

Lake Chelan 2023 Algae Summary

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1 Introduction

Lake Chelan is the longest (81 km) and deepest (>400 m) natural lake in Washington, formed by glacial retreat at the end of the last Ice Age. Based on water quality data collected in the 1980s, it is considered an oligotrophic lake (Rector and Hallock 1990) and has some of the clearest waters in the state. The Stehekin River is the primary tributary to the lake; the primary outlet is the Chelan River. Lake Chelan is used extensively for recreation and fisheries (Schoen and Beauchamp 2010). Lake Chelan's water level is controlled by a dam operated by the Chelan County PUD for multiple purposes, including power generation. Other water withdrawals are made for municipal drinking water and irrigation uses. Development in the watershed is concentrated around the shallower Wapato Basin, consisting primarily of agriculture, cattle grazing, logging, and residences (Rector and Hallock 1990).

Given the lake's importance for recreation and drinking water, there are concerns about the growth of algae in nearshore areas. One species of note is the invasive alga *Didymosphenia geminata* or "Didymo" (Figure 1). *Didymosphenia* grows in low nutrient waters and has become established in rivers on most continents, and is widespread in western North America (Spaulding and Elwell 2007). *Didymosphenia* is a stalked diatom that can form thick mats and is considered a nuisance species. It is hypothesized that *Didymosphenia* spreads with human vectors (e.g., fishing equipment; Bothwell et al. 2009), though recent studies suggest that changing environmental conditions are also facilitating range expansion (e.g., Lavery et al. 2014). *Didymosphenia* has been found in a number of locations in Washington (Kumar et al. 2009), including the Chelan River. Regardless of the reasons for its range expansion, lake users should be aware of the presence of this invasive species and follow best practices to prevent the spread of this and other aquatic invasive species (e.g., Clean, Drain, Dry; Play, Clean, Go; WA Invasive Species Council 2021).

Objectives: The purpose of our study was to document algal taxonomic richness and dominance at six sites along the shoreline of Lake Chelan, with the additional goal of creating an online algal image library to help future researchers identify algae from Lake Chelan. The image library is currently under construction at http://snoringcat.net/AlgaePage/index.php?path=Algae//Lake_Chelan.

2 Methods

The algae samples were collected from the shoreline of Lake Chelan by Lillie Tomlinson, Western Washington University, and the staff of the Lake Chelan Research Institute. Nearshore planktonic algae (phytoplankton) and attached algae (periphyton) were collected on July 31–August 1; August 24, September 16, and October 19, 2023 at Congdon Bay; Congdon headland; the Crystal View Estates Marina; Purtteman Creek; Lowry property; and the Sunset Marina at dock A22. Additional periphyton samples were collected at the Crystal View Estates Marina and Sunset Marina on May 1, and from Roses Lake on August 24. Site locations and GPS coordinates are included in Figures 2–9.

Nearshore phytoplankton were collected using a 20 μm plankton net attached to a hand-held line that was towed through the water column from slightly below the water surface to slightly above the lake sediments. Due to the low algal density in the lake, each phytoplankton sample required approximately 30–60 tows to collect sufficient algal material for identification of dominant taxa.¹ Periphyton was collected by scraping visible algae from submerged areas on the docks or from nearshore, underwater solid substrates. The phytoplankton and periphyton samples were kept cool and out of direct sunlight until they could be transported to the Institute for Watershed Studies laboratory. In the laboratory, the samples were split, with one portion remaining unpreserved and the remaining sample preserved with 4% formalin. The preserved and unpreserved samples were sent to Dr. Robin Matthews² for identification.

All algal identifications represent our best effort to provide accurate classifications using standard taxonomic keys and online sources. Unknown taxa that could be separated using morphological features were given a unique name (e.g., symmetric biraphid diatoms). Where possible, the taxa included in this report were identified to genus. Some groups were placed in broad categories due to taxonomic complexity or the difficulty of separating genera that have been renamed due to advances in genetic taxonomy. For example, *Limnothrix/Lyngbya* includes all species still assigned to the genus *Lyngbya*, plus former *Lyngbya* species recently reassigned to *Limnothrix* (e.g., *Limnothrix birgei*).

¹The word “taxa” (singular “taxon”) is used to distinguish unique groups of organisms.

²Current address: 1529 Old Buena Vista Rd., Buena Vista, VA, 24416

3 Results and Discussion

The periphyton and phytoplankton taxa identified in the 2023 samples are listed in Appendix A, beginning on page 30 (Tables A1–A3). The Appendix tables include all taxa observed in the samples collected at each location, including live and preserved algae, as well as separately labeled samples that were collected at the same site on the same day (e.g., CONB/A and CONB/B collected on August 23). The dominant taxa present in the July 31–October 19, 2023 periphyton and phytoplankton samples are listed in Table 1. Site-specific summaries of the percent of each major algal group are included in Tables 2–7. Figures 10–16 show the total and site-specific algae counts for each sampling date.

3.1 Dominant Taxa

For this report, dominant taxa are defined as species that were present in all or nearly all fields of view during microscopic observation; co-dominant taxa were present at the same or slightly lower density (Table 1). Many samples were either diverse or sparse; either case resulted in being listed as having no dominant taxa.

The dominant taxa in periphyton samples were mostly filamentous green algae (e.g., *Bulbochaete*, *Cladophora*, *Oedogonium*, *Spirogyra*, *Zygnema*), diatoms (*Diatoma* and *Tabellaria*), or filamentous bluegreen algae (*Dichothrix* and *Scytonema*). These taxa are common in lakes, and while they become a nuisance to lake shore residents and other recreational users, they are not likely to produce algal toxins. When the sample was dominated by bluegreen algae (e.g., Lowery property), the periphyton formed dark green, orange, or black tufts. When the sample was dominated by filamentous green algae (e.g., Sunset Marina and Crystal View Estates Marina), the periphyton formed bright green or yellowish-white tufts, depending on whether the filaments are healthy or decomposing.

The phytoplankton samples were often diverse, with no dominant taxa, which is common when no algal blooms are present. The most common taxa, when dominance occurred, were colonial greens (*Sphaerocystis*), colonial bluegreen algae (*Chroococcus*), and diatoms. Notably absent were blooms containing potentially toxic bluegreen algae like *Dolichospermum* and *Microcystis*. Filaments of *Limnothrix* and other members of the Oscillatoriales were present, but not at densities normally associated with harmful cyanotoxin concentrations.

3.2 Phytoplankton vs. Periphyton Samples

The phytoplankton samples usually contained more taxa than periphyton samples collected on the same date at the same site. This difference was more obvious in the August and September samples, which tended to have high numbers of taxa compared to October. The periphyton samples often contained dense mats of attached filamentous bluegreen algae, diatoms, and green algae. The phytoplankton samples contained many of the filamentous algae present in the periphyton samples, but also contained typical planktonic taxa like *Chroococcus* and *Sphaerocystis*.

3.3 Seasonal and Site Patterns

The total number of phytoplankton taxa at each site was slightly higher in mid-August and September compared to early August and October, especially at Congdon Bay (Figure 10). The Congdon Bay, Congdon headland, Lowry property, and Sunset Marina sites usually had more phytoplankton taxa than the other sites. The periphyton seasonal patterns were not as clear, with sites showing considerable variability in the number of taxa. Part of the differences between phytoplankton and periphyton seasonal patterns could be due to sampling design because the periphyton samples were collected from visible attached growth while the phytoplankton samples represent repeated tows through the water column.

3.4 Incidental Samples

Periphyton samples were collected on May 1, 2023 at Crystal View Estates Marina and Sunset Marina and preserved using Lugol's iodine solution. One additional periphyton samples was collected on August 24, 2023 from Roses Lake; this sample was processed by L. Tomlinson using the same methods as the regularly collected samples. All samples were sent to Dr. Robin Matthews for algal identifications. Because these samples were not collected using the same methods or at the same frequency as the other sites, the data are not included in the summary figures and tables, but are listed in Table A3.

The algae taxa present in the Crystal View Estates Marina and Sunset Marina samples were similar to samples collected later in the year. One taxon, *Prymnesium* (**Haptophyta**), was collected in the Crystal View Estates Marina sample; this genus is not common in freshwater lakes and was not observed in other Lake Chelan samples. The Roses Lake periphyton sample contained several taxa that were not present in the Lake Chelan samples, including *Arthrospira* and *Spirulina* (bluegreen algae); *Rhoicosphenia* (diatom); and *Euglena* (euglenoid). These four taxa are common, so their presence in Roses Lake does not provide any clear information about habitat differences.

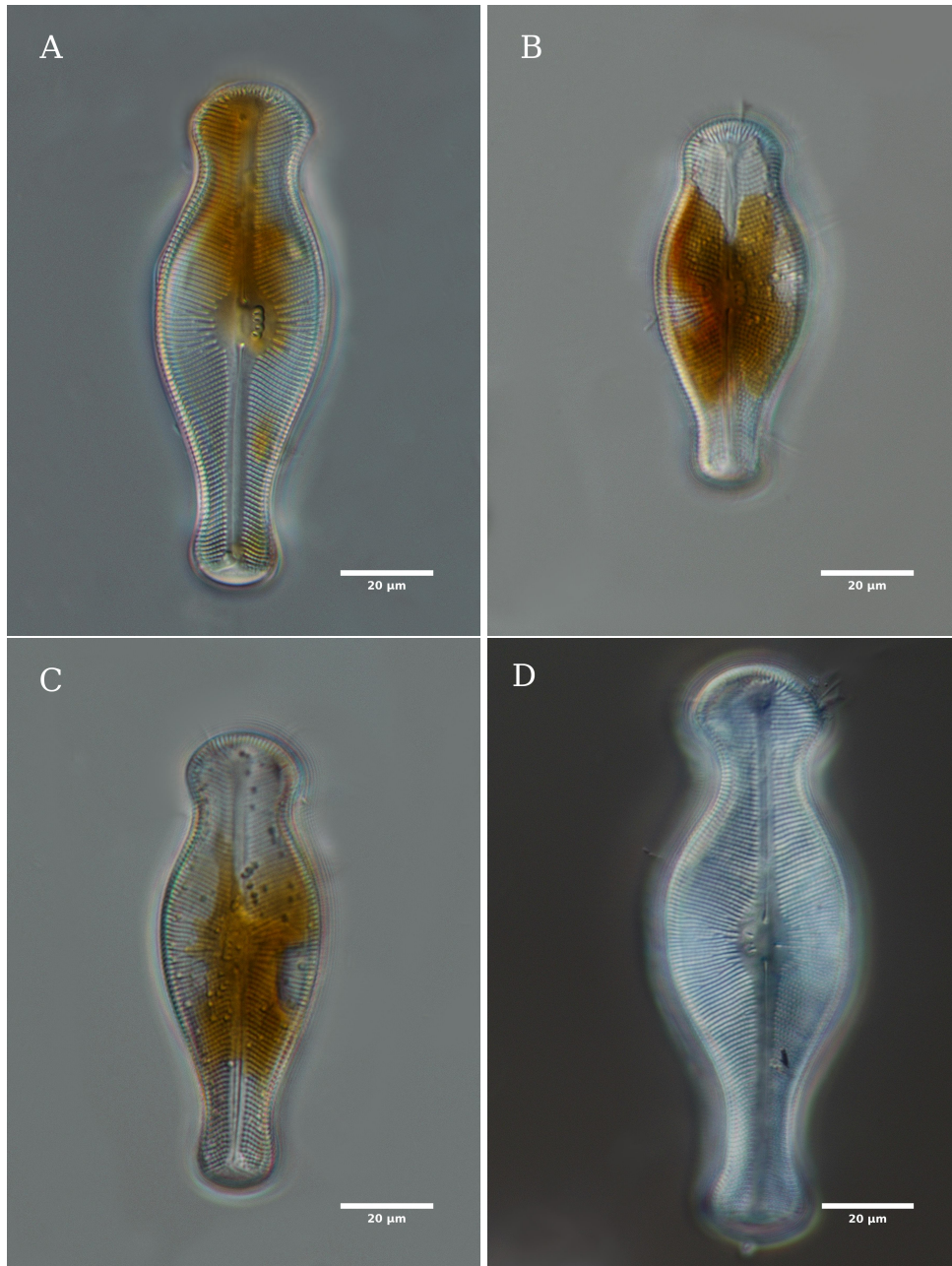
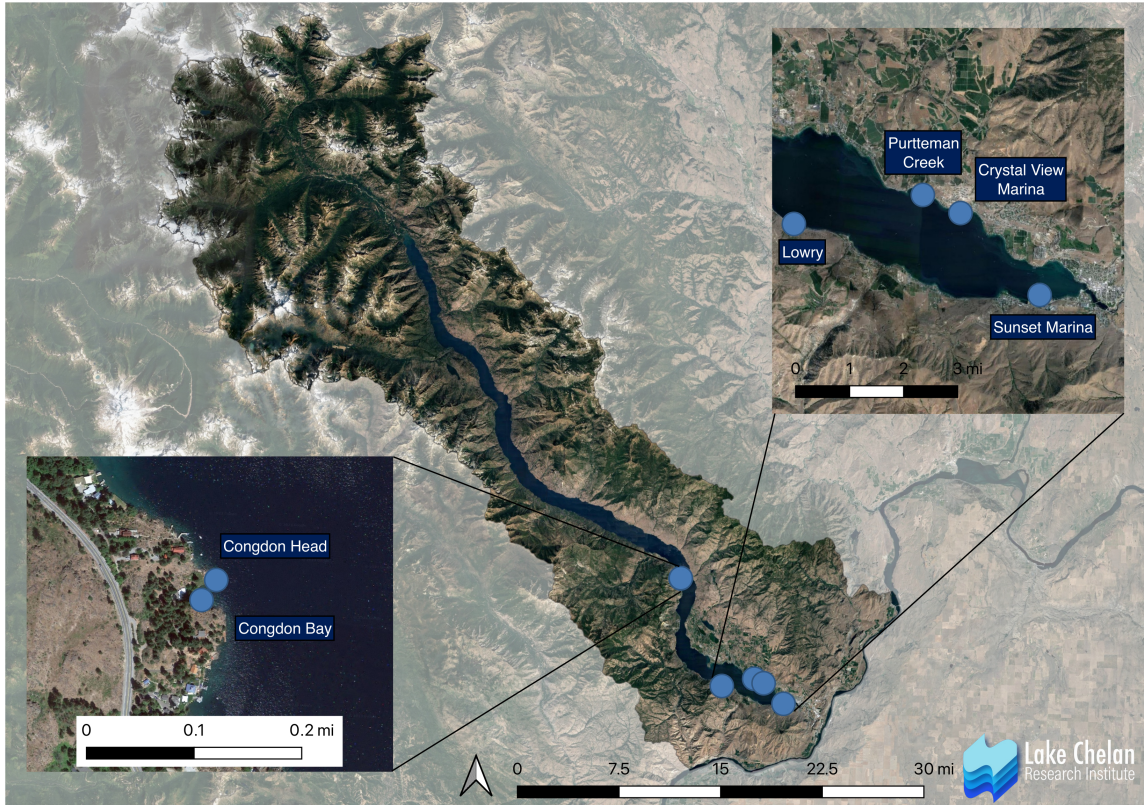


Figure 1: *Didymosphenia geminata* from the Chelan River (A-C) and Purteman Creek (D).



Sites	GPS locations	
Congdon Bay (CONB)	47°58'01"N	120°12'39"W
Congdon headland (CONH)	47°58'02"N	120°12'38"W
Crystal View Estates Marina (CRYV)	47°51'31"N	120°04'20"W
Lowry property (LOWR)	47°51'14"N	120°08'18"W
Roses Lake (ROSES; sampled once)	47°54'11"N	120°09'28"W
Purtteman Creek (PURC)	47°51'47"N	120°05'15"W
Sunset Marina, dock A22 (SUN)	47°50'15"N	120°02'22"W

Figure 2: Lake Chelan 2023 sampling locations. This figure and the GPS coordinates were provided by Nate Hough-Snee, Lake Chelan Research Institute, PO Box 1547, Chelan, WA.

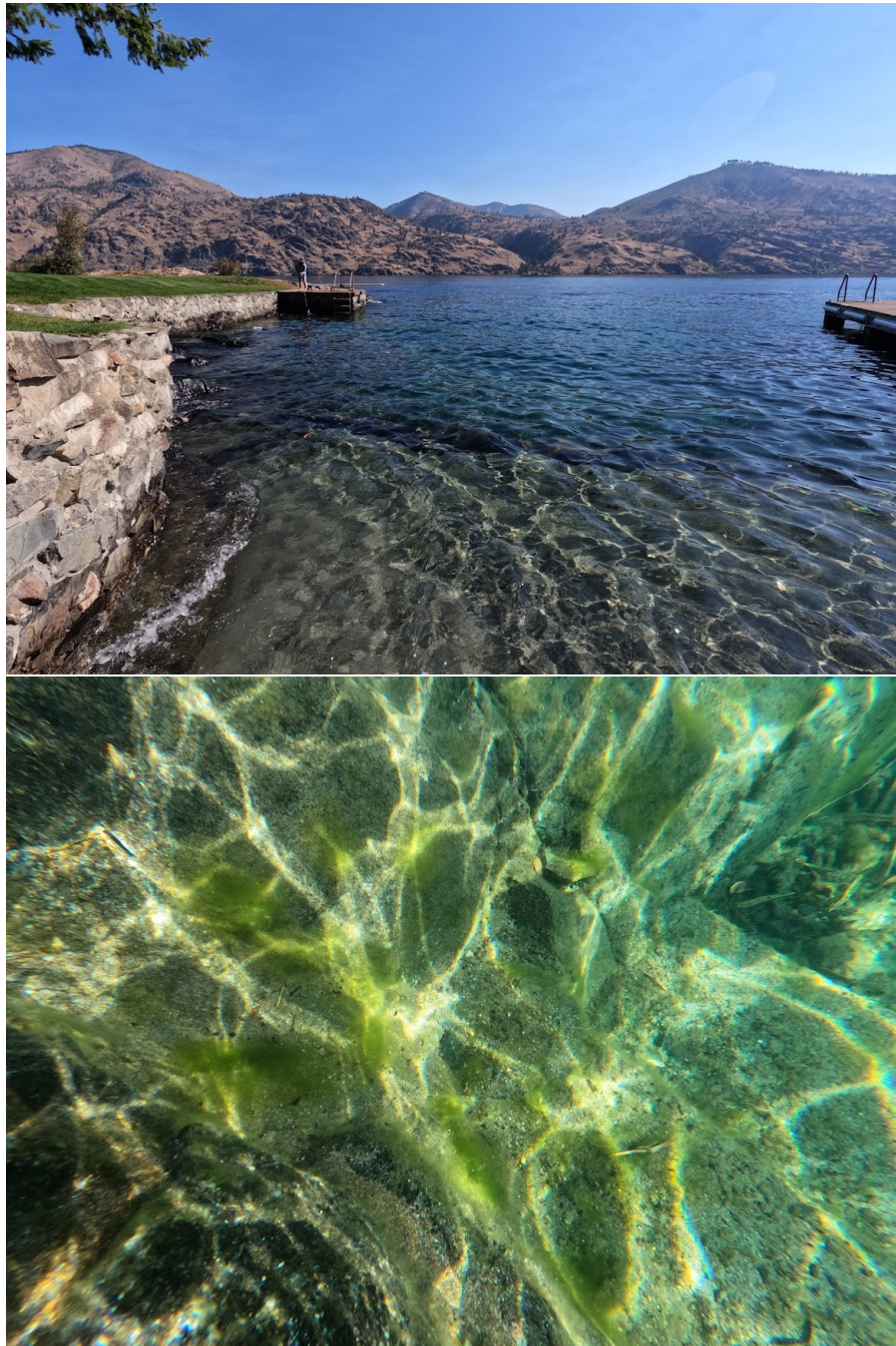


Figure 3: Congdon Bay (CONB) is protected from wave action, and is primarily bedrock and sand with depths that range from emergent at low pool to fully inundated (3–4 ft; 0.9–1.2 m) at high pool. This area is highly protected and serves as a swimming and fishing area surrounded by lawns, concrete breakwaters, and docks.



Figure 4: Congdon headland (CONH) is on a backwater point that faces northwest and is exposed to wave action from boats. The adjacent land is primarily shallow bedrock and lawns.



Figure 5: The Crystal View Estates Marina (CRYV) is a private floating dock marina just off the side of Highway 150. The sampling dock is perennially inundated and ranges from 20 ft (6 m) to over 30 ft (9 m) deep depending on lake stage.



Figure 6: Lowry property (LOWR) is a riparian margin of watered and fertilized turf grass adjacent to a private residence.

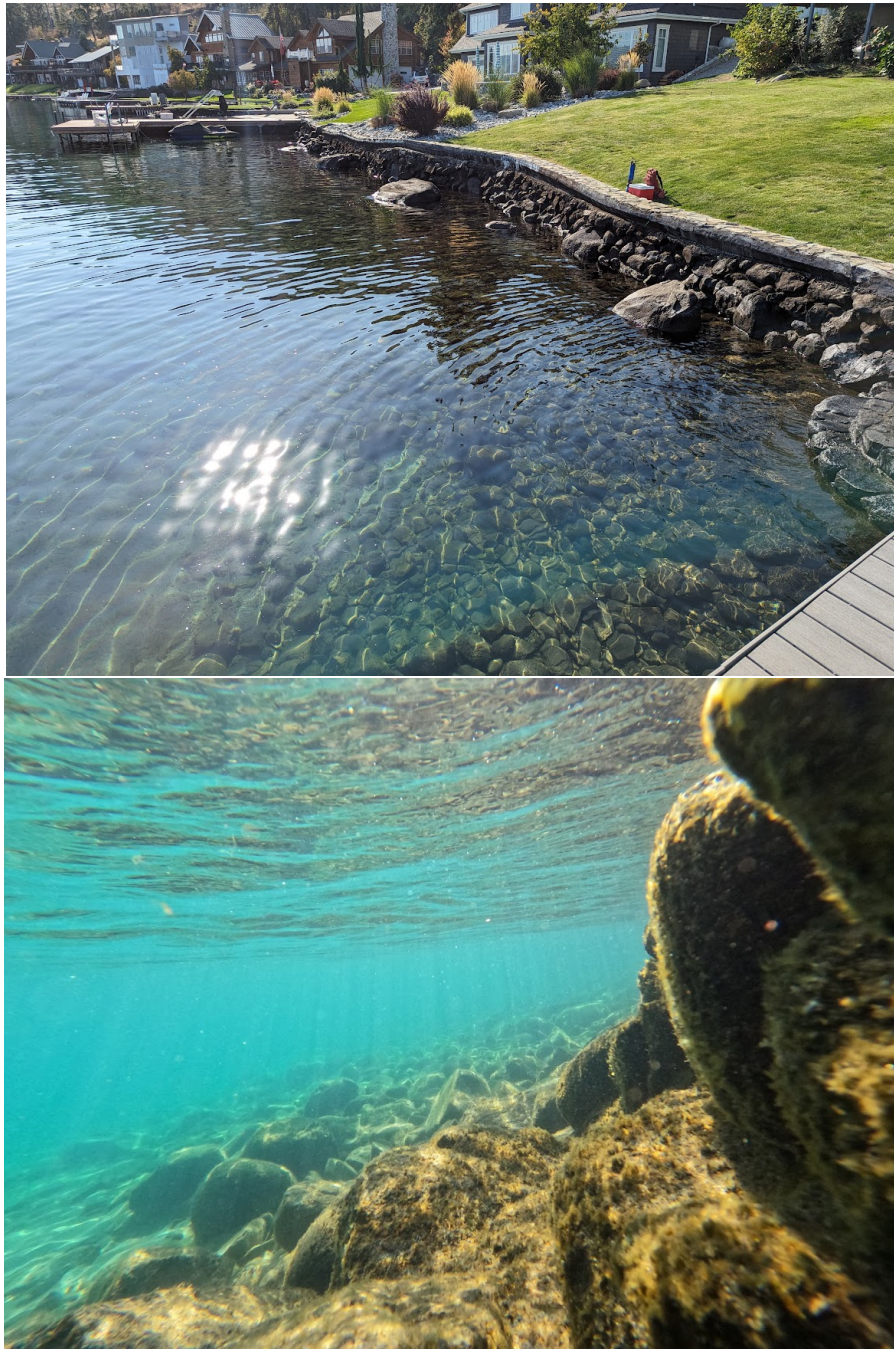


Figure 7: Lowry property (LOWR), continued. The substrate is large cobbles embedded in sand, with a stone and concrete break wall.



Figure 8: The Purtteman Creek (PURC) tributary discharges perennially to a sandy, cobble beach (low winter stage) or the lake (high summer stage) and is immediately adjacent to Highway 150.



Figure 9: Sunset Marina (SUN) is a large, wave protected, private marina with floating docks. This area is perennially deep, with water depths up to 40 ft (12 m) at high pool.

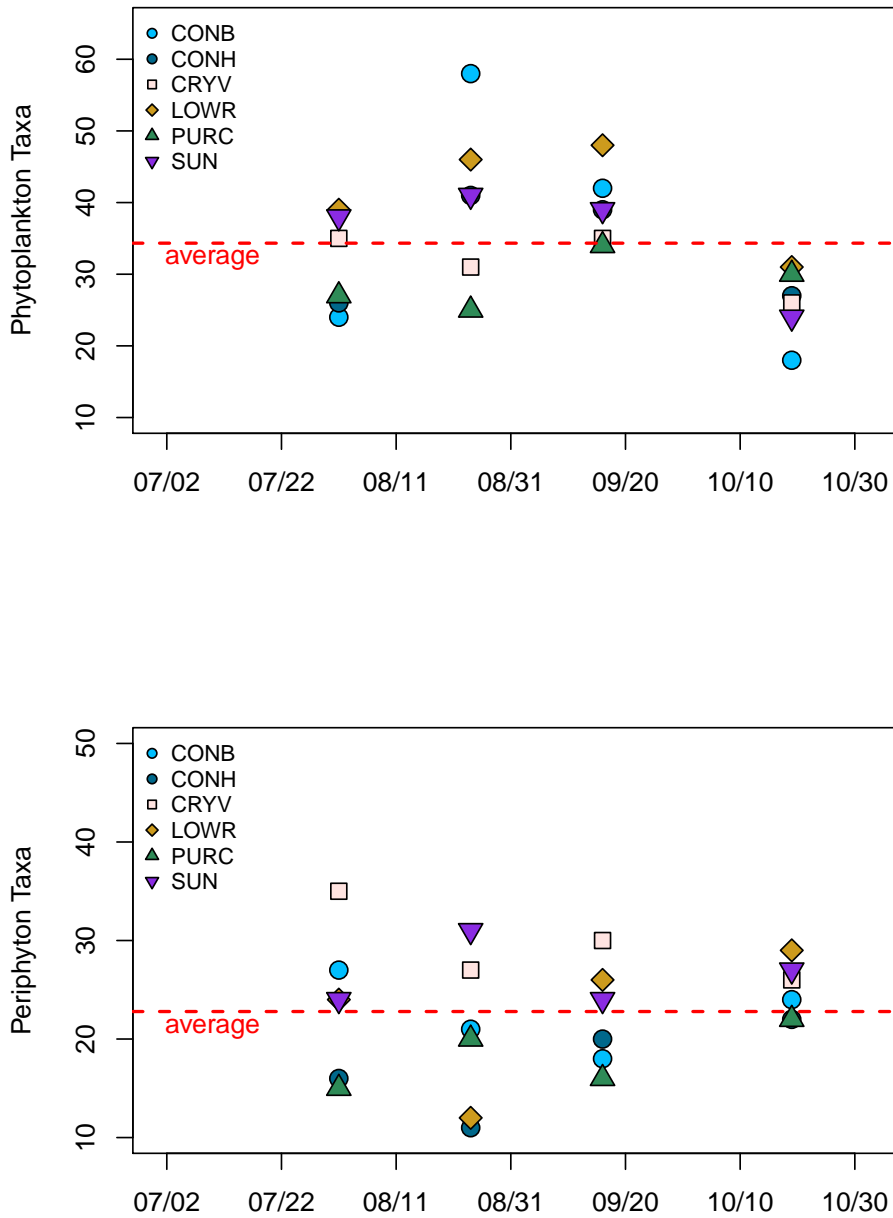


Figure 10: Lake Chelan total algal genera, August 1 – October 19, 2023. The horizontal red line indicates the average number of taxa in all counts. See Figure 2 for site abbreviations.

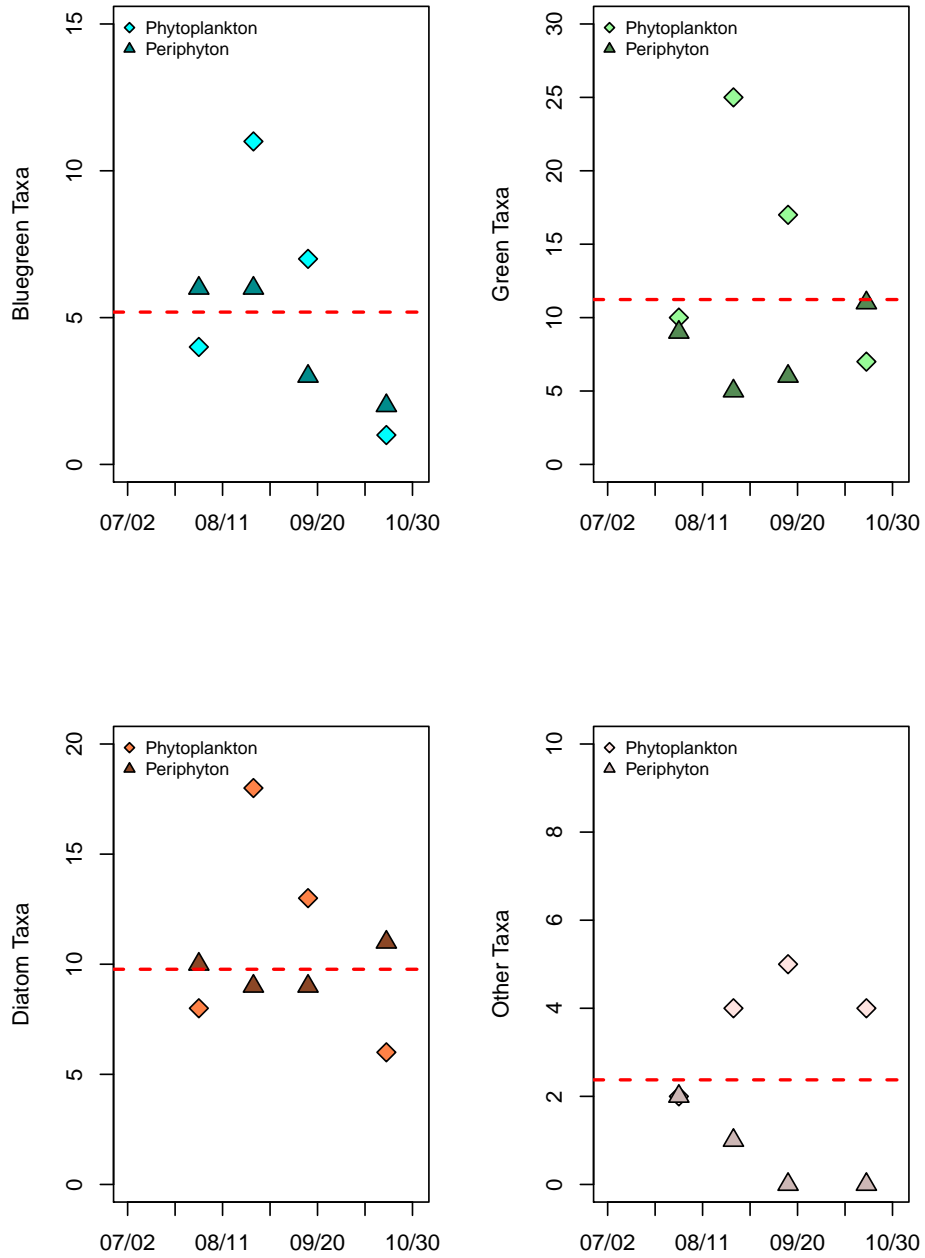


Figure 11: Summary of Congdon Bay algal genera by major groups, August 1 – October 19, 2023. The horizontal red line indicates the average number of taxa for that group.

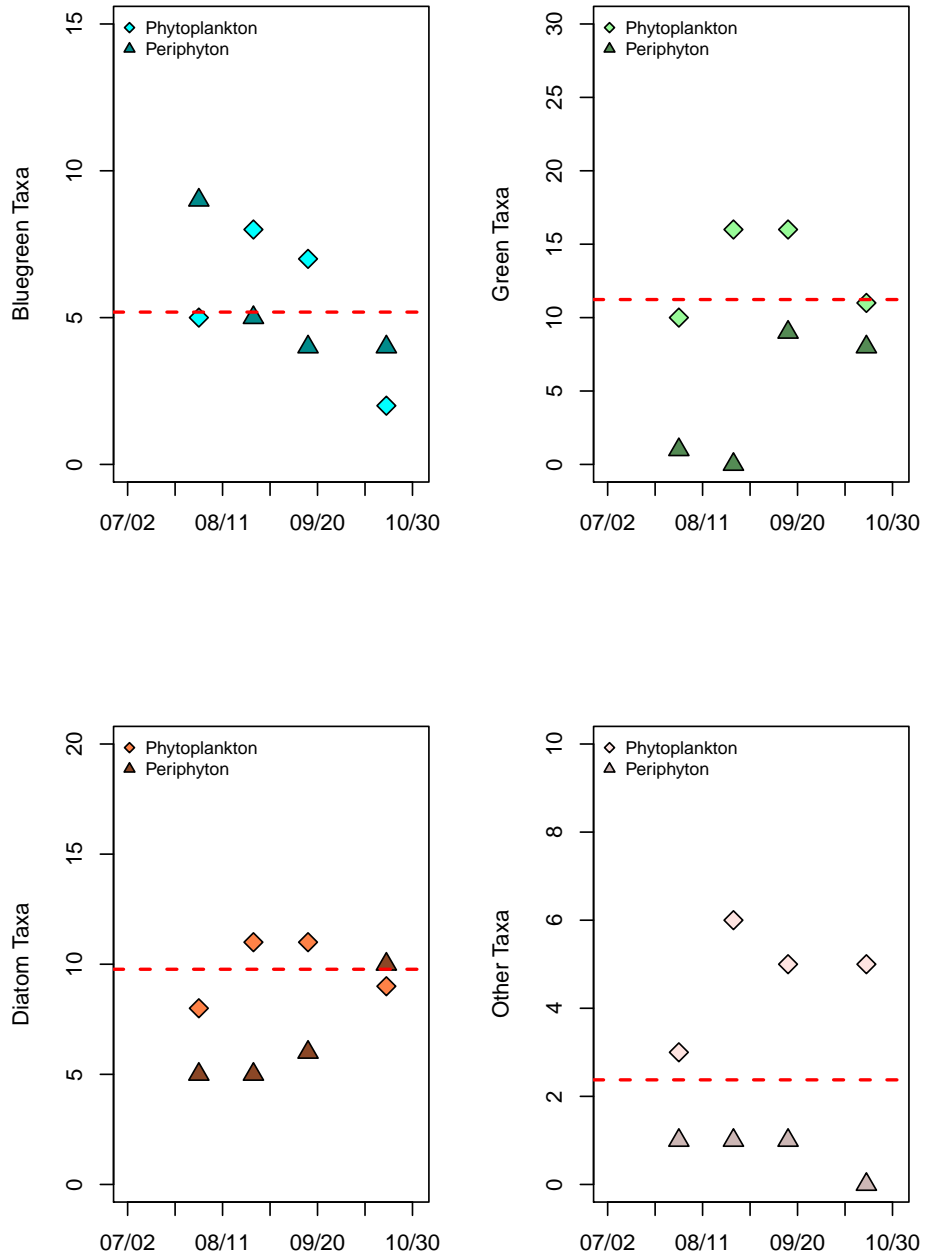


Figure 12: Summary of Congdon headland algal genera by major groups, August 1 – October 19, 2023. The horizontal red line indicates the average number of taxa for that group.

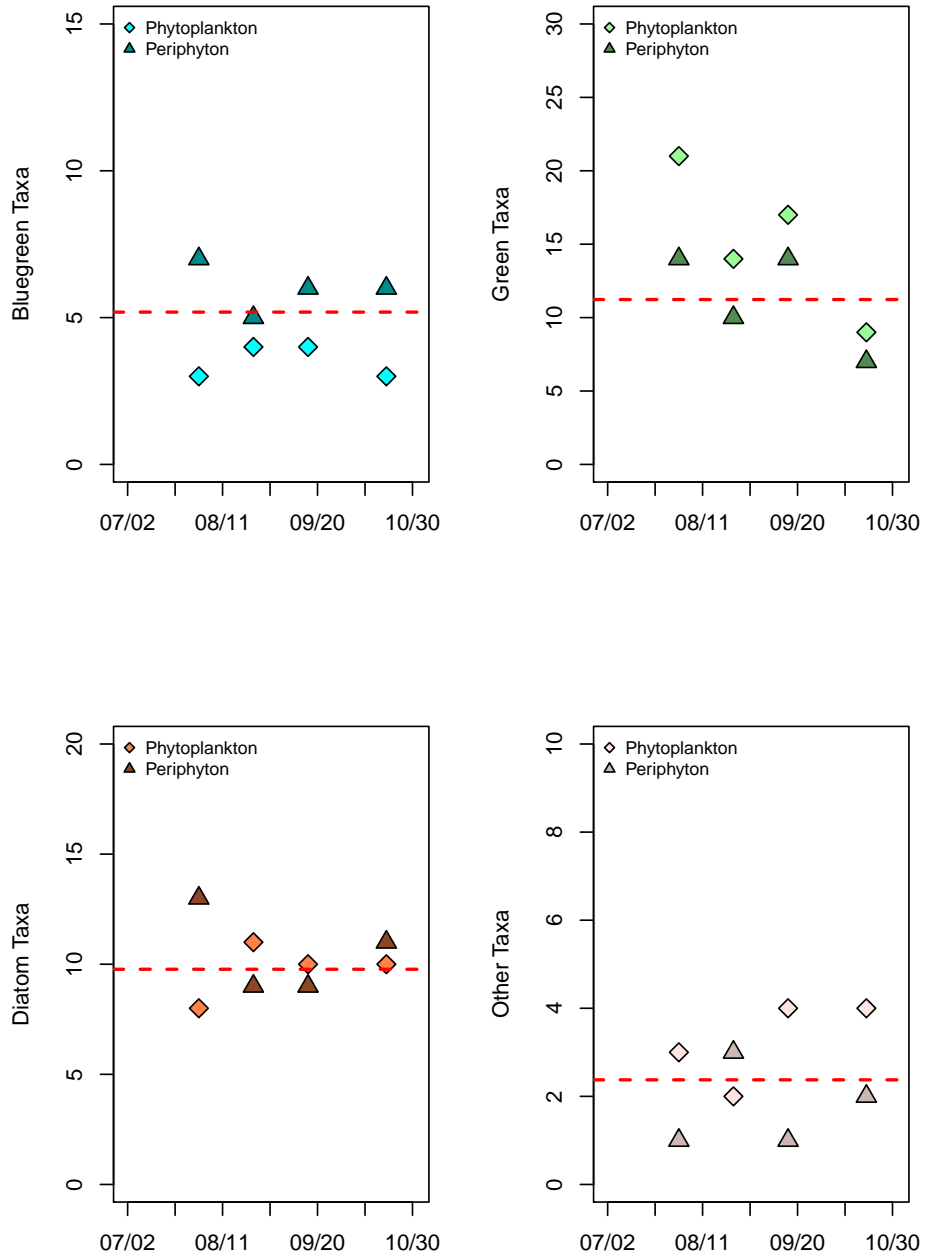


Figure 13: Summary of Crystal View Estates Marina algal genera by major groups, August 1 – October 19, 2023. The horizontal red line indicates the average number of taxa for that group.

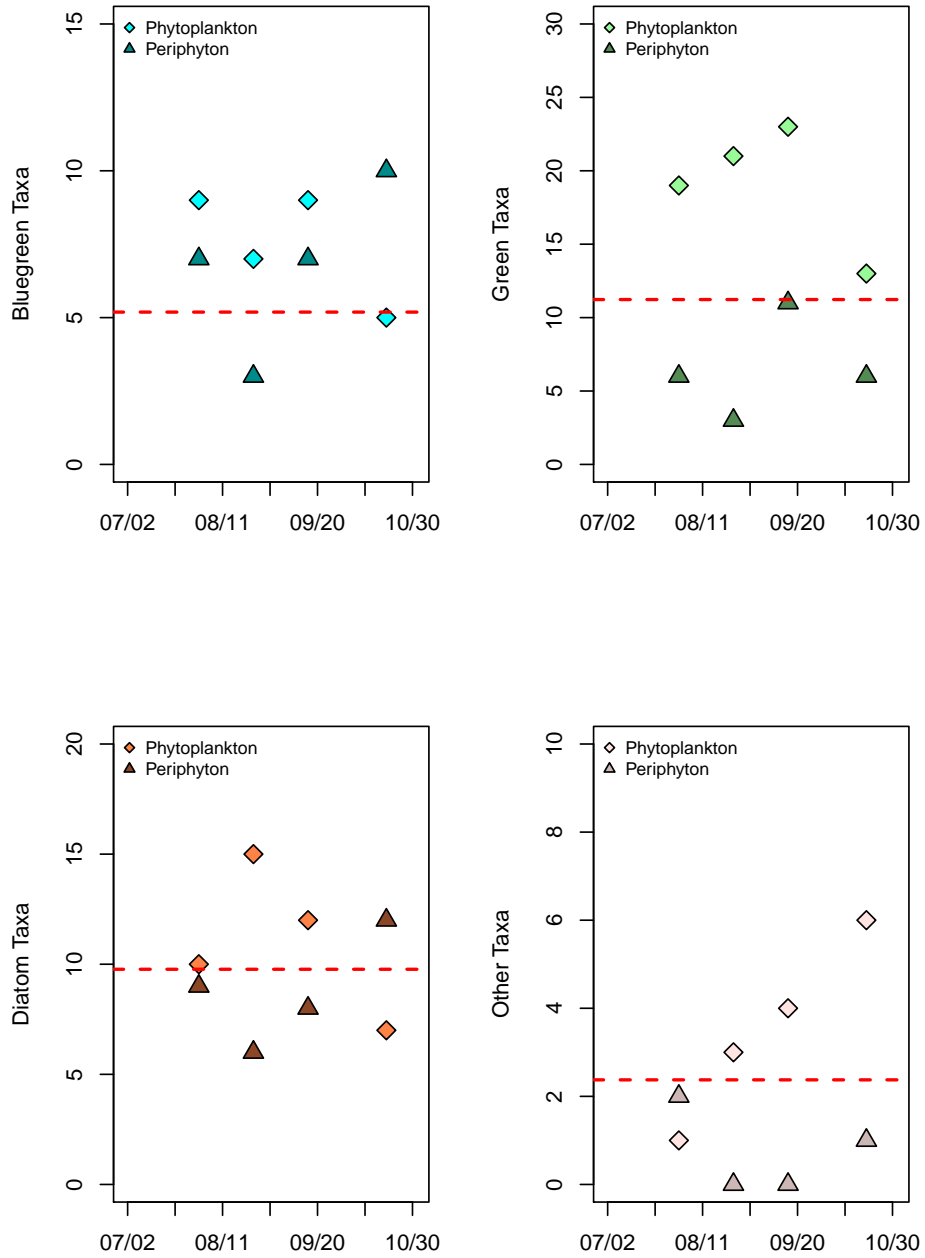


Figure 14: Summary of Lowry property algal genera by major groups, August 1 – October 19, 2023. The horizontal red line indicates the average number of taxa for that group.

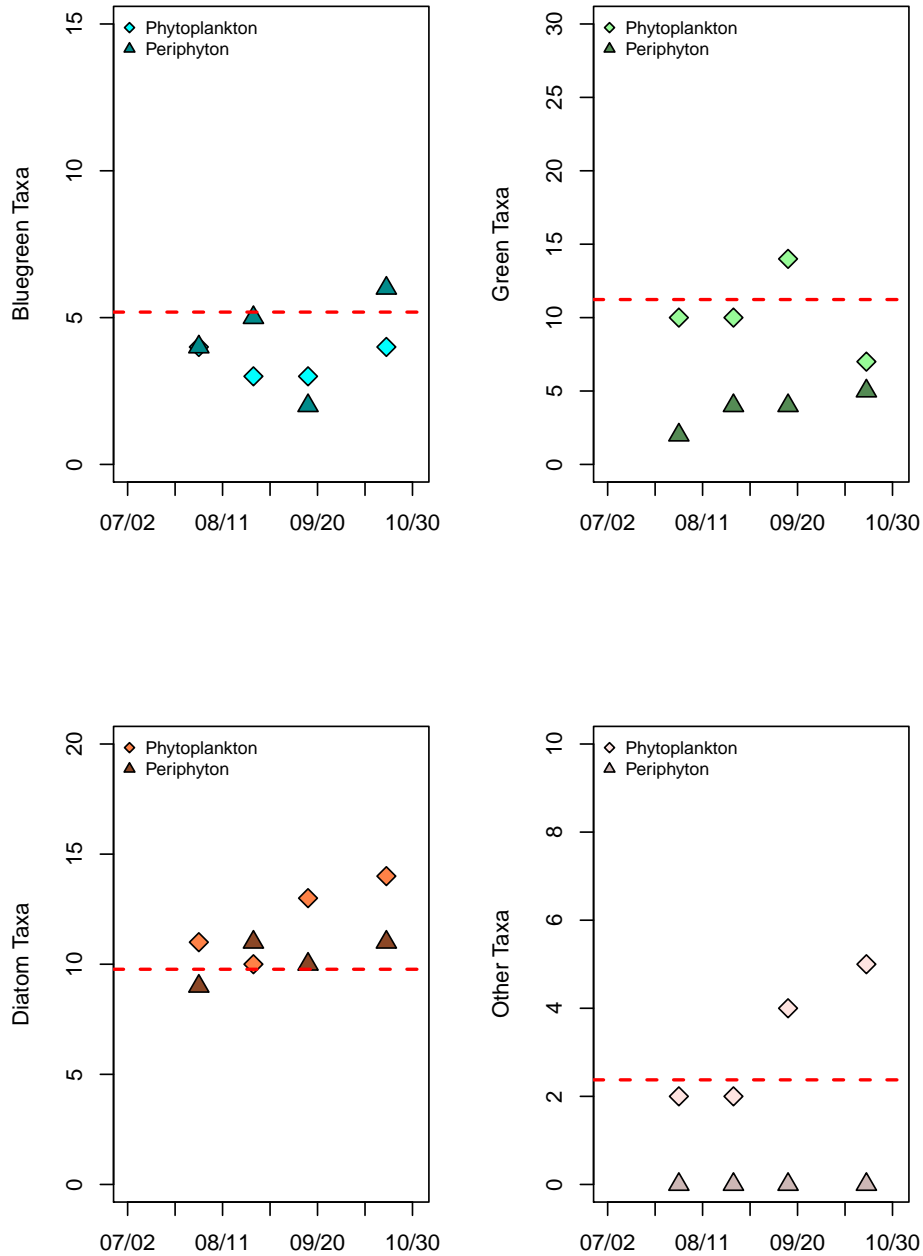


Figure 15: Summary of Purtteman Creek algal genera by major groups, August 1 – October 19, 2023. The horizontal red line indicates the average number of taxa for that group.

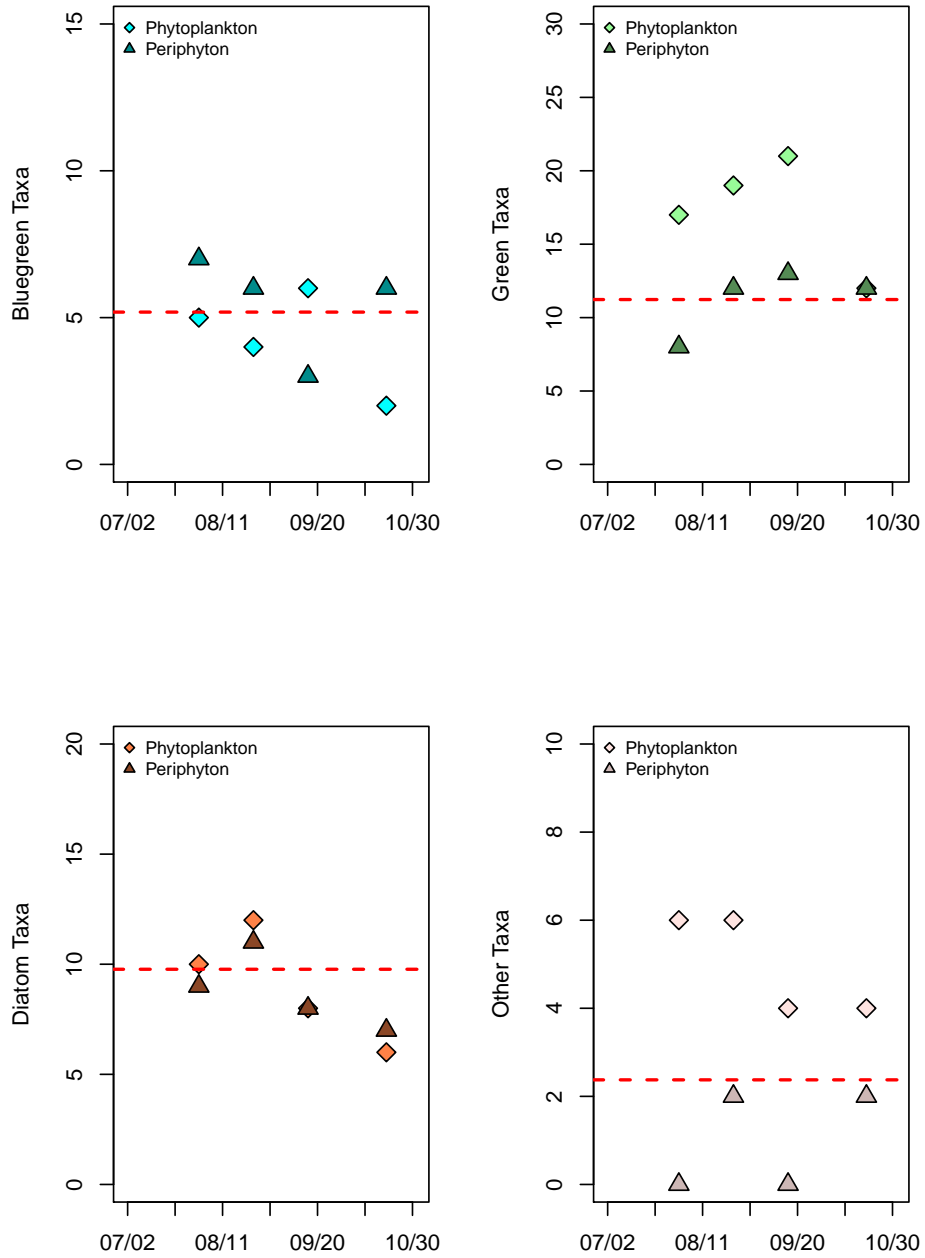


Figure 16: Summary of Sunset Marina algal genera by major groups, August 1 – October 19, 2023. The horizontal red line indicates the average number of taxa for that group.

Table 1: Dominant taxa in Lake Chelan algae samples, July 31–October 19, 2023. See figure 2 for site abbreviations.

Date	Site	Sample	Dominant taxa
Jul 31/Aug 1	CONB	plankton	sparse; no dominant
		periphyton	<i>Zygnema</i>
	CONH	plankton	<i>Sphaerocystis</i>
		periphyton	<i>Scytonema</i>
	CRYV	plankton	<i>Sphaerocystis</i>
		periphyton	<i>Bulbochaete, Spirogyra, Zygnema</i>
	LOWR	plankton	<i>Sphaerocystis</i>
		periphyton	diverse; no dominant
PURC	plankton	diatoms (<i>Diatoma</i>)	
	periphyton	<i>Cladophora</i> and mixed diatoms	
SUN	plankton	<i>Sphaerocystis</i>	
	periphyton	<i>Tabellaria</i> and <i>Spirogyra</i>	
Aug 24	CONB	plankton	diverse; no dominant
		periphyton	(A) <i>Spirogyra, Zygnema</i> ; (B) <i>Scytonema</i> ; (C) moss
	CONH	plankton	diverse; no dominant
		periphyton	<i>Scytonema</i>
	CRYV	plankton	<i>Sphaerocystis</i>
		periphyton	<i>Spirogyra</i> and <i>Zygnema</i>
	LOWR	plankton	diverse; no dominant
		periphyton	(A) <i>Dichothrix</i> and <i>Scytonema</i> ; (B) <i>Oedogonium, Zygnema</i>
PURC	plankton	<i>Diatoma, Phormidium</i>	
	periphyton	<i>Diatoma, Cladophora</i>	
SUN	plankton	diverse; no dominant	
	periphyton	<i>Tabellaria</i> and <i>Spirogyra</i>	
Sept 16	CONB	plankton	diverse; no dominant
		periphyton	<i>Spirogyra</i>
	CONH	plankton	diverse; no dominant
		periphyton	<i>Dichothrix, Scytonema</i>
	CRYV	plankton	<i>Chroococcus</i>
		periphyton	filamentous green algae and diatoms
LOWR	plankton	<i>Chroococcus</i>	

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Table 1: Lake Chelan dominant taxa, continued

Date	Site	Sample	Dominant taxa
		periphyton	<i>Scytonema</i>
	PURC	plankton	diverse; no dominant
		periphyton	<i>Cladophora</i> , diatoms
	SUN	plankton	diatoms
		periphyton	<i>Spirogyra</i> , <i>Mougeotia</i> , <i>Diclothrix</i>
Oct 19	CONB	plankton	sparse; no dominant
		periphyton	<i>Spirogyra</i> , <i>Scytonema</i>
	CONH	plankton	<i>Chroococcus</i> , <i>Tabellaria</i>
		periphyton	diverse; no dominant
	CRYV	plankton	<i>Chroococcus</i> , <i>Tabellaria</i>
		periphyton	diverse; no dominant
	LOWR	plankton	diverse; no dominant
		periphyton	<i>Scytonema</i>
	PURC	plankton	<i>Chroococcus</i> , <i>Tabellaria</i>
		periphyton	diatoms
	SUN	plankton	diverse; no dominant
	SUN	periphyton	<i>Spirogyra</i>

Table 2: Summary of Congdon Bay taxa for each major algal groups. Abbreviations: PL = phytoplankton; PE = periphyton; BG = bluegreen algae (**Cyanobacteria**); DI = diatoms (**Bacillariophyta**); GR = green algae and desmids (**Chlorophyta/Streptophyta**) OT = other (**Cryptophyta, Dinophyta, Euglenophyta, Ochrophyta**) See Tables [A1](#)–[A2](#) for taxa present at each site.

	Aug 1		Aug 24		Sept 16		Oct 19	
	PL	PE	PL	PE	PL	PE	PL	PE
Total BG Pct.	4 17%	6 22%	11 19%	6 29%	7 17%	3 17%	1 6%	2 8%
Total DI Pct.	8 33%	10 37%	18 31%	9 43%	13 31%	9 50%	6 33%	11 46%
Total GR Pct.	10 42%	9 33%	25 43%	5 24%	17 40%	6 33%	7 39%	11 46%
Total OT Pct.	2 8%	2 7%	4 7%	1 5%	5 12%	0 0%	4 22%	0 0%
Total taxa	24	27	58	21	42	18	18	24

Table 3: Summary of Congdon headland taxa for each major algal groups. Abbreviations: PL = phytoplankton; PE = periphyton; BG = bluegreen algae (**Cyanobacteria**); DI = diatoms (**Bacillariophyta**); GR = green algae and desmids (**Chlorophyta/Streptophyta**) OT = other (**Cryptophyta, Dinophyta, Euglenophyta, Ochrophyta**) See Tables [A1](#)–[A2](#) for taxa present at each site.

	Aug 1		Aug 24		Sept 16		Oct 19	
	PL	PE	PL	PE	PL	PE	PL	PE
Total BG Pct.	5 19%	9 56%	8 20%	5 45%	7 18%	4 20%	2 7%	4 18%
Total DI Pct.	8 31%	5 31%	11 27%	5 45%	11 28%	6 30%	9 33%	10 45%
Total GR Pct.	10 38%	1 6%	16 39%	0 0%	16 41%	9 45%	11 41%	8 36%
Total OT Pct.	3 12%	1 6%	6 15%	1 9%	5 13%	1 5%	5 19%	0 0%
Total taxa	26	16	41	11	39	20	27	22

Table 4: Summary of Crystal View Estates Marina taxa for each major algal groups. Abbreviations: PL = phytoplankton; PE = periphyton; BG = bluegreen algae (**Cyanobacteria**); DI = diatoms (**Bacillariophyta**); GR = green algae and desmids (**Chlorophyta/Streptophyta**) OT = other (**Cryptophyta, Dinophyta, Euglenophyta, Ochrophyta**) See Tables [A1](#)–[A2](#) for taxa present at each site.

	Aug 1		Aug 24		Sept 16		Oct 19	
	PL	PE	PL	PE	PL	PE	PL	PE
Total BG Pct.	3 9%	7 20%	4 13%	5 19%	4 11%	6 20%	3 12%	6 23%
Total DI Pct.	8 23%	13 37%	11 35%	9 33%	10 29%	9 30%	10 38%	11 42%
Total GR Pct.	21 60%	14 40%	14 45%	10 37%	17 49%	14 47%	9 35%	7 27%
Total OT Pct.	3 9%	1 3%	2 6%	3 11%	4 11%	1 3%	4 15%	2 8%
Total taxa	35	35	31	27	35	30	26	26

Table 5: Summary of Lowry property taxa for each major algal groups. Abbreviations: PL = phytoplankton; PE = periphyton; BG = bluegreen algae (**Cyanobacteria**); DI = diatoms (**Bacillariophyta**); GR = green algae and desmids (**Chlorophyta/Streptophyta**) OT = other (**Cryptophyta, Dinophyta, Euglenophyta, Ochrophyta**) See Tables [A1–A2](#) for taxa present at each site.

	Aug 1		Aug 24		Sept 16		Oct 19	
	PL	PE	PL	PE	PL	PE	PL	PE
Total BG Pct.	9 23%	7 29%	7 15%	3 25%	9 19%	7 27%	5 16%	10 34%
Total DI Pct.	10 26%	9 38%	15 33%	6 50%	12 25%	8 31%	7 23%	12 41%
Total GR Pct.	19 49%	6 25%	21 46%	3 25%	23 48%	11 42%	13 42%	6 21%
Total OT Pct.	1 3%	2 8%	3 7%	0 0%	4 8%	0 0%	6 19%	1 3%
Total taxa	39	24	46	12	48	26	31	29

Table 6: Summary of Purtteman Creek taxa for each major algal groups. Abbreviations: PL = phytoplankton; PE = periphyton; BG = bluegreen algae (**Cyanobacteria**); DI = diatoms (**Bacillariophyta**); GR = green algae and desmids (**Chlorophyta/Streptophyta**) OT = other (**Cryptophyta, Dinophyta, Euglenophyta, Ochrophyta**) See Tables [A1](#)–[A2](#) for taxa present at each site.

	Aug 1		Aug 24		Sept 16		Oct 19	
	PL	PE	PL	PE	PL	PE	PL	PE
Total BG Pct.	4 15%	4 27%	3 12%	5 25%	3 9%	2 13%	4 13%	6 27%
Total DI Pct.	11 41%	9 60%	10 40%	11 55%	13 38%	10 63%	14 47%	11 50%
Total GR Pct.	10 37%	2 13%	10 40%	4 20%	14 41%	4 25%	7 23%	5 23%
Total OT Pct.	2 7%	0 0%	2 8%	0 0%	4 12%	0 0%	5 17%	0 0%
Total taxa	27	15	25	20	34	16	30	22

Table 7: Summary of Sunset Marina taxa for each major algal groups. Abbreviations: PL = phytoplankton; PE = periphyton; BG = bluegreen algae (**Cyanobacteria**); DI = diatoms (**Bacillariophyta**); GR = green algae and desmids (**Chlorophyta/Streptophyta**) OT = other (**Cryptophyta, Dinophyta, Euglenophyta, Ochrophyta**) See Tables [A1](#)–[A2](#) for taxa present at each site.

	Aug 1		Aug 24		Sept 16		Oct 19	
	PL	PE	PL	PE	PL	PE	PL	PE
Total BG Pct.	5 13%	7 29%	4 10%	6 19%	6 15%	3 13%	2 8%	6 22%
Total DI Pct.	10 26%	9 38%	12 29%	11 35%	8 21%	8 33%	6 25%	7 26%
Total GR Pct.	17 45%	8 33%	19 46%	12 39%	21 54%	13 54%	12 50%	12 44%
Total OT Pct.	6 16%	0 0%	6 15%	2 6%	4 10%	0 0%	4 17%	2 7%
Total taxa	38	24	41	31	39	24	24	27

Table A1: Lake Chelan algae in periphyton samples, July 31–October 19, 2023. Only regularly sampled sites are included in this table. See Figure 2 for site abbreviations and Table A3 for taxa identified from the incidental samples collected on May 1 (CVE-1A, CVE-1B, SUN) and August 24 (Roses).

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
Cyanobacteria - Jul 31/Aug 1						
<i>Anabaena</i>		X				
<i>Aphanocapsa</i>		X				X
<i>Aphanothece</i>					X	
<i>Arthrospira</i>						
<i>Chroococcus</i>				X		X
<i>Coelomoron/Coelosphaerium</i>						
<i>Cyanophanon</i>					X	
<i>Cyanothece</i>						
<i>Cylindrospermum</i>						
<i>Dichothrix</i>	X	X	X	X		X
<i>Geitlerinema</i>						
<i>Gloeothece</i>	X	X	X			X
<i>Komvophoron</i>	X	X	X			
<i>Limnothrix/Lyngbya</i>		X		X		
<i>Merismopedia</i>	X		X			
<i>Nostoc</i>						
Oscillatoriales group	X	X	X	X	X	X
<i>Pseudanabaena</i>		X	X	X	X	X
<i>Scytonema</i>	X	X		X		X
<i>Snowella</i>			X	X		
<i>Spirulina</i>						
<i>Stigonema</i>						
unk. filament						
Diatoms - Jul 31/Aug 1						
<i>Achnantheidium</i>	X		X	X	X	X
<i>Asterionella</i>	X					
<i>Cocconeis</i>			X	X	X	
<i>Craticula</i>						
<i>Ctenophora</i> cf						

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Cyclotella</i>		X	X			
<i>Cymbella</i>	X		X	X	X	X
<i>Cymbopleura</i>			X			
<i>Diatoma</i>		X	X		X	X
<i>Didymosphenia</i>						
<i>Diploneis</i>	X		X	X		
<i>Encyonema</i>	X		X	X	X	X
<i>Epithemia/Rhopalodia</i>			X			X
<i>Eucoconeis</i>	X					
<i>Fragilaria</i> (filament)						
<i>Fragilaria/Ulnaria</i> (solitary)	X	X	X	X	X	X
<i>Gomphonema</i>	X		X	X	X	X
<i>Hannaea</i>						
<i>Melosira</i>					X	
Nitzschioid group						
<i>Pinnularia</i>						
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>						
<i>Stephanodiscus</i>						
<i>Surirella</i>						
Symmetric biraphid group	X	X	X	X	X	X
<i>Synedra</i> (star-shaped colony)						
<i>Tabellaria</i>	X	X	X	X		X
<i>Thalassiosira</i>						
Green - Jul 31/Aug 1						
<i>Acutodesmus</i>	X		X			
<i>Ankistrodesmus</i>						
<i>Botryococcus</i>		X	X	X		
<i>Bulbochaete</i>			X	X		X
<i>Chaetosphaeridium</i>						X
<i>Characium</i>						
<i>Chlamydomonas</i>						
<i>Cladophora</i>					X	

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Coelastrum</i>	X					
<i>Coleochaete</i>			X			
<i>Desmodesmus</i>	X		X	X		
<i>Elakatothrix</i>						X
<i>Eudorina</i>						
<i>Geminella</i>						
<i>Gloeocystis</i>			X			
<i>Hydrodictyon</i>						
<i>Kirchneriella</i>						
<i>Monoraphidium</i>			X			
<i>Mougeotia</i>	X		X			X
<i>Nephrocytium/Oonephris</i>						
<i>Oedogonium</i>			X	X	X	X
<i>Oocystis</i>			X			
<i>Pandorina</i>						
<i>Paulschulzia</i>						
<i>Planktosphaeria</i>	X					
<i>Pseudopediastrum</i>						
<i>Quadrigula</i>						
<i>Scenedesmus</i>	X		X			X
<i>Sphaerocystis</i>						
<i>Spirogyra</i>			X			X
<i>Stigeoclonium</i>						
<i>Ulothrix</i>						
unk. colonial						
<i>Willea</i>						
<i>Zygnema</i>	X		X	X		X
Desmids - Jul 31/Aug 1						
<i>Cosmarium</i>	X		X	X		
<i>Desmidium</i>						
<i>Euastrum</i>						
<i>Gonatozygon</i>						
<i>Hyalotheca</i>						

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Pleurotaenium</i>						
<i>Staurastrum</i>						
<i>Stauroidesmus</i>						
<i>Teilingia</i>	x					
Other, Cryptophyta - Jul 31/Aug 1						
<i>Cryptomonas</i>						
Other, Dinophyta						
<i>Ceratium</i>						
dinoflagellate cyst	x					
<i>Gymnodinium</i>						
<i>Parvodinium</i>						
<i>Peridinium</i>			x	x		
<i>Tovellia</i>						
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						
<i>Trachelomonas</i>		x				
Other, Ochrophyta						
<i>Binuclearia</i>				x		
<i>Dinobryon</i>						
<i>Gloeobotrys</i>						
<i>Mallomonas</i>						
<i>Nannochloropsis</i>						
<i>Phaeoplaca</i>	x					
<i>Stichogloea</i>						
Cyanobacteria - Aug 24						
<i>Anabaena</i>						
<i>Aphanocapsa</i>			x			
<i>Aphanothece</i>						x
<i>Arthrospira</i>						
<i>Chroococcus</i>	x		x			x
<i>Coelomoron/Coelosphaerium</i>						
<i>Cyanophanon</i>						

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Cyanothece</i>					X	
<i>Cylindrospermum</i>						
<i>Dichothrix</i>	X	X	X	X		X
<i>Geitlerinema</i>					X	
<i>Gloeothece</i>			X			
<i>Komvophoron</i>	X	X				
<i>Limnothrix/Lyngbya</i>	X				X	
<i>Merismopedia</i>						
<i>Nostoc</i>						
Oscillatoriales group	X	X			X	X
<i>Pseudanabaena</i>		X		X	X	X
<i>Scytonema</i>	X	X	X	X		
<i>Snowella</i>						X
<i>Spirulina</i>						
<i>Stigonema</i>						
unk. filament						
Diatoms - Aug 24						
<i>Achnantheidium</i>	X	X	X	X	X	X
<i>Asterionella</i>		X	X			
<i>Cocconeis</i>					X	
<i>Craticula</i>						
<i>Ctenophora</i> cf						
<i>Cyclotella</i>	X					
<i>Cymbella</i>	X		X	X	X	X
<i>Cymbopleura</i>					X	
<i>Diatoma</i>	d		X		X	
<i>Didymosphenia</i>						
<i>Diploneis</i>			X		X	X
<i>Encyonema</i>					X	X
<i>Epithemia/Rhopalodia</i>						X
<i>Eucoconeis</i>	X					
<i>Fragilaria</i> (filament)						
<i>Fragilaria/Ulnaria</i> (solitary)	X	X	X	X	X	X

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Gomphonema</i>	X		X	X	X	X
<i>Hannaea</i>						X
<i>Melosira</i>					X	
Nitzschioid group						
<i>Pinnularia</i>						
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>						
<i>Stephanodiscus</i>						
<i>Surirella</i>						
Symmetric biraphid group	X	X	X	X	X	X
<i>Synedra</i> (star-shaped colony)						
<i>Tabellaria</i>	X	X	X	X		X
<i>Thalassiosira</i>						X
Green - Aug 24						
<i>Acutodesmus</i>			X			
<i>Ankistrodesmus</i>						X
<i>Botryococcus</i>						
<i>Bulbochaete</i>			X			X
<i>Chaetosphaeridium</i>						
<i>Characium</i>						
<i>Chlamydomonas</i>				X		
<i>Cladophora</i>					X	
<i>Coelastrum</i>						
<i>Coleochaete</i>			X			
<i>Desmodesmus</i>						
<i>Elakatothrix</i>						
<i>Eudorina</i>						
<i>Geminella</i>						
<i>Gloeocystis</i>						X
<i>Hydrodictyon</i>						
<i>Kirchneriella</i>						
<i>Monoraphidium</i>						
<i>Mougeotia</i>	X		X			X

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Nephrocytium/Oonephris</i>						
<i>Oedogonium</i>	X		X	X	X	X
<i>Oocystis</i>			X			
<i>Pandorina</i>						
<i>Paulschulzia</i>						
<i>Planktosphaeria</i>						X
<i>Pseudopediastrum</i>						
<i>Quadrigula</i>						
<i>Scenedesmus</i>						X
<i>Sphaerocystis</i>			X			
<i>Spirogyra</i>	X		X			X
<i>Stigeoclonium</i>						
<i>Ulothrix</i>						
unk. colonial						
<i>Willea</i>					X	X
<i>Zygnema</i>	X		X	X	X	X
Desmids - Aug 24						
<i>Cosmarium</i>	X		X			X
<i>Desmidium</i>						
<i>Euastrum</i>						
<i>Gonatozygon</i>						
<i>Hyalotheca</i>						
<i>Pleurotaenium</i>						
<i>Staurastrum</i>						
<i>Stauroidesmus</i>						X
<i>Teilingia</i>						
Other, Cryptophyta - Aug 24						
<i>Cryptomonas</i>						
Other, Dinophyta						
<i>Ceratium</i>						
dinoflagellate cyst			X			
<i>Gymnodinium</i>						
<i>Parvodinium</i>						X

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Peridinium</i>	X	X	X			X
<i>Tovellia</i>						
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						
<i>Trachelomonas</i>						
Other, Ochrophyta						
<i>Binuclearia</i>						
<i>Dinobryon</i>						
<i>Gloeobotrys</i>						
<i>Mallomonas</i>						
<i>Nannochloropsis</i>						
<i>Phaeoplaca</i>						
<i>Stichogloea</i>			X			
Cyanobacteria - Sept 16						
<i>Anabaena</i>						
<i>Aphanocapsa</i>			X	X		
<i>Aphanothece</i>						
<i>Arthrospira</i>						
<i>Chroococcus</i>		X		X		
<i>Coelomonon/Coelosphaerium</i>						
<i>Cyanophanon</i>						
<i>Cyanothece</i>						
<i>Cylindrospermum</i>						
<i>Dichothrix</i>		X	X	X		X
<i>Geitlerinema</i>						
<i>Gloeothece</i>			X			
<i>Komvophoron</i>						
<i>Limnothrix/Lyngbya</i>					X	
<i>Merismopedia</i>	X					
<i>Nostoc</i>						
Oscillatoriales group	X	X	X	X	X	X
<i>Pseudanabaena</i>	X			X		

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Scytonema</i>		X	X	X		
<i>Snowella</i>			X			X
<i>Spirulina</i>						
<i>Stigonema</i>				X		
unk. filament						
Diatoms - Sept 16						
<i>Achnantheidium</i>	X	X	X	X	X	X
<i>Asterionella</i>						
<i>Cocconeis</i>				X	X	
<i>Craticula</i>						
<i>Ctenophora</i> cf						
<i>Cyclotella</i>						X
<i>Cymbella</i>	X	X	X	X	X	X
<i>Cymbopleura</i>	X					
<i>Diatoma</i>	X	X	X		X	X
<i>Didymosphenia</i>						
<i>Diploneis</i>					X	
<i>Encyonema</i>			X	X	X	
<i>Epithemia/Rhopalodia</i>						
<i>Eucoconeis</i>	X					
<i>Fragilaria</i> (filament)						
<i>Fragilaria/Ulnaria</i> (solitary)	X	X	X	X	X	X
<i>Gomphonema</i>	X	X	X	X	X	X
<i>Hannaea</i>						
<i>Melosira</i>					X	
Nitzschioid group						
<i>Pinnularia</i>						
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>			X			
<i>Stephanodiscus</i>						
<i>Surirella</i>						
Symmetric biraphid group	X		X	X	X	X
<i>Synedra</i> (star-shaped colony)						

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Tabellaria</i>	X	X	X	X		X
<i>Thalassiosira</i>						
Green - Sept 16						
<i>Acutodesmus</i>	X		X			
<i>Ankistrodesmus</i>				X		
<i>Botryococcus</i>		X				
<i>Bulbochaete</i>		X	X	X		X
<i>Chaetosphaeridium</i>						X
<i>Characium</i>						
<i>Chlamydomonas</i>						
<i>Cladophora</i>					X	
<i>Coelastrum</i>			X			X
<i>Coleochaete</i>		X	X	X		
<i>Desmodesmus</i>			X			
<i>Elakatothrix</i>						
<i>Eudorina</i>						
<i>Geminella</i>						
<i>Gloeocystis</i>				X		
<i>Hydrodictyon</i>						
<i>Kirchneriella</i>						
<i>Monoraphidium</i>						
<i>Mougeotia</i>	X	X	X	X		X
<i>Nephrocytium/Oonephris</i>						
<i>Oedogonium</i>		X	X	X	X	X
<i>Oocystis</i>		X	X			
<i>Pandorina</i>						
<i>Paulschulzia</i>						
<i>Planktosphaeria</i>			X			X
<i>Pseudopediastrum</i>		X	X	X		X
<i>Quadrigula</i>						
<i>Scenedesmus</i>			X	X	X	X
<i>Sphaerocystis</i>						
<i>Spirogyra</i>	X		X			X

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Stigeoclonium</i>						
<i>Ulothrix</i>					x	
unk. colonial						
<i>Willea</i>						x
<i>Zygnema</i>	x	x	x	x		x
Desmids - Sept 16						
<i>Cosmarium</i>	x	x	x	x		x
<i>Desmidium</i>						
<i>Euastrum</i>						
<i>Gonatozygon</i>	x					
<i>Hyalotheca</i>						
<i>Pleurotaenium</i>						
<i>Staurastrum</i>				x		x
<i>Stauroidesmus</i>						
<i>Teilingia</i>						
Other, Cryptophyta - Sept 16						
<i>Cryptomonas</i>						
Other, Dinophyta						
<i>Ceratium</i>						
dinoflagellate cyst						
<i>Gymnodinium</i>						
<i>Parvodinium</i>						
<i>Peridinium</i>			x			
<i>Tovellia</i>						
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						
<i>Trachelomonas</i>						
Other, Ochrophyta						
<i>Binuclearia</i>						
<i>Dinobryon</i>		x				
<i>Gloeobotrys</i>						
<i>Mallomonas</i>						

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Nannochloropsis</i>						
<i>Phaeoplaca</i>						
<i>Stichogloea</i>						
Cyanobacteria - Oct 19						
<i>Anabaena</i>				X		
<i>Aphanocapsa</i>		X	X	X	X	
<i>Aphanothece</i>					X	X
<i>Arthrospira</i>						
<i>Chroococcus</i>						X
<i>Coelomoron/Coelosphaerium</i>						
<i>Cyanophanon</i>						
<i>Cyanothece</i>						
<i>Cylindrospermum</i>				X		
<i>Dichothrix</i>	X	X	X	X		X
<i>Geitlerinema</i>						
<i>Gloeothece</i>				X		
<i>Komvophoron</i>				X		
<i>Limnothrix/Lyngbya</i>					X	
<i>Merismopedia</i>			X	X		X
<i>Nostoc</i>						
Oscillatoriales group		X	X	X	X	X
<i>Pseudanabaena</i>				X	X	
<i>Scytonema</i>	X	X	X	X		X
<i>Snowella</i>			X		X	
<i>Spirulina</i>						
<i>Stigonema</i>						
unk. filament						
Diatoms - Oct 19						
<i>Achnantheidium</i>	X	X	X	X	X	X
<i>Asterionella</i>						
<i>Cocconeis</i>					X	
<i>Craticula</i>						
<i>Ctenophora</i> cf						

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Cyclotella</i>						
<i>Cymbella</i>	X	X	X	X	X	X
<i>Cymbopleura</i>		X	X	X		
<i>Diatoma</i>	X	X	X		X	X
<i>Didymosphenia</i>						
<i>Diploneis</i>					X	
<i>Encyonema</i>				X	X	
<i>Epithemia/Rhopalodia</i>	X	X	X	X		
<i>Eucoconeis</i>		X				
<i>Fragilaria</i> (filament)				X		
<i>Fragilaria/Ulnaria</i> (solitary)	X	X	X	X		X
<i>Gomphonema</i>	X	X	X	X	X	X
<i>Hannaea</i>	X					
<i>Melosira</i>	X				X	
Nitzschioid group			X			
<i>Pinnularia</i>	X					
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>				X		
<i>Stephanodiscus</i>						
<i>Surirella</i>			X			
Symmetric biraphid group	X	X	X	X	X	X
<i>Synedra</i> (star-shaped colony)						
<i>Tabellaria</i>	X	X	X	X	X	X
<i>Thalassiosira</i>				X	X	
Green - Oct 19						
<i>Acutodesmus</i>					X	
<i>Ankistrodesmus</i>						
<i>Botryococcus</i>						
<i>Bulbochaete</i>	X	X		X		X
<i>Chaetosphaeridium</i>						X
<i>Characium</i>					X	
<i>Chlamydomonas</i>						
<i>Cladophora</i>					X	

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Coelastrum</i>			X			X
<i>Coleochaete</i>		X		X		
<i>Desmodesmus</i>	X	X				X
<i>Elakatothrix</i>						
<i>Eudorina</i>						
<i>Geminella</i>						
<i>Gloeocystis</i>						
<i>Hydrodictyon</i>						
<i>Kirchneriella</i>						
<i>Monoraphidium</i>						
<i>Mougeotia</i>	X	X	X	X		X
<i>Nephrocytium/Oonephris</i>						
<i>Oedogonium</i>	X			X	X	X
<i>Oocystis</i>	X	X		X	X	X
<i>Pandorina</i>						
<i>Paulschulzia</i>						
<i>Planktosphaeria</i>			X			
<i>Pseudopediastrum</i>						X
<i>Quadrigula</i>						
<i>Scenedesmus</i>			X			X
<i>Sphaerocystis</i>						
<i>Spirogyra</i>	X	X	X			X
<i>Stigeoclonium</i>	X					
<i>Ulothrix</i>						
unk. colonial						
<i>Willea</i>						
<i>Zygnema</i>	X	X	X			X
Desmids - Oct 19						
<i>Cosmarium</i>	X	X	X	X		
<i>Desmidium</i>						
<i>Euastrum</i>						
<i>Gonatozygon</i>	X					
<i>Hyalotheca</i>						

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Table A1: Lake Chelan algae, continued

Genus	Periphyton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Pleurotaenium</i>						
<i>Staurastrum</i>	x					x
<i>Stauroidesmus</i>						
<i>Teilingia</i>						
Other, Cryptophyta - Oct 19						
<i>Cryptomonas</i>						
Other, Dinophyta						
<i>Ceratium</i>						
dinoflagellate cyst						
<i>Gymnodinium</i>				x		x
<i>Parvodinium</i>						
<i>Peridinium</i>			x			x
<i>Tovellia</i>						
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						
<i>Trachelomonas</i>						
Other, Ochrophyta						
<i>Binuclearia</i>						
<i>Dinobryon</i>						
<i>Gloeobotrys</i>						
<i>Mallomonas</i>						
<i>Nannochloropsis</i>			x			
<i>Phaeoplaca</i>						
<i>Stichogloea</i>						

Table A2: Lake Chelan algae in phytoplankton samples, July 31–October 19, 2023. Only regularly sampled sites are included in this table. See Figure 2 for site abbreviations and Table A3 for taxa identified from the incidental samples collected on May 1 (CVE-1A, CVE-1B, SUN) and August 24 (Roses).

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
Cyanobacteria - Jul 31/Aug 1						
<i>Anabaena</i>				X	X	
<i>Aphanocapsa</i>	X			X		
<i>Aphanothece</i>			X	X		
<i>Arthrospira</i>						
<i>Chroococcus</i>		X		X		X
<i>Coelomoron/Coelosphaerium</i>						
<i>Cyanophanon</i>					X	X
<i>Cyanothece</i>						
<i>Cylindrospermum</i>						
<i>Dichothrix</i>	X	X		X		X
<i>Geitlerinema</i>						
<i>Gloeothece</i>		X				
<i>Komvophoron</i>						
<i>Limnothrix/Lyngbya</i>		X				
<i>Merismopedia</i>				X		
<i>Nostoc</i>						
Oscillatoriales group	X	X	X	X	X	X
<i>Pseudanabaena</i>						X
<i>Scytonema</i>	X			X		
<i>Snowella</i>			X	X	X	
<i>Spirulina</i>						
<i>Stigonema</i>						
unk. filament						
Diatoms - Jul 31/Aug1						
<i>Achnantheidium</i>		X	X	X	X	
<i>Asterionella</i>	X	X		X	X	
<i>Cocconeis</i>					X	
<i>Craticula</i>						
<i>Ctenophora</i> cf						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Cyclotella</i>	X	X		X		X
<i>Cymbella</i>	X	X	X	X	X	X
<i>Cymbopleura</i>						
<i>Diatoma</i>	X		X	X	X	X
<i>Didymosphenia</i>			X		X	
<i>Diploneis</i>						X
<i>Encyonema</i>						X
<i>Epithemia/Rhopalodia</i>						
<i>Eucoconeis</i>						
<i>Fragilaria</i> (filament)	X	X	X	X		X
<i>Fragilaria/Ulnaria</i> (solitary)	X	X	X	X	X	X
<i>Gomphonema</i>					X	X
<i>Hannaea</i>						
<i>Melosira</i>			X		X	
Nitzschioid group				X		
<i>Pinnularia</i>						
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>						
<i>Stephanodiscus</i>						
<i>Surirella</i>					X	
Symmetric biraphid group	X	X		X	X	X
<i>Synedra</i> (star-shaped colony)						
<i>Tabellaria</i>	X	X	X	X		X
<i>Thalassiosira</i>						
Green - Jul 31/Aug 1						
<i>Acutodesmus</i>						
<i>Ankistrodesmus</i>						
<i>Botryococcus</i>		X	X	X		X
<i>Bulbochaete</i>	X		X			
<i>Chaetosphaeridium</i>						
<i>Characium</i>						
<i>Chlamydomonas</i>		X				
<i>Cladophora</i>						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Coelastrum</i>	X	X	X	X	X	X
<i>Coleochaete</i>			X			
<i>Desmodesmus</i>				X		X
<i>Elakatothrix</i>	X	X	X	X		
<i>Eudorina</i>			X	X		X
<i>Geminella</i>						
<i>Gloeocystis</i>	X	X	X	X		X
<i>Hydrodictyon</i>					X	
<i>Kirchneriella</i>			X	X	X	X
<i>Monoraphidium</i>						
<i>Mougeotia</i>	X		X			X
<i>Nephrocytium/Oonephris</i>			X	X		X
<i>Oedogonium</i>			X	X	X	X
<i>Oocystis</i>	X	X	X	X	X	X
<i>Pandorina</i>						
<i>Paulschulzia</i>						
<i>Planktosphaeria</i>	X	X	X	X		X
<i>Pseudopediastrum</i>	X	X	X	X	X	X
<i>Quadrigula</i>				X		
<i>Scenedesmus</i>						X
<i>Sphaerocystis</i>	X	X	X	X	X	X
<i>Spirogyra</i>			X	X		X
<i>Stigeoclonium</i>						
<i>Ulothrix</i>						
unk. colonial						
<i>Willea</i>	X	X	X	X	X	X
<i>Zygnema</i>			X	X	X	X
Desmids - July 31/Aug 1						
<i>Cosmarium</i>				X	X	
<i>Desmidium</i>						
<i>Euastrum</i>			X			
<i>Gonatozygon</i>				X		
<i>Hyalotheca</i>			X			

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Pleurotaenium</i>						
<i>Staurastrum</i>			x			
<i>Stauroidesmus</i>						
<i>Teilingia</i>						
Other, Cryptophyta - Jul 31/Aug 1						
<i>Cryptomonas</i>						
Other, Dinophyta						
<i>Ceratium</i>				x		x
dinoflagellate cysts						x
<i>Gymnodinium</i>			x			
<i>Parvodinium</i>						x
<i>Peridinium</i>	x	x	x			x
<i>Tovellia</i>						
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						x
<i>Trachelomonas</i>			x			
Other, Ochrophyta						
<i>Binuclearia</i>						
<i>Dinobryon</i>	x	x			x	x
<i>Gloeobotrys</i>						
<i>Mallomonas</i>						
<i>Nannochloropsis</i>						
<i>Phaeoplaca</i>						
<i>Stichogloea</i>		x			x	
Cyanobacteria - Aug 24						
<i>Anabaena</i>						
<i>Aphanocapsa</i>	x			x	x	x
<i>Aphanothece</i>	x	x	x			
<i>Arthrospira</i>						
<i>Chroococcus</i>	x	x		x		x
<i>Coelomonon/Coelosphaerium</i>			x			
<i>Cyanophanon</i>						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Cyanothece</i>						
<i>Cylindrospermum</i>						
<i>Dichothrix</i>	X	X		X		
<i>Geitlerinema</i>						
<i>Gloeothece</i>		X				
<i>Komvophoron</i>						
<i>Limnothrix/Lyngbya</i>	X	X		X		
<i>Merismopedia</i>	X			X		
<i>Nostoc</i>	X					
Oscillatoriales group	X	X	X		X	X
<i>Pseudanabaena</i>	X					
<i>Scytonema</i>	X	X		X		
<i>Snowella</i>	X	X	X	X	X	X
<i>Spirulina</i>						
<i>Stigonema</i>						
unk. filament						
Diatoms - Aug 24						
<i>Achnantheidium</i>	X			X	X	X
<i>Asterionella</i>	X	X	X	X	X	X
<i>Cocconeis</i>					X	
<i>Craticula</i>			X			
<i>Ctenophora</i> cf		X				
<i>Cyclotella</i>	X	X	X	X	X	X
<i>Cymbella</i>	X			X	X	X
<i>Cymbopleura</i>	X			X		
<i>Diatoma</i>	X		X	X	X	X
<i>Didymosphenia</i>	X					
<i>Diploneis</i>	X			X		
<i>Encyonema</i>						
<i>Epithemia/Rhopalodia</i>	X	X				
<i>Eucoconeis</i>	X					
<i>Fragilaria</i> (filament)	X	X	X	X		X
<i>Fragilaria/Ulnaria</i> (solitary)	X	X	X	X	X	X

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Gomphonema</i>	X	X	X	X	X	
<i>Hannaea</i>						
<i>Melosira</i>				X	X	
Nitzschioid group		X				X
<i>Pinnularia</i>	X					
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>				X		X
<i>Stephanodiscus</i>						
<i>Surirella</i>			X			X
Symmetric biraphid group	X	X	X	X		
<i>Synedra</i> (star-shaped colony)	X	X				
<i>Tabellaria</i>	X	X	X	X	X	X
<i>Thalassiosira</i>	X		X	X		X
Green - Aug 24						
<i>Acutodesmus</i>						
<i>Ankistrodesmus</i>						
<i>Botryococcus</i>	X	X	X	X		X
<i>Bulbochaete</i>	X			X		
<i>Chaetosphaeridium</i>						
<i>Characium</i>						
<i>Chlamydomonas</i>	X	X				
<i>Cladophora</i>						
<i>Coelastrum</i>	X	X	X	X	X	X
<i>Coleochaete</i>				X		
<i>Desmodesmus</i>	X			X		X
<i>Elakatothrix</i>	X	X	X	X		X
<i>Eudorina</i>	X			X	X	X
<i>Geminella</i>		X				
<i>Gloeocystis</i>	X	X	X	X		X
<i>Hydrodictyon</i>						
<i>Kirchneriella</i>				X		X
<i>Monoraphidium</i>						
<i>Mougeotia</i>	X	X	X	X		X

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Nephrocytium/Oonephris</i>	X		X	X		X
<i>Oedogonium</i>	X	X	X	X	X	X
<i>Oocystis</i>	X	X		X	X	X
<i>Pandorina</i>	X					
<i>Paulschulzia</i>		X				X
<i>Planktosphaeria</i>	X	X	X	X		X
<i>Pseudopediastrum</i>	X	X	X	X	X	X
<i>Quadrigula</i>	X		X	X		X
<i>Scenedesmus</i>						
<i>Sphaerocystis</i>	X	X	X	X	X	X
<i>Spirogyra</i>	X					X
<i>Stigeoclonium</i>					X	
<i>Ulothrix</i>	X					
unk. colonial						
<i>Willea</i>	X	X	X	X	X	X
<i>Zygnema</i>	X	X	X	X	X	
Desmids - Aug 24						
<i>Cosmarium</i>	X		X	X	X	X
<i>Desmidium</i>						
<i>Euastrum</i>						
<i>Gonatozygon</i>	X					
<i>Hyalotheca</i>						
<i>Pleurotaenium</i>		X				
<i>Staurastrum</i>	X			X		
<i>Stauroidesmus</i>	X					
<i>Teilingia</i>						
Other, Cryptophyta - Aug 24						
<i>Cryptomonas</i>	X	X				
Other, Dinophyta						
<i>Ceratium</i>	X	X		X		
dinoflagellate cysts		X				X
<i>Gymnodinium</i>						
<i>Parvodinium</i>						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Peridinium</i>		X		X	X	X
<i>Tovellia</i>						
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						
<i>Trachelomonas</i>				X		
Other, Ochrophyta						
<i>Binuclearia</i>						
<i>Dinobryon</i>	X	X	X			X
<i>Gloeobotrys</i>						X
<i>Mallomonas</i>		X	X		X	X
<i>Nannochloropsis</i>						
<i>Phaeoplaca</i>						
<i>Stichogloea</i>	X					X
Cyanobacteria - Sept 16						
<i>Anabaena</i>						
<i>Aphanocapsa</i>			X	X		X
<i>Aphanothece</i>				X		
<i>Arthrospira</i>						
<i>Chroococcus</i>	X	X	X	X	X	X
<i>Coelomonon/Coelosphaerium</i>						
<i>Cyanophanon</i>						
<i>Cyanothece</i>						
<i>Cylindrospermum</i>						
<i>Dichothrix</i>	X	X		X		X
<i>Geitlerinema</i>						
<i>Gloeothece</i>						
<i>Komvophoron</i>						
<i>Limnothrix/Lyngbya</i>	X	X				
<i>Merismopedia</i>				X		
<i>Nostoc</i>		X				X
Oscillatoriales group	X		X	X	X	
<i>Pseudanabaena</i>	X	X				

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Scytonema</i>	X	X		X		
<i>Snowella</i>	X	X	X	X	X	X
<i>Spirulina</i>						
<i>Stigonema</i>				X		
unk. filament						X
Diatoms - Sept 16						
<i>Achnantheidium</i>	X	X	X	X	X	X
<i>Asterionella</i>	X	X		X	X	
<i>Cocconeis</i>						
<i>Craticula</i>						
<i>Ctenophora</i> cf						
<i>Cyclotella</i>		X	X	X	X	X
<i>Cymbella</i>	X	X	X	X	X	X
<i>Cymbopleura</i>	X			X		
<i>Diatoma</i>	X		X			X
<i>Didymosphenia</i>						
<i>Diploneis</i>	X					
<i>Encyonema</i>					X	
<i>Epithemia/Rhopalodia</i>		X		X		
<i>Eucoconeis</i>					X	
<i>Fragilaria</i> (filament)	X	X		X		
<i>Fragilaria/Ulnaria</i> (solitary)	X	X	X	X	X	X
<i>Gomphonema</i>	X	X	X	X	X	X
<i>Hannaea</i>						
<i>Melosira</i>	X	X	X	X	X	
Nitzschioid group						
<i>Pinnularia</i>	X				X	
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>						
<i>Stephanodiscus</i>						
<i>Surirella</i>						
Symmetric biraphid group	X	X	X	X	X	X
<i>Synedra</i> (star-shaped colony)						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Tabellaria</i>	X	X	X	X	X	X
<i>Thalassiosira</i>			X		X	
Green - Sept 16						
<i>Acutodesmus</i>						
<i>Ankistrodesmus</i>						
<i>Botryococcus</i>	X	X	X	X	X	X
<i>Bulbochaete</i>	X		X	X		X
<i>Chaetosphaeridium</i>						
<i>Characium</i>						
<i>Chlamydomonas</i>		X				
<i>Cladophora</i>					X	
<i>Coelastrum</i>	X	X	X	X	X	X
<i>Coleochaete</i>						
<i>Desmodesmus</i>				X		X
<i>Elakatothrix</i>	X	X				
<i>Eudorina</i>			X	X	X	
<i>Geminella</i>				X	X	
<i>Gloeocystis</i>						X
<i>Hydrodictyon</i>						
<i>Kirchneriella</i>			X	X	X	X
<i>Monoraphidium</i>						
<i>Mougeotia</i>	X	X	X	X	X	X
<i>Nephrocytium/Oonephris</i>	X	X	X	X	X	X
<i>Oedogonium</i>	X	X	X	X		X
<i>Oocystis</i>	X	X	X	X	X	X
<i>Pandorina</i>			X			
<i>Paulschulzia</i>						
<i>Planktosphaeria</i>	X	X	X	X	X	X
<i>Pseudopediastrum</i>	X	X	X	X	X	X
<i>Quadrigula</i>	X	X	X	X	X	X
<i>Scenedesmus</i>	X			X		X
<i>Sphaerocystis</i>	X		X	X		X
<i>Spirogyra</i>	X		X	X		X

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Stigeoclonium</i>						
<i>Ulothrix</i>				X		
unk. colonial		X			X	X
<i>Willea</i>	X	X	X	X	X	X
<i>Zygnema</i>	X	X	X	X		X
Desmids - Sept 16						
<i>Cosmarium</i>	X	X		X		X
<i>Desmidium</i>				X		
<i>Euastrum</i>						
<i>Gonatozygon</i>						
<i>Hyalotheca</i>						
<i>Pleurotaenium</i>						
<i>Staurastrum</i>		X		X		
<i>Stauroidesmus</i>						
<i>Teilingia</i>						X
Other, Cryptophyta - Sept 16						
<i>Cryptomonas</i>		X				X
Other, Dinophyta						
<i>Ceratium</i>						
dinoflagellate cysts						
<i>Gymnodinium</i>						
<i>Parvodinium</i>	X		X			
<i>Peridinium</i>				X		
<i>Tovellia</i>						
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						
<i>Trachelomonas</i>	X					
Other, Ochrophyta						
<i>Binuclearia</i>						
<i>Dinobryon</i>	X	X	X	X	X	X
<i>Gloeobotrys</i>		X	X	X	X	X
<i>Mallomonas</i>	X	X	X		X	

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Nannochloropsis</i>						
<i>Phaeoplaca</i>						
<i>Stichogloea</i>	X	X		X	X	X
Cyanobacteria - Oct 19						
<i>Anabaena</i>						
<i>Aphanocapsa</i>			X	X	X	
<i>Aphanothece</i>				X		
<i>Arthrospira</i>						
<i>Chroococcus</i>	X	X	X	X	X	X
<i>Coelomoron/Coelosphaerium</i>						
<i>Cyanophanon</i>						
<i>Cyanothece</i>						
<i>Cylindrospermum</i>						
<i>Dichothrix</i>						
<i>Geitlerinema</i>						
<i>Gloeothece</i>						
<i>Komvophoron</i>						
<i>Limnothrix/Lyngbya</i>						
<i>Merismopedia</i>					X	
<i>Nostoc</i>						
Oscillatoriales group						X
<i>Pseudanabaena</i>			X			
<i>Scytonema</i>				X		
<i>Snowella</i>		X		X	X	
<i>Spirulina</i>						
<i>Stigonema</i>						
unk. filament						
Diatoms - Oct 19						
<i>Achnantheidium</i>					X	
<i>Asterionella</i>	X	X	X	X	X	X
<i>Cocconeis</i>						
<i>Craticula</i>						
<i>Ctenophora</i> cf						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Cyclotella</i>	X	X	X	X	X	X
<i>Cymbella</i>					X	
<i>Cymbopleura</i>						
<i>Diatoma</i>		X	X	X		X
<i>Didymosphenia</i>						
<i>Diploneis</i>					X	
<i>Encyonema</i>						
<i>Epithemia/Rhopalodia</i>					X	
<i>Eucoconeis</i>						
<i>Fragilaria</i> (filament)	X	X	X		X	X
<i>Fragilaria/Ulnaria</i> (solitary)	X		X	X	X	X
<i>Gomphonema</i>					X	
<i>Hannaea</i>						
<i>Melosira</i>			X			
Nitzschoid group						
<i>Pinnularia</i>	X			X	X	
<i>Rhoicosphenia</i>						
<i>Stauroneis</i>			X		X	
<i>Stephanodiscus</i>		X				
<i>Surirella</i>					X	
Symmetric biraphid group		X	X			
<i>Synedra</i> (star-shaped colony)		X				
<i>Tabellaria</i>	X	X	X	X	X	X
<i>Thalassiosira</i>		X	X	X	X	
Green - Oct 19						
<i>Acutodesmus</i>						
<i>Ankistrodesmus</i>						
<i>Botryococcus</i>	X					
<i>Bulbochaete</i>				X		
<i>Chaetosphaeridium</i>						
<i>Characium</i>						
<i>Chlamydomonas</i>						
<i>Cladophora</i>						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Coelastrum</i>		X	X	X	X	X
<i>Coleochaete</i>						
<i>Desmodesmus</i>		X			X	X
<i>Elakatothrix</i>						
<i>Eudorina</i>			X	X		
<i>Geminella</i>						
<i>Gloeocystis</i>	X					
<i>Hydrodictyon</i>						
<i>Kirchneriella</i>			X			X
<i>Monoraphidium</i>					X	
<i>Mougeotia</i>				X		X
<i>Nephrocytium/Oonephris</i>	X	X	X	X		X
<i>Oedogonium</i>						
<i>Oocystis</i>	X	X	X	X	X	X
<i>Pandorina</i>						
<i>Paulschulzia</i>						
<i>Planktosphaeria</i>		X	X	X		X
<i>Pseudopediastrum</i>	X	X	X	X	X	X
<i>Quadrigula</i>	X	X	X	X	X	X
<i>Scenedesmus</i>						
<i>Sphaerocystis</i>		X				
<i>Spirogyra</i>		X		X		X
<i>Stigeoclonium</i>						
<i>Ulothrix</i>						
unk. colonial						
<i>Willea</i>						
<i>Zygnema</i>	X		X	X		X
Desmids - Oct 19						
<i>Cosmarium</i>		X		X	X	
<i>Desmidium</i>						
<i>Euastrum</i>						
<i>Gonatozygon</i>						
<i>Hyalotheca</i>						

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Table A2: Lake Chelan algae, continued

Genus	Phytoplankton					
	CONB	CONH	CRYV	LOWR	PURC	SUN
<i>Pleurotaenium</i>						
<i>Staurastrum</i>		X		X		X
<i>Stauroidesmus</i>						
<i>Teilingia</i>						
Other, Cryptophyta - Oct 19						
<i>Cryptomonas</i>		X		X	X	X
Other, Dinophyta						
<i>Ceratium</i>						
dinoflagellate cysts						
<i>Gymnodinium</i>	X					
<i>Parvodinium</i>						
<i>Peridinium</i>						
<i>Tovellia</i>				X		
Other, Euglenophyta						
<i>Euglena</i>						
<i>Phacus</i>						
<i>Trachelomonas</i>						
Other, Ochrophyta						
<i>Binuclearia</i>						
<i>Dinobryon</i>	X	X	X	X	X	X
<i>Gloeobotrys</i>	X	X	X	X	X	
<i>Mallomonas</i>						
<i>Nannochloropsis</i>	X	X	X	X	X	X
<i>Phaeoplaca</i>						
<i>Stichogloea</i>		X	X	X	X	X

Table A3: Incidental periphyton samples collected on May 1 (CVE, SUN) and August 24 (ROSES). See Figure 2 for site abbreviations

Genus	May 1		Aug 24
	CRYV	SUN	ROSES
Cyanobacteria			
<i>Aphanocapsa</i>	X		X
<i>Aphanothece</i>			X
<i>Arthrospira</i>			X
<i>Chroococcus</i>		X	X
<i>Cyanothece</i>		X	X
<i>Dichothrix</i>	X		
<i>Limnothrix/Lyngbya</i>			X
<i>Merismopedia</i>			X
Oscillatoriales group	X		X
<i>Pseudanabaena</i>			X
<i>Spirulina</i>			X
<i>Achnantheidium</i>	X	X	X
Diatoms			
<i>Cocconeis</i>			X
<i>Cyclotella</i>		X	X
<i>Cymbella</i>	X		X
<i>Diatoma</i>	X	X	X
<i>Diploneis</i>	X	X	X
<i>Epithemia/Rhopalodia</i>			X
<i>Eucoconeis</i>		X	
<i>Fragilaria</i>	X	X	
<i>Fragilaria/Ulnaria</i>	X	X	X
<i>Gomphonema</i>	X		X
<i>Pinnularia</i>		X	X
<i>Rhoicosphenia</i>			X
<i>Stauroneis</i>		X	
<i>Surirella</i>		X	
Symmetric biraphid group	X	X	X
<i>Tabellaria</i>	X	X	
Green			
<i>Acutodesmus</i>	X	X	

continued on next page

Table A3: Incidental periphyton samples, continued

Genus	May 1		Aug 24
	CRYV	SUN	ROSES
<i>Botryococcus</i>			X
<i>Bulbochaete</i>	X	X	
<i>Cladophora</i>			X
<i>Desmodesmus</i>	X	X	X
<i>Eudorina</i>			X
<i>Gloeocystis</i>	X		
<i>Mougeotia</i>	X	X	X
<i>Oedogonium</i>			X
<i>Oocystis</i>			X
<i>Pandorina</i>			X
<i>Planktosphaeria</i>	X		
<i>Pseudopediastrum</i>	X		
<i>Scenedesmus</i>	X	X	X
<i>Spirogyra</i>			X
<i>Ulothrix</i>	X		
<i>Zygnema</i>	X	X	
Desmids			
<i>Cosmarium</i>	X	X	
Other, Dinophyta			
<i>Gymnodinium</i>			X
<i>Peridinium</i>			X
Other, Euglenophyta			
<i>Euglena</i>			X
Other, Haptophyta			
<i>Prymnesium</i>	X		

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