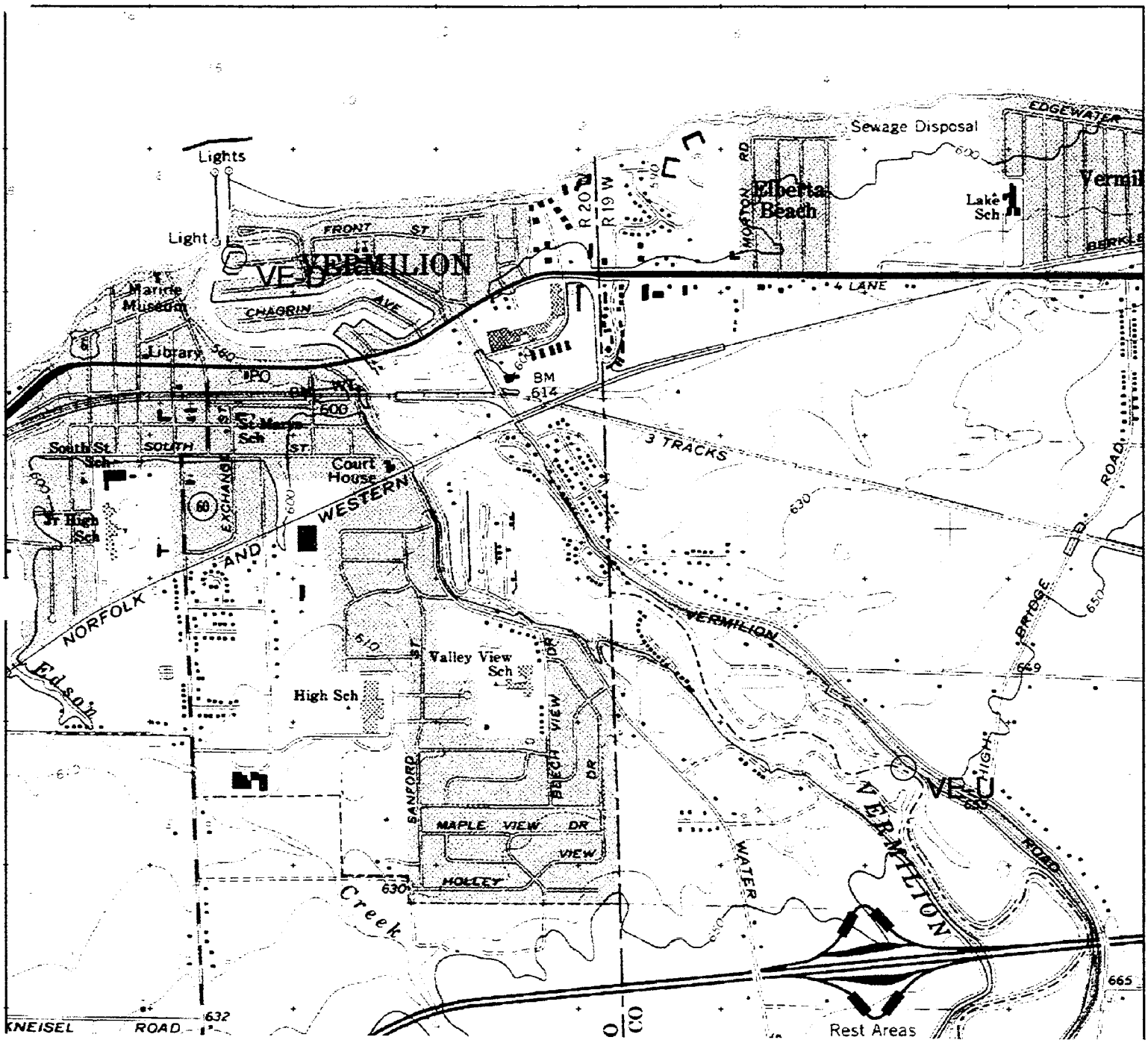


Figure 9. Vermilion River sites (open circles mark sites). VE-D = downstream site, VE-U = upstream site.

MATERIALS AND METHODS

Sampling Methods

The first two years of study we used professionally made diatometers that held 6 glass slides. These diatometers had blue styrofoam floats and appeared irresistible to vandals, and so during the second two years we used glass rods attached to short logs. These were much less prone to vandalism. However, all diatometers are subject to loss through high water events which bring debris down river that can entangle or break the diatometers and their mooring lines, and thus a chronic problem throughout the study was diatometer loss. Diatometers were left in the water for approximately two weeks. Care was taken to place the diatometers uniformly with regard to light and current effects. When diatometers were collected, all algal periphyton material on both sides of each diatometer slide was processed to make quantitative prepared diatom slides. For glass rod diatometers, all algae and diatoms on the rods were scraped with a piece of stiff tygon tubing, and the material likewise processed to make quantitative slides. In each sample period, three replicate samples (slides or rods) from each diatometer were examined to make the composite count for the site.

A grab sample refers to the material collected from a natural substrate. Although composite grab samples from a variety of substrates would have been more desirable, they were not possible in the dredged shipping channels. Epidendric samples from logs and sticks were collected for all grab samples in this study, as woody debris was present at all sites on all visits. Algae were scraped from the wood and put in whirl-pak bags. Samples were placed on ice until they could be refrigerated. Grab samples were collected at the same time as diatometers were retrieved.

Water chemistry samples (approximately 500 ml) at the sites were collected in polypropylene bottles for analysis of nutrient water chemistry. Additional water samples (approximately 50 ml) were collected in polypropylene bottles and filtered in the field with a 0.45 μm polycarbonate membrane filter and treated with high purity nitric acid to pH <2 for metals analysis. All samples were immediately placed on ice in coolers.

Dissolved oxygen, pH and temperature were determined in the field. Additional water chemistry analysis for nutrients was performed at the laboratory facilities of Old Woman Creek National Estuarine Research Reserve within 48 hours of collection. Parameters considered include: silicate, nitrate-nitrite, ammonia, phosphate, sulfate, alkalinity and conductivity. Standard methods were used (American Public Health Administration 1989) for all the above analysis, except for a modification of the ammonia assay first recommended by Zaborojny et al. (1973).

Concentrations of Mg, Ca, Fe, Cr, Ti, Cu, Se, Cd, Pb, and, Zn in the June, 1993, through April, 1994, samples were determined using an ELAN 250 inductively coupled plasma mass spectrometer (ICP/MS). Additionally, a semi-quantitative mass spectral scan was performed which covered most of the periodic table. Internal standard

procedures were used. The analyte and internal standard spectral lines monitored in this work were as follows: Mg 24, Ca 44, Ti 47, Cr 52, Fe 56, Cu 65, Zn 68, Se 82, Cd 111, Pb 206, Pb 207, Pb 208.

Concentrations of Fe, Ca, Mg, Cr and Ti were determined in the November, 1992, and April, 1993, samples by ICP emission spectrometry using a Jarrel-Ash 61 Spectrophotometer. Concentrations of Cu, Se, Cd, and Pb in these samples were determined using ICP/MS as described above. Concentrations of Mg and Fe were determined by flame atomic absorption analysis in June and September, 1994, samples using an Instrumentation Laboratory Smith-Hieftje Model 11AA/AE Spectrophotometer. Concentrations of Ca, Ti, Cr, Cu, Zn, Se, Cd, and, Pb in these samples were determined using ICP/MS as described above. Spot checks were also performed with flame atomic absorption.

Hg was not detected in any sample by the methods of sample collection and analysis used in this study.

During the 1995-96 sampling period water samples were collected in an identical fashion. Silicate, nitrate-nitrite, ammonia, phosphate, sulfate, alkalinity and conductivity were determined at the laboratory at Old Woman Creek National Estuarine Research Reserve as in the 1993-94 study. However, all metals analysis was performed by the Water Quality Laboratory at Heidelberg College following standard methods.

Processing and Examination of Samples

The grab samples were examined at 500X using an Olympus BH-2 or Olympus B-Max photomicroscope with Nomarski Differential Interference Contrast (DIC) optics. This was completed within five days after collection to identify non-diatom algae to the most specific taxon possible using standard references (Geitler 1930-32, Prescott 1970). Following identification of non-diatom algae, permanent diatom slides from whirl-pak material were prepared using standard techniques (St. Clair and Rushforth 1976).

The diatometer slides were washed with distilled water and scraped to remove all material. No attempt was made to distinguish living from dead organisms, though proportions of dead algae are probably less on the diatometer slides than from the grab samples (Stevenson and Lowe 1986). Permanent diatom slides were prepared from diatometer slide or rod material using standard techniques (St. Clair and Rushforth 1976). For a detailed account of diatom slide preparation see Sgro and Johansen (1998a).

Diatom slides were examined at 1250X using an Olympus BH-2 or Olympus B-Max photomicroscope with Nomarski DIC optics. Diatoms were identified to species and variety levels using standard references (Krammer and Lange-Bertalot 1986, 1988,

1991a, 1991b, Patrick and Reimer 1966, 1975). Additional primary sources were referred to for resolution of more confusing taxonomic problems. Most of the species encountered in this study are illustrated in Sgro and Johansen (1998b). Although recently there have been many revisions in diatom taxonomy, particularly at the genus level, our study follows the taxonomy of Krammer and Lange-Bertalot as described in the references mentioned above. It is hoped that the new taxonomic changes will improve the use of diatoms for ecological monitoring and can be incorporated later, but as the taxonomy is in a considerable state of flux, we felt following the extensive account of Krammer and Lange-Bertalot to be best for now.

Counts of approximately 400 diatom valves were made for grab samples and approximately 900 valves (300 from each of three replicate samples) were made for diatometer samples. Relative densities were calculated for all diatom samples. Relative densities were calculated for each species based on the percentage of the species in the total number of organisms counted for the sample.

Data Analysis

The Shannon Index (Ludwig and Reynolds 1988, Shannon and Weaver 1949) was used to calculate species diversity. The index attempts to combine species richness and evenness into a single value which characterizes abundance relationships between species and individuals in a community. Canonical correspondence analysis (CANOCO) (Jongman et al. 1987, ter Braak 1986) was used to analyze algal community response to water chemistry gradients. CANOCO ordinates both sites and taxa on axes that are linear combinations of environmental variables. Results of these analyses were used to help identify those environmental variables most related to species and site distributions. Weighted averaging was then used to determine indicator diatom species.

A detailed account of the analyses used to determine the metrics we recommend for use in the estuaries of Lake Erie is given in Sgro and Johansen (1998a).

ASSESSMENT OF WATER QUALITY

The average for each of the following metrics was calculated for each site: Lange-Bertalot Index (LI), Percent Sensitive Species Index (SSI), Trophic Diatom Index (TDI), Percent Tolerant Species Index (TSI), and Generic Diatom Index (Table 1). These indices are in fairly close agreement. The LI, SSI, and GDI decrease with decreasing water quality, while the TDI and TSI increase with decreasing water quality. A brief examination of the table demonstrates that the Ashtabula River, Grand River, and to a lesser extent the Chagrin River have the best water quality in their estuaries. The other rivers are difficult to separate with only a cursory look at the table.

Table 1. Average untransformed metrics for each of the 20 sites. The metric name is followed by a letter denoting sample type upon which the metric is based (d=diatometer, g=grab).

SITE	LI-d	SSI-d	TDI-d	TSI-d	GDI-g	MM-d
Ashtabula River - up	2.84	0.228	2.37	0.09	4.03	1.31
Ashtabula River - down	2.52	0.237	3.07	0.11	3.77	1.16
Black River - up	1.65	0.104	4.42	0.39	2.54	2.36
Black River - down	1.41	0.133	4.37	0.46	2.70	1.95
Chagrin River - up	2.43	0.186	3.63	0.42	3.08	2.01
Chagrin River - down	2.57	0.201	3.76	0.22	3.37	1.17
Cuyahoga River - up	1.31	0.125	4.70	0.74	2.13	2.40
Cuyahoga River - down	1.58	0.127	4.23	0.35	2.39	1.84
Grand River - up	2.65	0.212	3.11	0.16	3.78	2.07
Grand River - down	2.50	0.239	3.51	0.17	3.32	1.50
Huron River - up	2.22	0.160	3.83	0.33	2.68	2.68
Huron River - down	1.70	0.157	4.31	0.32	2.74	2.12
Maumee River - up	1.90	0.121	4.12	0.28	2.69	2.77
Maumee River - down	1.34	0.156	4.50	0.56	2.41	1.62
Old Woman Creek - up	1.86	0.157	4.03	0.43	2.63	1.87
Old Woman Creek - down	1.73	0.081	4.16	0.39	2.24	2.58
Portage River - up	1.93	0.135	4.51	0.35	2.70	2.88
Portage River - down	2.21	0.142	3.79	0.15	2.87	1.58
Vermilion River - up	2.29	0.175	3.83	0.43	2.82	2.09
Vermilion River - down	2.14	0.206	3.98	0.27	3.13	1.96

Sgro and Johansen (1998a) recommend transformation of the metrics using a scale calibrated from the "best" samples from the full study. Since the LI, SSI, TDI, and GDI are all transformed to the same scale (0-6, with higher numbers having better water quality), it is a little easier making comparisons between sites using the transformed metrics (Table 2). The Erie Diatom Index (EDI) is the sum of the LI, SSI, and TDI. This composite metric is recommended as the best single score for a simple evaluation of water quality in the estuaries (Sgro and Johansen 1998a). The agreement between the average EDI determined from diatometers and the average EDI determined from the grab samples is striking (Fig. 10). The correlation coefficient between the two methods is 0.912. This indicates that if a site is sampled a number of times (4-8 in this instance), then it matters little whether diatometers or grab samples are used. Indeed, the major outliers in the scatterplot of the two methods are the Chagrin and Cuyahoga Rivers, which at both sites for both rivers had heavy diatometer loss and thus less replication in calculating the mean EDI. The sites are easily compared with the EDI plot (Fig. 10), with a vector from the bottom left corner to the top right corner indicating increasing water quality. Again the Ashtabula, Grand, and Chagrin Rivers are cleanest, with the other rivers having poor water quality (particularly the Cuyahoga and Black Rivers).

Table 2. Average transformed metrics based on calibrations within the 10 estuaries in this study. Also included is the composite metric, the Erie Diatom Index (EDI) for both diatometer and grab samples. The metric name is followed by a letter denoting sample type upon which the metric is based (d=diatometer, g=grab).

SITE	LI-d	SSI-d	TDI-d	EDI-d	EDI-g	GDI-g
Ashtabula River - up	5.3	3.3	5.3	13.9	12.3	4.0
Ashtabula River - down	4.0	3.8	4.3	12.1	11.8	3.8
Black River - up	2.0	2.0	1.7	5.7	5.3	2.0
Black River - down	1.4	1.7	1.7	4.8	7.0	2.0
Chagrin River - up	4.0	3.0	2.0	9.0	11.0	2.5
Chagrin River - down	4.0	3.0	2.0	9.0	11.5	3.0
Cuyahoga River - up	1.7	2.0	1.0	4.0	5.8	1.8
Cuyahoga River - down	2.0	1.6	1.6	4.8	7.5	2.0
Grand River - up	5.0	4.0	4.0	13.0	13.0	4.0
Grand River - down	4.5	3.5	2.5	10.5	10.5	3.5
Huron River - up	3.3	2.7	2.7	8.7	6.5	2.0
Huron River - down	2.0	2.0	2.0	6.0	7.5	2.5
Maumee River - up	3.0	1.5	2.0	6.5	6.0	2.0
Maumee River - down	0.7	2.0	2.0	4.7	7.0	1.5
Old Woman Creek - up	2.6	2.3	2.6	7.5	7.8	2.3
Old Woman Creek - down	2.0	1.5	2.0	5.5	5.8	2.0
Portage River - up	2.5	2.0	1.5	6.0	5.5	2.0
Portage River - down	3.0	2.0	3.0	8.0	7.5	2.5
Vermilion River - up	3.5	2.0	2.5	8.0	8.0	2.5
Vermilion River - down	3.3	2.7	2.0	8.0	8.0	3.0

A principal components analysis was performed using 6 metrics, the untransformed LI-d, SSI-d, TDI-d, TSI-d, GDI-g, and EDI-g (d=diatometer, g=grab sample). The TDI and TSI had negative weightings on the first axis, while the other metrics had similar positive weightings. The TSI, SSI, and EDI-g contributed most to the positive scores on the second axis (Fig. 11). The plot of the sites based upon their component weights (which together explained 96% of the variation in the data), shows that the Ashtabula and Grand Rivers were cleanest, followed by the Chagrin and Vermilion Rivers (Fig. 12.). The meaning of the second axis is unclear, except that species with higher scores on the second axis have high percentages of tolerant species. The most challenged systems within the 20 sites in this study are likely the Cuyahoga River upstream site, Maumee River downstream site, and Black River downstream site.

Figure 10. Scatterplot of EDI scores from the grab samples against the EDI scores based on diatometers. The correlation coefficient for these averaged metrics was 0.912.

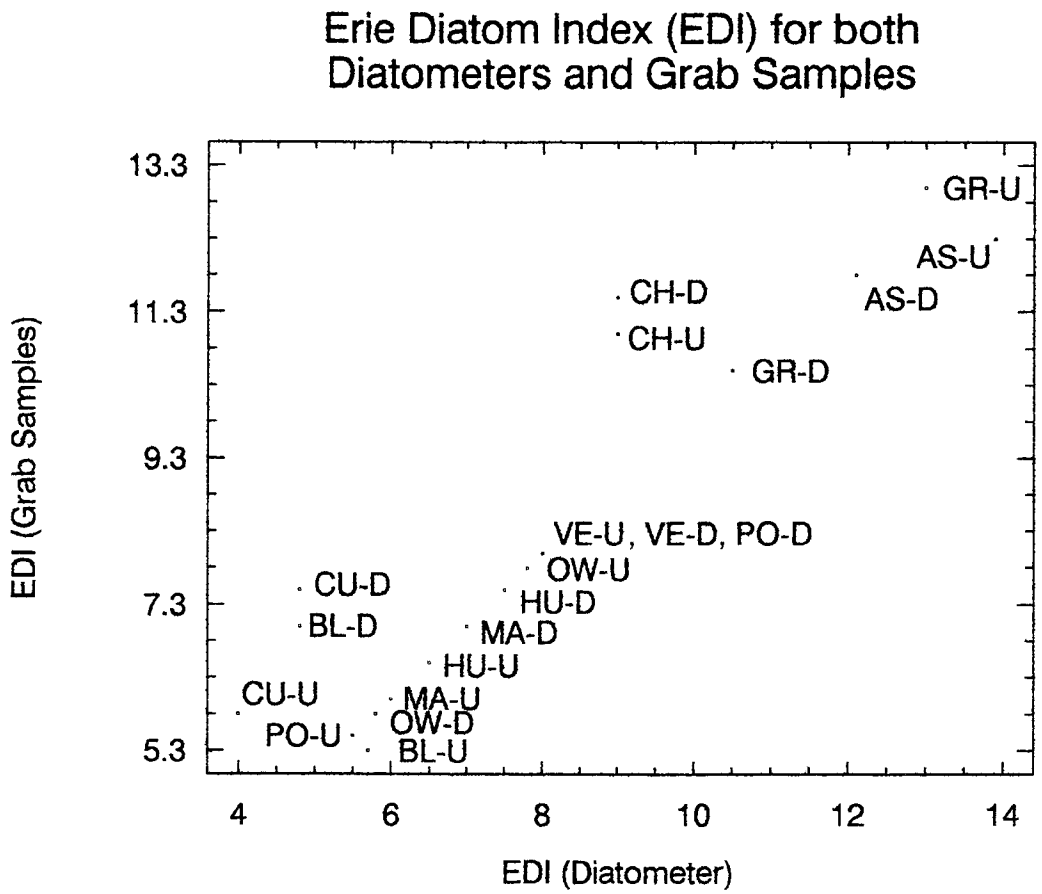


Figure 11. Component weights for a Principal Components Analysis using the untransformed LI-d, SSI-d, TDI-d, TSI-d, GDI-g, and EDI-g (d=diatometers, g=grab samples). The first axis explains 84% of the variability in the data.

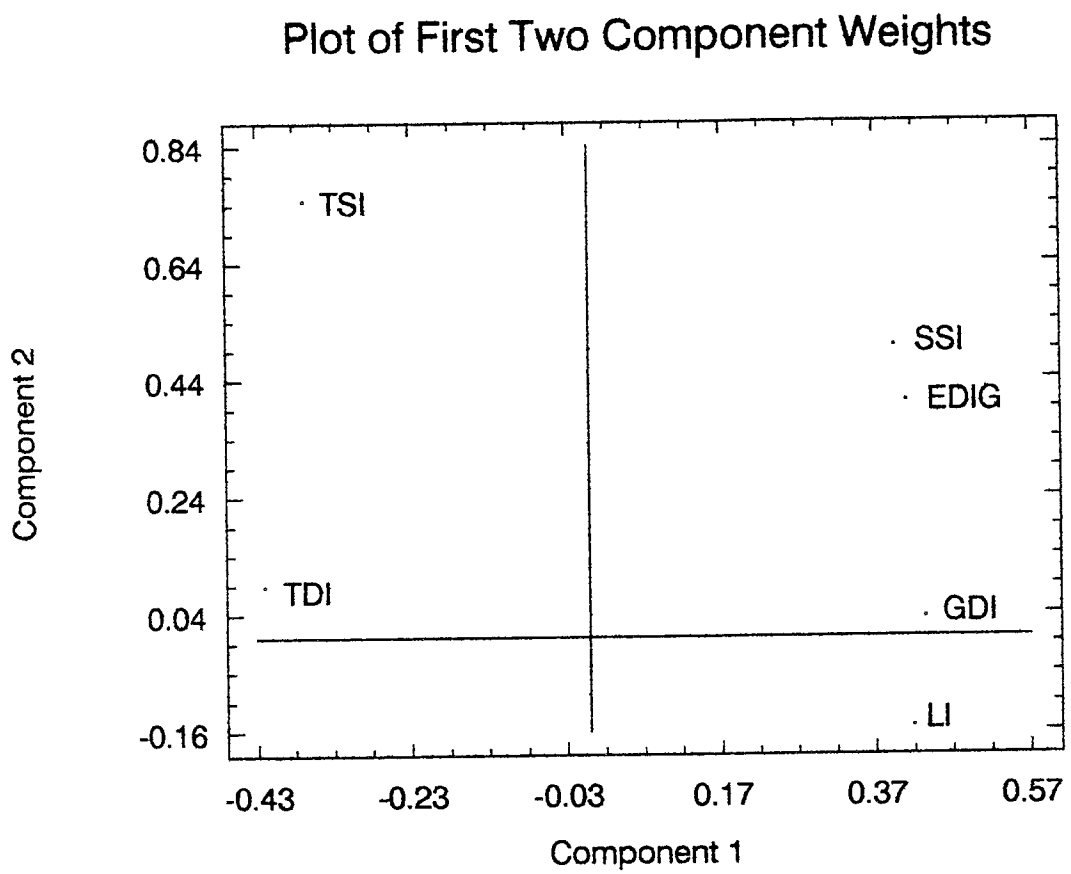
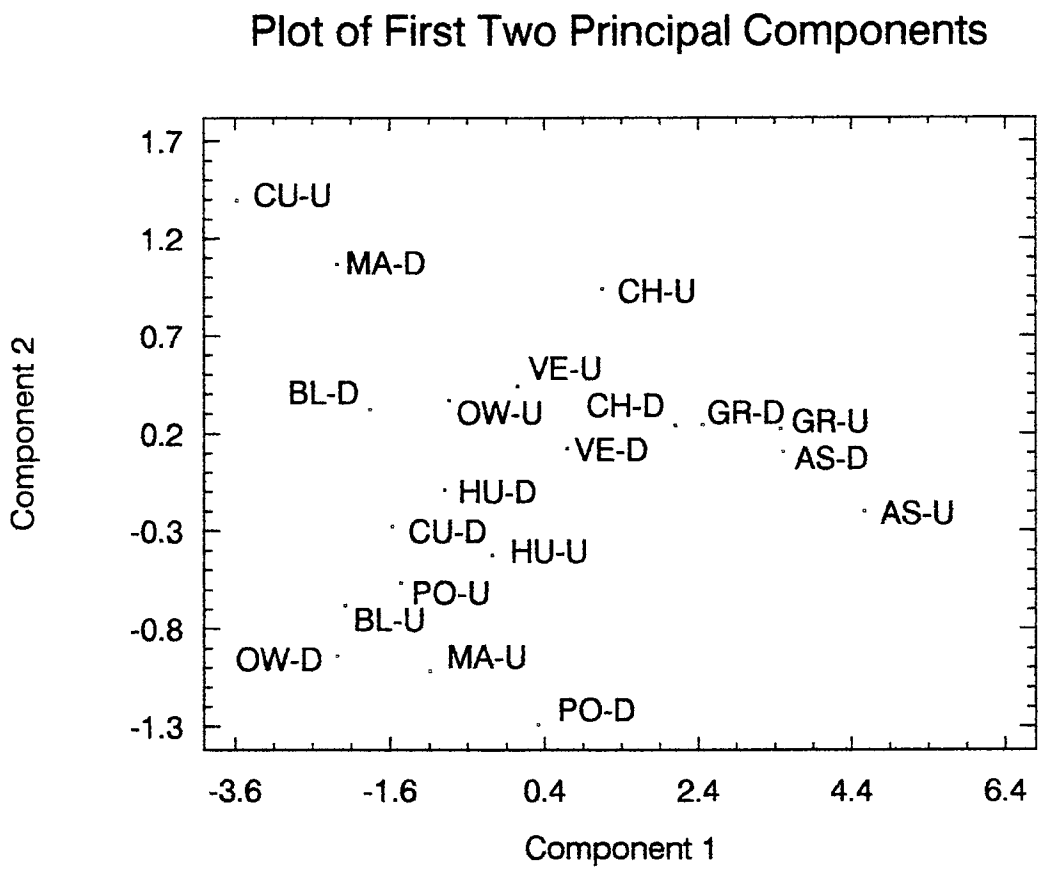


Figure 12. Principal Components for sites using the untransformed LI-d, SSI-d, TDI-d, TSI-d, GDI-g, and EDI-g (d=diatometers, g=grab samples). The first axis explains 84% of the variability in the data. River codes are the first two letters of the river, followed by an indication of site (U=upstream, D=downstream).



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APPENDIX 1
WATER CHEMISTRY DATA FOR 1993-94
ASHTABULA RIVER, BLACK RIVER, CUYAHOGA RIVER AND OLD WOMAN CREEK

Table 1. Temperature, pH, dissolved oxygen and alkalinity. AS=Ashtabula River, OW=Old Woman Creek, BL=Black River, CU=Cuyahoga River. U=upstream site, D=downstream site by mouth.

Site	Date	Temp. (C)	pH	DO (PPM)	Alk. (mg/l)
OW-U	26Jun93	23.1	7.92	7.0	173.600
OW-D	26Jun93	21.7	8.48	7.3	98.084
BL-U	26Jun93	26.2	8.72	9.7	151.542
BL-D	26Jun93	22.3	7.82	6.0	99.820
CU-U	26Jun93	25.2	7.31	6.0	117.180
CU-D	26Jun93	24.2	7.32	3.4	120.652
AS-U-I	26Jun93	26.0	7.31	5.0	69.440
AS-D-I	26Jun93	22.0	7.49	5.6	69.006
AS-U-II	26Jun93	NA	NA	NA	69.006
AS-D-II	26Jun93	NA	NA	NA	85.932
OW-U	11Sep93	17.9	7.98	6.0	231.000
OW-D	11Sep93	16.8	7.89	4.8	193.200
BL-U	11Sep93	22.6	8.45	8.2	109.620
BL-D	11Sep93	22.5	7.89	4.5	91.140
CU-U	11Sep93	24.7	7.75	3.9	123.900
CU-D	11Sep93	23.1	7.35	2.4	105.000
AS-U-I	11Sep93	18.0	6.68	7.6	79.380
AS-D-I	11Sep93	19.5	7.22	6.0	85.680
AS-U-II	11Sep93	NA	NA	NA	79.800
AS-D-II	11Sep93	NA	NA	NA	86.100
OW-U	18Jun94	29.6	7.75	4.6	177.630
OW-D	18Jun94	30.1	7.52	5.4	150.200
BL-U	18Jun94	32.3	9.10	15.0	111.070
BL-D	18Jun94	28.5	8.86	8.8	93.600
CU-U	18Jun94	30.2	7.30	3.4	122.700
CU-D	18Jun94	24.1	7.17	3.4	99.000
AS-U-I	18Jun94	31.8	7.30	6.0	64.500
AS-D-I	18Jun94	25.9	7.10	5.6	70.720
AS-U-II	18Jun94	NA	NA	NA	64.100
AS-D-II	18Jun94	NA	NA	NA	71.600
OW-U	17Sep94	24.2	8.00	7.2	152.670
OW-D	17Sep94	23.8	7.80	6.0	148.930
BL-U	17Sep94	25.7	8.45	15.0	102.340
BL-D	17Sep94	25.1	7.44	6.0	86.110
CU-U	17Sep94	26.5	7.98	10.2	121.060
CU-D	17Sep94	24.4	7.22	4.2	116.900
AS-U-I	17Sep94	22.8	8.00	9.0	80.700
AS-D-I	17Sep94	22.2	8.05	8.8	74.880
AS-U-II	17Sep94	NA	NA	NA	81.120
AS-D-II	17Sep94	NA	NA	NA	75.710

Table 2. Phosphate, ammonia, nitrate-N and nitrite-N. AS=Ashtabula River, OW=Old Woman Creek, BL=Black River, CU=Cuyahoga River. U=upstream site, D=downstream site by mouth.

Site	Date	Phosphate (ug/l)	Ammonia (mg/l)	Nitrate-N (mg/l)	Nitrite-N (ug/l)
OW-U	26Jun93	23.1	0.09	0.76	47
OW-D	26Jun93	14.8	0.06	0.38	16
BL-U	26Jun93	31.3	0.05	1.50	40
BL-D	26Jun93	43.8	0.11	1.53	43
CU-U	26Jun93	61.2	0.28	3.86	138
CU-D	26Jun93	19.8	0.17	2.02	98
AS-U-I	26Jun93	19.6	0.06	0.10	13
AS-D-I	26Jun93	23.3	0.06	0.10	13
AS-U-II	26Jun93	16.3	0.03	0.30	14
AS-D-II	26Jun93	15.6	0.04	0.41	17
OW-U	11Sep93	8.9	0.04	0.08	17
OW-D	11Sep93	12.6	0.05	0.09	18
BL-U	11Sep93	18.6	0.03	2.01	107
BL-D	11Sep93	34.0	0.15	0.71	67
CU-U	11Sep93	353.4	0.28	6.67	86
CU-D	11Sep93	168.2	0.20	3.50	95
AS-U-I	11Sep93	5.4	0.04	0.16	14
AS-D-I	11Sep93	11.1	0.05	0.19	16
AS-U-II	11Sep93	15.3	0.04	0.20	14
AS-D-II	11Sep93	11.6	0.06	0.19	9
OW-U	18Jun94	21.3	0.07	0.24	38
OW-D	18Jun94	12.1	0.03	0.04	4
BL-U	18Jun94	0.0	0.03	7.14	92
BL-D	18Jun94	4.9	0.05	1.65	57
CU-U	18Jun94	105.1	0.15	8.33	131
CU-D	18Jun94	29.1	0.09	3.45	94
AS-U-I	18Jun94	5.9	0.05	0.25	15
AS-D-I	18Jun94	0.0	0.05	0.63	19
AS-U-II	18Jun94	16.1	0.05	0.30	14
AS-D-II	18Jun94	0.0	0.06	0.74	19
OW-U	17Sep94	10.1	0.04	0.14	4
OW-D	17Sep94	12.4	0.04	0.11	4
BL-U	17Sep94	5.9	0.05	3.97	123
BL-D	17Sep94	25.4	0.04	1.33	140
CU-U	17Sep94	172.5	0.11	6.42	80
CU-D	17Sep94	150.7	0.13	7.24	126
AS-U-I	17Sep94	0.0	0.05	0.21	11
AS-D-I	17Sep94	9.6	0.05	0.15	14
AS-U-II	17Sep94	4.1	0.05	0.28	10
AS-D-II	17Sep94	8.6	0.05	0.25	16

Table 3. Sulfate, silicate, and conductivity. AS=Ashtabula River, OW=Old Woman Creek, BL=Black River, CU=Cuyahoga River. U=upstream site, D=downstream site by mouth.

Site	Date	Sulfate (mg/l)	Silicate (mg/l)	Condvty. (mmhos)
OW-U	26Jun93	65.05	0.52	0.574
OW-D	26Jun93	20.46	0.10	0.289
BL-U	26Jun93	107.87	0.38	0.625
BL-D	26Jun93	39.47	0.19	0.356
CU-U	26Jun93	82.82	0.51	0.757
CU-D	26Jun93	55.82	0.51	0.655
AS-U-I	26Jun93	30.94	0.18	0.341
AS-D-I	26Jun93	44.45	0.22	0.506
AS-U-II	26Jun93	40.89	0.17	0.338
AS-D-II	26Jun93	43.91	0.26	0.527
OW-U	11Sep93	62.03	0.30	0.584
OW-D	11Sep93	18.77	0.27	0.486
BL-U	11Sep93	106.45	0.28	0.589
BL-D	11Sep93	67.75	0.18	0.362
CU-U	11Sep93	103.07	0.69	0.910
CU-D	11Sep93	66.65	0.64	0.713
AS-U-I	11Sep93	82.91	0.24	0.772
AS-D-I	11Sep93	40.63	0.17	0.676
AS-U-II	11Sep93	80.24	0.23	0.770
AS-D-II	11Sep93	40.18	0.14	0.720
OW-U	18Jun94	67.01	0.30	0.684
OW-D	18Jun94	50.13	0.16	0.553
BL-U	18Jun94	177.86	0.06	0.923
BL-D	18Jun94	41.78	0.07	0.424
CU-U	18Jun94	102.80	0.58	0.993
CU-D	18Jun94	58.30	0.26	0.590
AS-U-I	18Jun94	33.79	0.22	0.352
AS-D-I	18Jun94	45.33	0.18	0.769
AS-U-II	18Jun94	34.85	0.20	0.361
AS-D-II	18Jun94	44.45	0.15	0.774
OW-U	17Sep94	64.88	0.37	0.652
OW-D	17Sep94	27.21	0.15	0.434
BL-U	17Sep94	83.88	0.10	0.648
BL-D	17Sep94	33.79	0.17	0.349
CU-U	17Sep94	95.61	0.53	0.915
CU-D	17Sep94	93.66	0.48	0.891
AS-U-I	17Sep94	67.90	NA	1.293
AS-D-I	17Sep94	29.88	0.11	0.679
AS-U-II	17Sep94	67.90	0.11	1.333
AS-D-II	17Sep94	31.48	0.12	0.703

Table 4. Calcium, magnesium, titanium, chromium, nd=not detectable. AS=Ashtabula River, OW=Old Woman Creek, BL=Black River, CU=Cuyahoga River. U=upstream site, D=downstream site by mouth.

Site	Date	Ca mg/l	Mg mg/l	Ti mg/l	Cr mg/l
OW-U	26Jun93	70.3000[e]	19.7000[e]	0.0047[e]	0.0015[e]
OW-D	26Jun93	37.6000	11.1000	0.0012	0.0074
BL-U	26Jun93	71.0000	18.7000	0.0039	0.0004
BL-D	26Jun93	43.4000	9.8000	0.0037	0.0005
CU-U	26Jun93	52.7000	14.3000	0.0077	0.0022
CU-D	26Jun93	57.7000	12.1000	0.0048	0.0009
AS-U-I	26Jun93	36.7000	7.1000	0.0028	0.0004
AS-D-I	26Jun93	63.6000	9.5000	0.0026	0.0011
AS-U-II	26Jun93	35.0000	8.0000	0.0027	0.0002
AS-D-II	26Jun93	66.8000	9.4000	0.0035	0.0031
OW-U	11Sep93	72.8000	20.0000	0.0038	0.0014
OW-D	11Sep93	64.3000	19.0000	0.0037	0.0023
BL-U	11Sep93	48.0000	15.8000	0.0029	0.0035
BL-D	11Sep93	35.2000	11.6000	0.0020	0.0005
CU-U	11Sep93	67.5000	17.1000	0.0089	0.0021
CU-D	11Sep93	50.9000	13.5000	0.0061	0.0012
AS-U-I	11Sep93	76.2000	10.0000	0.0021	0.0004
AS-D-I	11Sep93	68.5000	8.9000	0.0014	0.0007
AS-U-II	11Sep93	78.9000	9.9000	0.0028	0.0005
AS-D-II	11Sep93	74.6000	9.6000	0.0021	0.0007
OW-U	18Jun94	83.02	17.1	0.004	nd
OW-D	18Jun94	75.87	15.2	0.002	nd
BL-U	18Jun94	70.54	17.1	0.003	nd
BL-D	18Jun94	49.11	9.3	0.002	nd
CU-U	18Jun94	86.32	14.5	0.008	nd
CU-D	18Jun94	62.08	9.6	0.004	nd
AS-U-I	18Jun94	44.89	4.8	nd	nd
AS-D-I	18Jun94	103.78	5.9	0.002	nd
AS-U-II	18Jun94	44.53	4.4	nd	nd
AS-D-II	18Jun94	134.11	5.5	0.006	nd
OW-U	17Sep94	71.40	18.2	0.004	nd
OW-D	17Sep94	67.63	14.5	0.003	nd
BL-U	17Sep94	59.70	13.7	nd	nd
BL-D	17Sep94	43.29	7.6	0.003	nd
CU-U	17Sep94	91.79	17.1	0.007	nd
CU-D	17Sep94	81.84	16.0	0.006	nd
AS-U-I	17Sep94	209.72	12.2	0.004	nd
AS-D-I	17Sep94	115.87	8.1	0.003	nd
AS-U-II	17Sep94	217.96	11.5	0.002	nd
AS-D-II	17Sep94	113.73	8.1	0.002	nd

Table 5. Iron, copper, zinc, and selenium. NA=not available, nd=not detectable. AS=Ashtabula River, OW=Old Woman Creek, BL=Black River, CU=Cuyahoga River. U=upstream site, D=downstream site by mouth.

Site	Date	Fe mg/l	Cu mg/l	Zn mg/l	Se mg/l
OW-U	26Jun93	0.1300[e]	0.0090[e]	NA	0.0018[e]
OW-D	26Jun93	0.5200	0.0030	NA	0.0082
BL-U	26Jun93	0.0900	0.0070	NA	0.0000
BL-D	26Jun93	0.0600	0.0040	NA	0.0000
CU-U	26Jun93	0.1200	0.0060	NA	0.0030
CU-D	26Jun93	0.1000	0.0070	NA	0.0000
AS-U-I	26Jun93	0.3000	0.0060	NA	0.0000
AS-D-I	26Jun93	0.1700	0.0050	NA	0.0000
AS-U-II	26Jun93	0.3000	0.0060	NA	0.0024
AS-D-II	26Jun93	0.1600	0.0030	NA	0.0009
OW-U	11Sep93	0.1100	0.0030	NA	0.0035
OW-D	11Sep93	0.1600	0.0060	NA	0.0014
BL-U	11Sep93	0.0800	0.0040	NA	0.0026
BL-D	11Sep93	0.7500	0.0030	NA	0.0004
CU-U	11Sep93	0.1000	0.0060	NA	0.0000
CU-D	11Sep93	0.0800	0.0040	NA	0.0000
AS-U-I	11Sep93	0.2000	0.0030	NA	0.0024
AS-D-I	11Sep93	0.1100	0.0020	NA	0.0043
AS-U-II	11Sep93	0.2000	0.0040	NA	0.0000
AS-D-II	11Sep93	0.1100	0.0030	NA	0.0004
OW-U	18Jun94	nd	0.002	0.010	0.0074
OW-D	18Jun94	nd	0.006	0.011	0.0069
BL-U	18Jun94	nd	0.010	0.030	0.0142
BL-D	18Jun94	nd	0.004	0.952	0.0164
CU-U	18Jun94	nd	0.008	0.197	0.0068
CU-D	18Jun94	nd	0.006	0.080	0.0108
AS-U-I	18Jun94	nd	0.005	0.031	0.0010
AS-D-I	18Jun94	nd	0.004	0.016	0.0073
AS-U-II	18Jun94	nd	0.005	0.025	0.0025
AS-D-II	18Jun94	nd	0.005	0.016	0.0003
OW-U	17Sep94	nd	0.003	0.011	0.0007
OW-D	17Sep94	nd	0.001	0.008	0.0034
BL-U	17Sep94	nd	0.004	0.034	0.0158
BL-D	17Sep94	nd	0.004	0.016	0.0029
CU-U	17Sep94	nd	0.009	0.136	0.0154
CU-D	17Sep94	nd	0.007	0.116	0.0028
AS-U-I	17Sep94	nd	0.004	0.022	0.0131
AS-D-I	17Sep94	nd	0.005	0.015	0.0163
AS-U-II	17Sep94	nd	0.004	0.010	0.0080
AS-D-II	17Sep94	nd	0.001	0.006	0.0066

Table 6. Cadmium and lead, nd=not detectable. AS=Ashtabula River, OW=Old Woman Creek, BL=Black River, CU=Cuyahoga River. U=upstream site, D=downstream site by mouth.

Site	Date	Cd mg/l	Pb mg/l
OW-U	26Jun93	0.0019	0.0012
OW-D	26Jun93	0.0004	0.0013
BL-U	26Jun93	0.0003	0.0002
BL-D	26Jun93	0.0002	0.0001
CU-U	26Jun93	0.0005	0.0004
CU-D	26Jun93	0.0003	0.0003
AS-U-I	26Jun93	0.0003	0.0006
AS-D-I	26Jun93	0.0002	0.0002
AS-U-II	26Jun93	0.0001	0.0008
AS-D-II	26Jun93	0.0001	0.0003
OW-U	11Sep93	0.0002	0.0001
OW-D	11Sep93	0.0002	0.0005
BL-U	11Sep93	0.0007	0.0002
BL-D	11Sep93	0.0002	0.0002
CU-U	11Sep93	0.0002	0.0007
CU-D	11Sep93	0.0002	0.0005
AS-U-I	11Sep93	0.0001	0.0004
AS-D-I	11Sep93	0.0001	0.0002
AS-U-II	11Sep93	0.0000	0.0005
AS-D-II	11Sep93	0.0000	0.0005
OW-U	18Jun94	nd	nd
OW-D	18Jun94	nd	nd
BL-U	18Jun94	0.0005	nd
BL-D	18Jun94	nd	nd
CU-U	18Jun94	0.0012	nd
CU-D	18Jun94	nd	nd
AS-U-I	18Jun94	nd	nd
AS-D-I	18Jun94	nd	nd
AS-U-II	18Jun94	0.0005	nd
AS-D-II	18Jun94	nd	nd
OW-U	17Sep94	nd	nd
OW-D	17Sep94	nd	nd
BL-U	17Sep94	0.0030	nd
BL-D	17Sep94	0.0004	nd
CU-U	17Sep94	0.0014	nd
CU-D	17Sep94	nd	nd
AS-U-I	17Sep94	nd	nd
AS-D-I	17Sep94	nd	nd
AS-U-II	17Sep94	nd	nd
AS-D-II	17Sep94	0.0005	nd

APPENDIX 2
WATER CHEMISTRY DATA FOR 1995-1996
ELEVEN LAKE ERIE ESTUARIES

Table 7. Temperature, pH, dissolved oxygen, and sechii depth. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Temp. (C)	pH	DO (PPM)	Sechii (cm)
AS-U	18JUN95	27.2	7.6200	8.2	51.0
AS-D	18JUN95	23.5	7.6300	14.0	88.0
GR-U	18JUN95	26.8	7.9900	9.2	32.0
GR-D	18JUN95	22.9	7.3500	5.4	125.0
CH-U	18JUN95	24.5	8.3900	9.0	NA
CH-D	18JUN95	22.8	7.7900	6.6	NA
CU-U	18JUN95	28.2	7.6900	6.2	40.0
CU-D	18JUN95	21.8	7.5600	7.0	47.0
BL-U	18JUN95	28.6	8.3500	12.5	NA
BL-D	18JUN95	26.4	7.8300	9.8	63.0
VE-U	18JUN95	23.0	8.2600	NA	NA
VE-D	18JUN95	27.5	7.8200	8.6	29.0
OW-U	18JUN95	21.9	7.5000	6.0	5.0
OW-D	18JUN95	26.4	7.6100	6.5	9.0
HU-U	18JUN95	25.8	8.4200	14.2	NA
HU-D	18JUN95	23.5	7.2900	6.2	37.0
PO-U	18JUN95	30.1	8.4800	15.0	15.0
PO-D	18JUN95	22.8	7.9500	13.2	NA
MA-U	18JUN95	28.2	7.6600	11.0	6.0
MA-D	18JUN95	25.0	7.8700	15.0	18.0
AS-U	16SEP95	20.6	7.62	7.0	NA
AS-D	16SEP95	20.3	7.40	6.6	NA
GR-U	16SEP95	20.8	7.62	7.4	NA
GR-D	16SEP95	20.3	7.49	7.1	NA
CH-U	16SEP95	18.8	7.80	8.1	NA
CH-D	16SEP95	22.4	8.04	7.6	NA
CU-U	16SEP95	25.1	7.10	6.0	NA
CU-D	16SEP95	23.2	7.37	3.2	NA
BL-U	16SEP95	23.1	8.01	7.0	NA
BL-D	16SEP95	23.1	7.55	6.4	NA
VE-U	16SEP95	17.3	7.65	8.3	NA
VE-D	16SEP95	20.9	7.44	6.7	NA
OW-U	16SEP95	19.0	8.08	7.2	NA
OW-D	16SEP95	21.3	8.07	8.4	NA
HU-U	16SEP95	22.7	8.38	11.2	NA
HU-D	16SEP95	22.3	7.75	6.0	NA
PO-U	16SEP95	25.2	8.52	8.8	NA
PO-D	16SEP95	21.3	7.85	8.0	NA
MA-U	16SEP95	23.5	8.87	12.2	NA
MA-D	16SEP95	22.6	7.46	6.2	NA

Table 7. Continued.

Site	Date	Temp. (C)	pH	DO (P.P.M.)	Sechii (cm)
AS-U	9JUN96	0.00	0.60	19	3.91
AS-D	9JUN96	NA	1.11	27	8.45
GR-U	9JUN96	NA	0.58	12	7.73
GR-D	9JUN96	NA	0.42	6	14.82
CH-U	9JUN96	NA	0.54	18	19.00
CH-D	9JUN96	0.11	0.68	22	22.27
CU-U	9JUN96	0.20	1.35	45	42.27
CU-D	9JUN96	0.25	2.54	41	36.45
BL-U	9JUN96	0.23	3.23	116	35.55
BL-D	9JUN96	0.23	1.91	67	48.45
VE-U	9JUN96	0.22	5.58	164	27.00
VE-D	9JUN96	0.37	3.19	158	32.82
OW-U	9JUN96	0.71	10.94	258	33.00
OW-D	9JUN96	0.31	0.63	91	26.82
HU-U	9JUN96	0.40	3.13	133	32.45
HU-D	9JUN96	0.40	2.86	103	23.00
PO-U	9JUN96	0.44	11.37	126	18.45
PO-D	9JUN96	0.02	3.51	49	54.27
MA-U	9JUN96	0.05	8.67	55	31.55
MA-D	9JUN96	0.19	3.57	110	17.55
AR-1	9JUN96	0.04	1.13	30	30.64
AR-2	9JUN96	0.02	0.92	25	28.09
AR-3	9JUN96	0.00	1.18	21	28.27
AR-4	9JUN96	0.03	0.24	3	14.45
AR-5	9JUN96	0.00	0.63	29	33.18
AS-U	21SEP96	0.01	0.37	5	35.55
AS-D	21SEP96	0.07	0.44	11	27.55
GR-U	21SEP96	0.02	0.69	6	32.82
GR-D	21SEP96	0.02	0.50	31	26.82
CH-U	21SEP96	0.00	0.57	7	44.64
CH-D	21SEP96	0.05	0.61	8	42.09
CU-U	21SEP96	0.17	5.06	28	88.82
CU-D	21SEP96	0.20	3.32	34	71.36
BL-U	21SEP96	0.03	4.38	29	93.18
BL-D	21SEP96	0.14	1.25	40	48.64
VE-U	21SEP96	0.13	0.78	18	78.27
VE-D	21SEP96	0.06	1.28	19	46.82
OW-U	21SEP96	0.06	2.55	24	59.91
OW-D	21SEP96	0.00	0.37	33	41.73
HU-U	21SEP96	0.03	1.14	11	103.18
HU-D	21SEP96	0.04	0.51	17	36.09
PO-U	21SEP96	0.00	0.78	38	114.45
PO-D	21SEP96	0.00	0.61	9	21.00
MA-U	21SEP96	0.01	0.56	15	51.55
MA-D	21SEP96	0.19	2.62	86	47.91

Table 8. Alkalinity, conductivity, turbidity and phosphate. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Alk. (mg/l)	Condvty. (mmhos)	Turbidity (NTU)	Phosphate (ug/l)
AS-U	18JUN95	74.820	1.161	4.6	7.4
AS-D	18JUN95	73.960	1.056	2.2	3.6
GR-U	18JUN95	85.570	1.233	7.5	6.2
GR-D	18JUN95	87.290	0.484	1.7	4.5
CH-U	18JUN95	127.710	0.556	5.3	7.2
CH-D	18JUN95	95.460	0.537	9.2	6.6
CU-U	18JUN95	142.760	1.064	13.4	280.5
CU-D	18JUN95	111.370	0.618	7.6	82.1
BL-U	18JUN95	130.290	0.736	20.1	3.3
BL-D	18JUN95	108.790	0.496	4.7	25.2
VE-U	18JUN95	132.010	0.481	3.6	13.8
VE-D	18JUN95	130.720	0.438	16.0	2.1
OW-U	18JUN95	155.660	0.575	5.3	30.5
OW-D	18JUN95	122.550	0.413	13.0	63.9
HU-U	18JUN95	156.520	0.617	9.0	81.2
HU-D	18JUN95	121.690	0.424	5.2	24.3
PO-U	18JUN95	132.010	0.575	7.0	47.9
PO-D	18JUN95	91.160	0.320	3.5	22.4
MA-U	18JUN95	123.410	0.465	51.0	161.4
MA-D	18JUN95	144.480	0.570	8.0	39.7
AS-U	16SEP95	86.871	1.908	8.0	12.8
AS-D	16SEP95	80.582	0.950	5.5	16.7
GR-U	16SEP95	93.917	0.335	8.0	9.4
GR-D	16SEP95	77.044	0.322	8.0	17.8
CH-U	16SEP95	104.167	0.528	10.0	7.3
CH-D	16SEP95	78.223	0.282	3.4	13.5
CU-U	16SEP95	108.884	1.002	17.0	216.7
CU-D	16SEP95	106.525	0.960	23.0	236.5
BL-U	16SEP95	109.670	0.779	24.0	24.1
BL-D	16SEP95	80.582	0.331	8.0	46.5
VE-U	16SEP95	124.607	0.578	16.3	0.0
VE-D	16SEP95	85.692	0.310	12.0	5.5
OW-U	16SEP95	164.701	0.585	20.0	14.1
OW-D	16SEP95	133.255	0.409	9.5	42.1
HU-U	16SEP95	139.937	0.701	23.0	11.1
HU-D	16SEP95	80.189	0.276	8.0	31.9
PO-U	16SEP95	135.613	0.826	55.0	16.7
PO-D	16SEP95	77.044	0.248	37.0	27.9
MA-U	16SEP95	107.704	0.439	18.5	17.1
MA-D	16SEP95	115.173	0.490	16.0	134.4
AS-U	9JUN96	42.098	0.172	8.2	9.2
AS-D	9JUN96	59.458	0.249	8.4	9.7
GR-U	9JUN96	73.346	0.334	10.0	10.2
GR-D	9JUN96	80.290	0.401	8.0	4.5

Table 8. Continued.

Site	Date	Alk. (mg/l)	Condvty. (mmhos)	Turbidity (NTU)	Phosphate (ug/l)
CH-U	9JUN96	116.312	0.655	7.7	13.6
CH-D	9JUN96	113.274	0.500	NA	16.4
CU-U	9JUN96	114.142	0.442	23.0	63.9
CU-D	9JUN96	106.764	0.605	26.0	54.6
BL-U	9JUN96	103.292	0.477	57.0	103.4
BL-D	9JUN96	124.124	0.578	19.0	62.7
VE-U	9JUN96	106.764	0.387	56.0	73.9
VE-D	9JUN96	109.802	0.426	43.0	67.4
OW-U	9JUN96	103.726	0.469	17.0	50.9
OW-D	9JUN96	109.368	0.425	31.0	11.2
HU-U	9JUN96	96.348	0.403	59.0	64.6
HU-D	9JUN96	56.420	0.357	84.0	53.4
PO-U	9JUN96	101.990	0.424	85.0	122.5
PO-D	9JUN96	103.726	0.454	40.0	5.4
MA-U	9JUN96	152.334	0.506	20.0	103.8
MA-D	9JUN96	113.274	0.386	41.0	95.8
AR-1	9JUN96	95.914	0.457	10.0	32.0
AR-2	9JUN96	90.706	0.414	5.1	31.1
AR-3	9JUN96	86.800	0.438	5.8	32.7
AR-4	9JUN96	45.570	0.237	4.6	21.1
AR-5	9JUN96	108.500	0.511	7.4	38.1
AS-U	21SEP96	61.056	0.252	22.0	14.9
AS-D	21SEP96	66.144	0.232	9.0	14.4
GR-U	21SEP96	84.376	0.446	44.5	22.1
GR-D	21SEP96	83.104	0.344	21.5	10.9
CH-U	21SEP96	119.568	0.453	50.0	22.4
CH-D	21SEP96	120.416	0.441	43.0	20.6
CU-U	21SEP96	130.168	0.932	15.1	196.7
CU-D	21SEP96	123.384	0.726	14.9	107.1
BL-U	21SEP96	120.416	0.592	17.0	87.5
BL-D	21SEP96	92.432	0.632	13.5	64.5
VE-U	21SEP96	131.016	0.461	17.1	8.0
VE-D	21SEP96	93.280	0.321	5.1	21.5
OW-U	21SEP96	126.776	0.462	20.9	74.4
OW-D	21SEP96	112.360	0.368	19.0	6.5
HU-U	21SEP96	142.040	0.574	3.9	21.4
HU-D	21SEP96	88.192	0.283	6.5	17.4
PO-U	21SEP96	141.616	0.862	34.1	10.1
PO-D	21SEP96	82.256	0.221	13.1	19.2
MA-U	21SEP96	114.056	0.397	12.6	6.2
MA-D	21SEP96	98.792	0.423	22.0	116.2

Table 9. Ammonia, nitrate, nitrite, sulfate, and silicate. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Ammonia (mg/l)	Nitrate (mg/l)	Nitrite (ug/l)	Sulfate (mg/l)	Silicate (mg/l)
AS-U	18JUN95	1.28	0.14	15.2269	13.4617	0.1997
AS-D	18JUN95	0.49	0.59	17.5659	14.0353	0.1476
GR-U	18JUN95	0.55	0.17	6.7350	8.3002	0.1129
GR-D	18JUN95	0.86	0.49	11.4204	5.4320	0.2625
CH-U	18JUN95	0.09	0.11	2.0498	14.0353	0.1563
CH-D	18JUN95	1.14	0.26	8.7848	11.8460	0.1157
CU-U	18JUN95	1.29	6.02	114.2021	24.7242	0.7150
CU-D	18JUN95	2.09	3.08	115.6661	12.4711	0.5353
BL-U	18JUN95	2.91	5.08	67.0571	28.1656	0.2894
BL-D	18JUN95	2.41	2.71	53.5871	13.4096	0.3906
VE-U	18JUN95	0.71	0.24	3.5139	20.3965	0.1997
VE-D	18JUN95	2.23	1.40	42.4597	14.1396	0.4080
OW-U	18JUN95	0.37	3.21	44.2167	20.9179	0.5729
OW-D	18JUN95	3.13	0.65	67.3499	11.4804	0.1939
HU-U	18JUN95	0.14	1.83	22.8404	30.6162	0.0492
HU-D	18JUN95	0.60	1.81	56.2225	14.2439	0.3414
PO-U	18JUN95	0.33	3.98	40.9956	20.5008	0.1157
PO-D	18JUN95	0.42	1.59	2.9283	5.6927	0.6481
MA-U	18JUN95	0.11	6.97	61.7862	11.3240	0.4369
MA-D	18JUN95	1.28	4.73	97.2182	16.1731	0.1852
AS-U	16SEP95	0.28	0.34	8	66.47	0.23
AS-D	16SEP95	1.17	0.32	8	28.63	0.19
GR-U	16SEP95	2.35	0.26	24	51.73	0.31
GR-D	16SEP95	0.48	0.26	6	19.04	0.21
CH-U	16SEP95	0.18	0.15	1	54.22	0.45
CH-D	16SEP95	0.31	0.31	7	19.93	0.21
CU-U	16SEP95	3.37	6.00	92	83.53	0.73
CU-D	16SEP95	2.98	6.52	115	81.40	0.68
BL-U	16SEP95	1.26	7.47	114	111.78	0.21
BL-D	16SEP95	0.70	1.34	47	28.28	0.23
VE-U	16SEP95	1.08	0.11	2	92.25	0.56
VE-D	16SEP95	10.29	0.50	30	26.50	0.27
OW-U	16SEP95	0.21	0.36	2	57.06	0.61
OW-D	16SEP95	0.12	0.07	11	24.55	0.29
HU-U	16SEP95	0.22	1.51	18	144.82	0.31
HU-D	16SEP95	1.11	0.03	23	21.71	0.18
PO-U	16SEP95	0.16	2.38	61	107.51	0.12
PO-D	16SEP95	0.48	0.00	6	19.04	0.19
MA-U	16SEP95	0.14	0.13	21	43.91	0.10
MA-D	16SEP95	0.70	2.18	53	44.45	0.28
AS-U	9JUN96	0.00	0.60	19	3.91	0.38
AS-D	9JUN96	NA	1.11	27	8.45	0.37
GR-U	9JUN96	NA	0.58	12	7.73	0.33
GR-D	9JUN96	NA	0.42	6	14.82	0.27

Table 9. Continued.

Site	Date	Ammonia (mg/l)	Nitrate (mg/l)	Nitrite (ug/l)	Sulfate (mg/l)	Silicate (mg/l)
CH-U	9JUN96	NA	0.54	18	19.00	0.44
CH-D	9JUN96	0.11	0.68	22	22.27	0.46
CU-U	9JUN96	0.20	1.35	45	42.27	0.58
CU-D	9JUN96	0.25	2.54	41	36.45	0.52
BL-U	9JUN96	0.23	3.23	116	35.55	0.62
BL-D	9JUN96	0.23	1.91	67	48.45	0.39
VE-U	9JUN96	0.22	5.58	164	27.00	0.73
VE-D	9JUN96	0.37	3.19	158	32.82	0.63
OW-U	9JUN96	0.71	10.94	258	33.00	0.76
OW-D	9JUN96	0.31	0.63	91	26.82	0.38
HU-U	9JUN96	0.40	3.13	133	32.45	0.64
HU-D	9JUN96	0.40	2.86	103	23.00	0.46
PO-U	9JUN96	0.44	11.37	126	18.45	0.65
PO-D	9JUN96	0.02	3.51	49	54.27	0.05
MA-U	9JUN96	0.05	8.67	55	31.55	0.72
MA-D	9JUN96	0.19	3.57	110	17.55	0.61
AR-1	9JUN96	0.04	1.13	30	30.64	0.56
AR-2	9JUN96	0.02	0.92	25	28.09	0.60
AR-3	9JUN96	0.00	1.18	21	28.27	0.59
AR-4	9JUN96	0.03	0.24	3	14.45	0.39
AR-5	9JUN96	0.00	0.63	29	33.18	0.61
AS-U	21SEP96	0.01	0.37	5	35.55	0.48
AS-D	21SEP96	0.07	0.44	11	27.55	0.44
GR-U	21SEP96	0.02	0.69	6	32.82	0.58
GR-D	21SEP96	0.02	0.50	31	26.82	0.22
CH-U	21SEP96	0.00	0.57	7	44.64	0.67
CH-D	21SEP96	0.05	0.61	8	42.09	0.63
CU-U	21SEP96	0.17	5.06	28	88.82	0.91
CU-D	21SEP96	0.20	3.32	34	71.36	0.81
BL-U	21SEP96	0.03	4.38	29	93.18	0.91
BL-D	21SEP96	0.14	1.25	40	48.64	0.65
VE-U	21SEP96	0.13	0.78	18	78.27	0.56
VE-D	21SEP96	0.06	1.28	19	46.82	0.39
OW-U	21SEP96	0.06	2.55	24	59.91	0.79
OW-D	21SEP96	0.00	0.37	33	41.73	0.42
HU-U	21SEP96	0.03	1.14	11	103.18	0.39
HU-D	21SEP96	0.04	0.51	17	36.09	0.16
PO-U	21SEP96	0.00	0.78	38	114.45	0.01
PO-D	21SEP96	0.00	0.61	9	21.00	0.22
MA-U	21SEP96	0.01	0.56	15	51.55	0.17
MA-D	21SEP96	0.19	2.62	86	47.91	0.35

Table 10. Arsenic, selenium, silver, strontium. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	As (mg/l)	Se (mg/l)	Ag (mg/l)	Sr (mg/l)
AS-U	18JUN95	0.0066	0.0008	0.0000	0.2238
AS-D	18JUN95	0.0021	0.0000	0.0001	0.2967
GR-U	18JUN95	0.0012	0.0192	0.0002	0.9698
GR-D	18JUN95	0.0091	0.0166	0.0006	0.2016
CH-U	18JUN95	0.0036	0.0178	0.0004	0.1755
CH-D	18JUN95	0.0102	0.0136	0.0005	0.0000
CU-U	18JUN95	0.0013	0.0029	0.0002	0.2943
CU-D	18JUN95	0.0016	0.0000	0.0000	0.2388
BL-U	18JUN95	0.0054	0.0094	0.0000	0.2570
BL-D	18JUN95	0.0016	0.0025	0.0000	0.2356
VE-U	18JUN95	0.0000	0.0030	0.0000	0.3600
VE-D	18JUN95	0.0062	0.0075	0.0000	0.3243
OW-U	18JUN95	0.0067	0.0018	0.0000	0.1959
OW-D	18JUN95	0.0042	0.0007	0.0000	0.2115
HU-U	18JUN95	0.0055	0.0021	0.0000	0.3270
HU-D	18JUN95	0.0000	0.0037	0.0005	0.2670
PO-U	18JUN95	0.0017	0.0038	0.0001	1.9650
PO-D	18JUN95	0.0009	0.0045	0.0000	0.3167
MA-U	18JUN95	0.0001	0.0047	0.0000	0.6403
MA-D	18JUN95	0.0000	0.0000	0.0000	0.9147
AS-U	16SEP95	0.0040	0.0159	0.0002	0.2912
AS-D	16SEP95	0.0113	0.0093	0.0006	0.0000
GR-U	16SEP95	0.0000	0.0170	0.0007	0.0000
GR-D	16SEP95	0.0067	0.0152	0.0007	0.0005
CH-U	16SEP95	0.0074	0.0141	0.0009	0.0000
CH-D	16SEP95	0.0088	0.0162	0.0015	0.0000
CU-U	16SEP95	0.0118	0.0029	0.0002	0.2943
CU-D	16SEP95	0.0000	0.0029	0.0000	0.2721
BL-U	16SEP95	0.0043	0.0054	0.0000	0.2333
BL-D	16SEP95	0.0064	0.0098	0.0000	0.1704
VE-U	16SEP95	0.0000	0.0099	0.0000	0.3662
VE-D	16SEP95	0.0000	0.0035	0.0000	0.2095
OW-U	16SEP95	0.0032	0.0006	0.0000	0.3167
OW-D	16SEP95	0.0005	0.0001	0.0000	0.1811
HU-U	16SEP95	0.0052	0.0033	0.0000	0.3573
HU-D	16SEP95	0.0034	0.0090	0.0000	0.1788
PO-U	16SEP95	0.0072	0.0037	0.0000	3.8260
PO-D	16SEP95	0.0089	0.0009	0.0000	0.3256
MA-U	16SEP95	0.0040	0.0074	0.0000	0.7450
MA-D	16SEP95	0.0051	0.0075	0.0000	0.6682
AS-U	9JUN96	0.0006	0.0018	0.0000	0.0709
AS-D	9JUN96	0.0000	0.0000	0.0000	0.1127
GR-U	9JUN96	0.0020	0.0000	0.0000	0.1325
GR-D	9JUN96	0.0024	0.0004	0.0000	0.1513

Table 10. Continued.

Site	Date	As (mg/l)	Se (mg/l)	Ag (mg/l)	Sr (mg/l)
CH-U	9JUN96	0.0059	0.0000	0.0000	0.1520
CH-D	9JUN96	0.0032	0.0000	0.0000	0.1528
CU-U	9JUN96	0.0000	0.0000	0.0000	0.2145
CU-D	9JUN96	0.0000	0.0062	0.0000	0.2042
BL-U	9JUN96	0.0051	0.0000	0.0000	0.2035
BL-D	9JUN96	0.0015	0.0000	0.0000	0.2217
VE-U	9JUN96	0.0039	0.0000	0.0000	0.2299
VE-D	9JUN96	0.0021	0.0005	0.0000	0.2630
OW-U	9JUN96	0.0033	0.0004	0.0000	0.1704
OW-D	9JUN96	0.0028	0.0037	0.0000	0.1729
HU-U	9JUN96	0.0000	0.0045	0.0000	0.2137
HU-D	9JUN96	0.0032	0.0008	0.0000	0.1751
PO-U	9JUN96	0.0004	0.0000	0.0000	0.7998
PO-D	9JUN96	0.0055	0.0051	0.0000	1.2090
MA-U	9JUN96	0.0075	0.0000	0.0000	0.6426
MA-D	9JUN96	0.0013	0.0014	0.0000	0.4226
AR-1	9JUN96	0.0020	0.0000	0.0000	0.1547
AR-2	9JUN96	0.0055	0.0000	0.0000	0.1597
AR-3	9JUN96	0.0009	0.0000	0.0000	0.1543
AR-4	9JUN96	0.0036	0.0051	0.0000	0.1013
AR-5	9JUN96	0.0069	0.0001	0.0000	0.1737
AS-U	21SEP96	0.0060	0.0023	0.0026	0.1040
AS-D	21SEP96	0.0000	0.0027	0.0017	0.1315
GR-U	21SEP96	0.0050	0.0041	0.0020	0.1499
GR-D	21SEP96	0.0062	0.0000	0.0000	0.1655
CH-U	21SEP96	0.0049	0.0000	0.0000	0.1575
CH-D	21SEP96	0.0087	0.0000	0.0016	0.1597
CU-U	21SEP96	0.0048	0.0000	0.0000	0.2538
CU-D	21SEP96	0.0061	0.0000	0.0000	0.2088
BL-U	21SEP96	0.0019	0.0000	0.0078	0.2150
BL-D	21SEP96	0.0048	0.0081	0.0024	0.1729
VE-U	21SEP96	0.0049	0.0000	0.0012	0.3043
VE-D	21SEP96	0.0015	0.0028	0.0001	0.2102
OW-U	21SEP96	0.0044	0.0000	0.0050	0.1736
OW-D	21SEP96	0.0047	0.0042	0.0008	0.1725
HU-U	21SEP96	0.0073	0.0000	0.2955	0.2955
HU-D	21SEP96	0.0001	0.0012	0.2126	0.2126
PO-U	21SEP96	0.0021	0.0000	0.0000	4.0460
PO-D	21SEP96	0.0103	0.0000	0.0014	0.1724
MA-U	21SEP96	0.0087	0.0000	0.0063	0.6927
MA-D	21SEP96	0.0074	0.0000	0.0000	0.4946

Table 11. Thallium, aluminum, nickle, barium. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Tl (mg/l)	Al (mg/l)	Ni (mg/l)	Ba (mg/l)
AS-U	18JUN95	0.0000	0.0001	0.0010	0.0779
AS-D	18JUN95	0.0108	0.0197	0.0011	0.0532
GR-U	18JUN95	0.0351	0.0012	0.0026	0.1464
GR-D	18JUN95	0.0128	0.0000	0.0011	0.0340
CH-U	18JUN95	0.0346	0.0201	0.0011	0.0413
CH-D	18JUN95	0.0464	0.0140	0.0000	0.0449
CU-U	18JUN95	0.0071	0.0573	0.0228	0.0461
CU-D	18JUN95	0.0000	0.0177	0.0071	0.0382
BL-U	18JUN95	0.0103	0.0377	0.0068	0.0364
BL-D	18JUN95	0.0186	0.0333	0.0025	0.0332
VE-U	18JUN95	0.0097	0.0284	0.0060	0.0462
VE-D	18JUN95	0.0242	0.0223	0.0040	0.0484
OW-U	18JUN95	0.0118	0.0134	0.0032	0.0436
OW-D	18JUN95	0.0000	0.0168	0.0016	0.0334
HU-U	18JUN95	0.0000	0.0283	0.0029	0.0454
HU-D	18JUN95	0.0000	0.0143	0.0011	0.0334
PO-U	18JUN95	0.0000	0.0276	0.0019	0.0404
PO-D	18JUN95	0.0186	0.0286	0.0019	0.0218
MA-U	18JUN95	0.0000	0.0201	0.0016	0.0412
MA-D	18JUN95	0.0000	0.0153	0.0036	0.0484
AS-U	16SEP95	0.0569	0.0041	0.0015	0.0866
AS-D	16SEP95	0.0614	0.0065	0.0019	0.0434
GR-U	16SEP95	0.0578	0.0028	0.0008	0.0629
GR-D	16SEP95	0.0379	0.0026	0.0014	0.0255
CH-U	16SEP95	0.0543	0.0037	0.0010	0.0377
CH-D	16SEP95	0.0191	0.0143	0.0011	0.0220
CU-U	16SEP95	0.0071	0.0573	0.0228	0.0461
CU-D	16SEP95	0.0240	0.0183	0.0190	0.0450
BL-U	16SEP95	0.0086	0.0362	0.0086	0.0327
BL-D	16SEP95	0.0276	0.0300	0.0000	0.0255
VE-U	16SEP95	0.0156	0.0137	0.0058	0.0682
VE-D	16SEP95	0.0254	0.0251	0.0028	0.0370
OW-U	16SEP95	0.0186	0.0286	0.0019	0.0218
OW-D	16SEP95	0.0000	0.0203	0.0023	0.0341
HU-U	16SEP95	0.0000	0.0148	0.0073	0.0556
HU-D	16SEP95	0.0119	0.0291	0.0007	0.0232
PO-U	16SEP95	0.0225	0.0216	0.0006	0.0581
PO-D	16SEP95	0.0146	0.0575	0.0017	0.0234
MA-U	16SEP95	0.0025	0.0317	0.0018	0.0391
MA-D	16SEP95	0.0000	0.0303	0.0061	0.0370
AS-U	9JUN96	0.0000	0.0987	0.0010	0.0235
AS-D	9JUN96	0.0000	0.0458	0.0017	0.0330
GR-U	9JUN96	0.0000	0.0487	0.0014	0.0297
GR-D	9JUN96	0.0000	0.0347	0.0004	0.0336

Table 11. Continued.

Site	Date	Tl (mg/l)	Al (mg/l)	Ni (mg/l)	Ba (mg/l)
CH-U	9JUN96	0.0000	0.0221	0.0000	0.0374
CH-D	9JUN96	0.0000	0.0225	0.0007	0.0356
CU-U	9JUN96	0.0000	0.0157	0.0058	0.0411
CU-D	9JUN96	0.0236	0.0182	0.0087	0.0470
BL-U	9JUN96	0.0205	0.0961	0.0034	0.0356
BL-D	9JUN96	0.0000	0.0350	0.0032	0.0343
VE-U	9JUN96	0.0045	0.0424	0.0034	0.0414
VE-D	9JUN96	0.0000	0.0490	0.0049	0.0463
OW-U	9JUN96	0.0019	0.0209	0.0013	0.0448
OW-D	9JUN96	0.0000	0.0366	0.0021	0.0420
HU-U	9JUN96	0.0317	0.1226	0.0013	0.0415
HU-D	9JUN96	0.0147	0.0709	0.0011	0.0310
PO-U	9JUN96	0.0157	0.0476	0.0021	0.0374
PO-D	9JUN96	0.0156	0.0221	0.0038	0.0339
MA-U	9JUN96	0.0000	0.0253	0.0005	0.0434
MA-D	9JUN96	0.0014	0.0069	0.0000	0.0318
AR-1	9JUN96	0.0116	0.0212	0.0002	0.0411
AR-2	9JUN96	0.0000	0.0174	0.0022	0.0456
AR-3	9JUN96	0.0000	0.0241	0.0014	0.0455
AR-4	9JUN96	0.0000	0.1420	0.0057	0.0278
AR-5	9JUN96	0.0000	0.0141	0.0011	0.0511
AS-U	21SEP96	0.0265	0.0790	0.0022	0.0283
AS-D	21SEP96	0.0000	0.0411	0.0009	0.0309
GR-U	21SEP96	0.0000	0.0613	0.0038	0.0361
GR-D	21SEP96	0.0000	0.0278	0.0011	0.0331
CH-U	21SEP96	0.0077	0.0398	0.0005	0.0403
CH-D	21SEP96	0.0000	0.0211	0.0008	0.0428
CU-U	21SEP96	0.0000	0.0178	0.0178	0.0436
CU-D	21SEP96	0.0000	0.0091	0.0123	0.0376
BL-U	21SEP96	0.0178	0.0239	0.0054	0.0360
BL-D	21SEP96	0.0068	0.0378	0.0031	0.0296
VE-U	21SEP96	0.0000	0.0264	0.0102	0.0658
VE-D	21SEP96	0.0000	0.0268	0.0006	0.0359
OW-U	21SEP96	0.0000	0.0216	0.0024	0.0493
OW-D	21SEP96	0.0060	0.0079	0.0011	0.0353
HU-U	21SEP96	0.0142	0.0185	0.0050	0.0457
HU-D	21SEP96	0.0028	0.0150	0.0018	0.0277
PO-U	21SEP96	0.0000	0.0115	0.0058	0.0652
PO-D	21SEP96	0.0019	0.0380	0.0013	0.0236
MA-U	21SEP96	0.0000	0.0082	0.0037	0.0369
MA-D	21SEP96	0.0000	0.0229	0.0058	0.0304

Table 12. Cobalt, silica, manganese, iron. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Co (mg/l)	Si (mg/l)	Mn (mg/l)	Fe (mg/l)
AS-U	18JUN95	0.0009	0.7343	0.2735	0.0339
AS-D	18JUN95	0.0000	0.4172	0.0640	0.0045
GR-U	18JUN95	0.0000	1.0870	0.2214	0.0083
GR-D	18JUN95	0.0004	0.1389	0.0149	0.0132
CH-U	18JUN95	0.0003	0.6117	0.0268	0.0240
CH-D	18JUN95	0.0002	0.4748	0.0026	0.0063
CU-U	18JUN95	0.0007	4.2930	0.0994	0.1326
CU-D	18JUN95	0.0000	2.1140	0.0752	0.0152
BL-U	18JUN95	0.0000	1.6800	0.0104	0.0154
BL-D	18JUN95	0.0000	2.1190	0.0603	0.0328
VE-U	18JUN95	0.0000	0.9393	0.0034	0.0122
VE-D	18JUN95	0.0002	2.1690	0.0714	0.0093
OW-U	18JUN95	0.0000	2.9660	0.0992	0.0076
OW-D	18JUN95	0.0006	0.6806	0.0815	0.0154
HU-U	18JUN95	0.0000	2.0040	0.0464	0.0072
HU-D	18JUN95	0.0000	1.6790	0.0258	0.0060
PO-U	18JUN95	0.0002	0.0947	0.0127	0.0045
PO-D	18JUN95	0.0000	0.4432	0.0028	0.0220
MA-U	18JUN95	0.0009	4.2380	0.0037	0.0247
MA-D	18JUN95	0.0000	3.0830	0.0094	0.0100
AS-U	16SEP95	0.0007	0.7601	0.1308	0.0099
AS-D	16SEP95	0.0001	0.4572	0.0796	0.0083
GR-U	16SEP95	0.0002	0.0518	0.0471	0.0217
GR-D	16SEP95	0.0006	0.6682	0.0352	0.0123
CH-U	16SEP95	0.0000	2.1390	0.0177	0.0188
CH-D	16SEP95	0.0005	0.6251	0.0026	0.0063
CU-U	16SEP95	0.0007	4.2930	0.0994	0.1326
CU-D	16SEP95	0.0000	3.7920	0.0556	0.0203
BL-U	16SEP95	0.0000	0.7730	0.0081	0.0176
BL-D	16SEP95	0.0000	0.8913	0.0220	0.0197
VE-U	16SEP95	0.0000	3.6130	0.0669	0.0179
VE-D	16SEP95	0.0004	1.2960	0.0380	0.0263
OW-U	16SEP95	0.0000	0.4432	0.0028	0.0220
OW-D	16SEP95	0.0000	1.4520	0.0290	0.0226
HU-U	16SEP95	0.0001	1.4590	0.0304	0.0173
HU-D	16SEP95	0.0005	0.5558	0.0112	0.0207
PO-U	16SEP95	0.0003	0.1534	0.0115	0.0036
PO-D	16SEP95	0.0010	0.7533	0.0031	0.0414
MA-U	16SEP95	0.0010	0.1686	0.0026	0.0013
MA-D	16SEP95	0.0004	3.3420	0.0291	0.0251
AS-U	9JUN96	0.0000	2.1180	0.0217	0.3237
AS-D	9JUN96	0.0004	1.9190	0.0315	0.2659
GR-U	9JUN96	0.0004	1.6080	0.0148	0.2448
GR-D	9JUN96	0.0011	1.3760	0.0108	0.1512
CH-U	9JUN96	0.0000	2.4200	0.0234	0.0742

Table 12. Continued.

Site	Date	Co (mg/l)	Si (mg/l)	Mn (mg/l)	Fe (mg/l)
CH-D	9JUN96	0.0000	2.5490	0.0148	0.0649
CU-U	9JUN96	0.0002	3.1560	0.0284	0.0579
CU-D	9JUN96	0.0000	2.7050	0.0766	0.0518
BL-U	9JUN96	0.0000	3.4730	0.0206	0.2435
BL-D	9JUN96	0.0000	2.0540	0.0138	0.0651
VE-U	9JUN96	0.0000	3.6260	0.0081	0.0781
VE-D	9JUN96	0.0000	3.5620	0.0280	0.1075
OW-U	9JUN96	0.0000	4.3890	0.0406	0.0285
OW-D	9JUN96	0.0000	1.8470	0.0866	0.0597
HU-U	9JUN96	0.0000	3.8020	0.0105	0.1563
HU-D	9JUN96	0.0000	2.4700	0.0164	0.0937
PO-U	9JUN96	0.0000	3.4870	0.0102	0.0615
PO-D	9JUN96	0.0000	0.0000	0.0008	0.0034
MA-U	9JUN96	0.0002	3.7260	0.0047	0.0273
MA-D	9JUN96	0.0000	3.0890	0.0202	0.0175
AR-1	9JUN96	0.0001	3.2520	0.1002	0.2032
AR-2	9JUN96	0.0000	3.1040	0.1389	0.2307
AR-3	9JUN96	0.0000	3.2710	0.1282	0.2493
AR-4	9JUN96	0.0002	2.0370	0.0681	0.5266
AR-5	9JUN96	0.0000	3.5510	0.0996	0.1363
AS-U	21SEP96	0.0007	2.5060	0.0362	0.2454
AS-D	21SEP96	0.0000	1.9980	0.0658	0.3214
GR-U	21SEP96	0.0008	2.9240	0.0219	0.1601
GR-D	21SEP96	0.0006	1.1890	0.0372	0.0901
CH-U	21SEP96	0.0015	3.4030	0.0180	0.0704
CH-D	21SEP96	0.0012	3.3780	0.0450	0.0794
CU-U	21SEP96	0.0010	3.9040	0.0698	0.0174
CU-D	21SEP96	0.0000	4.0170	0.0647	0.0204
BL-U	21SEP96	0.0009	5.0210	0.0303	0.0885
BL-D	21SEP96	0.0016	3.3370	0.0195	0.1032
VE-U	21SEP96	0.0003	3.4440	0.2076	0.1056
VE-D	21SEP96	0.0010	2.1690	0.0558	0.0776
OW-U	21SEP96	0.0008	4.7110	0.0905	0.0611
OW-D	21SEP96	0.0000	2.3730	0.0266	0.0114
HU-U	21SEP96	0.0000	2.0740	0.0138	0.0151
HU-D	21SEP96	0.0003	0.7502	0.0045	0.0129
PO-U	21SEP96	0.0011	0.0629	0.0285	0.0097
PO-D	21SEP96	0.0005	1.3610	0.0014	0.0309
MA-U	21SEP96	0.0000	0.8281	0.0015	0.0121
MA-D	21SEP96	0.0000	1.9310	0.0198	0.0229

Table 13. Chromium, magnesium, vanadium, and sodium. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Cr (mg/l)	Mg (mg/l)	V (mg/l)	Na (mg/l)
AS-U	18JUN95	0.0004	13.0900	0.0000	126.4000
AS-D	18JUN95	0.0015	12.6100	0.0000	85.3200
GR-U	18JUN95	0.0121	16.9300	0.0006	254.5000
GR-D	18JUN95	0.0008	11.9000	0.0008	34.0500
CH-U	18JUN95	0.0001	18.7800	0.0008	43.6400
CH-D	18JUN95	0.0000	18.3700	0.0005	37.9200
CU-U	18JUN95	0.0017	23.1800	0.0035	107.0000
BL-U	18JUN95	0.0000	23.2600	0.0022	66.2900
BL-D	18JUN95	0.0001	17.8300	0.0017	33.7700
VE-U	18JUN95	0.0003	28.1100	0.0015	20.7300
VE-D	18JUN95	0.0000	22.2600	0.0013	19.1800
OW-U	18JUN95	0.0001	21.5600	0.0000	27.7600
OW-D	18JUN95	0.0002	16.0700	0.0004	17.4000
HU-U	18JUN95	0.0002	26.8900	0.0017	22.7000
HU-D	18JUN95	0.0000	17.1100	0.0005	13.0600
PO-U	18JUN95	0.0001	29.2200	0.0026	29.9800
PO-D	18JUN95	0.0000	12.5100	0.0000	9.5360
MA-U	18JUN95	0.0000	19.1300	0.0017	14.4500
MA-D	18JUN95	0.0004	26.6900	0.0019	28.4300
AS-U	16SEP95	0.0007	0.7601	0.1308	0.0099
AS-D	16SEP95	0.0001	0.4572	0.0796	0.0083
GR-U	16SEP95	0.0002	0.0518	0.0471	0.0217
GR-D	16SEP95	0.0006	0.6682	0.0352	0.0123
CH-U	16SEP95	0.0000	2.1390	0.0177	0.0188
CH-D	16SEP95	0.0005	0.6251	0.0026	0.0063
CU-U	16SEP95	0.0007	4.2930	0.0994	0.1326
CU-D	16SEP95	0.0000	3.7920	0.0556	0.0203
BL-U	16SEP95	0.0000	0.7730	0.0081	0.0176
BL-D	16SEP95	0.0000	0.8913	0.0220	0.0197
VE-U	16SEP95	0.0000	3.6130	0.0669	0.0179
VE-D	16SEP95	0.0004	1.2960	0.0380	0.0263
OW-U	16SEP95	0.0000	0.4432	0.0028	0.0220
OW-D	16SEP95	0.0000	1.4520	0.0290	0.0226
HU-U	16SEP95	0.0001	1.4590	0.0304	0.0173
HU-D	16SEP95	0.0005	0.5558	0.0112	0.0207
PO-U	16SEP95	0.0003	0.1534	0.0115	0.0036
PO-D	16SEP95	0.0010	0.7533	0.0031	0.0414
MA-U	16SEP95	0.0010	0.1686	0.0026	0.0013
MA-D	16SEP95	0.0004	3.3420	0.0291	0.0251
AS-U	9JUN96	0.0017	5.9170	0.0004	8.1100
AS-D	9JUN96	0.0021	8.1700	0.0000	14.6500
GR-U	9JUN96	0.0022	9.1940	0.0002	18.8200
GR-D	9JUN96	0.0031	10.1700	0.0005	29.1200
CH-U	9JUN96	0.0019	12.4000	0.0005	35.8800

Table 13. Continued.

Site	Date	Cr (mg/l)	Mg (mg/l)	V (mg/l)	Na (mg/l)
CH-D	9JUN96	0.0011	12.2000	0.0001	37.3400
CU-U	9JUN96	0.0016	15.3600	0.0000	62.7800
CU-D	9JUN96	0.0018	14.3800	0.0000	62.9500
BL-U	9JUN96	0.0031	16.4600	0.0009	28.4400
BL-D	9JUN96	0.0013	18.4000	0.0004	38.4100
VE-U	9JUN96	0.0018	15.8300	0.0000	11.1800
VE-D	9JUN96	0.0008	18.0200	0.0000	13.7100
OW-U	9JUN96	0.0016	18.7100	0.0005	15.7600
OW-D	9JUN96	0.0016	15.7200	0.0004	17.8100
HU-U	9JUN96	0.0019	17.6900	0.0032	10.3400
HU-D	9JUN96	0.0016	14.0000	0.0003	8.5510
PO-U	9JUN96	0.0010	17.8700	0.0003	9.6660
PO-D	9JUN96	0.0009	23.4800	0.0008	18.2600
MA-U	9JUN96	0.0017	23.6500	0.0009	12.6200
MA-D	9JUN96	0.0013	15.9900	0.0000	14.4300
AR-1	9JUN96	0.0016	12.0700	0.0001	29.9600
AR-2	9JUN96	0.0000	12.2600	0.0003	34.3800
AR-3	9JUN96	0.0017	12.1300	0.0002	30.5800
AR-4	9JUN96	0.0019	7.8070	0.0002	13.9400
AR-5	9JUN96	0.0009	13.6900	0.0000	36.4200
AS-U	21SEP96	0.0010	8.7560	0.0007	14.6100
AS-D	21SEP96	0.0017	8.3190	0.0008	10.5300
GR-U	21SEP96	0.0048	10.6100	0.0006	33.1600
GR-D	21SEP96	0.0021	10.3200	0.0011	22.2200
CH-U	21SEP96	0.0013	14.0200	0.0008	33.0700
CH-D	21SEP96	0.0014	13.4700	0.0009	30.9500
CU-U	21SEP96	0.0014	20.1600	0.0016	84.1100
CU-D	21SEP96	0.0000	18.3900	0.0017	60.2100
BL-U	21SEP96	0.0003	18.2800	0.0026	49.3600
BL-D	21SEP96	0.0004	13.0000	0.0029	22.1200
VE-U	21SEP96	0.0001	20.8900	0.0006	20.1600
VE-D	21SEP96	0.0000	13.5700	0.0008	12.1000
OW-U	21SEP96	0.0013	18.2300	0.0010	22.6500
OW-D	21SEP96	0.0011	14.5900	0.0020	18.2400
HU-U	21SEP96	0.0005	25.9600	0.0017	21.3200
HU-D	21SEP96	0.0001	14.6000	0.0019	9.3880
PO-U	21SEP96	0.0011	33.3000	0.0017	80.0200
PO-D	21SEP96	0.0017	11.0200	0.0018	6.2730
MA-U	21SEP96	0.0005	21.3000	0.0023	17.0400
MA-D	21SEP96	0.0004	17.3800	0.0025	25.6200

Table 14. Calcium, zinc, copper, and antimony. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Ca (mg/l)	Zn (mg/l)	Cu (mg/l)	Sb (mg/l)
AS-U	18JUN95	143.5000	0.0067	0.0062	0.0070
AS-D	18JUN95	121.6000	0.0087	0.0091	0.0096
GR-U	18JUN95	335.7000	0.0019	0.0038	0.0000
GR-D	18JUN95	54.5600	0.0172	0.0083	0.0203
CH-U	18JUN95	52.9000	0.0031	0.0068	0.0094
CH-D	18JUN95	53.1100	0.0062	0.0076	0.0046
CU-U	18JUN95	77.9000	0.0409	0.0110	0.0060
BL-U	18JUN95	69.3900	0.0037	0.0087	0.0090
BL-D	18JUN95	59.0700	0.0154	0.0144	0.0021
VE-U	18JUN95	73.3600	0.0046	0.0062	0.0085
VE-D	18JUN95	70.2100	0.0150	0.0265	0.0034
OW-U	18JUN95	75.9000	0.0031	0.0053	0.0008
OW-D	18JUN95	53.5700	0.0044	0.0061	0.0005
HU-U	18JUN95	85.1300	0.0034	0.0061	0.0063
HU-D	18JUN95	57.8500	0.0068	0.0084	0.0000
PO-U	18JUN95	64.0500	0.0053	0.0080	0.0065
PO-D	18JUN95	39.0200	0.0041	0.0073	0.0087
MA-U	18JUN95	60.1600	0.0047	0.0083	0.0078
MA-D	18JUN95	75.0300	0.0053	0.0076	0.0055
AS-U	16SEP95	213.5000	0.0030	0.0051	0.0049
AS-D	16SEP95	108.3000	0.0013	0.0049	0.0143
GR-U	16SEP95	134.0000	0.0020	0.0070	0.0020
GR-D	16SEP95	36.0900	0.0014	0.0047	0.0021
CH-U	16SEP95	48.3600	0.0028	0.0057	0.0000
CH-D	16SEP95	33.2800	0.0023	0.0087	0.0104
CU-U	16SEP95	69.8900	0.0559	0.0095	0.0000
CU-D	16SEP95	74.0800	0.0258	0.0078	0.0102
BL-U	16SEP95	60.4300	0.0077	0.0096	0.0100
BL-D	16SEP95	42.3800	0.0070	0.0073	0.0000
VE-U	16SEP95	84.0600	0.0020	0.0062	0.0103
VE-D	16SEP95	46.0800	0.0044	0.0065	0.0000
OW-U	16SEP95	77.6700	0.0012	0.0067	0.0000
OW-D	16SEP95	53.5900	0.0022	0.0060	0.0073
HU-U	16SEP95	84.0600	0.0021	0.0050	0.0000
HU-D	16SEP95	36.2000	0.0030	0.0067	0.0000
PO-U	16SEP95	69.6900	0.0019	0.0062	0.0000
PO-D	16SEP95	33.7000	0.0067	0.0083	0.0076
MA-U	16SEP95	44.9000	0.0132	0.0094	0.0084
MA-D	16SEP95	50.8300	0.0071	0.0076	0.0073
AS-U	9JUN96	13.2500	0.0017	0.0043	0.0012
AS-D	9JUN96	30.9900	0.0096	0.0053	0.0036
GR-U	9JUN96	38.7100	0.0015	0.0028	0.0030
GR-D	9JUN96	47.1100	0.0028	0.0030	0.0024
CH-U	9JUN96	50.9900	0.0094	0.0057	0.0000

Table 14. Continued.

Site	Date	Ca (mg/l)	Zn (mg/l)	Cu (mg/l)	Sb (mg/l)
CH-D	9JUN96	50.5400	0.0028	0.0038	0.0021
CU-U	9JUN96	60.1700	0.0282	0.0059	0.0024
CU-D	9JUN96	57.4700	0.0191	0.0069	0.0006
BL-U	9JUN96	56.4000	0.0073	0.0072	0.0001
BL-D	9JUN96	63.6600	0.0038	0.0038	0.0000
VE-U	9JUN96	58.9900	0.0043	0.0052	0.0021
VE-D	9JUN96	63.7900	0.0046	0.0059	0.0012
OW-U	9JUN96	71.3400	0.0027	0.0045	0.0009
OW-D	9JUN96	59.1000	0.0100	0.0043	0.0007
HU-U	9JUN96	64.6900	0.0080	0.0072	0.0007
HU-D	9JUN96	49.7800	0.0100	0.0059	0.0045
PO-U	9JUN96	68.3200	0.0102	0.0063	0.0000
PO-D	9JUN96	56.7600	0.0018	0.0042	0.0010
MA-U	9JUN96	85.1300	0.0086	0.0053	0.0000
MA-D	9JUN96	56.4300	0.0032	0.0039	0.0004
AR-1	9JUN96	52.1900	0.0112	0.0047	0.0009
AR-2	9JUN96	52.9900	0.0109	0.0046	0.0013
AR-3	9JUN96	50.9300	0.0121	0.0036	0.0013
AR-4	9JUN96	25.0900	0.0146	0.0052	0.0000
AR-5	9JUN96	61.3000	0.0096	0.0031	0.0031
AS-U	21SEP96	32.3100	0.0048	0.0035	0.0000
AS-D	21SEP96	32.1700	0.0040	0.0033	0.0000
GR-U	21SEP96	51.6100	0.0068	0.0036	0.0006
GR-D	21SEP96	41.3100	0.0035	0.0030	0.0008
CH-U	21SEP96	54.7200	0.0045	0.0054	0.0006
CH-D	21SEP96	54.1400	0.0034	0.0035	0.0002
CU-U	21SEP96	70.3000	0.0585	0.0051	0.0000
CU-D	21SEP96	62.1000	0.0263	0.0033	0.0020
BL-U	21SEP96	64.6800	0.0056	0.0051	0.0000
BL-D	21SEP96	46.7800	0.0036	0.0036	0.0011
VE-U	21SEP96	66.9800	0.0051	0.0036	0.0012
VE-D	21SEP96	44.3200	0.0032	0.0048	0.0000
OW-U	21SEP96	67.6500	0.0029	0.0031	0.0009
OW-D	21SEP96	52.4300	0.0026	0.0018	0.0001
HU-U	21SEP96	73.5000	0.0039	0.0030	0.0034
HU-D	21SEP96	38.4700	0.0025	0.0024	0.0000
PO-U	21SEP96	67.4500	0.0033	0.0018	0.0006
PO-D	21SEP96	32.6000	0.0027	0.0027	0.0034
MA-U	21SEP96	42.9400	0.0035	0.0032	0.0000
MA-D	21SEP96	39.8000	0.0053	0.0036	0.0044

Table 15. Lead, cadmium, beryllium, and potassium. First two letters refer to river system: AR=Arcola Creek, AS=Ashtabula River, BL=Black River, CH=Chagrin River, CU=Cuyahoga River, GR=Grand River, HU=Huron River, MA=Maumee River, OW=Old Woman Creek, PO=Portage River, VE=Vermilion River. Second letter refers to site on the river: U=upstream site at head of the estuary, D=downstream site near the mouth of the estuary.

Site	Date	Pb (mg/l)	Cd (mg/l)	Be (mg/l)	K (mg/l)
AS-U	18JUN95	0.0027	0.0001	0.0000	3.5900
AS-D	18JUN95	0.0004	0.0000	0.0000	3.7900
GR-U	18JUN95	0.0002	0.0000	0.0000	7.3140
GR-D	18JUN95	0.0000	0.0001	0.0000	2.1980
CH-U	18JUN95	0.0000	0.0000	0.0000	3.0770
CH-D	18JUN95	0.0000	0.0000	0.0000	2.9550
CU-U	18JUN95	0.0000	0.0001	0.0000	15.4800
BL-U	18JUN95	0.0000	0.0000	0.0000	12.3600
BL-D	18JUN95	0.0019	0.0005	0.0000	3.5560
VE-U	18JUN95	0.0000	0.0000	0.0000	4.2400
VE-D	18JUN95	0.0010	0.0001	0.0000	4.1590
OW-U	18JUN95	0.0043	0.0000	0.0000	5.6980
OW-D	18JUN95	0.0014	0.0000	0.0000	2.8970
HU-U	18JUN95	0.0098	0.0003	0.0000	4.5250
HU-D	18JUN95	0.0029	0.0001	0.0000	2.9060
PO-U	18JUN95	0.0038	0.0000	0.0000	2.7810
PO-D	18JUN95	0.0087	0.0000	0.0000	1.5860
MA-U	18JUN95	0.0034	0.0000	0.0000	0.0692
MA-D	18JUN95	0.0021	0.0000	0.0000	4.2920
AS-U	16SEP95	0.0000	0.0000	0.0000	3.6290
AS-D	16SEP95	0.0000	0.0000	0.0000	1.9310
GR-U	16SEP95	0.0000	0.0000	0.0000	3.6720
GR-D	16SEP95	0.0000	0.0000	0.0000	1.3180
CH-U	16SEP95	0.0000	0.0000	0.0000	3.3560
CH-D	16SEP95	0.0000	0.0000	0.0000	1.4800
CU-U	16SEP95	0.0023	0.0000	0.0000	15.8000
CU-D	16SEP95	0.0009	0.0000	0.0000	15.1000
BL-U	16SEP95	0.0006	0.0001	0.0000	17.2400
BL-D	16SEP95	0.0005	0.0000	0.0000	3.5560
VE-U	16SEP95	0.0008	0.0000	0.0000	6.0310
VE-D	16SEP95	0.0011	0.0000	0.0000	2.5660
OW-U	16SEP95	0.0043	0.0000	0.0000	5.6890
OW-D	16SEP95	0.0024	0.0000	0.0000	2.9200
HU-U	16SEP95	0.0036	0.0000	0.0000	5.9240
HU-D	16SEP95	0.0009	0.0000	0.0000	1.9900
PO-U	16SEP95	0.0048	0.0000	0.0000	6.5130
PO-D	16SEP95	0.0027	0.0000	0.0000	1.6840
MA-U	16SEP95	0.0022	0.0000	0.0000	5.7740
MA-D	16SEP95	0.0034	0.0000	0.0000	5.6120
AS-U	9JUN96	0.0000	0.0002	0.0000	2.3720
AS-D	9JUN96	0.0031	0.0002	0.0000	2.7820
GR-U	9JUN96	0.0000	0.0000	0.0000	2.7180
GR-D	9JUN96	0.0027	0.0001	0.0000	2.7490
CH-U	9JUN96	0.0011	0.0002	0.0000	2.8070

Table 15. Continued.

Site	Date	Pb (mg/l)	Cd (mg/l)	Be (mg/l)	K (mg/l)
CH-D	9JUN96	0.0004	0.0001	0.0000	2.8940
CU-U	9JUN96	0.0027	0.0001	0.0000	6.4850
CU-D	9JUN96	0.0000	0.0000	0.0000	6.3440
BL-U	9JUN96	0.0000	0.0002	0.0000	6.4400
BL-D	9JUN96	0.0005	0.0001	0.0000	6.3360
VE-U	9JUN96	0.0003	0.0000	0.0000	4.8220
VE-D	9JUN96	0.0000	0.0001	0.0000	5.0310
OW-U	9JUN96	0.0000	0.0000	0.0000	5.1543
OW-D	9JUN96	0.0006	0.0000	0.0000	3.6670
HU-U	9JUN96	0.0012	0.0000	0.0000	5.2180
HU-D	9JUN96	0.0000	0.0003	0.0000	4.7240
PO-U	9JUN96	0.0000	0.0001	0.0000	4.4330
PO-D	9JUN96	0.0000	0.0000	0.0000	2.6280
MA-U	9JUN96	0.0017	0.0001	0.0000	3.0690
MA-D	9JUN96	0.0000	0.0000	0.0000	3.5700
AR-1	9JUN96	0.0010	0.0000	0.0000	2.5960
AR-2	9JUN96	0.0007	0.0000	0.0000	2.8960
AR-3	9JUN96	0.0000	0.0002	0.0000	2.5660
AR-4	9JUN96	0.0000	0.0003	0.0000	2.0970
AR-5	9JUN96	0.0000	0.0001	0.0000	2.8810
AS-U	21SEP96	0.0000	0.0000	0.0000	2.6650
AS-D	21SEP96	0.0020	0.0000	0.0000	2.4950
GR-U	21SEP96	0.0000	0.0002	0.0000	4.0150
GR-D	21SEP96	0.0008	0.0001	0.0000	2.2170
CH-U	21SEP96	0.0004	0.0002	0.0000	3.2680
CH-D	21SEP96	0.0000	0.0001	0.0000	3.2410
CU-U	21SEP96	0.0010	0.0001	0.0000	11.3200
CU-D	21SEP96	0.0009	0.0000	0.0000	7.2800
BL-U	21SEP96	0.0013	0.0000	0.0000	9.1290
BL-D	21SEP96	0.0000	0.0001	0.0001	5.3230
VE-U	21SEP96	0.0000	0.0000	0.0000	5.4840
VE-D	21SEP96	0.0000	0.0001	0.0000	3.4140
OW-U	21SEP96	0.0008	0.0001	0.0000	6.0500
OW-D	21SEP96	0.0002	0.0000	0.0000	3.3420
HU-U	21SEP96	0.0008	0.0000	0.0000	4.0910
HU-D	21SEP96	0.0050	0.0000	0.0000	1.9180
PO-U	21SEP96	0.0044	0.0003	0.0000	8.0380
PO-D	21SEP96	0.0012	0.0001	0.0000	1.4870
MA-U	21SEP96	0.0034	0.0001	0.0000	4.5310
MA-D	21SEP96	0.0038	0.0000	0.0000	3.6980

APPENDIX 3
DIATOM SPECIES IN DIATOMETER SAMPLES

CONTENTS **Page**

Ashtabula River . . . . . .

Black River . . . . . .

Chagrin River . . . . . .

Cuyahoga River . . . . . .

Grand River . . . . . .

Huron River . . . . . .

Maumee River . . . . . .

Old Woman Creek . . . . . .

Portage River . . . . . .

Vermilion River . . . . . .

Ashtabula River, upstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	933	0.892
Cymbella sinuata	15	0.014
Navicula lanceolata	13	0.012
Navicula capitatoradiata	7	0.007
Nitzschia supralitorea	7	0.007
Navicula gregaria	6	0.006
Nitzschia acicularis	5	0.005
Cocconeis placentula var euglypta	4	0.004
Cymbella silesiaca	4	0.004
Gomphonema parvulum	3	0.003
Nitzschia archibaldii	3	0.003
Nitzschia dissipata	3	0.003
Nitzschia palea	3	0.003
Amphora pediculus	2	0.002
Cocconeis pediculus	2	0.002
Cyclotella pseudostelligera	2	0.002
Cymbella tumida	2	0.002
Entomoneis paludosa	2	0.002
Fragilaria vaucheriae	2	0.002
Gomphonema truncatum	2	0.002
Navicula minima	2	0.002
Navicula sp2	2	0.002
Nitzschia minuta	2	0.002
Surirella brebissonii var kuetzingi	2	0.002
Achnanthes lanceolata	1	0.001
Achnanthes minutissima var inconspi	1	0.001
Achnanthes minutissima var robusta	1	0.001
Achnanthes ricula	1	0.001
Cyclotella meneghiniana	1	0.001
Diatoma tenuis	1	0.001
Gomphonema minutum	1	0.001
Gomphonema olivaceum	1	0.001
Navicula atomus	1	0.001
Navicula menisculus	1	0.001
Navicula recens	1	0.001
Navicula slesvicensis	1	0.001
Nitzschia agnita	1	0.001
Nitzschia inconspicua	1	0.001
Nitzschia microcephala	1	0.001
Nitzschia paleacea	1	0.001
Nitzschia pusilla	1	0.001
Nitzschia recta	1	0.001

Total Counted	1046
Species Richness	42
Shannon Diversity (H)	0.70

Ashtabula River, downstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Cocconeis placentula var lineata	687	0.640
Achnanthes minutissima	255	0.238
Gomphonema parvulum	35	0.033
Cocconeis placentula	30	0.028
Cocconeis placentula var euglypta	26	0.024
Gomphonema minutum	13	0.012
Cocconeis pediculus	10	0.009
Nitzschia paleacea	4	0.004
Cymbella silesiaca	3	0.003
Gomphonema gracile	3	0.003
Nitzschia supralitorea	2	0.002
Rhoicosphenia curvata	2	0.002
Nitzschia dissipata	1	0.001
Nitzschia palea	1	0.001
Synedra pulchella	1	0.001
Total Counted	1073	
Species Richness	15	
Shannon Diversity (H)	1.12	

Ashtabula River, upstream, diatometer, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	848	0.883
Achnanthes minutissima var inconspi	11	0.011
Navicula viridula var germainii	9	0.009
Cocconeis placentula var lineata	8	0.008
Nitzschia palea	8	0.008
Navicula capitatoradiata	6	0.006
Nitzschia supralitorea	6	0.006
Synedra ulna var acus	6	0.006
Cymbella sinuata	4	0.004
Gomphonema parvulum	4	0.004
Nitzschia fonticola	4	0.004
Cyclotella pseudostelligera	3	0.003
Nitzschia filiformis	3	0.003
Synedra tenera	3	0.003
Cocconeis pediculus	2	0.002
Cyclotella atomus	2	0.002
Cyclotella meneghiniana	2	0.002
Cymbella silesiaca	2	0.002
Fragilaria capucina	2	0.002
Navicula cryptotenella	2	0.002
Navicula gregaria	2	0.002
Navicula lanceolata	2	0.002
Navicula pupula	2	0.002
Navicula recens	2	0.002
Navicula viridula var rostellata	2	0.002
Nitzschia inconspicua	2	0.002

Ashtabula River, upstream, diatometer, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia sinuata var tabellaria	2	0.002
Achnanthes lanceolata	1	0.001
Amphora montana	1	0.001
Cocconeis placentula var euglypta	1	0.001
Melosira varians	1	0.001
Navicula capitata	1	0.001
Navicula evanida	1	0.001
Nitzschia clausii	1	0.001
Nitzschia microcephala	1	0.001
Nitzschia rosenstockii	1	0.001
Stephanodiscus parvus	1	0.001
Synedra pulchella	1	0.001
Total Counted	960	
Species Richness	38	
Shannon Diversity (H)	0.75	

Ashtabula River, downstream, diatometer, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula recens	207	0.228
Achnanthes minutissima	197	0.217
Cocconeis placentula var lineata	42	0.046
Nitzschia palea	30	0.033
Cocconeis placentula var euglypta	28	0.031
Cyclotella ocellata	26	0.029
Stephanodiscus parvus	23	0.025
Navicula lanceolata	22	0.024
Nitzschia acicularis	19	0.021
Nitzschia dissipata	18	0.020
Skeletonema potamos	18	0.020
Cocconeis placentula	14	0.015
Gomphonema parvulum	14	0.015
Cyclotella pseudostelligera	13	0.014
Cyclotella atomus	11	0.012
Cyclotella distinguenda var unipunc	11	0.012
Stephanodiscus delicatus	11	0.012
Cymbella sinuata	10	0.011
Gomphonema affine	9	0.010
Nitzschia filiformis	8	0.009
Thalassiosira pseudonana	8	0.009
Cyclotella woltereckii	7	0.008
Navicula capitatoradiata	7	0.008
Cyclostephanos tholiformis	6	0.007
Cyclotella meneghiniana	6	0.007
Fragilaria vaucheriae	6	0.007
Navicula viridula var germainii	6	0.007
Nitzschia compressa var vexans	6	0.007
Surirella minuta	6	0.007

Ashtabula River, downstream, diatometer, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella michiganiana	5	0.006
Navicula atomus var permitis	5	0.006
Navicula cryptotenella	5	0.006
Navicula minima	5	0.006
Nitzschia sinuata var tabellaria	5	0.006
Nitzschia sociabilis	5	0.006
Stephanodiscus hantzschii	5	0.006
Navicula sp2	4	0.004
Amphora pediculus	3	0.003
Cymbella silesiaca	3	0.003
Navicula pupula	3	0.003
Nitzschia inconspicua	3	0.003
Nitzschia rosenstockii	3	0.003
Thalassiosira pseudonana var2	3	0.003
Achnanthes minutissima var robusta	2	0.002
Achnanthes sp5	2	0.002
Aulacoseira alpigena	2	0.002
Cocconeis pediculus	2	0.002
Cyclostephanos invisitatus	2	0.002
Cymbella caespitosa	2	0.002
Cymbella sp1	2	0.002
Eunotia soleirolii	2	0.002
Gomphonema olivaceum	2	0.002
Melosira varians	2	0.002
Navicula aquaedurae	2	0.002
Navicula cryptocephala	2	0.002
Navicula seminulum	2	0.002
Navicula tenelloides	2	0.002
Navicula tripunctata	2	0.002
Navicula vandamii	2	0.002
Nitzschia littoralis	2	0.002
Nitzschia paleacea	2	0.002
Nitzschia supralitorea	2	0.002
Stephanodiscus hantzschii var tenui	2	0.002
Synedra pulchella	2	0.002
Achnanthes cf. nitidiformis	1	0.001
Caloneis bacillum	1	0.001
Cyclotella meneghiniana f. plana	1	0.001
Cymbella microcephala	1	0.001
Cymbella tumida	1	0.001
Diatoma tenuis	1	0.001
Diatoma vulgaris	1	0.001
Eunotia curvata	1	0.001
Fragilaria capucina	1	0.001
Gomphonema minutum	1	0.001
Navicula capitata	1	0.001
Navicula gregaria	1	0.001
Navicula indifferens	1	0.001
Navicula monoculata	1	0.001
Navicula saprophila	1	0.001
Navicula subminuscula	1	0.001
Navicula viridula var rostellata	1	0.001

Ashtabula River, downstream, diatometer, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia dubia	1	0.001
Synedra ulna	1	0.001
Total Counted	909	
Species Richness	83	
Shannon Diversity (H)	3.11	

Ashtabula River, upstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Achnanthes minutissima	916	949505	0.958
Cymbella affinis	7	7256	0.007
Cymbella microcephala	4	4146	0.004
Gomphonema parvulum	4	4146	0.004
Nitzschia sinuata var tabellaria	4	4146	0.004
Synedra tenera	4	4146	0.004
Amphora pediculus	2	2073	0.002
Cymbella caespitosa	2	2073	0.002
Cymbella silesiaca	2	2073	0.002
Navicula capitata	2	2073	0.002
Navicula gregaria	2	2073	0.002
Nitzschia dissipata	2	2073	0.002
Nitzschia frustulum	2	2073	0.002
Achnanthes lanceolata	1	1037	0.001
Gomphonema olivaceum	1	1037	0.001
Navicula lanceolata	1	1037	0.001
TOTAL		990968	
Total Counted	956		
Species Richness	16		
Shannon Diversity (H)	0.28		

Ashtabula River, downstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Achnanthes minutissima	243	74946	0.302
Cymbella silesiaca	170	52431	0.211
Cocconeis placentula	63	19430	0.078
Gomphonema parvulum	62	19122	0.077
Cocconeis placentula var lineata	58	17888	0.072
Nitzschia dissipata	43	13262	0.053
Cocconeis placentula var euglypta	28	8636	0.035
Nitzschia paleacea	20	6168	0.025
Gomphonema minutum	17	5243	0.021

Ashtabula River, downstream, diatometer, 18 June 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Nitzschia palea	12	3701	0.015
Nitzschia acicularis	11	3393	0.014
Rhoicosphenia curvata	8	2467	0.010
Cymbella caespitosa	7	2159	0.009
Navicula recens	7	2159	0.009
Nitzschia gracilis	6	1851	0.007
Cyclotella pseudostelligera	5	1542	0.006
Fragilaria vaucheriae	5	1542	0.006
Gomphonema clavatum	5	1542	0.006
Navicula gregaria	5	1542	0.006
Synedra tenera	4	1234	0.005
Cyclostephanos invisitatus	3	925	0.004
Cymbella sinuata	3	925	0.004
Achnanthes lanceolata	2	617	0.002
Cymbella affinis	2	617	0.002
Melosira varians	2	617	0.002
Navicula seminulum	2	617	0.002
Nitzschia supralitorea	2	617	0.002
Synedra pulchella	2	617	0.002
Thalassiosira pseudonana var1	2	617	0.002
Cocconeis pediculus	1	308	0.001
Gomphonema acuminatum	1	308	0.001
Navicula tripunctata	1	308	0.001
Nitzschia fonticola	1	308	0.001
Nitzschia linearis var subtilis	1	308	0.001
TOTAL		247968	
Total Counted	804		
Species Richness	34		
Shannon Diversity (H)	2.35		

Ashtabula River, upstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Achnanthes minutissima	642	891785	0.696
Fragilaria capucina	26	36116	0.028
Gomphonema parvulum	21	29171	0.023
Nitzschia rosenstockii	18	25003	0.020
Nitzschia palea	17	23614	0.018
Synedra tenera	16	22225	0.017
Fragilaria vaucheriae	10	13891	0.011
Melosira varians	10	13891	0.011
Nitzschia acicularis	10	13891	0.011
Nitzschia pusilla	9	12502	0.010
Nitzschia agnita	8	11113	0.009
Amphipleura pellucida	7	9724	0.008
Cymbella silesiaca	7	9724	0.008
Cyclotella meneghiniana	6	8334	0.007
Gomphonema augur	6	8334	0.007

Ashtabula River, upstream, diatometer, 17 September 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Navicula cryptocephala	6	8334	0.007
Navicula viridula var germainii	6	8334	0.007
Cyclotella pseudostelligera var3	5	6945	0.005
Navicula gregaria	5	6945	0.005
Navicula lanceolata	5	6945	0.005
Nitzschia supralitorea	5	6945	0.005
Surirella brebissonii var kuetzingi	5	6945	0.005
Synedra pulchella	5	6945	0.005
Cymbella sinuata	4	5556	0.004
Navicula cryptotenella	4	5556	0.004
Navicula indifferens	4	5556	0.004
Navicula schroeteri	4	5556	0.004
Nitzschia filiformis	4	5556	0.004
Nitzschia microcephala	4	5556	0.004
Synedra ulna var acus	4	5556	0.004
Gomphonema clavatum	3	4167	0.003
Achnanthes lanceolata	2	2778	0.002
Cyclotella pseudostelligera	2	2778	0.002
Cymbella microcephala	2	2778	0.002
Denticula kuetzingii	2	2778	0.002
Navicula capitatoradiata	2	2778	0.002
Nitzschia agnewii	2	2778	0.002
Nitzschia capitellata	2	2778	0.002
Nitzschia intermedia	2	2778	0.002
Nitzschia linearis var subtilis	2	2778	0.002
Nitzschia nereidis	2	2778	0.002
Nitzschia sinuata var tabellaria	2	2778	0.002
Thalassiosira pseudonana	2	2778	0.002
Amphora montana	1	1389	0.001
Cocconeis placentula var euglypta	1	1389	0.001
Eunotia soleirolii	1	1389	0.001
Gomphonema olivaceum	1	1389	0.001
Gomphonema parvulum f. saprophilum	1	1389	0.001
Navicula atomus var permitis	1	1389	0.001
Navicula viridula var rostellata	1	1389	0.001
Nitzschia angustiforaminata	1	1389	0.001
Nitzschia dissipata	1	1389	0.001
Nitzschia reversa	1	1389	0.001
Surirella suecica	1	1389	0.001
Synedra fasiculata var truncata	1	1389	0.001
Synedra ulna	1	1389	0.001
TOTAL		1282115	
Total Counted	923		
Species Richness	56		
Shannon Diversity (H)	1.71		

Ashtabula River, downstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Achnanthes minutissima	305	158138	0.330
Navicula recens	285	147769	0.308
Cocconeis placentula var euglypta	50	25924	0.054
Nitzschia sociabilis	31	16073	0.034
Gomphonema minutum	26	13481	0.028
Nitzschia palea	25	12962	0.027
Nitzschia fonticola	18	9333	0.019
Gomphonema parvulum	16	8296	0.017
Stephanodiscus parvus	12	6222	0.013
Nitzschia dissipata	11	5703	0.012
Skeletonema potamos	8	4148	0.009
Cyclotella meneghiniana	6	3111	0.006
Melosira varians	6	3111	0.006
Navicula capitatoradiata	6	3111	0.006
Nitzschia supralitorea	6	3111	0.006
Cyclotella ocellata	5	2592	0.005
Cyclotella pseudostelligera	5	2592	0.005
Cyclotella pseudostelligera var1	5	2592	0.005
Navicula viridula var germainii	5	2592	0.005
Cyclotella woltereckii	4	2074	0.004
Cymbella microcephala	4	2074	0.004
Fragilaria capucina	4	2074	0.004
Navicula cryptotenella	4	2074	0.004
Navicula gregaria	4	2074	0.004
Navicula minima	4	2074	0.004
Nitzschia pusilla	4	2074	0.004
Thalassiosira pseudonana	4	2074	0.004
Navicula menisculus	3	1555	0.003
Navicula saprophila	3	1555	0.003
Nitzschia recta	3	1555	0.003
Synedra fasiculata var truncata	3	1555	0.003
Thalassiosira pseudonana var1	3	1555	0.003
Achnanthes exigua	2	1037	0.002
Cocconeis placentula var lineata	2	1037	0.002
Cyclotella atomus	2	1037	0.002
Cymbella caespitosa	2	1037	0.002
Cymbella silesiaca	2	1037	0.002
Cymbella sinuata	2	1037	0.002
Cymbella sp1	2	1037	0.002
Fragilaria vaucheriae	2	1037	0.002
Gomphonema parvulum var exilissimum	2	1037	0.002
Navicula menisculus var upsaliensis	2	1037	0.002
Navicula vandamii	2	1037	0.002
Navicula veneta	2	1037	0.002
Nitzschia subacicularis	2	1037	0.002
Stephanodiscus hantzschii var tenui	2	1037	0.002
Achnanthes lanceolata	1	518	0.001
Amphipleura pellucida	1	518	0.001
Amphora veneta	1	518	0.001
Cocconeis placentula	1	518	0.001
Cyclostephanos invisitatus	1	518	0.001
Cyclostephanos tholiformis	1	518	0.001
Gomphonema olivaceum	1	518	0.001
Navicula capitata	1	518	0.001

Ashtabula River, downstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Navicula catalanogermanica	1	518	0.001
Navicula lanceolata	1	518	0.001
Navicula schroeteri	1	518	0.001
Navicula tripunctata	1	518	0.001
Nitzschia acicularis	1	518	0.001
Nitzschia rosenstockii	1	518	0.001
Nitzschia sinuata var tabellaria	1	518	0.001
Rhoicosphenia curvata	1	518	0.001
Stephanodiscus parvus var1	1	518	0.001
Surirella brebissonii var kuetzingi	1	518	0.001
Surirella minuta	1	518	0.001
TOTAL		479600	
Total Counted	925		
Species Richness	65		
Shannon Diversity (H)	2.35		

Ashtabula River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	737	567411	0.808
Cocconeis pediculus	37	28486	0.041
Navicula gregaria	20	15398	0.022
Nitzschia palea	13	10009	0.014
Fragilaria vaucheriae	12	9239	0.013
Nitzschia dissipata	11	8469	0.012
Cymbella affinis	8	6159	0.009
Gomphonema minutum	6	4619	0.007
Fragilaria capucina	5	3849	0.005
Navicula capitatoradiata	5	3849	0.005
Cymbella microcephala	4	3080	0.004
Navicula sp2	4	3080	0.004
Nitzschia fonticola	4	3080	0.004
Amphora pediculus	3	2310	0.003
Gomphonema parvulum	3	2310	0.003
Navicula lanceolata	3	2310	0.003
Nitzschia acicularis	3	2310	0.003
Nitzschia inconspicua	3	2310	0.003
Nitzschia sinuata var tabellaria	3	2310	0.003
Nitzschia sociabilis	3	2310	0.003
Cocconeis placentula var lineata	2	1540	0.002
Cyclotella distinguenda var unipunc	2	1540	0.002
Cyclotella meneghiniana	2	1540	0.002
Cymbella caespitosa	2	1540	0.002
Navicula minima	2	1540	0.002
Navicula seminulum	2	1540	0.002
Nitzschia draveillensis	2	1540	0.002
Nitzschia microcephala	2	1540	0.002
Nitzschia recta	2	1540	0.002

Ashtabula River, upstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes biasolettiana	1	770	0.001
Achnanthes minutissima var inconspi	1	770	0.001
Cocconeis placentula var euglypta	1	770	0.001
Gomphonema olivaceum	1	770	0.001
Navicula atomus var permitis	1	770	0.001
Surirella minuta	1	770	0.001
Synedra pulchella	1	770	0.001
TOTAL		702142	
Total Counted	912		
Species Richness	36		
Shannon Diversity (H)	1.06		

Ashtabula River, downstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula recens	139	24595	0.153
Gomphonema minutum	89	15748	0.098
Achnanthes minutissima	78	13801	0.086
Cocconeis placentula var lineata	68	12032	0.075
Gomphonema parvulum var exilissimum	56	9909	0.061
Synedra fasiculata var truncata	51	9024	0.056
Cymbella silesiaca	37	6547	0.041
Synedra pulchella	36	6370	0.040
Rhoicosphenia curvata	34	6016	0.037
Diatoma tenuis	30	5308	0.033
Nitzschia dissipata	30	5308	0.033
Nitzschia palea	23	4070	0.025
Cocconeis placentula	22	3893	0.024
Navicula tripunctata	19	3362	0.021
Cymbella affinis	18	3185	0.020
Nitzschia sociabilis	17	3008	0.019
Gomphonema parvulum	14	2477	0.015
Melosira varians	12	2123	0.013
Nitzschia paleacea	11	1946	0.012
Cymbella caespitosa	10	1769	0.011
Fragilaria capucina	10	1769	0.011
Navicula gregaria	10	1769	0.011
Fragilaria vaucheriae	7	1239	0.008
Nitzschia filiformis	7	1239	0.008
Gomphonema truncatum	6	1062	0.007
Amphora pediculus	5	885	0.005
Navicula lanceolata	5	885	0.005
Nitzschia frustulum	5	885	0.005
Cocconeis pediculus	4	708	0.004
Navicula cryptocephala	4	708	0.004
Navicula cryptotenella	4	708	0.004
Nitzschia fonticola	4	708	0.004
Cymbella prostrata	3	531	0.003

Ashtabula River, downstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Stephanodiscus parvus	3	531	0.003
Surirella minuta	3	531	0.003
Cocconeis placentula var euglypta	2	354	0.002
Cyclotella meneghiniana	2	354	0.002
Cyclotella ocellata	2	354	0.002
Cyclotella pseudostelligera	2	354	0.002
Cymbella sp1	2	354	0.002
Navicula capitatoradiata	2	354	0.002
Navicula menisculus var grunowii	2	354	0.002
Nitzschia draveillensis	2	354	0.002
Stephanodiscus hantzschii	2	354	0.002
Surirella suecica	2	354	0.002
Synedra ulna	2	354	0.002
Achnanthes lanceolata	1	177	0.001
Cyclostephanos tholiformis	1	177	0.001
Cyclotella michiganiana	1	177	0.001
Cymbella sinuata	1	177	0.001
Epithemia adnata	1	177	0.001
Fragilaria capucina var mesolepta	1	177	0.001
Gomphonema olivaceum	1	177	0.001
Navicula atomus var permitis	1	177	0.001
Navicula capitata	1	177	0.001
Navicula lacunolaciniata	1	177	0.001
Navicula seminulum	1	177	0.001
Navicula sp2	1	177	0.001
Nitzschia agnita	1	177	0.001
Nitzschia archibaldii	1	177	0.001
Thalassiosira pseudonana	1	177	0.001
TOTAL		161192	
Total Counted	911		
Species Richness	61		
Shannon Diversity (H)	3.20		

Ashtabula River, upstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	531	1588506	0.564
Nitzschia palea	26	77780	0.028
Amphipleura pellucida	24	71797	0.026
Gomphonema parvulum	21	62822	0.022
Nitzschia rosenstockii	19	56839	0.020
Cymbella sinuata	16	47865	0.017
Nitzschia supralitorea	15	44873	0.016
Cyclotella meneghiniana	12	35898	0.013
Thalassiosira pseudonana	12	35898	0.013
Nitzschia acicularis	11	32907	0.012
Synedra pulchella	11	32907	0.012
Navicula gregaria	10	29915	0.011

Ashtabula River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula lanceolata	10	29915	0.011
Fragilaria vaucheriae	9	26924	0.010
Nitzschia pusilla	9	26924	0.010
Nitzschia sinuata var tabellaria	9	26924	0.010
Cyclotella pseudostelligera var1	8	23932	0.009
Navicula recens	8	23932	0.009
Nitzschia dissipata	8	23932	0.009
Navicula capitatoradiata	7	20941	0.007
Navicula viridula var germainii	7	20941	0.007
Navicula cryptotenella	6	17949	0.006
Cyclotella pseudostelligera	5	14958	0.005
Cymbella microcephala	5	14958	0.005
Cymbella silesiaca	5	14958	0.005
Navicula minima	5	14958	0.005
Nitzschia agnita	5	14958	0.005
Surirella minuta	5	14958	0.005
Achnanthes ricula	4	11966	0.004
Cyclotella atomus	4	11966	0.004
Cyclotella woltereckii	4	11966	0.004
Gomphonema minutum	4	11966	0.004
Nitzschia communis	4	11966	0.004
Nitzschia fonticola	4	11966	0.004
Nitzschia gracilis	4	11966	0.004
Nitzschia microcephala	4	11966	0.004
Thalassiosira weissflogii	4	11966	0.004
Achnanthes lanceolata	3	8975	0.003
Amphora pediculus	3	8975	0.003
Cymbella caespitosa	3	8975	0.003
Gomphonema olivaceum	3	8975	0.003
Navicula cryptocephala	3	8975	0.003
Navicula lundii	3	8975	0.003
Navicula sp2	3	8975	0.003
Navicula viridula var rostellata	3	8975	0.003
Nitzschia agnewii	3	8975	0.003
Nitzschia minuta	3	8975	0.003
Nitzschia sinuata	3	8975	0.003
Achnanthes minutissima var robusta	2	5983	0.002
Cocconeis pediculus	2	5983	0.002
Cymbella tumida	2	5983	0.002
Fragilaria construens f. venter	2	5983	0.002
Gomphonema affine	2	5983	0.002
Navicula phyllepta	2	5983	0.002
Nitzschia amphibia	2	5983	0.002
Nitzschia capitellata	2	5983	0.002
Nitzschia filiformis	2	5983	0.002
Nitzschia frustulum	2	5983	0.002
Nitzschia inconspicua	2	5983	0.002
Nitzschia pumila	2	5983	0.002
Skeletonema potamos	2	5983	0.002
Stephanodiscus delicatus	2	5983	0.002
Achnanthes minutissima var gracilli	1	2992	0.001
Asterionella formosa	1	2992	0.001
Cyclostephanos tholiformis	1	2992	0.001
Cyclotella pseudostelligera var3	1	2992	0.001

Ashtabula River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Diatoma tenuis	1	2992	0.001
Diatoma vulgaris	1	2992	0.001
Fragilaria capucina	1	2992	0.001
Fragilaria capucina var mesolepta	1	2992	0.001
Gomphonema clavatum	1	2992	0.001
Gyrosigma scalproides	1	2992	0.001
Navicula atomus	1	2992	0.001
Navicula molestiformis	1	2992	0.001
Navicula schroeteri	1	2992	0.001
Navicula sp1	1	2992	0.001
Navicula tenera	1	2992	0.001
Nitzschia calida	1	2992	0.001
Nitzschia intermedia	1	2992	0.001
Nitzschia sociabilis	1	2992	0.001
Nitzschia sp14	1	2992	0.001
Nitzschia tubicola	1	2992	0.001
Plagiotropis lepidoptera	1	2992	0.001
Surirella angusta	1	2992	0.001
Surirella suecica	1	2992	0.001
Synedra ulna	1	2992	0.001
Thalassiosira pseudonana var1	1	2992	0.001
TOTAL		2815036	
Total Counted	941		
Species Richness	87		
Shannon Diversity (H)	2.41		

Ashtabula River, downstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula recens	464	2706	0.516
Achnanthes minutissima	239	1394	0.266
Cocconeis placentula var euglypta	32	187	0.036
Gomphonema parvulum	27	157	0.030
Navicula capitatoradiata	11	64	0.012
Rhoicosphenia curvata	9	52	0.010
Cocconeis placentula var lineata	7	41	0.008
Nitzschia palea	7	41	0.008
Cyclotella ocellata	6	35	0.007
Navicula cryptotenella	6	35	0.007
Achnanthes cf. nitidiformis	5	29	0.006
Amphora pediculus	5	29	0.006
Cymbella microcephala	5	29	0.006
Navicula lanceolata	5	29	0.006
Nitzschia dissipata	5	29	0.006
Achnanthes lanceolata	4	23	0.004
Gomphonema minutum	4	23	0.004
Navicula viridula var rostellata	4	23	0.004
Cocconeis placentula	3	17	0.003

Ashtabula River, downstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema truncatum	3	17	0.003
Navicula gregaria	3	17	0.003
Nitzschia agnewii	3	17	0.003
Nitzschia supralitorea	3	17	0.003
Cyclotella atomus	2	12	0.002
Cyclotella cryptica	2	12	0.002
Cymbella affinis	2	12	0.002
Cymbella sinuata	2	12	0.002
Fragilaria vaucheriae	2	12	0.002
Navicula schroeteri	2	12	0.002
Navicula sp4	2	12	0.002
Nitzschia filiformis	2	12	0.002
Nitzschia microcephala	2	12	0.002
Amphipleura pellucida	1	6	0.001
Cymbella silesiaca	1	6	0.001
Fragilaria capucina	1	6	0.001
Gomphonema clavatum	1	6	0.001
Melosira varians	1	6	0.001
Meridion circulare	1	6	0.001
Navicula angusta	1	6	0.001
Navicula capitata	1	6	0.001
Navicula decussis	1	6	0.001
Navicula erifuga	1	6	0.001
Navicula minima	1	6	0.001
Navicula phyllepta	1	6	0.001
Nitzschia bacillum	1	6	0.001
Nitzschia fonticola	1	6	0.001
Nitzschia inconspicua	1	6	0.001
Nitzschia rosenstockii	1	6	0.001
Nitzschia sinuata var tabellaria	1	6	0.001
Nitzschia sociabilis	1	6	0.001
Nitzschia tubicola	1	6	0.001
Stephanodiscus alpinus	1	6	0.001
Stephanodiscus parvus	1	6	0.001
Thalassiosira pseudonana	1	6	0.001
TOTAL		5248	
Total Counted	900		
Species Richness	54		
Shannon Diversity (H)	1.76		

Ashtabula River, upstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	886	651482	0.946
Cymbella silesiaca	11	8088	0.012
Cymbella sinuata	7	5147	0.007
Gomphonema parvulum	6	4412	0.006
Navicula lanceolata	6	4412	0.006

Ashtabula River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia dissipata	5	3677	0.005
Navicula gregaria	3	2206	0.003
Synedra tenera	3	2206	0.003
Rhoicosphenia curvata	2	1471	0.002
Cyclotella meneghiniana	1	735	0.001
Gomphonema olivaceum var minutissim	1	735	0.001
Navicula minima	1	735	0.001
Navicula trivialis	1	735	0.001
Nitzschia acicularis	1	735	0.001
Nitzschia inconspicua	1	735	0.001
Nitzschia linearis var subtilis	1	735	0.001
Synedra ulna	1	735	0.001
TOTAL		688983	
Total Counted	937		
Species Richness	17		
Shannon Diversity (H)	0.34		

Ashtabula River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Diatoma tenuis	187	99184	0.203
Cymbella silesiaca	161	85394	0.175
Achnanthes minutissima	96	50918	0.104
Fragilaria vaucheriae	54	28641	0.059
Gomphonema parvulum	51	27050	0.055
Melosira varians	50	26520	0.054
Synedra ulna	44	23337	0.048
Nitzschia dissipata	35	18564	0.038
Synedra pulchella	31	16442	0.034
Synedra tenera	20	10608	0.022
Nitzschia palea	19	10078	0.021
Diatoma vulgaris	18	9547	0.020
Gomphonema truncatum	16	8486	0.017
Navicula lanceolata	15	7956	0.016
Fragilaria capucina var mesolepta	14	7426	0.015
Cymbella caespitosa	10	5304	0.011
Gomphonema sp6	9	4774	0.010
Nitzschia paleacea	9	4774	0.010
Fragilaria capucina	8	4243	0.009
Nitzschia archibaldii	8	4243	0.009
Synedra fasiculata var truncata	8	4243	0.009
Navicula gregaria	6	3182	0.007
Nitzschia rosenstockii	6	3182	0.007
Cymbella tumida	3	1591	0.003
Gomphonema sp7	3	1591	0.003
Nitzschia acicularis	3	1591	0.003
Nitzschia inconspicua	3	1591	0.003
Fragilaria construens f. venter	2	1061	0.002

Ashtabula River, downstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema minutum	2	1061	0.002
Gomphonema olivaceum	2	1061	0.002
Navicula capitatoradiata	2	1061	0.002
Navicula recens	2	1061	0.002
Nitzschia linearis var subtilis	2	1061	0.002
Stephanodiscus parvus	2	1061	0.002
Synedra ulna var acus	2	1061	0.002
Amphora inariensis	1	530	0.001
Cyclotella distinguenda var unipunc	1	530	0.001
Cyclotella pseudostelligera	1	530	0.001
Cymbella sinuata	1	530	0.001
Navicula angusta	1	530	0.001
Navicula aquaedurae	1	530	0.001
Navicula cryptotenella	1	530	0.001
Navicula minima	1	530	0.001
Navicula tripunctata	1	530	0.001
Nitzschia brevissima	1	530	0.001
Nitzschia fonticola	1	530	0.001
Nitzschia heufleriana	1	530	0.001
Nitzschia minuta	1	530	0.001
Nitzschia sociabilis	1	530	0.001
Simonsenia delognei	1	530	0.001
Skeletonema potamos	1	530	0.001
Surirella brebissonii var kuetzingi	1	530	0.001
Surirella minuta	1	530	0.001
TOTAL		488496	
Total Counted	921		
Species Richness	53		
Shannon Diversity (H)	2.82		

Ashtabula River, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	287	62591	0.358
Cymbella silesiaca	80	17447	0.100
Navicula capitatoradiata	80	17447	0.100
Gomphonema parvulum	58	12649	0.072
Nitzschia palea	51	11123	0.064
Navicula schroeteri	35	7633	0.044
Navicula cryptocephala	16	3489	0.020
Nitzschia supralitorea	15	3271	0.019
Cymbella caespitosa	14	3053	0.017
Gomphonema clavatum	12	2617	0.015
Nitzschia amphibia	10	2181	0.012
Cymbella tumida	9	1963	0.011
Cymbella sinuata	8	1745	0.010
Cocconeis placentula var euglypta	6	1309	0.007
Cocconeis placentula var lineata	6	1309	0.007

Ashtabula River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema truncatum	6	1309	0.007
Navicula viridula var rostellata	6	1309	0.007
Achnanthes minutissima var inconspi	5	1090	0.006
Navicula capitata	5	1090	0.006
Navicula minima	5	1090	0.006
Nitzschia fonticola	5	1090	0.006
Nitzschia inconspicua	5	1090	0.006
Melosira varians	4	872	0.005
Navicula cryptotenella	4	872	0.005
Navicula gregaria	4	872	0.005
Navicula phyllepta	4	872	0.005
Nitzschia clausii	4	872	0.005
Nitzschia dissipata	4	872	0.005
Cocconeis pediculus	3	654	0.004
Gomphonema parvulum var exilissimum	3	654	0.004
Navicula saprophila	3	654	0.004
Navicula viridula var germainii	3	654	0.004
Nitzschia capitellata	3	654	0.004
Nitzschia rosenstockii	3	654	0.004
Achnanthes lanceolata	2	436	0.002
Achnanthes ricula	2	436	0.002
Amphora inariensis	2	436	0.002
Amphora libyca	2	436	0.002
Amphora pediculus	2	436	0.002
Cyclotella meneghiniana	2	436	0.002
Fragilaria capucina	2	436	0.002
Navicula agrestis	2	436	0.002
Navicula menisculus var grunowii	2	436	0.002
Navicula seminulum	2	436	0.002
Nitzschia linearis	2	436	0.002
Nitzschia microcephala	2	436	0.002
Nitzschia minuta	2	436	0.002
Nitzschia sinuata	2	436	0.002
Synedra ulna	2	436	0.002
Fragilaria vaucheriae	1	218	0.001
Gomphonema clevei	1	218	0.001
Gomphonema minutum	1	218	0.001
Gomphonema sp7	1	218	0.001
Navicula minuscula	1	218	0.001
Navicula subminuscula	1	218	0.001
TOTAL		174907	
Total Counted	802		
Species Richness	55		
Shannon Diversity (H)	2.63		

Ashtabula River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	249	135379	0.277
Cocconeis placentula var euglypta	84	45670	0.094
Nitzschia palea	74	40233	0.082
Navicula capitatoradiata	70	38058	0.078
Gomphonema parvulum	68	36971	0.076
Navicula recens	59	32078	0.066
Cocconeis placentula var lineata	36	19573	0.040
Cymbella minuta	30	16311	0.033
Nitzschia dissipata	20	10874	0.022
Melosira varians	19	10330	0.021
Navicula schroeteri	17	9243	0.019
Navicula cryptotenella	14	7612	0.016
Cocconeis placentula	11	5981	0.012
Cymbella tumida	9	4893	0.010
Cymbella silesiaca	8	4350	0.009
Nitzschia fonticola	8	4350	0.009
Nitzschia supralitorea	8	4350	0.009
Achnanthes minutissima var inconspi	7	3806	0.008
Navicula tripunctata	7	3806	0.008
Synedra pulchella	7	3806	0.008
Navicula cryptocephala	6	3262	0.007
Navicula viridula var germainii	6	3262	0.007
Cymbella sinuata	5	2718	0.006
Fragilaria capucina	5	2718	0.006
Gomphonema truncatum	4	2175	0.004
Navicula contenta	4	2175	0.004
Navicula gregaria	4	2175	0.004
Nitzschia minuta	4	2175	0.004
Nitzschia rosenstockii	4	2175	0.004
Synedra fasiculata var truncata	4	2175	0.004
Fragilaria vaucheriae	3	1631	0.003
Gomphonema minutum	3	1631	0.003
Nitzschia paleacea	3	1631	0.003
Stephanodiscus parvus	3	1631	0.003
Amphora sp3	2	1087	0.002
Amphora veneta	2	1087	0.002
Cyclotella distinguenda	2	1087	0.002
Cymbella caespitosa	2	1087	0.002
Cymbella cistula	2	1087	0.002
Cymbella prostrata	2	1087	0.002
Gomphonema consector	2	1087	0.002
Meridion circulare	2	1087	0.002
Navicula minuscula	2	1087	0.002
Navicula pupula	2	1087	0.002
Navicula saprophila	2	1087	0.002
Nitzschia angustatula	2	1087	0.002
Synedra tenera	2	1087	0.002
Synedra ulna var acus	2	1087	0.002
Cyclostephanos invisitatus	1	544	0.001
Cyclotella pseudostelligera var1	1	544	0.001
Cyclotella pseudostelligera var3	1	544	0.001
Gomphonema clavatum	1	544	0.001
Navicula lanceolata	1	544	0.001

Ashtabula River, downstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia sociabilis	1	544	0.001
Thalassiosira pseudonana var1	1	544	0.001
TOTAL		488234	
Total Counted	898		
Species Richness	55		
Shannon Diversity (H)	2.83		

Black River, upstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Skeletonema potamos	126	0.133
Nitzschia supralitorea	125	0.132
Gomphonema parvulum	70	0.074
Thalassiosira pseudonana	65	0.069
Cyclotella atomus	56	0.059
Cocconeis placentula var lineata	44	0.046
Nitzschia palea	37	0.039
Achnanthes lanceolata	32	0.034
Nitzschia minuta	29	0.031
Thalassiosira pseudonana var1	29	0.031
Navicula lanceolata	25	0.026
Nitzschia acicularis	25	0.026
Cyclotella cryptica	22	0.023
Navicula gregaria	21	0.022
Nitzschia rosenstockii	15	0.016
Cyclotella pseudostelligera	14	0.015
Cyclotella meneghiniana	13	0.014
Navicula subminuscula	13	0.014
Nitzschia capitellata	12	0.013
Melosira varians	11	0.012
Nitzschia inconspicua	11	0.012
Navicula cryptotenella	10	0.011
Navicula viridula var germainii	10	0.011
Cyclostephanos tholiformis	9	0.009
Nitzschia angustiforaminata	9	0.009
Stephanodiscus parvus	8	0.008
Amphora pediculus	7	0.007
Navicula minima	7	0.007
Cyclotella pseudostelligera var1	6	0.006
Navicula molestiformis	6	0.006
Stephanodiscus hantzschii	6	0.006
Achnanthes minutissima	5	0.005
Cyclostephanos invisitatus	4	0.004
Gomphonema minutum	4	0.004
Navicula salinarum	4	0.004
Nitzschia amphibia	4	0.004
Surirella minuta	4	0.004
Nitzschia gracilis	3	0.003
Nitzschia levidensis	3	0.003
Nitzschia pusilla	3	0.003
Stephanodiscus delicatus	3	0.003
Stephanodiscus hantzschii var tenui	3	0.003
Amphora montana	2	0.002
Navicula menisculus	2	0.002
Navicula monoculata	2	0.002
Navicula seminulum	2	0.002
Nitzschia frustulum	2	0.002
Nitzschia intermedia	2	0.002
Nitzschia linearis var subtilis	2	0.002
Nitzschia paleacea	2	0.002
Nitzschia sociabilis	2	0.002
Surirella brebissonii var kuetzingi	2	0.002
Synedra ulna	2	0.002
Cyclotella distinguenda	1	0.001

Black River, upstream, diatometer, 26 June 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella woltereckii	1	0.001
Gomphonema olivaceum	1	0.001
Gyrosigma acuminatum	1	0.001
Navicula atomus	1	0.001
Navicula atomus var permitis	1	0.001
Navicula contenta	1	0.001
Navicula mutica	1	0.001
Navicula schroeteri	1	0.001
Navicula tenera	1	0.001
Navicula viridula var rostellata	1	0.001
Nitzschia sp2	1	0.001
Rhoicosphenia curvata	1	0.001
Total Counted	948	
Species Richness	66	
Shannon Diversity (H)	3.31	

Black River, downstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	288	0.349
Melosira varians	118	0.143
Nitzschia fonticola	65	0.079
Nitzschia supralitorea	46	0.056
Navicula recens	45	0.055
Navicula saprophila	31	0.038
Nitzschia palea	30	0.036
Nitzschia capitellata	25	0.030
Nitzschia minuta	18	0.022
Nitzschia frustulum	17	0.021
Navicula viridula var germainii	14	0.017
Nitzschia acicularis	12	0.015
Achnanthes lanceolata	9	0.011
Navicula gregaria	9	0.011
Nitzschia intermedia	8	0.010
Synedra ulna	7	0.008
Navicula monoculata	6	0.007
Cocconeis placentula var lineata	5	0.006
Navicula cryptotenella	5	0.006
Navicula minima	4	0.005
Navicula subminuscula	4	0.005
Skeletonema potamos	4	0.005
Amphora pediculus	3	0.004
Cocconeis placentula var euglypta	3	0.004
Cyclotella atomus	3	0.004
Cyclotella pseudostelligera	3	0.004
Diatoma vulgaris	3	0.004
Gomphonema gracile	3	0.004
Nitzschia filiformis	3	0.004
Nitzschia paleacea	3	0.004

Black River, downstream, diatometer, 26 June 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Surirella brebissonii var kuetzingi	3	0.004
Achnanthes minutissima	2	0.002
Amphora montana	2	0.002
Diatoma tenuis	2	0.002
Fragilaria vaucheriae	2	0.002
Navicula agrestis	2	0.002
Nitzschia dissipata	2	0.002
Nitzschia inconspicua	2	0.002
Synedra fasiculata var truncata	2	0.002
Cymbella tumida	1	0.001
Gomphonema olivaceum	1	0.001
Navicula atomus	1	0.001
Navicula atomus var permitis	1	0.001
Navicula lanceolata	1	0.001
Navicula molestiformis	1	0.001
Navicula sp4	1	0.001
Nitzschia agnita	1	0.001
Nitzschia angustiforaminata	1	0.001
Nitzschia rosenstockii	1	0.001
Stephanodiscus hantzschii	1	0.001
Stephanodiscus parvus	1	0.001
Total Counted	825	
Species Richness	51	
Shannon Diversity (H)	2.57	

Black River, upstream, diatometer, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	265	0.294
Nitzschia rosenstockii	198	0.220
Navicula viridula var germainii	68	0.075
Nitzschia palea	58	0.064
Cyclotella atomus	41	0.045
Nitzschia angustiforaminata	36	0.040
Nitzschia frustulum	25	0.028
Nitzschia supralitorea	21	0.023
Melosira varians	19	0.021
Navicula erifuga	19	0.021
Nitzschia amphibia	17	0.019
Cyclotella meneghiniana	14	0.016
Navicula viridula var rostellata	13	0.014
Nitzschia minuta	12	0.013
Gomphonema parvulum	9	0.010
Stephanodiscus delicatus	9	0.010
Cocconeis placentula var euglypta	8	0.009
Navicula lanceolata	7	0.008
Cyclotella meneghiniana f. plana	6	0.007
Navicula recens	6	0.007
Navicula subminuscula	5	0.006

Black River, upstream, diatometer, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclostephanos invisitatus	4	0.004
Cyclostephanos tholiformis	4	0.004
Navicula sp2	4	0.004
Achnanthes minutissima	3	0.003
Cyclotella pseudostelligera	3	0.003
Skeletonema potamos	3	0.003
Stephanodiscus parvus	3	0.003
Thalassiosira pseudonana var1	3	0.003
Achnanthes lanceolata	2	0.002
Cyclotella atomus var4	2	0.002
Gomphonema gracile	2	0.002
Navicula indifferens	2	0.002
Navicula tenera	2	0.002
Surirella angusta	2	0.002
Cocconeis pediculus	1	0.001
Cyclotella woltereckii	1	0.001
Fragilaria construens f. venter	1	0.001
Nitzschia agnewii	1	0.001
Nitzschia inconspicua	1	0.001
Stephanodiscus hantzschii var tenui	1	0.001
Surirella brebissonii var kuetzingi	1	0.001

Total Counted	902
Species Richness	42
Shannon Diversity (H)	2.51

Black River, downstream, diatometer, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula recens	292	0.322
Nitzschia palea	113	0.124
Gomphonema parvulum	65	0.072
Navicula saprophila	60	0.066
Cyclotella cryptica	54	0.059
Skeletonema potamos	54	0.059
Navicula viridula var germainii	35	0.039
Navicula viridula var rostellata	32	0.035
Cocconeis placentula var euglypta	29	0.032
Navicula schroeteri	12	0.013
Nitzschia minuta	10	0.011
Cyclotella atomus	9	0.010
Cyclotella meneghiniana	8	0.009
Nitzschia intermedia	7	0.008
Thalassiosira pseudonana	7	0.008
Achnanthes minutissima	6	0.007
Amphora pediculus	6	0.007
Cyclotella pseudostelligera	6	0.007
Nitzschia acicularis	6	0.007
Stephanodiscus hantzschii	6	0.007

Black River, downstream, diatometer, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus hantzschii var tenui	6	0.007
Synedra fasiculata var truncata	6	0.007
Cocconeis placentula var lineata	5	0.006
Cyclotella ocellata	5	0.006
Navicula erifuga	5	0.006
Stephanodiscus delicatus	5	0.006
Cymbella silesiaca	4	0.004
Gomphonema parvulum f. saprophilum	4	0.004
Navicula sanctaecrucis	4	0.004
Navicula indifferens	3	0.003
Stephanodiscus parvus	3	0.003
Cyclotella michiganiana	2	0.002
Gomphonema olivaceum	2	0.002
Melosira varians	2	0.002
Navicula gregaria	2	0.002
Navicula minima	2	0.002
Navicula sp2	2	0.002
Navicula subminuscula	2	0.002
Navicula tenera	2	0.002
Nitzschia agnewii	2	0.002
Nitzschia amphibia	2	0.002
Nitzschia filiformis	2	0.002
Nitzschia reversa	2	0.002
Nitzschia supralitorea	2	0.002
Surirella brebissonii var kuetzingi	2	0.002
Surirella minuta	2	0.002
Thalassiosira pseudonana var1	2	0.002
Thalassiosira weissflogii	2	0.002
Achnanthes lanceolata	1	0.001
Cyclostephanos tholiformis	1	0.001
Cyclotella atomus var4	1	0.001
Navicula cryptotenella	1	0.001
Nitzschia inconspicua	1	0.001
Nitzschia pusilla	1	0.001
Stephanodiscus alpinus	1	0.001

Total Counted	908
Species Richness	55
Shannon Diversity (H)	2.68

Black River, upstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Thalassiosira pseudonana	324	20033	0.356
Skeletonema potamos	169	10449	0.186
Cyclotella cryptica	64	3957	0.070
Stephanodiscus delicatus	42	2597	0.046
Nitzschia intermedia	39	2411	0.043
Cyclotella atomus	31	1917	0.034

Black River, upstream, diatometer, 18 June 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Thalassiosira pseudonana var1	31	1917	0.034
Cyclotella atomus var4	28	1731	0.031
Cyclotella meneghiniana	28	1731	0.031
Nitzschia palea	25	1546	0.027
Stephanodiscus hantzschii var tenui	11	680	0.012
Cyclotella pseudostelligera	10	618	0.011
Gomphonema parvulum	10	618	0.011
Nitzschia inconspicua	9	556	0.010
Nitzschia paleacea	9	556	0.010
Navicula atomus var permitis	8	495	0.009
Navicula gregaria	8	495	0.009
Nitzschia acicularis	6	371	0.007
Cyclotella woltereckii	5	309	0.005
Cyclostephanos tholiformis	4	247	0.004
Cyclotella pseudostelligera var1	4	247	0.004
Navicula lanceolata	4	247	0.004
Nitzschia minuta	4	247	0.004
Stephanodiscus hantzschii	4	247	0.004
Surirella minuta	4	247	0.004
Cyclotella sp1	3	185	0.003
Nitzschia gracilis	3	185	0.003
Achnanthes minutissima	2	124	0.002
Navicula capitata	2	124	0.002
Navicula veneta	2	124	0.002
Nitzschia agnita	2	124	0.002
Nitzschia dissipata	2	124	0.002
Nitzschia pusilla	2	124	0.002
Synedra tenera	2	124	0.002
Achnanthes lanceolata	1	62	0.001
Cyclostephanos invisitatus	1	62	0.001
Melosira varians	1	62	0.001
Navicula erifuga	1	62	0.001
Nitzschia angustiforaminata	1	62	0.001
Nitzschia frustulum	1	62	0.001
Stephanodiscus minutulus	1	62	0.001
Stephanodiscus parvus	1	62	0.001
Synedra fasiculata var truncata	1	62	0.001
Synedra ulna var acus	1	62	0.001
TOTAL		56328	
Total Counted	911		
Species Richness	44		
Shannon Diversity (H)	2.42		

Black River, downstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Gomphonema parvulum	428	49839	0.478
Navicula cryptotenella	128	14905	0.143

Black River, downstream, diatometer, 18 June 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Nitzschia paleacea	116	13508	0.129
Cocconeis placentula var lineata	92	10713	0.103
Achnanthes minutissima	23	2678	0.026
Gomphonema minutum	19	2212	0.021
Cocconeis pediculus	13	1514	0.015
Nitzschia intermedia	11	1281	0.012
Nitzschia dissipata	9	1048	0.010
Cyclotella atomus	6	699	0.007
Nitzschia gracilis	6	699	0.007
Nitzschia acicularis	5	582	0.006
Cymbella silesiaca	4	466	0.004
Navicula subminuscula	4	466	0.004
Fragilaria vaucheriae	3	349	0.003
Gomphonema truncatum	3	349	0.003
Rhoicosphenia curvata	3	349	0.003
Cocconeis placentula var euglypta	2	233	0.002
Cyclostephanos tholiformis	2	233	0.002
Cyclotella cryptica	2	233	0.002
Cyclotella meneghiniana	2	233	0.002
Navicula lanceolata	2	233	0.002
Nitzschia minuta	2	233	0.002
Nitzschia rosenstockii	2	233	0.002
Stephanodiscus delicatus	2	233	0.002
Achnanthes lanceolata	1	116	0.001
Cyclotella atomus var4	1	116	0.001
Cyclotella pseudostelligera	1	116	0.001
Navicula saprophila	1	116	0.001
Nitzschia fonticola	1	116	0.001
Nitzschia inconspicua	1	116	0.001
Thalassiosira pseudonana	1	116	0.001
TOTAL		104335	
Total Counted	896		
Species Richness	32		
Shannon Diversity (H)	1.83		

Black River, upstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Cyclotella cryptica	472	71798	0.520
Cyclotella atomus	71	10800	0.078
Cocconeis placentula var euglypta	54	8214	0.060
Gomphonema parvulum	38	5780	0.042
Stephanodiscus delicatus	29	4411	0.032
Cyclotella atomus var4	24	3651	0.026
Cyclotella pseudostelligera var1	23	3499	0.025
Gomphonema parvulum var exilissimum	23	3499	0.025
Skeletonema potamos	21	3194	0.023
Nitzschia palea	19	2890	0.021

Black River, upstream, diatometer, 17 September 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Cyclostephanos tholiformis	17	2586	0.019
Thalassiosira pseudonana	16	2434	0.018
Navicula lanceolata	10	1521	0.011
Nitzschia inconspicua	8	1217	0.009
Nitzschia supralitorea	7	1065	0.008
Amphora pediculus	6	913	0.007
Cyclotella meneghiniana f. plana	5	761	0.006
Navicula gregaria	5	761	0.006
Navicula viridula var germainii	5	761	0.006
Navicula viridula var rostellata	5	761	0.006
Nitzschia rosenstockii	5	761	0.006
Cyclotella meneghiniana	4	608	0.004
Gomphonema affine	4	608	0.004
Cocconeis pediculus	3	456	0.003
Gomphonema clavatum	3	456	0.003
Stephanodiscus hantzschii	3	456	0.003
Stephanodiscus hantzschii var tenui	3	456	0.003
Thalassiosira pseudonana var1	3	456	0.003
Achnanthes lanceolata	2	304	0.002
Cyclotella pseudostelligera	2	304	0.002
Cyclotella woltereckii	2	304	0.002
Navicula pygmaea	2	304	0.002
Nitzschia angustiforaminata	2	304	0.002
Nitzschia microcephala	2	304	0.002
Synedra tenera	2	304	0.002
Navicula atomus var permitis	1	152	0.001
Navicula minima	1	152	0.001
Navicula subminuscula	1	152	0.001
Nitzschia amphibia	1	152	0.001
Nitzschia capitellata	1	152	0.001
Nitzschia dissipata	1	152	0.001
Surirella minuta	1	152	0.001
TOTAL		137968	
Total Counted	907		
Species Richness	42		
Shannon Diversity (H)	2.14		

Black River, downstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Navicula recens	544	56603	0.596
Cocconeis placentula var euglypta	71	7387	0.078
Gomphonema parvulum	66	6867	0.072
Cyclotella cryptica	55	5723	0.060
Navicula viridula var rostellata	23	2393	0.025
Melosira varians	18	1873	0.020
Achnanthes minutissima	12	1249	0.013
Stephanodiscus hantzschii	10	1040	0.011

Black River, downstream, diatometer, 17 September 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Thalassiosira pseudonana var1	10	1040	0.011
Nitzschia palea	8	832	0.009
Achnanthes lanceolata	7	728	0.008
Amphora pediculus	7	728	0.008
Navicula viridula var germainii	7	728	0.008
Synedra ulna	7	728	0.008
Cyclotella atomus	6	624	0.007
Gomphonema parvulum f. saprophilum	5	520	0.005
Skeletonema potamos	5	520	0.005
Gomphonema parvulum var exilissimum	4	416	0.004
Nitzschia frustulum	4	416	0.004
Cyclotella pseudostelligera	3	312	0.003
Cymbella silesiaca	3	312	0.003
Navicula gregaria	3	312	0.003
Actinocyclus normanii	2	208	0.002
Cyclotella meneghiniana	2	208	0.002
Navicula erifuga	2	208	0.002
Navicula salinarum	2	208	0.002
Navicula seminulum	2	208	0.002
Nitzschia dissipata	2	208	0.002
Nitzschia filiformis	2	208	0.002
Nitzschia nereidis	2	208	0.002
Nitzschia rosenstockii	2	208	0.002
Synedra pulchella	2	208	0.002
Cyclostephanos invisitatus	1	104	0.001
Cyclostephanos tholiformis	1	104	0.001
Cyclotella atomus var4	1	104	0.001
Diatoma vulgaris	1	104	0.001
Navicula atomus var permitis	1	104	0.001
Navicula lanceolata	1	104	0.001
Navicula schroeteri	1	104	0.001
Nitzschia angustatula	1	104	0.001
Nitzschia angustiforaminata	1	104	0.001
Nitzschia inconspicua	1	104	0.001
Nitzschia sociabilis	1	104	0.001
Stephanodiscus hantzschii var tenui	1	104	0.001
Stephanodiscus parvus	1	104	0.001
Synedra fasciculata	1	104	0.001
Thalassiosira pseudonana	1	104	0.001
TOTAL		94997	
Total Counted	913		
Species Richness	47		
Shannon Diversity (H)	1.82		

Black River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	308	490605	0.347
Nitzschia supralitorea	93	148137	0.105
Cyclotella cryptica	68	108316	0.077
Navicula subminuscula	61	97165	0.069
Thalassiosira pseudonana	30	47786	0.034
Achnanthes minutissima	29	46193	0.033
Nitzschia inconspicua	25	39822	0.028
Achnanthes lanceolata	21	33450	0.024
Navicula agrestis	20	31858	0.023
Navicula atomus var permitis	20	31858	0.023
Rhoicosphenia curvata	20	31858	0.023
Nitzschia palea	16	25486	0.018
Navicula molestiformis	14	22300	0.016
Cyclotella atomus	9	14336	0.010
Skeletonema potamos	9	14336	0.010
Navicula gregaria	8	12743	0.009
Navicula cryptotenella	7	11150	0.008
Gomphonema parvulum var exilissimum	6	9557	0.007
Stephanodiscus hantzschii	6	9557	0.007
Navicula menisculus var grunowii	5	7964	0.006
Navicula minima	5	7964	0.006
Nitzschia frustulum	5	7964	0.006
Stephanodiscus delicatus	5	7964	0.006
Thalassiosira pseudonana var1	5	7964	0.006
Cocconeis placentula var euglypta	4	6372	0.005
Cyclotella meneghiniana	4	6372	0.005
Melosira varians	4	6372	0.005
Navicula lanceolata	4	6372	0.005
Navicula saprophila	4	6372	0.005
Nitzschia minuta	4	6372	0.005
Nitzschia rosenstockii	4	6372	0.005
Achnanthes minutissima var inconspi	3	4779	0.003
Cocconeis pediculus	3	4779	0.003
Cymbella silesiaca	3	4779	0.003
Nitzschia amphibia	3	4779	0.003
Nitzschia capitellata	3	4779	0.003
Nitzschia dissipata	3	4779	0.003
Amphora veneta	2	3186	0.002
Cyclostephanos tholiformis	2	3186	0.002
Cyclotella pseudostelligera	2	3186	0.002
Gomphonema gracile	2	3186	0.002
Gomphonema minutum	2	3186	0.002
Gomphonema sp7	2	3186	0.002
Navicula capitatoradiata	2	3186	0.002
Navicula monoculata	2	3186	0.002
Nitzschia acicularis	2	3186	0.002
Nitzschia agnita	2	3186	0.002
Nitzschia draveillensis	2	3186	0.002
Nitzschia fonticola	2	3186	0.002
Nitzschia gracilis	2	3186	0.002
Nitzschia paleacea	2	3186	0.002
Nitzschia sociabilis	2	3186	0.002
Pinnularia borealis var scalaris	2	3186	0.002
Surirella minuta	2	3186	0.002

Black River, upstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Amphora pediculus	1	1593	0.001
Cocconeis placentula var lineata	1	1593	0.001
Cyclotella atomus var4	1	1593	0.001
Diatoma vulgaris	1	1593	0.001
Navicula schroeteri	1	1593	0.001
Nitzschia linearis var subtilis	1	1593	0.001
Nitzschia microcephala	1	1593	0.001
Nitzschia perminuta	1	1593	0.001
Surirella brebissonii var kuetzingi	1	1593	0.001
Synedra fasiculata var truncata	1	1593	0.001
Synedra pulchella	1	1593	0.001
Synedra ulna	1	1593	0.001
Thalassiosira weissflogii	1	1593	0.001
TOTAL		1414473	
Total Counted	888		
Species Richness	67		
Shannon Diversity (H)	2.79		

Black River, downstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	700	691830	0.724
Navicula subminuscula	55	54358	0.057
Navicula cryptotenella	22	21743	0.023
Nitzschia supralitorea	21	20755	0.022
Navicula saprophila	17	16802	0.018
Rhoicosphenia curvata	15	14825	0.016
Nitzschia paleacea	13	12848	0.013
Nitzschia dissipata	10	9883	0.010
Cocconeis placentula var euglypta	9	8895	0.009
Navicula atomus var permitis	8	7907	0.008
Navicula gregaria	8	7907	0.008
Nitzschia inconspicua	8	7907	0.008
Nitzschia palea	8	7907	0.008
Synedra fasiculata var truncata	6	5930	0.006
Achnanthes minutissima	4	3953	0.004
Cyclotella cryptica	4	3953	0.004
Gomphonema clavatum	4	3953	0.004
Melosira varians	4	3953	0.004
Achnanthes lanceolata	3	2965	0.003
Navicula agrestis	3	2965	0.003
Navicula capitatoradiata	3	2965	0.003
Navicula lacunolaciniata	3	2965	0.003
Nitzschia solita	3	2965	0.003
Cyclotella atomus	2	1977	0.002
Gomphonema parvulum var exilissimum	2	1977	0.002
Navicula menisculus var grunowii	2	1977	0.002
Navicula recens	2	1977	0.002

Black River, downstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia compressa var vexans	2	1977	0.002
Nitzschia desertorum	2	1977	0.002
Nitzschia linearis var subtilis	2	1977	0.002
Nitzschia minuta	2	1977	0.002
Nitzschia sp12	2	1977	0.002
Stephanodiscus delicatus	2	1977	0.002
Stephanodiscus hantzschii	2	1977	0.002
Synedra pulchella	2	1977	0.002
Cocconeis pediculus	1	988	0.001
Cyclotella meneghiniana	1	988	0.001
Cymbella tumida	1	988	0.001
Gomphonema minutum	1	988	0.001
Navicula minuscula	1	988	0.001
Nitzschia filiformis	1	988	0.001
Nitzschia frustulum	1	988	0.001
Skeletonema potamos	1	988	0.001
Stephanodiscus parvus	1	988	0.001
Surirella minuta	1	988	0.001
Synedra ulna	1	988	0.001
Thalassiosira pseudonana	1	988	0.001
TOTAL		955714	
Total Counted	967		
Species Richness	47		
Shannon Diversity (H)	1.46		

Black River, downstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula recens	414	1170663	0.456
Gomphonema parvulum	74	209249	0.081
Melosira varians	53	149867	0.058
Nitzschia palea	37	104624	0.041
Cyclotella cryptica	36	101797	0.040
Navicula saprophila	28	79175	0.031
Cymbella silesiaca	25	70692	0.028
Navicula viridula var rostellata	25	70692	0.028
Cocconeis placentula var euglypta	18	50898	0.020
Navicula confervacea	18	50898	0.020
Cyclotella atomus	16	45243	0.018
Gomphonema clavatum	12	33932	0.013
Nitzschia inconspicua	11	31105	0.012
Cymbella tumida	10	28277	0.011
Stephanodiscus hantzschii	10	28277	0.011
Nitzschia filiformis	9	25449	0.010
Navicula viridula var germainii	8	22622	0.009
Navicula gregaria	7	19794	0.008
Cyclostephanos invisitatus	5	14138	0.006
Gomphonema parvulum var exilissimum	5	14138	0.006

Black River, downstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula lanceolata	5	14138	0.006
Synedra fasiculata var truncata	5	14138	0.006
Navicula minima	4	11311	0.004
Navicula schroeteri	4	11311	0.004
Cyclostephanos tholiformis	3	8483	0.003
Cyclotella meneghiniana	3	8483	0.003
Cyclotella ocellata	3	8483	0.003
Navicula subminuscula	3	8483	0.003
Nitzschia fonticola	3	8483	0.003
Surirella minuta	3	8483	0.003
Thalassiosira pseudonana var1	3	8483	0.003
Asterionella formosa	2	5655	0.002
Cyclotella pseudostelligera	2	5655	0.002
Cymbella caespitosa	2	5655	0.002
Fragilaria capucina var mesolepta	2	5655	0.002
Navicula agrestis	2	5655	0.002
Nitzschia capitellata	2	5655	0.002
Nitzschia dissipata	2	5655	0.002
Nitzschia microcephala	2	5655	0.002
Nitzschia rosenstockii	2	5655	0.002
Nitzschia supralitorea	2	5655	0.002
Pleurosira laevis f. polymorpha	2	5655	0.002
Rhoicosphenia curvata	2	5655	0.002
Synedra ulna	2	5655	0.002
Achnanthes lanceolata	1	2828	0.001
Amphora pediculus	1	2828	0.001
Caloneis bacillum	1	2828	0.001
Cocconeis placentula var lineata	1	2828	0.001
Gyrosigma acuminatum	1	2828	0.001
Navicula atomus var permitis	1	2828	0.001
Navicula decussis	1	2828	0.001
Navicula hustedtii	1	2828	0.001
Navicula praeterita	1	2828	0.001
Navicula pupula	1	2828	0.001
Nitzschia agnita	1	2828	0.001
Nitzschia amphibia	1	2828	0.001
Nitzschia apiculata	1	2828	0.001
Nitzschia clausii	1	2828	0.001
Nitzschia compressa var vexans	1	2828	0.001
Nitzschia gracilis	1	2828	0.001
Nitzschia intermedia	1	2828	0.001
Nitzschia minuta	1	2828	0.001
Nitzschia tubicola	1	2828	0.001
Stephanodiscus hantzschii var tenuis	1	2828	0.001
Thalassiosira pseudonana	1	2828	0.001
Thalassiosira weissflogii	1	2828	0.001
TOTAL		2567541	
Total Counted	908		
Species Richness	66		
Shannon Diversity (H)	2.48		

Black River, upstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia palea	126	5233	0.139
Melosira varians	102	4237	0.112
Navicula gregaria	101	4195	0.111
Navicula lanceolata	84	3489	0.093
Gomphonema parvulum	42	1744	0.046
Rhoicosphenia curvata	41	1703	0.045
Nitzschia dissipata	37	1537	0.041
Navicula cryptotenella	34	1412	0.037
Cyclotella meneghiniana	18	748	0.020
Navicula tripunctata	18	748	0.020
Nitzschia acicularis	17	706	0.019
Nitzschia inconspicua	17	706	0.019
Surirella minuta	13	540	0.014
Achnanthes lanceolata	12	498	0.013
Nitzschia recta	12	498	0.013
Achnanthes minutissima	11	457	0.012
Cyclotella stelligera	10	415	0.011
Skeletonema potamos	10	415	0.011
Synedra fasiculata var truncata	10	415	0.011
Gomphonema consector	9	374	0.010
Navicula atomus var permitis	9	374	0.010
Amphora pediculus	8	332	0.009
Gomphonema olivaceum	8	332	0.009
Navicula veneta	8	332	0.009
Nitzschia supralitorea	8	332	0.009
Thalassiosira pseudonana	8	332	0.009
Navicula subminuscula	7	291	0.008
Thalassiosira weissflogii	7	291	0.008
Navicula accomoda	6	249	0.007
Navicula salinarum	6	249	0.007
Nitzschia apiculata	6	249	0.007
Nitzschia gracilis	6	249	0.007
Thalassiosira pseudonana var1	6	249	0.007
Navicula saprophila	5	208	0.006
Nitzschia paleacea	5	208	0.006
Cyclotella atomus	4	166	0.004
Cymbella silesiaca	4	166	0.004
Navicula minima	4	166	0.004
Nitzschia hungarica	4	166	0.004
Nitzschia pusilla	4	166	0.004
Synedra ulna	4	166	0.004
Cyclostephanos invisitatus	3	125	0.003
Gomphonema truncatum	3	125	0.003
Navicula minuscula var muralis	3	125	0.003
Amphora montana	2	83	0.002
Amphora veneta	2	83	0.002
Aulacoseira granulata	2	83	0.002
Cyclostephanos tholiformis	2	83	0.002
Cyclotella cryptica	2	83	0.002
Gomphonema gracile	2	83	0.002
Gomphonema sp7	2	83	0.002
Navicula agrestis	2	83	0.002
Navicula capitata	2	83	0.002
Navicula capitatoradiata	2	83	0.002

Black River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula heimansii	2	83	0.002
Navicula sp2	2	83	0.002
Nitzschia agnita	2	83	0.002
Nitzschia archibaldii	2	83	0.002
Nitzschia communis	2	83	0.002
Nitzschia nereidis	2	83	0.002
Nitzschia perminuta	2	83	0.002
Pinnularia sp1	2	83	0.002
Surirella brebissonii var kuetzingi	2	83	0.002
Diatoma vulgaris	1	42	0.001
Navicula atomus	1	42	0.001
Navicula minuscula	1	42	0.001
Nitzschia capitellata	1	42	0.001
Nitzschia intermedia	1	42	0.001
Stephanodiscus hantzschii	1	42	0.001
Stephanodiscus parvus	1	42	0.001
Surirella angusta	1	42	0.001
Synedra tenera	1	42	0.001
TOTAL		37672	
Total Counted	907		
Species Richness	72		
Shannon Diversity (H)	3.29		

Black River, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	131	2653	0.146
Melosira varians	95	1924	0.106
Nitzschia supralitorea	56	1134	0.062
Nitzschia palea	50	1013	0.056
Navicula recens	49	992	0.055
Cocconeis placentula var euglypta	41	830	0.046
Navicula viridula var germainii	38	770	0.042
Nitzschia inconspicua	30	608	0.033
Achnanthes lanceolata	27	547	0.030
Navicula viridula var rostellata	19	385	0.021
Nitzschia dissipata	16	324	0.018
Nitzschia minuta	16	324	0.018
Nitzschia amphibia	15	304	0.017
Amphora pediculus	14	284	0.016
Navicula capitatoradiata	13	263	0.014
Navicula schroeteri	13	263	0.014
Navicula veneta	13	263	0.014
Gomphonema consector	11	223	0.012
Gomphonema sp7	11	223	0.012
Synedra fasiculata var truncata	11	223	0.012

Black River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula gregaria	10	203	0.011
Nitzschia frustulum	10	203	0.011
Gomphonema clevei	9	182	0.010
Gomphonema minutum	9	182	0.010
Gomphonema gracile	8	162	0.009
Navicula capitata	8	162	0.009
Navicula minima	8	162	0.009
Navicula subminuscula	8	162	0.009
Nitzschia fonticola	8	162	0.009
Navicula seminulum	7	142	0.008
Navicula tenera	7	142	0.008
Achnanthes ricula	6	122	0.007
Amphora inariensis	6	122	0.007
Amphora libyca	6	122	0.007
Cyclotella atomus	6	122	0.007
Gomphonema truncatum	6	122	0.007
Navicula cryptotenella	6	122	0.007
Nitzschia lanceola var minutula	6	122	0.007
Nitzschia levidensis	6	122	0.007
Diploneis pseudovalis	5	101	0.006
Rhoicosphenia curvata	5	101	0.006
Achnanthes minutissima	4	81	0.004
Cocconeis placentula var lineata	4	81	0.004
Navicula agrestis	4	81	0.004
Navicula hustedtii	4	81	0.004
Navicula vandamii	4	81	0.004
Nitzschia angustatula	4	81	0.004
Nitzschia angustiforaminata	4	81	0.004
Thalassiosira pseudonana var1	4	81	0.004
Cyclostephanos tholiformis	3	61	0.003
Cyclotella cryptica	3	61	0.003
Cymbella silesiaca	3	61	0.003
Gomphonema angustatum	3	61	0.003
Gomphonema clavatum	3	61	0.003
Nitzschia capitellata	3	61	0.003
Navicula cryptocephala	2	41	0.002
Navicula trivialis	2	41	0.002
Nitzschia aurariae	2	41	0.002
Nitzschia clausii	2	41	0.002
Nitzschia intermedia	2	41	0.002
Nitzschia microcephala	2	41	0.002
Nitzschia nereidis	2	41	0.002
Nitzschia rosenstockii	2	41	0.002
Nitzschia sp12	2	41	0.002
Stephanodiscus hantzschii	2	41	0.002
Surirella suecica	2	41	0.002
Caloneis bacillum	1	20	0.001
Cyclotella meneghiniana	1	20	0.001
Cyclotella pseudostelligera	1	20	0.001
Cymbella tumida	1	20	0.001
Gomphonema parvulum f. saprophilum	1	20	0.001
Navicula atomus var permitis	1	20	0.001

Black River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula salinarum	1	20	0.001
Nitzschia calida	1	20	0.001
TOTAL		18206	
Total Counted	899		
Species Richness	74		
Shannon Diversity (H)	3.53		

Black River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	164	0.211	
Navicula recens	142	0.182	
Gomphonema consector	50	0.064	
Cocconeis placentula var lineata	45	0.058	
Cocconeis placentula var euglypta	43	0.055	
Nitzschia palea	42	0.054	
Navicula cryptotenella	32	0.041	
Navicula capitatoradiata	26	0.033	
Nitzschia dissipata	23	0.030	
Gomphonema sp7	20	0.026	
Gomphonema clavatum	15	0.019	
Navicula viridula var rostellata	13	0.017	
Melosira varians	12	0.015	
Synedra fasiculata var truncata	12	0.015	
Gomphonema parvulum var exilissimum	11	0.014	
Synedra ulna	10	0.013	
Rhoicosphenia curvata	9	0.012	
Nitzschia supralitorea	8	0.010	
Gomphonema minutum	6	0.008	
Navicula agrestis	6	0.008	
Synedra pulchella	6	0.008	
Navicula gregaria	5	0.006	
Navicula schroeteri	5	0.006	
Navicula tripunctata	5	0.006	
Nitzschia inconspicua	5	0.006	
Cyclotella cryptica	4	0.005	
Gomphonema gracile	4	0.005	
Navicula cryptocephala	4	0.005	
Fragilaria vaucheriae	3	0.004	
Navicula minima	3	0.004	
Navicula viridula var germainii	3	0.004	
Stephanodiscus hantzschii	3	0.004	
Synedra tenera	3	0.004	
Amphora pediculus	2	0.003	
Cyclotella pseudostelligera	2	0.003	
Fragilaria capucina	2	0.003	
Gomphonema sp4	2	0.003	
Navicula capitata	2	0.003	

Black River, downstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula veneta	2	0.003	
Nitzschia angustatula	2	0.003	
Nitzschia fonticola	2	0.003	
Nitzschia intermedia	2	0.003	
Nitzschia lanceola var minutula	2	0.003	
Nitzschia minuta	2	0.003	
Stephanodiscus alpinus	2	0.003	
Achnanthes minutissima	1	0.001	
Cocconeis pediculus	1	0.001	
Cocconeis placentula	1	0.001	
Cyclotella pseudostelligera var1	1	0.001	
Cyclotella pseudostelligera var3	1	0.001	
Cyclotella sp1	1	0.001	
Gomphonema sp5	1	0.001	
Gomphonema truncatum	1	0.001	
Navicula atomus var permitis	1	0.001	
Nitzschia acicularis	1	0.001	
Nitzschia filiformis	1	0.001	
Nitzschia subacicularis	1	0.001	
Stephanodiscus parvus	1	0.001	

Total Counted	779
Species Richness	58
Shannon Diversity (H)	2.95

Chagrin River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	181	0.200
Navicula cryptotenella	110	0.121
Nitzschia microcephala	104	0.115
Navicula lanceolata	66	0.073
Navicula gregaria	54	0.060
Cyclotella meneghiniana	52	0.057
Nitzschia dissipata	46	0.051
Nitzschia inconspicua	27	0.030
Nitzschia sociabilis	26	0.029
Thalassiosira pseudonana	21	0.023
Cymbella sinuata	20	0.022
Navicula capitatoradiata	20	0.022
Navicula mutica var ventricosa	16	0.018
Nitzschia palea	16	0.018
Amphora pediculus	12	0.013
Thalassiosira pseudonana var1	12	0.013
Skeletonema potamos	11	0.012
Cymbella affinis	10	0.011
Melosira varians	10	0.011
Caloneis bacillum	9	0.010
Rhoicosphenia curvata	9	0.010
Cymbella silesiaca	7	0.008
Nitzschia pusilla	7	0.008
Nitzschia acicularis	6	0.007
Cocconeis pediculus	5	0.006
Nitzschia supralitorea	5	0.006
Gomphonema parvulum	4	0.004
Nitzschia archibaldii	4	0.004
Stephanodiscus delicatus	3	0.003
Surirella minuta	3	0.003
Achnanthes lanceolata	2	0.002
Cocconeis placentula var euglypta	2	0.002
Cyclotella atomus	2	0.002
Cyclotella pseudostelligera	2	0.002
Diatoma vulgaris	2	0.002
Fragilaria vaucheriae	2	0.002
Gomphonema minutum	2	0.002
Gomphonema parvulum f. saprophilum	2	0.002
Nitzschia clausii	2	0.002
Nitzschia gracilis	2	0.002
Stephanodiscus hantzschii var tenui	2	0.002
Cocconeis placentula var lineata	1	0.001
Cyclotella woltereckii	1	0.001
Frustulia vulgaris	1	0.001
Navicula atomus var permitis	1	0.001
Navicula recens	1	0.001
Nitzschia linearis	1	0.001
Simonsenia delognei	1	0.001
Synedra tenera	1	0.001
Thalassiosira pseudonana var2	1	0.001
Total Counted	907	
Species Richness	50	
Shannon Diversity (H)	2.93	

Chagrin River, downstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Diatoma vulgaris	136	106500	0.149
Achnanthes minutissima	105	82225	0.115
Cymbella affinis	81	63430	0.089
Thalassiosira pseudonana	64	50118	0.070
Gomphonema parvulum var exilissimum	51	39938	0.056
Rhoicosphenia curvata	46	36022	0.050
Thalassiosira pseudonana var1	36	28191	0.039
Nitzschia palea	33	25842	0.036
Melosira varians	26	20360	0.028
Navicula capitatoradiata	24	18794	0.026
Navicula cryptotenella	23	18011	0.025
Synedra ulna	17	13313	0.019
Skeletonema potamos	14	10963	0.015
Gomphonema minutum	13	10180	0.014
Nitzschia archibaldii	13	10180	0.014
Gomphonema parvulum	12	9397	0.013
Nitzschia draveillensis	12	9397	0.013
Cymbella silesiaca	11	8614	0.012
Nitzschia dissipata	11	8614	0.012
Nitzschia inconspicua	11	8614	0.012
Nitzschia sociabilis	11	8614	0.012
Navicula lanceolata	10	7831	0.011
Nitzschia supralitorea	10	7831	0.011
Cyclotella pseudostelligera	9	7048	0.010
Navicula gregaria	9	7048	0.010
Caloneis bacillum	8	6265	0.009
Cyclotella pseudostelligera var1	8	6265	0.009
Synedra tenera	8	6265	0.009
Cocconeis pediculus	7	5482	0.008
Cyclotella pseudostelligera var3	7	5482	0.008
Fragilaria vaucheriae	7	5482	0.008
Synedra fasiculata var truncata	7	5482	0.008
Cyclotella meneghiniana	6	4699	0.007
Nitzschia minuta	6	4699	0.007
Synedra ulna var acus	6	4699	0.007
Navicula lacunolaciniata	5	3915	0.005
Cymbella sinuata	4	3132	0.004
Nitzschia acicularis	4	3132	0.004
Surirella minuta	4	3132	0.004
Cyclotella michiganiana	3	2349	0.003
Stephanodiscus delicatus	3	2349	0.003
Amphora libyca	2	1566	0.002
Amphora pediculus	2	1566	0.002
Cyclotella atomus var4	2	1566	0.002
Cyclotella stelligera	2	1566	0.002
Navicula angusta	2	1566	0.002
Navicula viridula var rostellata	2	1566	0.002
Nitzschia capitellata	2	1566	0.002
Nitzschia linearis var subtilis	2	1566	0.002
Nitzschia microcephala	2	1566	0.002
Nitzschia paleacea	2	1566	0.002
Achnanthes lanceolata	1	783	0.001
Cyclostephanos tholiformis	1	783	0.001
Cyclotella atomus	1	783	0.001

Chagrin River, downstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Cymbella prostrata	1	783	0.001
Eunotia exigua	1	783	0.001
Navicula tenera	1	783	0.001
Nitzschia apiculata	1	783	0.001
Nitzschia clausii	1	783	0.001
Nitzschia gracilis	1	783	0.001
Nitzschia pusilla	1	783	0.001
Stephanodiscus hantzschii	1	783	0.001
Stephanodiscus parvus	1	783	0.001
Surirella brebissonii var kuetzingi	1	783	0.001
TOTAL		715745	
Total Counted	914		
Species Richness	64		
Shannon Diversity (H)	3.30		

Chagrin River, upstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	187	4853	0.204
Nitzschia inconspicua	147	3815	0.160
Nitzschia supralitorea	75	1947	0.082
Nitzschia microcephala	48	1246	0.052
Nitzschia palea	43	1116	0.047
Nitzschia frustulum	30	779	0.033
Navicula recens	27	701	0.029
Cyclotella atomus	24	623	0.026
Gomphonema parvulum	24	623	0.026
Amphora pediculus	16	415	0.017
Thalassiosira pseudonana	16	415	0.017
Cocconeis placentula var euglypta	15	389	0.016
Navicula capitatoradiata	14	363	0.015
Gomphonema minutum	13	337	0.014
Achnanthes minutissima var robusta	11	285	0.012
Cyclostephanos tholiformis	11	285	0.012
Nitzschia filiformis	11	285	0.012
Cyclotella cryptica	10	260	0.011
Navicula viridula var rostellata	9	234	0.010
Nitzschia pusilla	9	234	0.010
Cymbella sinuata	8	208	0.009
Navicula sp2	8	208	0.009
Navicula veneta	8	208	0.009
Nitzschia dissipata	8	208	0.009
Rhoicosphenia curvata	8	208	0.009
Cyclotella meneghiniana	7	182	0.008
Navicula gregaria	7	182	0.008
Navicula schroeteri	7	182	0.008
Navicula viridula var germainii	7	182	0.008
Nitzschia rosenstockii	7	182	0.008
Navicula cryptotenella	6	156	0.007

Chagrin River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia fonticola	6	156	0.007
Achnanthes lanceolata	5	130	0.005
Cyclotella pseudostelligera var1	5	130	0.005
Navicula minima	5	130	0.005
Amphora montana	4	104	0.004
Cymbella caespitosa	4	104	0.004
Cymbella tumida	4	104	0.004
Navicula cryptocephala	4	104	0.004
Cyclotella meneghiniana f. plana	3	78	0.003
Cyclotella pseudostelligera	3	78	0.003
Navicula menisculus var grunowii	3	78	0.003
Navicula seminulum	3	78	0.003
Navicula subminuscula	3	78	0.003
Navicula tenera	3	78	0.003
Nitzschia amphibia	3	78	0.003
Nitzschia clausii	3	78	0.003
Aulacoseira alpigena	2	52	0.002
Caloneis bacillum	2	52	0.002
Navicula erifuga	2	52	0.002
Navicula lanceolata	2	52	0.002
Navicula vandamii	2	52	0.002
Nitzschia agnita	2	52	0.002
Nitzschia angustatula	2	52	0.002
Nitzschia graciliformis	2	52	0.002
Nitzschia minuta	2	52	0.002
Stephanodiscus hantzschii	2	52	0.002
Thalassiosira pseudonana var1	2	52	0.002
Amphora inariensis	1	26	0.001
Cocconeis pediculus	1	26	0.001
Gyrosigma scalproides	1	26	0.001
Melosira varians	1	26	0.001
Navicula capitata	1	26	0.001
Navicula tenelloides	1	26	0.001
Nitzschia angustiforaminata	1	26	0.001
Nitzschia apiculata	1	26	0.001
Nitzschia calida	1	26	0.001
Nitzschia gracilis	1	26	0.001
Nitzschia intermedia	1	26	0.001
Nitzschia nereidis	1	26	0.001
Nitzschia rautenbachiae	1	26	0.001
Nitzschia sociabilis	1	26	0.001
TOTAL		23826	
Total Counted	918		
Species Richness	72		
Shannon Diversity (H)	3.20		

Chagrin River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia dissipata	80	0.325
Navicula capitatoradiata	23	0.093
Cymbella tumida	19	0.077
Gomphonema parvulum	14	0.057
Navicula recens	13	0.053
Navicula schroeteri	13	0.053
Navicula gregaria	7	0.028
Navicula viridula var rostellata	7	0.028
Nitzschia palea	7	0.028
Achnanthes minutissima	6	0.024
Aulacoseira alpigena	4	0.016
Fragilaria capucina	4	0.016
Gomphonema minutum	4	0.016
Nitzschia inconspicua	4	0.016
Cymbella affinis	3	0.012
Cymbella silesiaca	3	0.012
Navicula cryptotenella	3	0.012
Cocconeis placentula var euglypta	2	0.008
Cymbella sinuata	2	0.008
Gomphonema sp7	2	0.008
Navicula cryptocephala	2	0.008
Navicula tenera	2	0.008
Navicula veneta	2	0.008
Nitzschia clausii	2	0.008
Nitzschia nereidis	2	0.008
Nitzschia supralitorea	2	0.008
Rhoicosphenia curvata	2	0.008
Achnanthes minutissima var inconspi	1	0.004
Cocconeis placentula var lineata	1	0.004
Cyclostephanos tholiformis	1	0.004
Cyclotella meneghiniana	1	0.004
Gomphonema clavatum	1	0.004
Gyrosigma scalproides	1	0.004
Navicula tripunctata	1	0.004
Nitzschia dissipata var media	1	0.004
Nitzschia minuta	1	0.004
Nitzschia recta	1	0.004
Stephanodiscus parvus	1	0.004
Synedra fasiculata var truncata	1	0.004

Total Counted	246
Species Richness	39
Shannon Diversity (H)	2.74

Cuyahoga River, upstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	487	0.602
Nitzschia paleacea	74	0.091
Nitzschia inconspicua	34	0.042
Nitzschia supralitorea	29	0.036
Achnanthes lanceolata	18	0.022
Nitzschia minuta	15	0.019
Nitzschia palea	13	0.016
Navicula atomus var permitis	10	0.012
Nitzschia gracilis	9	0.011
Nitzschia pusilla	9	0.011
Achnanthes minutissima	8	0.010
Cyclotella meneghiniana	7	0.009
Navicula lanceolata	6	0.007
Navicula saprophila	6	0.007
Stephanodiscus hantzschii	6	0.007
Navicula minima	5	0.006
Navicula subminuscula	5	0.006
Nitzschia hungarica	5	0.006
Cyclotella atomus	4	0.005
Melosira varians	4	0.005
Nitzschia acicularis	4	0.005
Nitzschia capitellata	4	0.005
Nitzschia microcephala	4	0.005
Synedra tenera	4	0.005
Cocconeis placentula	3	0.004
Cocconeis placentula var euglypta	3	0.004
Nitzschia frustulum	3	0.004
Stephanodiscus hantzschii var tenui	3	0.004
Cylindrotheca gracilis	2	0.002
Navicula monoculata	2	0.002
Nitzschia apiculata	2	0.002
Nitzschia filiformis	2	0.002
Nitzschia sociabilis	2	0.002
Skeletonema potamos	2	0.002
Synedra fasiculata var truncata	2	0.002
Achnanthes sp4	1	0.001
Cyclostephanos tholiformis	1	0.001
Cyclotella pseudostelligera var1	1	0.001
Navicula capitata	1	0.001
Navicula cryptotenella	1	0.001
Navicula gregaria	1	0.001
Navicula minuscula	1	0.001
Navicula salinarum	1	0.001
Nitzschia agnita	1	0.001
Nitzschia subacicularis	1	0.001
Stephanodiscus parvus	1	0.001
Surirella brebissonii var kuetzingi	1	0.001
Thalassiosira pseudonana	1	0.001

Total Counted	809
Species Richness	48
Shannon Diversity (H)	1.90

Cuyahoga River, downstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	531	0.586
Nitzschia paleacea	56	0.062
Nitzschia supralitorea	29	0.032
Nitzschia palea	28	0.031
Melosira varians	27	0.030
Cyclotella atomus	24	0.026
Nitzschia inconspicua	19	0.021
Nitzschia minuta	18	0.020
Navicula lanceolata	16	0.018
Nitzschia capitellata	14	0.015
Navicula recens	13	0.014
Navicula gregaria	11	0.012
Gomphonema gracile	10	0.011
Rhoicosphenia curvata	7	0.008
Gomphonema parvulum f. saprophilum	6	0.007
Synedra fasiculata var truncata	6	0.007
Achnanthes lanceolata	5	0.006
Skeletonema potamos	5	0.006
Achnanthes minutissima	4	0.004
Cyclotella meneghiniana	4	0.004
Navicula veneta	4	0.004
Nitzschia apiculata	4	0.004
Nitzschia filiformis	4	0.004
Nitzschia rosenstockii	4	0.004
Stephanodiscus hantzschii	4	0.004
Synedra tenera	4	0.004
Thalassiosira pseudonana	4	0.004
Diatoma vulgaris	3	0.003
Navicula viridula var germainii	3	0.003
Nitzschia gracilis	3	0.003
Cyclostephanos tholiformis	2	0.002
Cymbella silesiaca	2	0.002
Navicula cryptotenella	2	0.002
Navicula menisculus	2	0.002
Navicula monoculata	2	0.002
Navicula pygmaea	2	0.002
Nitzschia pusilla	2	0.002
Stephanodiscus hantzschii var tenui	2	0.002
Surirella brebissonii var kuetzingi	2	0.002
Surirella minuta	2	0.002
Cocconeis placentula var euglypta	1	0.001
Cyclotella cryptica	1	0.001
Cyclotella pseudostelligera	1	0.001
Diatoma tenuis	1	0.001
Navicula atomus var permitis	1	0.001
Navicula goeppertiana	1	0.001
Navicula mutica var ventricosa	1	0.001
Navicula subminuscula	1	0.001
Navicula trivialis	1	0.001
Nitzschia acicularis	1	0.001
Nitzschia amphibia	1	0.001
Nitzschia levidensis	1	0.001
Stephanodiscus parvus	1	0.001
Synedra pulchella	1	0.001

Cuyahoga River, downstream, diatometer, 26 June 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Synedra ulna	1	0.001
Tabellaria flocculosa	1	0.001
Total Counted	906	
Species Richness	56	
Shannon Diversity (H)	2.05	

Cuyahoga River, upstream, diatometer, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	128	0.137
Nitzschia palea	108	0.116
Nitzschia inconspicua	97	0.104
Navicula viridula var rostellata	76	0.081
Nitzschia fonticola	50	0.054
Cyclotella meneghiniana	34	0.036
Navicula viridula var germainii	27	0.029
Cyclotella atomus	26	0.028
Nitzschia amphibia	26	0.028
Nitzschia supralitorea	26	0.028
Navicula subminuscula	23	0.025
Nitzschia minuta	21	0.022
Nitzschia rosenstockii	19	0.020
Achnanthes minutissima	16	0.017
Navicula erifuga	14	0.015
Nitzschia pusilla	14	0.015
Navicula recens	13	0.014
Navicula cryptotenella	12	0.013
Navicula gregaria	12	0.013
Nitzschia intermedia	12	0.013
Navicula lanceolata	11	0.012
Navicula minima	11	0.012
Cyclotella pseudostelligera var3	8	0.009
Amphora pediculus	7	0.007
Cyclostephanos tholiformis	7	0.007
Nitzschia microcephala	7	0.007
Gomphonema affine	6	0.006
Navicula schroeteri	6	0.006
Rhoicosphenia curvata	6	0.006
Gomphonema minutum	5	0.005
Nitzschia agnita	5	0.005
Synedra pulchella	5	0.005
Thalassiosira pseudonana	5	0.005
Achnanthes lanceolata	4	0.004
Cyclotella meneghiniana f. plana	4	0.004
Navicula slesvicensis	4	0.004
Nitzschia gracilis	4	0.004
Achnanthes exigua	3	0.003
Cocconeis placentula var euglypta	3	0.003

Cuyahoga River, upstream, diatometer, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Melosira varians	3	0.003
Navicula capitatoradiata	3	0.003
Nitzschia linearis var subtilis	3	0.003
Skeletonema potamos	3	0.003
Synedra fasiculata var truncata	3	0.003
Caloneis bacillum	2	0.002
Cyclotella cryptica	2	0.002
Gomphonema angustatum	2	0.002
Gomphonema clavatum	2	0.002
Gomphonema parvulum f. saprophilum	2	0.002
Navicula aquaedurae	2	0.002
Navicula elginensis	2	0.002
Navicula molestiformis	2	0.002
Navicula salinarum	2	0.002
Navicula sp2	2	0.002
Nitzschia capitellata	2	0.002
Nitzschia frustulum	2	0.002
Nitzschia littoralis	2	0.002
Nitzschia perminuta	2	0.002
Nitzschia sp7	2	0.002
Stephanodiscus hantzschii var tenui	2	0.002
Synedra tenera	2	0.002
Amphora libyca	1	0.001
Cocconeis placentula var lineata	1	0.001
Cyclostephanos invisitatus	1	0.001
Cyclotella pseudostelligera var1	1	0.001
Cyclotella woltereckii	1	0.001
Cymbella sinuata	1	0.001
Gomphonema brasiliense	1	0.001
Gomphonema gracile	1	0.001
Gyrosigma acuminatum	1	0.001
Navicula cryptocephala	1	0.001
Navicula monoculata	1	0.001
Navicula tripunctata	1	0.001
Nitzschia communis	1	0.001
Nitzschia paleacea	1	0.001
Stephanodiscus alpinus	1	0.001
Stephanodiscus delicatus	1	0.001
Stephanodiscus hantzschii	1	0.001
Surirella minuta	1	0.001
Thalassiosira pseudonana var1	1	0.001
Thalassiosira weissflogii	1	0.001

Total Counted	934
Species Richness	81
Shannon Diversity (H)	3.37

Cuyahoga River, upstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Gomphonema parvulum	281	19176	0.302
Thalassiosira pseudonana	97	6620	0.104
Nitzschia minuta	59	4026	0.063
Thalassiosira pseudonana var1	54	3685	0.058
Synedra tenera	42	2866	0.045
Navicula recens	40	2730	0.043
Nitzschia acicularis	27	1843	0.029
Nitzschia inconspicua	22	1501	0.024
Cyclotella meneghiniana	19	1297	0.020
Navicula lanceolata	19	1297	0.020
Nitzschia supralitorea	19	1297	0.020
Nitzschia palea	17	1160	0.018
Nitzschia intermedia	16	1092	0.017
Navicula atomus var permitis	15	1024	0.016
Navicula gregaria	15	1024	0.016
Skeletonema potamos	15	1024	0.016
Nitzschia capitellata	13	887	0.014
Achnanthes lanceolata	12	819	0.013
Cyclostephanos tholiformis	10	682	0.011
Navicula subminuscula	10	682	0.011
Nitzschia pusilla	9	614	0.010
Cyclotella meneghiniana f. plana	8	546	0.009
Navicula minima	6	409	0.006
Nitzschia microcephala	6	409	0.006
Achnanthes exigua	5	341	0.005
Achnanthes minutissima	5	341	0.005
Nitzschia paleacea	5	341	0.005
Stephanodiscus delicatus	5	341	0.005
Stephanodiscus hantzschii	5	341	0.005
Aulacoseira alpigena	4	273	0.004
Melosira varians	4	273	0.004
Nitzschia gracilis	4	273	0.004
Cyclotella michiganiana	3	205	0.003
Navicula pupula	3	205	0.003
Navicula seminulum	3	205	0.003
Nitzschia fonticola	3	205	0.003
Cyclostephanos invisitatus	2	136	0.002
Cyclotella atomus	2	136	0.002
Cyclotella ocellata	2	136	0.002
Cyclotella pseudostelligera var3	2	136	0.002
Gomphonema clavatum	2	136	0.002
Gomphonema olivaceum	2	136	0.002
Navicula capitatoradiata	2	136	0.002
Navicula slesvicensis	2	136	0.002
Navicula veneta	2	136	0.002
Nitzschia amphibia	2	136	0.002
Nitzschia desertorum	2	136	0.002
Nitzschia filiformis	2	136	0.002
Nitzschia levidensis	2	136	0.002
Nitzschia rosenstockii	2	136	0.002
Nitzschia tubicola	2	136	0.002
Stephanodiscus hantzschii var tenui	2	136	0.002
Surirella minuta	2	136	0.002
Aulacoseira granulata	1	68	0.001

Cuyahoga River, upstream, diatometer, 18 June 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Cyclotella pseudostelligera	1	68	0.001
Cyclotella pseudostelligera var1	1	68	0.001
Gyrosigma acuminatum	1	68	0.001
Navicula atomus	1	68	0.001
Navicula menisculus	1	68	0.001
Navicula molestiformis	1	68	0.001
Nitzschia linearis	1	68	0.001
Nitzschia sociabilis	1	68	0.001
Nitzschia solita	1	68	0.001
Stephanodiscus nipigonensis	1	68	0.001
Stephanodiscus parvus	1	68	0.001
Synedra fasiculata var truncata	1	68	0.001
Synedra ulna	1	68	0.001
Synedra ulna var acus	1	68	0.001
Thalassiosira weissflogii	1	68	0.001
TOTAL		63466	
Total Counted	930		
Species Richness	69		
Shannon Diversity (H)	2.97		

Cuyahoga River, downstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Gomphonema parvulum	306	80273	0.339
Melosira varians	159	41711	0.176
Achnanthes lanceolata	64	16789	0.071
Thalassiosira pseudonana	57	14953	0.063
Synedra fasiculata var truncata	41	10756	0.045
Diatoma tenuis	33	8657	0.037
Nitzschia filiformis	30	7870	0.033
Navicula recens	16	4197	0.018
Synedra tenera	13	3410	0.014
Thalassiosira pseudonana var1	13	3410	0.014
Navicula gregaria	12	3148	0.013
Navicula lanceolata	11	2886	0.012
Synedra pulchella	11	2886	0.012
Navicula atomus var permitis	10	2623	0.011
Nitzschia frustulum	10	2623	0.011
Diatoma vulgaris	8	2099	0.009
Nitzschia minuta	6	1574	0.007
Nitzschia pusilla	6	1574	0.007
Stephanodiscus hantzschii	6	1574	0.007
Navicula erifuga	5	1312	0.006
Nitzschia sociabilis	5	1312	0.006
Amphora pediculus	4	1049	0.004
Cyclostephanos tholiformis	4	1049	0.004
Cyclotella pseudostelligera	4	1049	0.004
Fragilaria vaucheriae	4	1049	0.004

Cuyahoga River, downstream, diatometer, 18 June 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Nitzschia angustiforaminata	4	1049	0.004
Nitzschia inconspicua	4	1049	0.004
Synedra ulna var acus	4	1049	0.004
Navicula menisculus	3	787	0.003
Nitzschia dissipata	3	787	0.003
Asterionella formosa	2	525	0.002
Cyclotella atomus var4	2	525	0.002
Cyclotella cryptica	2	525	0.002
Gomphonema sp3	2	525	0.002
Gomphonema truncatum	2	525	0.002
Navicula cryptotenella	2	525	0.002
Navicula mutica var ventricosa	2	525	0.002
Navicula saprophila	2	525	0.002
Navicula seminulum	2	525	0.002
Navicula veneta	2	525	0.002
Nitzschia acicularis	2	525	0.002
Nitzschia palea	2	525	0.002
Nitzschia paleacea	2	525	0.002
Nitzschia perminuta	2	525	0.002
Stephanodiscus minutulus	2	525	0.002
Synedra ulna	2	525	0.002
Cyclotella atomus	1	262	0.001
Cyclotella meneghiniana	1	262	0.001
Cyclotella michiganiana	1	262	0.001
Cyclotella ocellata	1	262	0.001
Cyclotella pseudostelligera var3	1	262	0.001
Cyclotella woltereckii	1	262	0.001
Gomphonema clavatum	1	262	0.001
Nitzschia archibaldii	1	262	0.001
Nitzschia fonticola	1	262	0.001
Nitzschia linearis var subtilis	1	262	0.001
Nitzschia supralitorea	1	262	0.001
Rhoicosphenia curvata	1	262	0.001
Stephanodiscus alpinus	1	262	0.001
Stephanodiscus delicatus	1	262	0.001
Stephanodiscus parvus	1	262	0.001
TOTAL		236885	
Total Counted	903		
Species Richness	61		
Shannon Diversity (H)	2.60		

Cuyahoga River, downstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Navicula recens	422	12356	0.458
Navicula viridula var germainii	89	2606	0.097
Melosira varians	50	1464	0.054
Nitzschia palea	46	1347	0.050
Cocconeis placentula var euglypta	44	1288	0.048
Synedra ulna	39	1142	0.042
Gomphonema parvulum	29	849	0.031
Achnanthes minutissima	24	703	0.026
Skeletonema potamos	17	498	0.018
Achnanthes lanceolata	9	264	0.010
Gomphonema clavatum	9	264	0.010
Nitzschia fonticola	9	264	0.010
Cyclotella atomus	7	205	0.008
Gomphonema brasiliense	6	176	0.007
Navicula erifuga	6	176	0.007
Navicula lanceolata	6	176	0.007
Nitzschia inconspicua	6	176	0.007
Thalassiosira pseudonana	6	176	0.007
Cyclotella cryptica	5	146	0.005
Cyclotella pseudostelligera var1	5	146	0.005
Gomphonema minutum	5	146	0.005
Gomphonema parvulum f. saprophilum	5	146	0.005
Navicula gregaria	5	146	0.005
Nitzschia rosenstockii	5	146	0.005
Amphora pediculus	4	117	0.004
Cyclotella meneghiniana	4	117	0.004
Nitzschia minuta	4	117	0.004
Nitzschia supralitorea	4	117	0.004
Navicula subminuscula	3	88	0.003
Rhoicosphenia curvata	3	88	0.003
Aulacoseira alpigena	2	59	0.002
Aulacoseira granulata	2	59	0.002
Cyclotella woltereckii	2	59	0.002
Fragilaria vaucheriae	2	59	0.002
Gomphonema affine	2	59	0.002
Navicula atomus var permitis	2	59	0.002
Navicula goeppertiana	2	59	0.002
Navicula minima	2	59	0.002
Navicula salinarum	2	59	0.002
Navicula sp1	2	59	0.002
Nitzschia acicularis	2	59	0.002
Nitzschia agnewii	2	59	0.002
Nitzschia angustiforaminata	2	59	0.002
Nitzschia filiformis	2	59	0.002
Nitzschia frustulum	2	59	0.002
Nitzschia sociabilis	2	59	0.002
Stephanodiscus hantzschii	2	59	0.002
Cyclostephanos tholiformis	1	29	0.001
Diatoma vulgaris	1	29	0.001
Hantzschia amphioxys	1	29	0.001
Navicula cryptotenella	1	29	0.001
Navicula molestiformis	1	29	0.001
Navicula schroeteri	1	29	0.001
Pleurosira laevis f. polymorpha	1	29	0.001

Cuyahoga River, downstream, diatometer, 17 September 1994 (Continued).

SPECIES	NUMBER	CELLS/MG	R.D.
Stephanodiscus delicatus	1	29	0.001
Stephanodiscus parvus	1	29	0.001
Synedra fasiculata var truncata	1	29	0.001
Synedra ulna var acus	1	29	0.001
TOTAL		26967	
Total Counted	921		
Species Richness	58		
Shannon Diversity (H)	2.39		

Cuyahoga River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	543	412417	0.588
Nitzschia filiformis	77	58483	0.083
Gomphonema parvulum var exilissimum	47	35697	0.051
Nitzschia inconspicua	41	31140	0.044
Nitzschia paleacea	39	29621	0.042
Nitzschia palea	16	12152	0.017
Nitzschia supralitorea	16	12152	0.017
Rhoicosphenia curvata	15	11393	0.016
Navicula cryptotenella	12	9114	0.013
Synedra fasiculata var truncata	12	9114	0.013
Nitzschia minuta	11	8355	0.012
Thalassiosira pseudonana	9	6836	0.010
Skeletonema potamos	8	6076	0.009
Aulacoseira alpigena	7	5317	0.008
Navicula atomus var permitis	7	5317	0.008
Synedra ulna	6	4557	0.006
Navicula subminuscula	5	3798	0.005
Gomphonema affine	4	3038	0.004
Navicula gregaria	4	3038	0.004
Nitzschia dissipata	3	2279	0.003
Nitzschia gracilis	3	2279	0.003
Stephanodiscus hantzschii	3	2279	0.003
Achnanthes minutissima	2	1519	0.002
Caloneis bacillum	2	1519	0.002
Gomphonema clavatum	2	1519	0.002
Melosira varians	2	1519	0.002
Navicula seminulum	2	1519	0.002
Nitzschia capitellata	2	1519	0.002
Nitzschia sigma	2	1519	0.002
Thalassiosira pseudonana var1	2	1519	0.002
Achnanthes lanceolata	1	760	0.001
Aulacoseira ambigua	1	760	0.001
Cocconeis placentula var lineata	1	760	0.001
Cyclotella atomus	1	760	0.001
Cyclotella atomus var4	1	760	0.001
Cyclotella meneghiniana	1	760	0.001

Cyclotella pseudostelligera var1	1	760	0.001
Cyclotella woltereckii	1	760	0.001
Navicula lacunolaciniata	1	760	0.001
Navicula lanceolata	1	760	0.001
Navicula minima	1	760	0.001
Navicula mutica var ventricosa	1	760	0.001
Nitzschia agnita	1	760	0.001
Nitzschia fonticola	1	760	0.001
Nitzschia intermedia	1	760	0.001
Nitzschia linearis var subtilis	1	760	0.001
Nitzschia recta	1	760	0.001
Stephanodiscus sp1	1	760	0.001
Surirella minuta	1	760	0.001
Thalassiosira weissflogii	1	760	0.001
TOTAL		701793	
Total Counted	924		
Species Richness	49		
Shannon Diversity (H)	1.88		

Cuyahoga River, upstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	407	7263	0.448
Navicula recens	133	2373	0.146
Nitzschia inconspicua	87	1553	0.096
Nitzschia palea	30	535	0.033
Achnanthes exigua	28	500	0.031
Nitzschia minuta	28	500	0.031
Achnanthes minutissima	27	482	0.030
Caloneis bacillum	18	321	0.020
Cyclotella atomus	15	268	0.017
Cyclotella meneghiniana	14	250	0.015
Amphora pediculus	7	125	0.008
Cyclotella cryptica	7	125	0.008
Navicula cryptotenella	7	125	0.008
Navicula subminuscula	7	125	0.008
Navicula viridula var germainii	7	125	0.008
Nitzschia rosenstockii	7	125	0.008
Navicula minima	6	107	0.007
Thalassiosira pseudonana var1	6	107	0.007
Aulacoseira alpigena	5	89	0.006
Navicula erifuga	5	89	0.006
Nitzschia supralitorea	5	89	0.006
Cocconeis placentula var euglypta	4	71	0.004
Gomphonema minutum	4	71	0.004
Melosira varians	4	71	0.004
Thalassiosira pseudonana	4	71	0.004
Gomphonema brasiliense	3	54	0.003
Gomphonema clavatum	3	54	0.003
Stephanodiscus hantzschii	3	54	0.003
Gomphonema affine	2	36	0.002
Navicula lanceolata	2	36	0.002
Navicula tenelloides	2	36	0.002
Nitzschia frustulum	2	36	0.002

Cuyahoga River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia pusilla	2	36	0.002
Cyclotella pseudostelligera var1	1	18	0.001
Gomphonema amoenum	1	18	0.001
Gomphonema gracile	1	18	0.001
Navicula capitatoradiata	1	18	0.001
Navicula cryptocephala	1	18	0.001
Navicula gregaria	1	18	0.001
Navicula sp2	1	18	0.001
Nitzschia agnita	1	18	0.001
Nitzschia angustiforaminata	1	18	0.001
Nitzschia clausii	1	18	0.001
Nitzschia coarctica	1	18	0.001
Nitzschia dissipata	1	18	0.001
Nitzschia filiformis	1	18	0.001
Nitzschia fonticola	1	18	0.001
Nitzschia microcephala	1	18	0.001
Nitzschia subacicularis	1	18	0.001
Rhoicosphenia curvata	1	18	0.001
Stephanodiscus alpinus	1	18	0.001
TOTAL		16221	
Total Counted	909		
Species Richness	51		
Shannon Diversity (H)	2.24		

Cuyahoga River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Melosira varians	630	30989	0.689
Synedra ulna	104	5116	0.114
Navicula lanceolata	29	1426	0.032
Gomphonema parvulum	25	1230	0.027
Nitzschia palea	23	1131	0.025
Synedra pulchella	16	787	0.018
Navicula gregaria	14	689	0.015
Synedra fasiculata var truncata	12	590	0.013
Nitzschia pusilla	8	394	0.009
Cyclotella meneghiniana	6	295	0.007
Rhoicosphenia curvata	6	295	0.007
Gomphonema olivaceum	5	246	0.005
Navicula cryptotenella	5	246	0.005
Aulacoseira alpigena	4	197	0.004
Diatoma vulgaris	4	197	0.004
Nitzschia acicularis	4	197	0.004
Synedra ulna var acus	3	148	0.003
Asterionella formosa	2	98	0.002
Gomphonema sp7	2	98	0.002
Nitzschia inconspicua	2	98	0.002
Achnanthes lanceolata	1	49	0.001

Cuyahoga River, downstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Amphora montana	1	49	0.001
Cyclostephanos invisitatus	1	49	0.001
Cyclotella stelligera	1	49	0.001
Fragilaria vaucheriae	1	49	0.001
Navicula tripunctata	1	49	0.001
Nitzschia gracilis	1	49	0.001
Nitzschia sociabilis	1	49	0.001
Skeletonema potamos	1	49	0.001
Thalassiosira pseudonana	1	49	0.001
TOTAL		44958	
Total Counted	914		
Species Richness	30		
Shannon Diversity (H)	1.37		

Cuyahoga River, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	658	58039	0.738
Navicula recens	50	4410	0.056
Gomphonema parvulum var exilissimum	32	2823	0.036
Nitzschia inconspicua	30	2646	0.034
Navicula minima	9	794	0.010
Fragilaria vaucheriae	8	706	0.009
Rhoicosphenia curvata	8	706	0.009
Nitzschia palea	7	617	0.008
Gomphonema gracile	6	529	0.007
Melosira varians	6	529	0.007
Navicula cryptotenella	6	529	0.007
Navicula schroeteri	6	529	0.007
Amphora pediculus	4	353	0.004
Cyclostephanos tholiformis	4	353	0.004
Navicula capitatoradiata	4	353	0.004
Nitzschia fonticola	4	353	0.004
Cymbella silesiaca	3	265	0.003
Navicula erifuga	3	265	0.003
Navicula lanceolata	3	265	0.003
Nitzschia clausii	3	265	0.003
Nitzschia frustulum	3	265	0.003
Nitzschia minuta	3	265	0.003
Achnanthes minutissima	2	176	0.002
Cocconeis placentula var euglypta	2	176	0.002
Cyclotella atomus	2	176	0.002
Cymbella affinis	2	176	0.002
Navicula absoluta	2	176	0.002
Navicula tripunctata	2	176	0.002
Navicula trivialis	2	176	0.002
Navicula veneta	2	176	0.002
Navicula viridula var germainii	2	176	0.002

Cuyahoga River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula viridula var rostellata	2	176	0.002
Nitzschia amphibia	2	176	0.002
Nitzschia dissipata	2	176	0.002
Stephanodiscus hantzschii	2	176	0.002
Cyclostephanos invisitatus	1	88	0.001
Cymatopleura solea	1	88	0.001
Navicula agrestis	1	88	0.001
Nitzschia microcephala	1	88	0.001
Nitzschia subacicularis	1	88	0.001
Thalassiosira pseudonana var1	1	88	0.001
TOTAL		78679	
Total Counted	892		
Species Richness	41		
Shannon Diversity (H)	1.36		

Cuyahoga River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema consector	463	248	0.523
Gomphonema parvulum	141	76	0.159
Gomphonema minutum	50	27	0.056
Gomphonema sp7	35	19	0.040
Synedra fasiculata var truncata	35	19	0.040
Rhoicosphenia curvata	31	17	0.035
Synedra ulna	26	14	0.029
Gomphonema parvulum var exilissimum	22	12	0.025
Navicula recens	18	10	0.020
Synedra pulchella	12	6	0.014
Cocconeis placentula var euglypta	6	3	0.007
Cocconeis placentula var lineata	6	3	0.007
Synedra ulna var acus	6	3	0.007
Gomphonema angustatum	4	2	0.005
Navicula capitatoradiata	4	2	0.005
Synedra tenera	4	2	0.005
Achnanthes minutissima	2	1	0.002
Navicula cryptotenella	2	1	0.002
Navicula tripunctata	2	1	0.002
Nitzschia aurariae	2	1	0.002
Nitzschia capitellata	2	1	0.002
Nitzschia inconspicua	2	1	0.002
Nitzschia lanceola var minutula	2	1	0.002
Nitzschia palea	2	1	0.002
Cocconeis pediculus	1	1	0.001
Cyclotella atomus	1	1	0.001
Cyclotella meneghiniana	1	1	0.001
Cyclotella sp1	1	1	0.001
Gomphonema gracile	1	1	0.001

Cuyahoga River, downstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Melosira varians	1	1	0.001
Navicula gregaria	1	1	0.001
TOTAL		475	
Total Counted	886		
Species Richness	31		
Shannon Diversity (H)	1.84		

Grand River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	344	230029	0.370
Cyclostephanos tholiformis	274	183220	0.295
Cocconeis pediculus	43	28754	0.046
Navicula lanceolata	31	20729	0.033
Nitzschia dissipata	16	10699	0.017
Stephanodiscus parvus	15	10030	0.016
Navicula gregaria	13	8693	0.014
Rhoicosphenia curvata	13	8693	0.014
Melosira varians	11	7356	0.012
Navicula cryptotenella	11	7356	0.012
Cymbella sinuata	10	6687	0.011
Nitzschia inconspicua	10	6687	0.011
Nitzschia sociabilis	8	5350	0.009
Thalassiosira pseudonana	8	5350	0.009
Amphora pediculus	7	4681	0.008
Stephanodiscus hantzschii	7	4681	0.008
Cyclotella meneghiniana	6	4012	0.006
Cocconeis placentula var euglypta	5	3343	0.005
Cocconeis placentula var lineata	5	3343	0.005
Cyclotella pseudostelligera	5	3343	0.005
Cyclotella woltereckii	5	3343	0.005
Navicula recens	5	3343	0.005
Gomphonema parvulum var exilissimum	4	2675	0.004
Nitzschia paleacea	4	2675	0.004
Nitzschia pusilla	4	2675	0.004
Surirella minuta	4	2675	0.004
Aulacoseira alpigena	3	2006	0.003
Cymbella affinis	3	2006	0.003
Fragilaria vaucheriae	3	2006	0.003
Navicula lacunolaciniata	3	2006	0.003
Stephanodiscus delicatus	3	2006	0.003
Caloneis bacillum	2	1337	0.002
Cyclostephanos invisitatus	2	1337	0.002
Cymbella silesiaca	2	1337	0.002
Diatoma vulgaris	2	1337	0.002
Gomphonema minutum	2	1337	0.002
Gomphonema olivaceum var minutissim	2	1337	0.002
Gomphonema parvulum	2	1337	0.002
Navicula capitatoradiata	2	1337	0.002
Nitzschia draveillensis	2	1337	0.002
Nitzschia fonticola	2	1337	0.002
Nitzschia microcephala	2	1337	0.002
Nitzschia minuta	2	1337	0.002
Nitzschia palea	2	1337	0.002
Nitzschia supralitorea	2	1337	0.002
Thalassiosira pseudonana var2	2	1337	0.002
Achnanthes lanceolata	1	669	0.001
Cymbella microcephala	1	669	0.001
Fragilaria capucina	1	669	0.001
Gomphonema olivaceum	1	669	0.001
Navicula cryptocephala	1	669	0.001
Navicula menisculus	1	669	0.001
Navicula mutica var ventricosa	1	669	0.001
Nitzschia compressa var vexans	1	669	0.001

Grand River, upstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia gracilis	1	669	0.001
Nitzschia pumila	1	669	0.001
Nitzschia subacicularis	1	669	0.001
Skeletonema potamos	1	669	0.001
Stephanodiscus hantzschii var tenui	1	669	0.001
Stephanodiscus minutulus	1	669	0.001
Synedra tenera	1	669	0.001
Thalassiosira pseudonana var1	1	669	0.001
TOTAL		621211	
Total Counted	929		
Species Richness	62		
Shannon Diversity (H)	2.27		

Grand River, downstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	153	37812	0.168
Cyclostephanos tholiformis	114	28173	0.125
Rhoicosphenia curvata	106	26196	0.116
Cymbella silesiaca	93	22984	0.102
Cocconeis pediculus	55	13592	0.060
Cymbella caespitosa	50	12357	0.055
Nitzschia sociabilis	45	11121	0.049
Cymbella affinis	42	10380	0.046
Navicula cryptotenella	42	10380	0.046
Nitzschia dissipata	36	8897	0.040
Gomphonema parvulum var exilissimum	31	7661	0.034
Melosira varians	22	5437	0.024
Diatoma vulgaris	18	4448	0.020
Synedra fasiculata var truncata	10	2471	0.011
Stephanodiscus delicatus	9	2224	0.010
Gomphonema minutum	7	1730	0.008
Navicula lanceolata	7	1730	0.008
Nitzschia paleacea	6	1483	0.007
Thalassiosira pseudonana	6	1483	0.007
Cymbella prostrata	5	1236	0.005
Fragilaria vaucheriae	5	1236	0.005
Navicula gregaria	5	1236	0.005
Cocconeis placentula var lineata	4	989	0.004
Cyclotella meneghiniana	4	989	0.004
Navicula capitatoradiata	3	741	0.003
Stephanodiscus parvus	3	741	0.003
Synedra ulna	3	741	0.003
Cymbella sinuata	2	494	0.002
Gomphonema gracile	2	494	0.002
Nitzschia inconspicua	2	494	0.002
Nitzschia microcephala	2	494	0.002
Nitzschia palea	2	494	0.002

Grand River, downstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Aulacoseira alpigena	1	247	0.001
Cyclotella pseudostelligera	1	247	0.001
Cyclotella pseudostelligera var1	1	247	0.001
Fragilaria capucina var mesolepta	1	247	0.001
Gomphonema olivaceum	1	247	0.001
Gomphonema parvulum	1	247	0.001
Navicula angusta	1	247	0.001
Navicula recens	1	247	0.001
Navicula subminuscula	1	247	0.001
Nitzschia filiformis	1	247	0.001
Nitzschia minuta	1	247	0.001
Stephanodiscus hantzschii	1	247	0.001
Stephanodiscus hantzschii var tenui	1	247	0.001
Stephanodiscus sp2	1	247	0.001
Surirella minuta	1	247	0.001
Synedra pulchella	1	247	0.001
Synedra tenera	1	247	0.001
TOTAL		225140	
Total Counted	911		
Species Richness	49		
Shannon Diversity (H)	2.83		

Grand River, downstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	545	257110	0.587
Cocconeis placentula var euglypta	110	51894	0.118
Gomphonema parvulum	88	41515	0.095
Navicula recens	47	22173	0.051
Gomphonema minutum	46	21701	0.050
Cocconeis placentula var lineata	26	12266	0.028
Navicula cryptotenella	8	3774	0.009
Gomphonema gracile	6	2831	0.006
Rhoicosphenia curvata	6	2831	0.006
Nitzschia dissipata	5	2359	0.005
Gomphonema truncatum	4	1887	0.004
Cyclostephanos tholiformis	3	1415	0.003
Navicula capitatoradiata	3	1415	0.003
Cyclotella meneghiniana	2	944	0.002
Cyclotella ocellata	2	944	0.002
Cymbella caespitosa	2	944	0.002
Cymbella tumida	2	944	0.002
Diatoma vulgaris	2	944	0.002
Gomphonema affine	2	944	0.002
Gomphonema olivaceum	2	944	0.002
Navicula minima	2	944	0.002
Nitzschia sociabilis	2	944	0.002
Synedra pulchella	2	944	0.002

Grand River, downstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes lanceolata	1	472	0.001
Cymbella microcephala	1	472	0.001
Gomphonema clavatum	1	472	0.001
Gomphonema sp6	1	472	0.001
Navicula vandamii	1	472	0.001
Nitzschia compressa var vexans	1	472	0.001
Nitzschia inconspicua	1	472	0.001
Nitzschia microcephala	1	472	0.001
Nitzschia minuta	1	472	0.001
Nitzschia palea	1	472	0.001
Stephanodiscus alpinus	1	472	0.001
Synedra fasiculata var truncata	1	472	0.001
TOTAL		438266	
Total Counted	929		
Species Richness	35		
Shannon Diversity (H)	1.60		

Grand River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Diatoma vulgaris	94	40054	0.103
Synedra ulna	70	29828	0.076
Nitzschia dissipata	55	23436	0.060
Synedra tenera	55	23436	0.060
Gomphonema parvulum	48	20453	0.052
Nitzschia archibaldii	45	19175	0.049
Nitzschia acicularis	39	16618	0.043
Melosira varians	38	16192	0.041
Diatoma tenuis	37	15766	0.040
Fragilaria vaucheriae	37	15766	0.040
Achnanthes minutissima	36	15340	0.039
Nitzschia palea	33	14062	0.036
Synedra pulchella	28	11931	0.031
Navicula lanceolata	23	9801	0.025
Synedra ulna var acus	21	8948	0.023
Cymbella affinis	20	8522	0.022
Gomphonema olivaceum	20	8522	0.022
Navicula cryptotenella	16	6818	0.017
Nitzschia graciliformis	14	5966	0.015
Stephanodiscus parvus	14	5966	0.015
Synedra fasiculata var truncata	14	5966	0.015
Cymbella silesiaca	13	5539	0.014
Fragilaria capucina	12	5113	0.013
Nitzschia paleacea	10	4261	0.011
Nitzschia recta	10	4261	0.011
Navicula gregaria	9	3835	0.010
Rhoicosphenia curvata	9	3835	0.010
Nitzschia linearis var subtilis	7	2983	0.008

Grand River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Cyclotella pseudostelligera	6	2557	0.007
Nitzschia inconspicua	6	2557	0.007
Cyclostephanos invisitatus	5	2131	0.005
Cyclostephanos tholiformis	5	2131	0.005
Nitzschia minuta	5	2131	0.005
Thalassiosira pseudonana	5	2131	0.005
Stephanodiscus hantzschii	4	1704	0.004
Thalassiosira pseudonana var1	4	1704	0.004
Navicula tripunctata	3	1278	0.003
Nitzschia rosenstockii	3	1278	0.003
Skeletonema potamos	3	1278	0.003
Surirella minuta	3	1278	0.003
Amphora pediculus	2	852	0.002
Cocconeis placentula var lineata	2	852	0.002
Cyclotella pseudostelligera var1	2	852	0.002
Cyclotella sp1	2	852	0.002
Navicula agrestis	2	852	0.002
Navicula capitatoradiata	2	852	0.002
Nitzschia draveillensis	2	852	0.002
Cocconeis placentula	1	426	0.001
Cyclotella cryptica	1	426	0.001
Cyclotella distinguenda var unipunc	1	426	0.001
Cyclotella meneghiniana	1	426	0.001
Cymbella prostrata	1	426	0.001
Cymbella tumida	1	426	0.001
Eunotia exigua	1	426	0.001
Gomphonema parvulum var exilissimum	1	426	0.001
Gomphonema truncatum	1	426	0.001
Meridion circulare	1	426	0.001
Navicula radiosa	1	426	0.001
Navicula tenelloides	1	426	0.001
Nitzschia amphibia	1	426	0.001
Nitzschia compressa var vexans	1	426	0.001
Nitzschia fonticola	1	426	0.001
Nitzschia gracilis	1	426	0.001
Nitzschia heufleriana	1	426	0.001
Nitzschia lanceola var minutula	1	426	0.001
Nitzschia sp18	1	426	0.001
Nitzschia supralitorea	1	426	0.001
Stephanodiscus delicatus	1	426	0.001
Surirella brebissonii var kuetzingi	1	426	0.001
Surirella sp1	1	426	0.001
TOTAL		390318	
Total Counted	916		
Species Richness	70		
Shannon Diversity (H)	3.47		

Grand River, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	291	1273	0.327
Melosira varians	86	376	0.097
Cocconeis placentula var euglypta	78	341	0.088
Nitzschia palea	60	262	0.067
Navicula capitatoradiata	59	258	0.066
Nitzschia inconspicua	37	162	0.042
Cymbella sinuata	29	127	0.033
Cymbella affinis	28	122	0.031
Navicula schroeteri	25	109	0.028
Nitzschia supralitorea	24	105	0.027
Cymbella silesiaca	21	92	0.024
Gomphonema parvulum	17	74	0.019
Gomphonema clavatum	13	57	0.015
Navicula cryptocephala	11	48	0.012
Navicula gregaria	9	39	0.010
Nitzschia microcephala	8	35	0.009
Surirella suecica	6	26	0.007
Nitzschia pusilla	5	22	0.006
Synedra pulchella	5	22	0.006
Cocconeis pediculus	4	17	0.004
Cymbella tumida	4	17	0.004
Fragilaria vaucheriae	4	17	0.004
Gomphonema minutum	4	17	0.004
Navicula cryptotenella	4	17	0.004
Navicula viridula var germainii	4	17	0.004
Fragilaria capucina	3	13	0.003
Navicula viridula var rostellata	3	13	0.003
Nitzschia acicularis	3	13	0.003
Nitzschia agnita	3	13	0.003
Achnanthes minutissima var robusta	2	9	0.002
Amphora inariensis	2	9	0.002
Cocconeis placentula var lineata	2	9	0.002
Cyclostephanos tholiformis	2	9	0.002
Cymbella microcephala	2	9	0.002
Gomphonema angustatum	2	9	0.002
Navicula capitata var hungarica	2	9	0.002
Navicula hustedtii	2	9	0.002
Nitzschia angustatula	2	9	0.002
Nitzschia calida	2	9	0.002
Nitzschia nereidis	2	9	0.002
Rhoicosphenia curvata	2	9	0.002
Synedra ulna	2	9	0.002
Synedra ulna var acus	2	9	0.002
Achnanthes exigua	1	4	0.001
Cyclotella cryptica	1	4	0.001
Cyclotella meneghiniana	1	4	0.001
Cymbella caespitosa	1	4	0.001
Gomphonema truncatum	1	4	0.001
Gyrosigma attenuatum	1	4	0.001
Navicula atomus var permitis	1	4	0.001
Navicula lanceolata	1	4	0.001
Nitzschia dissipata	1	4	0.001
Nitzschia rosenstockii	1	4	0.001
Nitzschia sinuata	1	4	0.001

Grand River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Stephanodiscus minutulus	1	4	0.001
Thalassiosira pseudonana var2	1	4	0.001
TOTAL		3889	
Total Counted	889		
Species Richness	56		
Shannon Diversity (H)	2.69		

Grand River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula recens	214	557	0.236
Gomphonema parvulum	132	344	0.146
Nitzschia dissipata	121	315	0.134
Gomphonema minutum	75	195	0.083
Navicula capitatoradiata	54	141	0.060
Achnanthes minutissima	53	138	0.058
Rhoicosphenia curvata	42	109	0.046
Navicula cryptotenella	25	65	0.028
Nitzschia palea	23	60	0.025
Cocconeis placentula var euglypta	21	55	0.023
Cymbella caespitosa	13	34	0.014
Gomphonema consector	12	31	0.013
Navicula tripunctata	11	29	0.012
Cymbella silesiaca	10	26	0.011
Synedra fasiculata var truncata	9	23	0.010
Cocconeis placentula var lineata	8	21	0.009
Cymbella prostrata	8	21	0.009
Gomphonema clavatum	6	16	0.007
Gomphonema truncatum	6	16	0.007
Navicula schroeteri	6	16	0.007
Nitzschia sociabilis	6	16	0.007
Cyclotella distinguenda	4	10	0.004
Fragilaria vaucheriae	4	10	0.004
Cocconeis pediculus	3	8	0.003
Nitzschia fonticola	3	8	0.003
Nitzschia inconspicua	3	8	0.003
Stephanodiscus parvus	3	8	0.003
Achnanthes minutissima var inconspi	2	5	0.002
Amphora libyca	2	5	0.002
Cymbella affinis	2	5	0.002
Diatoma vulgaris	2	5	0.002
Fragilaria capucina	2	5	0.002
Gomphonema gracile	2	5	0.002
Nitzschia clausii	2	5	0.002
Nitzschia filiformis	2	5	0.002
Nitzschia suchlandtii	2	5	0.002
Nitzschia supralitorea	2	5	0.002
Achnanthes lanceolata	1	3	0.001

Grand River, downstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Cocconeis placentula	1	3	0.001
Cyclostephanos tholiformis	1	3	0.001
Cyclotella cryptica	1	3	0.001
Cyclotella michiganiana	1	3	0.001
Cymbella microcephala	1	3	0.001
Cymbella tumida	1	3	0.001
Melosira varians	1	3	0.001
Navicula viridula	1	3	0.001
Navicula viridula var rostellata	1	3	0.001
Synedra tenera	1	3	0.001
TOTAL		2360	
Total Counted	906		
Species Richness	48		
Shannon Diversity (H)	2.68		

Huron River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	384	582723	0.436
Navicula agrestis	63	95603	0.072
Gomphonema parvulum	49	74358	0.056
Nitzschia palea	39	59183	0.044
Achnanthes lanceolata	37	56148	0.042
Nitzschia inconspicua	37	56148	0.042
Nitzschia supralitorea	29	44008	0.033
Navicula saprophila	25	37938	0.028
Nitzschia acicularis	19	28833	0.022
Melosira varians	15	22763	0.017
Cyclotella pseudostelligera var1	13	19728	0.015
Navicula atomus	13	19728	0.015
Navicula gregaria	12	18210	0.014
Navicula cryptotenella	11	16693	0.013
Navicula sp2	11	16693	0.013
Nitzschia minuta	10	15175	0.011
Cocconeis placentula var euglypta	9	13658	0.010
Thalassiosira pseudonana	9	13658	0.010
Nitzschia capitellata	6	9105	0.007
Nitzschia microcephala	6	9105	0.007
Thalassiosira pseudonana var1	6	9105	0.007
Cymbella silesiaca	5	7588	0.006
Navicula molestiformis	5	7588	0.006
Amphora pediculus	4	6070	0.005
Cymbella sinuata	4	6070	0.005
Navicula subminuscula	4	6070	0.005
Nitzschia sociabilis	4	6070	0.005
Skeletonema potamos	4	6070	0.005
Synedra fasiculata var truncata	4	6070	0.005
Navicula capitatoradiata	3	4553	0.003
Navicula menisculus var grunowii	3	4553	0.003
Navicula minima	3	4553	0.003
Nitzschia draveillensis	3	4553	0.003
Rhoicosphenia curvata	3	4553	0.003
Cyclotella meneghiniana	2	3035	0.002
Fragilaria capucina	2	3035	0.002
Gomphonema parvulum var exilissimum	2	3035	0.002
Navicula cincta	2	3035	0.002
Navicula erifuga	2	3035	0.002
Navicula lanceolata	2	3035	0.002
Nitzschia paleacea	2	3035	0.002
Nitzschia pusilla	2	3035	0.002
Stephanodiscus delicatus	2	3035	0.002
Cyclostephanos invisitatus	1	1518	0.001
Diatoma tenuis	1	1518	0.001
Navicula angusta	1	1518	0.001
Navicula minuscula	1	1518	0.001
Navicula mutica var ventricosa	1	1518	0.001
Nitzschia communis	1	1518	0.001
Nitzschia perminuta	1	1518	0.001
Simonsenia delognei	1	1518	0.001

Huron River, upstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Stephanodiscus hantzschii var tenui	1	1518	0.001
Surirella minuta	1	1518	0.001
TOTAL		1335406	
Total Counted	880		
Species Richness	53		
Shannon Diversity (H)	2.53		

Huron River, downstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Melosira varians	256	507574	0.281
Navicula recens	229	454041	0.252
Gomphonema parvulum	183	362836	0.201
Cymbella silesiaca	27	53533	0.030
Navicula saprophila	22	43620	0.024
Navicula cryptotenella	19	37672	0.021
Navicula lanceolata	15	29741	0.016
Nitzschia dissipata	14	27758	0.015
Nitzschia palea	11	21810	0.012
Nitzschia paleacea	10	19827	0.011
Cyclotella cryptica	9	17844	0.010
Navicula mutica	9	17844	0.010
Navicula tripunctata	8	15862	0.009
Nitzschia inconspicua	7	13879	0.008
Achnanthes minutissima	6	11896	0.007
Navicula atomus var permitis	6	11896	0.007
Nitzschia supralitorea	6	11896	0.007
Rhoicosphenia curvata	6	11896	0.007
Diatoma vulgaris	5	9914	0.005
Synedra fasiculata var truncata	5	9914	0.005
Synedra ulna	5	9914	0.005
Fragilaria capucina	4	7931	0.004
Nitzschia pusilla	4	7931	0.004
Gomphonema clavatum	3	5948	0.003
Navicula agrestis	3	5948	0.003
Navicula capitatoradiata	3	5948	0.003
Nitzschia agnita	3	5948	0.003
Synedra ulna var acus	3	5948	0.003
Thalassiosira pseudonana	3	5948	0.003
Navicula menisculus var grunowii	2	3965	0.002
Navicula sp2	2	3965	0.002
Nitzschia minuta	2	3965	0.002
Surirella angusta	2	3965	0.002
Surirella minuta	2	3965	0.002
Synedra tenera	2	3965	0.002
Asterionella formosa	1	1983	0.001
Aulacoseira alpigena	1	1983	0.001
Cocconeis placentula var euglypta	1	1983	0.001

Huron River, downstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Diatoma tenuis	1	1983	0.001
Fragilaria vaucheriae	1	1983	0.001
Gomphonema olivaceum	1	1983	0.001
Navicula angusta	1	1983	0.001
Navicula atomus	1	1983	0.001
Navicula menisculus	1	1983	0.001
Navicula trivialis	1	1983	0.001
Nitzschia communis	1	1983	0.001
Nitzschia recta	1	1983	0.001
Nitzschia sociabilis	1	1983	0.001
Stephanodiscus delicatus	1	1983	0.001
TOTAL		1804268	
Total Counted	910		
Species Richness	49		
Shannon Diversity (H)	2.27		

Huron River, upstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Rhoicosphenia curvata	247	11336	0.273
Navicula cryptotenella	100	4589	0.110
Navicula lanceolata	78	3580	0.086
Nitzschia dissipata	52	2386	0.057
Melosira varians	47	2157	0.052
Surirella minuta	41	1882	0.045
Navicula gregaria	29	1331	0.032
Cocconeis pediculus	26	1193	0.029
Cymbella silesiaca	24	1101	0.027
Nitzschia palea	24	1101	0.027
Navicula sp2	16	734	0.018
Navicula tripunctata	15	688	0.017
Nitzschia sociabilis	15	688	0.017
Nitzschia sp2	15	688	0.017
Navicula capitatoradiata	14	643	0.015
Gomphonema olivaceum	12	551	0.013
Cyclotella meneghiniana	9	413	0.010
Gomphonema parvulum	9	413	0.010
Nitzschia inconspicua	9	413	0.010
Achnanthes minutissima	8	367	0.009
Achnanthes lanceolata	7	321	0.008
Nitzschia sp20	7	321	0.008
Fragilaria vaucheriae	6	275	0.007
Synedra ulna	6	275	0.007
Nitzschia acicularis	5	229	0.006
Caloneis bacillum	4	184	0.004
Cymbella sinuata	4	184	0.004
Navicula subminuscula	4	184	0.004
Navicula viridula var germainii	4	184	0.004

Huron River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia capitellata	4	184	0.004
Nitzschia minuta	4	184	0.004
Amphora pediculus	3	138	0.003
Diatoma vulgaris	3	138	0.003
Gomphonema sp7	3	138	0.003
Navicula atomus var permitis	3	138	0.003
Navicula minima	3	138	0.003
Nitzschia recta	3	138	0.003
Cocconeis placentula var euglypta	2	92	0.002
Cyclostephanos tholiformis	2	92	0.002
Fragilaria capucina	2	92	0.002
Navicula atomus	2	92	0.002
Navicula heimansii	2	92	0.002
Navicula trivialis	2	92	0.002
Nitzschia frustulum	2	92	0.002
Nitzschia linearis var subtilis	2	92	0.002
Nitzschia paleacea	2	92	0.002
Surirella angusta	2	92	0.002
Synedra fasiculata var truncata	2	92	0.002
Synedra ulna var acus	2	92	0.002
Thalassiosira pseudonana	2	92	0.002
Cocconeis placentula var lineata	1	46	0.001
Cyclotella pseudostelligera	1	46	0.001
Cymbella caespitosa	1	46	0.001
Gomphonema minutum	1	46	0.001
Gomphonema parvulum f. saprophilum	1	46	0.001
Navicula monoculata	1	46	0.001
Navicula salinarum	1	46	0.001
Nitzschia apiculata	1	46	0.001
Nitzschia gracilis	1	46	0.001
Nitzschia linearis	1	46	0.001
Nitzschia nereidis	1	46	0.001
Nitzschia supralitorea	1	46	0.001
Stephanodiscus hantzschii	1	46	0.001
Surirella brebissonii var kuetzingi	1	46	0.001
Synedra tenera	1	46	0.001
Thalassiosira pseudonana var1	1	46	0.001
TOTAL		41534	
Total Counted	905		
Species Richness	66		
Shannon Diversity (H)	2.97		

Huron River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Melosira varians	250	11622	0.272
Gomphonema olivaceum	126	5857	0.137
Nitzschia dissipata	104	4835	0.113

Huron River, downstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula cryptotenella	55	2557	0.060
Navicula tripunctata	51	2371	0.056
Synedra ulna	49	2278	0.053
Navicula lanceolata	37	1720	0.040
Nitzschia palea	33	1534	0.036
Navicula capitatoradiata	19	883	0.021
Nitzschia sociabilis	18	837	0.020
Navicula sp2	16	744	0.017
Gomphonema parvulum	15	697	0.016
Rhoicosphenia curvata	15	697	0.016
Cymbella silesiaca	11	511	0.012
Diatoma tenuis	9	418	0.010
Fragilaria vaucheriae	6	279	0.007
Navicula heimansii	6	279	0.007
Surirella minuta	6	279	0.007
Caloneis bacillum	5	232	0.005
Navicula gregaria	5	232	0.005
Synedra ulna var acus	5	232	0.005
Thalassiosira pseudonana	5	232	0.005
Cyclostephanos invisitatus	4	186	0.004
Synedra fasiculata var truncata	4	186	0.004
Synedra pulchella	4	186	0.004
Cyclotella meneghiniana	3	139	0.003
Navicula cryptocephala	3	139	0.003
Navicula trivialis	3	139	0.003
Navicula viridula var germainii	3	139	0.003
Skeletonema potamos	3	139	0.003
Stephanodiscus parvus	3	139	0.003
Thalassiosira pseudonana var2	3	139	0.003
Cyclostephanos tholiformis	2	93	0.002
Cyclotella atomus	2	93	0.002
Cyclotella pseudostelligera	2	93	0.002
Fragilaria capucina	2	93	0.002
Gomphonema parvulum f. saprophilum	2	93	0.002
Navicula rhynchocephala	2	93	0.002
Navicula viridula	2	93	0.002
Nitzschia inconspicua	2	93	0.002
Synedra tenera	2	93	0.002
Achnanthes lanceolata	1	46	0.001
Achnanthes minutissima	1	46	0.001
Asterionella formosa	1	46	0.001
Cyclotella cryptica	1	46	0.001
Cyclotella sp1	1	46	0.001
Cyclotella stelligera	1	46	0.001
Diatoma vulgaris	1	46	0.001
Gomphonema parvulum var exilissimum	1	46	0.001
Navicula atomus var permitis	1	46	0.001
Navicula lacunolaciniata	1	46	0.001
Navicula minuscula	1	46	0.001
Navicula slesvicensis	1	46	0.001
Nitzschia acicularis	1	46	0.001
Nitzschia archibaldii	1	46	0.001
Nitzschia dubia	1	46	0.001
Nitzschia minuta	1	46	0.001

Huron River, downstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia perspicua	1	46	0.001
Nitzschia supralitorea	1	46	0.001
Stephanodiscus hantzschii	1	46	0.001
Surirella suecica	1	46	0.001
Thalassiosira pseudonana var1	1	46	0.001
TOTAL		42676	
Total Counted	918		
Species Richness	62		
Shannon Diversity (H)	2.76		

Huron River, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia palea	116	12821	0.173
Melosira varians	97	10721	0.145
Navicula mutica var ventricosa	84	9284	0.126
Cyclotella cryptica	29	3205	0.043
Nitzschia supralitorea	21	2321	0.031
Nitzschia inconspicua	19	2100	0.028
Nitzschia clausii	18	1989	0.027
Achnanthes minutissima	17	1879	0.025
Navicula schroeteri	16	1768	0.024
Cyclotella pseudostelligera var1	15	1658	0.022
Navicula veneta	15	1658	0.022
Cyclotella meneghiniana	14	1547	0.021
Navicula capitatoradiata	10	1105	0.015
Navicula viridula var germainii	10	1105	0.015
Nitzschia brevissima	10	1105	0.015
Nitzschia intermedia	10	1105	0.015
Cyclostephanos tholiformis	8	884	0.012
Navicula cryptotenella	7	774	0.010
Navicula erifuga	7	774	0.010
Navicula gregaria	7	774	0.010
Nitzschia dissipata	7	774	0.010
Navicula vandamii	6	663	0.009
Nitzschia capitellata	6	663	0.009
Cyclotella atomus	5	553	0.007
Skeletonema potamos	5	553	0.007
Thalassiosira pseudonana	5	553	0.007
Caloneis bacillum	4	442	0.006
Cyclotella pseudostelligera	4	442	0.006
Gomphonema minutum	4	442	0.006
Navicula lanceolata	4	442	0.006
Navicula minima	4	442	0.006
Nitzschia aurariae	4	442	0.006
Nitzschia microcephala	4	442	0.006
Nitzschia minuta	4	442	0.006
Navicula molestiformis	3	332	0.004

Huron River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula subminuscula	3	332	0.004
Navicula viridula	3	332	0.004
Nitzschia fonticola	3	332	0.004
Nitzschia rosenstockii	3	332	0.004
Achnanthes lanceolata	2	221	0.003
Amphora inariensis	2	221	0.003
Cymbella silesiaca	2	221	0.003
Cymbella tumida	2	221	0.003
Gomphonema parvulum	2	221	0.003
Navicula cincta	2	221	0.003
Navicula pupula	2	221	0.003
Nitzschia agnita	2	221	0.003
Nitzschia amphibia	2	221	0.003
Nitzschia angustiforaminata	2	221	0.003
Nitzschia draveillensis	2	221	0.003
Nitzschia nereidis	2	221	0.003
Nitzschia pumila	2	221	0.003
Nitzschia reversa	2	221	0.003
Nitzschia sp23	2	221	0.003
Rhoicosphenia curvata	2	221	0.003
Simonsenia delognei	2	221	0.003
Stephanodiscus hantzschii	2	221	0.003
Amphora libyca	1	111	0.001
Amphora pediculus	1	111	0.001
Cocconeis placentula var euglypta	1	111	0.001
Cyclotella sp1	1	111	0.001
Cyclotella woltereckii	1	111	0.001
Diatoma vulgaris	1	111	0.001
Fragilaria capucina	1	111	0.001
Navicula agrestis	1	111	0.001
Navicula atomus	1	111	0.001
Navicula atomus var permitis	1	111	0.001
Navicula menisculus	1	111	0.001
Navicula minuscula	1	111	0.001
Navicula monoculata	1	111	0.001
Navicula praeterita	1	111	0.001
Navicula saprophila	1	111	0.001
Nitzschia compressa var vexans	1	111	0.001
Nitzschia frustulum	1	111	0.001
Nitzschia lanceola var minutula	1	111	0.001
Nitzschia linearis	1	111	0.001
Stauroneis smithii	1	111	0.001
Surirella minuta	1	111	0.001
Thalassiosira pseudonana var2	1	111	0.001
TOTAL		73941	
Total Counted	669		
Species Richness	79		
Shannon Diversity (H)	3.30		

Huron River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula saprophila	275	104495	0.304
Navicula recens	231	87775	0.256
Gomphonema parvulum	77	29258	0.085
Nitzschia palea	60	22799	0.066
Nitzschia gracilis	33	12539	0.037
Cocconeis placentula var euglypta	25	9500	0.028
Gomphonema sp4	17	6460	0.019
Gomphonema amoenum	15	5700	0.017
Synedra tenera	14	5320	0.015
Thalassiosira pseudonana	13	4940	0.014
Navicula viridula var germainii	12	4560	0.013
Gomphonema minutum	9	3420	0.010
Nitzschia angustatula	8	3040	0.009
Gomphonema consector	7	2660	0.008
Stephanodiscus hantzschii	7	2660	0.008
Cyclostephanos invisitatus	6	2280	0.007
Cyclostephanos tholiformis	6	2280	0.007
Nitzschia dissipata	6	2280	0.007
Nitzschia subacicularis	6	2280	0.007
Cocconeis placentula var lineata	5	1900	0.006
Cyclotella pseudostelligera var1	5	1900	0.006
Navicula capitatoradiata	4	1520	0.004
Achnanthes minutissima	3	1140	0.003
Aulacoseira italica	3	1140	0.003
Cyclotella cryptica	3	1140	0.003
Nitzschia acicularis	3	1140	0.003
Nitzschia agnita	3	1140	0.003
Nitzschia fonticola	3	1140	0.003
Synedra fasiculata var truncata	3	1140	0.003
Amphora pediculus	2	760	0.002
Cyclotella atomus	2	760	0.002
Cyclotella ocellata	2	760	0.002
Cyclotella pseudostelligera	2	760	0.002
Cyclotella pseudostelligera var3	2	760	0.002
Gomphonema clavatum	2	760	0.002
Navicula atomus var permitis	2	760	0.002
Navicula minima	2	760	0.002
Nitzschia agnewii	2	760	0.002
Nitzschia draveillensis	2	760	0.002
Nitzschia intermedia	2	760	0.002
Nitzschia rosenstockii	2	760	0.002
Nitzschia supralitorea	2	760	0.002
Stephanodiscus parvus	2	760	0.002
Thalassiosira pseudonana var2	2	760	0.002
Achnanthes lanceolata	1	380	0.001
Cocconeis pediculus	1	380	0.001
Cocconeis placentula	1	380	0.001
Cyclotella meneghiniana	1	380	0.001
Cyclotella michiganiana	1	380	0.001
Cyclotella stelligera	1	380	0.001
Melosira varians	1	380	0.001
Navicula gregaria	1	380	0.001
Nitzschia archibaldii	1	380	0.001
Stephanodiscus alpinus	1	380	0.001

Huron River, downstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Surirella minuta	1	380	0.001
Thalassiosira pseudonana var1	1	380	0.001
TOTAL		343502	
Total Counted	904		
Species Richness	56		
Shannon Diversity (H)	2.45		

Maumee River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema minutum	105	2599	0.118
Cocconeis pediculus	89	2203	0.100
Gomphonema parvulum	68	1683	0.076
Nitzschia supralitorea	66	1634	0.074
Nitzschia inconspicua	62	1535	0.070
Achnanthes minutissima	33	817	0.037
Stephanodiscus hantzschii	31	767	0.035
Navicula cryptocephala	24	594	0.027
Nitzschia palea	23	569	0.026
Cocconeis placentula var euglypta	22	545	0.025
Navicula capitatoradiata	21	520	0.024
Navicula viridula var germainii	21	520	0.024
Cyclotella cryptica	20	495	0.022
Cyclotella atomus	17	421	0.019
Nitzschia dissipata	16	396	0.018
Nitzschia frustulum	15	371	0.017
Stephanodiscus delicatus	15	371	0.017
Navicula gregaria	14	347	0.016
Thalassiosira pseudonana	13	322	0.015
Achnanthes lanceolata	12	297	0.013
Navicula subminuscula	12	297	0.013
Amphora pediculus	11	272	0.012
Stephanodiscus parvus	11	272	0.012
Navicula schroeteri	10	248	0.011
Aulacoseira alpigena	8	198	0.009
Melosira varians	7	173	0.008
Navicula angusta	7	173	0.008
Navicula capitata	7	173	0.008
Navicula heimansii	7	173	0.008
Surirella minuta	7	173	0.008
Cyclostephanos invisitatus	6	149	0.007
Navicula erifuga	6	149	0.007
Navicula viridula var rostellata	6	149	0.007
Skeletonema potamos	6	149	0.007
Navicula atomus var permitis	5	124	0.006
Navicula saprophila	5	124	0.006
Rhoicosphenia curvata	5	124	0.006
Fragilaria capucina	4	99	0.004
Navicula molestiformis	4	99	0.004
Navicula sp2	4	99	0.004
Nitzschia rosenstockii	4	99	0.004
Nitzschia subacicularis	4	99	0.004
Surirella suecica	4	99	0.004
Cyclostephanos tholiformis	3	74	0.003
Cyclotella meneghiniana	3	74	0.003
Frustulia vulgaris	3	74	0.003
Nitzschia paleacea	3	74	0.003
Thalassiosira pseudonana var1	3	74	0.003
Amphora montana	2	50	0.002
Asterionella formosa	2	50	0.002
Aulacoseira granulata	2	50	0.002
Cyclotella pseudostelligera	2	50	0.002
Cymbella silesiaca	2	50	0.002
Navicula menisculus var grunowii	2	50	0.002

Maumee River, upstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula trivialis	2	50	0.002
Nitzschia minuta	2	50	0.002
Nitzschia perminuta	2	50	0.002
Nitzschia sociabilis	2	50	0.002
Synedra tenera	2	50	0.002
Cocconeis placentula var lineata	1	25	0.001
Cyclotella stelligera	1	25	0.001
Cyclotella woltereckii	1	25	0.001
Cylindrotheca gracilis	1	25	0.001
Fragilaria crotonensis	1	25	0.001
Navicula agrestis	1	25	0.001
Navicula lacunolaciniata	1	25	0.001
Navicula minima	1	25	0.001
Navicula minuscula	1	25	0.001
Navicula mutica	1	25	0.001
Navicula phyllepta	1	25	0.001
Nitzschia archibaldii	1	25	0.001
Nitzschia filiformis	1	25	0.001
Nitzschia fonticola	1	25	0.001
Rhopalodia musculus	1	25	0.001
Synedra ulna	1	25	0.001
Thalassiosira pseudonana var2	1	25	0.001
TOTAL		22056	
Total Counted	891		
Species Richness	76		
Shannon Diversity (H)	3.50		

Maumee River, upstream, diatometer, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	75	0.082
Cyclostephanos tholiformis	68	0.074
Cyclotella atomus	68	0.074
Nitzschia inconspicua	63	0.069
Aulacoseira alpigena	61	0.067
Nitzschia palea	47	0.051
Achnanthes minutissima	45	0.049
Navicula veneta	44	0.048
Navicula tenelloides	28	0.031
Navicula vandamii	28	0.031
Nitzschia supralitorea	28	0.031
Navicula erifuga	20	0.022
Navicula pupula	19	0.021
Stephanodiscus hantzschii	17	0.019
Navicula viridula var germainii	16	0.017
Nitzschia desertorum	15	0.016
Amphora pediculus	14	0.015
Cyclotella meneghiniana	11	0.012

Maumee River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia frustulum	11	0.012
Gomphonema parvulum	10	0.011
Navicula cryptocephala	9	0.010
Navicula tenera	9	0.010
Navicula viridula var rostellata	9	0.010
Nitzschia dissipata	9	0.010
Navicula cryptotenella	8	0.009
Nitzschia rosenstockii	8	0.009
Navicula schroeteri	7	0.008
Nitzschia capitellata	7	0.008
Nitzschia minuta	7	0.008
Achnanthes lanceolata	6	0.007
Navicula molestiformis	6	0.007
Navicula subminuscula	6	0.007
Nitzschia perminuta	6	0.007
Cyclotella pseudostelligera var1	5	0.005
Gyrosigma scalproides	5	0.005
Navicula lanceolata	5	0.005
Navicula minima	5	0.005
Amphora inariensis	4	0.004
Cyclotella meneghiniana f. plana	4	0.004
Navicula minuscula	4	0.004
Navicula recens	4	0.004
Nitzschia amphibia	4	0.004
Nitzschia clausii	4	0.004
Nitzschia fonticola	4	0.004
Nitzschia microcephala	4	0.004
Aulacoseira granulata	3	0.003
Navicula capitata	3	0.003
Nitzschia agnita	3	0.003
Nitzschia angustatula	3	0.003
Nitzschia gracilis	3	0.003
Achnanthes exigua	2	0.002
Achnanthes minutissima var robusta	2	0.002
Amphora montana	2	0.002
Cocconeis placentula var lineata	2	0.002
Cyclotella pseudostelligera	2	0.002
Fragilaria construens	2	0.002
Navicula atomus var permitis	2	0.002
Navicula capitatoradiata	2	0.002
Navicula gregaria	2	0.002
Navicula menisculus	2	0.002
Navicula saprophila	2	0.002
Navicula sp2	2	0.002
Nitzschia agnewii	2	0.002
Nitzschia filiformis	2	0.002
Stephanodiscus delicatus	2	0.002
Stephanodiscus parvus	2	0.002
Thalassiosira pseudonana	2	0.002
Thalassiosira pseudonana var1	2	0.002
Achnanthes ricula	1	0.001
Amphipleura pellucida	1	0.001
Caloneis bacillum	1	0.001
Cocconeis pediculus	1	0.001

Maumee River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cocconeis placentula var euglypta	1	0.001
Cyclotella pseudostelligera var3	1	0.001
Cyclotella stelligera	1	0.001
Cyclotella woltereckii	1	0.001
Cymbella sinuata	1	0.001
Cymbella sp1	1	0.001
Gomphonema minutum	1	0.001
Melosira varians	1	0.001
Navicula agrestis	1	0.001
Navicula decussis	1	0.001
Navicula hustedtii	1	0.001
Navicula salinarum	1	0.001
Nitzschia acicularis	1	0.001
Nitzschia compressa var vexans	1	0.001
Nitzschia intermedia	1	0.001
Nitzschia levidensis	1	0.001
Nitzschia pusilla	1	0.001
Nitzschia sigma	1	0.001
Nitzschia subacicularis	1	0.001
Stauroneis anceps	1	0.001
Surirella minuta	1	0.001
Surirella suecica	1	0.001
Synedra parasitica var subconstrict	1	0.001
Thalassiosira weissflogii	1	0.001

Total Counted	916
Species Richness	95
Shannon Diversity (H)	3.66

Maumee River, downstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	248	1076	0.271
Navicula saprophila	161	698	0.176
Navicula recens	160	694	0.175
Navicula subminuscula	108	468	0.118
Cocconeis placentula var euglypta	61	265	0.067
Nitzschia inconspicua	40	173	0.044
Navicula atomus var permitis	23	100	0.025
Nitzschia palea	16	69	0.017
Gomphonema parvulum f. saprophilum	12	52	0.013
Navicula minima	10	43	0.011
Nitzschia dissipata	10	43	0.011
Gomphonema clavatum	6	26	0.007
Synedra ulna	5	22	0.005
Navicula cryptotenella	4	17	0.004
Navicula molestiformis	4	17	0.004
Navicula schroeteri	4	17	0.004
Navicula sp10	4	17	0.004

Maumee River, downstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Caloneis bacillum	3	13	0.003
Navicula erifuga	3	13	0.003
Navicula goeppertiana	3	13	0.003
Navicula viridula var germainii	3	13	0.003
Amphora pediculus	2	9	0.002
Cocconeis placentula var lineata	2	9	0.002
Cyclotella atomus	2	9	0.002
Navicula seminulum	2	9	0.002
Nitzschia filiformis	2	9	0.002
Nitzschia tubicola	2	9	0.002
Achnanthes minutissima	1	4	0.001
Cocconeis pediculus	1	4	0.001
Cyclotella cryptica	1	4	0.001
Cyclotella pseudostelligera	1	4	0.001
Cymbella silesiaca	1	4	0.001
Fragilaria capucina	1	4	0.001
Gomphonema parvulum var exilissimum	1	4	0.001
Navicula agrestis	1	4	0.001
Navicula aquaedurae	1	4	0.001
Navicula menisculus	1	4	0.001
Navicula minuscula	1	4	0.001
Nitzschia desertorum	1	4	0.001
Nitzschia fonticola	1	4	0.001
Nitzschia levidensis	1	4	0.001
Synedra fasiculata var truncata	1	4	0.001
Thalassiosira pseudonana	1	4	0.001
TOTAL		3973	
Total Counted	916		
Species Richness	43		
Shannon Diversity (H)	2.28		

Maumee River, upstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Surirella minuta	100	34	0.133
Achnanthes minutissima	83	29	0.110
Gomphonema parvulum	76	26	0.101
Nitzschia dissipata	33	11	0.044
Rhoicosphenia curvata	30	10	0.040
Navicula cryptotenella	29	10	0.039
Cyclotella atomus	27	9	0.036
Navicula gregaria	24	8	0.032
Cyclotella meneghiniana	23	8	0.031
Cymbella silesiaca	23	8	0.031
Synedra ulna	23	8	0.031
Nitzschia palea	22	8	0.029
Cyclotella meneghiniana f. plana	19	7	0.025
Melosira varians	18	6	0.024

Maumee River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula lanceolata	18	6	0.024
Gomphonema olivaceum	10	3	0.013
Synedra fasiculata var truncata	10	3	0.013
Diatoma tenuis	8	3	0.011
Fragilaria capucina	8	3	0.011
Synedra tenera	8	3	0.011
Aulacoseira alpigena	7	2	0.009
Navicula tripunctata	7	2	0.009
Cyclostephanos invisitatus	6	2	0.008
Cyclostephanos tholiformis	6	2	0.008
Navicula cryptocephala	6	2	0.008
Navicula sp2	6	2	0.008
Nitzschia acicularis	6	2	0.008
Nitzschia minuta	6	2	0.008
Achnanthes lanceolata	5	2	0.007
Diatoma vulgaris	5	2	0.007
Fragilaria vaucheriae	5	2	0.007
Navicula agrestis	5	2	0.007
Synedra pulchella	5	2	0.007
Synedra ulna var acus	5	2	0.007
Cocconeis pediculus	4	1	0.005
Cyclotella cryptica	4	1	0.005
Gomphonema minutum	4	1	0.005
Amphora pediculus	3	1	0.004
Gomphonema parvulum f. saprophilum	3	1	0.004
Navicula capitatoradiata	3	1	0.004
Navicula goeppertiana	3	1	0.004
Nitzschia apiculata	3	1	0.004
Nitzschia inconspicua	3	1	0.004
Nitzschia supralitorea	3	1	0.004
Stephanodiscus hantzschii	3	1	0.004
Aulacoseira granulata	2	1	0.003
Caloneis bacillum	2	1	0.003
Cocconeis placentula var euglypta	2	1	0.003
Cylindrotheca gracilis	2	1	0.003
Gomphonema affine	2	1	0.003
Navicula capitata	2	1	0.003
Nitzschia frustulum	2	1	0.003
Nitzschia hungarica	2	1	0.003
Nitzschia linearis var subtilis	2	1	0.003
Nitzschia pumila	2	1	0.003
Surirella suecica	2	1	0.003
Amphora inariensis	1	0	0.001
Asterionella formosa	1	0	0.001
Cyclotella pseudostelligera	1	0	0.001
Cymbella caespitosa	1	0	0.001
Cymbella prostrata	1	0	0.001
Cymbella sinuata	1	0	0.001
Fragilaria capucina var mesolepta	1	0	0.001
Gomphonema clavatum	1	0	0.001
Gyrosigma scalproides	1	0	0.001
Navicula menisculus var grunowii	1	0	0.001
Navicula mutica	1	0	0.001
Navicula recens	1	0	0.001

Maumee River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula salinarum	1	0	0.001
Nitzschia fonticola	1	0	0.001
Nitzschia levidensis	1	0	0.001
Nitzschia paleacea	1	0	0.001
Nitzschia pusilla	1	0	0.001
Nitzschia recta	1	0	0.001
Stephanodiscus delicatus	1	0	0.001
Stephanodiscus parvus	1	0	0.001
Surirella brebissonii var kuetzingi	1	0	0.001
Thalassiosira pseudonana	1	0	0.001
Thalassiosira pseudonana var1	1	0	0.001
TOTAL		259	
Total Counted	753		
Species Richness	79		
Shannon Diversity (H)	3.47		

Maumee River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	202	221	0.225
Melosira varians	176	192	0.196
Fragilaria vaucheriae	113	123	0.126
Gomphonema olivaceum	36	39	0.040
Navicula lanceolata	32	35	0.036
Synedra ulna	32	35	0.036
Navicula capitatoradiata	28	31	0.031
Nitzschia dissipata	25	27	0.028
Nitzschia palea	21	23	0.023
Navicula mutica	17	19	0.019
Navicula cryptotenella	16	17	0.018
Navicula tripunctata	14	15	0.016
Navicula gregaria	13	14	0.015
Synedra fasiculata var truncata	11	12	0.012
Cyclotella atomus	10	11	0.011
Diatoma vulgaris	10	11	0.011
Navicula sp2	10	11	0.011
Cyclotella meneghiniana	9	10	0.010
Navicula recens	9	10	0.010
Nitzschia sociabilis	9	10	0.010
Fragilaria capucina	8	9	0.009
Stephanodiscus hantzschii	8	9	0.009
Cyclostephanos tholiformis	6	7	0.007
Nitzschia minuta	6	7	0.007
Nitzschia inconspicua	5	5	0.006
Synedra tenera	5	5	0.006
Achnanthes minutissima	4	4	0.004
Cyclostephanos invisitatus	4	4	0.004
Gomphonema sp7	4	4	0.004

Maumee River, downstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Rhoicosphenia curvata	4	4	0.004
Cyclotella cryptica	3	3	0.003
Navicula subminuscula	3	3	0.003
Nitzschia gracilis	3	3	0.003
Synedra ulna var acus	3	3	0.003
Cyclotella pseudostelligera	2	2	0.002
Gomphonema minutum	2	2	0.002
Navicula agrestis	2	2	0.002
Navicula capitata	2	2	0.002
Navicula cryptocephala	2	2	0.002
Navicula phyllepta	2	2	0.002
Navicula praeterita	2	2	0.002
Navicula seminulum	2	2	0.002
Nitzschia sp3	2	2	0.002
Nitzschia supralitorea	2	2	0.002
Surirella minuta	2	2	0.002
Thalassiosira pseudonana	2	2	0.002
Aulacoseira alpigena	1	1	0.001
Caloneis bacillum	1	1	0.001
Cymbella silesiaca	1	1	0.001
Diatoma tenuis	1	1	0.001
Gomphonema parvulum f. saprophilum	1	1	0.001
Gomphonema sp5	1	1	0.001
Hantzschia amphioxys	1	1	0.001
Navicula accomoda	1	1	0.001
Navicula atomus var permitis	1	1	0.001
Navicula saprophila	1	1	0.001
Nitzschia agnita	1	1	0.001
Nitzschia capitellata	1	1	0.001
Synedra pulchella	1	1	0.001
TOTAL		979	
Total Counted	896		
Species Richness	59		
Shannon Diversity (H)	2.84		

Maumee River, upstream, diatometer, 21 september 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Cyclotella atomus	181	9550	0.197
Nitzschia palea	89	4696	0.097
Aulacoseira alpigena	79	4168	0.086
Cyclotella cryptica	75	3957	0.082
Cyclostephanos tholiformis	72	3799	0.078
Stephanodiscus hantzschii	60	3166	0.065
Nitzschia inconspicua	46	2427	0.050
Gomphonema parvulum	31	1636	0.034
Navicula cryptotenella	21	1108	0.023
Navicula erifuga	14	739	0.015

Maumee River, upstream, diatometer, 21 september 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula phyllepta	14	739	0.015
Cyclostephanos invisitatus	13	686	0.014
Navicula viridula var germainii	13	686	0.014
Nitzschia rosenstockii	13	686	0.014
Thalassiosira pseudonana	13	686	0.014
Navicula capitatoradiata	12	633	0.013
Cyclotella stelligera	11	580	0.012
Nitzschia intermedia	11	580	0.012
Cyclotella meneghiniana	9	475	0.010
Navicula minima	9	475	0.010
Navicula schroeteri	8	422	0.009
Nitzschia minuta	8	422	0.009
Cyclotella pseudostelligera	7	369	0.008
Stephanodiscus alpinus	7	369	0.008
Aulacoseira granulata	6	317	0.007
Achnanthes minutissima	5	264	0.005
Cocconeis placentula var euglypta	5	264	0.005
Cyclotella meneghiniana f. plana	5	264	0.005
Cyclotella woltereckii	5	264	0.005
Nitzschia frustulum	5	264	0.005
Cyclotella pseudostelligera var3	4	211	0.004
Navicula tenelloides	4	211	0.004
Thalassiosira pseudonana var1	4	211	0.004
Cyclotella pseudostelligera var1	3	158	0.003
Navicula gregaria	3	158	0.003
Navicula recens	3	158	0.003
Achnanthes exigua	2	106	0.002
Amphora inariensis	2	106	0.002
Aulacoseira ambigua	2	106	0.002
Cocconeis placentula var lineata	2	106	0.002
Gomphonema minutum	2	106	0.002
Navicula cincta	2	106	0.002
Navicula molestiformis	2	106	0.002
Navicula seminulum	2	106	0.002
Navicula subminuscula	2	106	0.002
Navicula veneta	2	106	0.002
Navicula viridula var rostellata	2	106	0.002
Nitzschia acicularis	2	106	0.002
Nitzschia agnewii	2	106	0.002
Nitzschia aurariae	2	106	0.002
Nitzschia dissipata	2	106	0.002
Nitzschia draveillensis	2	106	0.002
Nitzschia microcephala	2	106	0.002
Nitzschia perminuta	2	106	0.002
Nitzschia supralitorea	2	106	0.002
Stephanodiscus parvus	2	106	0.002
Achnanthes kryophila	1	53	0.001
Cyclotella sp1	1	53	0.001
Gomphonema affine	1	53	0.001
Gyrosigma scalproides	1	53	0.001
Gyrosigma spencerii	1	53	0.001
Navicula capitata	1	53	0.001
Nitzschia capitellata	1	53	0.001
Nitzschia gracilis	1	53	0.001

Maumee River, upstream, diatometer, 21 september 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia obsoleta	1	53	0.001
Simonsenia delognei	1	53	0.001
Thalassiosira pseudonana var2	1	53	0.001
Thalassiosira weissflogii	1	53	0.001
TOTAL		48541	
Total Counted	920		
Species Richness	68		
Shannon Diversity (H)	3.12		

Maumee River, downstream, diatometer, 21 september 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	312	0.615
Navicula recens	53	0.105
Gomphonema clavatum	39	0.077
Cocconeis placentula var euglypta	30	0.059
Gomphonema parvulum f. saprophilum	13	0.026
Gomphonema sp4	11	0.022
Cymbella tumida	10	0.020
Synedra ulna	9	0.018
Cocconeis placentula var lineata	5	0.010
Melosira varians	5	0.010
Nitzschia dissipata	5	0.010
Gomphonema consector	2	0.004
Navicula schroeteri	2	0.004
Navicula viridula var germainii	2	0.004
Nitzschia palea	2	0.004
Achnanthes minutissima	1	0.002
Cyclotella atomus	1	0.002
Cyclotella cryptica	1	0.002
Navicula goeppertiana	1	0.002
Nitzschia filiformis	1	0.002
Synedra pulchella	1	0.002
Thalassiosira pseudonana	1	0.002
Total Counted	507	
Species Richness	22	
Shannon Diversity (H)	1.54	

Old Woman Creek, upstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	520	0.420
Gomphonema minutum	184	0.149
Cocconeis placentula var lineata	89	0.072
Melosira varians	77	0.062
Achnanthes minutissima	65	0.052
Gomphonema affine	53	0.043
Gomphonema clavatum	29	0.023
Gomphonema augur	27	0.022
Gomphonema truncatum	25	0.020
Achnanthes lanceolata	19	0.015
Cymbella silesiaca	16	0.013
Gomphonema acuminatum	16	0.013
Synedra fasiculata var truncata	13	0.010
Cocconeis pediculus	10	0.008
Gomphonema parvulum f. saprophilum	10	0.008
Navicula cryptotenella	10	0.008
Nitzschia palea	10	0.008
Gomphonema gracile	7	0.006
Rhoicosphenia curvata	7	0.006
Cymbella sinuata	5	0.004
Cymbella tumida	5	0.004
Navicula elginensis	5	0.004
Amphora pediculus	4	0.003
Cyclotella meneghiniana	4	0.003
Nitzschia apiculata	4	0.003
Gomphonema amoenum	3	0.002
Meridion circulare	3	0.002
Surirella minuta	3	0.002
Amphora libyca	2	0.002
Navicula capitata	2	0.002
Navicula gregaria	2	0.002
Navicula pupula	2	0.002
Nitzschia acicularis	2	0.002
Amphora montana	1	0.001
Navicula atomus var permitis	1	0.001
Navicula lanceolata	1	0.001
Navicula recens	1	0.001
Nitzschia archibaldii	1	0.001
Synedra ulna	1	0.001
Total Counted	1239	
Species Richness	39	
Shannon Diversity (H)	2.24	

Old Woman Creek, downstream, diatometer, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	300	0.316
Cyclotella cryptica	232	0.245
Nitzschia agnewii	123	0.130

Old Woman Creek, downstream, diatometer, 26 June 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	89	0.094
Skeletonema potamos	58	0.061
Thalassiosira pseudonana var1	36	0.038
Nitzschia acicularis	12	0.013
Achnanthes minutissima	8	0.008
Navicula salinarum	8	0.008
Cymbella silesiaca	7	0.007
Navicula gregaria	6	0.006
Navicula slesvicensis	6	0.006
Nitzschia supralitorea	6	0.006
Stephanodiscus hantzschii var tenui	6	0.006
Aulacoseira granulata	5	0.005
Cocconeis placentula var lineata	5	0.005
Cyclostephanos tholiformis	3	0.003
Surirella minuta	3	0.003
Achnanthes lanceolata	2	0.002
Cyclotella atomus	2	0.002
Navicula atomus var permitis	2	0.002
Navicula cryptocephala	2	0.002
Navicula molestiformis	2	0.002
Navicula saprophila	2	0.002
Nitzschia amphibia	2	0.002
Nitzschia dissipata	2	0.002
Nitzschia frustulum	2	0.002
Nitzschia linearis var subtilis	2	0.002
Amphora montana	1	0.001
Asterionella formosa	1	0.001
Aulacoseira alpigena	1	0.001
Cyclostephanos invisitatus	1	0.001
Cyclotella pseudostelligera	1	0.001
Cyclotella pseudostelligera var1	1	0.001
Cyclotella pseudostelligera var3	1	0.001
Navicula accomoda	1	0.001
Navicula monoculata	1	0.001
Navicula pupula	1	0.001
Nitzschia inconspicua	1	0.001
Nitzschia levidensis	1	0.001
Rhoicosphenia curvata	1	0.001
Surirella angusta	1	0.001
Thalassiosira pseudonana	1	0.001

Total Counted	948
Species Richness	43
Shannon Diversity (H)	2.12

Old Woman Creek, upstream, diatometer, 11 September 1993

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	132	0.147
Melosira varians	69	0.077
Nitzschia palea	69	0.077
Nitzschia paleacea	68	0.076
Nitzschia fonticola	66	0.073
Nitzschia supralitorea	49	0.055
Achnanthes minutissima	48	0.053
Aulacoseira alpigena	44	0.049
Cymbella silesiaca	42	0.047
Gomphonema sp4	37	0.041
Nitzschia filiformis	31	0.034
Navicula atomus var permitis	24	0.027
Nitzschia amphibia	18	0.020
Gomphonema clavatum	16	0.018
Thalassiosira pseudonana	16	0.018
Achnanthes lanceolata	14	0.016
Nitzschia agnita	10	0.011
Gomphonema gracile	8	0.009
Navicula sp4	8	0.009
Cyclostephanos tholiformis	7	0.008
Navicula gregaria	7	0.008
Nitzschia angustiforaminata	7	0.008
Cyclotella atomus	6	0.007
Cyclotella cryptica	6	0.007
Navicula subminuscula	6	0.007
Nitzschia agnewii	6	0.007
Nitzschia intermedia	6	0.007
Rhoicosphenia curvata	5	0.006
Amphora libyca	4	0.004
Cymbella tumida	4	0.004
Navicula minima	4	0.004
Nitzschia dissipata	4	0.004
Nitzschia pumila	4	0.004
Nitzschia sp5	4	0.004
Skeletonema potamos	4	0.004
Achnanthes hungarica	3	0.003
Navicula indifferens	3	0.003
Navicula lanceolata	3	0.003
Navicula viridula var germainii	3	0.003
Nitzschia inconspicua	3	0.003
Thalassiosira pseudonana var1	3	0.003
Amphora delicatissima	2	0.002
Cocconeis placentula var euglypta	2	0.002
Cyclotella pseudostelligera	2	0.002
Cymbella microcephala	2	0.002
Gomphonema sp3	2	0.002
Navicula capitatoradiata	2	0.002
Navicula tenera	2	0.002
Navicula veneta	2	0.002
Aulacoseira granulata	1	0.001
Cocconeis placentula	1	0.001
Cyclostephanos invisitatus	1	0.001
Cyclotella meneghiniana	1	0.001
Cyclotella pseudostelligera var1	1	0.001

Old Woman Creek, upstream, diatometer, 11 September 1993

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema truncatum	1	0.001
Navicula lacunolaciniata	1	0.001
Navicula pupula	1	0.001
Navicula recens	1	0.001
Navicula schroeteri	1	0.001
Nitzschia levidensis	1	0.001
Nitzschia sp4	1	0.001
Total Counted	899	
Species Richness	61	
Shannon Diversity (H)	3.23	

Old Woman Creek, downstream, diatometer, 11 September 1993

SPECIES	NUMBER	RELATIVE DENSITY
Thalassiosira pseudonana	265	0.299
Aulacoseira alpigena	140	0.158
Skeletonema potamos	105	0.119
Cyclotella cryptica	87	0.098
Cyclotella atomus	49	0.055
Nitzschia palea	31	0.035
Navicula indifferens	23	0.026
Nitzschia agnewii	22	0.025
Nitzschia agnita	16	0.018
Cyclostephanos tholiformis	13	0.015
Cyclotella meneghiniana	13	0.015
Navicula pupula	12	0.014
Nitzschia minuta	10	0.011
Nitzschia supralitorea	10	0.011
Achnanthes minutissima	7	0.008
Aulacoseira granulata	7	0.008
Navicula gregaria	6	0.007
Navicula slesvicensis	6	0.007
Nitzschia archibaldii	6	0.007
Stephanodiscus delicatus	6	0.007
Navicula recens	5	0.006
Stephanodiscus hantzschii	5	0.006
Cyclotella pseudostelligera	4	0.005
Nitzschia gracilis	4	0.005
Stephanodiscus hantzschii var tenui	3	0.003
Anomoeoneis vitrea	2	0.002
Cyclotella sp1	2	0.002
Navicula minima	2	0.002
Navicula trivialis	2	0.002
Nitzschia reversa	2	0.002
Stephanodiscus minutulus	2	0.002
Cocconeis placentula	1	0.001
Cocconeis placentula var euglypta	1	0.001
Cyclostephanos invisitatus	1	0.001

Old Woman Creek, downstream, diatometer, 11 Sept. 1993 (cont.)

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella pseudostelligera var1	1	0.001
Eunotia curvata	1	0.001
Gomphonema olivaceum	1	0.001
Navicula atomus var permitis	1	0.001
Navicula capitata	1	0.001
Navicula fossalis	1	0.001
Navicula lanceolata	1	0.001
Navicula monoculata	1	0.001
Navicula schroeteri	1	0.001
Navicula subminuscula	1	0.001
Navicula vandamii	1	0.001
Navicula viridula var germainii	1	0.001
Nitzschia amphibia	1	0.001
Nitzschia compressa var vexans	1	0.001
Stephanodiscus parvus var1	1	0.001
Total Counted	885	
Species Richness	49	
Shannon Diversity (H)	2.51	

Old Woman Creek, upstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Gomphonema parvulum	667	65929	0.728
Achnanthes minutissima	194	19176	0.212
Nitzschia paleacea	18	1779	0.020
Achnanthes minutissima var inconspi	11	1087	0.012
Nitzschia supralitorea	7	692	0.008
Gomphonema clavatum	5	494	0.005
Cymbella silesiaca	4	395	0.004
Cymbella tumida	2	198	0.002
Navicula gregaria	2	198	0.002
Amphora pediculus	1	99	0.001
Cocconeis pediculus	1	99	0.001
Cocconeis placentula var euglypta	1	99	0.001
Melosira varians	1	99	0.001
Navicula cryptotenella	1	99	0.001
Stephanodiscus delicatus	1	99	0.001
TOTAL		90541	
Total Counted	916		
Species Richness	15		
Shannon Diversity (H)	.085		

Old Woman Creek, downstream, diatometer, 18 June 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Stephanodiscus delicatus	199	1162755	0.220
Nitzschia acicularis	135	788804	0.150
Cyclostephanos tholiformis	116	677787	0.128
Thalassiosira pseudonana	89	520026	0.099
Cyclotella atomus	87	508340	0.096
Nitzschia agnewii	48	280464	0.053
Aulacoseira alpigena	23	134389	0.025
Thalassiosira pseudonana var1	23	134389	0.025
Cyclotella woltereckii	21	122703	0.023
Skeletonema potamos	18	105174	0.020
Cyclotella cryptica	17	99331	0.019
Nitzschia palea	12	70116	0.013
Cyclotella meneghiniana	11	64273	0.012
Navicula gregaria	9	52587	0.010
Nitzschia graciliformis	9	52587	0.010
Stephanodiscus hantzschii	8	46744	0.009
Cyclotella atomus var4	7	40901	0.008
Cyclotella sp1	7	40901	0.008
Stephanodiscus hantzschii var tenui	7	40901	0.008
Cyclotella pseudostelligera	6	35058	0.007
Navicula indifferens	6	35058	0.007
Amphora pediculus	4	23372	0.004
Nitzschia archibaldii	4	23372	0.004
Nitzschia rosenstockii	4	23372	0.004
Stephanodiscus minutulus	3	17529	0.003
Achnanthes minutissima	2	11686	0.002
Navicula molestiformis	2	11686	0.002
Navicula pupula	2	11686	0.002
Nitzschia gracilis	2	11686	0.002
Nitzschia levidensis	2	11686	0.002
Nitzschia minuta	2	11686	0.002
Nitzschia pumila	2	11686	0.002
Nitzschia pusilla	2	11686	0.002
Surirella brebissonii var kuetzingi	2	11686	0.002
Cyclostephanos invisitatus	1	5843	0.001
Cyclotella pseudostelligera var3	1	5843	0.001
Navicula atomus var permitis	1	5843	0.001
Navicula contenta	1	5843	0.001
Navicula cryptotenella	1	5843	0.001
Navicula salinarum	1	5843	0.001
Navicula seminulum	1	5843	0.001
Navicula slesvicensis	1	5843	0.001
Nitzschia agnita	1	5843	0.001
Nitzschia subacicularis	1	5843	0.001
Nitzschia supralitorea	1	5843	0.001
Stephanodiscus parvus	1	5843	0.001
TOTAL		5276220	
Total Counted	903		
Species Richness	46		
Shannon Diversity (H)	2.65		

Old Woman Creek, upstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Melosira varians	329	56478	0.427
Achnanthes minutissima	232	39827	0.301
Gomphonema parvulum	44	7553	0.057
Cocconeis placentula var euglypta	30	5150	0.039
Nitzschia fonticola	13	2232	0.017
Synedra fasiculata var truncata	13	2232	0.017
Nitzschia frustulum	11	1888	0.014
Achnanthes lanceolata	9	1545	0.012
Cymbella tumida	9	1545	0.012
Nitzschia palea	8	1373	0.010
Nitzschia amphibia	7	1202	0.009
Gomphonema clavatum	6	1030	0.008
Gomphonema minutum	6	1030	0.008
Nitzschia angustiforaminata	6	1030	0.008
Fragilaria capucina	5	858	0.006
Gomphonema parvulum var exilissimum	5	858	0.006
Aulacoseira alpigena	4	687	0.005
Navicula minima	4	687	0.005
Nitzschia inconspicua	4	687	0.005
Nitzschia paleacea	4	687	0.005
Cymbella sp2	2	343	0.003
Gomphonema affine	2	343	0.003
Navicula gregaria	2	343	0.003
Nitzschia gracilis	2	343	0.003
Nitzschia microcephala	2	343	0.003
Nitzschia supralitorea	2	343	0.003
Surirella minuta	2	343	0.003
Achnanthes hungarica	1	172	0.001
Cocconeis placentula var lineata	1	172	0.001
Cyclostephanos tholiformis	1	172	0.001
Cyclotella atomus	1	172	0.001
Cyclotella cryptica	1	172	0.001
Navicula menisculus	1	172	0.001
Stephanodiscus parvus	1	172	0.001
Thalassiosira pseudonana	1	172	0.001
TOTAL		132355	
Total Counted	771		
Species Richness	35		
Shannon Diversity (H)	1.87		

Old Woman Creek, downstream, diatometer, 17 September 1994.

SPECIES	NUMBER	CELLS/MG	R.D.
Achnanthes minutissima	264	163513	0.288
Aulacoseira alpigena	180	111486	0.197

Old Woman Creek, downstream, diatometer, 17 Sept. 1994.(Cont.)

SPECIES	NUMBER	CELLS/MG	R.D.
Thalassiosira pseudonana	76	47072	0.083
Gomphonema parvulum	56	34685	0.061
Cyclotella cryptica	47	29110	0.051
Thalassiosira pseudonana var1	38	23536	0.041
Nitzschia agnita	32	19820	0.035
Cyclotella atomus	28	17342	0.031
Skeletonema potamos	22	13626	0.024
Nitzschia rosenstockii	21	13007	0.023
Cyclostephanos tholiformis	19	11768	0.021
Gomphonema parvulum var exilissimum	19	11768	0.021
Nitzschia palea	12	7432	0.013
Nitzschia agnewii	8	4955	0.009
Cyclotella meneghiniana	7	4336	0.008
Aulacoseira granulata	6	3716	0.007
Stephanodiscus delicatus	6	3716	0.007
Stephanodiscus parvus	6	3716	0.007
Achnanthes hungarica	5	3097	0.005
Stephanodiscus hantzschii	5	3097	0.005
Cocconeis placentula var euglypta	4	2477	0.004
Cyclostephanos invisitatus	4	2477	0.004
Navicula indifferens	4	2477	0.004
Nitzschia minuta	4	2477	0.004
Nitzschia pusilla	4	2477	0.004
Aulacoseira ambigua	3	1858	0.003
Cymbella silesiaca	3	1858	0.003
Navicula pupula	3	1858	0.003
Nitzschia inconspicua	3	1858	0.003
Cyclotella pseudostelligera var1	2	1239	0.002
Gomphonema affine	2	1239	0.002
Navicula atomus var permitis	2	1239	0.002
Navicula decussis	2	1239	0.002
Navicula gregaria	2	1239	0.002
Navicula pygmaea	2	1239	0.002
Navicula schroeteri	2	1239	0.002
Nitzschia intermedia	2	1239	0.002
Nitzschia levidensis	2	1239	0.002
Stephanodiscus hantzschii var tenui	2	1239	0.002
Cyclotella woltereckii	1	619	0.001
Gomphonema minutum	1	619	0.001
Navicula cryptotenella	1	619	0.001
Navicula molestiformis	1	619	0.001
Navicula monoculata	1	619	0.001
Nitzschia frustulum	1	619	0.001
Nitzschia subacicularis	1	619	0.001
TOTAL		567341	
Total Counted	916		
Species Richness	46		
Shannon Diversity (H)	2.57		

Old Woman Creek, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes lanceolata	395	57531	0.436
Achnanthes minutissima	120	17478	0.132
Cocconeis placentula var euglypta	99	14419	0.109
Navicula gregaria	44	6409	0.049
Nitzschia inconspicua	33	4806	0.036
Melosira varians	24	3496	0.026
Nitzschia supralitorea	24	3496	0.026
Cymbella silesiaca	11	1602	0.012
Surirella minuta	11	1602	0.012
Nitzschia microcephala	10	1456	0.011
Cymbella sinuata	9	1311	0.010
Navicula atomus var permitis	9	1311	0.010
Amphora pediculus	8	1165	0.009
Navicula veneta	8	1165	0.009
Navicula cryptocephala	7	1020	0.008
Navicula minima	7	1020	0.008
Nitzschia minuta	7	1020	0.008
Nitzschia capitellata	6	874	0.007
Cocconeis pediculus	5	728	0.006
Gomphonema parvulum var exilissimum	5	728	0.006
Navicula lanceolata	5	728	0.006
Navicula rhynchocephala	5	728	0.006
Navicula sp2	5	728	0.006
Gomphonema parvulum	4	583	0.004
Navicula capitata	4	583	0.004
Navicula salinarum	4	583	0.004
Navicula menisculus var grunowii	3	437	0.003
Navicula subminuscula	3	437	0.003
Nitzschia palea	3	437	0.003
Cyclotella cryptica	2	291	0.002
Gomphonema parvulum f. saprophilum	2	291	0.002
Navicula minuscula	2	291	0.002
Navicula molestiformis	2	291	0.002
Nitzschia archibaldii	2	291	0.002
Nitzschia dissipata	2	291	0.002
Nitzschia gracilis	2	291	0.002
Nitzschia pusilla	2	291	0.002
Nitzschia rosenstockii	2	291	0.002
Cocconeis placentula var lineata	1	146	0.001
Cyclotella atomus	1	146	0.001
Gomphonema olivaceum	1	146	0.001
Navicula angusta	1	146	0.001
Navicula cincta	1	146	0.001
Nitzschia acicularis	1	146	0.001
Nitzschia desertorum	1	146	0.001
Nitzschia frustulum var bulnheimian	1	146	0.001
Nitzschia perminuta	1	146	0.001
Thalassiosira pseudonana var1	1	146	0.001
TOTAL		131958	
Total Counted	906		
Species Richness	48		
Shannon Diversity (H)	2.28		

Old Woman Creek, downstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	727	130216	0.794
Nitzschia palea	49	8777	0.053
Nitzschia rosenstockii	21	3761	0.023
Melosira varians	14	2508	0.015
Cyclotella cryptica	12	2149	0.013
Nitzschia supralitorea	9	1612	0.010
Achnanthes minutissima	8	1433	0.009
Cymbella silesiaca	7	1254	0.008
Nitzschia gracilis	6	1075	0.007
Gomphonema gracile	4	716	0.004
Nitzschia agnita	4	716	0.004
Rhoicosphenia curvata	4	716	0.004
Achnanthes lanceolata	3	537	0.003
Aulacoseira alpigena	3	537	0.003
Navicula minuscula	3	537	0.003
Navicula recens	3	537	0.003
Navicula vandamii	3	537	0.003
Cyclotella pseudostelligera var1	2	358	0.002
Navicula atomus var permitis	2	358	0.002
Navicula cryptotenella	2	358	0.002
Navicula molestiformis	2	358	0.002
Navicula subminuscula	2	358	0.002
Nitzschia inconspicua	2	358	0.002
Nitzschia pumila	2	358	0.002
Nitzschia pusilla	2	358	0.002
Stephanodiscus minutulus	2	358	0.002
Surirella minuta	2	358	0.002
Thalassiosira pseudonana var1	2	358	0.002
Cocconeis placentula var euglypta	1	179	0.001
Cyclostephanos invisitatus	1	179	0.001
Cymbella caespitosa	1	179	0.001
Navicula gregaria	1	179	0.001
Navicula lanceolata	1	179	0.001
Navicula salinarum	1	179	0.001
Navicula veneta	1	179	0.001
Nitzschia amphibia	1	179	0.001
Nitzschia dissipata	1	179	0.001
Nitzschia fonticola	1	179	0.001
Nitzschia minuta	1	179	0.001
Stephanodiscus hantzschii	1	179	0.001
Stephanodiscus parvus	1	179	0.001
Stephanodiscus sp4	1	179	0.001
TOTAL		164069	
Total Counted	916		
Species Richness	42		
Shannon Diversity (H)	1.12		

Old Woman Creek, upstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema minutum	211	147598	0.228
Gomphonema parvulum	159	111224	0.172
Nitzschia amphibia	116	81144	0.125
Achnanthes minutissima	69	48267	0.075
Nitzschia fonticola	52	36375	0.056
Nitzschia frustulum	31	21685	0.034
Nitzschia palea	26	18187	0.028
Nitzschia desertorum	18	12591	0.019
Gomphonema clavatum	17	11892	0.018
Amphora pediculus	15	10493	0.016
Navicula pupula	15	10493	0.016
Gomphonema parvulum var exilissimum	14	9793	0.015
Gomphonema affine	12	8394	0.013
Nitzschia supralitorea	11	7695	0.012
Navicula erifuga	10	6995	0.011
Cymbella silesiaca	9	6296	0.010
Gomphonema gracile	9	6296	0.010
Nitzschia angustiforaminata	9	6296	0.010
Nitzschia inconspicua	9	6296	0.010
Achnanthes lanceolata	7	4897	0.008
Navicula agrestis	6	4197	0.006
Navicula veneta	6	4197	0.006
Cyclotella pseudostelligera var1	5	3498	0.005
Navicula atomus var permitis	5	3498	0.005
Navicula minima	4	2798	0.004
Navicula tenera	4	2798	0.004
Nitzschia agnita	4	2798	0.004
Skeletonema potamos	4	2798	0.004
Achnanthes minutissima var robusta	3	2099	0.003
Gomphonema sp7	3	2099	0.003
Navicula monoculata	3	2099	0.003
Navicula subminuscula	3	2099	0.003
Nitzschia rosenstockii	3	2099	0.003
Rhoicosphenia curvata	3	2099	0.003
Amphora montana	2	1399	0.002
Cyclotella cryptica	2	1399	0.002
Cyclotella pseudostelligera	2	1399	0.002
Cyclotella pseudostelligera var3	2	1399	0.002
Gomphonema augur	2	1399	0.002
Hantzschia amphioxys	2	1399	0.002
Navicula trivialis	2	1399	0.002
Navicula vandamii	2	1399	0.002
Navicula viridula var germainii	2	1399	0.002
Nitzschia coarctica	2	1399	0.002
Nitzschia dissipata	2	1399	0.002
Nitzschia levidensis	2	1399	0.002
Stephanodiscus delicatus	2	1399	0.002
Surirella minuta	2	1399	0.002
Amphora sp1	1	700	0.001
Cocconeis placentula var euglypta	1	700	0.001
Cyclotella atomus	1	700	0.001
Cyclotella meneghiniana	1	700	0.001
Cymbella caespitosa	1	700	0.001

Old Woman Creek, upstream, diatometer, 16 Sept. 1995 (Cont).

SPECIES	NUMBER	CELLS/cm	R.D.
Fragilaria construens	1	700	0.001
Gomphonema acuminatum	1	700	0.001
Melosira varians	1	700	0.001
Navicula capitata	1	700	0.001
Navicula capitatoradiata	1	700	0.001
Navicula cryptotenella	1	700	0.001
Navicula minuscula	1	700	0.001
Navicula molestiformis	1	700	0.001
Navicula schroeteri	1	700	0.001
Navicula seminulum	1	700	0.001
Nitzschia angustatula	1	700	0.001
Nitzschia capitellata	1	700	0.001
Nitzschia compressa var vexans	1	700	0.001
Nitzschia paleacea	1	700	0.001
Stauroneis tackei	1	700	0.001
Surirella suecica	1	700	0.001
Synedra ulna var acus	1	700	0.001
TOTAL		647055	
Total Counted	925		
Species Richness	70		
Shannon Diversity (H)	2.87		

Old Woman Creek, downstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula confervacea	202	504329	0.228
Gomphonema parvulum	89	222205	0.100
Navicula recens	78	194741	0.088
Nitzschia amphibia	62	154794	0.070
Nitzschia palea	61	152298	0.069
Aulacoseira alpigena	47	117344	0.053
Nitzschia supralitorea	26	64914	0.029
Gomphonema parvulum var exilissimum	25	62417	0.028
Nitzschia filiformis	24	59920	0.027
Cyclotella atomus	23	57424	0.026
Navicula pupula	22	54927	0.025
Nitzschia fonticola	22	54927	0.025
Cyclotella cryptica	18	44940	0.020
Melosira varians	18	44940	0.020
Cocconeis placentula var euglypta	15	37450	0.017
Achnanthes minutissima	12	29960	0.014
Cymbella silesiaca	10	24967	0.011
Navicula minima	10	24967	0.011
Nitzschia gracilis	9	22470	0.010
Nitzschia frustulum	8	19973	0.009
Stephanodiscus delicatus	7	17477	0.008
Navicula cryptocephala	6	14980	0.007
Navicula schroeteri	6	14980	0.007

Old Woman Creek, downstream, diatometer, 16 Sept. 1995 (Cont).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula subminuscula	6	14980	0.007
Nitzschia levidensis	5	12483	0.006
Nitzschia minuta	5	12483	0.006
Nitzschia pusilla	5	12483	0.006
Nitzschia rosenstockii	5	12483	0.006
Thalassiosira pseudonana	4	9987	0.005
Navicula molestiformis	3	7490	0.003
Nitzschia acicularis	3	7490	0.003
Nitzschia subacicularis	3	7490	0.003
Surirella minuta	3	7490	0.003
Thalassiosira pseudonana var1	3	7490	0.003
Achnanthes lanceolata	2	4993	0.002
Amphora pediculus	2	4993	0.002
Cyclostephanos invisitatus	2	4993	0.002
Cyclotella meneghiniana	2	4993	0.002
Cyclotella ocellata	2	4993	0.002
Gomphonema gracile	2	4993	0.002
Navicula salinarum	2	4993	0.002
Navicula seminulum	2	4993	0.002
Nitzschia agnita	2	4993	0.002
Nitzschia angustiforaminata	2	4993	0.002
Nitzschia dissipata	2	4993	0.002
Nitzschia sp12	2	4993	0.002
Achnanthes hungarica	1	2497	0.001
Achnanthes kryophila	1	2497	0.001
Cocconeis placentula var lineata	1	2497	0.001
Cyclostephanos tholiformis	1	2497	0.001
Gomphonema augur	1	2497	0.001
Gomphonema clavatum	1	2497	0.001
Gomphonema olivaceum	1	2497	0.001
Navicula capitatoradiata	1	2497	0.001
Navicula lanceolata	1	2497	0.001
Navicula menisculus	1	2497	0.001
Navicula saprophila	1	2497	0.001
Navicula viridula var germainii	1	2497	0.001
Nitzschia linearis	1	2497	0.001
Nitzschia rautenbachiae	1	2497	0.001
Stephanodiscus minutulus	1	2497	0.001
Synedra ulna	1	2497	0.001
Thalassiosira pseudonana var2	1	2497	0.001
TOTAL		2212059	
Total Counted	886		
Species Richness	63		
Shannon Diversity (H)	3.04		

Old Woman Creek, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	257	86721	0.273
Nitzschia palea	89	30032	0.094
Gomphonema olivaceum	73	24633	0.077
Nitzschia dissipata	50	16872	0.053
Navicula cryptocephala	35	11810	0.037
Navicula pupula	35	11810	0.037
Navicula gregaria	26	8773	0.028
Gomphonema consector	25	8436	0.027
Gomphonema minutum	23	7761	0.024
Aulacoseira alpigena	21	7086	0.022
Nitzschia supralitorea	19	6411	0.020
Thalassiosira pseudonana	18	6074	0.019
Nitzschia amphibia	16	5399	0.017
Navicula atomus var permitis	15	5062	0.016
Skeletonema potamos	13	4387	0.014
Cyclotella atomus	11	3712	0.012
Cymbella silesiaca	9	3037	0.010
Navicula minuscula	9	3037	0.010
Navicula molestiformis	9	3037	0.010
Nitzschia paleacea	9	3037	0.010
Diatoma tenuis	8	2699	0.008
Navicula agrestis	8	2699	0.008
Nitzschia frustulum	7	2362	0.007
Nitzschia pusilla	7	2362	0.007
Fragilaria vaucheriae	6	2025	0.006
Navicula cryptotenella	6	2025	0.006
Navicula menisculus var grunowii	6	2025	0.006
Navicula tripunctata	6	2025	0.006
Nitzschia perminuta	6	2025	0.006
Synedra tenera	6	2025	0.006
Achnanthes lanceolata	5	1687	0.005
Cyclotella cryptica	5	1687	0.005
Cyclotella meneghiniana	5	1687	0.005
Navicula lanceolata	5	1687	0.005
Navicula saprophila	5	1687	0.005
Nitzschia minuta	5	1687	0.005
Achnanthes minutissima	4	1350	0.004
Cyclostephanos invisitatus	4	1350	0.004
Navicula salinarum	4	1350	0.004
Navicula subminuscula	4	1350	0.004
Navicula veneta	4	1350	0.004
Thalassiosira pseudonana var1	4	1350	0.004
Fragilaria capucina	3	1012	0.003
Navicula monoculata	3	1012	0.003
Nitzschia acicularis	3	1012	0.003
Nitzschia lanceola var minutula	3	1012	0.003
Rhoicosphenia curvata	3	1012	0.003
Stephanodiscus hantzschii	3	1012	0.003
Stephanodiscus parvus	3	1012	0.003
Cyclotella pseudostelligera	2	675	0.002
Navicula cincta	2	675	0.002
Navicula elginensis	2	675	0.002

Old Woman Creek, downstream, diatometer, 9 June 1996 (Cont).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula menisculus	2	675	0.002
Navicula sp2	2	675	0.002
Navicula trivialis	2	675	0.002
Navicula vandamii	2	675	0.002
Nitzschia angustiforaminata	2	675	0.002
Nitzschia archibaldii	2	675	0.002
Nitzschia capitellata	2	675	0.002
Nitzschia inconspicua	2	675	0.002
Achnanthes hungarica	1	337	0.001
Actinocyclus normanii	1	337	0.001
Cyclostephanos tholiformis	1	337	0.001
Cyclotella woltereckii	1	337	0.001
Cymbella tumida	1	337	0.001
Gomphonema clavatum	1	337	0.001
Melosira varians	1	337	0.001
Navicula angusta	1	337	0.001
Navicula atomus	1	337	0.001
Navicula capitata	1	337	0.001
Navicula capitatoradiata	1	337	0.001
Navicula seminulum	1	337	0.001
Nitzschia draveillensis	1	337	0.001
Nitzschia gracilis	1	337	0.001
Nitzschia lacuum	1	337	0.001
Nitzschia perspicua	1	337	0.001
Surirella minuta	1	337	0.001
Synedra ulna	1	337	0.001
TOTAL		318203	
Total Counted	943		
Species Richness	78		
Shannon Diversity (H)	3.18		

Old Woman Creek, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia palea	101	30737	0.113
Navicula schroeteri	60	18260	0.067
Nitzschia supralitorea	52	15825	0.058
Cymbella tumida	42	12782	0.047
Nitzschia amphibia	42	12782	0.047
Gomphonema parvulum	34	10347	0.038
Nitzschia angustiforaminata	32	9739	0.036
Navicula subminuscula	30	9130	0.034
Amphora libyca	26	7913	0.029
Nitzschia inconspicua	25	7608	0.028
Navicula viridula var germainii	23	7000	0.026
Melosira varians	22	6695	0.025
Achnanthes minutissima	20	6087	0.022
Navicula veneta	17	5174	0.019

Old Woman Creek, upstream, diatometer, 21 Sept. 1996 (Cont).

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes lanceolata	16	4869	0.018
Gomphonema minutum	15	4565	0.017
Navicula atomus var permitis	14	4261	0.016
Navicula erifuga	13	3956	0.015
Nitzschia microcephala	13	3956	0.015
Gomphonema clavatum	12	3652	0.013
Navicula agrestis	12	3652	0.013
Navicula gregaria	12	3652	0.013
Nitzschia aurariae	12	3652	0.013
Nitzschia frustulum	11	3348	0.012
Amphora veneta	10	3043	0.011
Nitzschia minuta	10	3043	0.011
Cymbella silesiaca	9	2739	0.010
Navicula minima	9	2739	0.010
Navicula minuscula	9	2739	0.010
Amphora pediculus	8	2435	0.009
Navicula cryptotenella	8	2435	0.009
Navicula molestiformis	8	2435	0.009
Nitzschia agnita	8	2435	0.009
Nitzschia dissipata	8	2435	0.009
Navicula capitatoradiata	7	2130	0.008
Navicula tenera	7	2130	0.008
Navicula cryptocephala	6	1826	0.007
Navicula menisculus	6	1826	0.007
Navicula pupula	6	1826	0.007
Nitzschia angustatula	6	1826	0.007
Nitzschia desertorum	6	1826	0.007
Aulacoseira alpigena	5	1522	0.006
Navicula vandamii	5	1522	0.006
Nitzschia apiculata	5	1522	0.006
Cocconeis placentula var euglypta	4	1217	0.004
Fragilaria capucina	4	1217	0.004
Gomphonema parvulum f. saprophilum	4	1217	0.004
Gyrosigma scalproides	4	1217	0.004
Navicula elginensis	4	1217	0.004
Nitzschia sp23	4	1217	0.004
Surirella angusta	4	1217	0.004
Amphora montana	3	913	0.003
Cocconeis placentula var lineata	3	913	0.003
Navicula lanceolata	3	913	0.003
Navicula tenelloides	3	913	0.003
Navicula viridula var rostellata	3	913	0.003
Achnanthes lanceolata var rostrata	2	609	0.002
Achnanthes minutissima var robusta	2	609	0.002
Gomphonema acuminatum	2	609	0.002
Navicula halophila	2	609	0.002
Navicula hustedtii	2	609	0.002
Navicula salinarum	2	609	0.002
Navicula tripunctata	2	609	0.002
Navicula viridula	2	609	0.002
Nitzschia acicularis	2	609	0.002
Nitzschia calida	2	609	0.002
Nitzschia dubia	2	609	0.002
Nitzschia lacuum	2	609	0.002

Old Woman Creek, upstream, diatometer, 21 Sept. 1996 (Cont).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia levidensis	2	609	0.002
Nitzschia linearis var subtilis	2	609	0.002
Nitzschia nereidis	2	609	0.002
Nitzschia paleaeformis	2	609	0.002
Nitzschia pusilla	2	609	0.002
Rhoicosphenia curvata	2	609	0.002
Surirella minuta	2	609	0.002
Cyclotella atomus	1	304	0.001
Gomphonema gracile	1	304	0.001
Gomphonema truncatum	1	304	0.001
Navicula insociabilis	1	304	0.001
Nitzschia dissipata var media	1	304	0.001
Thalassiosira pseudonana	1	304	0.001
Thalassiosira weissflogii	1	304	0.001
TOTAL		270854	
Total Counted	890		
Species Richness	82		
Shannon Diversity (H)	3.76		

Old Woman Creek, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	260	366768	0.292
Melosira varians	95	134011	0.107
Gomphonema parvulum	79	111441	0.089
Nitzschia palea	64	90281	0.072
Gomphonema parvulum var exilissimum	49	69122	0.055
Aulacoseira alpigena	44	62068	0.049
Nitzschia amphibia	26	36677	0.029
Nitzschia gracilis	15	21160	0.017
Nitzschia supralitorea	14	19749	0.016
Navicula agrestis	13	18338	0.015
Cyclostephanos invisitatus	11	15517	0.012
Cyclotella atomus	11	15517	0.012
Cymbella tumida	11	15517	0.012
Nitzschia filiformis	11	15517	0.012
Nitzschia subacicularis	10	14106	0.011
Cymbella silesiaca	9	12696	0.010
Stephanodiscus hantzschii	9	12696	0.010
Synedra tenera	9	12696	0.010
Cyclotella cryptica	8	11285	0.009
Navicula cryptocephala	8	11285	0.009
Nitzschia minuta	8	11285	0.009
Navicula confervacea	7	9875	0.008
Navicula cryptotenella	7	9875	0.008
Nitzschia intermedia	6	8464	0.007
Synedra radians	6	8464	0.007
Thalassiosira pseudonana var1	6	8464	0.007

Old Woman Creek, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes lanceolata	5	7053	0.006
Cyclostephanos tholiformis	5	7053	0.006
Navicula pupula	5	7053	0.006
Gomphonema clavatum	4	5643	0.004
Navicula minima	4	5643	0.004
Navicula saprophila	4	5643	0.004
Navicula seminulum	4	5643	0.004
Navicula subminuscula	4	5643	0.004
Nitzschia frustulum	4	5643	0.004
Surirella minuta	4	5643	0.004
Gomphonema affine	3	4232	0.003
Navicula gregaria	3	4232	0.003
Amphora pediculus	2	2821	0.002
Cocconeis placentula	2	2821	0.002
Cocconeis placentula var lineata	2	2821	0.002
Cyclotella pseudostelligera	2	2821	0.002
Gomphonema minutum	2	2821	0.002
Navicula capitatoradiata	2	2821	0.002
Navicula molestiformis	2	2821	0.002
Navicula schroeteri	2	2821	0.002
Navicula viridula var rostellata	2	2821	0.002
Nitzschia agnewii	2	2821	0.002
Nitzschia angustatula	2	2821	0.002
Surirella suecica	2	2821	0.002
Thalassiosira pseudonana var2	2	2821	0.002
Achnanthes kryophila	1	1411	0.001
Achnanthes rosenstockii	1	1411	0.001
Cocconeis placentula var euglypta	1	1411	0.001
Cyclotella distinguenda var unipunc	1	1411	0.001
Cyclotella ocellata	1	1411	0.001
Cyclotella pseudostelligera var1	1	1411	0.001
Cyclotella pseudostelligera var3	1	1411	0.001
Fragilaria capucina	1	1411	0.001
Navicula menisculus var grunowii	1	1411	0.001
Navicula menisculus var upsaliensis	1	1411	0.001
Navicula recens	1	1411	0.001
Navicula salinarum	1	1411	0.001
Navicula vandamii	1	1411	0.001
Nitzschia agnita	1	1411	0.001
Nitzschia pusilla	1	1411	0.001
Stephanodiscus parvus	1	1411	0.001
Synedra ulna	1	1411	0.001
Synedra ulna var acus	1	1411	0.001
Thalassiosira pseudonana	1	1411	0.001
TOTAL		1255474	
Total Counted	890		
Species Richness	70		
Shannon Diversity (H)	2.94		

Portage River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	94	2180	0.109
Cyclotella cryptica	80	1855	0.092
Nitzschia supralitorea	67	1554	0.077
Cyclotella atomus	64	1484	0.074
Skeletonema potamos	55	1275	0.064
Nitzschia inconspicua	48	1113	0.055
Navicula gregaria	36	835	0.042
Nitzschia fonticola	34	788	0.039
Gomphonema minutum	32	742	0.037
Thalassiosira pseudonana	31	719	0.036
Navicula subminuscula	26	603	0.030
Nitzschia palea	23	533	0.027
Achnanthes lanceolata	17	394	0.020
Stephanodiscus hantzschii	15	348	0.017
Thalassiosira pseudonana var1	15	348	0.017
Achnanthes minutissima	14	325	0.016
Cyclotella pseudostelligera var1	14	325	0.016
Nitzschia frustulum	14	325	0.016
Nitzschia dissipata	13	301	0.015
Navicula sp2	12	278	0.014
Surirella minuta	12	278	0.014
Navicula atomus var permitis	11	255	0.013
Navicula capitatoradiata	10	232	0.012
Navicula viridula var germainii	8	186	0.009
Navicula agrestis	7	162	0.008
Cymbella silesiaca	6	139	0.007
Navicula cryptocephala	6	139	0.007
Cyclostephanos tholiformis	5	116	0.006
Cyclotella pseudostelligera	5	116	0.006
Navicula cryptotenella	5	116	0.006
Navicula menisculus	5	116	0.006
Navicula minima	5	116	0.006
Navicula saprophila	5	116	0.006
Amphora pediculus	4	93	0.005
Navicula veneta	4	93	0.005
Nitzschia angustiforaminata	4	93	0.005
Nitzschia minuta	4	93	0.005
Rhoicosphenia curvata	4	93	0.005
Synedra fasiculata var truncata	4	93	0.005
Cocconeis pediculus	3	70	0.003
Navicula menisculus var grunowii	3	70	0.003
Navicula molestiformis	3	70	0.003
Nitzschia acicularis	3	70	0.003
Stephanodiscus delicatus	3	70	0.003
Cyclostephanos invisitatus	2	46	0.002
Cyclotella meneghiniana	2	46	0.002
Melosira varians	2	46	0.002
Navicula angusta	2	46	0.002
Navicula atomus	2	46	0.002
Navicula minuscula	2	46	0.002
Nitzschia amphibia	2	46	0.002
Nitzschia desertorum	2	46	0.002
Nitzschia pusilla	2	46	0.002
Nitzschia sociabilis	2	46	0.002

Portage River, upstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Amphora libyca	1	23	0.001
Cocconeis placentula var euglypta	1	23	0.001
Fragilaria construens	1	23	0.001
Hantzschia amphioxys	1	23	0.001
Navicula erifuga	1	23	0.001
Navicula monoculata	1	23	0.001
Navicula mutica	1	23	0.001
Navicula schroeteri	1	23	0.001
Nitzschia apiculata	1	23	0.001
Nitzschia capitellata	1	23	0.001
Nitzschia microcephala	1	23	0.001
Nitzschia paleacea	1	23	0.001
Stephanodiscus parvus	1	23	0.001
TOTAL		20082	
Total Counted	866		
Species Richness	67		
Shannon Diversity (H)	3.41		

Portage River, upstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Cyclotella atomus	328	20511	0.361
Cyclotella cryptica	99	6191	0.109
Gomphonema parvulum	92	5753	0.101
Nitzschia frustulum	89	5565	0.098
Thalassiosira pseudonana	67	4190	0.074
Navicula recens	43	2689	0.047
Nitzschia palea	37	2314	0.041
Navicula saprophila	20	1251	0.022
Nitzschia minuta	20	1251	0.022
Nitzschia supralitorea	15	938	0.017
Cyclotella meneghiniana	11	688	0.012
Nitzschia inconspicua	10	625	0.011
Gomphonema parvulum var exilissimum	9	563	0.010
Thalassiosira pseudonana var1	8	500	0.009
Navicula erifuga	6	375	0.007
Skeletonema potamos	5	313	0.006
Navicula pupula	4	250	0.004
Navicula seminulum	4	250	0.004
Navicula schroeteri	3	188	0.003
Navicula viridula var germainii	3	188	0.003
Navicula viridula var rostellata	3	188	0.003
Nitzschia capitellata	3	188	0.003
Nitzschia microcephala	3	188	0.003
Cyclostephanos invisitatus	2	125	0.002
Cyclotella pseudostelligera var1	2	125	0.002
Navicula atomus var permitis	2	125	0.002
Navicula cryptocephala	2	125	0.002

Portage River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula subminuscula	2	125	0.002
Nitzschia filiformis	2	125	0.002
Nitzschia fonticola	2	125	0.002
Nitzschia pusilla	2	125	0.002
Nitzschia reversa	2	125	0.002
Amphora pediculus	1	63	0.001
Cocconeis pediculus	1	63	0.001
Cyclotella distinguenda var unipunc	1	63	0.001
Cyclotella pseudostelligera var3	1	63	0.001
Navicula capitatoradiata	1	63	0.001
Navicula tenera	1	63	0.001
Nitzschia agnita	1	63	0.001
Nitzschia amphibia	1	63	0.001
Stephanodiscus delicatus	1	63	0.001
TOTAL		56843	
Total Counted	909		
Species Richness	41		
Shannon Diversity (H)	2.35		

Portage River, upstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Skeletonema potamos	53	3268	0.058
Nitzschia dissipata	50	3083	0.055
Navicula sp2	49	3022	0.054
Navicula gregaria	48	2960	0.053
Navicula subminuscula	39	2405	0.043
Navicula atomus var permitis	38	2343	0.042
Cyclotella atomus	37	2282	0.041
Nitzschia inconspicua	37	2282	0.041
Surirella minuta	34	2097	0.037
Cyclotella cryptica	29	1788	0.032
Thalassiosira pseudonana	26	1603	0.029
Rhoicosphenia curvata	25	1542	0.028
Navicula saprophila	24	1480	0.026
Stephanodiscus parvus	23	1418	0.025
Achnanthes minutissima	22	1357	0.024
Stephanodiscus hantzschii	22	1357	0.024
Cyclostephanos invisitatus	16	987	0.018
Nitzschia palea	16	987	0.018
Navicula cryptotenella	14	863	0.015
Navicula molestiformis	14	863	0.015
Navicula minima	13	802	0.014
Achnanthes lanceolata	12	740	0.013
Gomphonema olivaceum	12	740	0.013
Melosira varians	12	740	0.013
Nitzschia acicularis	12	740	0.013
Amphora pediculus	11	678	0.012

Portage River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema parvulum	11	678	0.012
Navicula tripunctata	10	617	0.011
Nitzschia supralitorea	10	617	0.011
Navicula trivialis	9	555	0.010
Navicula veneta	9	555	0.010
Navicula agrestis	8	493	0.009
Navicula capitatoradiata	8	493	0.009
Fragilaria vaucheriae	7	432	0.008
Navicula menisculus var grunowii	7	432	0.008
Nitzschia agnita	7	432	0.008
Nitzschia frustulum	7	432	0.008
Aulacoseira granulata	6	370	0.007
Cyclotella meneghiniana	6	370	0.007
Navicula lacunolaciniata	6	370	0.007
Nitzschia linearis var subtilis	6	370	0.007
Cocconeis pediculus	5	308	0.006
Cyclotella pseudostelligera	5	308	0.006
Gomphonema minutum	5	308	0.006
Cyclotella pseudostelligera var3	4	247	0.004
Cymbella silesiaca	4	247	0.004
Gomphonema parvulum f. saprophilum	4	247	0.004
Navicula menisculus	4	247	0.004
Nitzschia microcephala	4	247	0.004
Fragilaria capucina	3	185	0.003
Navicula atomus	3	185	0.003
Navicula minuscula	3	185	0.003
Nitzschia amphibia	3	185	0.003
Nitzschia apiculata	3	185	0.003
Nitzschia linearis	3	185	0.003
Nitzschia pusilla	3	185	0.003
Thalassiosira pseudonana var1	3	185	0.003
Cyclostephanos tholiformis	2	123	0.002
Gomphonema angustatum	2	123	0.002
Navicula capitata	2	123	0.002
Navicula heimansii	2	123	0.002
Navicula lanceolata	2	123	0.002
Navicula viridula var germainii	2	123	0.002
Nitzschia agnewii	2	123	0.002
Nitzschia capitellata	2	123	0.002
Nitzschia hungarica	2	123	0.002
Nitzschia minuta	2	123	0.002
Nitzschia perminuta	2	123	0.002
Nitzschia recta	2	123	0.002
Caloneis bacillum	1	62	0.001
Cocconeis placentula var euglypta	1	62	0.001
Cyclotella stelligera	1	62	0.001
Gomphonema consector	1	62	0.001
Gomphonema sp7	1	62	0.001
Gomphonema truncatum	1	62	0.001
Meridion circulare	1	62	0.001
Navicula accomoda	1	62	0.001
Navicula mutica	1	62	0.001
Navicula pygmaea	1	62	0.001
Navicula viridula	1	62	0.001

Portage River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia clausii	1	62	0.001
Nitzschia communis	1	62	0.001
Nitzschia gracilis	1	62	0.001
Nitzschia sociabilis	1	62	0.001
Nitzschia tubicola	1	62	0.001
Plagiotropis lepidoptera var probos	1	62	0.001
Stauroneis anceps	1	62	0.001
Synedra pulchella	1	62	0.001
Synedra ulna	1	62	0.001
Synedra ulna var acus	1	62	0.001
TOTAL		56054	
Total Counted	909		
Species Richness	90		
Shannon Diversity (H)	3.87		

Portage River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Gomphonema olivaceum	210	2558	0.227
Nitzschia dissipata	99	1206	0.107
Navicula viridula	66	804	0.071
Gomphonema minutum	46	560	0.050
Gomphonema parvulum	38	463	0.041
Diatoma tenuis	37	451	0.040
Navicula tripunctata	35	426	0.038
Melosira varians	32	390	0.035
Cyclostephanos invisitatus	29	353	0.031
Nitzschia palea	29	353	0.031
Diatoma vulgaris	28	341	0.030
Thalassiosira pseudonana	21	256	0.023
Fragilaria vaucheriae	17	207	0.018
Achnanthes minutissima	16	195	0.017
Navicula capitatoradiata	16	195	0.017
Nitzschia agnewii	16	195	0.017
Nitzschia sociabilis	14	171	0.015
Stephanodiscus hantzschii	14	171	0.015
Nitzschia rosenstockii	13	158	0.014
Synedra ulna	13	158	0.014
Navicula cryptotenella	12	146	0.013
Stephanodiscus parvus	10	122	0.011
Nitzschia acicularis	9	110	0.010
Nitzschia recta	9	110	0.010
Cymbella helvetica	6	73	0.006
Fragilaria capucina var mesolepta	6	73	0.006
Cyclotella atomus	5	61	0.005
Fragilaria capucina	5	61	0.005
Nitzschia paleacea	5	61	0.005
Rhoicosphenia curvata	5	61	0.005

Portage River, downstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Thalassiosira pseudonana var1	5	61	0.005
Aulacoseira granulata	4	49	0.004
Nitzschia agnita	4	49	0.004
Navicula saprophila	3	37	0.003
Aulacoseira alpigena	2	24	0.002
Aulacoseira sp1	2	24	0.002
Cyclostephanos tholiformis	2	24	0.002
Cyclotella pseudostelligera var3	2	24	0.002
Navicula menisculus var grunowii	2	24	0.002
Navicula minima	2	24	0.002
Navicula mutica var ventricosa	2	24	0.002
Navicula sp2	2	24	0.002
Navicula veneta	2	24	0.002
Nitzschia inconspicua	2	24	0.002
Nitzschia supralitorea	2	24	0.002
Synedra ulna var acus	2	24	0.002
Cocconeis placentula var euglypta	1	12	0.001
Cyclotella cryptica	1	12	0.001
Cymbella caespitosa	1	12	0.001
Cymbella silesiaca	1	12	0.001
Gomphonema consector	1	12	0.001
Navicula capitata	1	12	0.001
Navicula confervacea	1	12	0.001
Navicula decussis	1	12	0.001
Navicula gregaria	1	12	0.001
Navicula lanceolata	1	12	0.001
Navicula molestiformis	1	12	0.001
Navicula pseudoanglica	1	12	0.001
Navicula pupula	1	12	0.001
Navicula salinarum	1	12	0.001
Nitzschia gracilis	1	12	0.001
Nitzschia lanceola var minutula	1	12	0.001
Nitzschia levidensis	1	12	0.001
Nitzschia microcephala	1	12	0.001
Skeletonema potamos	1	12	0.001
Stephanodiscus delicatus	1	12	0.001
Surirella angusta	1	12	0.001
Surirella brebissonii var kuetzingi	1	12	0.001
Synedra pulchella	1	12	0.001
TOTAL		11254	
Total Counted	924		
Species Richness	69		
Shannon Diversity (H)	3.15		

Portage River, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Cyclotella atomus	290	3762	0.325
Thalassiosira pseudonana	92	1194	0.103
Navicula recens	78	1012	0.087
Nitzschia frustulum	71	921	0.080
Nitzschia palea	61	791	0.068
Cyclotella cryptica	51	662	0.057
Stephanodiscus hantzschii	29	376	0.033
Gomphonema parvulum	24	311	0.027
Navicula viridula var germainii	16	208	0.018
Skeletonema potamos	14	182	0.016
Navicula erifuga	13	169	0.015
Nitzschia inconspicua	12	156	0.013
Cyclotella pseudostelligera var1	9	117	0.010
Nitzschia gracilis	7	91	0.008
Achnanthes minutissima	6	78	0.007
Fragilaria capucina	6	78	0.007
Navicula schroeteri	6	78	0.007
Nitzschia agnita	6	78	0.007
Stephanodiscus parvus	6	78	0.007
Cyclotella pseudostelligera	5	65	0.006
Navicula agrestis	5	65	0.006
Nitzschia dissipata	5	65	0.006
Nitzschia fonticola	5	65	0.006
Achnanthes lanceolata	4	52	0.004
Cyclostephanos tholiformis	4	52	0.004
Navicula gregaria	4	52	0.004
Navicula molestiformis	4	52	0.004
Navicula vandamii	4	52	0.004
Navicula veneta	4	52	0.004
Navicula saprophila	3	39	0.003
Surirella minuta	3	39	0.003
Amphora veneta	2	26	0.002
Cymbella silesiaca	2	26	0.002
Gomphonema minutum	2	26	0.002
Gomphonema olivaceum	2	26	0.002
Melosira varians	2	26	0.002
Navicula atomus var permitis	2	26	0.002
Navicula menisculus var grunowii	2	26	0.002
Navicula minuscula	2	26	0.002
Navicula slesvicensis	2	26	0.002
Nitzschia aurariae	2	26	0.002
Nitzschia hungarica	2	26	0.002
Nitzschia intermedia	2	26	0.002
Nitzschia minuta	2	26	0.002
Nitzschia supralitorea	2	26	0.002
Amphora inariensis	1	13	0.001
Amphora libyca	1	13	0.001
Aulacoseira granulata	1	13	0.001
Cocconeis placentula	1	13	0.001
Cocconeis placentula var lineata	1	13	0.001
Cyclostephanos invisitatus	1	13	0.001
Cyclotella meneghiniana	1	13	0.001
Cyclotella stelligera	1	13	0.001
Cyclotella woltereckii	1	13	0.001

Portage River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Diploneis pseudovalis	1	13	0.001
Fragilaria construens f. venter	1	13	0.001
Navicula lanceolata	1	13	0.001
Navicula seminulum	1	13	0.001
Nitzschia pusilla	1	13	0.001
Nitzschia reversa	1	13	0.001
Thalassiosira pseudonana var2	1	13	0.001
Thalassiosira weissflogii	1	13	0.001
TOTAL		11572	
Total Counted	892		
Species Richness	62		
Shannon Diversity (H)	2.69		

Portage River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Synedra pulchella	297	99658	0.337
Navicula recens	164	55030	0.186
Nitzschia palea	49	16442	0.056
Synedra fasiculata var truncata	48	16106	0.054
Gomphonema parvulum	46	15435	0.052
Navicula viridula var germainii	42	14093	0.048
Cocconeis placentula var euglypta	38	12751	0.043
Cocconeis placentula var lineata	35	11744	0.040
Gomphonema clavatum	27	9060	0.031
Nitzschia gracilis	17	5704	0.019
Gomphonema minutum	16	5369	0.018
Melosira varians	15	5033	0.017
Cymbella tumida	9	3020	0.010
Fragilaria vaucheriae	8	2684	0.009
Navicula decussis	8	2684	0.009
Diatoma vulgaris	6	2013	0.007
Nitzschia dissipata	6	2013	0.007
Achnanthes minutissima	4	1342	0.005
Nitzschia agnewii	4	1342	0.005
Stephanodiscus parvus	4	1342	0.005
Cymbella caespitosa	3	1007	0.003
Navicula pupula var mutata	3	1007	0.003
Navicula trivialis	3	1007	0.003
Nitzschia lanceola var minutula	3	1007	0.003
Nitzschia minuta	3	1007	0.003
Navicula capitata	2	671	0.002
Navicula gregaria	2	671	0.002
Navicula sp2	2	671	0.002
Nitzschia rosenstockii	2	671	0.002
Surirella suecica	2	671	0.002
Achnanthes lanceolata	1	336	0.001
Cyclostephanos invisitatus	1	336	0.001

Portage River, downstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Cyclostephanos tholiformis	1	336	0.001
Navicula agrestis	1	336	0.001
Navicula elginensis	1	336	0.001
Navicula menisculus	1	336	0.001
Navicula pupula	1	336	0.001
Navicula tripunctata	1	336	0.001
Nitzschia filiformis	1	336	0.001
Nitzschia fonticola	1	336	0.001
Stephanodiscus hantzschii	1	336	0.001
Synedra ulna	1	336	0.001
Thalassiosira pseudonana var1	1	336	0.001
TOTAL		295619	
Total Counted	881		
Species Richness	43		
Shannon Diversity (H)	2.42		

Vermilion River, upstream, diatometer, 18 June 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	349	14666	0.384
Stephanodiscus hantzschii	63	2647	0.069
Nitzschia acicularis	58	2437	0.064
Cyclotella atomus	49	2059	0.054
Cyclotella meneghiniana	42	1765	0.046
Navicula cryptotenella	21	882	0.023
Cocconeis placentula var euglypta	20	840	0.022
Cyclotella atomus var4	20	840	0.022
Nitzschia palea	16	672	0.018
Nitzschia inconspicua	15	630	0.016
Amphora pediculus	14	588	0.015
Navicula atomus var permitis	13	546	0.014
Navicula gregaria	13	546	0.014
Nitzschia pumila	13	546	0.014
Gomphonema parvulum	12	504	0.013
Navicula recens	12	504	0.013
Navicula sp2	12	504	0.013
Caloneis bacillum	11	462	0.012
Melosira varians	11	462	0.012
Navicula lanceolata	11	462	0.012
Achnanthes lanceolata	9	378	0.010
Nitzschia draveillensis	9	378	0.010
Stephanodiscus delicatus	9	378	0.010
Nitzschia agnewii	8	336	0.009
Cocconeis pediculus	6	252	0.007
Surirella minuta	6	252	0.007
Nitzschia minuta	5	210	0.005
Nitzschia paleacea	5	210	0.005
Cyclostephanos tholiformis	4	168	0.004
Cyclotella pseudostelligera	4	168	0.004
Cymbella affinis	4	168	0.004
Nitzschia filiformis	4	168	0.004
Nitzschia sociabilis	4	168	0.004
Rhoicosphenia curvata	4	168	0.004
Synedra tenera	4	168	0.004
Nitzschia capitellata	3	126	0.003
Skeletonema potamos	3	126	0.003
Thalassiosira pseudonana	3	126	0.003
Thalassiosira pseudonana var1	3	126	0.003
Cyclotella pseudostelligera var3	2	84	0.002
Cymbella caespitosa	2	84	0.002
Cymbella silesiaca	2	84	0.002
Cymbella sinuata	2	84	0.002
Diatoma vulgaris	2	84	0.002
Navicula cincta	2	84	0.002
Navicula menisculus var grunowii	2	84	0.002
Navicula minima	2	84	0.002
Navicula salinarum	2	84	0.002
Navicula sp3	2	84	0.002
Navicula subminuscula	2	84	0.002
Navicula tripunctata	2	84	0.002
Nitzschia dissipata	2	84	0.002
Nitzschia microcephala	2	84	0.002
Nitzschia pusilla	2	84	0.002

Vermilion River, upstream, diatometer, 18 June 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia recta	2	84	0.002
Asterionella formosa	1	42	0.001
Navicula menisculus	1	42	0.001
Navicula minuscula	1	42	0.001
Nitzschia rosenstockii	1	42	0.001
Nitzschia tubicola	1	42	0.001
Stephanodiscus minutulus	1	42	0.001
TOTAL		38241	
Total Counted	910		
Species Richness	61		
Shannon Diversity (H)	2.80		

Vermilion River, upstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Achnanthes minutissima	239	139265	0.261
Gomphonema parvulum	229	133438	0.251
Nitzschia inconspicua	61	35545	0.067
Nitzschia palea	26	15150	0.028
Amphora pediculus	21	12237	0.023
Navicula cryptotenella	21	12237	0.023
Cyclotella cryptica	20	11654	0.022
Gomphonema parvulum var exilissimum	17	9906	0.019
Nitzschia frustulum	15	8741	0.016
Cocconeis placentula var euglypta	14	8158	0.015
Nitzschia rosenstockii	14	8158	0.015
Navicula pupula	12	6992	0.013
Navicula viridula var rostellata	11	6410	0.012
Stephanodiscus hantzschii	11	6410	0.012
Navicula gregaria	9	5244	0.010
Navicula schroeteri	9	5244	0.010
Gomphonema minutum	8	4662	0.009
Navicula lanceolata	7	4079	0.008
Achnanthes lanceolata	6	3496	0.007
Cyclotella meneghiniana	6	3496	0.007
Cyclotella pseudostelligera var1	6	3496	0.007
Cymbella sinuata	6	3496	0.007
Surirella minuta	6	3496	0.007
Cyclostephanos tholiformis	5	2914	0.005
Navicula minima	5	2914	0.005
Navicula viridula var germainii	5	2914	0.005
Nitzschia microcephala	5	2914	0.005
Stephanodiscus delicatus	5	2914	0.005
Caloneis bacillum	4	2331	0.004
Cyclotella pseudostelligera	4	2331	0.004
Gomphonema gracile	4	2331	0.004
Navicula atomus var permitis	4	2331	0.004
Navicula capitatoradiata	4	2331	0.004

Vermilion River, upstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula seminulum	4	2331	0.004
Navicula vandamii	4	2331	0.004
Navicula veneta	4	2331	0.004
Nitzschia compressa var vexans	4	2331	0.004
Nitzschia supralitorea	4	2331	0.004
Cyclotella atomus	3	1748	0.003
Cyclotella meneghiniana f. plana	3	1748	0.003
Navicula erifuga	3	1748	0.003
Nitzschia acicularis	3	1748	0.003
Nitzschia agnita	3	1748	0.003
Nitzschia dissipata	3	1748	0.003
Nitzschia perminuta	3	1748	0.003
Nitzschia sociabilis	3	1748	0.003
Aulacoseira granulata	2	1165	0.002
Cymbella silesiaca	2	1165	0.002
Gomphonema olivaceum	2	1165	0.002
Navicula agrestis	2	1165	0.002
Navicula sp2	2	1165	0.002
Navicula subminuscula	2	1165	0.002
Navicula tripunctata	2	1165	0.002
Nitzschia archibaldii	2	1165	0.002
Nitzschia calida	2	1165	0.002
Nitzschia fonticola	2	1165	0.002
Nitzschia sp12	2	1165	0.002
Rhoicosphenia curvata	2	1165	0.002
Skeletonema potamos	2	1165	0.002
Synedra tenera	2	1165	0.002
Thalassiosira pseudonana	2	1165	0.002
Achnanthes ricula	1	583	0.001
Cyclostephanos invisitatus	1	583	0.001
Cyclotella distinguenda var unipunc	1	583	0.001
Cyclotella pseudostelligera var3	1	583	0.001
Cyclotella woltereckii	1	583	0.001
Gomphonema parvulum f. saprophilum	1	583	0.001
Gomphonema sp7	1	583	0.001
Gyrosigma scalproides	1	583	0.001
Navicula capitata	1	583	0.001
Navicula cryptocephala	1	583	0.001
Navicula minuscula	1	583	0.001
Navicula monoculata	1	583	0.001
Nitzschia agnewii	1	583	0.001
Nitzschia apiculata	1	583	0.001
Nitzschia capitellata	1	583	0.001
Nitzschia draveillensis	1	583	0.001
Nitzschia dubia	1	583	0.001
Nitzschia minuta	1	583	0.001
Nitzschia pusilla	1	583	0.001
Stauroneis smithii	1	583	0.001
Thalassiosira weissflogii	1	583	0.001
TOTAL		532588	
Total Counted	914		
Species Richness	82		
Shannon Diversity (H)	2.88		

Vermilion River, downstream, diatometer, 16 September 1995.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula recens	147	226187	0.159
Nitzschia dissipata	102	156946	0.110
Gomphonema parvulum	50	76934	0.054
Stephanodiscus parvus	50	76934	0.054
Cocconeis placentula var euglypta	44	67702	0.048
Gomphonema minutum	40	61547	0.043
Navicula cryptotenella	33	50777	0.036
Navicula schroeteri	33	50777	0.036
Nitzschia filiformis	30	46161	0.032
Cymbella silesiaca	29	44622	0.031
Nitzschia palea	28	43083	0.030
Synedra ulna	20	30774	0.022
Navicula capitatoradiata	19	29235	0.021
Gomphonema affine	18	27696	0.019
Achnanthes minutissima	17	26158	0.018
Gomphonema clavatum	17	26158	0.018
Melosira varians	17	26158	0.018
Stephanodiscus hantzschii	15	23080	0.016
Nitzschia sociabilis	14	21542	0.015
Fragilaria vaucheriae	11	16926	0.012
Navicula viridula var germainii	11	16926	0.012
Amphora pediculus	9	13848	0.010
Cyclotella cryptica	9	13848	0.010
Navicula tripunctata	9	13848	0.010
Nitzschia archibaldii	9	13848	0.010
Rhoicosphenia curvata	9	13848	0.010
Nitzschia inconspicua	8	12309	0.009
Nitzschia pusilla	7	10771	0.008
Gomphonema gracile	6	9232	0.006
Gomphonema parvulum f. saprophilum	6	9232	0.006
Gomphonema parvulum var exilissimum	6	9232	0.006
Navicula gregaria	6	9232	0.006
Surirella suecica	6	9232	0.006
Nitzschia rosenstockii	5	7693	0.005
Cyclotella pseudostelligera var1	4	6155	0.004
Cymbella caespitosa	4	6155	0.004
Synedra fasiculata var truncata	4	6155	0.004
Synedra tenera	4	6155	0.004
Cyclostephanos tholiformis	3	4616	0.003
Cymbella tumida	3	4616	0.003
Navicula cryptocephala	3	4616	0.003
Navicula lundii	3	4616	0.003
Navicula saprophila	3	4616	0.003
Navicula sp2	3	4616	0.003
Surirella minuta	3	4616	0.003
Achnanthes lanceolata	2	3077	0.002
Amphipleura pellucida	2	3077	0.002
Aulacoseira granulata	2	3077	0.002
Caloneis bacillum	2	3077	0.002
Cyclotella pseudostelligera	2	3077	0.002
Gomphonema amoenum	2	3077	0.002
Gomphonema sp7	2	3077	0.002
Gyrosigma acuminatum	2	3077	0.002
Navicula angusta	2	3077	0.002

Vermilion River, downstream, diatometer, 16 September 1995 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula lanceolata	2	3077	0.002
Navicula minima	2	3077	0.002
Navicula viridula var rostellata	2	3077	0.002
Nitzschia linearis	2	3077	0.002
Nitzschia supralitorea	2	3077	0.002
Asterionella formosa	1	1539	0.001
Aulacoseira alpigena	1	1539	0.001
Cocconeis pediculus	1	1539	0.001
Cyclostephanos invisitatus	1	1539	0.001
Cyclotella atomus	1	1539	0.001
Cyclotella meneghiniana	1	1539	0.001
Gomphonema olivaceum	1	1539	0.001
Gomphonema sp5	1	1539	0.001
Navicula atomus var permitis	1	1539	0.001
Navicula heimansii	1	1539	0.001
Navicula menisculus	1	1539	0.001
Navicula minuscula	1	1539	0.001
Navicula subminuscula	1	1539	0.001
Nitzschia acicularis	1	1539	0.001
Nitzschia agnita	1	1539	0.001
Nitzschia compressa var vexans	1	1539	0.001
Nitzschia paleacea	1	1539	0.001
Nitzschia tubicola	1	1539	0.001
Thalassiosira pseudonana	1	1539	0.001
TOTAL		1421745	
Total Counted	924		
Species Richness	78		
Shannon Diversity (H)	3.44		

Vermilion River, upstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia dissipata	184	2277	0.199
Melosira varians	73	904	0.079
Navicula sp2	51	631	0.055
Nitzschia palea	51	631	0.055
Rhoicosphenia curvata	49	606	0.053
Amphora pediculus	47	582	0.051
Navicula gregaria	43	532	0.046
Achnanthes minutissima	41	507	0.044
Achnanthes lanceolata	32	396	0.035
Navicula cryptotenella	27	334	0.029
Nitzschia sociabilis	27	334	0.029
Navicula lanceolata	23	285	0.025
Surirella minuta	19	235	0.021
Nitzschia inconspicua	16	198	0.017
Navicula tripunctata	12	149	0.013
Cyclotella meneghiniana	11	136	0.012

Vermilion River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Cymbella sinuata	10	124	0.011
Navicula atomus var permitis	10	124	0.011
Navicula lacunolaciniata	9	111	0.010
Navicula cryptocephala	8	99	0.009
Navicula trivialis	8	99	0.009
Stephanodiscus hantzschii	8	99	0.009
Caloneis bacillum	7	87	0.008
Cocconeis pediculus	7	87	0.008
Gomphonema consector	7	87	0.008
Gomphonema olivaceum	7	87	0.008
Nitzschia capitellata	7	87	0.008
Skeletonema potamos	7	87	0.008
Synedra tenera	7	87	0.008
Cymbella silesiaca	6	74	0.006
Nitzschia archibaldii	6	74	0.006
Nitzschia frustulum	6	74	0.006
Nitzschia supralitorea	6	74	0.006
Synedra ulna	6	74	0.006
Gomphonema parvulum	5	62	0.005
Navicula minuscula	5	62	0.005
Nitzschia acicularis	5	62	0.005
Navicula capitatoradiata	4	50	0.004
Nitzschia communis	4	50	0.004
Nitzschia minuta	4	50	0.004
Surirella angusta	4	50	0.004
Nitzschia amphibia	3	37	0.003
Nitzschia recta	3	37	0.003
Stephanodiscus parvus	3	37	0.003
Asterionella formosa	2	25	0.002
Cocconeis placentula var euglypta	2	25	0.002
Cyclostephanos invisitatus	2	25	0.002
Cyclotella atomus	2	25	0.002
Fragilaria capucina	2	25	0.002
Fragilaria construens f. venter	2	25	0.002
Gomphonema parvulum f. saprophilum	2	25	0.002
Gomphonema truncatum	2	25	0.002
Navicula agrestis	2	25	0.002
Navicula minima	2	25	0.002
Navicula saprophila	2	25	0.002
Navicula subminuscula	2	25	0.002
Nitzschia gracilis	2	25	0.002
Nitzschia intermedia	2	25	0.002
Nitzschia levidensis	2	25	0.002
Nitzschia linearis var subtilis	2	25	0.002
Nitzschia microcephala	2	25	0.002
Nitzschia sp21	2	25	0.002
Nitzschia vermicularis	2	25	0.002
Thalassiosira pseudonana	2	25	0.002
Cyclostephanos tholiformis	1	12	0.001
Cyclotella stelligera	1	12	0.001
Meridion circulare	1	12	0.001
Navicula menisculus	1	12	0.001
Navicula minuscula var muralis	1	12	0.001

Vermilion River, upstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula veneta	1	12	0.001
Synedra pulchella	1	12	0.001
TOTAL		11449	
Total Counted	925		
Species Richness	71		
Shannon Diversity (H)	3.34		

Vermilion River, downstream, diatometer, 9 June 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia dissipata	214	71259	0.235
Nitzschia acicularis	106	35296	0.117
Nitzschia sociabilis	93	30968	0.102
Melosira varians	87	28970	0.096
Gomphonema parvulum	43	14318	0.047
Synedra ulna	38	12653	0.042
Navicula cryptotenella	35	11654	0.039
Nitzschia palea	23	7659	0.025
Navicula capitatoradiata	21	6993	0.023
Navicula lanceolata	20	6660	0.022
Navicula sp2	19	6327	0.021
Synedra ulna var acus	19	6327	0.021
Navicula tripunctata	18	5994	0.020
Navicula gregaria	13	4329	0.014
Stephanodiscus hantzschii	13	4329	0.014
Achnanthes minutissima	12	3996	0.013
Fragilaria vaucheriae	10	3330	0.011
Gomphonema olivaceum	10	3330	0.011
Rhoicosphenia curvata	10	3330	0.011
Navicula atomus var permitis	7	2331	0.008
Nitzschia linearis var subtilis	7	2331	0.008
Fragilaria capucina	6	1998	0.007
Surirella minuta	6	1998	0.007
Synedra tenera	6	1998	0.007
Aulacoseira granulata	4	1332	0.004
Nitzschia agnewii	4	1332	0.004
Nitzschia paleacea	4	1332	0.004
Amphora pediculus	3	999	0.003
Cymbella silesiaca	3	999	0.003
Navicula saprophila	3	999	0.003
Achnanthes lanceolata	2	666	0.002
Cyclotella atomus	2	666	0.002
Navicula capitata	2	666	0.002
Navicula cryptocephala	2	666	0.002
Navicula menisculus	2	666	0.002
Navicula minuscula	2	666	0.002
Navicula trivialis	2	666	0.002
Nitzschia archibaldii	2	666	0.002

Vermilion River, downstream, diatometer, 9 June 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia gracilis	2	666	0.002
Nitzschia linearis	2	666	0.002
Nitzschia pusilla	2	666	0.002
Nitzschia supralitorea	2	666	0.002
Nitzschia tubicola	2	666	0.002
Skeletonema potamos	2	666	0.002
Stephanodiscus minutulus	2	666	0.002
Synedra fasiculata var truncata	2	666	0.002
Thalassiosira pseudonana var1	2	666	0.002
Achnanthes ricula	1	333	0.001
Aulacoseira alpigena	1	333	0.001
Caloneis bacillum	1	333	0.001
Cocconeis pediculus	1	333	0.001
Cyclotella pseudostelligera	1	333	0.001
Cyclotella stelligera	1	333	0.001
Diatoma vulgaris	1	333	0.001
Navicula atomus	1	333	0.001
Navicula lacunolaciniata	1	333	0.001
Navicula minima	1	333	0.001
Navicula minuscula var muralis	1	333	0.001
Navicula veneta	1	333	0.001
Nitzschia apiculata	1	333	0.001
Nitzschia communis	1	333	0.001
Nitzschia inconspicua	1	333	0.001
Nitzschia recta	1	333	0.001
Stephanodiscus parvus	1	333	0.001
Thalassiosira pseudonana	1	333	0.001
TOTAL		302684	
Total Counted	909		
Species Richness	65		
Shannon Diversity (H)	2.95		

Vermilion River, upstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia palea	75	7771	0.085
Nitzschia supralitorea	66	6839	0.075
Melosira varians	60	6217	0.068
Navicula cryptotenella	50	5181	0.057
Navicula viridula var germainii	48	4974	0.054
Achnanthes minutissima	44	4559	0.050
Navicula schroeteri	38	3937	0.043
Nitzschia inconspicua	33	3419	0.037
Achnanthes ricula	30	3109	0.034
Amphora pediculus	29	3005	0.033
Navicula sp2	28	2901	0.032
Navicula capitatoradiata	22	2280	0.025
Achnanthes lanceolata	21	2176	0.024

Vermilion River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula minima	21	2176	0.024
Nitzschia dissipata	16	1658	0.018
Amphora inariensis	15	1554	0.017
Cocconeis placentula var euglypta	12	1243	0.014
Navicula veneta	12	1243	0.014
Nitzschia rosenstockii	12	1243	0.014
Navicula pupula	11	1140	0.012
Navicula vandamii	11	1140	0.012
Nitzschia amphibia	10	1036	0.011
Navicula menisculus var grunowii	9	933	0.010
Gyrosigma acuminatum	8	829	0.009
Navicula heimansii	8	829	0.009
Navicula subminuscula	7	725	0.008
Nitzschia agnita	7	725	0.008
Nitzschia angustatula	7	725	0.008
Cymbella silesiaca	6	622	0.007
Gomphonema amoenum	6	622	0.007
Gomphonema clavatum	6	622	0.007
Gomphonema parvulum	6	622	0.007
Navicula cryptocephala	6	622	0.007
Navicula molestiformis	6	622	0.007
Simonsenia delognei	6	622	0.007
Caloneis bacillum	5	518	0.006
Navicula atomus var permitis	5	518	0.006
Navicula gregaria	5	518	0.006
Navicula tenera	5	518	0.006
Nitzschia apiculata	5	518	0.006
Nitzschia nereidis	5	518	0.006
Amphora libyca	4	414	0.005
Gomphonema minutum	4	414	0.005
Navicula tenelloides	4	414	0.005
Nitzschia microcephala	4	414	0.005
Cocconeis placentula var lineata	3	311	0.003
Cymbella tumida	3	311	0.003
Navicula sp3	3	311	0.003
Nitzschia clausii	3	311	0.003
Nitzschia minuta	3	311	0.003
Stephanodiscus hantzschii	3	311	0.003
Achnanthes minutissima var inconspi	2	207	0.002
Amphora veneta	2	207	0.002
Cyclotella cryptica	2	207	0.002
Cyclotella pseudostelligera var1	2	207	0.002
Cymbella affinis	2	207	0.002
Gomphonema angustatum	2	207	0.002
Gyrosigma attenuatum	2	207	0.002
Navicula agrestis	2	207	0.002
Navicula cincta	2	207	0.002
Navicula minuscula	2	207	0.002
Navicula pygmaea	2	207	0.002
Navicula tripunctata	2	207	0.002
Nitzschia agnewii	2	207	0.002
Nitzschia angustiforaminata	2	207	0.002
Nitzschia dissipata var media	2	207	0.002
Nitzschia dubia	2	207	0.002

Vermilion River, upstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia flexa	2	207	0.002
Nitzschia fonticola	2	207	0.002
Nitzschia frustulum	2	207	0.002
Nitzschia siliqua	2	207	0.002
Nitzschia solita	2	207	0.002
Rhoicosphenia curvata	2	207	0.002
Surirella angusta	2	207	0.002
Achnanthes minutissima var robusta	1	104	0.001
Cocconeis pediculus	1	104	0.001
Cyclostephanos invisitatus	1	104	0.001
Cyclotella meneghiniana	1	104	0.001
Fragilaria capucina	1	104	0.001
Fragilaria construens f. venter	1	104	0.001
Gomphonema truncatum	1	104	0.001
Meridion circulare	1	104	0.001
Navicula atomus	1	104	0.001
Navicula erifuga	1	104	0.001
Navicula lacunolaciniata	1	104	0.001
Navicula lanceolata	1	104	0.001
Navicula recens	1	104	0.001
Navicula viridula var rostellata	1	104	0.001
Nitzschia rautenbachiae	1	104	0.001
Nitzschia tubicola	1	104	0.001
Surirella brebissonii var kuetzingi	1	104	0.001
Surirella minuta	1	104	0.001
Thalassiosira weissflogii	1	104	0.001
TOTAL		91287	
Total Counted	881		
Species Richness	93		
Shannon Diversity (H)	3.73		

Vermilion River, downstream, diatometer, 21 September 1996.

SPECIES	NUMBER	CELLS/cm	R.D.
Navicula recens	141	110	0.157
Gomphonema parvulum	106	82	0.118
Nitzschia palea	98	76	0.109
Nitzschia dissipata	78	61	0.087
Cocconeis placentula var euglypta	75	58	0.084
Navicula capitatoradiata	53	41	0.059
Achnanthes minutissima	42	33	0.047
Navicula schroeteri	30	23	0.033
Navicula cryptotenella	28	22	0.031
Melosira varians	22	17	0.025
Gomphonema minutum	21	16	0.023
Gomphonema parvulum var exilissimum	18	14	0.020
Cocconeis placentula var lineata	15	12	0.017
Gomphonema clavatum	11	9	0.012

Vermilion River, downstream, diatometer, 21 September 1996 (Continued).

SPECIES	NUMBER	CELLS/cm	R.D.
Nitzschia sp2	11	9	0.012
Gomphonema consector	10	8	0.011
Gomphonema angustatum	9	7	0.010
Synedra ulna	9	7	0.010
Cymbella caespitosa	8	6	0.009
Cymbella tumida	7	5	0.008
Synedra tenera	7	5	0.008
Cymbella silesiaca	6	5	0.007
Fragilaria capucina	6	5	0.007
Nitzschia inconspicua	6	5	0.007
Cymbella sinuata	5	4	0.006
Navicula viridula var germainii	5	4	0.006
Amphora pediculus	4	3	0.004
Gomphonema gracile	4	3	0.004
Gomphonema sp4	4	3	0.004
Navicula tripunctata	4	3	0.004
Nitzschia sociabilis	4	3	0.004
Synedra pulchella	4	3	0.004
Cyclotella distinguenda var unipunc	3	2	0.003
Nitzschia supralitorea	3	2	0.003
Achnanthes minutissima var inconspi	2	2	0.002
Amphora libyca	2	2	0.002
Cyclotella atomus	2	2	0.002
Fragilaria vaucheriae	2	2	0.002
Gomphonema sp7	2	2	0.002
Navicula minuscula	2	2	0.002
Navicula tenera	2	2	0.002
Navicula viridula var rostellata	2	2	0.002
Nitzschia fonticola	2	2	0.002
Nitzschia gracilis	2	2	0.002
Nitzschia microcephala	2	2	0.002
Rhoicosphenia curvata	2	2	0.002
Stephanodiscus hantzschii	2	2	0.002
Synedra fasiculata var truncata	2	2	0.002
Actinocyclus normanii	1	1	0.001
Amphipleura pellucida	1	1	0.001
Cocconeis pediculus	1	1	0.001
Gomphonema olivaceum	1	1	0.001
Gyrosigma attenuatum	1	1	0.001
Navicula erifuga	1	1	0.001
Navicula phyllepta	1	1	0.001
Navicula sp2	1	1	0.001
Navicula subminuscula	1	1	0.001
Nitzschia clausii	1	1	0.001
Stephanodiscus parvus	1	1	0.001
Synedra ulna var acus	1	1	0.001
TOTAL		697	
Total Counted	897		
Species Richness	60		
Shannon Diversity (H)	3.05		

APPENDIX 4
DIATOM SPECIES IN GRAB SAMPLES

CONTENTS **Page**

Ashtabula River . . . . . .

Black River . . . . . .

Chagrin River . . . . . .

Cuyahoga River . . . . . .

Grand River . . . . . .

Huron River . . . . . .

Maumee River . . . . . .

Old Woman Creek . . . . . .

Portage River . . . . . .

Vermilion River . . . . . .

Ashtabula River, upstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	309	0.748
Navicula capitatoradiata	14	0.034
Cyclotella meneghiniana	9	0.022
Navicula lanceolata	8	0.019
Cocconeis pediculus	7	0.017
Nitzschia acicularis	6	0.015
Nitzschia minuta	6	0.015
Nitzschia palea	6	0.015
Nitzschia supralitorea	6	0.015
Gomphonema parvulum	5	0.012
Navicula atomus var permitis	5	0.012
Cymbella silesiaca	4	0.010
Nitzschia frustulum	4	0.010
Fragilaria vaucheriae	3	0.007
Nitzschia dissipata	3	0.007
Navicula cryptocephala	2	0.005
Nitzschia fonticola	2	0.005
Synedra tenera	2	0.005
Cyclotella pseudostelligera var1	1	0.002
Cymbella sinuata	1	0.002
Fragilaria capucina	1	0.002
Gomphonema minutum	1	0.002
Melosira varians	1	0.002
Navicula gregaria	1	0.002
Navicula salinarum	1	0.002
Nitzschia paleacea	1	0.002
Nitzschia subacicularis	1	0.002
Stephanodiscus alpinus	1	0.002
Surirella brebissonii var kuetzingi	1	0.002
Surirella minuta	1	0.002
Total Counted	413	
Species Richness	30	
Shannon Diversity (H)	1.33	

Ashtabula River, downstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	230	0.539
Synedra fasiculata var truncata	24	0.056
Rhoicosphenia curvata	21	0.049
Cocconeis placentula var lineata	17	0.040
Nitzschia dissipata	17	0.040
Nitzschia fonticola	16	0.037
Nitzschia palea	16	0.037
Gomphonema parvulum	15	0.035
Gomphonema minutum	12	0.028
Cocconeis pediculus	11	0.026
Fragilaria vaucheriae	9	0.021

Ashtabula River, downstream, grab sample, 26 June 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Synedra pulchella	5	0.012
Cymbella silesiaca	4	0.009
Nitzschia filiformis	4	0.009
Melosira varians	3	0.007
Nitzschia paleacea	3	0.007
Nitzschia supralitorea	3	0.007
Achnanthes lanceolata	2	0.005
Cymbella tumida	2	0.005
Gomphonema clavatum	2	0.005
Navicula capitatoradiata	2	0.005
Navicula gregaria	2	0.005
Navicula recens	2	0.005
Nitzschia sociabilis	2	0.005
Cyclotella meneghiniana	1	0.002
Diatoma vulgaris	1	0.002
Nitzschia sinuata var tabellaria	1	0.002
Total Counted	427	
Species Richness	27	
Shannon Diversity (H)	2.00	

Ashtabula River, upstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	253	0.634
Nitzschia filiformis	10	0.025
Nitzschia reversa	8	0.020
Nitzschia supralitorea	8	0.020
Nitzschia inconspicua	7	0.018
Navicula lanceolata	6	0.015
Nitzschia intermedia	6	0.015
Nitzschia palea	6	0.015
Gomphonema clavatum	5	0.013
Navicula capitatoradiata	5	0.013
Cyclotella meneghiniana	4	0.010
Cyclotella pseudostelligera var1	4	0.010
Nitzschia amphibia	4	0.010
Synedra ulna var acus	4	0.010
Cocconeis pediculus	3	0.008
Cyclostephanos tholiformis	3	0.008
Navicula tenera	3	0.008
Navicula viridula var rostellata	3	0.008
Nitzschia acicularis	3	0.008
Synedra pulchella	3	0.008
Achnanthes lanceolata	2	0.005
Aulacoseira granulata	2	0.005
Gomphonema parvulum	2	0.005
Gomphonema truncatum	2	0.005
Melosira varians	2	0.005

Ashtabula River, upstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula cryptocephala	2	0.005
Navicula gregaria	2	0.005
Navicula minima	2	0.005
Navicula pupula	2	0.005
Nitzschia calida	2	0.005
Nitzschia levidensis	2	0.005
Nitzschia paleacea	2	0.005
Rhoicosphenia curvata	2	0.005
Stephanodiscus hantzschii	2	0.005
Synedra ulna	2	0.005
Thalassiosira weissflogii	2	0.005
Cyclotella atomus	1	0.003
Cyclotella meneghiniana f. plana	1	0.003
Cyclotella pseudostelligera	1	0.003
Cymbella silesiaca	1	0.003
Cymbella sinuata	1	0.003
Diatoma tenuis	1	0.003
Fragilaria capucina	1	0.003
Fragilaria vaucheriae	1	0.003
Gomphonema brasiliense	1	0.003
Gomphonema olivaceum	1	0.003
Navicula menisculus	1	0.003
Navicula minuscula	1	0.003
Navicula recens	1	0.003
Nitzschia fonticola	1	0.003
Nitzschia microcephala	1	0.003
Nitzschia sinuata var tabellaria	1	0.003
Stephanodiscus minutulus	1	0.003
Stephanodiscus parvus	1	0.003
Thalassiosira pseudonana	1	0.003
Total Counted	399	
Species Richness	55	
Shannon Diversity (H)	1.99	

Ashtabula River, downstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	147	0.366
Amphora veneta	98	0.244
Synedra pulchella	66	0.164
Gomphonema parvulum	24	0.060
Amphora pediculus	7	0.017
Cocconeis pediculus	6	0.015
Navicula minima	5	0.012
Nitzschia inconspicua	5	0.012
Cocconeis placentula var euglypta	4	0.010
Cocconeis placentula var lineata	4	0.010
Fragilaria vaucheriae	4	0.010

Ashtabula River, downstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula recens	4	0.010
Gomphonema truncatum	3	0.007
Navicula lanceolata	3	0.007
Navicula sp2	3	0.007
Nitzschia palea	3	0.007
Achnanthes lanceolata	2	0.005
Cymbella silesiaca	2	0.005
Navicula cryptocephala	2	0.005
Cyclostephanos invisitatus	1	0.002
Cyclostephanos tholiformis	1	0.002
Cymbella microcephala	1	0.002
Gomphonema parvulum f. saprophilum	1	0.002
Navicula gregaria	1	0.002
Navicula indifferens	1	0.002
Nitzschia dissipata	1	0.002
Nitzschia perminuta	1	0.002
Surirella minuta	1	0.002
Thalassiosira pseudonana	1	0.002
Total Counted	402	
Species Richness	29	
Shannon Diversity (H)	1.98	

Ashtabula River, upstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	257	0.643
Fragilaria vaucheriae	42	0.105
Synedra pulchella	29	0.073
Gomphonema parvulum	14	0.035
Synedra tenera	8	0.020
Cymbella affinis	7	0.018
Cocconeis pediculus	6	0.015
Cymbella silesiaca	5	0.013
Fragilaria capucina	4	0.010
Gomphonema minutum	4	0.010
Nitzschia capitellata	4	0.010
Navicula gregaria	3	0.008
Nitzschia palea	3	0.008
Navicula lanceolata	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia rosenstockii	2	0.005
Nitzschia supralitorea	2	0.005
Synedra fasiculata var truncata	2	0.005
Achnanthes lanceolata	1	0.003
Caloneis bacillum	1	0.003

Ashtabula River, upstream, grab sample, 18 June 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cymbella sp1	1	0.003
Fragilaria construens f. venter	1	0.003
Total Counted	400	
Species Richness	22	
Shannon Diversity (H)	1.49	

Ashtabula River, downstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	229	0.571
Gomphonema minutum	48	0.120
Rhoicosphenia curvata	46	0.115
Cocconeis pediculus	23	0.057
Gomphonema parvulum	17	0.042
Nitzschia paleacea	7	0.017
Navicula gregaria	6	0.015
Cocconeis placentula var lineata	4	0.010
Nitzschia dissipata	4	0.010
Cocconeis placentula	3	0.007
Navicula atomus var permitis	2	0.005
Navicula lanceolata	2	0.005
Navicula minima	2	0.005
Navicula minuscula	2	0.005
Synedra pulchella	2	0.005
Cymbella silesiaca	1	0.002
Cymbella sinuata	1	0.002
Synedra fasiculata var truncata	1	0.002
Thalassiosira pseudonana var1	1	0.002
Total Counted	401	
Species Richness	19	
Shannon Diversity (H)	1.57	

Ashtabula River, upstream, grab sample, 17 September 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	260	0.642
Fragilaria capucina	43	0.106
Synedra fasiculata var truncata	13	0.032
Nitzschia palea	9	0.022
Fragilaria vaucheriae	8	0.020
Cyclotella pseudostelligera var3	5	0.012
Cymbella sinuata	4	0.010

Ashtabula River, upstream, grab sample, 17 September 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia dissipata	4	0.010
Nitzschia fonticola	4	0.010
Synedra tenera	4	0.010
Amphipleura pellucida	3	0.007
Cyclotella meneghiniana	3	0.007
Cyclotella pseudostelligera	3	0.007
Cymbella microcephala	3	0.007
Navicula cryptotenella	3	0.007
Navicula schroeteri	3	0.007
Nitzschia filiformis	3	0.007
Nitzschia reversa	3	0.007
Gomphonema parvulum	2	0.005
Navicula cryptocephala	2	0.005
Navicula vandamii	2	0.005
Navicula viridula var rostellata	2	0.005
Nitzschia agnewii	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia sinuata var tabellaria	2	0.005
Nitzschia supralitorea	2	0.005
Synedra pulchella	2	0.005
Diatoma mesodon	1	0.002
Gomphonema clavatum	1	0.002
Melosira varians	1	0.002
Navicula lanceolata	1	0.002
Nitzschia clausii	1	0.002
Nitzschia tubicola	1	0.002
Synedra ulna var acus	1	0.002
Total Counted	405	
Species Richness	35	
Shannon Diversity (H)	1.69	

Ashtabula River, downstream, grab sample, 17 September 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	174	0.441
Nitzschia sociabilis	54	0.137
Nitzschia dissipata	43	0.109
Nitzschia fonticola	11	0.028
Cocconeis placentula var euglypta	10	0.025
Amphora pediculus	8	0.020
Nitzschia supralitorea	8	0.020
Navicula minima	7	0.018
Navicula recens	7	0.018
Thalassiosira pseudonana	7	0.018
Navicula capitatoradiata	6	0.015
Navicula tripunctata	6	0.015
Stephanodiscus parvus	5	0.013

Ashtabula River, downstream, grab sample, 17 September 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella ocellata	4	0.010
Navicula cryptotenella	4	0.010
Navicula lanceolata	4	0.010
Gomphonema minutum	3	0.008
Nitzschia filiformis	3	0.008
Nitzschia tubicola	3	0.008
Achnanthes minutissima var robusta	2	0.005
Cyclotella pseudostelligera var1	2	0.005
Cymbella silesiaca	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia palea	2	0.005
Cyclotella distinguenda var unipunc	1	0.003
Cyclotella michiganiana	1	0.003
Cyclotella pseudostelligera	1	0.003
Cyclotella pseudostelligera var3	1	0.003
Eunotia exigua	1	0.003
Fragilaria vaucheriae	1	0.003
Gomphonema parvulum	1	0.003
Navicula ignota	1	0.003
Navicula schroeteri	1	0.003
Nitzschia minuta	1	0.003
Nitzschia perminuta	1	0.003
Nitzschia recta	1	0.003
Simonsenia delognei	1	0.003
Skeletonema potamos	1	0.003
Synedra fasiculata var truncata	1	0.003
Synedra pulchella	1	0.003
Synedra ulna	1	0.003
Thalassiosira pseudonana var1	1	0.003
Total Counted	395	
Species Richness	42	
Shannon Diversity (H)	2.28	

Ashtabula River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	271	0.664
Nitzschia palea	17	0.042
Nitzschia draveillensis	12	0.029
Cyclotella meneghiniana	11	0.027
Navicula capitatoradiata	7	0.017
Cocconeis pediculus	6	0.015
Fragilaria vaucheriae	6	0.015
Navicula gregaria	6	0.015
Navicula lacunolaciniata	6	0.015
Cymbella silesiaca	4	0.010
Cymbella sinuata	4	0.010
Nitzschia fonticola	4	0.010

Ashtabula River, upstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cymbella affinis	3	0.007
Navicula veneta	3	0.007
Cymbella caespitosa	2	0.005
Diatoma tenuis	2	0.005
Fragilaria capucina	2	0.005
Gomphonema angustatum	2	0.005
Gomphonema minutum	2	0.005
Navicula sp2	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia dissipata	2	0.005
Nitzschia inconspicua	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia minuta	2	0.005
Nitzschia recta	2	0.005
Nitzschia sinuata var tabellaria	2	0.005
Synedra ulna	2	0.005
Achnanthes lanceolata	1	0.002
Achnanthes pusilla	1	0.002
Cyclostephanos tholiformis	1	0.002
Cyclotella atomus	1	0.002
Diatoma vulgaris	1	0.002
Gomphonema olivaceum	1	0.002
Gomphonema parvulum	1	0.002
Gomphonema sp7	1	0.002
Navicula cryptocephala	1	0.002
Navicula cryptotenella	1	0.002
Navicula lanceolata	1	0.002
Navicula minima	1	0.002
Nitzschia agnita	1	0.002
Nitzschia angustiforaminata	1	0.002
Nitzschia communis	1	0.002
Nitzschia filiformis	1	0.002
Nitzschia sociabilis	1	0.002
Rhoicosphenia curvata	1	0.002
Skeletonema potamos	1	0.002
Synedra fasiculata var truncata	1	0.002
Total Counted	408	
Species Richness	48	
Shannon Diversity (H)	1.79	

Ashtabula River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	237	0.590
Nitzschia dissipata	24	0.060
Navicula gregaria	21	0.052
Navicula lanceolata	18	0.045
Navicula lacunolaciniata	11	0.027

Ashtabula River, downstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia sociabilis	10	0.025
Navicula tripunctata	9	0.022
Synedra fasiculata var truncata	8	0.020
Rhoicosphenia curvata	7	0.017
Cocconeis placentula var lineata	6	0.015
Cymbella caespitosa	5	0.012
Gomphonema minutum	5	0.012
Nitzschia inconspicua	5	0.012
Cymbella silesiaca	3	0.007
Cymbella sinuata	3	0.007
Navicula cryptotenella	3	0.007
Navicula minima	3	0.007
Cyclotella meneghiniana	2	0.005
Fragilaria capucina	2	0.005
Nitzschia fonticola	2	0.005
Synedra pulchella	2	0.005
Cocconeis pediculus	1	0.002
Cocconeis placentula	1	0.002
Cyclotella pseudostelligera	1	0.002
Cymbella affinis	1	0.002
Cymbella prostrata	1	0.002
Diatoma tenuis	1	0.002
Fragilaria vaucheriae	1	0.002
Gomphonema olivaceum	1	0.002
Gomphonema parvulum	1	0.002
Navicula capitatoradiata	1	0.002
Navicula erifuga	1	0.002
Nitzschia draveillensis	1	0.002
Nitzschia frustulum	1	0.002
Nitzschia paleacea	1	0.002
Nitzschia sinuata var tabellaria	1	0.002
Surirella minuta	1	0.002
Total Counted	402	
Species Richness	37	
Shannon Diversity (H)	1.91	

Ashtabula River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	178	0.441
Nitzschia sinuata	25	0.062
Nitzschia palea	18	0.045
Nitzschia amphibia	17	0.042
Synedra fasiculata var truncata	12	0.030
Cyclotella meneghiniana	10	0.025
Nitzschia rosenstockii	9	0.022
Skeletonema potamos	9	0.022
Gomphonema parvulum	8	0.020

Ashtabula River, upstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia filiformis	8	0.020
Thalassiosira pseudonana	8	0.020
Gomphonema clavatum	7	0.017
Nitzschia supralitorea	7	0.017
Synedra pulchella	7	0.017
Navicula minima	6	0.015
Gomphonema minutum	4	0.010
Navicula gregaria	4	0.010
Navicula recens	4	0.010
Nitzschia acicularis	3	0.007
Synedra ulna	3	0.007
Achnanthes ricula	2	0.005
Anomoeoneis vitrea	2	0.005
Cocconeis pediculus	2	0.005
Cyclotella pseudostelligera	2	0.005
Cymbella affinis	2	0.005
Cymbella microcephala	2	0.005
Cymbella silesiaca	2	0.005
Fragilaria capucina	2	0.005
Gomphonema affine	2	0.005
Gomphonema olivaceum	2	0.005
Navicula agrestis	2	0.005
Navicula cryptocephala	2	0.005
Navicula lanceolata	2	0.005
Navicula molestiformis	2	0.005
Navicula seminulum	2	0.005
Navicula viridula var rostellata	2	0.005
Nitzschia angustiforaminata	2	0.005
Nitzschia draveillensis	2	0.005
Nitzschia fonticola	2	0.005
Nitzschia gracilis	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia recta	2	0.005
Achnanthes lanceolata	1	0.002
Amphipleura pellucida	1	0.002
Cyclotella woltereckii	1	0.002
Diatoma tenuis	1	0.002
Fragilaria vaucheriae	1	0.002
Gomphonema olivaceum var minutissim	1	0.002
Navicula atomus	1	0.002
Navicula lacunolaciniata	1	0.002
Navicula subminuscula	1	0.002
Nitzschia dissipata	1	0.002
Nitzschia inconspicua	1	0.002
Synedra tenera	1	0.002
Synedra ulna var acus	1	0.002

Total Counted	404
Species Richness	55
Shannon Diversity (H)	2.66

Ashtabula River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	299	0.729
Nitzschia amphibia	23	0.056
Nitzschia inconspicua	18	0.044
Navicula atomus var permitis	15	0.037
Cocconeis placentula var euglypta	13	0.032
Nitzschia frustulum	8	0.020
Gomphonema clavatum	6	0.015
Rhoicosphenia curvata	6	0.015
Gomphonema parvulum	4	0.010
Navicula minima	4	0.010
Navicula recens	3	0.007
Nitzschia palea	3	0.007
Nitzschia filiformis	2	0.005
Achnanthes lanceolata	1	0.002
Amphora pediculus	1	0.002
Cymbella caespitosa	1	0.002
Diatoma vulgaris	1	0.002
Nitzschia microcephala	1	0.002
Nitzschia rosenstockii	1	0.002
Total Counted	410	
Species Richness	19	
Shannon Diversity (H)	1.24	

Ashtabula River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	207	0.512
Nitzschia palea	50	0.124
Nitzschia paleacea	32	0.079
Cymbella silesiaca	18	0.045
Gomphonema parvulum	18	0.045
Navicula atomus var permitis	14	0.035
Fragilaria capucina	10	0.025
Nitzschia archibaldii	6	0.015
Nitzschia dissipata	6	0.015
Navicula gregaria	5	0.012
Nitzschia inconspicua	4	0.010
Fragilaria vaucheriae	3	0.007
Navicula minima	3	0.007
Synedra tenera	3	0.007
Navicula saprophila	2	0.005
Nitzschia acicularis	2	0.005
Nitzschia gracilis	2	0.005
Nitzschia intermedia	2	0.005
Nitzschia minuta	2	0.005
Achnanthes lanceolata	1	0.002
Cyclotella atomus	1	0.002
Cyclotella pseudostelligera var1	1	0.002

Ashtabula River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Eunotia curvata	1	0.002
Gomphonema minutum	1	0.002
Navicula lacunolaciniata	1	0.002
Navicula lanceolata	1	0.002
Navicula subminuscula	1	0.002
Nitzschia agnita	1	0.002
Nitzschia fonticola	1	0.002
Nitzschia frustulum	1	0.002
Nitzschia perminuta	1	0.002
Nitzschia sinuata	1	0.002
Nitzschia sociabilis	1	0.002
Thalassiosira weissflogii	1	0.002
Total Counted	404	
Species Richness	34	
Shannon Diversity (H)	1.96	

Ashtabula River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Cymbella silesiaca	79	0.196
Fragilaria vaucheriae	78	0.194
Achnanthes minutissima	43	0.107
Nitzschia paleacea	26	0.065
Diatoma tenuis	17	0.042
Gomphonema parvulum	15	0.037
Nitzschia dissipata	15	0.037
Synedra tenera	14	0.035
Nitzschia palea	13	0.032
Melosira varians	9	0.022
Diatoma vulgaris	7	0.017
Fragilaria capucina	7	0.017
Synedra pulchella	7	0.017
Fragilaria capucina var mesolepta	6	0.015
Navicula gregaria	6	0.015
Navicula capitatoradiata	5	0.012
Nitzschia archibaldii	5	0.012
Nitzschia fonticola	4	0.010
Stephanodiscus parvus	4	0.010
Synedra ulna	4	0.010
Cymbella caespitosa	3	0.007
Nitzschia sociabilis	3	0.007
Navicula atomus var permitis	2	0.005
Nitzschia heufleriana	2	0.005
Nitzschia inconspicua	2	0.005
Nitzschia intermedia	2	0.005
Nitzschia pusilla	2	0.005
Rhoicosphenia curvata	2	0.005
Surirella minuta	2	0.005

Ashtabula River, downstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes lanceolata	1	0.002
Achnanthes minutissima var inconspi	1	0.002
Cyclotella atomus	1	0.002
Cyclotella meneghiniana	1	0.002
Gomphonema olivaceum	1	0.002
Gomphonema parvulum f. saprophilum	1	0.002
Navicula lanceolata	1	0.002
Navicula minuscula	1	0.002
Navicula viridula	1	0.002
Nitzschia acicularis	1	0.002
Nitzschia agnita	1	0.002
Nitzschia compressa var vexans	1	0.002
Nitzschia filiformis	1	0.002
Nitzschia graciliformis	1	0.002
Nitzschia minuta	1	0.002
Nitzschia perminuta	1	0.002
Stephanodiscus delicatus	1	0.002
Surirella brebissonii var kuetzingi	1	0.002
Synedra fasiculata var truncata	1	0.002
Total Counted	403	
Species Richness	48	
Shannon Diversity (H)		

Ashtabula River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	278	0.686
Navicula seminulum	47	0.116
Nitzschia perminuta	16	0.040
Nitzschia clausii	11	0.027
Nitzschia frustulum	10	0.025
Nitzschia amphibia	8	0.020
Nitzschia inconspicua	7	0.017
Nitzschia supralitorea	6	0.015
Amphora delicatissima	4	0.010
Navicula minima	4	0.010
Nitzschia palea	4	0.010
Denticula subtilis	3	0.007
Achnanthes minutissima var inconspi	2	0.005
Achnanthes lanceolata	1	0.002
Gomphonema parvulum	1	0.002
Navicula aquaedurae	1	0.002

Ashtabula River, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula atomus var permitis	1	0.002
Nitzschia brevissima	1	0.002
Total Counted	405	
Species Richness	18	
Shannon Diversity (H)	1.31	

Ashtabula River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	85	0.213
Achnanthes minutissima	73	0.182
Gomphonema parvulum	37	0.093
Navicula recens	25	0.063
Navicula capitatoradiata	22	0.055
Navicula schroeteri	18	0.045
Nitzschia inconspicua	16	0.040
Cocconeis placentula var euglypta	13	0.033
Navicula cryptotenella	10	0.025
Nitzschia dissipata	10	0.025
Nitzschia fonticola	8	0.020
Navicula cryptocephala	7	0.018
Nitzschia supralitorea	7	0.018
Cymbella microcephala	5	0.013
Melosira varians	5	0.013
Navicula sp2	5	0.013
Cocconeis placentula var lineata	4	0.010
Cymbella caespitosa	4	0.010
Gomphonema minutum	4	0.010
Nitzschia frustulum	3	0.008
Nitzschia intermedia	3	0.008
Synedra tenera	3	0.008
Amphora inariensis	2	0.005
Cymbella prostrata	2	0.005
Cymbella silesiaca	2	0.005
Fragilaria vaucheriae	2	0.005
Gomphonema parvulum var exilissimum	2	0.005
Navicula gregaria	2	0.005
Navicula minuscula	2	0.005
Navicula viridula var germainii	2	0.005
Nitzschia rosenstockii	2	0.005
Cyclotella meneghiniana	1	0.003
Cymbella affinis	1	0.003
Cymbella sinuata	1	0.003
Cymbella tumida	1	0.003
Fragilaria capucina	1	0.003
Navicula molestiformis	1	0.003
Navicula seminulum	1	0.003
Navicula tripunctata	1	0.003

Ashtabula River, downstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia sinuata	1	0.003
Rhoicosphenia curvata	1	0.003
Stephanodiscus hantzschii	1	0.003
Stephanodiscus parvus	1	0.003
Synedra fasiculata var truncata	1	0.003
Synedra ulna	1	0.003
Synedra ulna var acus	1	0.003
Total Counted	400	
Species Richness	46	
Shannon Diversity (H)	2.85	

Black River, upstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula schroeteri	45	0.131
Cyclotella woltereckii	30	0.087
Cyclotella pseudostelligera var1	28	0.081
Thalassiosira pseudonana var1	23	0.067
Cyclotella atomus	16	0.047
Cyclotella cryptica	15	0.044
Navicula gregaria	15	0.044
Navicula cryptotenella	14	0.041
Nitzschia minuta	13	0.038
Nitzschia palea	11	0.032
Skeletonema potamos	11	0.032
Thalassiosira pseudonana	10	0.029
Melosira varians	9	0.026
Nitzschia acicularis	8	0.023
Navicula sp2	7	0.020
Nitzschia inconspicua	7	0.020
Stephanodiscus delicatus	7	0.020
Cyclotella meneghiniana	6	0.017
Navicula tripunctata	6	0.017
Nitzschia dissipata	6	0.017
Cocconeis pediculus	5	0.015
Nitzschia supralitorea	5	0.015
Achnanthes lanceolata	4	0.012
Amphora pediculus	4	0.012
Gomphonema minutum	3	0.009
Navicula viridula var germainii	3	0.009
Cyclostephanos tholiformis	2	0.006
Cyclotella atomus var4	2	0.006
Navicula atomus var permitis	2	0.006
Navicula capitatoradiata	2	0.006
Navicula minima	2	0.006
Navicula recens	2	0.006
Navicula saprophila	2	0.006
Navicula veneta	2	0.006
Nitzschia agnewii	2	0.006
Nitzschia capitellata	2	0.006
Nitzschia littoralis	2	0.006
Nitzschia sociabilis	2	0.006
Synedra fasiculata var truncata	2	0.006
Achnanthes minutissima	1	0.003
Aulacoseira alpigena	1	0.003
Aulacoseira granulata	1	0.003
Cyclotella pseudostelligera	1	0.003
Navicula monoculata	1	0.003
Surirella minuta	1	0.003
Synedra ulna	1	0.003

Total Counted	344
Species Richness	46
Shannon Diversity (H)	3.31

Black River, downstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Diatoma vulgaris	172	0.422
Nitzschia paleacea	72	0.176
Navicula cryptotenella	31	0.076
Rhoicosphenia curvata	30	0.074
Nitzschia inconspicua	27	0.066
Achnanthes minutissima	11	0.027
Cocconeis pediculus	9	0.022
Nitzschia dissipata	9	0.022
Navicula atomus var permitis	7	0.017
Navicula subminuscula	6	0.015
Nitzschia sociabilis	5	0.012
Nitzschia frustulum	4	0.010
Navicula lanceolata	3	0.007
Cyclotella atomus	2	0.005
Gomphonema minutum	2	0.005
Gomphonema parvulum	2	0.005
Navicula minuscula	2	0.005
Navicula tripunctata	2	0.005
Nitzschia minuta	2	0.005
Nitzschia palea	2	0.005
Nitzschia perminuta	2	0.005
Fragilaria vaucheriae	1	0.002
Gomphonema olivaceum	1	0.002
Navicula molestiformis	1	0.002
Navicula sp2	1	0.002
Nitzschia supralitorea	1	0.002
Stephanodiscus parvus	1	0.002
Total Counted	408	
Species Richness	27	
Shannon Diversity (H)	2.07	

Black River, upstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	207	0.510
Cyclotella atomus	27	0.067
Navicula veneta	25	0.062
Nitzschia palea	13	0.032
Thalassiosira pseudonana	12	0.030
Cyclotella pseudostelligera var1	11	0.027
Navicula erifuga	8	0.020
Cyclotella atomus var4	7	0.017
Navicula cryptotenella	7	0.017
Synedra fasiculata var truncata	7	0.017
Nitzschia agnita	6	0.015
Cocconeis pediculus	5	0.012
Nitzschia inconspicua	5	0.012
Nitzschia supralitorea	5	0.012

Black River, upstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Amphora pediculus	4	0.010
Navicula tenelloides	4	0.010
Nitzschia minuta	4	0.010
Cyclotella meneghiniana	3	0.007
Melosira varians	3	0.007
Navicula recens	3	0.007
Nitzschia amphibia	3	0.007
Nitzschia fonticola	3	0.007
Nitzschia sp2	3	0.007
Gomphonema parvulum	2	0.005
Navicula atomus var permitis	2	0.005
Navicula monoculata	2	0.005
Navicula seminulum	2	0.005
Navicula subminuscula	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia rosenstockii	2	0.005
Synedra pulchella	2	0.005
Aulacoseira granulata	1	0.002
Cyclostephanos tholiformis	1	0.002
Cyclotella meneghiniana f. plana	1	0.002
Cyclotella pseudostelligera	1	0.002
Diatoma vulgaris	1	0.002
Gomphonema parvulum f. saprophilum	1	0.002
Navicula minima	1	0.002
Navicula minuscula	1	0.002
Navicula viridula var germainii	1	0.002
Nitzschia acicularis	1	0.002
Nitzschia agnewii	1	0.002
Skeletonema potamos	1	0.002
Stephanodiscus delicatus	1	0.002
Stephanodiscus hantzschii var tenui	1	0.002
Surirella minuta	1	0.002
Total Counted	406	
Species Richness	46	
Shannon Diversity (H)	2.30	

Black River, downstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Synedra fasiculata var truncata	84	0.199
Nitzschia filiformis	56	0.132
Navicula recens	44	0.104
Navicula minima	40	0.095
Gomphonema parvulum	39	0.092
Pleurosira laevis f. polymorpha	38	0.090
Cocconeis pediculus	20	0.047
Cyclotella cryptica	16	0.038
Nitzschia inconspicua	12	0.028

Black River, downstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula seminulum	10	0.024
Amphora pediculus	6	0.014
Gomphonema brasiliense	6	0.014
Navicula monoculata	6	0.014
Melosira varians	5	0.012
Nitzschia palea	5	0.012
Rhoicosphenia curvata	4	0.009
Cyclotella atomus	3	0.007
Synedra pulchella	3	0.007
Achnanthes lanceolata	2	0.005
Achnanthes minutissima var inconspi	2	0.005
Amphora libyca	2	0.005
Cyclostephanos tholiformis	2	0.005
Cyclotella meneghiniana	2	0.005
Gomphonema amoenum	2	0.005
Navicula erifuga	2	0.005
Navicula menisculus	2	0.005
Nitzschia minuta	2	0.005
Nitzschia supralitorea	2	0.005
Bacillaria paradoxa	1	0.002
Cocconeis placentula var lineata	1	0.002
Navicula lanceolata	1	0.002
Navicula molestiformis	1	0.002
Navicula subminuscula	1	0.002
Navicula veneta	1	0.002
Total Counted	423	
Species Richness	34	
Shannon Diversity (H)	2.68	

Black River, upstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Thalassiosira pseudonana	110	0.275
Cyclotella cryptica	39	0.098
Skeletonema potamos	32	0.080
Stephanodiscus delicatus	29	0.073
Cyclotella pseudostelligera var1	26	0.065
Cyclotella atomus	22	0.055
Thalassiosira pseudonana var1	20	0.050
Stephanodiscus parvus	15	0.038
Stephanodiscus hantzschii var tenui	14	0.035
Stephanodiscus hantzschii	13	0.033
Cyclotella meneghiniana	9	0.023
Navicula lanceolata	9	0.023
Cyclotella pseudostelligera	8	0.020
Cyclostephanos invisitatus	7	0.018
Navicula gregaria	7	0.018
Nitzschia palea	7	0.018

Black River, upstream, grab sample, 18 June 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclostephanos tholiformis	3	0.008
Caloneis bacillum	2	0.005
Melosira varians	2	0.005
Navicula capitata	2	0.005
Navicula indifferens	2	0.005
Navicula monoculata	2	0.005
Navicula recens	2	0.005
Nitzschia acicularis	2	0.005
Nitzschia fonticola	2	0.005
Nitzschia inconspicua	2	0.005
Surirella minuta	2	0.005
Cyclotella pseudostelligera var3	1	0.003
Frustulia vulgaris	1	0.003
Navicula atomus	1	0.003
Navicula atomus var permitis	1	0.003
Navicula minuscula	1	0.003
Nitzschia amphibia	1	0.003
Nitzschia microcephala	1	0.003
Stephanodiscus binderanus	1	0.003
Synedra tenera	1	0.003
Synedra ulna var acus	1	0.003
Total Counted	400	
Species Richness	37	
Shannon Diversity (H)	2.73	

Black River, downstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Rhoicosphenia curvata	69	0.170
Nitzschia paleacea	60	0.148
Gomphonema olivaceum	38	0.094
Diatoma vulgaris	22	0.054
Skeletonema potamos	22	0.054
Cyclotella atomus	19	0.047
Nitzschia dissipata	19	0.047
Thalassiosira pseudonana	18	0.044
Cocconeis pediculus	13	0.032
Fragilaria vaucheriae	11	0.027
Cyclotella cryptica	10	0.025
Thalassiosira pseudonana var1	10	0.025
Navicula atomus var permitis	9	0.022
Cyclotella meneghiniana	8	0.020
Cyclotella pseudostelligera var1	7	0.017
Nitzschia palea	7	0.017
Stephanodiscus delicatus	7	0.017
Gomphonema parvulum f. saprophilum	6	0.015
Navicula mutica var ventricosa	6	0.015

Black River, downstream, grab sample, 18 June 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	4	0.010
Cocconeis placentula var lineata	4	0.010
Navicula cryptotenella	4	0.010
Navicula menisculus	4	0.010
Diatoma tenuis	3	0.007
Navicula gregaria	3	0.007
Nitzschia acicularis	3	0.007
Nitzschia filiformis	2	0.005
Nitzschia gracilis	2	0.005
Nitzschia minuta	2	0.005
Nitzschia sociabilis	2	0.005
Stephanodiscus hantzschii	2	0.005
Achnanthes lanceolata	1	0.002
Cyclostephanos tholiformis	1	0.002
Cyclotella pseudostelligera	1	0.002
Cyclotella sp1	1	0.002
Navicula capitata	1	0.002
Nitzschia amphibia	1	0.002
Nitzschia angustiforaminata	1	0.002
Nitzschia tubicola	1	0.002
Synedra fasiculata var truncata	1	0.002
Synedra pulchella	1	0.002
Total Counted	406	
Species Richness	41	
Shannon Diversity (H)	3.00	

Black River, upstream, grab sample, 17 September 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	230	0.574
Cyclotella atomus	55	0.137
Cyclostephanos tholiformis	17	0.042
Thalassiosira pseudonana	17	0.042
Skeletonema potamos	14	0.035
Cyclotella atomus var4	12	0.030
Stephanodiscus delicatus	10	0.025
Cyclotella pseudostelligera var1	8	0.020
Thalassiosira pseudonana var1	5	0.012
Cyclotella meneghiniana	4	0.010
Cyclostephanos invisitatus	3	0.007
Gomphonema parvulum	3	0.007
Achnanthes minutissima	2	0.005
Achnanthes sp5	2	0.005
Navicula lanceolata	2	0.005
Navicula seminulum	2	0.005
Nitzschia desertorum	2	0.005
Nitzschia palea	2	0.005
Nitzschia rosenstockii	2	0.005

Black River, upstream, grab sample, 17 September 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia supralitorea	2	0.005
Cyclotella meneghiniana f. plana	1	0.002
Cymbella silesiaca	1	0.002
Navicula erifuga	1	0.002
Navicula minima	1	0.002
Nitzschia agnewii	1	0.002
Nitzschia tubicola	1	0.002
Stephanodiscus hantzschii var tenui	1	0.002
Total Counted	401	
Species Richness	27	
Shannon Diversity (H)	1.74	

Black River, downstream, grab sample, 17 September 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Synedra fasiculata var truncata	62	0.153
Bacillaria paradoxa	35	0.086
Navicula recens	27	0.067
Navicula seminulum	27	0.067
Nitzschia inconspicua	27	0.067
Nitzschia supralitorea	27	0.067
Nitzschia filiformis	25	0.062
Navicula veneta	20	0.049
Cyclotella cryptica	19	0.047
Navicula minima	18	0.044
Synedra pulchella	18	0.044
Gomphonema parvulum	10	0.025
Achnanthes minutissima	9	0.022
Gomphonema parvulum var exilissimum	8	0.020
Nitzschia palea	7	0.017
Amphora pediculus	6	0.015
Cyclotella atomus	5	0.012
Navicula atomus var permitis	5	0.012
Navicula monoculata	5	0.012
Navicula viridula var germainii	5	0.012
Melosira varians	4	0.010
Navicula viridula var rostellata	3	0.007
Synedra ulna	3	0.007
Achnanthes lanceolata	2	0.005
Achnanthes sp5	2	0.005
Cyclotella michiganiana	2	0.005
Gomphonema clavatum	2	0.005
Navicula capitatoradiata	2	0.005
Navicula lanceolata	2	0.005
Navicula subminuscula	2	0.005
Pleurosira laevis f. polymorpha	2	0.005
Simonsenia delognei	2	0.005
Stephanodiscus delicatus	2	0.005

Black River, downstream, grab sample, 17 September 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus parvus	2	0.005
Thalassiosira pseudonana var1	2	0.005
Cyclotella atomus var4	1	0.002
Cyclotella pseudostelligera var1	1	0.002
Diatoma vulgaris	1	0.002
Navicula schroeteri	1	0.002
Navicula tenelloides	1	0.002
Nitzschia amphibia	1	0.002
Nitzschia angustiforaminata	1	0.002
Total Counted	406	
Species Richness	42	
Shannon Diversity (H)	3.09	

Black River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	151	0.378
Thalassiosira pseudonana	66	0.165
Skeletonema potamos	44	0.110
Cyclotella atomus	29	0.073
Cyclostephanos tholiformis	11	0.028
Navicula gregaria	9	0.023
Nitzschia inconspicua	9	0.023
Stephanodiscus hantzschii	9	0.023
Stephanodiscus hantzschii var tenui	8	0.020
Thalassiosira pseudonana var1	6	0.015
Gomphonema parvulum	5	0.013
Navicula lanceolata	5	0.013
Cyclostephanos invisitatus	4	0.010
Cyclotella meneghiniana	4	0.010
Melosira varians	3	0.008
Navicula minima	3	0.008
Synedra fasiculata var truncata	3	0.008
Achnanthes minutissima	2	0.005
Aulacoseira granulata	2	0.005
Caloneis bacillum	2	0.005
Cyclotella stelligera	2	0.005
Navicula veneta	2	0.005
Nitzschia apiculata	2	0.005
Nitzschia clausii	2	0.005
Nitzschia fonticola	2	0.005
Rhoicosphenia curvata	2	0.005
Stephanodiscus delicatus	2	0.005
Amphora pediculus	1	0.003
Gomphonema olivaceum	1	0.003
Navicula minuscula	1	0.003
Navicula monoculata	1	0.003
Navicula subminuscula	1	0.003

Black River, upstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula tenelloides	1	0.003
Navicula tripunctata	1	0.003
Nitzschia supralitorea	1	0.003
Synedra ulna	1	0.003
Thalassiosira weissflogii	1	0.003
Total Counted	399	
Species Richness	37	
Shannon Diversity (H)	2.31	

Black River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia paleacea	33	0.081
Diatoma vulgaris	28	0.069
Navicula gregaria	26	0.064
Nitzschia dissipata	25	0.062
Nitzschia palea	25	0.062
Nitzschia supralitorea	23	0.057
Gomphonema parvulum	22	0.054
Navicula atomus var permitis	22	0.054
Melosira varians	18	0.044
Nitzschia filiformis	17	0.042
Nitzschia fonticola	17	0.042
Navicula subminuscula	15	0.037
Nitzschia rosenstockii	13	0.032
Nitzschia minuta	12	0.030
Navicula agrestis	11	0.027
Navicula cryptotenella	11	0.027
Nitzschia inconspicua	11	0.027
Navicula lacunolaciniata	10	0.025
Nitzschia pusilla	8	0.020
Navicula minuscula	5	0.012
Navicula recens	5	0.012
Nitzschia recta	5	0.012
Nitzschia sociabilis	5	0.012
Nitzschia desertorum	4	0.010
Cyclotella cryptica	3	0.007
Navicula capitatoradiata	3	0.007
Navicula cryptocephala	3	0.007
Navicula lanceolata	3	0.007
Nitzschia amphibia	3	0.007
Cyclotella atomus	2	0.005
Navicula mutica var ventricosa	2	0.005
Navicula veneta	2	0.005
Rhoicosphenia curvata	2	0.005
Stephanodiscus hantzschii	2	0.005
Achnanthes exigua	1	0.002
Achnanthes minutissima	1	0.002

Black River, downstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Fragilaria vaucheriae	1	0.002
Gomphonema affine	1	0.002
Navicula menisculus var grunowii	1	0.002
Nitzschia archibaldii	1	0.002
Nitzschia capitellata	1	0.002
Synedra ulna var acus	1	0.002
Thalassiosira pseudonana	1	0.002
Total Counted	405	
Species Richness	43	
Shannon Diversity (H)	3.30	

Black River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	128	0.314
Cyclotella atomus	59	0.145
Cyclotella cryptica	44	0.108
Navicula minima	21	0.051
Navicula veneta	18	0.044
Navicula seminulum	13	0.032
Navicula subminuscula	13	0.032
Nitzschia palea	12	0.029
Simonsenia delognei	12	0.029
Nitzschia amphibia	11	0.027
Navicula recens	9	0.022
Cyclotella pseudostelligera var1	6	0.015
Nitzschia frustulum	6	0.015
Amphora pediculus	4	0.010
Caloneis bacillum	4	0.010
Navicula viridula var rostellata	4	0.010
Nitzschia supralitorea	4	0.010
Stephanodiscus delicatus	4	0.010
Cyclotella meneghiniana	3	0.007
Cyclotella pseudostelligera	3	0.007
Navicula atomus var permitis	3	0.007
Navicula sp3	3	0.007
Thalassiosira pseudonana	3	0.007
Navicula gregaria	2	0.005
Navicula saprophila	2	0.005
Navicula tenelloides	2	0.005
Nitzschia angustiforaminata	2	0.005
Nitzschia compressa var vexans	2	0.005
Nitzschia fonticola	2	0.005
Skeletonema potamos	2	0.005
Thalassiosira weissflogii	2	0.005
Diploneis pseudovalis	1	0.002
Navicula indifferens	1	0.002
Navicula viridula var germainii	1	0.002

Black River, upstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia intermedia	1	0.002
Thalassiosira pseudonana var1	1	0.002
Total Counted	408	
Species Richness	36	
Shannon Diversity (H)	2.57	

Black River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula minima	73	0.179
Navicula confervacea	66	0.162
Nitzschia inconspicua	34	0.083
Pleurosira laevis f. polymorpha	32	0.078
Cyclotella cryptica	15	0.037
Navicula viridula var rostellata	14	0.034
Gomphonema parvulum	13	0.032
Navicula veneta	13	0.032
Nitzschia palea	13	0.032
Navicula cryptotenella	11	0.027
Navicula menisculus	8	0.020
Nitzschia filiformis	8	0.020
Synedra fasiculata var truncata	8	0.020
Cyclotella atomus	7	0.017
Melosira varians	7	0.017
Gomphonema brasiliense	6	0.015
Gomphonema parvulum f. saprophilum	6	0.015
Navicula recens	6	0.015
Stephanodiscus hantzschii	5	0.012
Navicula atomus var permitis	4	0.010
Navicula schroeteri	4	0.010
Nitzschia dissipata	4	0.010
Achnanthes minutissima	3	0.007
Navicula capitatoradiata	3	0.007
Navicula viridula var germainii	3	0.007
Nitzschia sociabilis	3	0.007
Stephanodiscus parvus	3	0.007
Synedra pulchella	3	0.007
Achnanthes ricula	2	0.005
Caloneis bacillum	2	0.005
Cyclotella ocellata	2	0.005
Navicula goeppertiana	2	0.005
Navicula subminuscula	2	0.005
Navicula tripunctata	2	0.005
Nitzschia frustulum	2	0.005
Nitzschia rosenstockii	2	0.005
Rhoicosphenia curvata	2	0.005
Skeletonema potamos	2	0.005
Stephanodiscus delicatus	2	0.005

Black River, downstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Synedra ulna	2	0.005
Thalassiosira pseudonana var1	2	0.005
Cocconeis pediculus	1	0.002
Cocconeis placentula var euglypta	1	0.002
Cyclotella meneghiniana	1	0.002
Cyclotella stelligera	1	0.002
Navicula contenta	1	0.002
Nitzschia hungarica	1	0.002
Nitzschia tubicola	1	0.002
Total Counted	408	
Species Richness	48	
Shannon Diversity (H)	3.07	

Black River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula mutica var ventricosa	93	0.233
Navicula gregaria	56	0.140
Cyclotella pseudostelligera var1	33	0.083
Skeletonema potamos	28	0.070
Navicula lanceolata	22	0.055
Nitzschia palea	22	0.055
Cyclotella atomus	20	0.050
Surirella minuta	18	0.045
Melosira varians	16	0.040
Nitzschia pusilla	9	0.023
Nitzschia dissipata	8	0.020
Cyclotella meneghiniana	6	0.015
Nitzschia acicularis	5	0.013
Frustulia vulgaris	4	0.010
Navicula minuscula var muralis	4	0.010
Navicula veneta	4	0.010
Diatoma vulgaris	3	0.008
Navicula cryptotenella	3	0.008
Nitzschia capitellata	3	0.008
Nitzschia clausii	3	0.008
Nitzschia inconspicua	3	0.008
Gomphonema parvulum	2	0.005
Navicula atomus var permitis	2	0.005
Navicula capitatoradiata	2	0.005
Navicula salinarum	2	0.005
Navicula sp2	2	0.005
Nitzschia apiculata	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia rosenstockii	2	0.005
Stephanodiscus hantzschii	2	0.005
Cyclostephanos invisitatus	1	0.003
Gomphonema olivaceum	1	0.003

Black River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum f. saprophilum	1	0.003
Gomphonema parvulum var exilissimum	1	0.003
Meridion circulare	1	0.003
Navicula atomus	1	0.003
Navicula capitata	1	0.003
Navicula goeppertiana	1	0.003
Navicula insociabilis	1	0.003
Navicula tripunctata	1	0.003
Nitzschia agnita	1	0.003
Nitzschia brevissima	1	0.003
Nitzschia gracilis	1	0.003
Nitzschia intermedia	1	0.003
Nitzschia recta	1	0.003
Surirella brebissonii var kuetzingi	1	0.003
Synedra fasiculata var truncata	1	0.003
Thalassiosira pseudonana var2	1	0.003
Thalassiosira weissflogii	1	0.003

Total Counted	400
Species Richness	49
Shannon Diversity (H)	2.85

Black River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia paleacea	125	0.306
Nitzschia dissipata	72	0.176
Nitzschia palea	57	0.139
Navicula atomus var permitis	30	0.073
Navicula lanceolata	19	0.046
Navicula lacunolaciniata	13	0.032
Nitzschia inconspicua	12	0.029
Navicula subminuscula	11	0.027
Navicula agrestis	10	0.024
Gomphonema olivaceum	9	0.022
Gomphonema parvulum	9	0.022
Navicula gregaria	8	0.020
Nitzschia sociabilis	6	0.015
Navicula cryptotenella	5	0.012
Navicula molestiformis	4	0.010
Caloneis bacillum	2	0.005
Gomphonema sp7	2	0.005
Navicula mutica var ventricosa	2	0.005
Navicula sp2	2	0.005
Thalassiosira pseudonana	2	0.005
Achnanthes lanceolata	1	0.002
Cyclostephanos tholiformis	1	0.002
Cyclotella atomus	1	0.002
Diatoma vulgaris	1	0.002

Black River, downstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum f. saprophilum	1	0.002
Melosira varians	1	0.002
Navicula minuscula	1	0.002
Navicula monoculata	1	0.002
Surirella brebissonii var kuetzingi	1	0.002
Total Counted	409	
Species Richness	29	
Shannon Diversity (H)	2.35	

Black River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	120	0.298
Achnanthes minutissima var inconspi	70	0.174
Synedra fasiculata var truncata	37	0.092
Navicula seminulum	35	0.087
Cyclotella atomus	25	0.062
Cyclotella cryptica	12	0.030
Nitzschia palea	12	0.030
Navicula schroeteri	8	0.020
Nitzschia supralitorea	8	0.020
Cyclotella meneghiniana	6	0.015
Cyclostephanos tholiformis	5	0.012
Navicula minima	4	0.010
Navicula viridula var germainii	4	0.010
Amphora pediculus	3	0.007
Cyclostephanos invisitatus	3	0.007
Cyclotella pseudostelligera	3	0.007
Navicula cryptotenella	3	0.007
Navicula tenelloides	3	0.007
Navicula veneta	3	0.007
Skeletonema potamos	3	0.007
Achnanthes lanceolata	2	0.005
Aulacoseira granulata	2	0.005
Cocconeis placentula var euglypta	2	0.005
Navicula gregaria	2	0.005
Navicula recens	2	0.005
Navicula subminuscula	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia microcephala	2	0.005
Rhoicosphenia curvata	2	0.005
Simonsenia delognei	2	0.005
Stephanodiscus parvus	2	0.005
Thalassiosira pseudonana var1	2	0.005
Achnanthes ricula	1	0.002
Amphora montana	1	0.002
Navicula capitata	1	0.002
Navicula capitatoradiata	1	0.002

Black River, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula erifuga	1	0.002
Navicula lanceolata	1	0.002
Navicula tripunctata	1	0.002
Navicula viridula var rostellata	1	0.002
Nitzschia dissipata	1	0.002
Nitzschia levidensis	1	0.002
Nitzschia sp12	1	0.002
Thalassiosira pseudonana	1	0.002
Total Counted	403	
Species Richness	44	
Shannon Diversity (H)	2.59	

Black River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula recens	52	0.129
Diatoma vulgaris	45	0.111
Nitzschia filiformis	35	0.087
Synedra fasiculata var truncata	32	0.079
Amphora inariensis	18	0.045
Gomphonema brasiliense	18	0.045
Melosira varians	17	0.042
Navicula cryptotenella	17	0.042
Nitzschia sociabilis	16	0.040
Cocconeis pediculus	15	0.037
Nitzschia palea	11	0.027
Rhoicosphenia curvata	10	0.025
Nitzschia inconspicua	9	0.022
Nitzschia supralitorea	9	0.022
Synedra ulna	9	0.022
Gomphonema parvulum	8	0.020
Nitzschia siliqua	8	0.020
Amphora pediculus	6	0.015
Navicula minima	6	0.015
Navicula menisculus var grunowii	5	0.012
Bacillaria paradoxa	4	0.010
Caloneis bacillum	4	0.010
Navicula schroeteri	3	0.007
Nitzschia dissipata	3	0.007
Achnanthes lanceolata	2	0.005
Achnanthes minutissima	2	0.005
Cyclostephanos tholiformis	2	0.005
Cyclotella atomus	2	0.005
Cyclotella cryptica	2	0.005
Navicula gregaria	2	0.005
Navicula seminulum	2	0.005
Navicula sp2	2	0.005
Navicula viridula var germainii	2	0.005

Black River, downstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia sp22	2	0.005
Pleurosira laevis f. polymorpha	2	0.005
Stephanodiscus minutulus	2	0.005
Cocconeis placentula var euglypta	1	0.002
Cyclotella meneghiniana	1	0.002
Cyclotella pseudostelligera var3	1	0.002
Cymbella prostrata	1	0.002
Fragilaria vaucheriae	1	0.002
Gomphonema clavatum	1	0.002
Hantzschia amphioxys	1	0.002
Navicula capitatoradiata	1	0.002
Navicula erifuga	1	0.002
Navicula subminuscula	1	0.002
Navicula tripunctata	1	0.002
Nitzschia angustatula	1	0.002
Nitzschia clausii	1	0.002
Nitzschia hungarica	1	0.002
Nitzschia sp23	1	0.002
Stephanodiscus alpinus	1	0.002
Stephanodiscus hantzschii	1	0.002
Stephanodiscus parvus	1	0.002
Surirella angusta	1	0.002
Surirella suecica	1	0.002

Total Counted	404
Species Richness	56
Shannon Diversity (H)	3.27

Chagrin River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula cryptotenella	46	0.114
Achnanthes minutissima	35	0.087
Cyclotella meneghiniana	34	0.084
Nitzschia microcephala	33	0.082
Nitzschia dissipata	32	0.079
Thalassiosira pseudonana var1	30	0.074
Thalassiosira pseudonana	27	0.067
Skeletonema potamos	23	0.057
Cyclotella pseudostelligera	12	0.030
Nitzschia palea	10	0.025
Caloneis bacillum	9	0.022
Cyclotella atomus var4	9	0.022
Nitzschia inconspicua	9	0.022
Stephanodiscus hantzschii var tenui	9	0.022
Navicula lanceolata	8	0.020
Cyclotella pseudostelligera var1	7	0.017
Navicula gregaria	7	0.017
Stephanodiscus delicatus	5	0.012
Cyclostephanos invisitatus	4	0.010
Cyclostephanos tholiformis	4	0.010
Cymbella affinis	4	0.010
Cymbella sinuata	4	0.010
Amphipleura pellucida	3	0.007
Navicula atomus var permitis	3	0.007
Nitzschia gracilis	3	0.007
Cyclotella atomus	2	0.005
Cyclotella woltereckii	2	0.005
Fragilaria capucina	2	0.005
Fragilaria vaucheriae	2	0.005
Navicula aquaedurae	2	0.005
Navicula capitatoradiata	2	0.005
Navicula viridula var rostellata	2	0.005
Nitzschia archibaldii	2	0.005
Rhoicosphenia curvata	2	0.005
Simonsenia delognei	2	0.005
Achnanthes minutissima var robusta	1	0.002
Cocconeis placentula var euglypta	1	0.002
Gomphonema olivaceum	1	0.002
Gomphonema parvulum f. saprophilum	1	0.002
Melosira varians	1	0.002
Navicula recens	1	0.002
Nitzschia acicularis	1	0.002
Nitzschia apiculata	1	0.002
Nitzschia linearis	1	0.002
Nitzschia pusilla	1	0.002
Nitzschia sociabilis	1	0.002
Nitzschia supralitorea	1	0.002
Synedra tenera	1	0.002

Total Counted	403
Species Richness	48
Shannon Diversity (H)	3.17

Chagrin River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	105	0.255
Diatoma vulgaris	101	0.246
Rhoicosphenia curvata	52	0.127
Cymbella affinis	23	0.056
Thalassiosira pseudonana var1	22	0.054
Navicula cryptotenella	19	0.046
Cyclotella pseudostelligera var1	10	0.024
Cyclotella meneghiniana	7	0.017
Cocconeis pediculus	6	0.015
Gomphonema minutum	6	0.015
Thalassiosira pseudonana	6	0.015
Navicula lanceolata	5	0.012
Cyclotella pseudostelligera	4	0.010
Cymbella silesiaca	4	0.010
Fragilaria vaucheriae	4	0.010
Gomphonema parvulum var exilissimum	4	0.010
Cyclostephanos tholiformis	3	0.007
Navicula capitatoradiata	3	0.007
Nitzschia dissipata	3	0.007
Nitzschia inconspicua	3	0.007
Nitzschia palea	3	0.007
Navicula molestiformis	2	0.005
Navicula mutica var ventricosa	2	0.005
Nitzschia microcephala	2	0.005
Achnanthes lanceolata	1	0.002
Cyclotella atomus var4	1	0.002
Cymbella prostrata	1	0.002
Cymbella sinuata	1	0.002
Navicula atomus var permitis	1	0.002
Nitzschia apiculata	1	0.002
Nitzschia linearis	1	0.002
Nitzschia sociabilis	1	0.002
Skeletonema potamos	1	0.002
Stephanodiscus hantzschii	1	0.002
Synedra pulchella	1	0.002
Synedra tenera	1	0.002
Total Counted	411	
Species Richness	36	
Shannon Diversity (H)	2.42	

Chagrin River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	100	0.248
Thalassiosira pseudonana	31	0.077
Navicula minima	30	0.074
Amphora pediculus	26	0.065
Achnanthes minutissima	25	0.062

Chagrin River, upstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia dissipata	18	0.045
Nitzschia palea	14	0.035
Navicula erifuga	12	0.030
Nitzschia microcephala	12	0.030
Skeletonema potamos	12	0.030
Navicula seminulum	11	0.027
Caloneis bacillum	10	0.025
Nitzschia filiformis	10	0.025
Cyclotella meneghiniana	9	0.022
Navicula schroeteri	5	0.012
Nitzschia fonticola	5	0.012
Nitzschia minuta	5	0.012
Cyclostephanos tholiformis	4	0.010
Navicula cryptotenella	4	0.010
Navicula recens	4	0.010
Nitzschia pusilla	4	0.010
Cyclotella atomus	3	0.007
Cyclotella cryptica	3	0.007
Navicula cryptocephala	3	0.007
Navicula gregaria	3	0.007
Navicula sp2	3	0.007
Achnanthes minutissima var robusta	2	0.005
Cyclotella pseudostelligera var1	2	0.005
Cyclotella stelligera	2	0.005
Cymbella sinuata	2	0.005
Navicula capitatoradiata	2	0.005
Navicula saprophila	2	0.005
Navicula tenelloides	2	0.005
Rhoicosphenia curvata	2	0.005
Simonsenia delognei	2	0.005
Achnanthes minutissima var inconspi	1	0.002
Amphora inariensis	1	0.002
Amphora libyca	1	0.002
Cocconeis placentula var euglypta	1	0.002
Cyclotella atomus var4	1	0.002
Cyclotella pseudostelligera	1	0.002
Gomphonema minutum	1	0.002
Gyrosigma scalproides	1	0.002
Navicula atomus var permitis	1	0.002
Navicula minuscula	1	0.002
Navicula pygmaea	1	0.002
Navicula subminuscula	1	0.002
Navicula veneta	1	0.002
Navicula viridula var rostellata	1	0.002
Nitzschia agnita	1	0.002
Nitzschia capitellata	1	0.002
Nitzschia linearis	1	0.002
Nitzschia rautenbachiae	1	0.002
Nitzschia sociabilis	1	0.002

Total Counted	403
Species Richness	54
Shannon Diversity (H)	3.07

Chagrin River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Synedra fasiculata var truncata	143	0.355
Navicula recens	39	0.097
Nitzschia filiformis	32	0.079
Achnanthes minutissima	30	0.074
Nitzschia inconspicua	21	0.052
Navicula minima	12	0.030
Nitzschia palea	12	0.030
Navicula atomus var permitis	10	0.025
Navicula viridula var rostellata	9	0.022
Thalassiosira pseudonana	8	0.020
Cyclotella atomus	7	0.017
Skeletonema potamos	7	0.017
Gomphonema parvulum	6	0.015
Navicula cryptotenella	6	0.015
Cyclostephanos tholiformis	5	0.012
Navicula erifuga	5	0.012
Amphora libyca	4	0.010
Cymbella tumida	4	0.010
Navicula schroeteri	4	0.010
Aulacoseira granulata	3	0.007
Cyclotella cryptica	3	0.007
Cyclotella distinguenda var unipunc	3	0.007
Nitzschia dissipata	3	0.007
Nitzschia microcephala	3	0.007
Amphora pediculus	2	0.005
Aulacoseira alpigena	2	0.005
Cyclotella pseudostelligera var1	2	0.005
Fragilaria capucina	2	0.005
Navicula goeppertiana	2	0.005
Navicula subminuscula	2	0.005
Navicula veneta	2	0.005
Cocconeis placentula var euglypta	1	0.002
Cyclotella ocellata	1	0.002
Cymbella prostrata	1	0.002
Gomphonema olivaceum	1	0.002
Gyrosigma acuminatum	1	0.002
Navicula lanceolata	1	0.002
Navicula molestiformis	1	0.002
Navicula saprophila	1	0.002
Surirella minuta	1	0.002
Thalassiosira pseudonana var1	1	0.002

Total Counted	403
Species Richness	41
Shannon Diversity (H)	2.63

Chagrin River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula cryptocephala	67	0.165
Navicula sublinearis	50	0.123
Navicula aquaedurae	34	0.084
Nitzschia aurariae	25	0.061
Navicula pygmaea	20	0.049
Navicula veneta	19	0.047
Achnanthes minutissima	15	0.037
Cyclotella sp1	15	0.037
Cymbella sp1	14	0.034
Nitzschia filiformis	12	0.029
Frustulia vulgaris	7	0.017
Gyrosigma spencerii	7	0.017
Nitzschia coarctica	7	0.017
Nitzschia palea	7	0.017
Navicula sp2	6	0.015
Navicula subminuscula	6	0.015
Nitzschia communis	6	0.015
Nitzschia sp14	6	0.015
Nitzschia sp22	6	0.015
Cyclotella atomus var4	5	0.012
Nitzschia agnita	5	0.012
Pinnularia lundii	5	0.012
Cymbella caespitosa	4	0.010
Gomphonema sp6	4	0.010
Neidium ampliatum	4	0.010
Aulacoseira italica	3	0.007
Navicula viridula	3	0.007
Nitzschia rautenbachiae	3	0.007
Nitzschia subacicularis	3	0.007
Amphora montana	2	0.005
Aulacoseira alpigena	2	0.005
Denticula subtilis	2	0.005
Gomphonema grovei var lingulatum	2	0.005
Navicula fossalis	2	0.005
Navicula integra	2	0.005
Nitzschia acicularioides	2	0.005
Nitzschia angustatula	2	0.005
Nitzschia lanceola var minutula	2	0.005
Nitzschia sp23	2	0.005
Nitzschia sp24	2	0.005
Achnanthes lanceolata	1	0.002
Achnanthes minutissima var robusta	1	0.002
Amphora delicatissima	1	0.002
Cyclotella meneghiniana f. plana	1	0.002
Navicula schroeteri	1	0.002
Navicula trivialis	1	0.002
Nitzschia agnewii	1	0.002
Nitzschia clausii	1	0.002
Nitzschia dissipata	1	0.002
Nitzschia gracilis	1	0.002
Nitzschia levidensis	1	0.002
Nitzschia natalensis	1	0.002
Nitzschia recta	1	0.002
Nitzschia rosenstockii	1	0.002

Chagrin River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Pinnularia borealis var scalaris	1	0.002
Pinnularia ignobilis	1	0.002
Pinnularia sp1	1	0.002
Total Counted	407	
Species Richness	57	
Shannon Diversity (H)	3.26	

Chagrin River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	57	0.141
Navicula lanceolata	50	0.123
Nitzschia dissipata	39	0.096
Nitzschia acicularis	35	0.086
Achnanthes minutissima	17	0.042
Nitzschia filiformis	17	0.042
Cymbella affinis	14	0.035
Nitzschia gracilis	13	0.032
Cyclotella meneghiniana	12	0.030
Nitzschia inconspicua	11	0.027
Diatoma vulgaris	10	0.025
Navicula cryptotenella	10	0.025
Navicula gregaria	10	0.025
Nitzschia draveillensis	10	0.025
Thalassiosira pseudonana	9	0.022
Nitzschia graciliformis	7	0.017
Synedra tenera	7	0.017
Rhoicosphenia curvata	6	0.015
Skeletonema potamos	5	0.012
Surirella brebissonii var kuetzingi	5	0.012
Cyclotella atomus	4	0.010
Gomphonema olivaceum	4	0.010
Nitzschia sociabilis	4	0.010
Cyclotella pseudostelligera var1	3	0.007
Cymbella sp7	3	0.007
Fragilaria capucina	3	0.007
Navicula capitatoradiata	3	0.007
Nitzschia agnita	3	0.007
Nitzschia heufleriana	3	0.007
Synedra ulna var acus	3	0.007
Asterionella formosa	2	0.005
Aulacoseira ambigua	2	0.005
Fragilaria vaucheriae	2	0.005
Melosira varians	2	0.005
Navicula cryptocephala	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia pusilla	2	0.005

Chagrin River, downstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Surirella minuta	2	0.005
Cyclostephanos invisitatus	1	0.002
Cyclotella stelligera	1	0.002
Cymbella silesiaca	1	0.002
Diatoma tenuis	1	0.002
Navicula atomus	1	0.002
Navicula recens	1	0.002
Navicula sp12	1	0.002
Navicula sp2	1	0.002
Nitzschia frustulum	1	0.002
Synedra ulna	1	0.002
Total Counted	405	
Species Richness	49	
Shannon Diversity (H)	3.20	

Chagrin River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	230	0.574
Neidium ampliatum	44	0.110
Nitzschia rautenbachiae	13	0.032
Aulacoseira italica	9	0.022
Achnanthes minutissima var inconspi	8	0.020
Amphora delicatissima	8	0.020
Nitzschia palea	8	0.020
Gomphonema sp6	6	0.015
Nitzschia aurariae	6	0.015
Gyrosigma spencerii	5	0.012
Meridion circulare	5	0.012
Navicula sublinearis	5	0.012
Cyclotella atomus var4	4	0.010
Nitzschia lanceola var minutula	4	0.010
Cocconeis placentula var euglypta	3	0.007
Navicula trivialis	3	0.007
Amphora montana	2	0.005
Caloneis bacillum	2	0.005
Cyclotella sp1	2	0.005
Cylindrotheca gracilis	2	0.005
Cymbella affinis	2	0.005
Navicula ingenua	2	0.005
Navicula phyllepta	2	0.005
Navicula schroeteri	2	0.005
Navicula sp3	2	0.005
Nitzschia acicularioides	2	0.005
Nitzschia sp18	2	0.005
Achnanthes lanceolata	1	0.002
Bacillaria paradoxa	1	0.002
Cocconeis placentula	1	0.002

Chagrin River, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclostephanos invisitatus	1	0.002
Cymbella microcephala var crassa	1	0.002
Frustulia vulgaris	1	0.002
Gomphonema grovei var lingulatum	1	0.002
Gyrosigma exile	1	0.002
Gyrosigma scalproides	1	0.002
Navicula aquaedurae	1	0.002
Navicula cincta	1	0.002
Navicula fossalis	1	0.002
Navicula lanceolata	1	0.002
Navicula pseudoanglica	1	0.002
Navicula pupula	1	0.002
Navicula salinarum	1	0.002
Nitzschia sp5	1	0.002
Nitzschia sp6	1	0.002
Total Counted	401	
Species Richness	45	
Shannon Diversity (H)	2.01	

Chagrin River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	295	0.730
Nitzschia dissipata	15	0.037
Nitzschia filiformis	12	0.030
Nitzschia inconspicua	10	0.025
Synedra fasiculata var truncata	8	0.020
Nitzschia sociabilis	7	0.017
Cymbella microcephala	5	0.012
Navicula cryptotenella	5	0.012
Navicula recens	5	0.012
Cymbella affinis	3	0.007
Melosira varians	3	0.007
Skeletonema potamos	3	0.007
Achnanthes minutissima var inconspi	2	0.005
Amphora inariensis	2	0.005
Cyclotella meneghiniana	2	0.005
Cyclotella ocellata	2	0.005
Cymbella prostrata	2	0.005
Cymbella tumida	2	0.005
Gomphonema minutum	2	0.005
Navicula capitatoradiata	2	0.005
Nitzschia lanceola var minutula	2	0.005
Nitzschia palea	2	0.005
Rhoicosphenia curvata	2	0.005
Amphora libyca	1	0.002
Cyclostephanos invisitatus	1	0.002
Fragilaria vaucheriae	1	0.002

Chagrin River, downstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula lanceolata	1	0.002
Navicula schroeteri	1	0.002
Navicula viridula var germainii	1	0.002
Nitzschia aurariae	1	0.002
Nitzschia frustulum	1	0.002
Stephanodiscus hantzschii	1	0.002
Stephanodiscus parvus	1	0.002
Synedra tenera	1	0.002
Total Counted	404	
Species Richness	34	
Shannon Diversity (H)	1.42	

Cuyahoga River, upstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula saprophila	135	0.329
Navicula atomus var permitis	126	0.307
Nitzschia inconspicua	41	0.100
Achnanthes minutissima	20	0.049
Navicula lanceolata	11	0.027
Nitzschia paleacea	10	0.024
Nitzschia sociabilis	10	0.024
Navicula cryptotenella	9	0.022
Navicula gregaria	9	0.022
Melosira varians	5	0.012
Nitzschia palea	5	0.012
Nitzschia filiformis	4	0.010
Nitzschia minuta	4	0.010
Navicula mutica var ventricosa	2	0.005
Navicula sp2	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia subacicularis	2	0.005
Nitzschia supralitorea	2	0.005
Surirella brebissonii var kuetzingi	2	0.005
Cyclotella atomus	1	0.002
Navicula atomus	1	0.002
Navicula goeppertiana	1	0.002
Navicula subminuscula	1	0.002
Nitzschia dissipata	1	0.002
Nitzschia graciliformis	1	0.002
Nitzschia gracilis	1	0.002
Nitzschia perminuta	1	0.002
Nitzschia perspicua	1	0.002
Total Counted	410	
Species Richness	28	
Shannon Diversity (H)	2.04	

Cuyahoga River, downstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula gregaria	125	0.300
Melosira varians	59	0.141
Navicula lanceolata	39	0.094
Navicula atomus var permitis	38	0.091
Nitzschia minuta	22	0.053
Nitzschia filiformis	19	0.046
Nitzschia inconspicua	16	0.038
Nitzschia palea	15	0.036
Synedra fasiculata var truncata	9	0.022
Gomphonema parvulum	8	0.019
Navicula cryptotenella	7	0.017
Navicula molestiformis	7	0.017
Nitzschia dissipata	6	0.014

Cuyahoga River, downstream, grab sample, 26 June 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella atomus	4	0.010
Navicula capitatoradiata	4	0.010
Nitzschia frustulum	4	0.010
Nitzschia sociabilis	4	0.010
Nitzschia supralitorea	4	0.010
Nitzschia fonticola	3	0.007
Caloneis bacillum	2	0.005
Cyclotella meneghiniana	2	0.005
Nitzschia perspicua	2	0.005
Stephanodiscus hantzschii	2	0.005
Synedra tenera	2	0.005
Cyclotella atomus var4	1	0.002
Cymbella prostrata	1	0.002
Diatoma vulgaris	1	0.002
Fragilaria elliptica	1	0.002
Fragilaria vaucheriae	1	0.002
Frustulia vulgaris	1	0.002
Navicula subminuscula	1	0.002
Nitzschia subacicularis	1	0.002
Rhoicosphenia curvata	1	0.002
Skeletonema potamos	1	0.002
Surirella angusta	1	0.002
Surirella minuta	1	0.002
Synedra ulna	1	0.002
Synedra ulna var acus	1	0.002
Total Counted	417	
Species Richness	38	
Shannon Diversity (H)	2.56	

Cuyahoga River, upstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	218	0.538
Navicula atomus var permitis	50	0.123
Navicula recens	28	0.069
Navicula minima	20	0.049
Navicula veneta	19	0.047
Nitzschia palea	15	0.037
Nitzschia amphibia	11	0.027
Navicula lanceolata	9	0.022
Navicula cryptotenella	7	0.017
Melosira varians	5	0.012
Synedra pulchella	5	0.012
Gomphonema parvulum	4	0.010
Navicula subminuscula	3	0.007
Achnanthes minutissima	2	0.005
Cyclotella atomus	2	0.005
Navicula gregaria	2	0.005

Cuyahoga River, upstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia capitellata	2	0.005
Gomphonema brasiliense	1	0.002
Navicula viridula var rostellata	1	0.002
Stephanodiscus hantzschii	1	0.002
Total Counted	405	
Species Richness	20	
Shannon Diversity (H)	1.78	

Cuyahoga River, downstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	196	0.491
Gomphonema brasiliense	46	0.115
Navicula atomus var permitis	26	0.065
Melosira varians	20	0.050
Navicula recens	18	0.045
Gomphonema parvulum	16	0.040
Navicula minima	6	0.015
Synedra fasiculata var truncata	6	0.015
Navicula gregaria	4	0.010
Nitzschia amphibia	4	0.010
Nitzschia filiformis	4	0.010
Nitzschia palea	4	0.010
Rhoicosphenia curvata	4	0.010
Achnanthes minutissima var inconspi	3	0.008
Cyclotella cryptica	3	0.008
Navicula angusta	3	0.008
Navicula seminulum	3	0.008
Amphora pediculus	2	0.005
Navicula cryptotenella	2	0.005
Navicula veneta	2	0.005
Navicula viridula var germainii	2	0.005
Nitzschia intermedia	2	0.005
Nitzschia minuta	2	0.005
Nitzschia pusilla	2	0.005
Pleurosira laevis f. polymorpha	2	0.005
Skeletonema potamos	2	0.005
Stephanodiscus hantzschii	2	0.005
Surirella minuta	2	0.005
Synedra pulchella	2	0.005
Aulacoseira granulata var angustiss	1	0.003
Caloneis bacillum	1	0.003
Cyclotella atomus	1	0.003
Cyclotella distinguenda var unipunc	1	0.003
Cyclotella meneghiniana	1	0.003
Gomphonema minutum	1	0.003
Gomphonema parvulum f. saprophilum	1	0.003

Cuyahoga River, downstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula lanceolata	1	0.003
Nitzschia fonticola	1	0.003
Total Counted	399	
Species Richness	38	
Shannon Diversity (H)	2.15	

Cuyahoga River, upstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia filiformis	192	0.464
Navicula mutica var ventricosa	31	0.075
Nitzschia inconspicua	29	0.070
Thalassiosira pseudonana	24	0.058
Navicula gregaria	22	0.053
Nitzschia palea	20	0.048
Navicula lanceolata	17	0.041
Navicula atomus var permitis	16	0.039
Nitzschia pusilla	10	0.024
Nitzschia rosenstockii	7	0.017
Navicula erifuga	6	0.014
Thalassiosira pseudonana var1	4	0.010
Cyclostephanos tholiformis	3	0.007
Achnanthes minutissima	2	0.005
Cyclotella michiganiana	2	0.005
Cyclotella pseudostelligera var1	2	0.005
Gomphonema minutum	2	0.005
Gomphonema parvulum	2	0.005
Melosira varians	2	0.005
Navicula minima	2	0.005
Navicula seminulum	2	0.005
Navicula viridula var germainii	2	0.005
Nitzschia capitellata	2	0.005
Nitzschia dissipata	2	0.005
Nitzschia minuta	2	0.005
Achnanthes lanceolata	1	0.002
Cyclotella atomus	1	0.002
Navicula mobiliensis	1	0.002
Navicula subminuscula	1	0.002
Nitzschia angustiforaminata	1	0.002
Nitzschia paleacea	1	0.002
Nitzschia supralitorea	1	0.002
Skeletonema potamos	1	0.002
Stephanodiscus parvus	1	0.002
Total Counted	414	
Species Richness	34	
Shannon Diversity (H)	2.20	

Cuyahoga River, downstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia pusilla	193	0.481
Nitzschia filiformis	73	0.182
Diatoma vulgaris	39	0.097
Navicula gregaria	16	0.040
Synedra fasiculata var truncata	15	0.037
Navicula atomus var permitis	8	0.020
Nitzschia inconspicua	5	0.012
Nitzschia paleacea	5	0.012
Thalassiosira pseudonana	4	0.010
Melosira varians	3	0.007
Navicula mutica var ventricosa	3	0.007
Nitzschia dissipata	3	0.007
Nitzschia palea	3	0.007
Stephanodiscus hantzschii	3	0.007
Aulacoseira alpigena	2	0.005
Gomphonema minutum	2	0.005
Navicula contenta	2	0.005
Navicula lanceolata	2	0.005
Navicula minima	2	0.005
Navicula minuscula	2	0.005
Navicula saprophila	2	0.005
Nitzschia capitellata	2	0.005
Nitzschia supralitorea	2	0.005
Skeletonema potamos	2	0.005
Synedra pulchella	2	0.005
Cyclostephanos invisitatus	1	0.002
Cyclotella atomus	1	0.002
Fragilaria elliptica	1	0.002
Gomphonema parvulum	1	0.002
Nitzschia frustulum	1	0.002
Synedra ulna var acus	1	0.002
Total Counted	401	
Species Richness	31	
Shannon Diversity (H)	1.93	

Cuyahoga River, upstream, grab sample, 17 September 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia clausii	73	0.179
Nitzschia palea	63	0.155
Skeletonema potamos	47	0.115
Cyclotella meneghiniana	20	0.049
Nitzschia capitellata	19	0.047
Navicula goeppertiana	15	0.037
Nitzschia hungarica	15	0.037
Nitzschia minuta	12	0.029
Cyclotella atomus	10	0.025
Navicula minima	10	0.025

Cuyahoga River, upstream, grab sample, 17 September 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia filiformis	9	0.022
Nitzschia inconspicua	8	0.020
Navicula seminulum	7	0.017
Navicula recens	6	0.015
Navicula viridula var germainii	6	0.015
Nitzschia pusilla	6	0.015
Nitzschia sigma	6	0.015
Nitzschia supralitorea	6	0.015
Navicula erifuga	5	0.012
Nitzschia apiculata	5	0.012
Aulacoseira alpigena	4	0.010
Nitzschia agnita	4	0.010
Navicula gregaria	3	0.007
Nitzschia microcephala	3	0.007
Nitzschia rosenstockii	3	0.007
Thalassiosira pseudonana	3	0.007
Thalassiosira pseudonana var1	3	0.007
Caloneis bacillum	2	0.005
Cyclotella cryptica	2	0.005
Cyclotella pseudostelligera	2	0.005
Melosira varians	2	0.005
Navicula salinarum	2	0.005
Nitzschia acicularis	2	0.005
Nitzschia fonticola	2	0.005
Nitzschia nereidis	2	0.005
Nitzschia perminuta	2	0.005
Nitzschia subacicularis	2	0.005
Stephanodiscus hantzschii	2	0.005
Cocconeis placentula var euglypta	1	0.002
Cyclostephanos tholiformis	1	0.002
Cyclotella ocellata	1	0.002
Navicula atomus var permitis	1	0.002
Navicula cryptocephala	1	0.002
Navicula mutica var ventricosa	1	0.002
Navicula schroeteri	1	0.002
Navicula tenelloides	1	0.002
Navicula veneta	1	0.002
Navicula viridula var rostellata	1	0.002
Stephanodiscus delicatus	1	0.002
Surirella minuta	1	0.002
Synedra fasiculata var truncata	1	0.002
Thalassiosira weissflogii	1	0.002

Total Counted	407
Species Richness	51
Shannon Diversity (H)	3.07

Cuyahoga River, downstream, grab sample, 17 September 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula recens	143	0.360
Nitzschia inconspicua	73	0.184
Nitzschia filiformis	25	0.063
Nitzschia sociabilis	20	0.050
Nitzschia palea	19	0.048
Navicula goeppertiana	14	0.035
Navicula gregaria	12	0.030
Nitzschia minuta	11	0.028
Navicula viridula var germainii	6	0.015
Navicula atomus var permitis	5	0.013
Achnanthes minutissima	4	0.010
Diatoma vulgaris	4	0.010
Gomphonema parvulum	4	0.010
Melosira varians	4	0.010
Navicula erifuga	4	0.010
Navicula subminuscula	4	0.010
Nitzschia clausii	4	0.010
Nitzschia dissipata	4	0.010
Synedra ulna	4	0.010
Navicula veneta	3	0.008
Surirella brebissonii	3	0.008
Navicula mutica var ventricosa	2	0.005
Navicula viridula var rostellata	2	0.005
Nitzschia agnita	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia rosenstockii	2	0.005
Nitzschia subacicularis	2	0.005
Nitzschia supralitorea	2	0.005
Synedra fasiculata var truncata	2	0.005
Thalassiosira pseudonana	2	0.005
Thalassiosira pseudonana var1	2	0.005
Cyclotella atomus	1	0.003
Gyrosigma acuminatum	1	0.003
Navicula cryptotenella	1	0.003
Navicula schroeteri	1	0.003
Nitzschia gracilis	1	0.003
Nitzschia paleacea	1	0.003
Surirella angusta	1	0.003
Total Counted	397	
Species Richness	38	
Shannon Diversity (H)	2.45	

Cuyahoga River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	100	0.257
Thalassiosira pseudonana	42	0.108
Nitzschia dissipata	35	0.090

Cuyahoga River, upstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Aulacoseira alpigena	27	0.069
Navicula atomus var permitis	26	0.067
Nitzschia filiformis	25	0.064
Cyclotella atomus	14	0.036
Cyclotella meneghiniana	10	0.026
Navicula gregaria	10	0.026
Navicula minima	10	0.026
Navicula lanceolata	9	0.023
Navicula mutica var ventricosa	9	0.023
Nitzschia palea	8	0.021
Skeletonema potamos	8	0.021
Nitzschia minuta	7	0.018
Nitzschia supralitorea	7	0.018
Amphora pediculus	4	0.010
Nitzschia apiculata	4	0.010
Nitzschia capitellata	4	0.010
Cymbella sinuata	3	0.008
Cyclotella michiganiana	2	0.005
Cyclotella pseudostelligera var1	2	0.005
Gomphonema parvulum	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia microcephala	2	0.005
Thalassiosira pseudonana var1	2	0.005
Thalassiosira weissflogii	2	0.005
Cyclostephanos tholiformis	1	0.003
Cyclotella cryptica	1	0.003
Cyclotella woltereckii	1	0.003
Fragilaria construens f. venter	1	0.003
Navicula atomus	1	0.003
Navicula cryptotenella	1	0.003
Nitzschia linearis var subtilis	1	0.003
Nitzschia perminuta	1	0.003
Nitzschia sociabilis	1	0.003
Stephanodiscus delicatus	1	0.003
Stephanodiscus hantzschii	1	0.003
Surirella angusta	1	0.003
Synedra tenera	1	0.003
Total Counted	389	
Species Richness	40	
Shannon Diversity (H)	2.77	

Cuyahoga River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia bacillum	99	0.241
Navicula tenelloides	62	0.151
Nitzschia angustatula	58	0.141
Gomphonema grovei var lingulatum	25	0.061

Cuyahoga River, downstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia clausii	25	0.061
Cymbella sp1	22	0.054
Gomphonema sp3	18	0.044
Gomphonema sp6	17	0.041
Nitzschia sp18	15	0.036
Nitzschia aurariae	10	0.024
Navicula sp2	8	0.019
Neidium ampliatum	6	0.015
Navicula aquaedurae	4	0.010
Navicula confervacea	4	0.010
Amphora veneta	3	0.007
Navicula cryptocephala	3	0.007
Navicula menisculus var grunowii	3	0.007
Nitzschia sp14	3	0.007
Gyrosigma spencerii	2	0.005
Navicula mobiliensis	2	0.005
Navicula tripunctata	2	0.005
Nitzschia laevis	2	0.005
Nitzschia rautenbachiae	2	0.005
Nitzschia sp5	2	0.005
Achnanthes minutissima	1	0.002
Amphora sp4	1	0.002
Cocconeis placentula var euglypta	1	0.002
Navicula fossalis	1	0.002
Navicula reinhardtii	1	0.002
Navicula schroeteri	1	0.002
Nitzschia agnita	1	0.002
Nitzschia coarctica	1	0.002
Nitzschia compressa var vexans	1	0.002
Nitzschia filiformis	1	0.002
Nitzschia lanceola var minutula	1	0.002
Nitzschia rostellata	1	0.002
Nitzschia sp23	1	0.002
Nitzschia sp24	1	0.002
Total Counted	411	
Species Richness	38	
Shannon Diversity (H)	2.61	

Cuyahoga River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	76	0.184
Navicula recens	60	0.146
Nitzschia palea	42	0.102
Cyclotella atomus	34	0.083
Cyclotella meneghiniana	18	0.044
Navicula minima	15	0.036
Skeletonema potamos	14	0.034

Cuyahoga River, upstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Amphora pediculus	12	0.029
Cyclotella pseudostelligera var1	11	0.027
Navicula absoluta	10	0.024
Nitzschia apiculata	10	0.024
Nitzschia intermedia	9	0.022
Navicula erifuga	8	0.019
Thalassiosira pseudonana	8	0.019
Gomphonema parvulum	7	0.017
Nitzschia minuta	7	0.017
Cyclotella cryptica	6	0.015
Aulacoseira granulata	5	0.012
Navicula viridula var rostellata	5	0.012
Navicula lanceolata	4	0.010
Nitzschia supralitorea	4	0.010
Navicula atomus var permitis	3	0.007
Navicula cryptotenella	3	0.007
Navicula gregaria	3	0.007
Achnanthes minutissima	2	0.005
Asterionella formosa	2	0.005
Cyclotella pseudostelligera	2	0.005
Navicula saprophila	2	0.005
Navicula seminulum	2	0.005
Nitzschia agnita	2	0.005
Nitzschia compressa var vexans	2	0.005
Nitzschia draveillensis	2	0.005
Nitzschia graciliformis	2	0.005
Nitzschia gracilis	2	0.005
Nitzschia sociabilis	2	0.005
Rhoicosphenia curvata	2	0.005
Caloneis bacillum	1	0.002
Gomphonema gracile	1	0.002
Navicula subminuscula	1	0.002
Nitzschia amphibia	1	0.002
Nitzschia commutata	1	0.002
Nitzschia filiformis	1	0.002
Nitzschia fonticola	1	0.002
Nitzschia frustulum	1	0.002
Nitzschia hungarica	1	0.002
Nitzschia microcephala	1	0.002
Nitzschia rosenstockii	1	0.002
Nitzschia sp13	1	0.002
Surirella angusta	1	0.002
Surirella brebissonii var kuetzingi	1	0.002

Total Counted	412
Species Richness	50
Shannon Diversity (H)	3.04

Cuyahoga River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula ingenua	149	0.370
Neidium ampliatum	139	0.345
Gomphonema sp3	13	0.032
Navicula rhynchocephala	12	0.030
Navicula fossalis	11	0.027
Navicula mobiliensis	8	0.020
Navicula lacunolaciniata	7	0.017
Navicula libonensis	7	0.017
Navicula praeterita	6	0.015
Navicula trivialis	6	0.015
Nitzschia aurariae	5	0.012
Nitzschia rautenbachiae	4	0.010
Nitzschia sp5	4	0.010
Navicula confervacea	3	0.007
Navicula menisculus var grunowii	3	0.007
Achnanthes minutissima	2	0.005
Amphora montana	2	0.005
Cyclotella atomus var4	2	0.005
Gomphonema sp6	2	0.005
Navicula heimansii	2	0.005
Navicula sp3	2	0.005
Navicula tenelloides	2	0.005
Nitzschia sp23	2	0.005
Cyclotella distinguenda var unipunc	1	0.002
Fragilaria vaucheriae	1	0.002
Gomphonema brasiliense	1	0.002
Gomphonema grovei var lingulatum	1	0.002
Meridion circulare	1	0.002
Navicula lanceolata	1	0.002
Navicula pupula	1	0.002
Nitzschia compressa var vexans	1	0.002
Nitzschia lanceola var minutula	1	0.002
Nitzschia ovalis	1	0.002
Total Counted	403	
Species Richness	33	
Shannon Diversity (H)	1.97	

Cuyahoga River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula lanceolata	102	0.258
Navicula gregaria	76	0.192
Navicula schroeteri	32	0.081
Navicula recens	21	0.053
Nitzschia palea	17	0.043
Nitzschia dissipata	16	0.040
Thalassiosira pseudonana	12	0.030
Gomphonema parvulum	11	0.028

Cuyahoga River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	10	0.025
Nitzschia intermedia	8	0.020
Navicula veneta	6	0.015
Achnanthes minutissima	5	0.013
Navicula cryptotenella	5	0.013
Aulacoseira granulata	4	0.010
Diatoma vulgaris	4	0.010
Melosira varians	4	0.010
Navicula atomus var permitis	4	0.010
Nitzschia acicularis	4	0.010
Nitzschia minuta	4	0.010
Nitzschia sociabilis	4	0.010
Aulacoseira alpigena	3	0.008
Surirella minuta	3	0.008
Amphora pediculus	2	0.005
Caloneis bacillum	2	0.005
Cyclotella pseudostelligera	2	0.005
Fragilaria construens	2	0.005
Gomphonema olivaceum	2	0.005
Navicula agrestis	2	0.005
Navicula minima	2	0.005
Navicula mutica var ventricosa	2	0.005
Navicula salinarum	2	0.005
Stephanodiscus alpinus	2	0.005
Surirella brebissonii var kuetzingi	2	0.005
Achnanthes lanceolata	1	0.003
Cocconeis placentula var euglypta	1	0.003
Cyclotella atomus var4	1	0.003
Cyclotella meneghiniana	1	0.003
Cyclotella ocellata	1	0.003
Cymbella silesiaca	1	0.003
Diatoma tenuis	1	0.003
Frustulia weinholdii	1	0.003
Navicula atomus	1	0.003
Navicula erifuga	1	0.003
Neidium ampliatum	1	0.003
Nitzschia apiculata	1	0.003
Nitzschia filiformis	1	0.003
Nitzschia subacicularis	1	0.003
Rhoicosphenia curvata	1	0.003
Stephanodiscus parvus	1	0.003
Synedra tenera	1	0.003
Synedra ulna	1	0.003
Thalassiosira weissflogii	1	0.003

Total Counted	396
Species Richness	52
Shannon Diversity (H)	2.89

Cuyahoga River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	106	0.274
Navicula lanceolata	57	0.147
Melosira varians	46	0.119
Navicula gregaria	33	0.085
Nitzschia capitellata	24	0.062
Navicula mutica var ventricosa	20	0.052
Nitzschia pusilla	16	0.041
Nitzschia sociabilis	11	0.028
Surirella brebissonii var kuetzingi	10	0.026
Navicula atomus var permitis	9	0.023
Gomphonema parvulum	8	0.021
Nitzschia dissipata	5	0.013
Nitzschia filiformis	5	0.013
Gomphonema olivaceum	4	0.010
Nitzschia frustulum	4	0.010
Surirella minuta	4	0.010
Thalassiosira pseudonana	4	0.010
Aulacoseira alpigena	3	0.008
Nitzschia inconspicua	3	0.008
Diatoma tenuis	2	0.005
Navicula cryptotenella	2	0.005
Nitzschia paleacea	2	0.005
Skeletonema potamos	2	0.005
Fragilaria capucina	1	0.003
Gomphonema clavatum	1	0.003
Navicula subminuscula	1	0.003
Nitzschia acicularis	1	0.003
Nitzschia perminuta	1	0.003
Nitzschia recta	1	0.003
Synedra tenera	1	0.003
Total Counted	387	
Species Richness	30	
Shannon Diversity (H)	2.51	

Cuyahoga River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	110	0.378
Navicula recens	36	0.124
Nitzschia filiformis	24	0.082
Nitzschia amphibia	15	0.052
Navicula subminuscula	12	0.041
Nitzschia supralitorea	9	0.031
Navicula schroeteri	8	0.027
Aulacoseira ambigua	7	0.024
Nitzschia apiculata	7	0.024
Navicula confervacea	5	0.017
Navicula viridula var rostellata	4	0.014

Cuyahoga River, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Amphora calumetica	3	0.010
Cocconeis placentula var euglypta	3	0.010
Gomphonema parvulum	3	0.010
Achnanthes minutissima var inconspi	2	0.007
Amphora inariensis	2	0.007
Amphora pediculus	2	0.007
Navicula absoluta	2	0.007
Navicula erifuga	2	0.007
Navicula lacunolaciniata	2	0.007
Navicula monoculata	2	0.007
Navicula veneta	2	0.007
Navicula viridula var germainii	2	0.007
Nitzschia homburgiensis	2	0.007
Rhoicosphenia curvata	2	0.007
Skeletonema potamos	2	0.007
Surirella brightwellii	2	0.007
Achnanthes exigua	1	0.003
Achnanthes minutissima	1	0.003
Cyclotella atomus	1	0.003
Cyclotella meneghiniana f. plana	1	0.003
Cyclotella ocellata	1	0.003
Gomphonema angustatum	1	0.003
Gomphonema olivaceum	1	0.003
Navicula atomus var permitis	1	0.003
Navicula goeppertiana	1	0.003
Navicula gregaria	1	0.003
Navicula minima	1	0.003
Nitzschia aurariae	1	0.003
Nitzschia capitellata	1	0.003
Nitzschia dissipata	1	0.003
Nitzschia hungarica	1	0.003
Nitzschia reversa	1	0.003
Surirella angusta	1	0.003
Synedra fasiculata var truncata	1	0.003
Thalassiosira pseudonana	1	0.003
Total Counted	291	
Species Richness	46	
Shannon Diversity (H)	2.59	

Cuyahoga River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	102	0.254
Gomphonema parvulum	63	0.157
Navicula recens	51	0.127
Nitzschia inconspicua	37	0.092
Achnanthes minutissima	22	0.055
Rhoicosphenia curvata	22	0.055

Cuyahoga River, downstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula mutica var ventricosa	21	0.052
Navicula subminuscula	7	0.017
Nitzschia intermedia	7	0.017
Nitzschia supralitorea	7	0.017
Nitzschia fonticola	6	0.015
Cocconeis pediculus	4	0.010
Gomphonema parvulum f. saprophilum	4	0.010
Navicula veneta	4	0.010
Navicula cryptotenella	3	0.007
Navicula gregaria	3	0.007
Skeletonema potamos	3	0.007
Amphora inariensis	2	0.005
Amphora montana	2	0.005
Diatoma vulgaris	2	0.005
Navicula menisculus var grunowii	2	0.005
Navicula schroeteri	2	0.005
Navicula trivialis	2	0.005
Navicula viridula var germainii	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia frustulum	2	0.005
Nitzschia minuta	2	0.005
Thalassiosira pseudonana	2	0.005
Actinocyclus normanii	1	0.002
Cyclotella meneghiniana	1	0.002
Cyclotella ocellata	1	0.002
Cyclotella pseudostelligera var3	1	0.002
Cymbella prostrata	1	0.002
Fragilaria vaucheriae	1	0.002
Gomphonema sp5	1	0.002
Melosira varians	1	0.002
Navicula erifuga	1	0.002
Navicula minima	1	0.002
Navicula tripunctata	1	0.002
Nitzschia clausii	1	0.002
Stephanodiscus parvus	1	0.002
Thalassiosira pseudonana var1	1	0.002

Total Counted	402
Species Richness	42
Shannon Diversity (H)	2.61

Grand River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	286	0.696
Rhoicosphenia curvata	69	0.168
Cyclostephanos tholiformis	11	0.027
Cocconeis pediculus	8	0.019
Cymbella silesiaca	8	0.019
Nitzschia dissipata	7	0.017
Navicula cryptotenella	4	0.010
Cymbella affinis	3	0.007
Nitzschia palea	3	0.007
Nitzschia sociabilis	3	0.007
Cymbella prostrata	2	0.005
Navicula menisculus var grunowii	2	0.005
Achnanthes minutissima var robusta	1	0.002
Cyclostephanos invisitatus	1	0.002
Navicula minuscula var muralis	1	0.002
Nitzschia paleacea	1	0.002
Thalassiosira pseudonana	1	0.002
Total Counted	411	
Species Richness	17	
Shannon Diversity (H)	1.14	

Grand River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	105	0.257
Cyclostephanos tholiformis	101	0.248
Cymbella affinis	22	0.054
Navicula cryptotenella	20	0.049
Navicula gregaria	16	0.039
Navicula lanceolata	16	0.039
Nitzschia dissipata	16	0.039
Nitzschia palea	12	0.029
Nitzschia microcephala	11	0.027
Cymbella silesiaca	9	0.022
Stephanodiscus parvus	6	0.015
Nitzschia inconspicua	5	0.012
Nitzschia supralitorea	5	0.012
Navicula capitatoradiata	4	0.010
Navicula molestiformis	4	0.010
Nitzschia clausii	4	0.010
Nitzschia fonticola	4	0.010
Stephanodiscus hantzschii	4	0.010
Amphora pediculus	3	0.007
Cymbella sinuata	3	0.007
Gomphonema minutum	3	0.007
Cyclotella meneghiniana	2	0.005
Cymbella caespitosa	2	0.005
Cymbella microcephala	2	0.005

Grand River, downstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum var exilissimum	2	0.005
Navicula lacunolaciniata	2	0.005
Navicula pupula	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia pusilla	2	0.005
Nitzschia sociabilis	2	0.005
Stephanodiscus hantzschii var tenui	2	0.005
Synedra tenera	2	0.005
Cyclostephanos invisitatus	1	0.002
Cyclotella atomus	1	0.002
Cyclotella pseudostelligera	1	0.002
Diatoma vulgaris	1	0.002
Fragilaria capucina	1	0.002
Fragilaria vaucheriae	1	0.002
Melosira varians	1	0.002
Navicula erifuga	1	0.002
Navicula monoculata	1	0.002
Navicula recens	1	0.002
Nitzschia recta	1	0.002
Nitzschia sinuata var tabellaria	1	0.002
Thalassiosira pseudonana	1	0.002
Total Counted	408	
Species Richness	45	
Shannon Diversity (H)	2.65	

Grand River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	239	0.575
Cyclotella atomus	39	0.094
Nitzschia palea	28	0.067
Cyclotella cryptica	27	0.065
Nitzschia microcephala	14	0.034
Skeletonema potamos	10	0.024
Navicula viridula var rostellata	7	0.017
Nitzschia agnita	6	0.014
Cyclotella pseudostelligera	5	0.012
Thalassiosira pseudonana	5	0.012
Cyclostephanos tholiformis	4	0.010
Cyclotella pseudostelligera var1	3	0.007
Navicula lanceolata	3	0.007
Nitzschia pusilla	3	0.007
Cymbella microcephala	2	0.005
Navicula saprophila	2	0.005
Navicula schroeteri	2	0.005
Navicula vandamii	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia gracilis	2	0.005

Grand River, upstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	2	0.005
Nitzschia rosenstockii	2	0.005
Achnanthes lanceolata	1	0.002
Aulacoseira granulata	1	0.002
Fragilaria construens	1	0.002
Navicula sp2	1	0.002
Nitzschia clausii	1	0.002
Nitzschia supralitorea	1	0.002
Surirella minuta	1	0.002
Total Counted	416	
Species Richness	29	
Shannon Diversity (H)	1.79	

Grand River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	78	0.193
Nitzschia sociabilis	53	0.131
Navicula recens	47	0.116
Cymbella prostrata	38	0.094
Diatoma vulgaris	18	0.044
Rhoicosphenia curvata	14	0.035
Synedra fasiculata var truncata	14	0.035
Achnanthes minutissima var robusta	13	0.032
Nitzschia filiformis	11	0.027
Navicula minima	10	0.025
Fragilaria capucina	9	0.022
Nitzschia dissipata	8	0.020
Cyclostephanos tholiformis	7	0.017
Navicula viridula var rostellata	7	0.017
Nitzschia palea	6	0.015
Nitzschia rosenstockii	6	0.015
Synedra pulchella	6	0.015
Nitzschia inconspicua	5	0.012
Aulacoseira granulata	4	0.010
Cocconeis placentula var euglypta	4	0.010
Gomphonema parvulum	4	0.010
Navicula atomus var permitis	4	0.010
Cyclotella ocellata	3	0.007
Navicula capitatoradiata	3	0.007
Navicula minuscula	3	0.007
Achnanthes lanceolata	2	0.005
Amphora pediculus	2	0.005
Cyclotella atomus	2	0.005
Cyclotella meneghiniana	2	0.005
Cyclotella stelligera	2	0.005
Gomphonema parvulum f. saprophilum	2	0.005
Navicula cryptotenella	2	0.005

Grand River, downstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia microcephala	2	0.005
Nitzschia pusilla	2	0.005
Nitzschia supralitorea	2	0.005
Amphora libyca	1	0.002
Cyclostephanos invisitatus	1	0.002
Cyclotella distinguenda var unipunc	1	0.002
Cyclotella pseudostelligera var1	1	0.002
Nitzschia acicularis	1	0.002
Nitzschia frustulum	1	0.002
Nitzschia recta	1	0.002
Skeletonema potamos	1	0.002
Stephanodiscus delicatus	1	0.002
Stephanodiscus hantzschii	1	0.002
Total Counted	405	
Species Richness	45	
Shannon Diversity (H)	2.97	

Grand River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula lanceolata	45	0.109
Nitzschia acicularis	34	0.083
Achnanthes minutissima	27	0.066
Cyclotella meneghiniana	21	0.051
Navicula gregaria	21	0.051
Nitzschia dissipata	18	0.044
Diatoma vulgaris	16	0.039
Nitzschia palea	15	0.036
Nitzschia graciliformis	14	0.034
Melosira varians	13	0.032
Aulacoseira granulata	12	0.029
Nitzschia draveillensis	11	0.027
Navicula agrestis	9	0.022
Nitzschia archibaldii	9	0.022
Nitzschia inconspicua	8	0.019
Achnanthes lanceolata	6	0.015
Cyclostephanos tholiformis	6	0.015
Nitzschia capitellata	6	0.015
Nitzschia gracilis	6	0.015
Cyclotella pseudostelligera var1	5	0.012
Cymbella sinuata	5	0.012
Nitzschia agnita	5	0.012
Nitzschia microcephala	5	0.012
Surirella minuta	5	0.012
Aulacoseira ambigua	4	0.010
Cyclotella pseudostelligera	4	0.010
Cymbella affinis	4	0.010
Navicula cryptotenella	4	0.010

Grand River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia linearis	4	0.010
Nitzschia sociabilis	4	0.010
Surirella brebissonii var kuetzingi	4	0.010
Thalassiosira pseudonana	4	0.010
Nitzschia linearis var subtilis	3	0.007
Rhoicosphenia curvata	3	0.007
Amphora pediculus	2	0.005
Cymbella silesiaca	2	0.005
Fragilaria construens	2	0.005
Gomphonema olivaceum	2	0.005
Gomphonema parvulum	2	0.005
Navicula veneta	2	0.005
Nitzschia pusilla	2	0.005
Nitzschia rosenstockii	2	0.005
Nitzschia sp2	2	0.005
Skeletonema potamos	2	0.005
Stephanodiscus alpinus	2	0.005
Synedra tenera	2	0.005
Synedra ulna	2	0.005
Synedra ulna var acus	2	0.005
Cyclotella atomus	1	0.002
Diatoma tenuis	1	0.002
Fragilaria capucina	1	0.002
Fragilaria vaucheriae	1	0.002
Navicula atomus	1	0.002
Navicula atomus var permitis	1	0.002
Navicula goeppertiana	1	0.002
Navicula phyllepta	1	0.002
Navicula pupula	1	0.002
Navicula radiosa	1	0.002
Navicula seminulum	1	0.002
Navicula tenelloides	1	0.002
Nitzschia dissipata var media	1	0.002
Nitzschia dubia	1	0.002
Nitzschia fonticola	1	0.002
Nitzschia intermedia	1	0.002
Nitzschia minuta	1	0.002
Nitzschia perminuta	1	0.002
Nitzschia sigma	1	0.002
Nitzschia sp21	1	0.002
Nitzschia sp4	1	0.002
Stauroneis tackei	1	0.002
Stephanodiscus delicatus	1	0.002

Total Counted	411
Species Richness	70
Shannon Diversity (H)	3.63

Grand River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Diatoma vulgaris	115	0.285
Gomphonema olivaceum	49	0.122
Nitzschia dissipata	30	0.074
Synedra tenera	29	0.072
Gomphonema parvulum	26	0.065
Achnanthes minutissima	22	0.055
Cymbella silesiaca	18	0.045
Fragilaria vaucheriae	16	0.040
Nitzschia sociabilis	12	0.030
Melosira varians	8	0.020
Nitzschia palea	8	0.020
Fragilaria capucina	7	0.017
Navicula lanceolata	6	0.015
Navicula cryptotenella	4	0.010
Navicula gregaria	4	0.010
Nitzschia archibaldii	4	0.010
Surirella brebissonii var kuetzingi	4	0.010
Cyclostephanos tholiformis	3	0.007
Navicula saprophila	3	0.007
Surirella minuta	3	0.007
Synedra ulna var acus	3	0.007
Caloneis bacillum	2	0.005
Cymbella affinis	2	0.005
Diatoma tenuis	2	0.005
Nitzschia graciliformis	2	0.005
Nitzschia inconspicua	2	0.005
Nitzschia paleacea	2	0.005
Rhoicosphenia curvata	2	0.005
Stephanodiscus alpinus	2	0.005
Synedra ulna	2	0.005
Cyclotella pseudostelligera	1	0.002
Cyclotella pseudostelligera var3	1	0.002
Navicula agrestis	1	0.002
Navicula atomus	1	0.002
Navicula lacunolaciniata	1	0.002
Navicula minuscula	1	0.002
Nitzschia dissipata var media	1	0.002
Nitzschia filiformis	1	0.002
Nitzschia minuta	1	0.002
Stephanodiscus parvus	1	0.002
Thalassiosira pseudonana	1	0.002

Total Counted	403
Species Richness	41
Shannon Diversity (H)	2.72

Grand River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	201	0.496
Rhoicosphenia curvata	69	0.170
Nitzschia inconspicua	45	0.111
Cymbella microcephala	11	0.027
Cocconeis pediculus	8	0.020
Nitzschia brevissima	6	0.015
Nitzschia palea	6	0.015
Fragilaria vaucheriae	5	0.012
Gomphonema minutum	5	0.012
Navicula minima	5	0.012
Navicula phyllepta	3	0.007
Nitzschia microcephala	3	0.007
Synedra pulchella	3	0.007
Cymbella affinis	2	0.005
Diatoma vulgaris	2	0.005
Fragilaria capucina	2	0.005
Melosira varians	2	0.005
Navicula cryptocephala	2	0.005
Navicula gregaria	2	0.005
Navicula recens	2	0.005
Navicula schroeteri	2	0.005
Nitzschia amphibia	2	0.005
Achnanthes ricula	1	0.002
Cocconeis placentula	1	0.002
Cyclotella atomus	1	0.002
Cyclotella meneghiniana	1	0.002
Cyclotella pseudostelligera	1	0.002
Cymbella silesiaca	1	0.002
Gomphonema parvulum	1	0.002
Navicula capitatoradiata	1	0.002
Navicula cryptotenella	1	0.002
Navicula seminulum	1	0.002
Navicula tenelloides	1	0.002
Navicula veneta	1	0.002
Navicula viridula var rostellata	1	0.002
Nitzschia dissipata	1	0.002
Nitzschia frustulum	1	0.002
Nitzschia perminuta	1	0.002
Nitzschia supralitorea	1	0.002
Total Counted	405	
Species Richness	39	
Shannon Diversity (H)	1.95	

Grand River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula recens	166	0.407
Nitzschia palea	61	0.150
Achnanthes minutissima	26	0.064
Nitzschia dissipata	24	0.059
Navicula capitatoradiata	20	0.049
Navicula cryptotenella	11	0.027
Nitzschia sociabilis	11	0.027
Navicula schroeteri	9	0.022
Gomphonema parvulum	8	0.020
Rhoicosphenia curvata	7	0.017
Cymbella caespitosa	6	0.015
Melosira varians	4	0.010
Navicula tripunctata	4	0.010
Cyclostephanos invisitatus	3	0.007
Fragilaria capucina	3	0.007
Nitzschia frustulum	3	0.007
Nitzschia inconspicua	3	0.007
Cyclostephanos tholiformis	2	0.005
Gomphonema clavatum	2	0.005
Gomphonema parvulum f. saprophilum	2	0.005
Navicula cryptocephala	2	0.005
Navicula seminulum	2	0.005
Navicula viridula var germainii	2	0.005
Nitzschia angustatula	2	0.005
Nitzschia linearis var subtilis	2	0.005
Nitzschia rosenstockii	2	0.005
Nitzschia supralitorea	2	0.005
Skeletonema potamos	2	0.005
Thalassiosira pseudonana	2	0.005
Aulacoseira italica	1	0.002
Cocconeis placentula	1	0.002
Cocconeis placentula var euglypta	1	0.002
Cyclotella meneghiniana	1	0.002
Cyclotella ocellata	1	0.002
Cymbella prostrata	1	0.002
Cymbella sinuata	1	0.002
Gomphonema minutum	1	0.002
Navicula tenelloides	1	0.002
Nitzschia fonticola	1	0.002
Nitzschia lanceola var minutula	1	0.002
Nitzschia subacicularis	1	0.002
Stephanodiscus parvus	1	0.002
Synedra fasiculata var truncata	1	0.002
Synedra tenera	1	0.002

Total Counted	408
Species Richness	44
Shannon Diversity (H)	2.39

Huron River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	44	0.110
Navicula atomus var permitis	40	0.100
Achnanthes minutissima	25	0.062
Navicula cryptotenella	25	0.062
Navicula sp2	20	0.050
Thalassiosira pseudonana	17	0.042
Cyclotella pseudostelligera var1	16	0.040
Skeletonema potamos	16	0.040
Nitzschia acicularis	14	0.035
Nitzschia dissipata	14	0.035
Thalassiosira pseudonana var1	14	0.035
Navicula gregaria	11	0.027
Nitzschia palea	11	0.027
Caloneis bacillum	10	0.025
Nitzschia sociabilis	10	0.025
Nitzschia supralitorea	10	0.025
Navicula agrestis	8	0.020
Nitzschia minuta	7	0.017
Surirella minuta	7	0.017
Gomphonema parvulum	6	0.015
Nitzschia frustulum	6	0.015
Amphora pediculus	5	0.012
Navicula angusta	5	0.012
Nitzschia pusilla	5	0.012
Cyclotella meneghiniana	4	0.010
Cymbella silesiaca	4	0.010
Navicula subminuscula	4	0.010
Nitzschia draveillensis	4	0.010
Achnanthes lanceolata	3	0.007
Cyclotella atomus	3	0.007
Navicula saprophila	3	0.007
Cyclostephanos invisitatus	2	0.005
Cymbella sinuata	2	0.005
Melosira varians	2	0.005
Navicula capitatoradiata	2	0.005
Navicula erifuga	2	0.005
Navicula lanceolata	2	0.005
Navicula minima	2	0.005
Nitzschia apiculata	2	0.005
Rhoicosphenia curvata	2	0.005
Stephanodiscus hantzschii var tenui	2	0.005
Synedra pulchella	2	0.005
Amphora montana	1	0.002
Cyclotella pseudostelligera	1	0.002
Gomphonema olivaceum	1	0.002
Navicula molestiformis	1	0.002
Nitzschia filiformis	1	0.002
Nitzschia fonticola	1	0.002
Nitzschia perminuta	1	0.002
Nitzschia rosenstockii	1	0.002
Total Counted	401	
Species Richness	50	
Shannon Diversity (H)	3.39	

Huron River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula saprophila	55	0.139
Nitzschia paleacea	54	0.137
Melosira varians	53	0.134
Navicula atomus var permitis	36	0.091
Nitzschia dissipata	35	0.089
Navicula agrestis	28	0.071
Nitzschia palea	27	0.068
Diatoma vulgaris	24	0.061
Nitzschia inconspicua	16	0.041
Navicula minuscula	8	0.020
Navicula cryptotenella	7	0.018
Nitzschia supralitorea	5	0.013
Thalassiosira pseudonana	5	0.013
Cyclotella cryptica	4	0.010
Fragilaria vaucheriae	4	0.010
Gomphonema parvulum	4	0.010
Nitzschia frustulum	4	0.010
Nitzschia minuta	3	0.008
Rhoicosphenia curvata	3	0.008
Navicula mutica var ventricosa	2	0.005
Nitzschia pusilla	2	0.005
Synedra ulna	2	0.005
Cyclostephanos invisitatus	1	0.003
Cymbella silesiaca	1	0.003
Gomphonema olivaceum	1	0.003
Navicula angusta	1	0.003
Navicula erifuga	1	0.003
Navicula lacunolaciniata	1	0.003
Navicula menisculus	1	0.003
Navicula mutica	1	0.003
Navicula recens	1	0.003
Nitzschia fonticola	1	0.003
Nitzschia sociabilis	1	0.003
Stephanodiscus hantzschii var tenui	1	0.003
Surirella minuta	1	0.003
Synedra ulna var acus	1	0.003

Total Counted	395
Species Richness	36
Shannon Diversity (H)	2.73

Huron River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	146	0.361
Skeletonema potamos	117	0.290
Cyclotella pseudostelligera var1	31	0.077
Cyclotella pseudostelligera	14	0.035
Nitzschia inconspicua	11	0.027

Huron River, upstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella atomus	10	0.025
Cyclotella meneghiniana	10	0.025
Amphora pediculus	8	0.020
Cyclotella meneghiniana f. plana	6	0.015
Nitzschia palea	5	0.012
Nitzschia acicularis	4	0.010
Nitzschia gracilis	4	0.010
Navicula minima	3	0.007
Achnanthes lanceolata	2	0.005
Achnanthes minutissima	2	0.005
Caloneis bacillum	2	0.005
Cyclotella distinguenda	2	0.005
Cymbella sinuata	2	0.005
Gomphonema parvulum	2	0.005
Navicula cryptotenella	2	0.005
Navicula gregaria	2	0.005
Navicula molestiformis	2	0.005
Navicula vandamii	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia dissipata	2	0.005
Nitzschia intermedia	2	0.005
Nitzschia reversa	2	0.005
Thalassiosira pseudonana	2	0.005
Navicula lanceolata	1	0.002
Nitzschia microcephala	1	0.002
Synedra tenera	1	0.002
Thalassiosira pseudonana var1	1	0.002
Thalassiosira weissflogii	1	0.002
Total Counted	404	
Species Richness	33	
Shannon Diversity (H)	2.09	

Huron River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Cocconeis placentula var euglypta	100	0.202
Rhoicosphenia curvata	68	0.138
Gomphonema minutum	61	0.123
Cocconeis pediculus	53	0.107
Navicula cryptotenella	49	0.099
Nitzschia inconspicua	28	0.057
Navicula minima	23	0.047
Amphora pediculus	12	0.024
Navicula angusta	12	0.024
Achnanthes minutissima	11	0.022
Gomphonema parvulum	11	0.022
Navicula recens	10	0.020
Navicula sp2	5	0.010

Huron River, downstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Synedra fasiculata var truncata	5	0.010
Fragilaria vaucheriae	3	0.006
Navicula menisculus	3	0.006
Navicula saprophila	3	0.006
Navicula veneta	3	0.006
Navicula viridula var rostellata	3	0.006
Nitzschia dissipata	3	0.006
Nitzschia palea	3	0.006
Stephanodiscus hantzschii	3	0.006
Achnanthes lanceolata	2	0.004
Cyclotella cryptica	2	0.004
Navicula viridula var germainii	2	0.004
Nitzschia acicularis	2	0.004
Nitzschia archibaldii	2	0.004
Nitzschia supralitorea	2	0.004
Stephanodiscus parvus	2	0.004
Aulacoseira italica	1	0.002
Cyclotella atomus	1	0.002
Gyrosigma acuminatum	1	0.002
Melosira varians	1	0.002
Navicula atomus var permitis	1	0.002
Navicula gregaria	1	0.002
Surirella minuta	1	0.002
Thalassiosira pseudonana var1	1	0.002

Total Counted	494
Species Richness	37
Shannon Diversity (H)	2.65

Huron River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula lanceolata	88	0.219
Surirella minuta	52	0.130
Navicula gregaria	22	0.055
Nitzschia dissipata	15	0.037
Rhoicosphenia curvata	15	0.037
Melosira varians	12	0.030
Nitzschia acicularis	12	0.030
Gomphonema olivaceum	11	0.027
Amphora inariensis	10	0.025
Gomphonema parvulum	10	0.025
Nitzschia palea	10	0.025
Achnanthes lanceolata	9	0.022
Navicula trivialis	9	0.022
Cyclotella meneghiniana	8	0.020
Navicula cryptotenella	8	0.020
Navicula capitatoradiata	7	0.017
Nitzschia sociabilis	7	0.017

Huron River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia sp24	6	0.015
Navicula tripunctata	5	0.012
Achnanthes minutissima	4	0.010
Frustulia weinholdii	4	0.010
Navicula sp2	4	0.010
Nitzschia amphibia	4	0.010
Nitzschia gracilis	4	0.010
Nitzschia pusilla	4	0.010
Skeletonema potamos	4	0.010
Surirella angusta	4	0.010
Diatoma vulgaris	3	0.007
Navicula angusta	3	0.007
Navicula cryptocephala	3	0.007
Navicula viridula var germainii	3	0.007
Achnanthes minutissima var inconspi	2	0.005
Meridion circulare	2	0.005
Navicula atomus var permitis	2	0.005
Navicula menisculus var grunowii	2	0.005
Navicula tenelloides	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia capitellata	2	0.005
Nitzschia dissipata var media	2	0.005
Nitzschia hungarica	2	0.005
Nitzschia inconspicua	2	0.005
Synedra ulna var acus	2	0.005
Thalassiosira pseudonana	2	0.005
Aulacoseira alpigena	1	0.002
Cocconeis pediculus	1	0.002
Cocconeis placentula var euglypta	1	0.002
Cyclostephanos invisitatus	1	0.002
Cyclotella atomus	1	0.002
Cyclotella meneghiniana f. plana	1	0.002
Cyclotella pseudostelligera var3	1	0.002
Cymbella silesiaca	1	0.002
Fragilaria capucina	1	0.002
Fragilaria vaucheriae	1	0.002
Navicula mutica	1	0.002
Navicula pupula	1	0.002
Navicula sublinearis	1	0.002
Navicula viridula var rostellata	1	0.002
Nitzschia linearis	1	0.002
Surirella brebissonii var kuetzingi	1	0.002
Synedra ulna	1	0.002

Total Counted	401
Species Richness	60
Shannon Diversity (H)	3.26

Huron River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Skeletonema potamos	55	0.139
Stephanodiscus delicatus	38	0.096
Navicula capitatoradiata	36	0.091
Cyclotella meneghiniana	35	0.088
Navicula lanceolata	21	0.053
Nitzschia dissipata	18	0.045
Navicula cryptotenella	17	0.043
Nitzschia palea	17	0.043
Cyclostephanos invisitatus	16	0.040
Cyclotella atomus	13	0.033
Navicula gregaria	13	0.033
Melosira varians	12	0.030
Navicula tripunctata	12	0.030
Navicula trivialis	8	0.020
Surirella minuta	8	0.020
Amphora pediculus	4	0.010
Cyclotella cryptica	4	0.010
Gomphonema olivaceum	4	0.010
Nitzschia acicularis	4	0.010
Nitzschia pusilla	4	0.010
Stephanodiscus hantzschii	4	0.010
Achnanthes lanceolata	3	0.008
Aulacoseira alpigena	3	0.008
Aulacoseira sp2	3	0.008
Nitzschia recta	3	0.008
Aulacoseira granulata	2	0.005
Gomphonema parvulum f. saprophilum	2	0.005
Navicula pygmaea	2	0.005
Navicula salinarum	2	0.005
Navicula sp2	2	0.005
Nitzschia agnita	2	0.005
Nitzschia lanceola var minutula	2	0.005
Nitzschia levidensis	2	0.005
Surirella angusta	2	0.005
Asterionella formosa	1	0.003
Cyclotella pseudostelligera	1	0.003
Cyclotella pseudostelligera var1	1	0.003
Cyclotella pseudostelligera var3	1	0.003
Fragilaria capucina	1	0.003
Hantzschia amphioxys	1	0.003
Navicula atomus var permitis	1	0.003
Navicula cincta	1	0.003
Navicula cryptocephala	1	0.003
Navicula menisculus	1	0.003
Navicula pupula	1	0.003
Navicula veneta	1	0.003
Nitzschia capitellata	1	0.003
Nitzschia dissipata var media	1	0.003
Nitzschia draveillensis	1	0.003
Nitzschia hungarica	1	0.003
Nitzschia linearis	1	0.003
Nitzschia sociabilis	1	0.003
Pinnularia obscura	1	0.003
Stephanodiscus alpinus	1	0.003

Huron River, downstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus minutulus	1	0.003
Synedra ulna	1	0.003
Thalassiosira pseudonana	1	0.003
Thalassiosira pseudonana var2	1	0.003
Total Counted	397	
Species Richness	58	
Shannon Diversity (H)	3.25	

Huron River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula mutica var ventricosa	84	0.227
Nitzschia palea	59	0.159
Nitzschia clausii	18	0.049
Navicula veneta	15	0.041
Cyclotella cryptica	14	0.038
Nitzschia inconspicua	12	0.032
Nitzschia brevissima	10	0.027
Nitzschia supralitorea	10	0.027
Cyclotella pseudostelligera var1	9	0.024
Navicula schroeteri	9	0.024
Nitzschia intermedia	9	0.024
Cyclotella meneghiniana	8	0.022
Navicula erifuga	7	0.019
Nitzschia dissipata	7	0.019
Cyclostephanos tholiformis	6	0.016
Navicula vandamii	6	0.016
Navicula viridula var germainii	6	0.016
Navicula cryptotenella	5	0.014
Skeletonema potamos	5	0.014
Thalassiosira pseudonana	5	0.014
Cyclotella atomus	4	0.011
Cyclotella pseudostelligera	4	0.011
Navicula minima	4	0.011
Navicula gregaria	3	0.008
Navicula molestiformis	3	0.008
Navicula subminuscula	3	0.008
Navicula viridula	3	0.008
Nitzschia fonticola	3	0.008
Caloneis bacillum	2	0.005
Navicula cincta	2	0.005
Navicula lanceolata	2	0.005
Navicula pupula	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia minuta	2	0.005
Nitzschia pumila	2	0.005
Simonsenia delognei	2	0.005

Huron River, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Amphora libyca	1	0.003
Amphora pediculus	1	0.003
Cocconeis placentula var euglypta	1	0.003
Cyclotella woltereckii	1	0.003
Diatoma vulgaris	1	0.003
Fragilaria capucina	1	0.003
Navicula agrestis	1	0.003
Navicula atomus	1	0.003
Navicula menisculus	1	0.003
Navicula monoculata	1	0.003
Navicula praeterita	1	0.003
Nitzschia compressa var vexans	1	0.003
Nitzschia frustulum	1	0.003
Nitzschia lanceola var minutula	1	0.003
Nitzschia linearis	1	0.003
Nitzschia rosenstockii	1	0.003
Rhoicosphenia curvata	1	0.003
Stauroneis smithii	1	0.003
Stephanodiscus hantzschii	1	0.003
Surirella minuta	1	0.003
Thalassiosira pseudonana var2	1	0.003

Total Counted	370
Species Richness	58
Shannon Diversity (H)	3.15

Huron River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	119	0.298
Navicula subminuscula	50	0.125
Navicula atomus var permitis	43	0.108
Gomphonema parvulum	42	0.105
Nitzschia palea	32	0.080
Navicula recens	27	0.068
Navicula molestiformis	11	0.028
Nitzschia filiformis	9	0.023
Nitzschia frustulum	9	0.023
Navicula minima	7	0.018
Navicula seminulum	7	0.018
Navicula veneta	6	0.015
Nitzschia minuta	4	0.010
Nitzschia supralitorea	4	0.010
Nitzschia clausii	3	0.008
Nitzschia dissipata	3	0.008
Synedra ulna	3	0.008
Fragilaria vaucheriae	2	0.005
Navicula goeppertiana	2	0.005
Navicula lundii	2	0.005
Navicula mutica var ventricosa	2	0.005

Huron River, downstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia rosenstockii	2	0.005
Rhoicosphenia curvata	2	0.005
Achnanthes minutissima	1	0.003
Aulacoseira alpigena	1	0.003
Cyclotella cryptica	1	0.003
Cymbella tumida	1	0.003
Navicula menisculus	1	0.003
Navicula schroeteri	1	0.003
Navicula sp2	1	0.003
Navicula viridula	1	0.003
TOTAL 31	399	
Total Counted	399	
Species Richness	31	
Shannon Diversity (H)	2.44	

Maumee River, upstream, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia dissipata	47	0.116
Nitzschia inconspicua	37	0.092
Navicula cryptotenella	30	0.074
Navicula viridula var germainii	20	0.050
Stephanodiscus hantzschii	20	0.050
Navicula gregaria	19	0.047
Cyclotella atomus	14	0.035
Stephanodiscus delicatus	12	0.030
Navicula schroeteri	10	0.025
Nitzschia palea	10	0.025
Rhoicosphenia curvata	10	0.025
Thalassiosira pseudonana	10	0.025
Aulacoseira granulata	8	0.020
Cyclotella cryptica	8	0.020
Navicula angusta	8	0.020
Navicula veneta	7	0.017
Fragilaria vaucheriae	6	0.015
Melosira varians	6	0.015
Navicula lanceolata	6	0.015
Navicula sp2	6	0.015
Aulacoseira alpigena	5	0.012
Cyclostephanos invisitatus	5	0.012
Navicula atomus var permitis	5	0.012
Navicula capitatoradiata	5	0.012
Navicula heimansii	5	0.012
Skeletonema potamos	5	0.012
Surirella minuta	5	0.012
Cocconeis pediculus	4	0.010
Cyclotella meneghiniana	4	0.010
Gomphonema clavatum	4	0.010
Navicula erifuga	4	0.010
Nitzschia supralitorea	4	0.010
Achnanthes minutissima	3	0.007
Cyclotella pseudostelligera var1	3	0.007
Navicula recens	3	0.007
Navicula trivialis	3	0.007
Nitzschia angustatula	3	0.007
Nitzschia sociabilis	3	0.007
Stephanodiscus parvus	3	0.007
Achnanthes lanceolata	2	0.005
Cyclostephanos tholiformis	2	0.005
Navicula cryptocephala	2	0.005
Navicula minima	2	0.005
Navicula mutica	2	0.005
Nitzschia frustulum	2	0.005
Nitzschia hungarica	2	0.005
Nitzschia levidensis	2	0.005
Nitzschia rosenstockii	2	0.005
Thalassiosira weissflogii	2	0.005
Amphora pediculus	1	0.002
Caloneis bacillum	1	0.002
Frustulia vulgaris	1	0.002
Gomphonema minutum	1	0.002
Gomphonema parvulum	1	0.002

Maumee River, upstream, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula atomus	1	0.002
Navicula monoculata	1	0.002
Navicula phyllepta	1	0.002
Nitzschia calida	1	0.002
Nitzschia clausii	1	0.002
Nitzschia microcephala	1	0.002
Nitzschia paleacea	1	0.002
Stephanodiscus alpinus	1	0.002
Synedra fasiculata var truncata	1	0.002
Total Counted	404	
Species Richness	63	
Shannon Diversity (H)	3.55	

Maumee River, downstream, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula mutica	245	0.598
Skeletonema potamos	87	0.212
Cyclotella cryptica	19	0.046
Aulacoseira granulata	6	0.015
Stephanodiscus delicatus	6	0.015
Aulacoseira alpigena	5	0.012
Stephanodiscus parvus	5	0.012
Cyclotella atomus	4	0.010
Gomphonema parvulum	4	0.010
Melosira varians	4	0.010
Nitzschia dissipata	4	0.010
Nitzschia filiformis	4	0.010
Fragilaria vaucheriae	3	0.007
Cyclostephanos tholiformis	2	0.005
Navicula atomus var permitis	2	0.005
Nitzschia agnewii	2	0.005
Cyclotella pseudostelligera	1	0.002
Navicula angusta	1	0.002
Navicula lanceolata	1	0.002
Navicula minima	1	0.002
Navicula recens	1	0.002
Stephanodiscus alpinus	1	0.002
Stephanodiscus hantzschii	1	0.002
Thalassiosira pseudonana	1	0.002
Total Counted	410	
Species Richness	24	
Shannon Diversity (H)	1.47	

Maumee River, upstream, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella atomus	118	0.295
Cyclostephanos tholiformis	42	0.105
Aulacoseira alpigena	40	0.100
Cyclotella cryptica	37	0.093
Skeletonema potamos	37	0.093
Nitzschia inconspicua	17	0.043
Nitzschia palea	17	0.043
Stephanodiscus hantzschii	11	0.028
Stephanodiscus hantzschii var tenui	9	0.023
Cyclotella pseudostelligera var1	8	0.020
Navicula minima	6	0.015
Navicula subminuscula	6	0.015
Nitzschia supralitorea	6	0.015
Nitzschia minuta	4	0.010
Thalassiosira pseudonana	4	0.010
Thalassiosira pseudonana var1	4	0.010
Cyclotella meneghiniana	3	0.008
Cyclotella pseudostelligera	3	0.008
Navicula erifuga	3	0.008
Navicula vandamii	3	0.008
Stephanodiscus delicatus	3	0.008
Cyclotella meneghiniana f. plana	2	0.005
Cyclotella woltereckii	2	0.005
Navicula seminulum	2	0.005
Navicula veneta	2	0.005
Nitzschia agnewii	2	0.005
Rhoicosphenia curvata	2	0.005
Navicula cryptotenella	1	0.003
Navicula molestiformis	1	0.003
Navicula recens	1	0.003
Nitzschia amphibia	1	0.003
Nitzschia linearis	1	0.003
Nitzschia reversa	1	0.003
Stephanodiscus minutulus	1	0.003
Total Counted	400	
Species Richness	34	
Shannon Diversity (H)	2.57	

Maumee River, downstream, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia capitellata	242	0.587
Nitzschia minuta	35	0.085
Navicula subminuscula	26	0.063
Nitzschia inconspicua	15	0.036
Navicula recens	14	0.034
Navicula erifuga	12	0.029
Nitzschia filiformis	8	0.019

Maumee River, downstream, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	8	0.019
Cyclotella atomus	7	0.017
Navicula saprophila	7	0.017
Stephanodiscus hantzschii	6	0.015
Cyclotella cryptica	5	0.012
Navicula agrestis	5	0.012
Achnanthes minutissima var robusta	3	0.007
Gomphonema parvulum	3	0.007
Cyclostephanos tholiformis	2	0.005
Cyclotella meneghiniana	2	0.005
Nitzschia clausii	2	0.005
Nitzschia frustulum	2	0.005
Nitzschia pusilla	2	0.005
Aulacoseira alpigena	1	0.002
Fragilaria vaucheriae	1	0.002
Navicula molestiformis	1	0.002
Navicula viridula var germainii	1	0.002
Stephanodiscus delicatus	1	0.002
Synedra ulna	1	0.002
Total Counted	412	
Species Richness	26	
Shannon Diversity (H)	1.78	

Maumee River, upstream, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus hantzschii	69	0.170
Cyclotella atomus	48	0.118
Aulacoseira alpigena	27	0.066
Achnanthes minutissima	18	0.044
Navicula gregaria	18	0.044
Surirella minuta	17	0.042
Cyclostephanos invisitatus	16	0.039
Skeletonema potamos	14	0.034
Cyclotella meneghiniana	12	0.029
Cyclotella cryptica	10	0.025
Rhoicosphenia curvata	10	0.025
Stephanodiscus parvus	10	0.025
Thalassiosira pseudonana var2	9	0.022
Gomphonema olivaceum	7	0.017
Gomphonema parvulum	7	0.017
Nitzschia palea	6	0.015
Cyclotella meneghiniana f. plana	5	0.012
Gomphonema parvulum f. saprophilum	5	0.012
Navicula cryptotenella	5	0.012
Nitzschia dissipata	5	0.012
Synedra tenera	5	0.012
Synedra ulna	5	0.012

Maumee River, upstream, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclostephanos tholiformis	4	0.010
Fragilaria vaucheriae	4	0.010
Thalassiosira pseudonana	4	0.010
Amphora inariensis	3	0.007
Asterionella formosa	3	0.007
Melosira varians	3	0.007
Navicula atomus var permitis	3	0.007
Navicula erifuga	3	0.007
Navicula minuscula	3	0.007
Navicula subminuscula	3	0.007
Nitzschia acicularis	3	0.007
Nitzschia frustulum	3	0.007
Stephanodiscus alpinus	3	0.007
Achnanthes lanceolata	2	0.005
Amphora veneta	2	0.005
Cyclotella stelligera	2	0.005
Navicula minima	2	0.005
Navicula tripunctata	2	0.005
Navicula veneta	2	0.005
Navicula viridula var germainii	2	0.005
Nitzschia capitellata	2	0.005
Nitzschia clausii	2	0.005
Nitzschia hungarica	2	0.005
Nitzschia recta	2	0.005
Amphora pediculus	1	0.002
Cocconeis pediculus	1	0.002
Cyclotella pseudostelligera	1	0.002
Cymbella sinuata	1	0.002
Navicula lacunolaciniata	1	0.002
Navicula lanceolata	1	0.002
Navicula menisculus	1	0.002
Navicula mutica	1	0.002
Navicula schroeteri	1	0.002
Nitzschia archibaldii	1	0.002
Nitzschia desertorum	1	0.002
Nitzschia sociabilis	1	0.002
Stauroneis laterostrata	1	0.002
Surirella brebissonii var kuetzingi	1	0.002
Surirella sp2	1	0.002

Total Counted	407
Species Richness	61
Shannon Diversity (H)	3.38

Maumee River, downstream, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula gregaria	36	0.091
Navicula mutica var ventricosa	33	0.083
Nitzschia brevissima	28	0.071
Stephanodiscus hantzschii	27	0.068
Aulacoseira alpigena	22	0.055
Cyclostephanos invisitatus	20	0.050
Nitzschia dissipata	19	0.048
Cyclotella atomus	16	0.040
Navicula lanceolata	16	0.040
Navicula tripunctata	14	0.035
Cyclotella cryptica	12	0.030
Cyclostephanos tholiformis	11	0.028
Skeletonema potamos	11	0.028
Navicula atomus var permitis	8	0.020
Surirella minuta	8	0.020
Cyclotella meneghiniana	7	0.018
Navicula capitatoradiata	7	0.018
Gomphonema parvulum	6	0.015
Navicula cryptotenella	5	0.013
Navicula veneta	5	0.013
Nitzschia palea	5	0.013
Asterionella formosa	4	0.010
Fragilaria vaucheriae	4	0.010
Melosira varians	4	0.010
Thalassiosira pseudonana	4	0.010
Achnanthes lanceolata	3	0.008
Fragilaria capucina	3	0.008
Navicula salinarum	3	0.008
Nitzschia acicularis	3	0.008
Nitzschia angustatula	3	0.008
Nitzschia inconspicua	3	0.008
Stephanodiscus parvus	3	0.008
Surirella angusta	3	0.008
Aulacoseira granulata	2	0.005
Cyclotella meneghiniana f. plana	2	0.005
Diploneis pseudovalis	2	0.005
Navicula erifuga	2	0.005
Navicula pupula	2	0.005
Navicula trivialis	2	0.005
Nitzschia apiculata	2	0.005
Nitzschia capitellata	2	0.005
Nitzschia clausii	2	0.005
Nitzschia frustulum	2	0.005
Nitzschia sociabilis	2	0.005
Amphora veneta	1	0.003
Cocconeis pediculus	1	0.003
Cocconeis placentula var euglypta	1	0.003
Cyclotella pseudostelligera	1	0.003
Cyclotella pseudostelligera var1	1	0.003
Cyclotella stelligera	1	0.003
Fragilaria construens f. venter	1	0.003
Frustulia weinholdii	1	0.003
Navicula capitata	1	0.003
Navicula goeppertiana	1	0.003

Maumee River, downstream, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula mutica	1	0.003
Navicula recens	1	0.003
Navicula subminuscula	1	0.003
Nitzschia gracilis	1	0.003
Nitzschia linearis var subtilis	1	0.003
Nitzschia pusilla	1	0.003
Nitzschia supralitorea	1	0.003
Nitzschia umbonata	1	0.003
Rhoicosphenia curvata	1	0.003
Total Counted	397	
Species Richness	63	
Shannon Diversity (H)	3.52	

Maumee River, upstream, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula schroeteri	73	0.184
Nitzschia inconspicua	41	0.103
Cyclotella atomus	34	0.086
Aulacoseira alpigena	28	0.071
Nitzschia dissipata	21	0.053
Navicula phyllepta	19	0.048
Stephanodiscus hantzschii	18	0.045
Nitzschia palea	16	0.040
Navicula vandamii	14	0.035
Nitzschia clausii	14	0.035
Cyclotella cryptica	12	0.030
Navicula tenelloides	11	0.028
Navicula cryptotenella	10	0.025
Nitzschia supralitorea	6	0.015
Cyclostephanos tholiformis	5	0.013
Cyclotella pseudostelligera	5	0.013
Navicula erifuga	5	0.013
Cyclotella meneghiniana	4	0.010
Cyclotella meneghiniana f. plana	4	0.010
Navicula recens	4	0.010
Skeletonema potamos	4	0.010
Amphora montana	3	0.008
Cyclotella pseudostelligera var1	3	0.008
Cyclotella stelligera	3	0.008
Cyclotella woltereckii	3	0.008
Gomphonema parvulum	3	0.008
Navicula pupula	3	0.008
Navicula seminulum	3	0.008
Navicula slesvicensis	3	0.008
Navicula aquaedurae	2	0.005
Navicula cincta	2	0.005
Nitzschia intermedia	2	0.005

Maumee River, upstream, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus alpinus	2	0.005
Aulacoseira italica	1	0.003
Cocconeis placentula var euglypta	1	0.003
Cyclostephanos invisitatus	1	0.003
Diploneis pseudovalis	1	0.003
Fragilaria construens	1	0.003
Navicula capitatoradiata	1	0.003
Navicula menisculus var grunowii	1	0.003
Navicula subminuscula	1	0.003
Navicula trivialis	1	0.003
Nitzschia agnita	1	0.003
Nitzschia aurariae	1	0.003
Nitzschia calida	1	0.003
Nitzschia levidensis	1	0.003
Nitzschia microcephala	1	0.003
Nitzschia minuta	1	0.003
Nitzschia sp12	1	0.003
Rhoicosphenia curvata	1	0.003
Total Counted	397	
Species Richness	50	
Shannon Diversity (H)	3.12	

Maumee River, downstream, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	77	0.190
Navicula agrestis	52	0.128
Navicula saprophila	39	0.096
Navicula subminuscula	34	0.084
Nitzschia palea	30	0.074
Gomphonema parvulum	25	0.062
Navicula recens	23	0.057
Navicula molestiformis	17	0.042
Nitzschia supralitorea	14	0.035
Navicula atomus var permitis	13	0.032
Rhoicosphenia curvata	10	0.025
Achnanthes minutissima	7	0.017
Nitzschia dissipata	7	0.017
Nitzschia laevis	7	0.017
Navicula mutica var ventricosa	6	0.015
Nitzschia filiformis	6	0.015
Navicula seminulum	5	0.012
Navicula minima	4	0.010
Navicula veneta	4	0.010
Nitzschia pusilla	4	0.010
Synedra ulna	4	0.010
Gomphonema parvulum f. saprophilum	3	0.007
Nitzschia clausii	2	0.005

Maumee River, downstream, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia minuta	2	0.005
Caloneis bacillum	1	0.002
Cocconeis placentula var euglypta	1	0.002
Diatoma vulgaris	1	0.002
Fragilaria vaucheriae	1	0.002
Navicula cryptotenella	1	0.002
Navicula erifuga	1	0.002
Navicula schroeteri	1	0.002
Nitzschia capitellata	1	0.002
Nitzschia frustulum	1	0.002
Stephanodiscus hantzschii	1	0.002
Total Counted	405	
Species Richness	34	
Shannon Diversity (H)	2.80	

Old Woman Creek, upstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Melosira varians	109	0.260
Nitzschia inconspicua	68	0.162
Achnanthes minutissima	63	0.150
Navicula cryptotenella	20	0.048
Navicula gregaria	20	0.048
Amphora pediculus	14	0.033
Navicula minima	13	0.031
Rhoicosphenia curvata	12	0.029
Navicula veneta	11	0.026
Navicula trivialis	10	0.024
Navicula atomus var permitis	8	0.019
Achnanthes lanceolata	7	0.017
Navicula lanceolata	7	0.017
Navicula pupula	7	0.017
Gomphonema parvulum	6	0.014
Nitzschia capitellata	6	0.014
Nitzschia dissipata	6	0.014
Navicula sp2	5	0.012
Nitzschia hungarica	4	0.010
Nitzschia sociabilis	4	0.010
Nitzschia amphibia	3	0.007
Navicula minuscula	2	0.005
Nitzschia dubia	2	0.005
Nitzschia palea	2	0.005
Achnanthes minutissima var inconspi	1	0.002
Amphora montana	1	0.002
Cocconeis pediculus	1	0.002
Cymbella silesiaca	1	0.002
Fragilaria capucina	1	0.002
Gomphonema brasiliense	1	0.002
Gomphonema olivaceum	1	0.002
Navicula capitata	1	0.002
Navicula cryptocephala	1	0.002
Navicula tenelloides	1	0.002
Nitzschia linearis var subtilis	1	0.002
Total Counted	420	
Species Richness	35	
Shannon Diversity (H)	2.59	

Old Woman Creek, downstream, grab sample, 26 June 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia agnewii	91	0.233
Cyclotella cryptica	78	0.199
Skeletonema potamos	47	0.120
Nitzschia palea	38	0.097
Thalassiosira pseudonana var1	26	0.066
Nitzschia gracilis	16	0.041

Old Woman Creek, downstream, grab sample, 26 June 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus hantzschii var tenui	8	0.020
Aulacoseira alpigena	7	0.018
Nitzschia minuta	6	0.015
Cyclotella sp1	5	0.013
Aulacoseira ambigua	4	0.010
Cyclotella atomus	4	0.010
Navicula cryptotenella	4	0.010
Navicula pupula	4	0.010
Nitzschia acicularis	4	0.010
Nitzschia dissipata	4	0.010
Stephanodiscus delicatus	4	0.010
Cyclotella pseudostelligera var1	3	0.008
Fragilaria capucina	3	0.008
Navicula gregaria	3	0.008
Navicula minuscula	3	0.008
Nitzschia amphibia	3	0.008
Achnanthes lanceolata	2	0.005
Cyclotella meneghiniana	2	0.005
Cyclotella pseudostelligera var3	2	0.005
Navicula salinarum	2	0.005
Nitzschia sociabilis	2	0.005
Amphora pediculus	1	0.003
Cyclotella pseudostelligera	1	0.003
Cyclotella stelligera	1	0.003
Gomphonema angustatum	1	0.003
Navicula atomus var permitis	1	0.003
Navicula lanceolata	1	0.003
Navicula slesvicensis	1	0.003
Navicula sp2	1	0.003
Navicula veneta	1	0.003
Nitzschia agnita	1	0.003
Nitzschia supralitorea	1	0.003
Stephanodiscus alpinus	1	0.003
Surirella brebissonii var kuetzingi	1	0.003
Surirella minuta	1	0.003
Thalassiosira pseudonana	1	0.003
Thalassiosira pseudonana var2	1	0.003

Total Counted	391
Species Richness	43
Shannon Diversity (H)	2.62

Old Woman Creek, upstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Aulacoseira alpigena	82	0.215
Thalassiosira pseudonana	73	0.191
Skeletonema potamos	22	0.058
Cyclostephanos tholiformis	21	0.055
Navicula gregaria	21	0.055
Cyclotella atomus	18	0.047
Cyclotella sp1	12	0.031
Nitzschia agnita	10	0.026
Cyclotella cryptica	9	0.024
Nitzschia palea	8	0.021
Rhoicosphenia curvata	8	0.021
Cyclotella meneghiniana	7	0.018
Navicula lanceolata	6	0.016
Cyclotella pseudostelligera	5	0.013
Stephanodiscus parvus	5	0.013
Achnanthes lanceolata	4	0.010
Achnanthes minutissima	4	0.010
Stephanodiscus hantzschii var tenui	4	0.010
Navicula minima	3	0.008
Navicula seminulum	3	0.008
Nitzschia filiformis	3	0.008
Nitzschia minuta	3	0.008
Nitzschia supralitorea	3	0.008
Surirella minuta	3	0.008
Cyclotella woltereckii	2	0.005
Navicula atomus var permitis	2	0.005
Navicula cincta	2	0.005
Navicula cryptocephala	2	0.005
Navicula slesvicensis	2	0.005
Nitzschia acicularis	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia desertorum	2	0.005
Nitzschia frustulum	2	0.005
Nitzschia hungarica	2	0.005
Nitzschia intermedia	2	0.005
Stephanodiscus hantzschii	2	0.005
Surirella angusta	2	0.005
Thalassiosira pseudonana var1	2	0.005
Amphora pediculus	1	0.003
Cyclotella distinguenda var unipunc	1	0.003
Gomphonema gracile	1	0.003
Gomphonema minutum	1	0.003
Gomphonema olivaceum	1	0.003
Gomphonema parvulum	1	0.003
Gomphonema parvulum f. saprophilum	1	0.003
Navicula cryptotenella	1	0.003
Navicula erifuga	1	0.003
Navicula halophila	1	0.003
Navicula pupula	1	0.003
Nitzschia capitellata	1	0.003
Nitzschia fonticola	1	0.003
Nitzschia inconspicua	1	0.003
Nitzschia linearis var subtilis	1	0.003

Old Woman Creek, upstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia pusilla	1	0.003
Thalassiosira pseudonana var2	1	0.003
Total Counted	382	
Species Richness	55	
Shannon Diversity (H)	3.00	

Old Woman Creek, downstream, grab sample, 11 September 1993.

SPECIES	NUMBER	RELATIVE DENSITY
Thalassiosira pseudonana	48	0.159
Skeletonema potamos	36	0.120
Aulacoseira alpigena	33	0.110
Cyclotella cryptica	27	0.090
Cyclotella atomus	20	0.066
Nitzschia agnita	18	0.060
Navicula cryptotenella	17	0.056
Navicula indifferens	15	0.050
Cyclostephanos tholiformis	8	0.027
Nitzschia palea	8	0.027
Navicula recens	7	0.023
Navicula viridula var germainii	7	0.023
Gomphonema parvulum	5	0.017
Navicula sp2	5	0.017
Achnanthes minutissima	4	0.013
Navicula atomus var permitis	4	0.013
Nitzschia minuta	4	0.013
Navicula gregaria	3	0.010
Navicula slesvicensis	3	0.010
Navicula viridula var rostellata	3	0.010
Nitzschia angustiforaminata	3	0.010
Stephanodiscus hantzschii	3	0.010
Stephanodiscus hantzschii var tenui	3	0.010
Cyclostephanos invisitatus	2	0.007
Navicula aquaedurae	2	0.007
Navicula minima	2	0.007
Navicula schroeteri	2	0.007
Nitzschia sp6	2	0.007
Achnanthes hungarica	1	0.003
Cocconeis placentula var euglypta	1	0.003
Navicula erifuga	1	0.003
Navicula menisculus	1	0.003
Navicula molestiformis	1	0.003

Old Woman Creek, downstream, grab sample, 11 September 1993 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia levidensis	1	0.003
Stephanodiscus delicatus	1	0.003
Total Counted	301	
Species Richness	35	
Shannon Diversity (H)	2.92	

Old Woman Creek, upstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia frustulum	39	0.096
Nitzschia palea	39	0.096
Navicula atomus var permitis	23	0.057
Navicula veneta	20	0.049
Nitzschia agnita	19	0.047
Nitzschia inconspicua	18	0.044
Achnanthes minutissima	17	0.042
Nitzschia supralitorea	16	0.040
Navicula molestiformis	10	0.025
Nitzschia desertorum	9	0.022
Navicula gregaria	8	0.020
Achnanthes lanceolata	7	0.017
Aulacoseira ambigua	7	0.017
Cyclotella pseudostelligera var1	7	0.017
Navicula capitata	7	0.017
Navicula menisculus	7	0.017
Nitzschia minuta	7	0.017
Surirella minuta	7	0.017
Aulacoseira granulata	6	0.015
Cyclotella atomus	6	0.015
Cymbella silesiaca	6	0.015
Navicula minima	6	0.015
Navicula slesvicensis	6	0.015
Cyclostephanos tholiformis	5	0.012
Gomphonema olivaceum	5	0.012
Nitzschia dissipata	5	0.012
Nitzschia pusilla	5	0.012
Cyclostephanos invisitatus	4	0.010
Cyclotella woltereckii	4	0.010
Navicula capitatoradiata	4	0.010
Thalassiosira pseudonana	4	0.010
Thalassiosira pseudonana var1	4	0.010
Amphora pediculus	3	0.007
Gomphonema parvulum f. saprophilum	3	0.007
Melosira varians	3	0.007
Navicula cryptocephala	3	0.007
Navicula pupula	3	0.007
Navicula subminuscula	3	0.007
Nitzschia angustiforaminata	3	0.007

Old Woman Creek, upstream, grab sample, 18 June 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus delicatus	3	0.007
Amphora libyca	2	0.005
Caloneis bacillum	2	0.005
Cyclotella sp1	2	0.005
Fragilaria capucina	2	0.005
Fragilaria vaucheriae	2	0.005
Navicula salinarum	2	0.005
Navicula sp2	2	0.005
Nitzschia acicularis	2	0.005
Nitzschia agnewii	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia apiculata	2	0.005
Nitzschia linearis	2	0.005
Rhoicosphenia curvata	2	0.005
Skeletonema potamos	2	0.005
Surirella suecica	2	0.005
Cyclotella atomus var4	1	0.002
Cyclotella meneghiniana	1	0.002
Cyclotella pseudostelligera	1	0.002
Navicula atomus	1	0.002
Navicula confervacea	1	0.002
Navicula contenta	1	0.002
Navicula elginensis	1	0.002
Navicula erifuga	1	0.002
Navicula tripunctata	1	0.002
Nitzschia angustatula	1	0.002
Nitzschia dubia	1	0.002
Stephanodiscus hantzschii	1	0.002
Surirella angusta	1	0.002
Synedra fasiculata var truncata	1	0.002
Total Counted	405	
Species Richness	69	
Shannon Diversity (H)	3.69	

Old Woman Creek, downstream, grab sample, 18 June 1994.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia acicularis	127	0.321
Stephanodiscus delicatus	55	0.139
Thalassiosira pseudonana	42	0.106
Cyclostephanos tholiformis	27	0.068
Cyclotella atomus	16	0.040
Nitzschia agnewii	15	0.038
Skeletonema potamos	13	0.033
Cyclotella cryptica	11	0.028
Nitzschia graciliformis	11	0.028
Nitzschia palea	11	0.028
Stephanodiscus hantzschii	8	0.020

Old Woman Creek, downstream, grab sample, 18 June 1994 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella woltereckii	7	0.018
Stephanodiscus parvus	7	0.018
Cyclotella sp1	6	0.015
Navicula salinarum	6	0.015
Thalassiosira pseudonana var1	4	0.010
Cyclotella pseudostelligera	3	0.008
Navicula slesvicensis	3	0.008
Nitzschia rosenstockii	3	0.008
Cyclotella pseudostelligera var3	2	0.005
Navicula accomoda	2	0.005
Navicula veneta	2	0.005
Nitzschia capitellata	2	0.005
Nitzschia compressa var vexans	2	0.005
Nitzschia minuta	2	0.005
Nitzschia pusilla	2	0.005
Tabellaria flocculosa	2	0.005
Nitzschia inconspicua	1	0.003
Nitzschia paleacea	1	0.003
Stephanodiscus minutulus	1	0.003

Total Counted	396
Species Richness	30
Shannon Diversity (H)	2.49

Old Woman Creek, upstream, grab sample, 17 September.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	203	0.502
Synedra fasiculata var truncata	58	0.144
Nitzschia amphibia	30	0.074
Nitzschia supralitorea	29	0.072
Gomphonema clavatum	15	0.037
Aulacoseira alpigena	7	0.017
Thalassiosira pseudonana	5	0.012
Navicula cryptotenella	4	0.010
Nitzschia palea	4	0.010
Cocconeis pediculus	3	0.007
Gomphonema gracile	3	0.007
Melosira varians	3	0.007
Amphora pediculus	2	0.005
Fragilaria vaucheriae	2	0.005
Gomphonema parvulum	2	0.005
Gomphonema parvulum var exilissimum	2	0.005
Navicula accomoda	2	0.005
Navicula erifuga	2	0.005
Navicula minima	2	0.005
Navicula monoculata	2	0.005
Navicula subminuscula	2	0.005
Navicula veneta	2	0.005

Old Woman Creek, upstream, grab sample, 17 September (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia compressa var vexans	2	0.005
Nitzschia fonticola	2	0.005
Nitzschia inconspicua	2	0.005
Nitzschia sigma	2	0.005
Rhoicosphenia curvata	2	0.005
Cyclostephanos tholiformis	1	0.002
Cyclotella atomus var4	1	0.002
Gomphonema acuminatum	1	0.002
Navicula contenta	1	0.002
Navicula lanceolata	1	0.002
Navicula viridula var rostellata	1	0.002
Nitzschia linearis	1	0.002
Nitzschia paleacea	1	0.002
Synedra pulchella	1	0.002
Thalassiosira pseudonana var1	1	0.002

Total Counted	404
Species Richness	36
Shannon Diversity (H)	1.99

Old Woman Creek, downstream, grab sample, 17 September.

SPECIES	NUMBER	RELATIVE DENSITY
Aulacoseira alpigena	183	0.453
Thalassiosira pseudonana	61	0.151
Thalassiosira pseudonana var1	26	0.064
Cyclotella cryptica	25	0.062
Cyclostephanos tholiformis	15	0.037
Cyclotella atomus	13	0.032
Skeletonema potamos	12	0.030
Navicula erifuga	11	0.027
Navicula viridula var germainii	7	0.017
Navicula schroeteri	6	0.015
Nitzschia agnita	6	0.015
Gomphonema parvulum	4	0.010
Achnanthes minutissima	3	0.007
Cyclotella meneghiniana	3	0.007
Navicula gregaria	3	0.007
Navicula indifferens	3	0.007
Stephanodiscus hantzschii	3	0.007
Cyclostephanos invisitatus	2	0.005
Navicula capitatoradiata	2	0.005
Navicula phyllepta	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia gracilis	2	0.005
Nitzschia minuta	2	0.005
Stephanodiscus delicatus	2	0.005
Cyclotella pseudostelligera	1	0.002
Cyclotella woltereckii	1	0.002

Old Woman Creek, downstream, grab sample, 17 September (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula viridula var rostellata	1	0.002
Nitzschia perminuta	1	0.002
Stephanodiscus hantzschii var tenui	1	0.002
Stephanodiscus parvus	1	0.002
Total Counted	404	
Species Richness	30	
Shannon Diversity (H)	2.12	

Old Woman Creek, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula gregaria	51	0.134
Nitzschia dissipata	25	0.065
Surirella minuta	24	0.063
Nitzschia palea	22	0.058
Nitzschia inconspicua	18	0.047
Nitzschia pusilla	18	0.047
Navicula lanceolata	15	0.039
Navicula trivialis	14	0.037
Melosira varians	12	0.031
Achnanthes lanceolata	11	0.029
Navicula atomus	10	0.026
Navicula atomus var permitis	10	0.026
Amphora pediculus	9	0.024
Nitzschia minuta	9	0.024
Navicula capitata	8	0.021
Nitzschia supralitorea	8	0.021
Nitzschia acicularis	7	0.018
Achnanthes minutissima	6	0.016
Navicula veneta	6	0.016
Nitzschia agnita	6	0.016
Nitzschia capitellata	5	0.013
Nitzschia gracilis	5	0.013
Nitzschia sociabilis	5	0.013
Navicula minima	4	0.010
Navicula molestiformis	4	0.010
Nitzschia rosenstockii	4	0.010
Nitzschia sp2	4	0.010
Gomphonema olivaceum	3	0.008
Navicula cryptotenella	3	0.008
Nitzschia angustatula	3	0.008
Nitzschia dubia	3	0.008
Nitzschia linearis var subtilis	3	0.008
Nitzschia rautenbachiae	3	0.008
Cyclotella meneghiniana	2	0.005
Fragilaria vaucheriae	2	0.005
Gomphonema augur	2	0.005
Gomphonema parvulum f. saprophilum	2	0.005

Old Woman Creek, upstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula monoculata	2	0.005
Navicula schroeteri	2	0.005
Nitzschia amphibia	2	0.005
Nitzschia apiculata	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia filiformis	2	0.005
Nitzschia fonticola	2	0.005
Nitzschia levidensis	2	0.005
Nitzschia linearis	2	0.005
Nitzschia recta	2	0.005
Thalassiosira weissflogii	2	0.005
Achnanthes minutissima var inconspi	1	0.003
Cyclotella atomus var4	1	0.003
Cyclotella stelligera	1	0.003
Cymatopleura solea	1	0.003
Fragilaria construens f. venter	1	0.003
Gomphonema grovei var lingulatum	1	0.003
Gyrosigma acuminatum	1	0.003
Meridion circulare	1	0.003
Navicula elginensis	1	0.003
Navicula goeppertiana	1	0.003
Neidium ampliatum	1	0.003
Nitzschia calida	1	0.003
Nitzschia perminuta	1	0.003
Synedra fasiculata var truncata	1	0.003
Total Counted	382	
Species Richness	62	
Shannon Diversity (H)	3.52	

Old Woman Creek, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	47	0.116
Cyclotella cryptica	44	0.108
Cyclotella atomus	33	0.081
Cyclotella pseudostelligera var1	24	0.059
Nitzschia palea	20	0.049
Nitzschia amphibia	15	0.037
Navicula minima	13	0.032
Achnanthes minutissima	12	0.030
Aulacoseira granulata	10	0.025
Cyclotella pseudostelligera	10	0.025
Nitzschia minuta	10	0.025
Nitzschia rosenstockii	10	0.025
Aulacoseira alpigena	9	0.022
Nitzschia frustulum	9	0.022
Navicula recens	8	0.020
Nitzschia pusilla	8	0.020

Old Woman Creek, downstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula veneta	7	0.017
Achnanthes lanceolata	6	0.015
Navicula gregaria	6	0.015
Navicula molestiformis	6	0.015
Nitzschia agnewii	5	0.012
Stephanodiscus hantzschii	5	0.012
Cymbella silesiaca	4	0.010
Navicula angusta	4	0.010
Navicula cryptotenella	4	0.010
Nitzschia inconspicua	4	0.010
Nitzschia perminuta	4	0.010
Nitzschia sociabilis	4	0.010
Thalassiosira pseudonana	4	0.010
Achnanthes minutissima var inconspi	3	0.007
Cocconeis placentula var lineata	3	0.007
Navicula pupula	3	0.007
Navicula subminuscula	3	0.007
Nitzschia dissipata	3	0.007
Nitzschia fonticola	3	0.007
Cocconeis pediculus	2	0.005
Cyclotella woltereckii	2	0.005
Fragilaria capucina	2	0.005
Gomphonema gracile	2	0.005
Navicula accomoda	2	0.005
Navicula agrestis	2	0.005
Navicula cryptocephala	2	0.005
Navicula minuscula	2	0.005
Navicula tripunctata	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia aurariae	2	0.005
Nitzschia levidensis	2	0.005
Asterionella formosa	1	0.002
Caloneis schumanniana	1	0.002
Cyclotella meneghiniana	1	0.002
Fragilaria vaucheriae	1	0.002
Navicula capitatoradiata	1	0.002
Navicula cohnii	1	0.002
Navicula contenta	1	0.002
Navicula menisculus	1	0.002
Navicula menisculus var grunowii	1	0.002
Navicula phyllepta	1	0.002
Nitzschia acicularis	1	0.002
Nitzschia agnita	1	0.002
Nitzschia angustiforaminata	1	0.002
Nitzschia compressa var vexans	1	0.002
Nitzschia paleacea	1	0.002
Nitzschia supralitorea	1	0.002
Rhoicosphenia curvata	1	0.002
Synedra fasiculata var truncata	1	0.002
Synedra tenera	1	0.002
Total Counted	406	
Species Richness	66	
Shannon Diversity (H)	3.53	

Old Woman Creek, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	151	0.369
Navicula minima	62	0.152
Nitzschia amphibia	57	0.139
Navicula veneta	22	0.054
Achnanthes minutissima	14	0.034
Navicula atomus var permitis	9	0.022
Nitzschia palea	8	0.020
Amphora pediculus	7	0.017
Cyclotella cryptica	7	0.017
Cyclotella pseudostelligera	7	0.017
Navicula erifuga	7	0.017
Nitzschia supralitorea	6	0.015
Navicula cryptotenella	5	0.012
Achnanthes lanceolata	4	0.010
Navicula schroeteri	4	0.010
Navicula subminuscula	4	0.010
Achnanthes saxonica	2	0.005
Amphora montana	2	0.005
Navicula gregaria	2	0.005
Nitzschia agnita	2	0.005
Nitzschia angustatula	2	0.005
Nitzschia fonticola	2	0.005
Nitzschia frustulum	2	0.005
Nitzschia sociabilis	2	0.005
Nitzschia tubicola	2	0.005
Stephanodiscus delicatus	2	0.005
Synedra fasiculata var truncata	2	0.005
Caloneis bacillum	1	0.002
Cyclotella atomus	1	0.002
Gyrosigma scalproides	1	0.002
Meridion circulare	1	0.002
Navicula agrestis	1	0.002
Navicula angusta	1	0.002
Navicula elginensis	1	0.002
Navicula menisculus var grunowii	1	0.002
Navicula sp2	1	0.002
Navicula trivialis	1	0.002
Nitzschia desertorum	1	0.002
Nitzschia dissipata	1	0.002
Thalassiosira pseudonana	1	0.002

Total Counted	409
Species Richness	40
Shannon Diversity (H)	2.37

Old Woman Creek, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Gomphonema parvulum	68	0.167
Nitzschia amphibia	60	0.148
Aulacoseira alpigena	58	0.143
Navicula confervacea	44	0.108
Nitzschia palea	39	0.096
Nitzschia fonticola	21	0.052
Cyclotella atomus	18	0.044
Navicula recens	17	0.042
Cyclotella cryptica	10	0.025
Navicula schroeteri	10	0.025
Nitzschia inconspicua	9	0.022
Navicula pupula	8	0.020
Navicula erifuga	5	0.012
Achnanthes minutissima	4	0.010
Navicula gregaria	4	0.010
Navicula minima	4	0.010
Nitzschia supralitorea	4	0.010
Cyclotella meneghiniana	3	0.007
Navicula viridula var germainii	3	0.007
Navicula atomus var permitis	2	0.005
Navicula subminuscula	2	0.005
Nitzschia angustiforaminata	2	0.005
Nitzschia minuta	2	0.005
Stephanodiscus hantzschii	2	0.005
Achnanthes hungarica	1	0.002
Cyclotella pseudostelligera var1	1	0.002
Navicula agrestis	1	0.002
Navicula rhynchocephala	1	0.002
Nitzschia dissipata	1	0.002
Nitzschia tubicola	1	0.002
Stephanodiscus delicatus	1	0.002
Total Counted	406	
Species Richness	31	
Shannon Diversity (H)	2.64	

Old Woman Creek, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Surirella minuta	95	0.235
Navicula gregaria	75	0.185
Navicula lanceolata	26	0.064
Rhoicosphenia curvata	19	0.047
Nitzschia palea	18	0.044
Gomphonema olivaceum	16	0.040
Achnanthes lanceolata	10	0.025
Fragilaria vaucheriae	10	0.025
Nitzschia dissipata	10	0.025
Nitzschia inconspicua	10	0.025

Old Woman Creek, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula salinarum	7	0.017
Achnanthes minutissima	6	0.015
Meridion circulare	6	0.015
Navicula trivialis	6	0.015
Melosira varians	5	0.012
Navicula cryptotenella	5	0.012
Nitzschia linearis	5	0.012
Navicula seminulum	4	0.010
Nitzschia apiculata	4	0.010
Surirella angusta	4	0.010
Amphora pediculus	3	0.007
Nitzschia perminuta	3	0.007
Cyclotella atomus	2	0.005
Diatoma vulgaris	2	0.005
Fragilaria capucina	2	0.005
Gomphonema clavatum	2	0.005
Gomphonema minutum	2	0.005
Gyrosigma acuminatum	2	0.005
Navicula capitata	2	0.005
Navicula cincta	2	0.005
Navicula menisculus var grunowii	2	0.005
Navicula tenelloides	2	0.005
Navicula tripunctata	2	0.005
Navicula veneta	2	0.005
Nitzschia archibaldii	2	0.005
Nitzschia fonticola	2	0.005
Amphora montana	1	0.002
Amphora ovalis	1	0.002
Cocconeis pediculus	1	0.002
Cocconeis placentula var euglypta	1	0.002
Cymatopleura solea	1	0.002
Cymbella silesiaca	1	0.002
Fragilaria construens f. venter	1	0.002
Frustulia weinholdii	1	0.002
Gomphonema parvulum	1	0.002
Gomphonema sp7	1	0.002
Navicula capitatoradiata	1	0.002
Navicula cryptocephala	1	0.002
Navicula elginensis	1	0.002
Navicula lacunolaciniata	1	0.002
Navicula minuscula	1	0.002
Navicula tenera	1	0.002
Nitzschia brevissima	1	0.002
Nitzschia capitellata	1	0.002
Nitzschia dubia	1	0.002
Nitzschia frustulum var bulnheimian	1	0.002
Nitzschia hantzschiana	1	0.002
Nitzschia lanceola var minutula	1	0.002
Nitzschia levidensis	1	0.002
Nitzschia pusilla	1	0.002
Nitzschia recta	1	0.002
Nitzschia sinuata	1	0.002
Nitzschia sociabilis	1	0.002
Nitzschia tubicola	1	0.002

Old Woman Creek, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Synedra fasiculata var truncata	1	0.002
Synedra pulchella	1	0.002
Total Counted	405	
Species Richness	66	
Shannon Diversity (H)	3.05	

Old Woman Creek, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Skeletonema potamos	39	0.102
Nitzschia amphibia	32	0.083
Cyclotella atomus	31	0.081
Aulacoseira sp2	23	0.060
Navicula pupula	23	0.060
Navicula gregaria	22	0.057
Navicula phyllepta	22	0.057
Nitzschia palea	18	0.047
Thalassiosira pseudonana	18	0.047
Cyclostephanos invisitatus	14	0.036
Nitzschia dissipata	14	0.036
Stephanodiscus hantzschii	13	0.034
Navicula slesvicensis	8	0.021
Surirella minuta	8	0.021
Achnanthes lanceolata	7	0.018
Navicula sp2	7	0.018
Cyclotella meneghiniana	6	0.016
Navicula veneta	6	0.016
Gomphonema parvulum	5	0.013
Navicula libonensis	4	0.010
Nitzschia frustulum	4	0.010
Aulacoseira sp1	3	0.008
Gomphonema olivaceum	3	0.008
Navicula cryptocephala	3	0.008
Navicula salinarum	3	0.008
Navicula tripunctata	3	0.008
Nitzschia fonticola	3	0.008
Cyclotella cryptica	2	0.005
Cyclotella pseudostelligera	2	0.005
Cymbella silesiaca	2	0.005
Fragilaria capucina	2	0.005
Navicula cincta	2	0.005
Navicula cryptotenella	2	0.005
Navicula molestiformis	2	0.005
Navicula trivialis	2	0.005
Nitzschia acicularis	2	0.005
Nitzschia capitellata	2	0.005
Nitzschia dissipata var media	2	0.005
Nitzschia pusilla	2	0.005

Old Woman Creek, downstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Amphora sp2	1	0.003
Aulacoseira alpigena	1	0.003
Cyclotella pseudostelligera var1	1	0.003
Gomphonema clavatum	1	0.003
Meridion circulare	1	0.003
Navicula capitata	1	0.003
Navicula confervacea	1	0.003
Navicula decussis	1	0.003
Navicula elginensis	1	0.003
Navicula lacunolaciniata	1	0.003
Navicula lanceolata	1	0.003
Navicula minuscula	1	0.003
Neidium ampliatum	1	0.003
Nitzschia angustiforaminata	1	0.003
Nitzschia calida	1	0.003
Nitzschia desertorum	1	0.003
Nitzschia minuta	1	0.003
Rhoicosphenia curvata	1	0.003
Total Counted	384	
Species Richness	57	
Shannon Diversity (H)	3.37	

Old Woman Creek, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	51	0.144
Nitzschia inconspicua	26	0.074
Nitzschia agnita	24	0.068
Nitzschia minuta	22	0.062
Surirella minuta	16	0.045
Nitzschia capitellata	15	0.042
Aulacoseira alpigena	14	0.040
Navicula trivialis	10	0.028
Navicula veneta	10	0.028
Achnanthes lanceolata	6	0.017
Amphora pediculus	6	0.017
Navicula pupula	6	0.017
Nitzschia amphibia	6	0.017
Nitzschia apiculata	6	0.017
Achnanthes minutissima	5	0.014
Navicula agrestis	5	0.014
Navicula gregaria	5	0.014
Navicula lanceolata	5	0.014
Nitzschia tubicola	5	0.014
Navicula erifuga	4	0.011
Navicula molestiformis	4	0.011
Navicula schroeteri	4	0.011
Navicula seminulum	4	0.011

Old Woman Creek, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula sp2	4	0.011
Navicula tenera	4	0.011
Navicula vandamii	4	0.011
Nitzschia dissipata	4	0.011
Nitzschia supralitorea	4	0.011
Cyclotella cryptica	3	0.008
Cyclotella pseudostelligera var1	3	0.008
Navicula minima	3	0.008
Amphora libyca	2	0.006
Amphora veneta	2	0.006
Cocconeis placentula var euglypta	2	0.006
Cyclotella meneghiniana	2	0.006
Fragilaria capucina	2	0.006
Gyrosigma scalproides	2	0.006
Navicula angusta	2	0.006
Navicula aquaedurae	2	0.006
Navicula atomus var permitis	2	0.006
Navicula cryptocephala	2	0.006
Navicula decussis	2	0.006
Navicula goeppertiana	2	0.006
Navicula menisculus var grunowii	2	0.006
Navicula minuscula	2	0.006
Navicula viridula var rostellata	2	0.006
Nitzschia angustiforaminata	2	0.006
Nitzschia calida	2	0.006
Nitzschia compressa var vexans	2	0.006
Nitzschia frustulum	2	0.006
Nitzschia pusilla	2	0.006
Rhoicosphenia curvata	2	0.006
Surirella angusta	2	0.006
Amphora inariensis	1	0.003
Cocconeis pediculus	1	0.003
Cyclotella pseudostelligera	1	0.003
Cyclotella stelligera	1	0.003
Cylindrotheca gracilis	1	0.003
Navicula contenta	1	0.003
Navicula cryptotenella	1	0.003
Navicula incertata	1	0.003
Navicula phyllepta	1	0.003
Navicula rhynchocephala	1	0.003
Nitzschia acicularioides	1	0.003
Nitzschia acicularis	1	0.003
Nitzschia communis	1	0.003
Nitzschia frustulum var bulnheimian	1	0.003
Nitzschia linearis	1	0.003
Nitzschia perminuta	1	0.003
Nitzschia rautenbachiae	1	0.003
Stephanodiscus binderanus	1	0.003
Stephanodiscus parvus	1	0.003

Old Woman Creek, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Synedra ulna var acus	1	0.003
Thalassiosira pseudonana	1	0.003
Total Counted	353	
Species Richness	74	
Shannon Diversity (H)	3.65	

Old Woman Creek, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia amphibia	75	0.188
Aulacoseira alpigena	60	0.150
Nitzschia palea	52	0.130
Nitzschia gracilis	19	0.048
Navicula minima	17	0.043
Cyclotella cryptica	12	0.030
Stephanodiscus hantzschii	12	0.030
Gomphonema parvulum	8	0.020
Cymbella silesiaca	7	0.018
Achnanthes minutissima	6	0.015
Cyclostephanos invisitatus	6	0.015
Cyclotella atomus	6	0.015
Navicula cryptocephala	6	0.015
Navicula veneta	6	0.015
Nitzschia intermedia	6	0.015
Navicula schroeteri	5	0.013
Nitzschia agnita	5	0.013
Nitzschia minuta	5	0.013
Melosira varians	4	0.010
Navicula salinarum	4	0.010
Navicula viridula	4	0.010
Synedra tenera	4	0.010
Gomphonema parvulum var exilissimum	3	0.008
Navicula confervacea	3	0.008
Navicula pupula	3	0.008
Nitzschia supralitorea	3	0.008
Nitzschia tubicola	3	0.008
Thalassiosira pseudonana	3	0.008
Achnanthes lanceolata	2	0.005
Aulacoseira ambigua	2	0.005
Aulacoseira granulata	2	0.005
Cyclotella pseudostelligera	2	0.005
Cymbella tumida	2	0.005
Navicula gregaria	2	0.005
Navicula molestiformis	2	0.005
Navicula sp2	2	0.005
Nitzschia angustatula	2	0.005
Nitzschia angustiforaminata	2	0.005
Nitzschia filiformis	2	0.005

Old Woman Creek, downstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia linearis	2	0.005
Nitzschia rautenbachiae	2	0.005
Surirella minuta	2	0.005
Aulacoseira crassipunctata	1	0.003
Aulacoseira italica	1	0.003
Caloneis sp1	1	0.003
Cyclostephanos tholiformis	1	0.003
Cyclotella meneghiniana	1	0.003
Cyclotella pseudostelligera var1	1	0.003
Cyclotella pseudostelligera var3	1	0.003
Cyclotella stelligera	1	0.003
Navicula erifuga	1	0.003
Navicula lanceolata	1	0.003
Navicula minuscula	1	0.003
Navicula seminulum	1	0.003
Navicula subminuscula	1	0.003
Navicula trivialis	1	0.003
Nitzschia acicularis	1	0.003
Nitzschia capitellata	1	0.003
Nitzschia frustulum	1	0.003
Nitzschia reversa	1	0.003
Nitzschia sp13	1	0.003
Nitzschia subacicularis	1	0.003
Stephanodiscus binderanus	1	0.003
Stephanodiscus minutulus	1	0.003
Surirella suecica	1	0.003
Synedra ulna	1	0.003
Thalassiosira pseudonana var2	1	0.003

Total Counted	400
Species Richness	67
Shannon Diversity (H)	3.19

Portage River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	103	0.252
Cyclotella atomus	63	0.154
Skeletonema potamos	44	0.108
Stephanodiscus hantzschii	21	0.051
Navicula gregaria	20	0.049
Thalassiosira pseudonana	20	0.049
Cyclotella atomus var4	14	0.034
Nitzschia inconspicua	9	0.022
Thalassiosira pseudonana var1	8	0.020
Achnanthes minutissima	7	0.017
Navicula veneta	7	0.017
Stephanodiscus delicatus	7	0.017
Rhoicosphenia curvata	6	0.015
Gomphonema parvulum	5	0.012
Nitzschia supralitorea	5	0.012
Cyclotella meneghiniana	4	0.010
Navicula molestiformis	4	0.010
Navicula subminuscula	4	0.010
Nitzschia acicularis	4	0.010
Nitzschia dissipata	4	0.010
Nitzschia fonticola	4	0.010
Nitzschia frustulum	4	0.010
Nitzschia rosenstockii	4	0.010
Navicula agrestis	3	0.007
Navicula atomus var permitis	3	0.007
Nitzschia brevissima	3	0.007
Cymbella silesiaca	2	0.005
Navicula viridula var germainii	2	0.005
Nitzschia agnita	2	0.005
Nitzschia communis	2	0.005
Nitzschia microcephala	2	0.005
Surirella minuta	2	0.005
Achnanthes lanceolata	1	0.002
Cocconeis pediculus	1	0.002
Cyclostephanos invisitatus	1	0.002
Cyclotella pseudostelligera var1	1	0.002
Navicula lanceolata	1	0.002
Navicula menisculus var grunowii	1	0.002
Navicula minuscula	1	0.002
Navicula tenelloides	1	0.002
Nitzschia capitellata	1	0.002
Nitzschia gracilis	1	0.002
Nitzschia palea	1	0.002
Nitzschia paleacea	1	0.002
Nitzschia recta	1	0.002
Nitzschia slesvicensis	1	0.002
Synedra ulna	1	0.002
Synedra ulna var acus	1	0.002

Total Counted	408
Species Richness	48
Shannon Diversity (H)	2.84

Portage River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula sublinearis	157	0.392
Gomphonema parvulum	23	0.058
Gomphonema grovei var lingulatum	21	0.053
Nitzschia perminuta	19	0.048
Achnanthes minutissima	14	0.035
Nitzschia sp21	11	0.028
Navicula aquaedurae	10	0.025
Cyclostephanos invisitatus	9	0.023
Cymbella sp1	9	0.023
Nitzschia filiformis	9	0.023
Nitzschia rostellata	8	0.020
Cocconeis pediculus	7	0.018
Cyclotella stelligera	7	0.018
Gomphonema sp6	7	0.018
Caloneis schumanniana	5	0.013
Nitzschia aurariae	5	0.013
Nitzschia sp6	5	0.013
Navicula ingenua	4	0.010
Navicula menisculus var upsaliensis	4	0.010
Navicula pseudoanglica	4	0.010
Nitzschia compressa var vexans	4	0.010
Aulacoseira alpigena	3	0.008
Cymbella affinis	3	0.008
Eunotia curvata	3	0.008
Gomphonema olivaceum var minutissim	3	0.008
Navicula mutica var ventricosa	3	0.008
Navicula saprophila	3	0.008
Nitzschia clausii	3	0.008
Nitzschia palea	3	0.008
Amphora montana	2	0.005
Gomphonema sp4	2	0.005
Navicula elginensis	2	0.005
Navicula fossalis	2	0.005
Navicula pygmaea	2	0.005
Navicula recens	2	0.005
Navicula tenelloides	2	0.005
Nitzschia lanceola var minutula	2	0.005
Nitzschia sp18	2	0.005
Achnanthes ricula	1	0.003
Amphora delicatissima	1	0.003
Cymatopleura solea	1	0.003
Frustulia vulgaris	1	0.003
Gomphonema sp5	1	0.003
Gyrosigma scalproides	1	0.003
Navicula heimansii	1	0.003
Navicula hustedtii	1	0.003
Navicula pupula	1	0.003
Navicula reinhardtii	1	0.003
Navicula subminuscula	1	0.003
Nitzschia acicularis	1	0.003
Nitzschia coarctica	1	0.003
Nitzschia communis	1	0.003

Portage River, downstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia recta	1	0.003
Nitzschia sp23	1	0.003
Total Counted	400	
Species Richness	54	
Shannon Diversity (H)	2.81	

Portage River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella cryptica	157	0.381
Cyclotella atomus	73	0.177
Thalassiosira pseudonana	50	0.121
Skeletonema potamos	37	0.090
Nitzschia palea	17	0.041
Cyclotella meneghiniana	10	0.024
Nitzschia inconspicua	10	0.024
Cyclotella pseudostelligera var1	7	0.017
Nitzschia supralitorea	6	0.015
Navicula viridula var germainii	5	0.012
Gomphonema olivaceum	4	0.010
Navicula gregaria	4	0.010
Nitzschia dissipata	4	0.010
Nitzschia minuta	4	0.010
Cyclotella pseudostelligera	2	0.005
Gomphonema parvulum	2	0.005
Navicula capitata	2	0.005
Navicula capitatoradiata	2	0.005
Navicula cryptotenella	2	0.005
Navicula minima	2	0.005
Navicula veneta	2	0.005
Nitzschia levidensis	2	0.005
Thalassiosira pseudonana var1	2	0.005
Cocconeis pediculus	1	0.002
Fragilaria construens f. venter	1	0.002
Navicula schroeteri	1	0.002
Nitzschia amphibia	1	0.002
Stephanodiscus hantzschii	1	0.002
Stephanodiscus parvus	1	0.002
Total Counted	412	
Species Richness	29	
Shannon Diversity (H)	2.14	

Portage River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Gyrosigma spencerii	83	0.208
Navicula fossalis	30	0.075
Cymatopleura solea	23	0.058
Navicula agrestis	20	0.050
Nitzschia filiformis	18	0.045
Nitzschia rosenstockii	13	0.033
Nitzschia sp18	12	0.030
Navicula ingenua	11	0.028
Navicula incertata	10	0.025
Navicula pseudoanglica	10	0.025
Achnanthes minutissima	9	0.023
Amphora montana	9	0.023
Navicula phyllepta	9	0.023
Navicula tenelloides	9	0.023
Nitzschia sp5	9	0.023
Hantzschia amphioxys	8	0.020
Nitzschia aurariae	8	0.020
Nitzschia rostellata	8	0.020
Nitzschia sp6	8	0.020
Gomphonema parvulum	6	0.015
Navicula sublinearis	6	0.015
Nitzschia sinuata var tabellaria	6	0.015
Cocconeis placentula	5	0.013
Cocconeis placentula var euglypta	5	0.013
Gomphonema sp3	5	0.013
Cyclostephanos invisitatus	4	0.010
Cyclotella distinguenda var unipunc	4	0.010
Cyclotella meneghiniana f. plana	4	0.010
Navicula lanceolata	4	0.010
Navicula sp6	4	0.010
Nitzschia lanceola var minutula	4	0.010
Gomphonema amoenum	3	0.008
Cyclotella meneghiniana	2	0.005
Gyrosigma acuminatum	2	0.005
Navicula ignota	2	0.005
Navicula praeterita	2	0.005
Navicula reinhardtii	2	0.005
Nitzschia compressa var vexans	2	0.005
Nitzschia graciliformis	2	0.005
Nitzschia palea	2	0.005
Achnanthes lanceolata	1	0.003
Achnanthes lanceolata var rostrata	1	0.003
Amphora inariensis	1	0.003
Amphora pediculus	1	0.003
Bacillaria paradoxa	1	0.003
Caloneis bacillum	1	0.003
Diatoma tenuis	1	0.003
Epithemia adnata	1	0.003
Eunotia curvata	1	0.003
Gomphonema olivaceum var minutissim	1	0.003
Gomphonema sp4	1	0.003
Navicula evanida	1	0.003
Navicula sp12	1	0.003
Neidium ampliatum	1	0.003

Portage River, downstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia recta	1	0.003
Nitzschia sp2	1	0.003
Total Counted	399	
Species Richness	56	
Shannon Diversity (H)	3.34	

Portage River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Skeletonema potamos	39	0.098
Navicula gregaria	32	0.081
Nitzschia dissipata	31	0.078
Surirella minuta	30	0.076
Navicula cryptotenella	15	0.038
Gomphonema olivaceum	14	0.035
Nitzschia palea	14	0.035
Cyclotella atomus	13	0.033
Stephanodiscus parvus	13	0.033
Cyclotella cryptica	12	0.030
Rhoicosphenia curvata	12	0.030
Stephanodiscus hantzschii	10	0.025
Thalassiosira pseudonana	10	0.025
Gomphonema minutum	9	0.023
Navicula sp2	9	0.023
Gomphonema parvulum f. saprophilum	8	0.020
Nitzschia acicularis	8	0.020
Achnanthes lanceolata	7	0.018
Nitzschia inconspicua	7	0.018
Cyclotella meneghiniana	6	0.015
Melosira varians	6	0.015
Navicula capitatoradiata	6	0.015
Navicula salinarum	5	0.013
Nitzschia capitellata	5	0.013
Amphora pediculus	4	0.010
Cocconeis pediculus	4	0.010
Achnanthes minutissima	3	0.008
Diatoma vulgaris	3	0.008
Fragilaria capucina	3	0.008
Gomphonema parvulum	3	0.008
Navicula tripunctata	3	0.008
Synedra ulna	3	0.008
Caloneis bacillum	2	0.005
Cyclostephanos invisitatus	2	0.005
Cyclotella pseudostelligera var3	2	0.005
Cymbella tumida	2	0.005
Fragilaria vaucheriae	2	0.005
Navicula agrestis	2	0.005
Navicula minima	2	0.005

Portage River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula pygmaea	2	0.005
Navicula seminulum	2	0.005
Navicula subminuscula	2	0.005
Nitzschia levidensis	2	0.005
Nitzschia recta	2	0.005
Achnanthes minutissima var robusta	1	0.003
Amphora inariensis	1	0.003
Aulacoseira crassipunctata	1	0.003
Aulacoseira granulata	1	0.003
Cyclostephanos tholiformis	1	0.003
Gomphonema sp7	1	0.003
Hantzschia amphioxys	1	0.003
Navicula accomoda	1	0.003
Navicula atomus	1	0.003
Navicula lanceolata	1	0.003
Navicula menisculus var grunowii	1	0.003
Navicula minuscula	1	0.003
Navicula molestiformis	1	0.003
Navicula tenelloides	1	0.003
Nitzschia apiculata	1	0.003
Nitzschia brevissima	1	0.003
Nitzschia communis	1	0.003
Nitzschia pusilla	1	0.003
Nitzschia sociabilis	1	0.003
Nitzschia supralitorea	1	0.003
Stephanodiscus hantzschii var tenui	1	0.003
Surirella angusta	1	0.003
Surirella suecica	1	0.003
Thalassiosira pseudonana var1	1	0.003
Thalassiosira pseudonana var2	1	0.003

Total Counted	396
Species Richness	69
Shannon Diversity (H)	3.59

Portage River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus hantzschii	39	0.300
Melosira varians	14	0.108
Navicula tripunctata	14	0.108
Skeletonema potamos	8	0.062
Navicula viridula	7	0.054
Nitzschia dissipata	6	0.046
Cyclotella pseudostelligera	4	0.031
Nitzschia angustatula	4	0.031
Nitzschia palea	4	0.031
Cyclotella atomus	3	0.023
Navicula subrotundata	3	0.023

Portage River, downstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella meneghiniana	2	0.015
Cymbella helvetica	2	0.015
Navicula salinarum	2	0.015
Navicula slesvicensis	2	0.015
Nitzschia agnita	2	0.015
Stephanodiscus alpinus	2	0.015
Cyclostephanos tholiformis	1	0.008
Cyclotella cryptica	1	0.008
Cymatopleura elliptica	1	0.008
Cymatopleura solea	1	0.008
Fragilaria construens var1	1	0.008
Navicula decussis	1	0.008
Navicula reinhardtii	1	0.008
Stephanodiscus parvus	1	0.008
Surirella biseriata	1	0.008
Surirella brebissonii	1	0.008
Surirella minuta	1	0.008
Synedra fasiculata var truncata	1	0.008
Total Counted	130	
Species Richness	29	
Shannon Diversity (H)	2.64	

Portage River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Cyclotella atomus	249	0.619
Stephanodiscus hantzschii	33	0.082
Skeletonema potamos	28	0.070
Thalassiosira pseudonana	27	0.067
Cyclotella cryptica	15	0.037
Cyclotella meneghiniana	7	0.017
Cyclostephanos invisitatus	5	0.012
Cyclotella woltereckii	4	0.010
Navicula gregaria	4	0.010
Nitzschia inconspicua	4	0.010
Rhoicosphenia curvata	4	0.010
Amphora pediculus	3	0.007
Nitzschia supralitorea	3	0.007
Achnanthes lanceolata	2	0.005
Achnanthes minutissima	2	0.005
Cocconeis pediculus	2	0.005
Gomphonema olivaceum	2	0.005
Cyclotella pseudostelligera var1	1	0.002
Cyclotella stelligera	1	0.002
Navicula minima	1	0.002
Navicula subminuscula	1	0.002
Navicula veneta	1	0.002
Nitzschia clausii	1	0.002

Portage River, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia microcephala	1	0.002
Surirella minuta	1	0.002
Total Counted	402	
Species Richness	25	
Shannon Diversity (H)	1.59	

Portage River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Fragilaria construens var1	101	0.250
Nitzschia palea	39	0.097
Skeletonema potamos	23	0.057
Cyclotella cryptica	14	0.035
Navicula viridula var germainii	14	0.035
Stephanodiscus parvus	14	0.035
Navicula recens	13	0.032
Stephanodiscus hantzschii	12	0.030
Nitzschia lanceola var minutula	11	0.027
Nitzschia rosenstockii	11	0.027
Cyclostephanos invisitatus	10	0.025
Cyclostephanos tholiformis	9	0.022
Fragilaria vaucheriae	7	0.017
Thalassiosira pseudonana	7	0.017
Aulacoseira alpigena	5	0.012
Navicula elginensis	5	0.012
Navicula mutica var ventricosa	5	0.012
Nitzschia dissipata	5	0.012
Nitzschia filiformis	5	0.012
Nitzschia minuta	5	0.012
Achnanthes minutissima	4	0.010
Actinocyclus normanii	4	0.010
Aulacoseira italica	4	0.010
Navicula decussis	4	0.010
Navicula minima	4	0.010
Aulacoseira granulata	3	0.007
Cyclotella atomus	3	0.007
Navicula cryptotenella	3	0.007
Nitzschia agnita	3	0.007
Synedra fasiculata var truncata	3	0.007
Achnanthes lanceolata	2	0.005
Amphora veneta	2	0.005
Aulacoseira ambigua	2	0.005
Caloneis bacillum	2	0.005
Cyclotella meneghiniana	2	0.005
Cymbella prostrata	2	0.005
Gomphonema parvulum	2	0.005
Navicula accomoda	2	0.005
Navicula gregaria	2	0.005

Portage River, downstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula menisculus var grunowii	2	0.005
Navicula pupula	2	0.005
Navicula seminulum	2	0.005
Navicula tenera	2	0.005
Nitzschia agnewii	2	0.005
Nitzschia linearis var subtilis	2	0.005
Nitzschia microcephala	2	0.005
Nitzschia perminuta	2	0.005
Nitzschia pusilla	2	0.005
Nitzschia sp6	2	0.005
Amphora inariensis	1	0.002
Cocconeis placentula var euglypta	1	0.002
Cyclotella ocellata	1	0.002
Cyclotella stelligera	1	0.002
Fragilaria capucina	1	0.002
Navicula lundii	1	0.002
Navicula minuscula	1	0.002
Navicula molestiformis	1	0.002
Navicula schroeteri	1	0.002
Navicula tripunctata	1	0.002
Nitzschia heufleriana	1	0.002
Nitzschia inconspicua	1	0.002
Nitzschia sociabilis	1	0.002
Stephanodiscus alpinus	1	0.002
Surirella suecica	1	0.002
Thalassiosira pseudonana var2	1	0.002

Total Counted	404
Species Richness	65
Shannon Diversity (H)	3.29

Vermilion River, upstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus hantzschii	58	0.160
Navicula gregaria	36	0.099
Navicula lanceolata	34	0.094
Surirella minuta	29	0.080
Nitzschia acicularis	19	0.052
Nitzschia sociabilis	15	0.041
Amphora pediculus	14	0.039
Nitzschia dissipata	11	0.030
Cyclotella atomus	10	0.028
Caloneis bacillum	9	0.025
Navicula cryptotenella	9	0.025
Navicula sp2	9	0.025
Nitzschia inconspicua	6	0.017
Cyclotella meneghiniana	5	0.014
Navicula tripunctata	5	0.014
Nitzschia capitellata	5	0.014
Nitzschia draveillensis	4	0.011
Nitzschia supralitorea	4	0.011
Surirella angusta	4	0.011
Cocconeis pediculus	3	0.008
Melosira varians	3	0.008
Meridion circulare	3	0.008
Navicula atomus	3	0.008
Nitzschia agnita	3	0.008
Nitzschia archibaldii	3	0.008
Nitzschia linearis	3	0.008
Nitzschia palea	3	0.008
Aulacoseira granulata	2	0.006
Cyclostephanos tholiformis	2	0.006
Fragilaria vaucheriae	2	0.006
Frustulia vulgaris	2	0.006
Gomphonema minutum	2	0.006
Gomphonema parvulum	2	0.006
Navicula agrestis	2	0.006
Navicula atomus var permitis	2	0.006
Navicula goeppertiana	2	0.006
Navicula menisculus var grunowii	2	0.006
Nitzschia apiculata	2	0.006
Nitzschia calida	2	0.006
Nitzschia flexa	2	0.006
Nitzschia minuta	2	0.006
Nitzschia nereidis	2	0.006
Nitzschia tubicola	2	0.006
Stephanodiscus parvus	2	0.006
Achnanthes ricula	1	0.003
Asterionella formosa	1	0.003
Cyclostephanos invisitatus	1	0.003
Cyclotella pseudostelligera var3	1	0.003
Gomphonema angustatum	1	0.003
Gomphonema olivaceum	1	0.003
Hantzschia amphioxys	1	0.003
Navicula capitatoradiata	1	0.003
Navicula molestiformis	1	0.003
Nitzschia frustulum	1	0.003

Vermilion River, upstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia graciliformis	1	0.003
Nitzschia hungarica	1	0.003
Nitzschia perminuta	1	0.003
Nitzschia pusilla	1	0.003
Nitzschia solita	1	0.003
Stephanodiscus delicatus	1	0.003
Surirella brebissonii var kuetzingi	1	0.003
Synedra tenera	1	0.003
Thalassiosira pseudonana var1	1	0.003
Total Counted	363	
Species Richness	63	
Shannon Diversity (H)	3.34	

Vermilion River, downstream, grab sample, 18 June 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Navicula mutica var ventricosa	164	0.415
Gomphonema parvulum	61	0.154
Achnanthes minutissima	27	0.068
Cyclotella atomus	23	0.058
Stephanodiscus hantzschii	20	0.051
Navicula gregaria	8	0.020
Thalassiosira pseudonana	8	0.020
Cyclostephanos invisitatus	7	0.018
Cyclostephanos tholiformis	5	0.013
Gomphonema parvulum var exilissimum	5	0.013
Nitzschia inconspicua	5	0.013
Nitzschia supralitorea	5	0.013
Stephanodiscus hantzschii var tenui	5	0.013
Cyclotella atomus var4	4	0.010
Cyclotella woltereckii	4	0.010
Navicula cryptotenella	4	0.010
Navicula subminuscula	4	0.010
Nitzschia dissipata	4	0.010
Achnanthes lanceolata	3	0.008
Achnanthes minutissima var inconspi	3	0.008
Aulacoseira granulata	3	0.008
Thalassiosira pseudonana var1	3	0.008
Amphora pediculus	2	0.005
Cyclotella cryptica	2	0.005
Cyclotella pseudostelligera	2	0.005
Navicula lanceolata	2	0.005
Rhoicosphenia curvata	2	0.005
Surirella minuta	2	0.005
Synedra tenera	2	0.005
Cyclotella pseudostelligera var1	1	0.003
Gomphonema olivaceum	1	0.003
Navicula angusta	1	0.003

Vermilion River, downstream, grab sample, 18 June 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula atomus var permitis	1	0.003
Nitzschia acicularis	1	0.003
Nitzschia subacicularis	1	0.003
Total Counted	395	
Species Richness	35	
Shannon Diversity (H)	2.31	

Vermilion River, upstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia palea	52	0.130
Nitzschia inconspicua	41	0.103
Achnanthes minutissima	29	0.073
Cyclotella cryptica	27	0.068
Amphora pediculus	18	0.045
Navicula mutica	13	0.033
Nitzschia frustulum	13	0.033
Navicula viridula var germainii	12	0.030
Nitzschia supralitorea	12	0.030
Navicula cryptotenella	11	0.028
Achnanthes ricula	10	0.025
Navicula sp2	10	0.025
Cocconeis placentula var euglypta	9	0.023
Nitzschia desertorum	9	0.023
Navicula minima	8	0.020
Achnanthes lanceolata	7	0.018
Navicula pupula	7	0.018
Nitzschia agnita	7	0.018
Navicula erifuga	6	0.015
Navicula viridula var rostellata	6	0.015
Nitzschia clausii	6	0.015
Cyclotella meneghiniana	5	0.013
Navicula cryptocephala	5	0.013
Nitzschia rosenstockii	5	0.013
Navicula agrestis	4	0.010
Navicula insociabilis	4	0.010
Navicula subminuscula	4	0.010
Cocconeis pediculus	3	0.008
Navicula capitata	3	0.008
Navicula minuscula	3	0.008
Navicula phyllepta	3	0.008
Navicula schroeteri	3	0.008
Stephanodiscus hantzschii	3	0.008
Caloneis bacillum	2	0.005
Cyclotella pseudostelligera	2	0.005
Gyrosigma scalproides	2	0.005
Navicula hustedtii	2	0.005
Navicula salinarum	2	0.005

Vermilion River, upstream, grab sample, 16 September 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula veneta	2	0.005
Nitzschia angustiforaminata	2	0.005
Nitzschia compressa var vexans	2	0.005
Nitzschia graciliformis	2	0.005
Nitzschia minuta	2	0.005
Nitzschia nereidis	2	0.005
Achnanthes minutissima var robusta	1	0.003
Amphora montana	1	0.003
Aulacoseira granulata	1	0.003
Cyclotella atomus	1	0.003
Cyclotella pseudostelligera var1	1	0.003
Melosira varians	1	0.003
Navicula angusta	1	0.003
Navicula capitatoradiata	1	0.003
Navicula gregaria	1	0.003
Navicula halophila	1	0.003
Navicula monoculata	1	0.003
Nitzschia apiculata	1	0.003
Nitzschia dissipata	1	0.003
Nitzschia draveillensis	1	0.003
Nitzschia hungarica	1	0.003
Nitzschia paleacea	1	0.003
Nitzschia sp12	1	0.003
Surirella angusta	1	0.003
Surirella minuta	1	0.003
Total Counted	399	
Species Richness	63	
Shannon Diversity (H)	3.48	

Vermilion River, downstream, grab sample, 16 September 1995.

SPECIES	NUMBER	RELATIVE DENSITY
Stephanodiscus parvus	131	0.328
Achnanthes minutissima	37	0.093
Navicula cryptotenella	30	0.075
Navicula recens	19	0.048
Nitzschia palea	16	0.040
Stephanodiscus hantzschii	16	0.040
Navicula capitatoradiata	10	0.025
Navicula minima	8	0.020
Navicula sp2	8	0.020
Nitzschia dissipata	8	0.020
Cyclotella cryptica	7	0.018
Nitzschia inconspicua	7	0.018
Fragilaria vaucheriae	5	0.013
Melosira varians	5	0.013
Navicula gregaria	5	0.013
Amphora pediculus	4	0.010

Vermilion River, downstream, grab sample, 16 Sept. 1995 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Aulacoseira granulata	4	0.010
Cocconeis placentula var euglypta	4	0.010
Cymbella sinuata	4	0.010
Navicula cryptocephala	4	0.010
Navicula vandamii	4	0.010
Cyclotella pseudostelligera	3	0.008
Navicula lanceolata	3	0.008
Navicula schroeteri	3	0.008
Navicula seminulum	3	0.008
Navicula subminuscula	3	0.008
Achnanthes lanceolata	2	0.005
Cyclostephanos tholiformis	2	0.005
Cyclotella atomus	2	0.005
Cyclotella meneghiniana	2	0.005
Cyclotella ocellata	2	0.005
Cyclotella stelligera	2	0.005
Gomphonema parvulum	2	0.005
Gyrosigma scalproides	2	0.005
Navicula angusta	2	0.005
Navicula menisculus	2	0.005
Navicula molestiformis	2	0.005
Navicula viridula var germainii	2	0.005
Navicula viridula var rostellata	2	0.005
Nitzschia agnewii	2	0.005
Nitzschia agnita	2	0.005
Nitzschia sociabilis	2	0.005
Rhoicosphenia curvata	2	0.005
Surirella brebissonii var kuetzingi	2	0.005
Surirella minuta	2	0.005
Thalassiosira pseudonana	2	0.005
Amphipleura pellucida	1	0.003
Amphora sp2	1	0.003
Gomphonema minutum	1	0.003
Navicula atomus	1	0.003
Nitzschia angustatula	1	0.003
Nitzschia filiformis	1	0.003
Nitzschia rosenstockii	1	0.003
Synedra fasiculata var truncata	1	0.003

Total Counted	399
Species Richness	54
Shannon Diversity (H)	2.93

Vermilion River, upstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Thalassiosira pseudonana	38	0.095
Nitzschia dissipata	33	0.083
Navicula gregaria	32	0.080
Stephanodiscus hantzschii	30	0.075
Skeletonema potamos	19	0.048
Surirella minuta	19	0.048
Navicula cryptotenella	17	0.043
Navicula lanceolata	17	0.043
Nitzschia inconspicua	13	0.033
Gomphonema olivaceum	11	0.028
Navicula sp2	10	0.025
Cyclotella atomus	9	0.023
Achnanthes lanceolata	8	0.020
Nitzschia palea	8	0.020
Amphora pediculus	6	0.015
Navicula tripunctata	6	0.015
Stephanodiscus parvus	6	0.015
Cocconeis pediculus	5	0.013
Cyclotella pseudostelligera	5	0.013
Stephanodiscus delicatus	5	0.013
Achnanthes minutissima	4	0.010
Cyclotella meneghiniana	4	0.010
Navicula pupula	4	0.010
Navicula trivialis	4	0.010
Navicula veneta	4	0.010
Nitzschia acicularis	4	0.010
Nitzschia dubia	4	0.010
Nitzschia minuta	4	0.010
Synedra tenera	4	0.010
Hantzschia amphioxys	3	0.008
Navicula minima	3	0.008
Nitzschia archibaldii	3	0.008
Nitzschia slesvicensis	3	0.008
Rhoicosphenia curvata	3	0.008
Thalassiosira pseudonana var1	3	0.008
Amphora inariensis	2	0.005
Caloneis bacillum	2	0.005
Melosira varians	2	0.005
Navicula atomus var permitis	2	0.005
Navicula capitatoradiata	2	0.005
Navicula cryptocephala	2	0.005
Navicula menisculus	2	0.005
Nitzschia draveillensis	2	0.005
Nitzschia nereidis	2	0.005
Nitzschia paleacea	2	0.005
Stephanodiscus hantzschii var tenui	2	0.005
Synedra ulna	2	0.005
Achnanthes ricula	1	0.003
Amphora montana	1	0.003
Asterionella formosa	1	0.003
Aulacoseira granulata	1	0.003
Cyclostephanos tholiformis	1	0.003
Cyclotella cryptica	1	0.003
Cyclotella pseudostelligera var1	1	0.003

Vermilion River, upstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Fragilaria vaucheriae	1	0.003
Gyrosigma scalproides	1	0.003
Navicula erifuga	1	0.003
Navicula minuscula	1	0.003
Navicula molestiformis	1	0.003
Navicula saprophila	1	0.003
Navicula sp12	1	0.003
Nitzschia capitellata	1	0.003
Nitzschia filiformis	1	0.003
Nitzschia heufleriana	1	0.003
Nitzschia intermedia	1	0.003
Nitzschia lanceola var minutula	1	0.003
Nitzschia linearis	1	0.003
Nitzschia recta	1	0.003
Nitzschia tubicola	1	0.003
Simonsenia delognei	1	0.003
Total Counted	398	
Species Richness	70	
Shannon Diversity (H)	3.59	

Vermilion River, downstream, grab sample, 9 June 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia dissipata	101	0.272
Stephanodiscus hantzschii	28	0.075
Melosira varians	20	0.054
Navicula sp2	20	0.054
Navicula lanceolata	18	0.048
Surirella minuta	16	0.043
Navicula cryptotenella	12	0.032
Nitzschia palea	12	0.032
Achnanthes minutissima	8	0.022
Cyclotella atomus	8	0.022
Navicula capitatoradiata	8	0.022
Navicula gregaria	8	0.022
Navicula tripunctata	8	0.022
Skeletonema potamos	8	0.022
Stephanodiscus delicatus	7	0.019
Thalassiosira pseudonana	6	0.016
Navicula mutica var ventricosa	5	0.013
Nitzschia recta	5	0.013
Synedra ulna var acus	5	0.013
Cyclotella pseudostelligera	4	0.011
Gomphonema parvulum	4	0.011
Nitzschia acicularis	4	0.011
Nitzschia linearis var subtilis	4	0.011
Nitzschia sociabilis	4	0.011
Rhoicosphenia curvata	4	0.011

Vermilion River, downstream, grab sample, 9 June 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Synedra tenera	4	0.011
Achnanthes lanceolata	3	0.008
Caloneis bacillum	3	0.008
Amphora inariensis	2	0.005
Asterionella formosa	2	0.005
Cyclotella meneghiniana	2	0.005
Cymbella silesiaca	2	0.005
Fragilaria construens f. venter	2	0.005
Fragilaria vaucheriae	2	0.005
Navicula atomus var permitis	2	0.005
Navicula cryptocephala	2	0.005
Navicula trivialis	2	0.005
Nitzschia gracilis	2	0.005
Nitzschia minuta	2	0.005
Synedra ulna	2	0.005
Amphora pediculus	1	0.003
Cyclostephanos tholiformis	1	0.003
Fragilaria construens	1	0.003
Gomphonema amoenum	1	0.003
Gomphonema olivaceum	1	0.003
Navicula molestiformis	1	0.003
Nitzschia dubia	1	0.003
Nitzschia pusilla	1	0.003
Nitzschia supralitorea	1	0.003
Stephanodiscus parvus	1	0.003
Thalassiosira weissflogii	1	0.003
Total Counted	372	
Species Richness	51	
Shannon Diversity (H)	3.09	

Vermilion River, upstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	195	0.479
Nitzschia frustulum	32	0.079
Nitzschia palea	26	0.064
Nitzschia inconspicua	17	0.042
Nitzschia supralitorea	16	0.039
Achnanthes ricula	14	0.034
Navicula sp2	12	0.029
Navicula veneta	10	0.025
Nitzschia clausii	10	0.025
Nitzschia microcephala	9	0.022
Nitzschia rosenstockii	7	0.017
Melosira varians	6	0.015
Navicula cryptocephala	4	0.010
Navicula cryptotenella	4	0.010
Nitzschia perminuta	4	0.010

Vermilion River, upstream, grab sample, 21 September 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Navicula capitatoradiata	3	0.007
Navicula menisculus	3	0.007
Navicula mutica var ventricosa	3	0.007
Navicula schroeteri	3	0.007
Navicula seminulum	3	0.007
Navicula viridula var rostellata	3	0.007
Nitzschia nereidis	3	0.007
Surirella suecica	3	0.007
Amphora pediculus	2	0.005
Navicula monoculata	2	0.005
Navicula vandamii	2	0.005
Navicula viridula var germainii	2	0.005
Achnanthes lanceolata	1	0.002
Frustulia vulgaris	1	0.002
Gomphonema clavatum	1	0.002
Gomphonema parvulum	1	0.002
Navicula minima	1	0.002
Navicula subminuscula	1	0.002
Nitzschia amphibia	1	0.002
Nitzschia angustatula	1	0.002
Nitzschia dissipata	1	0.002
Total Counted	407	
Species Richness	36	
Shannon Diversity (H)	2.27	

Vermilion River, downstream, grab sample, 21 September 1996.

SPECIES	NUMBER	RELATIVE DENSITY
Achnanthes minutissima	123	0.305
Navicula recens	60	0.149
Nitzschia dissipata	55	0.136
Nitzschia palea	30	0.074
Nitzschia filiformis	27	0.067
Navicula cryptotenella	18	0.045
Melosira varians	14	0.035
Nitzschia sociabilis	6	0.015
Navicula capitatoradiata	5	0.012
Navicula schroeteri	5	0.012
Navicula sp2	5	0.012
Cyclostephanos tholiformis	4	0.010
Cymbella prostrata	4	0.010
Cymbella silesiaca	4	0.010
Synedra ulna	4	0.010
Achnanthes ricula	3	0.007
Aulacoseira italica	3	0.007
Cyclotella ocellata	3	0.007
Nitzschia angustatula	3	0.007
Stephanodiscus parvus	3	0.007

Vermilion River, downstream, grab sample, 21 Sept. 1996 (Continued).

SPECIES	NUMBER	RELATIVE DENSITY
Nitzschia inconspicua	2	0.005
Achnanthes lanceolata	1	0.002
Amphora veneta	1	0.002
Cocconeis pediculus	1	0.002
Cocconeis placentula var euglypta	1	0.002
Cyclotella meneghiniana	1	0.002
Cyclotella pseudostelligera	1	0.002
Cyclotella pseudostelligera var1	1	0.002
Cyclotella stelligera	1	0.002
Cymbella sp1	1	0.002
Meridion circulare	1	0.002
Navicula lanceolata	1	0.002
Navicula minima	1	0.002
Navicula viridula var germainii	1	0.002
Nitzschia amphibia	1	0.002
Nitzschia apiculata	1	0.002
Nitzschia compressa var vexans	1	0.002
Nitzschia fonticola	1	0.002
Nitzschia linearis var subtilis	1	0.002
Stephanodiscus hantzschii	1	0.002
Synedra tenera	1	0.002
Thalassiosira pseudonana	1	0.002
Thalassiosira pseudonana var1	1	0.002
Total Counted	403	
Species Richness	43	
Shannon Diversity (H)	2.49	