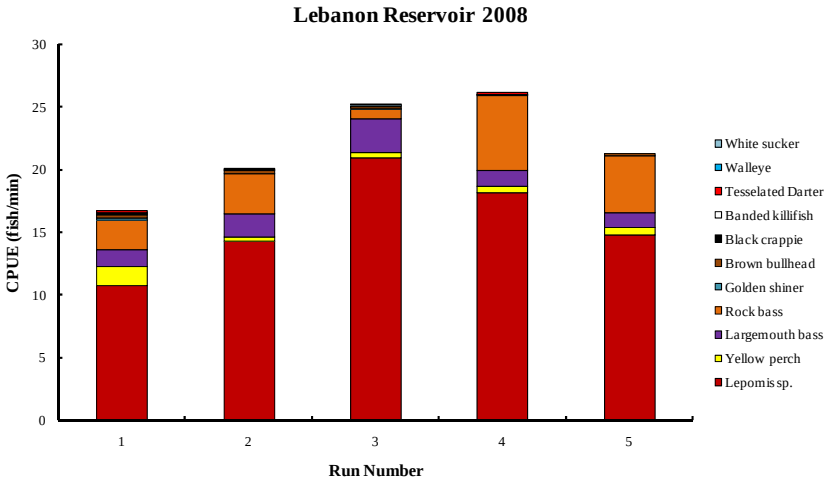
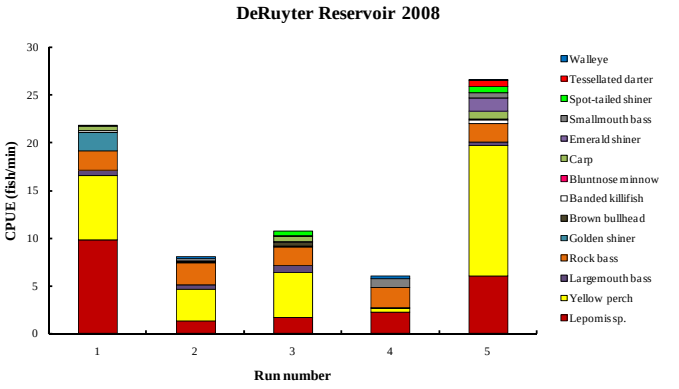
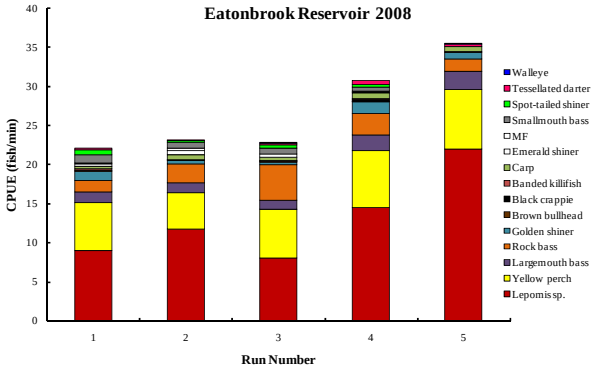
Year 5: Monitor and Evaluate Impacts of Herbivorous Insects on Eurasian Watermilfoil Growth in Lebanon, Eatonbrook and DeRuyter Reservoirs in Conjunction with Stocking of Walleye and Smallmouth Bass







Paul H. Lord
Jason D. Johnson
Christina C. Killourhy
Nicholas Sledziona
Robert L. Johnson

Cornell University Research Ponds
Department of Ecology & Evolutionary Biology
Corson Hall, Cornell University
Ithaca, New York 14853

Cover

Graphs of Madison County Electrofishing Results 2008

Year 5: Monitor and Evaluate Impacts of Herbivorous Insects on Eurasian Watermilfoil Growth in Lebanon, Eatonbrook and DeRuyter Reservoirs in Conjunction with Stocking of Walleye and Smallmouth Bass

2008 Project Report
December 2009

Submitted to:
Madison County Planning Department

Submitted by:
Dr. Nelson G. Hairston Jr.
ngh1@cornell.edu
Paul H Lord
phl6@cornell.edu
Robert L. Johnson
rlj5@cornell.edu

Department of Ecology & Evolutionary Biology
Corson Hall, Cornell University
Ithaca, New York 14853

Executive Summary

This report summarizes a cooperative project between Madison County administrated by the Planning Department and the Department of Ecology and Evolutionary Biology, Cornell University, Ithaca NY. In 2008, we conducted aquatic plant research for Madison County with the goal of defining the role that Eurasian watermilfoil (*Myriophyllum spicatum*) plays in the ecology of Lebanon, DeRuyter and Eatonbrook Reservoirs. The project focus is on the biological control of the growth of the non-native invasive Eurasian watermilfoil by insect herbivores and the encouragement of native submersed aquatic plant communities in Lebanon, DeRuyter and Eatonbrook Reservoirs.

2008 Major Findings

- Watermilfoil in 2008 is the most abundant plant species in Lebanon Reservoir with a measured biomass of 83.8 g/m^2 (Table 18).

- Watermilfoil's 2008 biomass in Lebanon Reservoir at 83.8 g/m^2 is in the biomass range of 2003 (118.5 g/m^2) and 2004 (65.2 g/m^2), however stems/m^2 at 89.2 in 2008 is down from the stems/m^2 at 210 in 2003 and 176 in 2004 (Table 17).

- Watermilfoil apical stems collected in 2008 at the 3 meter depth in Lebanon to assess herbivore populations continue to show no presence of the moth or weevil (Table 2) and almost no presence of any insects (Personal observation).

- Electrofishing data for Lebanon in 2008 shows 943 sunfish caught per hour almost the same as the other high sunfish number of 957 caught per hour in 2003 suggesting no trend-line decrease in sunfish numbers over the last six years (Table 3). Additionally, sunfish as % of total fish sampled remained the same from 2002 at 74% to 2008 at 72% (Table 3).

- Watermilfoil's 2008 abundance in DeRuyter Reservoir measured by the rake–toss method is varied but averages out as sparse density for the reservoir. Elodea, coontail and najas measured abundance all rival watermilfoil for dominance (Table 20, Figures 3-7).

- Watermilfoil's 2008 abundance in Eatonbrook measured by the rake-toss method is sparse density overwhelmed by elodea the dominant plant species in the reservoir (Table 21, Figures 8-10).

- Watermilfoil's apical stems collected from DeRuyter showed very little herbivory under the microscope analysis on stems collected, however herbivory was noticeable on watermilfoil in the reservoir (Table 2).

- Watermilfoil's apical stems collected from Eatonbrook showed more herbivory under the microscope analysis on stems collected as well as much higher numbers of both moths and weevils present (Table 2).

- Electrofishing data for DeRuyter in 2008 shows 253 sunfish caught per hour out of a total of 885 fish sampled or a very low 29% sunfish of all fish sampled from the reservoir (Table 4).

- Electrofishing data for Eatonbrook in 2008 shows 782 sunfish caught per hour out of a total of 1617 total fish sampled resulting in sunfish at 48% of all fish sampled (Table 5).

Contents

Figures

Tables

Introduction

In 2008, we conducted aquatic plant research for and supported by Madison County in an effort to define the role that Eurasian watermilfoil (*Myriophyllum spicatum*) plays in the ecology of Lebanon, DeRuyter and Eatonbrook Reservoirs. This report's focus is on the biological control of the non-native Eurasian watermilfoil by insect herbivores and restoration of native submersed aquatic plant communities in Lebanon, DeRuyter and Eatonbrook Reservoirs. Evidence suggests the high densities of sunfish (bluegill and pumpkinseed) limit insect herbivore populations and thereby allow excessive watermilfoil growth, without the limiting of growth caused by herbivorus insect damage. To accomplish limiting excessive watermilfoil growth an experiment in Lebanon Reservoir to increase insect herbivore populations that feed on watermilfoil was untaken. The hypothesis for this project is that by increasing the populations of predator fish consuming sunfish will decrease the sunfish population allowing insect herbivores to increase and limit watermilfoil growth in Lebanon Reservoir (Lord 2003, Lord 2004).

This report describes the continuing effort begun in 2002 by Paul Lord completing graduate studies at SUNY Oneonta that focuses on the herbivores that eat watermilfoil and the influence the herbivores play in changing the plant community structure. Many small fish, especially sunfish eat insect herbivores. Lebanon Reservoir appears to have a very high density of sunfish shown by sampling the warm-water fish species composition of the reservoir. The primary project focus continues to assess the above hypothesis that high densities of sunfish in a water body limit insect herbivore populations. Additionally, the hypothesis suggests that decreasing sunfish populations by increased predator fish feeding on Lebanon sunfish would allow an increase in herbivores eating watermilfoil.

The primary warm-water predators in Lebanon now and before this experiment is a healthy largemouth bass (*Micropterus salmoides*) population known for feeding heavily on bluegill (*Lepomis macrochirus*) and pumpkinseed (*Lepomis gibbosus*) sunfish. This largemouth bass population appears relatively stable from 2002 – 2008 and is critical to a healthy fishery and limiting sunfish populations in Lebanon.

In 1994 in an effort to increase predators of sunfish, a onetime addition of smallmouth bass (*Micropterus dolomieui*) was made to the reservoir. At the same time, an introduction of walleye (*Sander vitreus*) was made and walleye additions have continued yearly since at the following numbers:

2004 fingerlings stocked: 17,390(1,410 short of goal)
2005 fingerlings stocked: 3,300(2004 shortfall + NYS stocking rate)
2006 fingerlings stocked: 3,900(104% of goal; 140 over goal)
2007 fingerlings stocked: 0 because of VHS restrictions; however, 130,000 fry were stocked
2008 fingerlings stocked: 7,520

In 2008, we conducted aquatic plant abundance and insect herbivore surveys on DeRuyter and Eatonbrook Reservoirs and the results are included in this report. Additionally, Mark Cornwell SUNY – Cobleskill provided us with electrofishing data he collected on the two reservoirs in 2008 and we include the collected data in this report.

Methods

Eurasian Watermilfoil Herbivore and Watermilfoil Damage Surveys

In 2008, we continued measurements taken in previous years from 2002 to 2007 from Lebanon Reservoir of indigenous watermilfoil insect herbivore populations and insect herbivore damage to watermilfoil. We record all insects found on the watermilfoil samples but only report here the populations of the moth, *Acentria* and the weevil, *Euhrychiopsis* both known to limit growth of watermilfoil by feeding damage in many New York Lakes. We also initiated sampling of herbivore populations feeding on watermilfoil in DeRuyter and Eatonbrook Reservoirs in 2008. We follow with a description of our methods to estimate populations of herbivores feeding on watermilfoil and our estimates of herbivore damage to watermilfoil.

At each sampling location, we randomly collected a series of aquatic plant samples using a grapple hook formed by connecting the "heads" of two garden rakes back-to-back. In the boat, we blindly selected twenty-five watermilfoil stems from our "rake-toss" samples (no more than five from each rake toss) by choosing them from their basal ends. We then pinched off the top 25 cm of each stem (the apical stem) for our sample. We placed each apical stem into an individually labeled plastic zipper bag and stored all samples in a cooler chest for transport to our laboratory.

In the laboratory, we refrigerated all samples until we examined each apical stem. Apical stems and herbivores are stored in the refrigerator for up to two weeks, and we froze any samples for later analysis that we could not examine within two weeks. At the time of examination, we placed each apical stem under a stereoscopic dissecting microscope. We dissected each stem and evaluated the entire sample, recording numbers and types of herbivores found, evidence of herbivore use (e.g., retreats, cocoons, or pupae chambers), and plant tissue damage (leaflet damage, stem mining, missing or grazed apical meristems).

For each apical stem sampled, we identified, counted and recorded all life stages (eggs, larvae, pupae and adults) of each herbivore species found. We qualified and quantified all watermilfoil tissue damage using a consistent scoring system we developed in our laboratory. Finally, we calculated the numbers of moths and weevils per apical stem, including individuals in all life stages. Using this standard protocol, we are able to determine which herbivores are responsible for particular types of damage and can assess the amount of plant damage caused by each herbivore.

Aquatic Macrophyte Community and Density Survey

In 2008, we collected 20 randomly selected individual quadrats ($0.01m^2$) around the reservoir. The samples of aquatic plants from Lebanon Reservoir were processed to assess aquatic plant species and biomass (g/m^2) present in the reservoir. We used methods described in Lord and Johnson 2005 to choose the 20 sample locations where we collected individual $0.01m^2$ samples to process later.

Electrofishing

The Electrofishing data in 2008 was collected and provided by Mark Cornwell SUNY – Cobleskill using the same warm water fish sampling procedures he has used for all previous years collections of Lebanon Reservoir described in Lord 2004. The method used is in general conformance with NYSDEC, Division of Fish and Wildlife, Bureau of Fisheries guidelines.

Aquatic Plant Species Identifications, Abundance Estimates and Location Surveys

To identify lake-wide trends in plant community structure and relative abundance we sampled and recorded aquatic plant species presence and abundance at selected locations in DeRuyter and Eatonbrook Reservoirs in 2008. We generally sampled on 100m X 100m UTM (NAD27 datum and true north) transect grids. Hand-held GPS equipment guided our movement to these locations. We used an enhanced modification of a basic point intercept rake-toss method (Madsen, 1999) where three randomly tossed rakes collected submersed aquatic plants at selected locations identified by a UTM point intercept. We brought the samples into the boat with a dual headed rake (Figure 1) and assigned an overall plant abundance estimate to the amount on the rake. We classified and recorded the entire rake sample as: "dense" - more than an armful and difficult to get into the boat, "medium" - an arm full, "sparse" - two hands full, "trace" - a small handful or less, or "zero" - a bare rake (Table 1). The field crew then separated each sample to individual species and analyzed the separations by recording the species identification (Borman *et al*. 1999, Crow and Hellquist 1999) and a percentage estimate of each species on site. We later entered all data into an MS Excel spreadsheet and listed the collected information in Tables 20 and 21.

Figure 1. Sample with dual-headed rake and separation to species for an estimate of species percentage.

Table 1. Abundance categories used to describe rake-toss samples with the assumed mean dry weight values (g / m^2) and ranges used in spreadsheet processing of field data to obtain an estimate of abundance for individual species or grouping of species (Tables 20, 21).

Abundance Categories	Rake-toss Abundance Number	Dry Weight (g/m^2) Ranges associated with Total Plants Abundance	Mean (g/m^2)	Dry Weight (g/m^2) Ranges associated with Single Species Abundance
"O" = no plant(s)	0	0.0	0.0	same
"T" = trace plant(s)	1	~0.0001 - 0.9999	0.5	same
"S" = sparse plant(s)	2	~1.0000 - 24.9999	13.0	same
"M" = medium plant(s)	3	~25.0000 - 99.9999	62.5	same
"D" = dense plant(s)	4	~100.0000 - 400.0000+	250.0	same

To obtain an all species combined abundance value for tables and maps we averaged the three field estimated rake abundance categories from the three recorded rake tosses (Tables 20, 21) to produce a mean value at each specific lake location.

To analyze the abundance data of individual species we use table 1 our standard assumed abundance value and the relationship to dry biomass (g / m^2). Figure 2 described the basis for table 1 concluded from an earlier Chautauqua Lake study where we compared the "rake-toss" estimates at specific locations to absolute dry biomass data collected from the same location at the same time (Johnson 2008). From this quadrat biomass sampling, we are able to report the results in figure 2, as the best-fit regression line. We used 18 lake locations and collected five 0.25m^2 quadrat samples from each location for a total of 90 biomass samples. We calculated a mean biomass dry weight (g / m^2) for each of the 18 locations and that mean was regressed with the mean of the two rake-toss estimates at each location and depicted as Figure 2.

Table 1 displays the resulting assumptions and values from which we estimated our species abundance and used that estimate to construct our maps of species abundance (Figures 3 - 10). We calculated single species abundance using the table mean biomass for a determined abundance category (Table 1) and the field percent estimate for each species recorded in this survey to assign a weighted species abundance category. Using the relationships in table 1 and the 2008 rake-toss data sets we calculated mean species abundances for each location sampled. We placed the resulting abundance values on individual species maps for each sampled location to create a visual record of the relative species abundance (Figures 3 - 10).

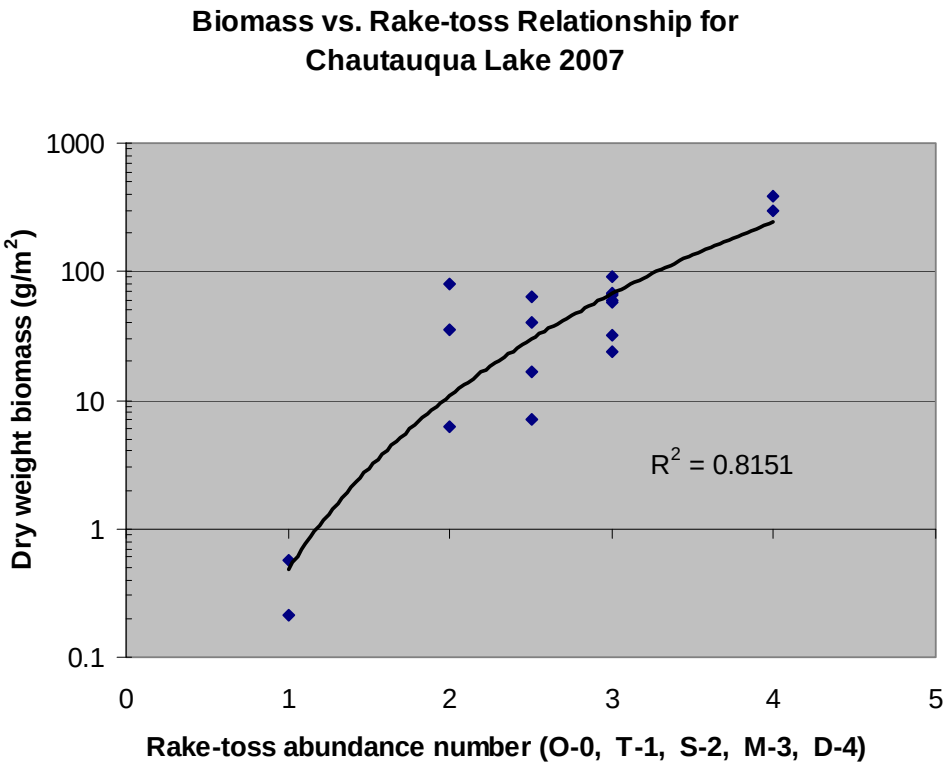


Figure 2. Best-fit line to describe the relationship between estimates made with the rake-toss method and biomass measures in a previous study at the same locations and times (Racine - Johnson 2008).

Results and Discussion

The following tables and figures depict the information collected from Lebanon, DeRuyter and Eatonbrook Reservoirs. Table 2 shows the herbivore density and damage for all three reservoirs with Lebanon showing no herbivores found, but a number of herbivores found on Eatonbrook material.

Table 3 Lebanon Reservoir 2002 – 2008 yearly electrofishing summary gives us good information because of the long-term sampling. The number of sunfish, both bluegill and pumpkinseed have varied year to year but we see no long-term trend from the data. Additionally, the percentage of sunfish and percentage of bluegill remains the same at the start July 2002 as well as at the end July 2008. The electrofishing results from DeRuyter and Eatonbrook shown in tables 4 and 5 respectively have very diverse fisheries with largemouth bass, smallmouth bass and walleye present. DeRuyter has a very low percentage of sunfish at 29 and Eatonbrook higher at 48 but far less that Lebanon at 72. This percentage of sunfish may be important and we have included electrofishing data from other lakes for comparison. All other lakes included have sunfish but below 60% of the total fish sampled per unit effort, with the only one above 60% being Lebanon. All the other lakes have sizeable populations of insect herbivores even with lots of sunfish present and feeding on the herbivores. Please note that Tables 3 – 5 have catch per hour as the CPUE while tables 6 – 13 have CPUE analyzed as catch per minute.

The aquatic plant species richness of each reservoir is shown in tables14 -16. Table 17 shows the long-term trend for total plant biomass and biomass of watermilfoil from 2003 to 2008. Year to year variation of plant growth is quite large in many lakes with Lebanon being no exception with 2008 watermilfoil biomass still down from its high over the years. Tables 18 and 19 contain the actual dry biomass plant data harvested in 2008 as well as length of watermilfoil stems measured.

Aquatic plant data recorded in table 20 from rake-toss sampling in DeRuyter in 2008 includes the species identified as well as abundance estimated as a percentage for each. We estimated in the field and included in the table an overall abundance of all species combined. We calculated from the % of major species recorded on table 20 in the field and depicted that value as an abundance on figures 3 – 7. Table 21 shows the aquatic plant data recorded from rake-toss sampling in Eatonbrook in 2008 including the species identified and the abundance estimated as a percentage for each. We calculated from the % of major species recorded on table 21 in the field and depicted that value as an abundance on figures 8 – 10.

Table 2. Mean numbers of weevils (all life stages – eggs, larvae, pupae and adults) and moths (larvae and pupae) recorded on milfoil apical stems and a mean damage rating for apical stems at Lebanon, DeRuyter and Eatonbrook Reservoir locations for 2008.

Lake	Plot	Date	No. of Apical Stems	Weevils per apical stem mean (SE)	Moths per apical stem mean (SE)	Damage Rating mean (SE)
Lebanon Reservior	L	6/20/2008	25	0	0	0.88 (0.11)
	L	7/22/2008	25	0	0	1.28 (0.17)
DeRuyter Reservior	D	6/19/2008	25	0	0	2.28 (0.14)
	D	7/25/2008	25	0.04 (0.04)	0	2.28 (0.17)
Eatonbrook Reservior	E	6/18/2008	25	0.28 (0.15)	0.04 (0.04)	1.40 (0.20)
	E	8/6/2008	25	0.04 (0.18)	0.04 (0.04)	1.20 (0.23)
					7.12 (7.08)*	

*Eatonbrook has 7.12 moths per apical stem if you count moth eggs as we count weevil eggs

Table 3. Lebanon Reservoir 2002 – 2008 yearly electrofishing summary (# of fish caught per hour of sampling effort). Mark Cornwell at SUNY Cobleskill collected fish data on July 2, 2008. Total sampling time = 63.8 minutes for collection of all fish in 2008.

	Catch/hr						
Species	Jul-02	Jun-03	Jul-04	Jul-05	Jul-06	Aug-07	Jul-08
Banded killifish	0.0	1.7	1.6	0.9	0.0	0.9	0.8
Black crappie	0.0	2.6	0.8	1.8	0.7	0.9	1.5
Bluegill	442.4	775.7	373.6	309.3	230.1	507.1	842.5
Brown bullhead	14.1	12.0	12.0	1.8	9.5	5.1	9.0
Golden shiner	14.1	12.0	4.0	2.7	4.4	18.8	3.0
Largemouth bass	123.6	129.4	116.8	141.3	84.3	89.1	99.3
Pumpkinseed	82.4	180.9	69.6	49.8	38.8	40.3	97.8
Rock bass	23.6	46.3	75.2	54.2	7.3	120.8	206.7
Smallmouth bass	0.0	0.0	0.8	0.9	0.0	0.0	0.0
Tessellated darter	0.0	0.0	0.0	0.0	0.0	0.0	3.7
Unknown minnow	0.0	0.0	0.0	2.7	0.0	0.0	0.0
Unknown small sunfish	0.0	33.4	0.0	19.6	0.0	0.0	0.0
Walleye	0.0	0.0	0.8	1.8	0.7	0.9	2.2
White sucker	2.4	15.4	15.2	0.0	2.9	0.0	1.5
Yellow perch	3.5	2.6	1.6	4.4	0.0	3.4	38.8
Fish:	706.1	1212.0	672.0	591.1	378.7	787.3	1306.7
Total sunfish:	**524.8**	**956.6**	**444.0**	**360.9**	**269.6**	**548.3**	**942.5**
Sunfish as % of fish	**74**	**79**	**66**	**61**	**71**	**70**	**72**
Bluegill as % of fish	**63**	**64**	**56**	**52**	**61**	**64**	**64**

Table 4. DeRuyter Reservoir electrofishing summary. Mark Cornwell at SUNY Cobleskill collected fish data on July 22, 2008. Total sampling time = 51.52 minutes.

	Species	Catch/hr Jul-
1	Banded killifish	8.2
2	Bluegill	100.2
3	Bluntnose minnow	1.2
4	Brown bullhead	4.7
5	Common carp	23.3
6	Emerald shiner	17.5
7	Golden shiner	24.5
8	Largemouth bass	26.8
9	Pumpkinseed	152.6
10	Rock bass	125.8
11	Smallmouth bass	19.8
12	Spot-tailed shiner	15.1
13	Tessellated darter	8.2
14	Walleye	8.2
15	Yellow perch	349.4
	Fish	885.1
	Total sunfish	**252.7**
	Sunfish as % of fish	**29%**

Table 5. Eatonbrook Reservoir electrofishing summary. Mark Cornwell at SUNY Cobleskill collected fish data on September 29, 2008. Total sampling time = 77.98 minutes.

	Species	Catch/hr Sep-
1	Banded killifish	3.9
2	Black crappie	3.1
3	Bluegill	502.3
4	Brown bullhead	5.4
5	Common carp	33.1
6	Emerald shiner	10.0
7	Golden shiner	54.6
8	Largemouth bass	99.2
9	MF???	12.3
10	Pumpkinseed	280.0
11	Rock bass	151.5
12	Smallmouth bass	36.2
13	Spot-tailed shiner	20.0
14	Tessellated darter	18.5
15	Walleye	2.3
16	Yellow perch	384.6
	Fish	1616.9
	Total sunfish	**782.3**
	Sunfish as % of fish	**48%**

Table 6. Lebanon Reservoir estimate of fish community from data collected by electrofishing in 2008, accompanied by a graph of fish species collected per minute (CPUE).

Lebanon Reservoir 2008		Total Time (min) = 80.48		
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)
Fundulus diaphanus	Banded killifish	1	0.06	0.01
Pomoxis nigromaculatus	Black crappie	2	0.11	0.02
Lepomis sp.	**Bluegill/Pumpkinseed**	**1260**	**71.96**	**15.67**
Ictalurus nebulosus	Brown bullhead	12	0.69	0.15
Notemigonus crysoleucas	Golden shiner	4	0.23	0.05
Micropterus salmoides	Largemouth bass	133	7.60	1.65
Ambloplites rupestris	Rock bass	277	15.82	3.45
Micropterus dolomieui	Smallmouth bass	0	0.00	0.00
Etheostoma olmstedi	Tessellated darter	5	0.29	0.06
Sander vitreus	Walleye	3	0.17	0.04
Catastomus commersoni	White sucker	2	0.11	0.02
Perca flavescens	Yellow perch	52	2.97	0.65
	Total Fish / 80.48 min.	**1751**	**100.00**	**21.78**
	Total Sunfish	**1260**		
	Sunfish as a % of total fish	**72**		

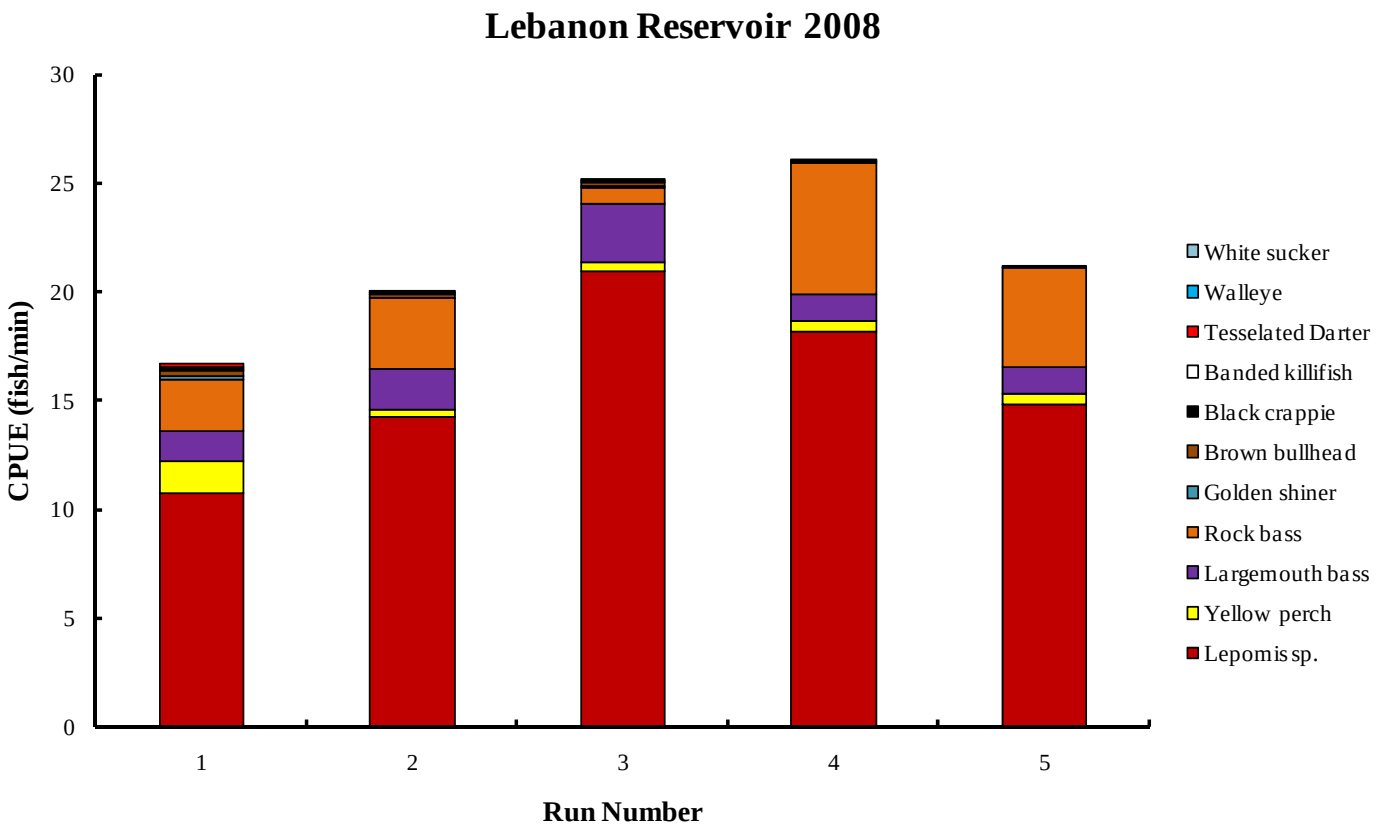


Table 7. DeRuyter Reservoir estimate of fish community from data collected by electrofishing in 2008, accompanied by a graph of fish species collected per minute (CPUE).

DeRuyter Reservoir Electrofishing Summary		Total Time (min) = 51.52		
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)
Fundulus diaphanus	Banded killifish	7	0.9	0.14
Lepomis sp.	**Bluegill/Pumpkinseed**	**217**	**28.6**	**4.21**
Pinephales notatus	Bluntnose minnow	1	0.1	0.02
Ictalurus nebulosus	Brown bullhead	4	0.5	0.08
Cyprinus carpio	Common carp	20	2.6	0.39
Notropis atherinoides	Emerald shiner	15	2.0	0.29
Notemigonus crysoleucas	Golden shiner	21	2.8	0.41
Micropterus salmoides	Largemouth bass	23	3.0	0.45
Ambloplites rupestris	Rock bass	108	14.2	2.10
Micropterus dolomieui	Smallmouth bass	17	2.2	0.33
Notropis hudsonius	Spot-tailed shiner	13	1.7	0.25
Etherostoma olmstedi	Tessellated darter	7	0.9	0.14
Sander vitreus	Walleye	7	0.9	0.14
Perca flavescens	Yellow perch	300	39.5	5.82
	Total Fish / 51.52 min.	**760.0**	**100.0**	**14.8**
	Total Sunfish	**217**		
	Sunfish as % of total fish	**28.6**		

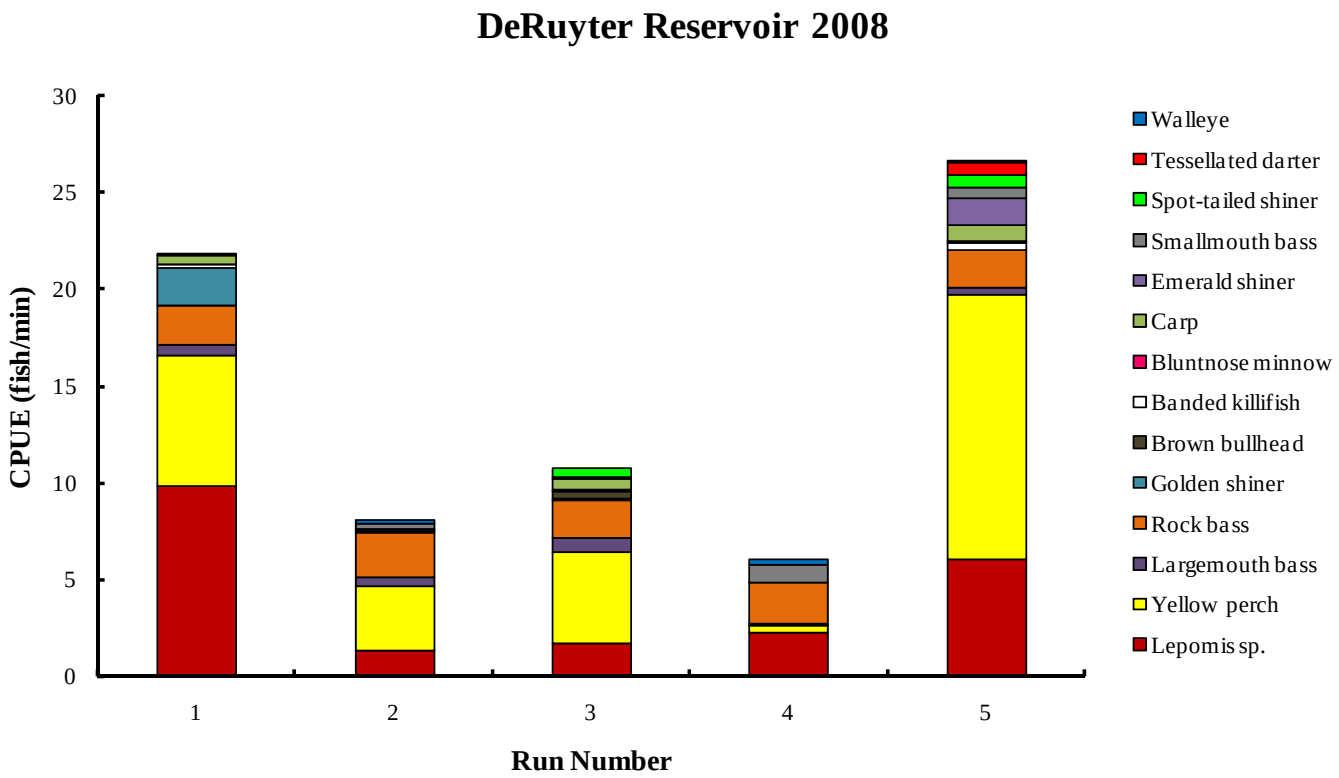


Table 8. Eatonbrook Reservoir estimate of fish community from data collected by electrofishing in 2008, accompanied by a graph of fish species collected per minute (CPUE).

Eatonbrook Reservoir Electrofishing Summary		Total time (min) = 77.98		
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)
Fundulus diaphanus	Banded killifish	5	0.2	0.06
Pomoxis nigromaculatus	Black crappie	4	0.2	0.05
Lepomis sp.	**Bluegill/Pumpkinseed**	**1017**	**48.4**	**13.04**
Ictalurus nebulosus	Brown bullhead	7	0.3	0.09
Cyprinus carpio	Common carp	43	2.0	0.55
Notropis atherinoides	Emerald shiner	13	0.6	0.17
Notemigonus crysoleucas	Golden shiner	71	3.4	0.91
Micropterus salmoides	Largemouth bass	129	6.1	1.65
MF???	MF???	16	0.8	0.21
Ambloplites rupestris	Rock bass	197	9.4	2.53
Micropterus dolomieui	Smallmouth bass	47	2.2	0.60
Notropis hudsonius	Spot-tailed shiner	26	1.2	0.33
Etherostoma olmstedi	Tessellated darter	24	1.1	0.31
Sander vitreus	Walleye	3	0.1	0.04
Perca flavescens	Yellow perch	500	23.8	6.41
	Total Fish / 77.98 min.	**2102**	**100.0**	**27.0**
	Total Sunfish	**1017**		
	Sunfish as % of total fish	**48.4**		

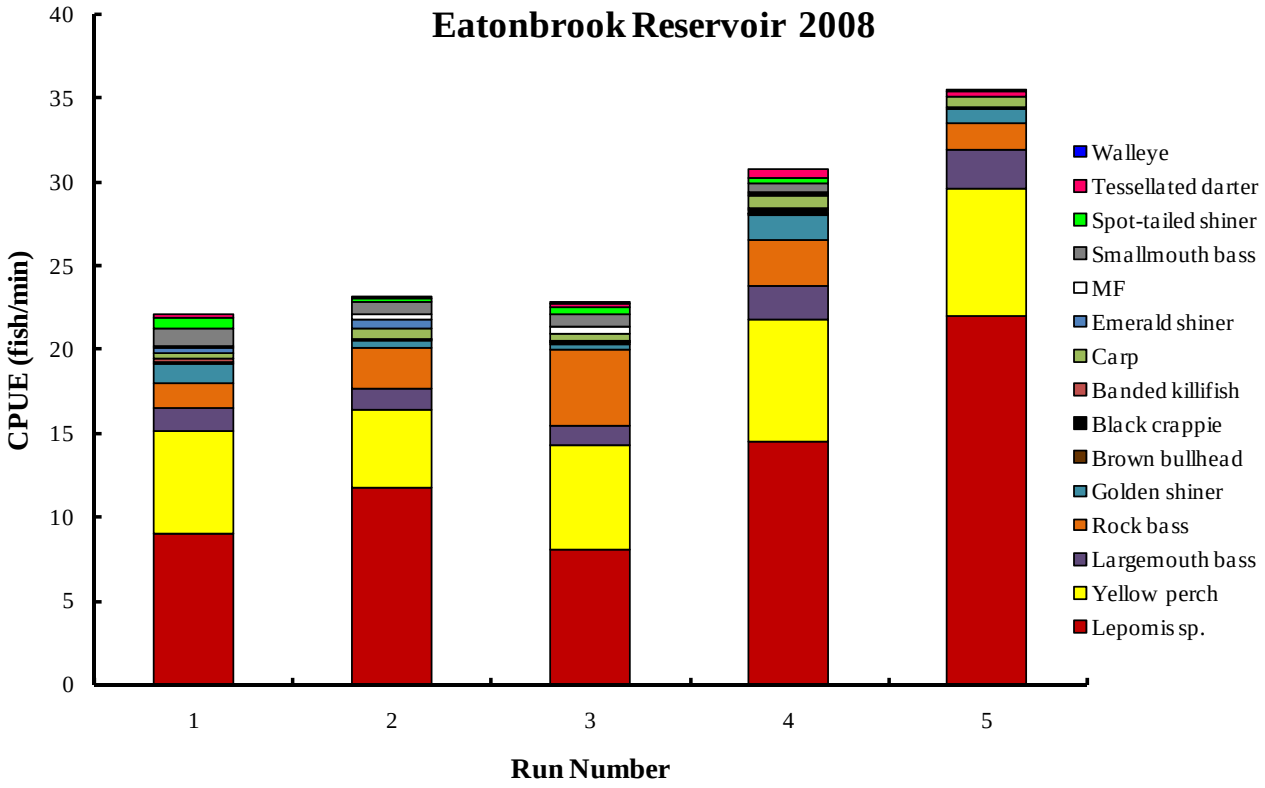


Table 9. Chautauqua Lake estimate of fish community from data collected by electrofishing in 2003, accompanied by a graph of fish species collected per minute (CPUE).

Chautauqua Lake 2003			TOTAL Time (min) =	45
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)
Fundulus diaphanus	Banded killifish	1	0.1	0.022
Pomoxis nigromaculatus	Black crappie	1	0.1	0.022
Lepomis spp.	Bluegill/Sunfish	200	20.8	4.444
Ictalurus nebulosus	Brown bullhead	10	1.0	0.222
Cyprinus carpio	Common carp	3	0.3	0.067
Notropis atherinoides	Emerald shiner	1	0.1	0.022
Notemigonus crysoleucas	Golden shiner	24	2.5	0.533
Micropterus salmoides	Largemouth bass	32	3.3	0.711
Percina caprodes	Logperch	6	0.6	0.133
Ambloplites rupestris	Rock bass	46	4.8	1.022
Labidesthes hudsonius	Brook silversides	4	0.4	0.089
Micropterus dolomieui	Smallmouth bass	16	1.7	0.356
	Unknown minnows	35	3.6	0.778
Morone americana	White perch	365	38.0	8.111
Catostomus commersoni	White sucker	12	1.3	0.267
Perca flavescens	Yellow perch	203	21.1	4.511
	ST?	1	0.1	0.022
	TOTAL	960		21.333

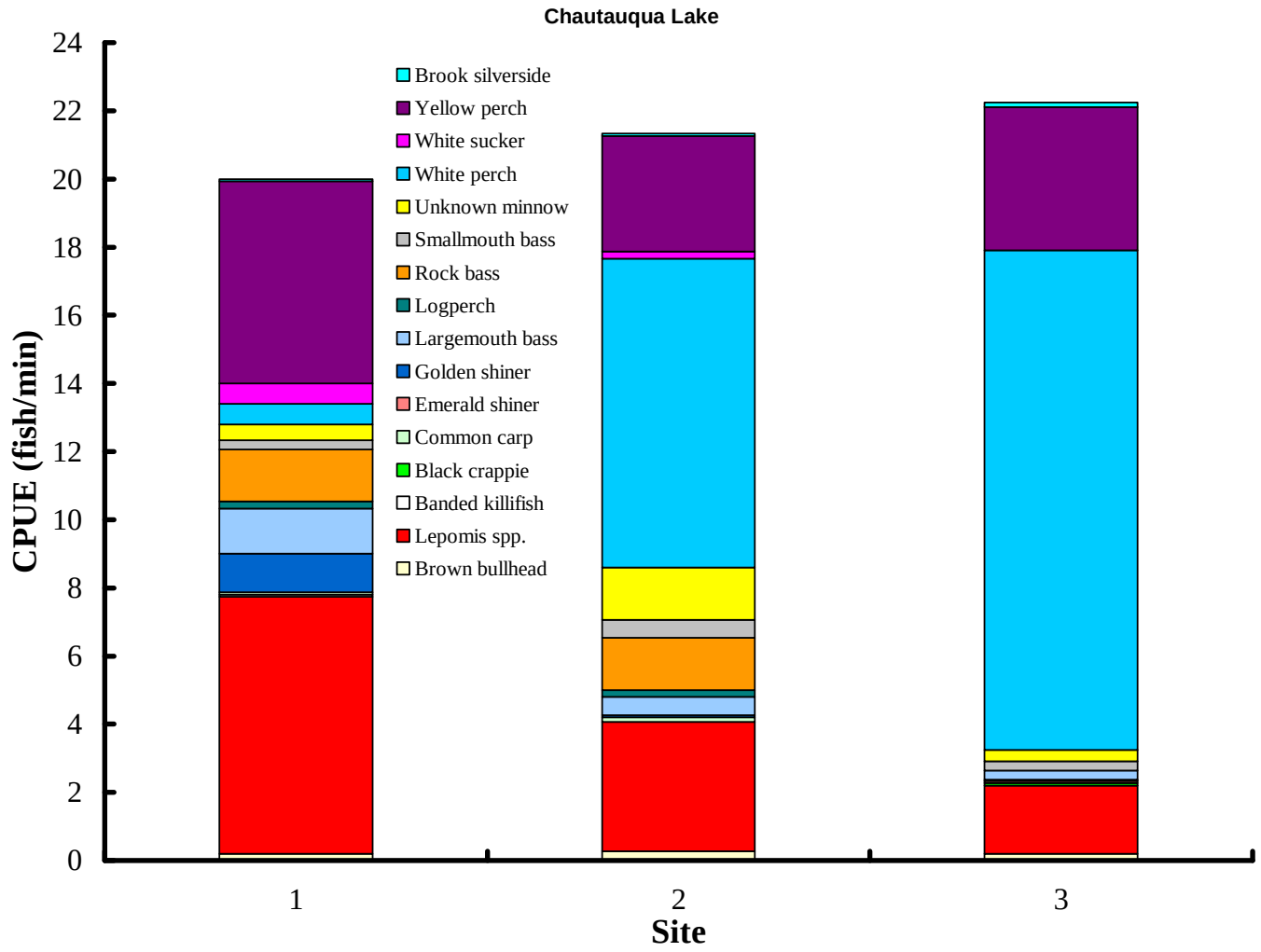


Table 10. Findley Lake estimate of fish community from data collected by electrofishing in 2003, accompanied by a graph of fish species collected per minute (CPUE).

Findley Lake 2003			TOTAL Time (min) =	60	
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)	
Pomoxis nigromaculatus	Black crappie	208	16.0	3.467	
Lepomis spp.	Bluegill/Sunfish	461	35.4	7.683	
Ictalurus nebulosus	Brown bullhead	27	2.1	0.450	
Notropis hudsonius	Spottail shiner	6	0.5	0.100	
Pimephales notatus	Bluntnose minnow	19	1.5	0.317	
Micropterus salmoides	Largemouth bass	85	6.5	1.417	
Percina caprodes	Logperch	25	1.9	0.417	
Ambloplites rupestris	Rock bass	15	1.2	0.250	
Micropterus dolomieui	Smallmouth bass	55	4.2	0.917	
Labidesthes sicculus	Brook silverside	4	0.3	0.067	
Stizostedion vitreum	Walleye	21	1.6	0.350	
Morone americana	White perch	5	0.4	0.083	
Perca flavescens	Yellow perch	373	28.6	6.217	
	TOTAL	1304		21.733	

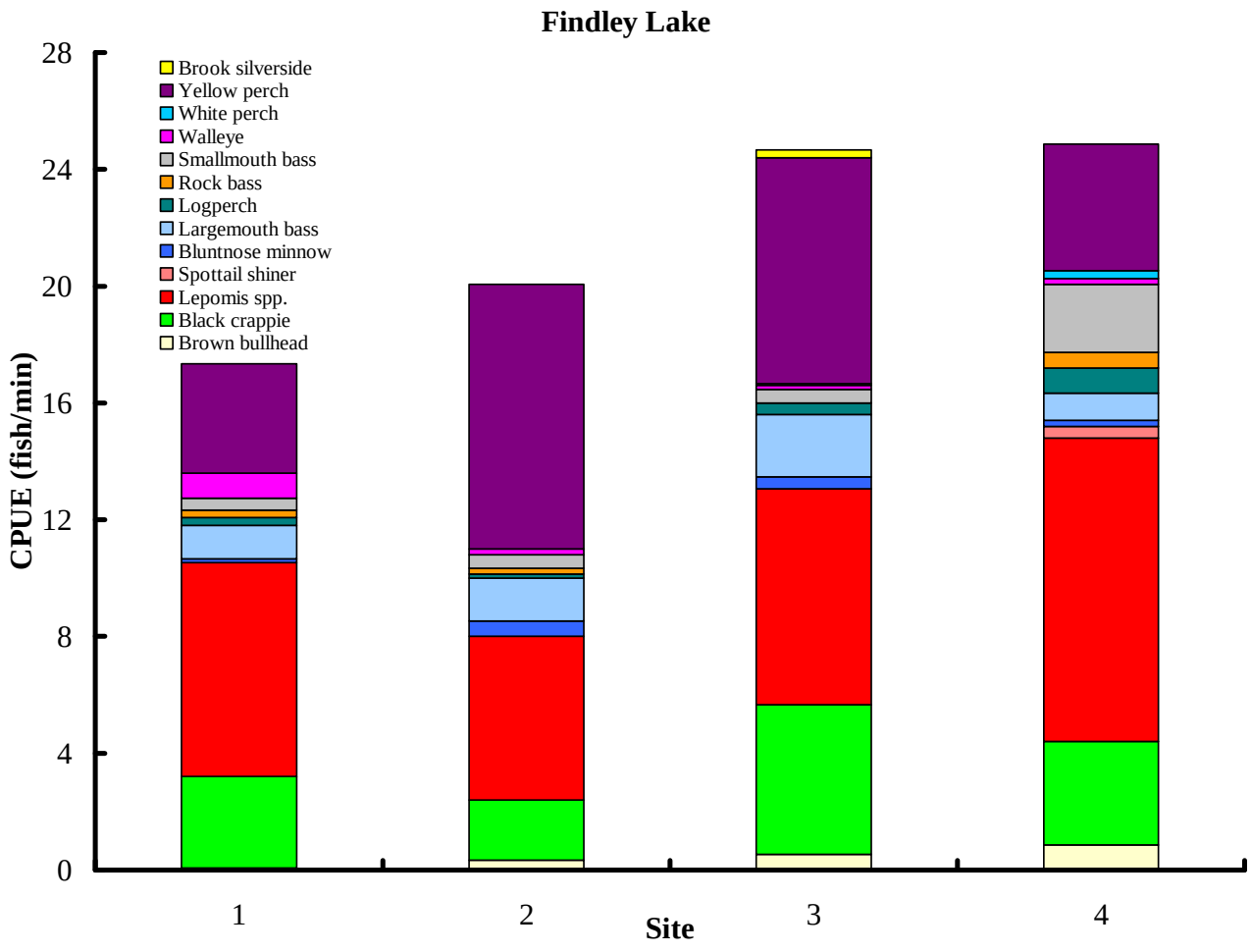


Table 11. Dryden Lake estimate of fish community from data collected by electrofishing in 2003, accompanied by a graph of fish species collected per minute (CPUE).

Dryden Lake 2003			TOTAL Time (min) =	45	
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)	
Pomoxis nigromaculatus	Black crappie	1	0.2	0.022	
Lepomis spp.	Lepomis spp.	361	58.6	8.022	
Ictalurus nebulosus	Brown bullhead	6	1.0	0.133	
Cyprinus carpio	Common carp	7	1.1	0.156	
Notemigonus crysoleucas	Golden shiner	91	14.8	2.022	
Micropterus salmoides	Largemouth bass	124	20.1	2.756	
Catostomus commersoni	White sucker	6	1.0	0.133	
Perca flavescens	Yellow perch	20	3.2	0.444	
	TOTAL	616		13.689	

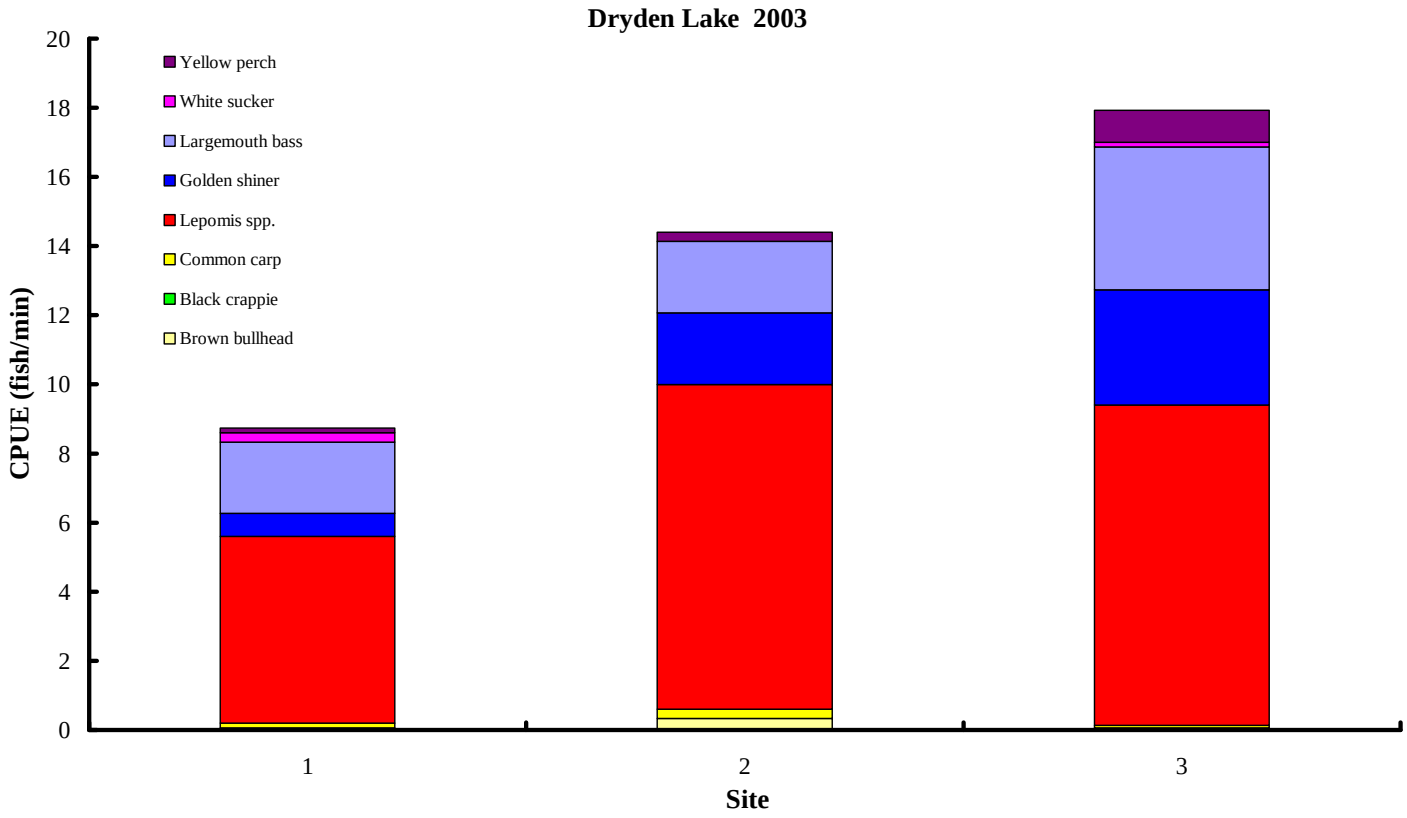


Table 12. Otisco Lake estimate of fish community from data collected by electrofishing in 2004, accompanied by a graph of fish species collected per minute (CPUE).

Otisco 2004			67.067	minutes total	
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)	
Fundulus diaphanus	Banded killifish	1	0.3	0.015	
Lepomis spp.	Bluegill/Sunfish	204	52.8	3.042	
Ictalurus nebulosus	Brown bullhead	3	0.8	0.045	
Cyprinus carpio	Common carp	11	2.8	0.164	
Notemigonus crysoleucas	Golden shiner	16	4.1	0.239	
Micropterus salmoides	Largemouth bass	53	13.7	0.790	
Ambloplites rupestris	Rock bass	18	4.7	0.268	
Micropterus dolomieui	Smallmouth bass	6	1.6	0.089	
Notropis hudsonius	Spottail shiner	9	2.3	0.134	
Etheostoma olmstedi	Tessellated darter	1	0.3	0.015	
Esox masquinongy x *lucius*	Tiger muskellunge	1	0.3	0.015	
Morone americana	White perch	27	7.0	0.403	
Perca flavescens	Yellow perch	36	9.3	0.537	
	TOTAL	386		5.755	

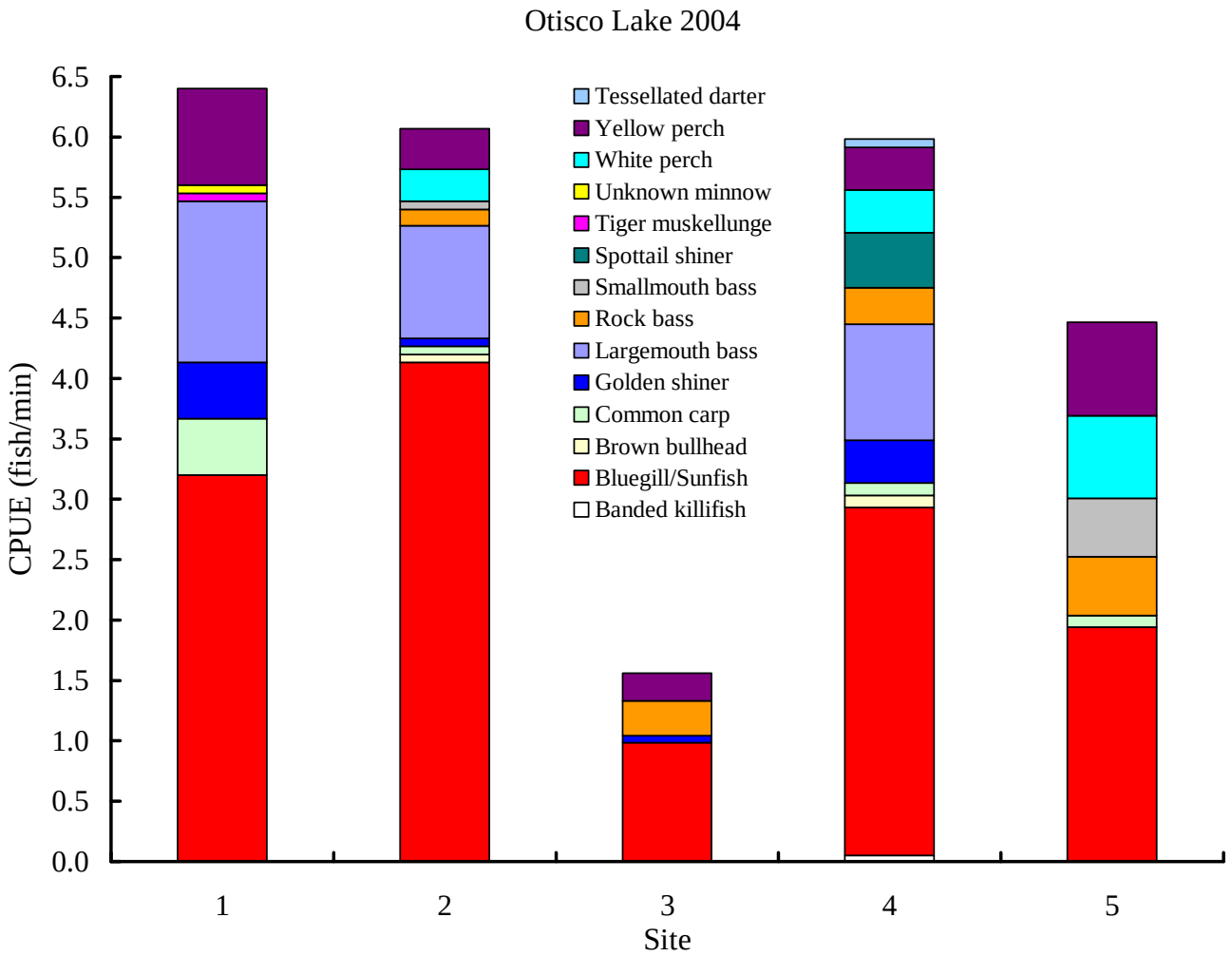


Table 13. Skaneateles Lake estimate of fish community from data collected by electrofishing in 2004, accompanied by a graph of fish species collected per minute (CPUE).

Skaneateles Lake 2004			Total time (min) =	95	
Scientific Name	Common Name	No. Fish	% Composition	CPUE (fish/min)	
Fundulus diaphanus	Banded killifish	1	0.3	0.011	
Lepomis gibbosus	Pumpkinseed	17	5.8	0.179	
Ictalurus nebulosus	Brown bullhead	2	0.7	0.021	
Cyprinus carpio	Common carp	5	1.7	0.053	
Notemigonus crysoleucas	Golden shiner	1	0.3	0.011	
Micropterus salmoides	Largemouth bass	1	0.3	0.011	
Ambloplites rupestris	Rock bass	82	28.0	0.863	
Micropterus dolomieui	Smallmouth bass	137	46.8	1.442	
Notropis hudsonius	Spottail shiner	3	1.0	0.032	
Salmo gairdneri	Rainbow trout	3	1.0	0.032	
Perca flavescens	Yellow perch	41	14.0	0.432	
	TOTAL	293		3.084	

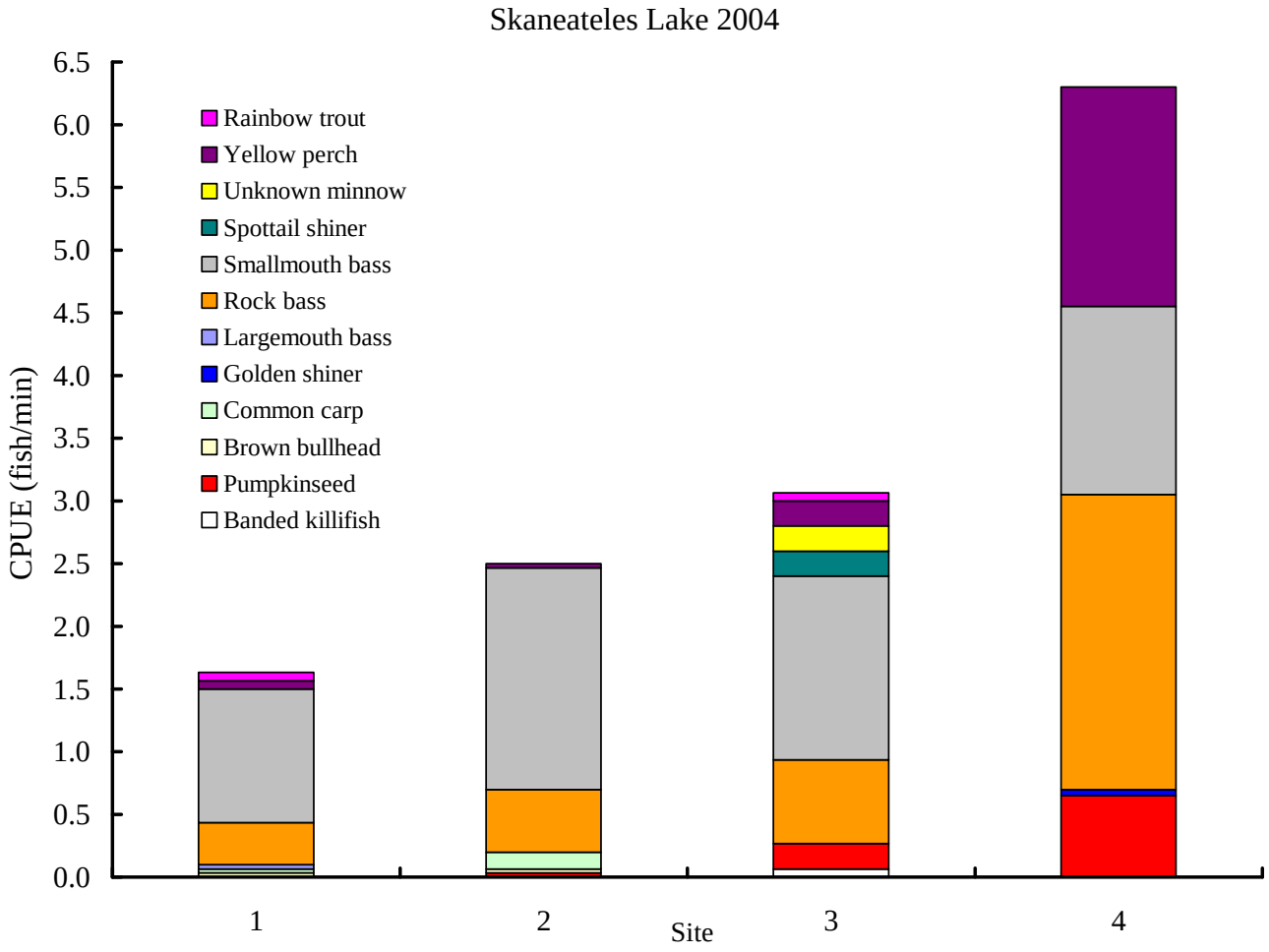


Table 14. Plant species found in Lebanon Reservoir on June 22, 2008.

Scientific Name	Common Name
Ceratophyllum demersum	coontail, hornwort
Chara vulgaris	chara, muskgrass
Elodea sp.	elodea, common waterweed
Myriophyllum spicatum	**Eurasian watermilfoil**
Najas flexilis	slender naiad, bushy naiad
Najas guadalupensis	southern naiad
Nitella sp.	nitella, stonewort
Nitellopsis obtusa	**starry stonewort**
Potamogeton crispus	**curly-leaf pondweed**
Potamogeton pusillus	small pondweed
Potamogeton zosteriformis	flat-stem pondweed
Ranunculus trichophyllus	white water crowfoot
Stuckenia pectinata	sago pondweed
Vallisneria americana	wild celery, eel grass, tapegrass
Zosterella dubia	water stargrass

Table 15. Plant species found in DeRuyter Reservoir on July 25, 2008.

Scientific Name	Common Name
Ceratophyllum demersum	coontail, hornwort
Chara vulgaris	chara, muskgrass
Elodea sp.	elodea, common waterweed
Myriophyllum spicatum	**Eurasian watermilfoil**
Najas guadalupensis	southern naiad
Nitella sp.	nitella, stonewort
Potamogeton sp.	unknown pondweed
Potamogeton pusillus	small pondweed
Potamogeton richardsonii	clasping-leaf pondweed
Potamogeton zosteriformis	flat-stem pondweed
Vallisneria americana	wild celery, eel grass, tapegrass
Zosterella dubia	water stargrass

Table 16. Plant species found in Eatonbrook Reservoir in June 2008

Scientific Name	Common Name
Ceratophyllum demersum	coontail, hornwort
Chara vulgaris	chara, muskgrass
Elodea sp.	elodea, common waterweed
Myriophyllum sibiricum	northern watermilfoil
Myriophyllum spicatum	**Eurasian watermilfoil**
Najas flexilis	slender naiad, bushy naiad
Najas guadalupensis	southern naiad
Nitella sp.	nitella, stonewort
Potamogeton amplifolius	bass weed, large-leaf pondweed
Potamogeton crispus	**curly-leaf pondweed**
Potamogeton foliosus	leafy pondweed
Potamogeton hillii	Hill's pondweed
Potamogeton pusillus	small pondweed
Potamogeton richardsonii	clasping-leaf pondweed
Potamogeton zosteriformis	flat-stem pondweed
Ranunculus trichophyllus	white water crowfoot
Spirodela polyrhiza	great duckweed
Vallisneria americana	wild celery, eel grass, tapegrass
Zosterella dubia	water stargrass

Table 17. Plant biomass and stem summary for Eurasian watermilfoil in Lebanon Reservoir as sampled in years 2002 through 2008 from random locations along the 10’ (3.3 m) contour.

	2002	2003	2004	2005	2006	2007	2008
Total Plant Biomass (g/m^2)	NA	119.6	71.1	261.9	35.2	277.0	251.7
Total *M. spicatum* Biomass (g/m^2)	NA	118.5	65.2	205.6	28.5	32.6	83.8
M. spicatum percent of Total Biomass	NA	99.1%	91.6%	78.5%	81.0%	11.8%	33.3%
# *M. spicatum* stems/m^2	295.0	210.1	176.0	252.5	66.5	109.0	88.0
Average *M. spicatum* stem length (cm)	109.5	109.0	88.2	119.0	46.4	45.5	89.2

Table 18. Lebanon Reservoir dry biomass (g/0.1 m^2) recorded on June 22, 2008 by collecting above sediment plant mass from a 0.1 m^2 quadrat tossed at randomly selected locations.

Sample Point (SP)	Ceratophyllum demersum	Chara vulgaris	Elodea sp.	Myriophyllum spicatum	Najas flexilis	Najas guadalupensis	Nitella sp.	Nitellopsis obtusa	Potamogeton crispus	Potamogeton pusillus	Potamogeton zosteriformis	Ranunculus trichophyllus	Stuckenia pectinata	Vallisneria americana	Zosterella dubia	Total
1	5.13		0.3600	0.7077		0.0155			5.92	47.24	27.25		0.1455			86.77
2	0.0067	0.4609	0.9875	2.17		0.3681			0.4877	9.59	5.50		2.34	0.3930		22.30
3	2.77		1.22	2.90		0.6300				1.67	1.72			3.57		14.48
4	0.0538		0.0956	0.9195		2.70				0.2757				0.8014		4.85
5	0.8068				0.0032	0.0204				2.67	3.40			0.0044		6.90
6		0.4551		0.0013	2.18	0.0063				0.1255				0.4411		3.21
7		0.0137	0.1020		0.1966						0.8938			2.89	0.0379	4.13
8	1.17	1.91	0.8686	0.1409	1.75	0.9600	0.0121		0.0670	0.0055	2.67			0.1979		9.75
9	0.8336	0.1680	0.1266	0.1073	0.3657	0.6736				4.11				1.29	0.2485	7.92
10		6.77	2.69	0.5330	0.1748	1.94	0.0021			1.54	8.91		1.08	0.2056		23.85
11	0.0647	0.6222		0.6340		12.95	0.0097			0.0188						14.30
12		6.98	0.8605	0.1815		4.88			0.0576	0.8571				0.0016		13.82
13			0.0132	123.08							0.7631					123.86
14				30.23												30.23
15		48.24	0.2120			0.2989				0.0199	0.9200	0.0238		1.00		50.71
16	0.0471	18.31	0.4330			6.89				0.4631				0.0676		26.21
17	0.3999			0.4810	0.1490			0.1067		3.36	0.5120			0.1108	0.4030	5.52
18	0.1136	0.0076		4.72		0.1319				5.14						10.11
19	6.09		0.0466	0.7361		0.0982				3.35	0.0314	0.0184		0.8830		11.25
20	0.2270		0.0100	0.0200					3.13	29.73						33.12
gm	17.71	83.94	8.03	167.56	4.82	32.56	0.0239	0.1067	9.66	110.17	52.57	0.0422	3.57	11.86	0.6894	503.30
mean	0.89	4.20	0.40	8.38	0.24	1.63	0.0012	0.0053	0.48	5.51	2.63	0.0021	0.18	0.59	0.0345	25.17
g/m2	**8.86**	**41.97**	**4.01**	**83.78**	**2.41**	**16.28**	**0.01**	**0.05**	**4.83**	**55.08**	**26.29**	**0.02**	**1.78**	**5.93**	**0.34**	**251.65**

Table 19. Eurasian watermilfoil stem numbers and length of stems from each 0.1 m^2 biomass quadrat.

Stem #	Sample #1	Sample #2	Sample #3	Sample #4	Sample #5	Sample #6	Sample #8	Sample #9	Sample #10	Sample #11	Sample #12	Sample #13	Sample #14	Sample #17	Sample #18	Sample #19	Sample #20
1	140	120	177	200	0	5	26	9	120	50	14	76	234	47	51	75	0
2	8	171	110	79			3	4	22	3	12	224	62	12	6	37	
3	31	117	57	9			15	9		20		226	3	50	12	40	
4	16	135	50							8		234	5	17	10	17	
5	25	99	42							17		213	14	9	235		
6	7		114							6		265	51	22	1		
7	8		40							10		220	25	6	25		
8	6		189									69	245		12		
9			58									17	101		23		
10			67									22	7		21		
11			48									233	255		26		
12			14									111	74		12		
13			2									240	143		81		
14			28									161	150		97		
15			26									241	106		18		
16			21									234	110		21		
17												247	12		14		
18												244	5		54		
19												234	135		13		
20												182	14		90		
21												236	7		12		
22												253	112		14		
23												19	99				
24												226	12				
25												254	10				
26												221	94				
27												249	137				
28												94	139				
29												255	68				
30												252	42				
31												6	119				
32												109	116				
33												230	117				
34												228	12				
35												227	17				
36												231					
37												240					
38												274					
39												31					
40												12					
41												234					
42												45					
43												207					
44												226					
45												22					
46												122					
47												141					
48												116					
49												18					
50												122					
51												170					
52												24					
53												239					
54												17					
55												14					
56												15					
57												17					
58												12					
Total	241	642	1043	288	0	5	44	22	142	114	26	9101	2852	163	848	169	0
Average	30.1	128.4	65.2	96.0	0.0	5.0	14.7	7.3	71.0	16.3	13.0	156.9	81.5	23.3	38.5	42.3	0.0

176 total milfoil stems

Mean of 8.8 stems per sample

Mean stem length of 89.20 cm

Table 20. Aquatic plant data recorded from rake-toss sampling in DeRuyter in 2008. Each rake-toss is recorded as either "D" = dense macrophytes; "M" = medium macrophytes; "S" = sparse macrophytes; "T" = trace macrophytes; and/or "O" = no macrophytes. The numbers below are estimates of the percentage of each plant species as part of the whole rake-toss. See Methods for description of rake-toss sampling.

Sample Point (SP)	NAD27 X coord EAST	NAD27 Y coord NORTH	Depth (m) on Date	Rake toss #	Rake Abundance	ABUNDANCE #	Ceratophyllum demersum	Chara vulgaris	Elodea sp.	Myriophyllum spicatum	Najas guadalupensis	Nitella sp.	Potamogeton sp.	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton zosteriformis	Vallisneria americana	Zosterella dubia
DeRuyter	18T 0426632	4740336	3.3	1	S	**2.0**			0	100	0			0		0	0	
2				2	S	**2.0**			60	0	35			0		0	5	
				3	M	**3.0**			0	60	0			35		5	0	
DeRuyter	18T 0426484	4740768	3.3	1	M	**3.0**	0		0	95	5					0		
7				2	M	**3.0**	10		0	2	85					3		
				3	M	**3.0**	18		13	0	60					9		
DeRuyter	18T 0426460	4740820	3.3	1	M	**3.0**	15		35	0	30	0			3	10	7	
8				2	S	**2.0**	15		30	7	0	41			0	7	0	
				3	M	**3.0**	60		10	9	0	20			0	1	0	
DeRuyter	18T 0426360	4741572	3.3	1	M	**3.0**			60	6		0			20	10	4	
17				2	S	**2.0**			35	40		15			0	0	10	
				3	S	**2.0**			20	7		35			3	0	35	
DeRuyter	18T 0426604	4741728	3.3	1	S	**2.0**	0		50	0	40	0				0	10	
21				2	S	**2.0**	0		10	0	0	85				5	0	
				3	S	**2.0**	30		5	50	0	0				10	5	
DeRuyter	18T 0426942	4741594	3.3	1	S	**2.0**	0		3	0	95	0		1		1	0	
25				2	M	**3.0**	2		28	4	28	20		10		0	8	
				3	S	**2.0**	0		2	4	80	8		2		2	2	
DeRuyter	18T 0426992	4741293	3.3	1	S	**2.0**	0		5	0	0	78				2	15	
29				2	S	**2.0**	0.01		0	5	0	5				0	90	
				3	S	**2.0**	0		7	0	3	35				35	20	
DeRuyter	18T 0427349	4740952	3.3	1	M	**3.0**		0	1	20	1	78		0	0	0	0	
33				2	S	**2.0**		0	5	43	40	0		0	4	4	4	
				3	S	**2.0**		15	3	72	0	0		0.01	0	5	5	
DeRuyter	18T 0427558	4740402	3.3	1	S	**2.0**	50		0	50	0.01	0		0		0	0	
38				2	M	**3.0**	44		7	5	1	2		0		1	40	
				3	M	**3.0**	40		30	6	0	0		20		0	4	
DeRuyter	18T 0427587	4740286	3.3	1	M	**3.0**	8		10	69	3			2	4	4	0	
40				2	S	**2.0**	35		0	62	3			0	0	0	0	
				3	D	**4.0**	0		5	70	0			0	3	7	15	

Table 20. (continued) Aquatic plant data recorded from rake-toss sampling in DeRuyter in 2008. Each rake-toss is recorded as either "D" = dense macrophytes; "M" = medium macrophytes; "S" = sparse macrophytes; "T" = trace macrophytes; and/or "O" = no macrophytes. The numbers below are estimates of the percentage of each plant species as part of the whole rake-toss. See Methods for description of rake-toss sampling.

Sample Point (SP)	NAD27 X coord EAST	NAD27 Y coord NORTH	Depth (m) on Date	Rake toss #	Rake Abundance	ABUNDANCE #	Ceratophyllum demersum	Chara vulgaris	Elodea sp.	Myriophyllum spicatum	Najas guadalupensis	Nitella sp.	Potamogeton sp.	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton zosteriformis	Vallisneria americana	Zosterella dubia
DeRuyter	18T 0427604	4740080	3.3	1	M	**3.0**			5	55	0	0				40	0	
42				2	M	**3.0**			30	7	0	60				3	0	
				3	M	**3.0**			15	27	5	15				0	38	
DeRuyter	18T 0427604	4739838	3.3	1	S	**2.0**	0		60	5	32	0				0	3	
45				2	M	**3.0**	15		50	8	25	2				0	0	
				3	T	**1.0**	0		0	0	0	0				100	0	
DeRuyter	18T 0427608	4739736	3.3	1	S	**2.0**	37	4	10	1	42	0		0	6	0		0
46				2	S	**2.0**	40	2	46	0	7	0		2	0	3		0
				3	S	**2.0**	35	0	45	5	10	2		0	0	0		3
DeRuyter	18T 0427581	4739616	3.3	1	S	**2.0**	60	0		15				10		15		
48				2	S	**2.0**	0	0		85				15		0		
				3	S	**2.0**	8	8		74				5		5		
DeRuyter	18T 0427514	4739443	3.3	1	M	**3.0**	0		7	50	40		0		3	0		
51				2	M	**3.0**	0		0	75	0		5		20	0		
				3	M	**3.0**	25		0	60	0		6		2	7		
DeRuyter	18T 0426932	4749842	3.3	1	M	**3.0**	0		65	22						3	10	
67				2	D	**4.0**	61		7	30						0	2	
				3	D	**4.0**	65		8	22						2	3	
DeRuyter	18T 0427048	4740056	3.3	1	M	**3.0**	60		5	10						0	0	25
69				2	M	**3.0**	78		6	12						4	0	0
				3	M	**3.0**	50		35	7						4	4	0
DeRuyter	18T 0427025	4740192	3.3	1	M	**3.0**			75	15					4		6	
71				2	M	**3.0**			92	0					0		8	
				3	M	**3.0**			90	0					0		10	
DeRuyter	19T 0426812	4740018	3.3	1	M	**3.0**	45		30	16	2				4			3
77				2	M	**3.0**	0		15	85	0				0			0
				3	M	**3.0**	0		0	100	0				0			0
DeRuyter	18T 0426749	4740064	3.3	1	M	**3.0**	40		35	17	0				5		3	
79				2	M	**3.0**	35		5	12	0				45		3	
				3	M	**3.0**	60		4	16	0.01				10		10	

Table 21. Aquatic plant data recorded from rake-toss sampling in Eatonbrook in 2008. Each rake-toss is recorded as either "D" = dense macrophytes; "M" = medium macrophytes; "S" = sparse macrophytes; "T" = trace macrophytes; and/or "O" = no macrophytes. The numbers below are estimates of the percentage of each plant species as part of the whole rake-toss. See Methods for description of rake-toss sampling.

Sample Point (SP)	NAD27 X coord EAST	NAD27 Y coord NORTH	Depth (m) on Date	Rake toss #	Rake Abundance	ABUNDANCE #	Ceratophyllum demersum	Chara vulgaris	Elodea sp.	Myriophyllum sibiricum	Myriophyllum spicatum	Najas flexilis	Najas guadalupensis	Nitella sp.	Potamogeton amplifolius	Potamogeton crispus	Potamogeton foliosus	Potamogeton hillii	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton zosteriformis	Ranunculus trichophyllus	Spirodela polyrhiza	Vallisneria americana	Zosterella dubia
Eatonbrook	18T 443100	4745140	3.3	1	M	**3.0**	0		68		25		2		2						1			2	
1				2	D	**4.0**	10		49		40		0		0						1			0	
				3	M	**3.0**	0		58		38		0		3						1			0	
Eatonbrook	18T 443190	4745190	3.3	1	M	**3.0**	0		84		14				2						0			0	0
2				2	M	**3.0**	0		50		40				5						2			0	3
				3	D	**4.0**	15		53		28				3						0			1	0
Eatonbrook	18T 443240	4745230	3.3	1	D	**4.0**	8		64		0				8					5	15				
3				2	M	**3.0**	0		63		12				10					5	10				
				3	M	**3.0**	0		60		15				25					0	0				
Eatonbrook	18T 443530	4745440	3.3	1	M	**3.0**			75		15										3			0	7
4				2	M	**3.0**			89		10										1			0.01	0
				3	M	**3.0**			70		30										0			0	0
Eatonbrook	18T 443700	4745740	3.3	1	M	**3.0**			96		4		0		0						0		0	0.01	
5				2	D	**4.0**			96		2		0.01		1						0		0	1	
				3	D	**4.0**			98		0		0		0						1		1	0.01	
Eatonbrook	18T 443760	4746090	3.3	1	M	**3.0**	0		88		10									1	1	0	0.01	0.01	
6				2	M	**3.0**	0		75		17									5	1	1	0	1	
				3	M	**3.0**	8		55		17									0	20	0	0	0	
Eatonbrook	18T 443720	4746100	3.3	1	M	**3.0**	4		0		6									90				0.01	
7				2	M	**3.0**	15		0		25									60				0	
				3	M	**3.0**	0		2		3									95				0	
Eatonbrook	18T 443500	4745810	3.3	1	M	**3.0**			61		19										0			1	19
8				2	M	**3.0**			80		10										3			0	7
				3	M	**3.0**			90		7										1			0	2
Eatonbrook	18T 443300	4745520	3.3	1	D	**4.0**			97		1				0						2			0	0
9				2	M	**3.0**			95		4				0						0			0	1
				3	M	**3.0**			85		8				0.01						3			1	3
Eatonbrook	18T 442920	4745510	3.3	1	M	**3.0**		0	54		30		0				10				5			1	
10				2	M	**3.0**		0	90		3		0				0				7			0	
				3	M	**3.0**		1	60		30		1				8				0			0.01	

Table 21. (continued) Aquatic plant data recorded from rake-toss sampling in Eatonbrook in 2008. Each rake-toss is recorded as either "D" = dense macrophytes; "M" = medium macrophytes; "S" = sparse macrophytes; "T" = trace macrophytes; and/or "O" = no macrophytes. The numbers below are estimates of the percentage of each plant species as part of the whole rake-toss. See Methods for description of rake-toss sampling.

Sample Point (SP)	NAD27 X coord EAST	NAD27 Y coord NORTH	Depth (m) on Date	Rake toss #	Rake Abundance	ABUNDANCE #	Ceratophyllum demersum	Chara vulgaris	Elodea sp.	Myriophyllum sibiricum	Myriophyllum spicatum	Najas flexilis	Najas guadalupensis	Nitella sp.	Potamogeton amplifolius	Potamogeton crispus	Potamogeton foliosus	Potamogeton hillii	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton zosteriformis	Ranunculus trichophyllus	Spirodela polyrhiza	Vallisneria americana	Zosterella dubia
Eatonbrook	18T 442030	4745940	3.3	1	M	**3.0**	4		1		35	0	0.01	0							60			0.01	0.01
12				2	M	**3.0**	12		22		10	0	0.01	0							55			1	0
				3	M	**3.0**	4		25		10	3	1	2							50			5	0
Eatonbrook	18T 442220	4745760	3.3	1	M	**3.0**			98		0				0						0	0		2	0.01
13				2	M	**3.0**			61		1				8						25	1		1	3
				3	M	**3.0**			99		0				0.01						1	0		0	0
Eatonbrook	18T 442240	4745740	3.3	1	M	**3.0**	2		43	0	0				14				0	17	21	0		3	0.01
14				2	S	**2.0**	0		30	0	10				0				0	0	60	0		0	0
				3	M	**3.0**	0		70	3	0				0				0.01	15	5	6		0.01	1
Eatonbrook	18T 442300	4745670	3.3	1	S	**2.0**			85		10								0		5			0	
15				2	M	**3.0**			63		6								0		6			25	
				3	M	**3.0**			69		15								5		10			1	
Eatonbrook	18T 442320	4745650	3.3	1	M	**3.0**	1		90		0.01		1		0			1				0		5	2
16				2	M	**3.0**	0		98		1		0		0			0				0		0	1
				3	M	**3.0**	2		85		4		0		4			0				2		0.01	3
Eatonbrook	18T 442390	4745570	3.3	1	M	**3.0**			20	10	2				0			2		15		11			40
17				2	M	**3.0**			60	0	35				5			0		0		0			0
				3	M	**3.0**			55	0	5				40			0		0		0			0
Eatonbrook	18T 442470	4745390	3.3	1	D	**4.0**	0		20	0	35							0		2	2			0	41
18				2	M	**3.0**	0		90	0	6							0		0	1			0	3
				3	M	**3.0**	2		35	1	2							1		3	25			1	30
Eatonbrook	18T 442580	4745160	3.3	1	M	**3.0**	2	0	59	0	20		5		3	0		0			0	0		1	10
19				2	M	**3.0**	0	0.01	69	0.01	19		0		3	0.01		0.01			4	1		3	1
				3	M	**3.0**	2	0	71	0	8		12		3	0		0			1	0		2	1
Eatonbrook	18T 442480	4744700	3.3	1	M	**3.0**		0	59	1	6		20		8						4			0	2
20				2	S	**2.0**		0.01	25	0	30		10		15						2			16	2
				3	M	**3.0**		0	9	0	90		0		1						0			0	0.01

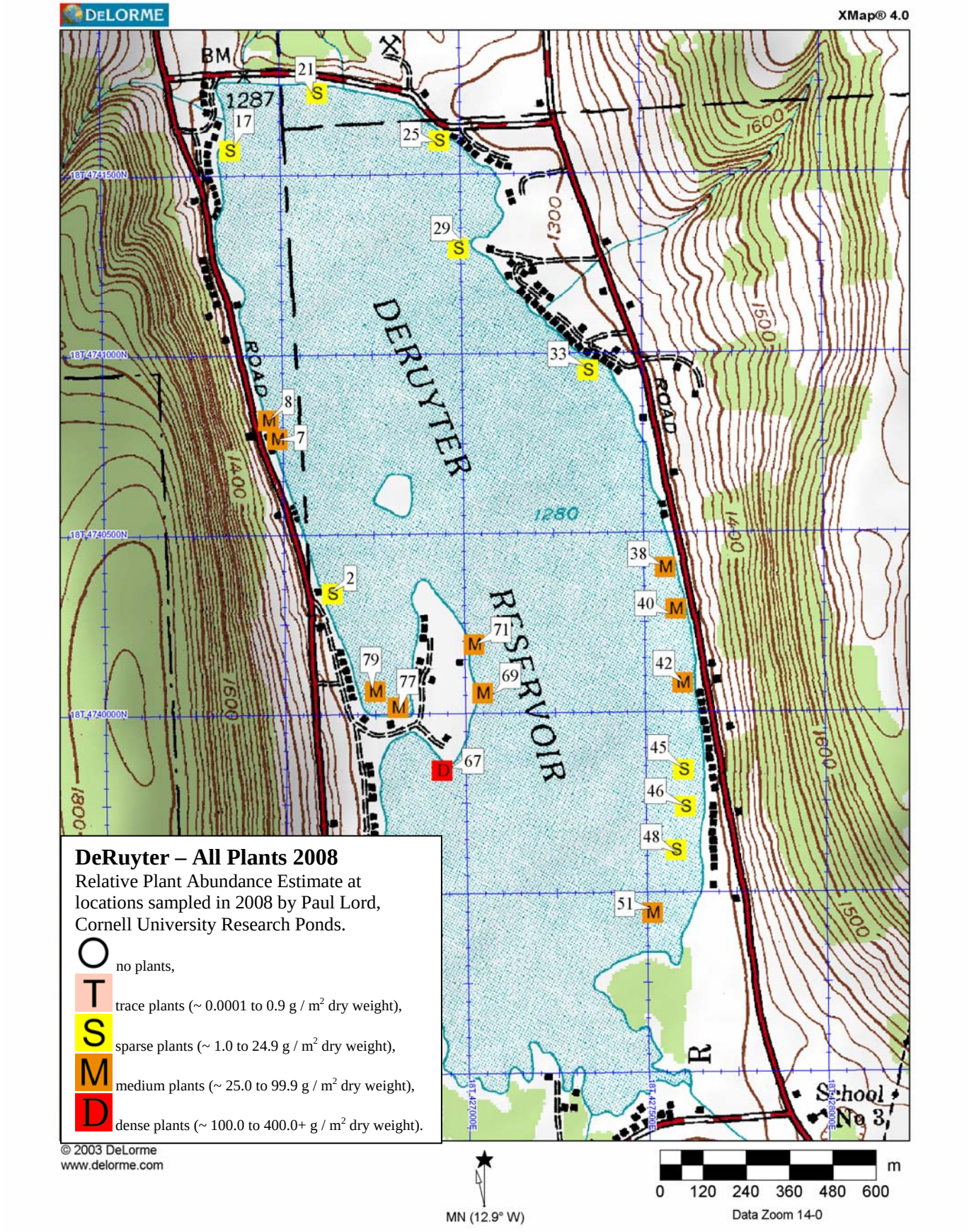


Figure 3. DeRuyter Reservoir: Macrophyte Presence and Abundance at Sampled Locations in 2008.

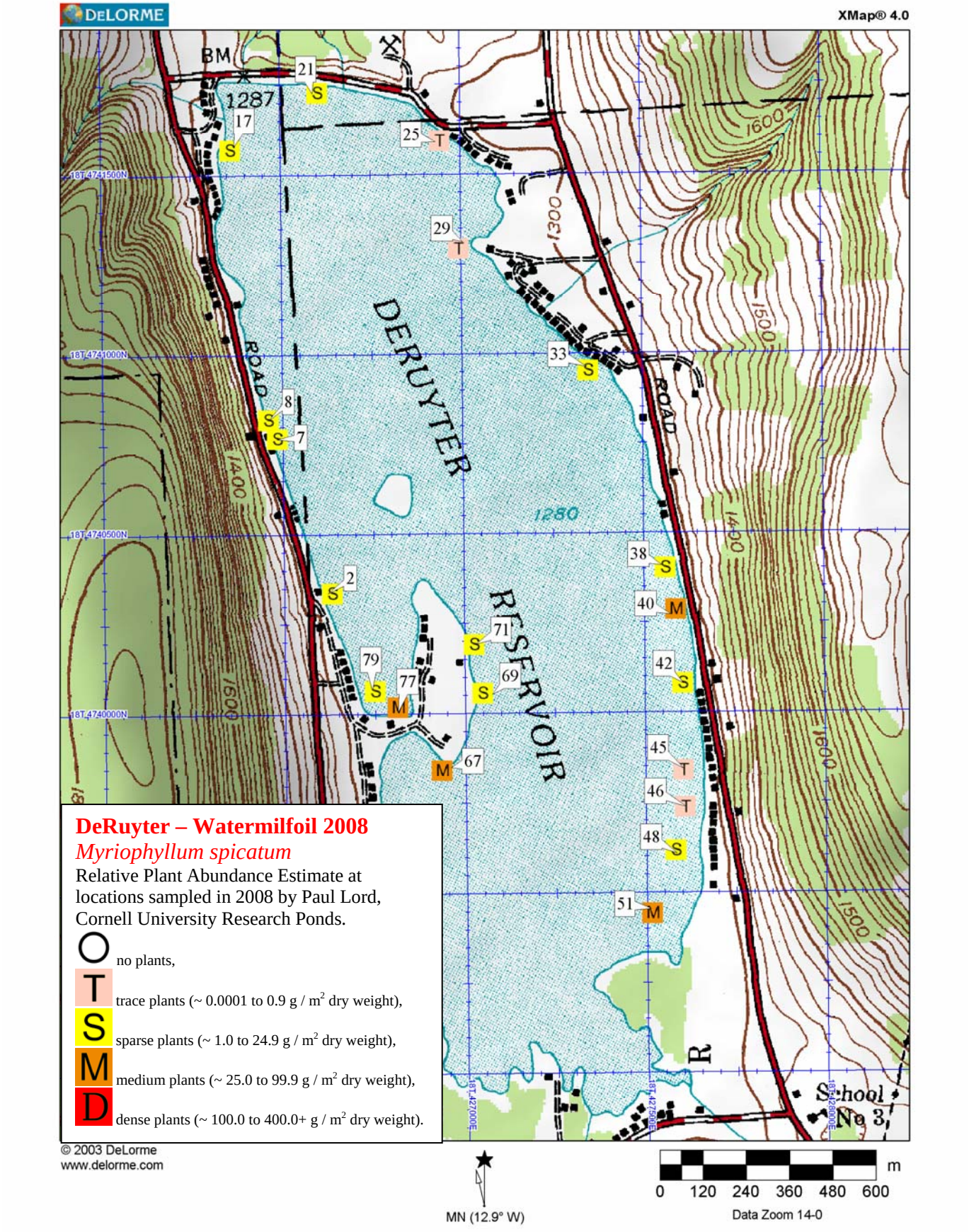


Figure 4. DeRuyter Reservoir: Watermilfoil Presence and Abundance at Sampled Locations in 2008.

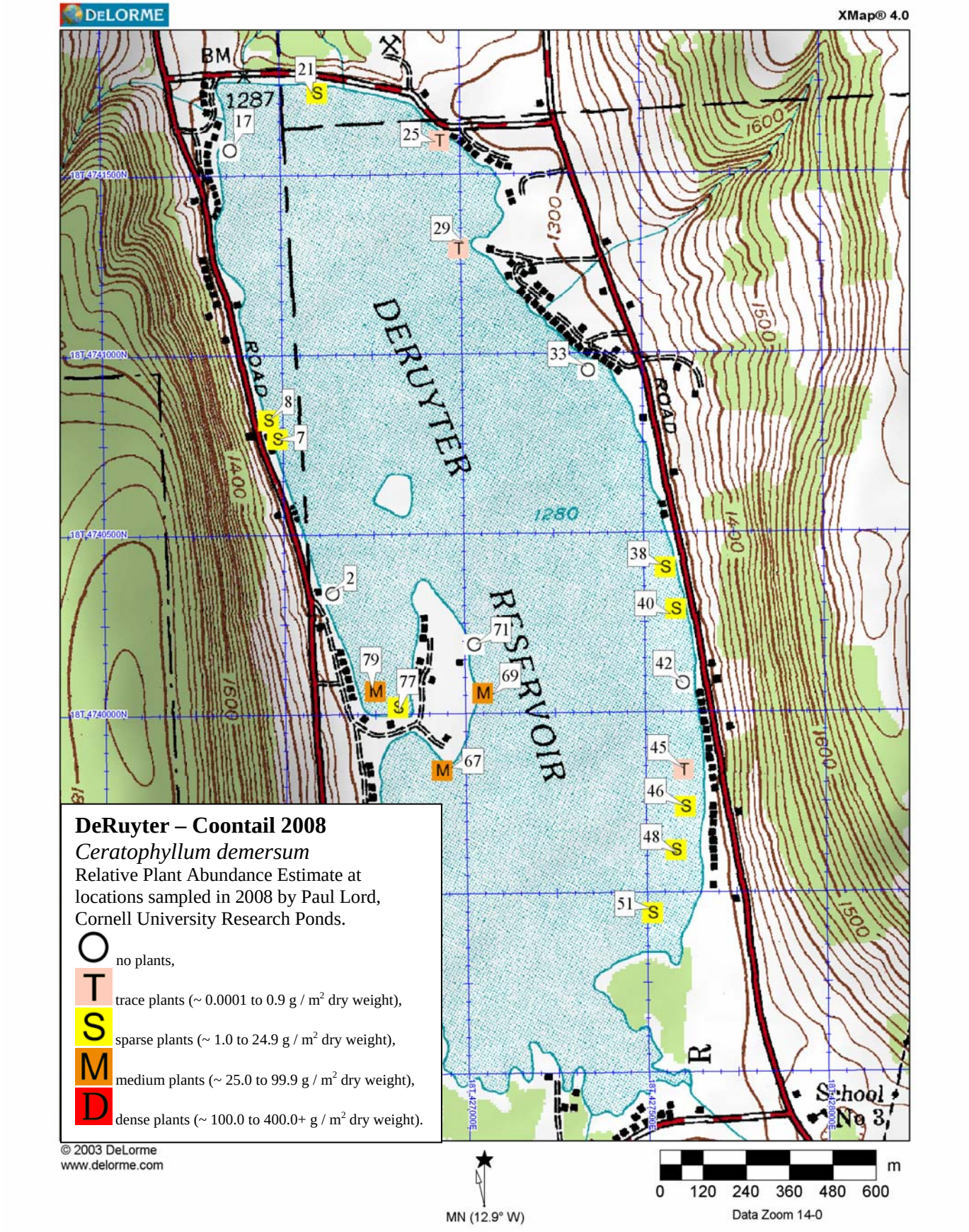


Figure 5. DeRuyter Reservoir: Coontail Presence and Abundance at Sampled Locations in 2008.

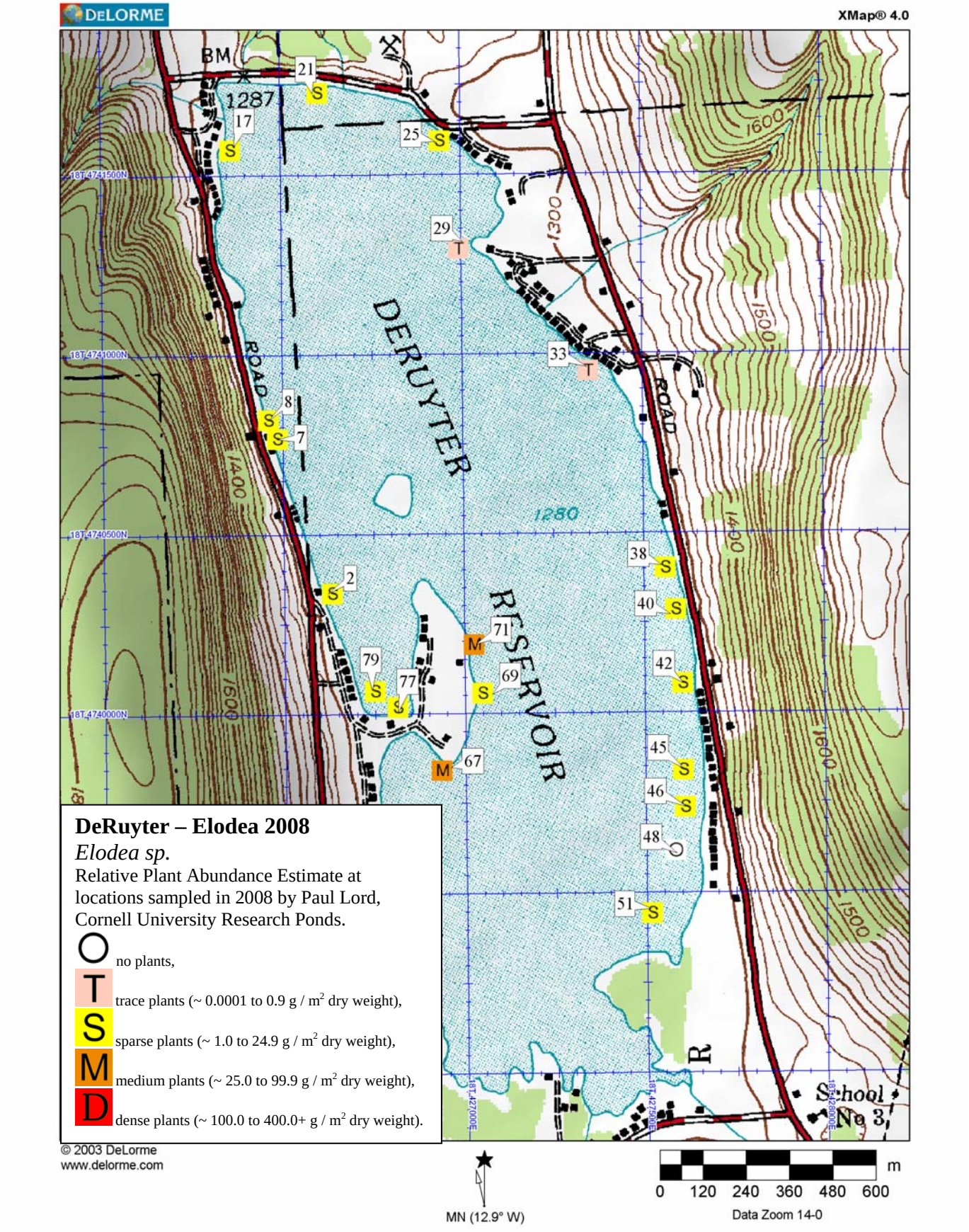


Figure 6. DeRuyter Reservoir: Elodea Presence and Abundance at Sampled Locations in 2008.

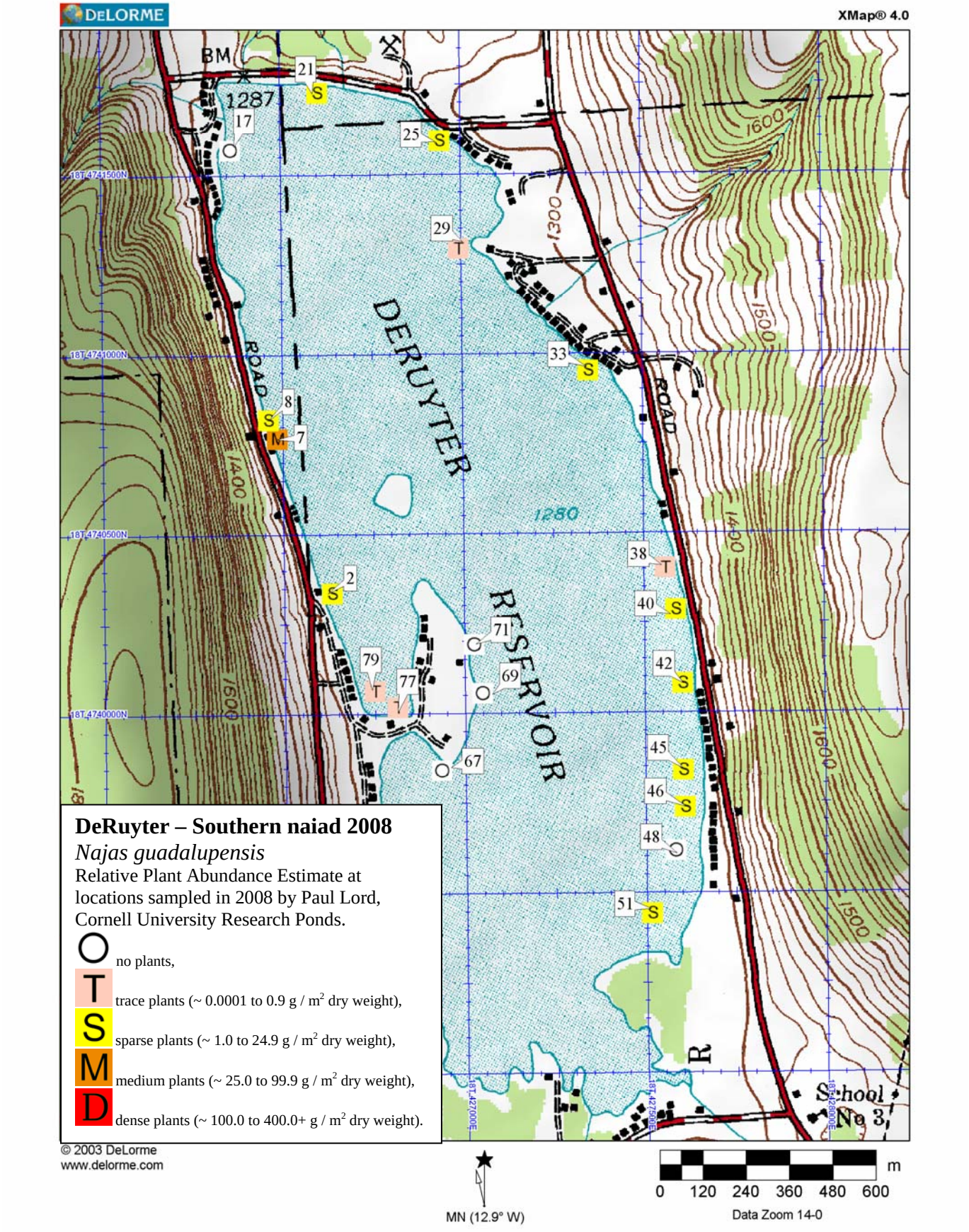


Figure 7. DeRuyter Reservoir: Southern naiad Presence and Abundance at Sampled Locations in 2008.

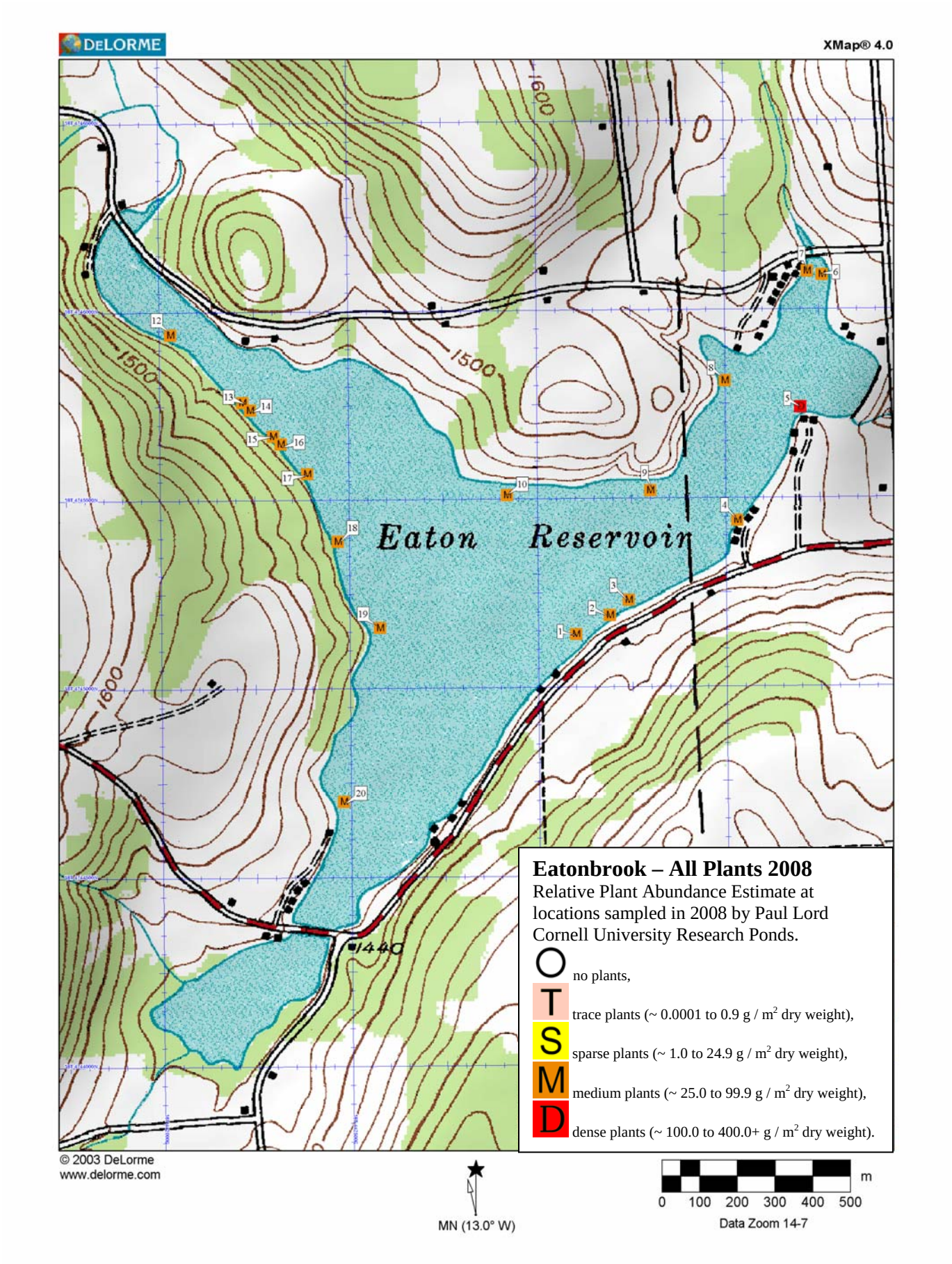


Figure 8. Eatonbrook Reservoir: Macrophyte Presence and Abundance at Sampled Locations in 2008.

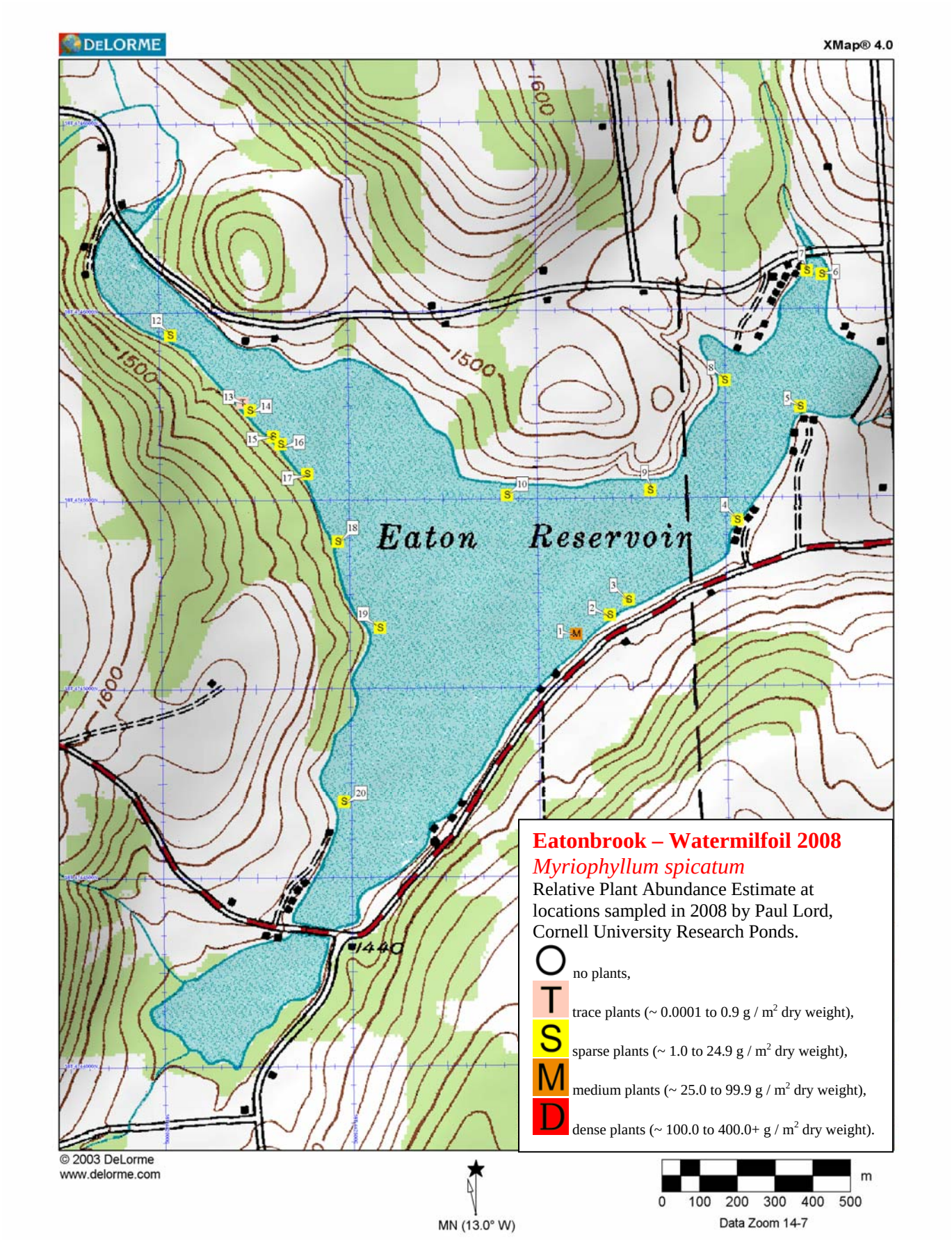


Figure 9. Eatonbrook Reservoir: Watermilfoil Presence and Abundance at Sampled Locations in 2008.

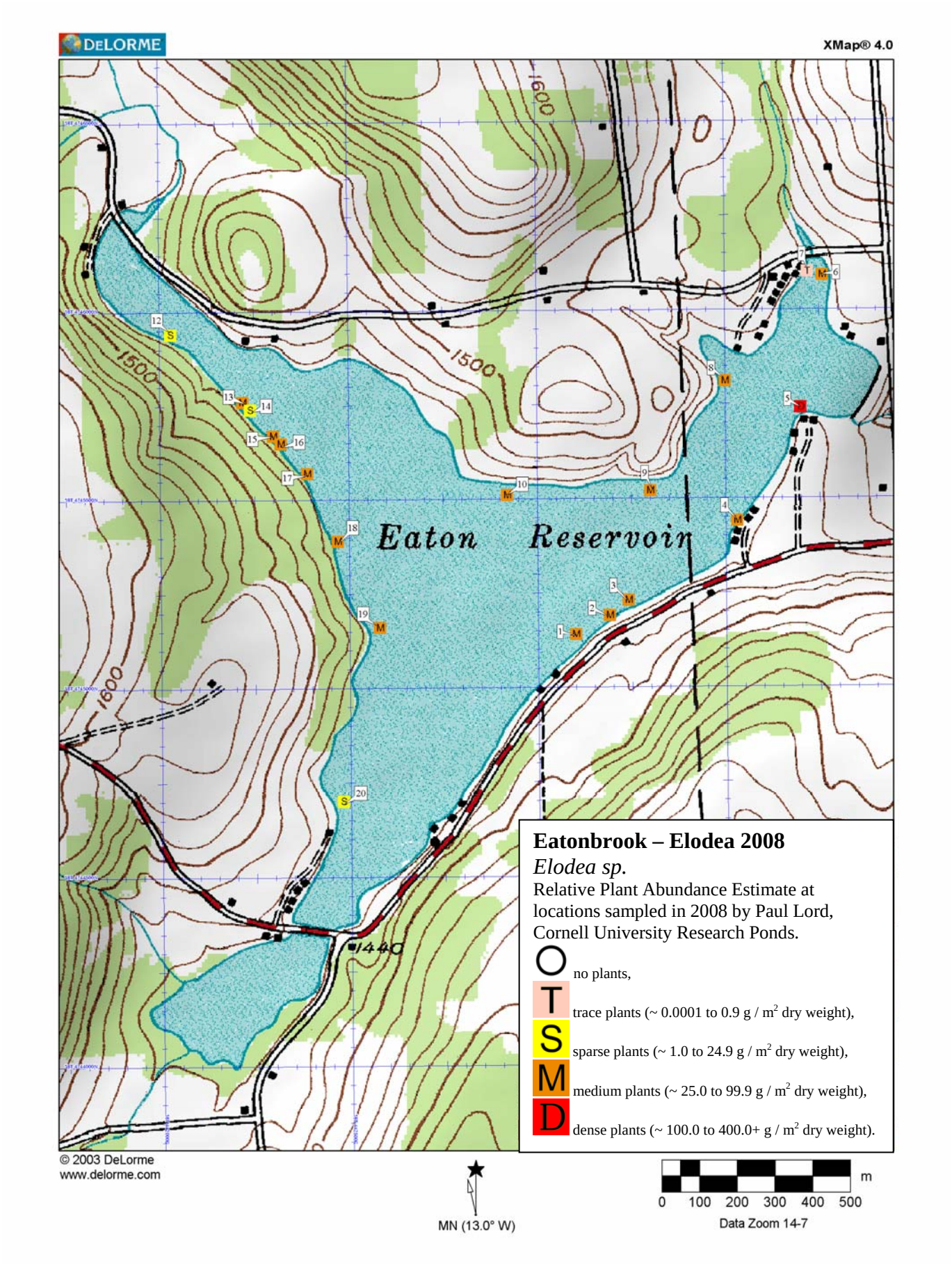


Figure 10. Eatonbrook Reservoir: Elodea Presence and Abundance at Sampled Locations in 2008.

References

Johnson, R. L. 2008. Aquatic Plant and Aquatic Macroinvertebrate Monitoring in Chautauqua Lake during 2007. Racine-Johnson Aquatic Ecologists, 1185 Ellis Hollow Road Ithaca, NY 14850.

Johnson, R. L., P. H. Lord and J. M. Riggs. 2005. The Importance of Aquatic Plants, "Weeds", to Chautauqua Lake's Ecosystem. CURP, Dept of Ecology & Evolutionary Biology, Corson Hall, Cornell University, Ithaca, NY. 2004 Project Completion Report. 85p.

Lord, P. H. 2003. Augmentation of the "Aquatic Macrophyte Moth" (*Acentria ephemerella*) into Lebanon Reservoir for control of Eurasian water-milfoil (*Myriophyllum spicatum*) and follow-up monitoring of fish, insects and water-milfoil. BFS Technical Report # 18. SUNY Oneonta Bio Fld. Sta, Cooperstown, NY. 68p.

Lord, P. H. 2004. Biocontrol of Eurasian water-milfoil in Central New York State: *Myriophyllum spicatum* L., its insect herbivores and associated fish. BFS Occ. Ppr. #38. SUNY Oneonta Bio Fld. Sta, Cooperstown, NY. 69p.

Lord, P. H. and R. L. Johnson. 2005. Monitor and evaluate herbivorous insect impacts on Eurasian watermilfoil (*Myriophyllum spicatum*) growth in Lebanon Reservoir in conjunction with stocking of walleye (*Sander vitreus*) and smallmouth bass (*Micropterus dolomieu*). 2004 Rpt for Madison County Planning Department. Cornell University Research Ponds, Dept of Ecol & Evol Bio. Cornell University, Ithaca, NY 14853.

Lord, P. H. and R. L. Johnson. 2006. Year 2: Monitor and evaluate herbivorous insect impacts on Eurasian watermilfoil (*Myriophyllum spicatum*) growth in Lebanon Reservoir in conjunction with stocking of walleye (*Sander vitreus*) and smallmouth bass (*Micropterus dolomieu*). 2005 Rpt for Madison County Planning Department. Cornell University Research Ponds, Dept of Ecol & Evol Bio. Cornell University, Ithaca, NY 14853.

Lord, P. H. and R. L. Johnson. 2007. Year 3: Monitor and evaluate herbivorous insect impacts on Eurasian watermilfoil (*Myriophyllum spicatum*) growth in Lebanon Reservoir in conjunction with stocking of walleye (*Sander vitreus*) and smallmouth bass (*Micropterus dolomieu*). 2006 Rpt for Madison County Planning Department. Cornell University Research Ponds, Dept of Ecol & Evol Bio. Cornell University, Ithaca, NY 14853.

Lord, P. H. and R. L. Johnson. 2008. Year 4: Monitor and evaluate herbivorous insect impacts on Eurasian watermilfoil (*Myriophyllum spicatum*) growth in Lebanon Reservoir in conjunction with stocking of walleye (*Sander vitreus*) and smallmouth bass (*Micropterus dolomieu*). 2007 Rpt for Madison County Planning Department. Cornell University Research Ponds, Dept of Ecol & Evol Bio. Cornell University, Ithaca, NY 14853.

Madsen, J. D. 1999. Point and line intercept methods for aquatic plant management. APCRP Technical Notes Collection (TN APCRP-M1-02), U.S. Army Engineer Research and Development Center, Vicksburg, MS. 16 p. www.wes.army.mil/el/aqua.