RESULTS OF SEDIMENT CORES TAKEN FROM AMNICON AND DOWLING LAKES, DOUGLAS COUNTY, WISCONSIN

Paul Garrison Wisconsin Department of Natural Resources
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Aquatic organisms are good indicators of a lake's water quality because they are in direct contact with the water and are strongly affected by the chemical composition of their surroundings. Most indicator groups grow rapidly and are short lived so the community composition responds rapidly to changing environmental conditions. One of the most useful organisms for paleolimnological analysis are diatoms. These are a type of algae which possess siliceous cell walls, which enables them to be highly resistant to degradation and are usually abundant, diverse, and well-preserved in sediments. They are especially useful, as they are ecologically diverse. Diatom species have unique features as shown in Figure 1, which enable

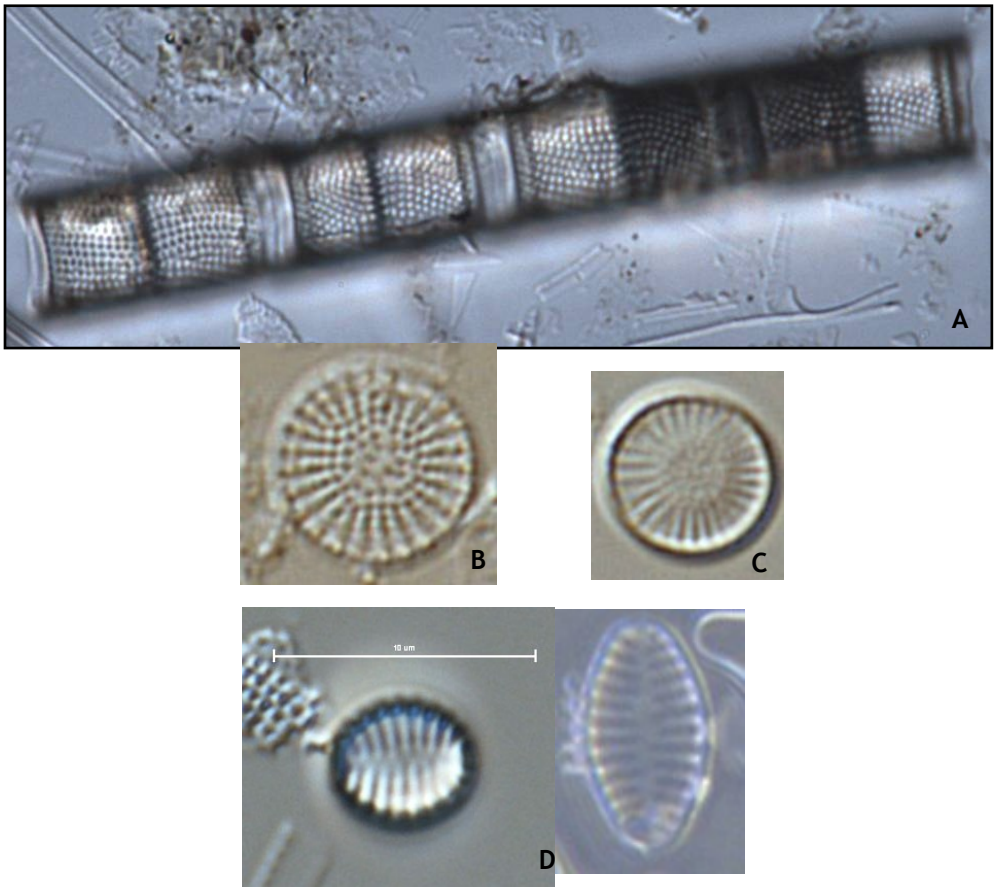


Figure 1. Photomicrographs of the diatoms commonly found in the study lakes. The top three diatoms, *Aulacoseira am*bigua (A), *Cyclostephanos tholiformis* (B), and *Stephanodiscus hantzschii* (C) are found in the open water environments while the bottom two diatoms are part of the benthic *Fragilaria* (D). The latter two diatoms are commonly found attached to substrates such as macrophytes. Diatoms B and C are found in waters with elevated phosphorus concentrations.

them to be readily identified. Certain taxa are usually found under nutrient poor conditions while others are more common under elevated nutrient levels. Some species float in the open water areas while others grow attached to objects such as aquatic plants or the lake bottom.

By determining changes in the diatom community it is possible to determine water quality changes that have occurred in the lake. The diatom community provides information about changes in nutrient concentrations, water clarity, and pH conditions as well as alterations in the aquatic plant (macrophyte) community.

On 28 August 2012 sediment cores were collected near the deep areas of Amnicon (N46.47780° W92.05885°) and Dowling (N46.47434° W92.04238°) lakes using a gravity corer. The water depth in Amnicon Lake was 22 feet and 12 feet in Dowling Lake. The length of the Amnicon core was 36.5 cm and the length of the Dowling core was 32.5 cm. In the Amnicon and Dowling cores the sediment was brown in color throughout the core. It is assumed that the upper sample represents present conditions while the deeper sample is indicative of water quality conditions at least 100 years ago. A radiochemical analysis of the bottom samples will be conducted to determine if the sample was deposited at least 100 years ago. This analysis will not be completed until the fall of 2013.

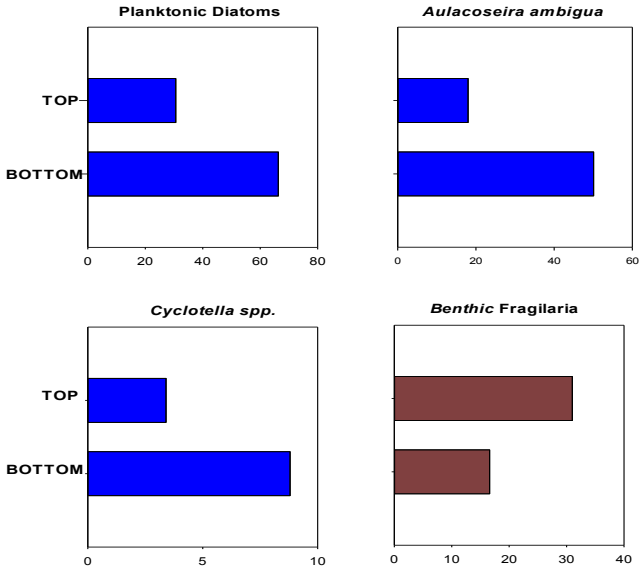
Results

The diatom communities in the bottom samples of both lakes are somewhat similar. The communities are dominated by planktonic diatoms, those that float in the open water. The diatom *Aulacoseira ambigua* is a dominant component of this community (Figure 2). The bottom samples contain some benthic *Fragilaria* which indicate the presence of submerged aquatic vegetation (SAV) in the lakes at that time. The top samples are very different in the lakes indicating that their water quality is presently much different. In Amnicon Lake, there is a higher percentage of benthic *Fragilaria* which indicates an increase in SAV. In Dowling Lake there appear to be fewer SAV at the present time. In fact when the core was taken we also extensively examined the nearshore area around the lake. We observed very few submerged plants. In Dowling Lake the biggest change in the diatom community between the bottom and top samples was the dominance of *Cyclostephanos tholiformis* and *Stephanodiscus hantzschii* and *S. minutulus* in the top samples. These diatoms are usually found when phosphorus levels are elevated. This indicates that phosphorus concentrations in Dowling Lake at the present time are much higher than they were historically.

In many lakes in northern and north central WI that have significant shoreland development, there has been an increase in submerged aquatic vegetation and only a small increase in phosphorus in recent years. This appears to be the case with Amnicon Lake but not Dowling Lake. In fact Dowling seems to have fewer SAV and there has been a large increase in phosphorus levels.

In order to better understand how much the lakes have changed from historical times, a multivariate statistical analysis, detrended correspondence analysis, was performed on the diatom communities in the top and bottom samples of a number of lakes where cores were collected in 2012. The greater the separation between the bottom and top samples, the more the lake is different at the present time from its historical ecosystem. The bottom samples from Amnicon and Dowling are fairly close together (Figure 4) indicating these lakes

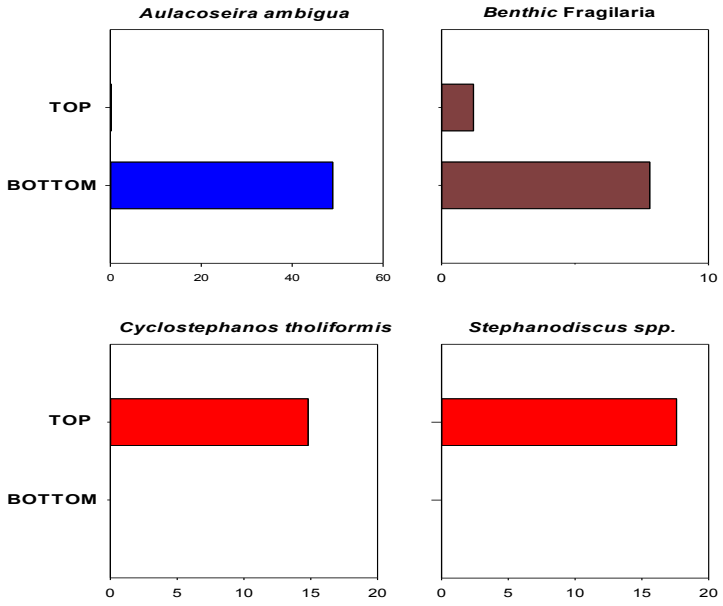
AMNICON LAKE



Percentage of Total Diatoms

Figure 2. Changes in the abundance of some important diatoms found in the Amnicon Lake sediment core. The decrease in planktonic diatoms in the top sample compared with the bottom sample, indicates more submerged aquatic vegetation at the present time.

DOWLING LAKE



Percentage of Total Diatoms

Figure 3. Changes in the abundance of some important diatoms found in the Dowling Lake sediment core. The large increase of *C. tholiformis* and *Stephanodiscus* indicates higher phosphorus levels at the present time.

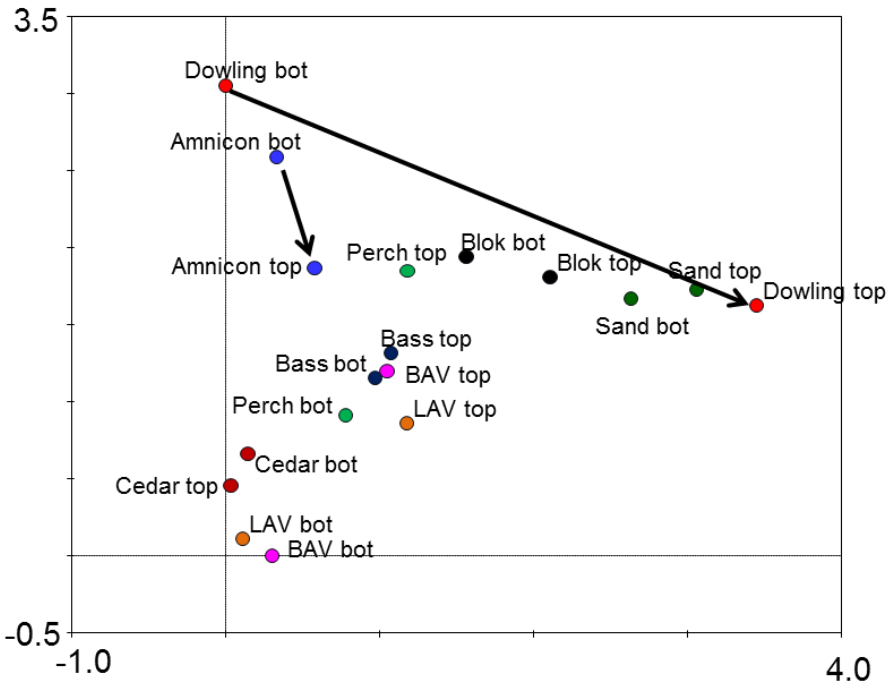


Figure 4. A detrended correspondence analysis plot of top and bottom samples from selected lakes. The further apart the bottom and top samples for the same lake the greater the change in the diatom community and thus the lake ecosystem.

were similar prior to development. The top sample from Amnicon is separated somewhat from the bottom sample but not by a lot. In contrast, the top sample of Dowling Lake is very far away from the bottom sample. This is further indication that this lake has changed in the last 100 years. In fact the difference between the bottom and top samples is greater for Dowling than any of the other 8 lakes.

Diatom assemblages historically have been used as indicators of nutrient changes in a qualitative way. In recent years, ecologically relevant statistical methods have been developed to infer environmental conditions from diatom assemblages. These methods are based on multivariate ordination and weighted averaging regression and calibration. Ecological preferences of diatom species are determined by relating modern limnological variables to surface sediment diatom assemblages. The species-environment relationships are then used to infer environmental conditions from fossil diatom assemblages found in the sediment core.

Such a model was applied to the diatom communities in the Amnicon and Dowling lakes. The estimated historical phosphorus concentration in both lakes was about 25 µg L^{-1} (Table 1). In Amnicon Lake the phosphorus concentration in the top sample is very similar to the bottom sample. In contrast, the top sample of Dowling Lake is over 3 times higher at 86 µg L^{-1} compared with the phosphorus concentration in the bottom sample. This amount of increase in phosphorus is unusual in northern Wisconsin lakes that have shoreland development. I have only seen this in 2 other lakes, Big and Little Arbor Vitae lakes in Vilas County. Similar to Dowling Lake, these lakes are relatively shallow. The large increase in phosphorus may be partially the result of increased internal phosphorus loading from the bottom sediments. Historically the internal loading rate may have been low but increased external loading from

Table. 1. Mean summer phosphorus concentrations Amnicon and Dowling lakes (μg L^{-1}). The concentration for the top and bottom samples were estimated from the diatom community.

	Top	Bottom
Amnicon	26	25
Dowling	80	26

shoreland development may have been enough to push these lakes past the threshold where internal loading is now a significant part of the phosphorus budget in these relatively shallow lakes.

In summary, like many northern Wisconsin lakes with shoreland development, Amnicon has experienced little change in phosphorus concentrations in the last 100 years but there has been an increase in the growth of submerged aquatic plants. In contrast, Dowling Lake has experienced a very large increase in phosphorus concentrations and a loss of aquatic plants.

AMNICON LAKE

Douglas County

Top (0-2 cm)

TAXA	COUNT TOTAL Number	Prop.
Achnanthidium spp	3	0.006
Achnanthes levanderi Hustedt	3	0.006
Achnanthidium exiguum (Grunow) Czarnecki	1	0.002
Achnanthidium minutissimum (Kützing) Czarnecki	10	0.020
Asterionella formosa Hassal	19	0.038
Aulacoseira ambigua (Grunow) Simonsen	90	0.180
Aulacoseira granulata (Ehrenberg) Simonsen	9	0.018
Aulacoseira italica (Ehrenberg) Simonsen	8	0.016
Aulacoseira pusilla (Meister) Tuji et Houki	1	0.002
Aulacoseira spp.	3	0.006
Aulacoseira subarctica (Müller) Haworth	3	0.006
Caloneis bacillum (Grunow) Cleve	1	0.002
Cavinula scutelloides (Smith) Lange-Bertalot et Metzeltin	1	0.002
Chamaepinnularia mediocris (Krasske) Lange-Bertalot	2	0.004
Cocconeis placentula var. placentula Ehrenberg	4	0.008
Cyclotella bodanica var. affinis (Grunow) Cleve-Euler	2	0.004
Cyclotella bodanica var. lemanica Müller	2	0.004
Cymbella naviculiformis Auerswald ex Héribaud	2	0.004
Cymbella rupicola Grunow	1	0.002
Diploneis ovalis (Hilse ex Rabenhorst) Cleve	2	0.004
Discotella stelligera (Hustedt) Houk et Klee	13	0.026
Encyonema minutum (Hilse) Mann	3	0.006
Encyonema spp.	3	0.006
Eunotia formica Ehrenberg	7	0.014
Eunotia incisa Smith ex Gregory	3	0.006
Eunotia intermedia (Krasske ex Hustedt) Nörpel et Lange-Bertalot	2	0.004
Eunotia spp.	5	0.010
Fragilaria capucina var. mesolepta Rabenhorst	2	0.004
Fragilaria crotonensis Kitton	3	0.006
Fragilaria sp. 1	1	0.002
Fragilaria tenera (Smith) Lange-Bertalot	6	0.012
Fragilaria vaucheriae (Kützing) Petersen	18	0.036
Gomphonema acuminatum Ehrenberg	2	0.004
Gomphonema acuminatum var. clavus (Breb) Grunow	2	0.004
Gomphonema anjae Lange-Bertalot et Reichardt	2	0.004
Gomphonema minutum (Agardh) Agardh	2	0.004
Gomphonema spp.	2	0.004
Gomphonema truncatum var. capitatum (Ehrenberg) Patrick	1	0.002
Gomphosphenia grovei (M. Schmidt in Schmidt et al.) Lange-Bertalot	1	0.002
Gyrosigma spp.	1	0.002
Karayevia clevei (Grunow) Bukhtiyarova	1	0.002
Navicula cryptotenella Lange-Bertalot ex Krammer et Lange-Bertalot	3	0.006

AMNICON LAKE

Douglas County

Top (0-2 cm)

TAXA	COUNT TOTAL Number	Prop.
Navicula leptostriata Jörgansen	2	0.004
Navicula minima Grunow in Van Heurck	2	0.004
Navicula radiosa Kützing	2	0.004
Navicula recondita (Hustedt) Lange-Bertalot	2	0.004
Navicula spp.	2	0.004
Nitzschia amphibia Grunow	2	0.004
Nitzschia spp.	5	0.010
Placoneis abiskoensis (Hustedt) Lange-Bertalot et Metzeltin	2	0.004
Planothidium biporomum (Hohn et Hellerman) Lange-Bertalot	1	0.002
Planothidium frequentissimum (Lange-Bertalot) Lange-Bertalot	6	0.012
Planothidium lanceolatum (Brébisson ex Kützing) Lange-Bertalot	1	0.002
Pseudostaurosira brevistriata (Grunow) Williams et Round	37	0.074
Pseudostaurosira subsalina (Hustedt) Morales	2	0.004
Punctastriata mimetica Morales	2	0.004
Rossithidium linearis (Smith) Round et Bukhtiyarova	1	0.002
Rossithidium nodosum (A. Cleve) Aboal in Aboal, Alvarez-Cobelas, Cambra and Ector	1	0.002
Rossithidium pusillum (Grunow) Round et Bukhtiyarova	1	0.002
Sellaphora laevissima (Kützing) Mann	1	0.002
Stauroneis spp.	1	0.002
Staurosira construens Ehrenberg	23	0.046
Staurosira construens var. binodis (Ehrenberg) Hamilton	2	0.004
Staurosira construens var. venter (Ehrenberg) Hamilton	48	0.096
Staurosirella pinnata (Ehrenberg) Williams et Round	39	0.078
Staurosirella pinnata var. lancettula (Schumann) Siver et Hamilton	1	0.002
Synedra delicatissima Smith	7	0.014
Synedra famelica Kützing	4	0.008
Synedra ulna var. danica (Kützing) Van Heurck	1	0.002
Tabellaria fenestrata (Lyngbye) Kützing	1	0.002
Tabellaria flocculosa (strain III) sensu Koppen	28	0.056
Tabellaria flocculosa (strain IIIp) sensu Koppen	5	0.010
Tabellaria spp.	8	0.016
unknown pennate	10	0.020
TOTAL	500	1.000

Planktonic diatoms		0.306
Nonplanktonic diatoms		0.674
Chrysophyte scale	3	
Chrysophyte cyst	27	
Pediastrum coenubia	1	
Sponge spicule	1	

AMNICON LAKE

Douglas County

Bottom (32-34 cm)

TAXA	COUNT TOTAL Number	Prop.
Achnanthidium spp	4	0.008
Achnanthidium altergracillima (Lange-Bertalot) Round et Bukhtiyarova	3	0.006
Achnanthidium minutissimum (Kützing) Czarnecki	4	0.008
Asterionella formosa Hassal	2	0.004
Aulacoseira ambigua (Grunow) Simonsen	251	0.501
Aulacoseira crassipunctata Krammer	2	0.004
Aulacoseira italica (Ehrenberg) Simonsen	18	0.036
Aulacoseira pusilla (Meister) Tuji et Houki	5	0.010
Aulacoseira subarctica (Müller) Haworth	1	0.002
Brachysira brebissonii Ross	2	0.004
Cocconeis neothumensis Krammer	1	0.002
Cocconeis placentula var. placentula Ehrenberg	1	0.002
Cyclotella bodanica var. lemanica Müller	19	0.038
Discotella glomerata (Hustedt) Houk et Klee	9	0.018
Discotella stelligera (Hustedt) Houk et Klee	16	0.032
Encyonema mesianum (Cholnoky) Mann in Round, Crawford and Mann	2	0.004
Encyonema minutum (Hilse) Mann	2	0.004
Encyonema spp.	1	0.002
Encyonopsis descripta (Hustedt) Krammer	2	0.004
Eunotia intermedia (Krasske ex Hustedt) Nörpel et Lange-Bertalot	1	0.002
Eunotia spp.	3	0.006
Eunotia zasuminensis (Cabejszekowna) Körner	2	0.004
Fragilaria capucina var. mesolepta Rabenhorst	2	0.004
Fragilaria crotonensis Kitton	4	0.008
Fragilaria sepes Ehrenberg	2	0.004
Fragilaria tenera (Smith) Lange-Bertalot	2	0.004
Fragilaria vaucheriae (Kützing) Petersen	4	0.008
Gomphonema acuminatum Ehrenberg	1	0.002
Gomphonema auritum Braun ex Kutzing	1	0.002
Gomphonema exilissimum (Grunow in Van Heurck) Lange-Bertalot et Reichardt in Lange-Bertalot and Metzeltin	4	0.008
Gomphonema minutum (Agardh) Agardh	1	0.002
Gomphonema parvulius (Lange-Bertalot et Reichardt) Lange-Bertalot et Reichardt	3	0.006
Gomphonema spp.	1	0.002
Navicula medioconvexa Hustedt	2	0.004
Navicula minima Grunow in Van Heurck	3	0.006
Navicula spp.	2	0.004
Navicula subminuscula Manguin	2	0.004

AMNICON LAKE

Douglas County

Bottom (32-34 cm)

TAXA	COUNT TOTAL Number	Prop.
Nitzschia linearis (Agardh ex Smith) Smith	1	0.002
Pinnularia biceps Gregory	2	0.004
Pinnularia viridiformis Krammer	1	0.002
Pseudostaurosira brevistriata (Grunow) Williams et Round	6	0.012
Sellaphora disjuncta (Hustedt) Mann	2	0.004
Staurosira construens Ehrenberg	10	0.020
Staurosira construens var. venter (Ehrenberg) Hamilton	53	0.106
Staurosirella pinnata (Ehrenberg) Williams et Round	14	0.028
Surirella linearis Smith	1	0.002
Synedra acus var. angustissima (Grunow) Van Heurck	1	0.002
Synedra delicatissima Smith	2	0.004
Synedra famelica Kützing	2	0.004
Synedra rumpens Kützing	1	0.002
Tabellaria flocculosa (strain III) sensu Koppen	13	0.026
Tabellaria flocculosa (strain IIIp) sensu Koppen	1	0.002
Tabellaria spp.	1	0.002
unknown pennate	5	0.010
TOTAL	501	1.000

Planktonic diatoms		0.663
Nonplanktonic diatoms		0.327
Chrysophyte scale	7	
Chrysophyte cyst	10	
Phytolith	1	
Sponge spicule	1	

DOWLING LAKE

Douglas County

Top (0-2 cm)

TAXA	COUNT TOTAL Number	Prop.
Amphora copulata (Kützing) Schoeman et Archibald	3	0.005
Amphora ovalis (Kützing) Kützing	2	0.003
Amphora sp. 1 ?	1	0.002
Amphora veneta Kützing	8	0.013
Aulacoseira ambigua (Grunow in Van Heurck) Simonsen	3	0.005
Aulacoseira granulata (Ehrenberg) Simonsen	74	0.123
Cocconeis placentula Ehrenberg	31	0.051
Craticula buderi (Hustedt) Lange-Bertalot in U. Rumrich, Lange-Bertalot and M. Rumrich	5	0.008
Craticula cuspidata (Kützing) Mann in Round, Crawford and Mann	1	0.002
Craticula molestiformis (Hustedt) Mayama	2	0.003
Cyclostephanos dubius (Fricke) Round	4	0.007
Cyclostephanos invisitatus (Hohn et Hellerman) Theriot, Stoermer et Håkansson	8	0.013
Cyclostephanos tholiformis Stoermer, Håkansson et Theriot	89	0.148
Cyclotella meneghiniana Kützing	13	0.022
Cyclotella sp. 1 ?	21	0.035
Cymbella cistula (Ehrenberg in Hemprich and Ehrenberg) Kirchner	1	0.002
Cymbella spp.	1	0.002
Discostella pseudostelligera (Hustedt) Houk et Klee	7	0.012
Discostella stelligera (Cleve et Grunow in Cleve) Houk et Klee	4	0.007
Discostella stelligeroides (Hustedt) Houk et Klee	5	0.008
Encyonema sp. 1 ?	1	0.002
Fragilaria capucina var. mesolepta (Rabenhorst) Rabenhorst	4	0.007
Fragilaria crotonensis Kitton	1	0.002
Fragilaria vaucheriae (Kützing) Petersen	5	0.008
Gomphonema aquaemineralis Lange-Bertalot et Reichardt	3	0.005
Gomphonema carolinense Hagelstein	4	0.007
Gomphonema gracile Ehrenberg	2	0.003
Gomphonema minutum (Agardh) Agardh	2	0.003
Gomphonema parvulum (Kützing) Kützing	1	0.002
Gomphonema parvulum fo. saprophilum Lange-Bertalot et Reichardt in Lange-Bertalot	1	0.002
Gomphonema spp.	11	0.018
Gomphonema truncatum var. capitatum (Ehrenberg) Patrick in Patrick and Reimer	1	0.002
Luticola mutica (Kützing) Mann in Round, Crawford and Mann	1	0.002
Mayamaea recondita (Hustedt) Lange-Bertalot	16	0.027
Melosira arentii (Kolbe) Nagumo et Kobayasi	1	0.002
Navicula lanceolata (Agardh) Kützing	10	0.017
Navicula minima Grunow in Van Heurck	4	0.007
Navicula spp.	4	0.007
Navicula subminuscula Manguin	3	0.005
Navicula utermoehlii Hustedt in A. Schmidt	12	0.020

DOWLING LAKE

Douglas County

Top (0-2 cm)

TAXA	COUNT TOTAL Number	Prop.
Nitzschia amphibia Grunow	5	0.008
Nitzschia dissipata var. media (Hantzsch) Grunow in Van Heurck	2	0.003
Nitzschia fonticola (Grunow) Grunow in Van Heurck	2	0.003
Nitzschia gracilis Hantzsch in Rabenhorst	6	0.010
Nitzschia lacuum Lange-Bertalot	1	0.002
Nitzschia liebethruthii Rabenhorst	31	0.051
Nitzschia palea var. debilis (Kützing) Grunow in Cleve and Grunow	51	0.085
Nitzschia spp.	2	0.003
Pinnularia subcapitata Gregory	1	0.002
Planothidium biporomum (Hohn et Hellerman) Lange-Bertalot	1	0.002
Planothidium frequentissimum (Lange-Bertalot in Krammer and Lange-Bertalot) Lange-Bertalot	3	0.005
Planothidium lanceolatum (Brébisson ex Kützing) Lange-Bertalot	4	0.007
Planothidium spp.	1	0.002
Sellaphora laevissima (Kützing) Mann	1	0.002
Sellaphora seminulum (Grunow) Mann	2	0.003
Stauroneis phoenicenteron (Nitzsch) Ehrenberg	2	0.003
Staurosirella pinnata (Ehrenberg) Williams et Round	2	0.003
Stephanodiscus hantzschii fo. tenuis (Hustedt) Håkansson et Stoermer	9	0.015
Stephanodiscus hantzschii Grunow in Cleve and Grunow	46	0.076
Stephanodiscus minutulus (Kützing) Cleve et Möller	43	0.071
Stephanodiscus parvus Stoermer et Håkansson	8	0.013
Synedra acus Kützing	1	0.002
Synedra rumpens Kützing	1	0.002
Undetermined pennate	8	0.013
TOTAL	603	1.000

Planktonic diatoms	0.556
Nonplanktonic diatoms	0.431

DOWLING LAKE

Douglas County

Bottom (30-32 cm)

lots of debris

TAXA	COUNT TOTAL Number	Prop.
Achnanthes sp. 1 ?	1	0.002
Achnanthidium exiguum (Grunow in Cleve and Grunow) Czarnecki	3	0.005
Achnanthidium minutissimum (Kützing) Czarnecki	1	0.002
Achnanthidium spp.	1	0.002
Adlafia minuscula var. muralis (Grunow in Van Heurck) Lange-Bertalot in Lange-Bertalot and Genkal	9	0.014
Asterionella formosa Hassall	9	0.014
Aulacoseira ambigua (Grunow in Van Heurck) Simonsen	210	0.338
Aulacoseira distans (Ehrenberg) Simonsen	10	0.016
Aulacoseira granulata (Ehrenberg) Simonsen	2	0.003
Aulacoseira italica (Ehrenberg) Simonsen	21	0.034
Aulacoseira spp.	26	0.042
Aulacoseira subarctica (Müller) Haworth	60	0.097
Aulacoseira tenella (Nygaard) Simonsen	87	0.140
Brachysira serians (Brébisson) Round et Mann	1	0.002
Cocconeis placentula Ehrenberg	1	0.002
Diploneis spp.	2	0.003
Discostella stelligera (Cleve et Grunow in Cleve) Houk et Klee	18	0.029
Encyonema lunatum (Smith) Van Heurck	1	0.002
Encyonema minutum (Hilse in Rabenhorst) Mann in Round, Crawford and Mann	3	0.005
Entomoneis ornata (Bailey) Reimer in Patrick and Reimer	1	0.002
Eunotia faba (Ehrenberg) Grunow in Van Heurck	1	0.002
Eunotia zasuminensis (Cabejszekowna) Körner	5	0.008
Fragilaria crotonensis Kitton	8	0.013
Fragilaria pinnata var. lancettula (Schumann) Hustedt in Schmidt	14	0.023
Fragilaria pinnata var. lancettula f. subcapitata Fusey	2	0.003
Fragilaria radians (Kützing) Williams et Round	2	0.003
Gomphonema spp.	1	0.002
Gyrosigma spp.	2	0.003
Navicula minima Grunow in Van Heurck	3	0.005
Navicula sp. 1?	1	0.002
Navicula spp.	6	0.010
Navicula subrotundata Hustedt	2	0.003
Nitzschia dissipata (Kützing) Grunow	1	0.002
Nitzschia palea var. debilis (Kützing) Grunow in Cleve and Grunow	1	0.002
Nitzschia spp.	2	0.003
Pinnularia nodosa (Ehrenberg) Smith	2	0.003
Pinnularia spp.	1	0.002

DOWLING LAKE

Douglas County

Bottom (30-32 cm)

lots of debris

TAXA	COUNT TOTAL Number	Prop.
Planothidium frequentissimum (Lange-Bertalot in Krammer and Lange-Bertalot) Lange-Bertalot	2	0.003
Pseudostaurosira brevistriata (Grunow in Van Heurck) Williams et Round	25	0.040
Pseudostaurosira parasitica (Smith) Morales	3	0.005
Rossithidium nodosum (A. Cleve) Aboal in Aboal, Alvarez-Cobelas, Cambra and Ector	6	0.010
Sellaphora seminulum (Grunow) Mann	2	0.003
Stauroforma exiguiformis (Lange-Bertalot) Flower, Jones et Round	1	0.002
Stauroneis kriegeri Patrick	2	0.003
Stauroneis smithii Grunow	1	0.002
Stauroneis spp.	1	0.002
Staurosira construens var. venter (Ehrenberg) Hamilton in Hamilton, Poulin, Charles and Angell	3	0.005
Staurosirella pinnata (Ehrenberg) Williams et Round	25	0.040
Synedra rumpens Kützing	2	0.003
Synedra spp.	9	0.014
Tabellaria flocculosa (strain III) sensu Koppen (Roth) Kützing	1	0.002
Tabellaria spp.	4	0.006
Undetermined Centric sp. 1 ?	2	0.003
Undetermined Pennate sp. 1 ?	1	0.002
Undetermined pennate	10	0.016
TOTAL	621	1.000

Planktonic diatoms	0.696
Nonplanktonic diatoms	0.288