

Cyanobacteria Monitoring Program 2021 Report
Summer-Fall 2021

Rhode Island Department of Environmental Management
Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908



Lower Melville Pond – July 2021

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Introduction

Cyanobacteria (blue-green algae) are microscopic, photosynthetic bacteria naturally found in waterbodies. These organisms either attach to a substrate or float in the water column as individual cells or within colonies. There are many factors that may cause cyanobacteria to experience rapid growth events known as blooms. Such factors include the duration and intensity of sunlight to surface waters, water temperature, excess nutrient loads (phosphorus in particular), and other influxes of polluted stormwater runoff. Most cyanobacteria produce intracellular toxins which are released into waters when the cells die or are ruptured. This can potentially cause health risks for humans as well as wildlife, pets, and livestock.

The Rhode Island Department of Health (HEALTH) and the Rhode Island Department of Environmental Management (RIDEM) work cooperatively to monitor for the presence of cyanobacteria blooms, evaluate the potential risks to the public, and issue health advisories notifying the public of health concerns. The agencies jointly issue health/recreational advisories when any of the following three guidelines are met:

- Evidence of a visible cyanobacteria scum or mat or lake/pond-wide cyanobacteria bloom.
- Cyanobacteria cell count exceeding 70,000 cells/mL.
- Toxin (Microcystin-LR) level of lysed cells meeting or exceeding 4 ppb ($\mu\text{g/L}$).

Health advisories recommend that individuals avoid all contact with the affected waterbody, including recreational activities such as swimming, boating, or fishing. People are also advised to not eat fish from the affected waterbody or to allow pets to wade in, swim in, or drink untreated water from the affected waters. Health advisories remain in effect, unless follow-up sampling by a city, town, third party or RIDEM indicate that the advisory can be lifted.

Health advisories may be lifted after two successive and representative sampling rounds two weeks apart demonstrate no evidence of a cyanobacterial scum or mat, and testing results find cyanobacteria cell counts and toxin levels to be below threshold concentrations. Local residents are still advised to exercise caution around these waters, as blooms may reappear.

Due to the prolonged warm weather into the fall and winter seasons and potential for secondary recreation (e.g. boating, fishing) to continue into cooler months, all health advisories placed over the summer have remained in place past the November 1st, if no follow up sampling to lift the advisories is conducted. Beginning November 1st, RIDEM conducts visual checks monthly at ponds with active advisories in November and December to confirm blooms have subsided. Following these visual checks, the advisories are lifted.

RIDEM's Office of Water Resources (OWR) receives reports annually about nuisance algal conditions and cyanobacteria blooms from municipal staff, lake and watershed associations, as well as the broader public. From 2011 to 2021, 49 waterbodies have had recreational/health advisories issued with an average of approximately 14 waterbodies per year. Twelve of the 49 waterbodies are public drinking water supplies and nearly all the remaining waterbodies have a public boat/canoe launch, are routinely used for recreational activities, or have a well-known public access point.

In 2017 and 2018, RIDEM OWR received an EPA Multi-Purpose Grant allowing for biweekly cyanobacteria monitoring of 32 waterbodies throughout the state during the field seasons. While this funding was not available for 2019, RIDEM OWR was able to once again secure the grant for 2020 and continue monitoring 21 waterbodies. In 2021, RIDEM OWR monitored 27 waterbodies. This report provides a summary of the results of the 2021 cyanobacteria monitoring program. Previous year's reports, as well as a table listing all advisories from 2011-present, are located at DEM's cyanobacteria homepage [here](#).

Methods

RIDEM's Quality Assurance Project Plan (QAPP) describes in detail the field and analytical methods and quality assurance/quality control procedures related to this sampling program (link to: [HAB QAPP](#)). The QAPP ("Rhode Island Freshwater Harmful Algal Bloom Monitoring") is available at DEM's Providence office and was written and approved in 2017. Every year an addendum is written to update the list of waterbodies to be evaluated on a regular basis.

In 2021, RIDEM OWR conducted routine biweekly cyanobacteria monitoring of 13 waterbodies from early June to late November (Table 1). These waterbodies were selected for monitoring at the start of the 2021 season due to having a history of frequent cyanobacteria blooms in previous years. Additional monitoring was done in response to calls from the public, municipal staff, watershed associations, or other RIDEM staff about potential cyanobacteria blooms. There were 14 waterbodies which were visited as a response to concerns about a bloom.

During each visit a fieldsheet was filled out and photographs were taken, regardless of whether or not a bloom was observed. The fieldsheet documented information about location, extent and physical appearance of the bloom, weather conditions, and any active recreation occurring at the waterbody.

If a bloom was observed during a visit, one or more samples were collected following the procedure outlined in the QAPP. Samples were collected from the shoreline with the aid of a sampling stick from the densest portion of the bloom. Typically, monitoring and sample collection occurred at public access points on each pond. If no public access was available, monitoring and sample collection were done from a secondary access location or through permission of a private owner. Monitoring and sampling locations for each waterbody are listed in Table 1.

Samples were sent to the Rhode Island State Health Laboratory for cyanotoxin analysis and identification/enumeration by colony count of cyanobacteria genera. The cyanotoxins identified by the lab are listed in Table 2, and the cyanobacteria genera are listed in Table 3, along with the thresholds for issuing an advisory. RIDEM OWR staff estimated cyanobacteria cell counts from colony counts using conversion factors provided in Hartman and Graffius (1960). Cyanotoxin concentration, colony count, cell count estimation, and visual appearance were evaluated by RIDEM OWR and HEALTH and an advisory was issued if any of the previously mentioned thresholds were met. If an advisory was issued for a waterbody as a result of a response visit, the

waterbody was subsequently added to the routine biweekly monitoring schedule. Follow-up sampling to lift advisories was conducted when possible.

Table 1: List of Waterbodies Evaluated for Cyanobacteria Blooms.

Sampling Program	Name	Town	Waterbody ID	Primary Access
Screening Level	Almy Pond	Newport	RI0010047L-01	Access off Coggeshell Ave on South side
	Blackamore Pond	Cranston	RI0006018L-06	Access off Winter Ave
	J.L. Curran Reservoir (Upper)	Cranston	RI0006016L-02	Access area off Seven Mile Rd (boat Launch area)
	Georgiaville Pond	Smithfield	RI0002007L-02	Access from public beach off of Stillwater Rd
	Little Pond	Warwick	RI0007024L-01	Access behind Warwick Veterans Junior High School
	Mashapaug Pond	Providence	RI0006017L-06	Access from boat launch near baseball field off Access Rd
	Melville Pond (Lower)	Portsmouth	RI0007029R-04	Access near gate at the end of Smith Rd
	Melville Pond (Upper)	Portsmouth	RI0007029R-04	Access near elementary school at fishing dock
	Slack Reservoir	Smithfield-Johnston	RI0002007L-03	Access at public beach off Green Lake Dr or Terrace Dr
	Spectacle Pond	Cranston	RI0006017L-07	Access at end of Midwood St on south end of pond
	Stafford Pond	Tiverton	RI0007037L-01	Access at DEM Boat Ramp or Pelletier Ln
	Turner Reservoir	Rumford	RI0004009L-01B	Access off of Newman Ave (route 152) bridge or along Bridgham Farm walking area off of Bridgham Farm Rd
	Warwick Pond	Warwick	RI0007024L-02	Access at boat launch or park off of Edgehill Rd on east side of pond
Response Level	Barney Pond	Lincoln	RI0003008L-02	Access off Grandview Ave
	Belleville Pond	North Kingstown	RI0007027R-02	Access at boat launch in Ryan Park
	Brickyard Pond	Barrington	RI0007020L-02	Access via Veterans Memorial Park

	Carbuncle Pond	Coventry	RI0005011L-01	Access via state entrance off Plainfield Pike
	Central Pond	Rumford	RI0004009L-01A	Access of bridge on Highway 152
	Johnson's Pond	Coventry	RI0006013L-01	Access off Old Flat River Road, Indian Trail, and Waters Edge Family Campground
	Larkin Pond	South Kingstown	RI0008039L-11	Access from Camp Hoffman and Kingston's Camp Beach
	Pascoag Reservoir (Echo Lake)	Burrillville/Glocester	RI0001002L-03	Access at 50 Point Lane
	Roger Williams Park	Providence	RI0006017L-05	Access off FC Greene Memorial Blvd/Natural History Ave
	Sachem Pond	New Shoreham	RI0010046L-03	Access off Corn Neck Road
	Ten Mile River	East Providence	RI0004009R-01B	Access at Turner Reservoir Loop Trailhead parking lot
	Tiogogue Lake	Coventry	RI0006014L-02	Access at Briar Point Beach
	Wenscott Reservoir	North Providence	RI0003008L-05	Access across from the Twin Rivers Building off Douglas Pike
	Worden Pond	South Kingstown	RI0008039L-07	Access at State Boat Launch

Table 2: List of cyanotoxins analyzed and advisory threshold level.

Toxin	Threshold for Issuance of Advisory
Total Microcystins*	4.0 µg/L
Cylindrospermopsin	None Defined
Anatoxin	
Nodularin	

*: Most common toxin found in samples.

Table 3: List of cyanobacteria genera identified by the State Health Laboratory

Genera	Threshold for Issuance of Advisory
<i>Anabaena</i> *	
<i>Aphanizomenon</i>	
<i>Chlorella</i>	

<i>Cylindrospermopsis</i>	>70,000 cells/mL (total cyanobacteria)
<i>Microcystis</i> *	
<i>Nodularia</i>	
<i>Planktothrix</i> *	
<i>Woronichina</i>	

*: Most common genera found in samples.

Results

Routine cyanobacteria monitoring occurred biweekly from June through December, resulting in approximately 13 visits to each of the pre-chosen waterbodies. Additional visits were conducted on 17 occasions in response to calls from citizens, town managers, environmental organizations, or other RIDEM field staff about potential blooms (Table 4). Starting in November, sampling ceased, except for visual surveys that were conducted to lift advisories still in effect at the end of the recreational season.

Table 4: 2021 Response Visits

Waterbody	Date	# of Samples collected	Advisory Issued
Barney Pond	6/30/2021	2	No
Carbuncle Pond	7/21/2021	1	No
Echo Lake (Pascoag)	7/23/2021	3	No
Belleville Pond	7/27/2021	2	No
Carbuncle Pond	7/28/2021	1	No
Wenscott Reservoir	8/3/2021	1	Yes, 8/6/2021 - 12/7/2021
Sachem Pond	8/7/2021	1	Yes, 8/6/2021 - 11/19/2021
Larkin Pond	8/10/2021	1	Yes, 8/12/2021 - 9/3/2021
Little Pond	8/12/2021	1	No
Tiogue Lake	8/16/2021	1	Yes, 8/19/2021 - 9/17/2021
Brickyard Pond	8/31/2021	1	Yes, 9/3/2021 - 9/30/2021
Johnson's Pond	9/17/2021	2	Yes, 9/20/2021 - 12/7/2021
Cunliff Lake	9/23/2021	1	No
Worden Pond	9/27/2021	1	Yes, 9/30/2021- 11/19/2021
Carbuncle Pond	10/7/2021	1	No
Roger Williams Park	10/8/2021	3	Yes, 10/8/2021-
Carbuncle Pond	10/29/2021	1	No

The field visits led to the issuance of 19 recreational advisories for cyanobacteria blooms, 11 of which were a result of routine monitoring (Table 5). Response visits resulted in the issuance of 8 advisories. The majority of the advisories were issued based on visual appearance and exceedance of the cell count threshold.

A total of 81 cyanobacteria samples were collected from 27 waterbodies throughout the state. Of the 81 samples, 48 were collected to support initial issuance of an advisory while 33 were collected as follow-up samples in an effort to lift the advisories. Lifting an advisory in which 2 samples collected 2 weeks apart exhibited toxin levels and cell counts below the advisory thresholds was done for Georgiaville Pond, Upper Curran Reservoir, Larkin Pond, Warwick Pond, Johnson’s Pond (Flat River Reservoir), Tiogue Lake, Brickyard Pond, Worden Pond, and Wenscott Reservoir.

Table 5: List of confirmed cyanobacteria blooms throughout the 2021 monitoring season

Waterbody	Town	Date Advisory Posted	Date Advisory Lifted	Basis for Advisory	Screening or Response Visit
Almy Pond	Newport	6/12/2021	Not lifted*	Cell Count	Screening
Georgiaville Pond	Smithfield	6/28/2021	8/6/2021	Cell Count	Screening
Mashapaug Pond	Providence	7/13/2021	12/7/2021	Cell Count	Screening
Blackamore Pond	Cranston	7/13/2021	Not lifted*	Cell Count/Toxin Levels	Screening
Upper J.L. Curran Reservoir	Cranston	7/13/2021	8/19/2021	Cell Count	Screening
Spectacle Pond	Cranston	7/13/2021	12/21/2021	Cell Count	Screening
Melville Ponds	Portsmouth	7/16/2021	12/21/2021	Cell Count/Toxin Levels	Screening
Warwick Pond	Warwick	7/23/2021	9/3/2021	Cell Count	Screening
Sachem Pond	New Shoreham	8/6/2021	11/19/2021	Toxin Levels	Response
Slack Reservoir	Smithfield/Johnston	8/6/2021	11/19/2021	Cell Count/Toxin Levels	Screening
Wenscott Reservoir	North Providence	8/6/2021	12/7/2021	Cell Count	Response
Larkin Pond	South Kingstown	8/12/2021	9/3/2021	Cell Count/Toxin Levels	Response
Tiogue Lake	Coventry	8/19/2021	9/17/2021	Toxin Levels	Response
Brickyard Pond	Barrington	9/3/2021	9/30/2021	Cell Count	Response
Flat River Reservoir (Johnson’s Pond)	Coventry	9/20/2021	12/7/2021	Toxin Levels	Response
Worden Pond	South Kingstown	9/30/2021	11/19/2021	Cell Count/Toxin Levels	Response
Warwick Pond	Warwick	10/7/2021	12/7/2021	Cell Count	Screening
Roger Williams Park	Providence	10/8/2021	12/21/2021	Cell Count/Toxin Levels	Response

*Still visible signs of blooms in December.

The highest detected total microcystin concentration was 170 ug/L in Worden Pond and the highest cyanobacteria colony cell count was 5,423,120 cells/mL in Upper Melville Pond. The total microcystin threshold was exceeded in 10 samples from 8 different waterbodies (Table 6). The cell count threshold was exceeded in 18 samples from 16 different waterbodies (Table 7).

Potentially toxigenic species *Anabaena*, *Aphanizomenon*, *Microcystis*, *Planktothrix*, and *Woronichinia* were identified in 58 of the 81 samples collected.

Table 6: Distribution of Total microcystin concentration in samples

	Total Microcystin concentration (ug/L)		
	Non-detect (< 1.0)	1.0 - 4.0	≥ 4.0
# of samples	66	5	10

Table 7: Cell count distribution in samples

	Cell Count Estimation (cells/mL)		
	Non-detect (< 1.0)	1 – 70,000	> 70,000
# of samples	23	41	17

Conclusions

The results for 2021 demonstrate the importance of conducting continued cyanobacteria monitoring throughout the recreational season as 10 of the 19 advisories in 2021 resulted from routine monitoring efforts. Prior to 2017, RIDEM only conducted cyanobacteria field visits in response to calls from the public. Public involvement and awareness are still crucial to identifying problematic cyanobacteria blooms, but relying solely on the public to report blooms would result in many blooms going undetected which would increase the potential for cyanobacteria-related illnesses in local residents.

Follow-up sampling conducted this season for the purpose of lifting advisories highlights the complicated nature of cyanobacteria blooms. On some ponds, blooms subsided then re-emerged over periods of days or weeks. Consequently, nine sets of follow up samples from Georgiaville Pond, Upper Curran Reservoir, Larkin Pond, Warwick Pond, Johnson’s Pond (Flat River Reservoir), Tiogue Lake, Brickyard Pond, Worden Pond, and Wenscott Reservoir resulted in the lifting of advisories in 2021.

Estimation of cell counts from colony counts using conversion factors from Hartmann and Graffius (1960)¹ was used for issuing advisories in 2021 (Table 8), with 18 samples from 16 different waterbodies receiving advisories issued on cell count estimations exceeding the threshold. Since there is no guidance for issuing an advisory based on colony counts, estimating cell counts from colony counts allows for more thorough identification of potentially harmful blooms.

Table 8: Conversion of cyanobacteria genera colony count to cell count

Genera	Anabaena	Aphanizomenon (Single)	Aphanizomenon (Bundle)	Microcystis	Planktothrix	Woronichinia
Colony Conversion	x23	x28	x280	x140	x28	x250

There are several differences in the monitoring results from 2020 to 2021. In 2020, 6.8% (6 out of 88) of samples exceeded the total microcystin threshold, compared to 12.3% (10 out of 81) in 2021 (Figure 1). After back to back years of Slack Reservoir having the highest total microcystin concentration of all samples, in 2021 it was Worden Pond that had the highest sample at 170 ug/L compared to Slack Reservoir in 2020 at 260 ug/L.

¹ Hartman RT, Graffius JH (1960). “Quantitative seasonal changes in the phytoplankton communities of Pymatuning Reservoir”. *Ecology* 41(2): 334-340.

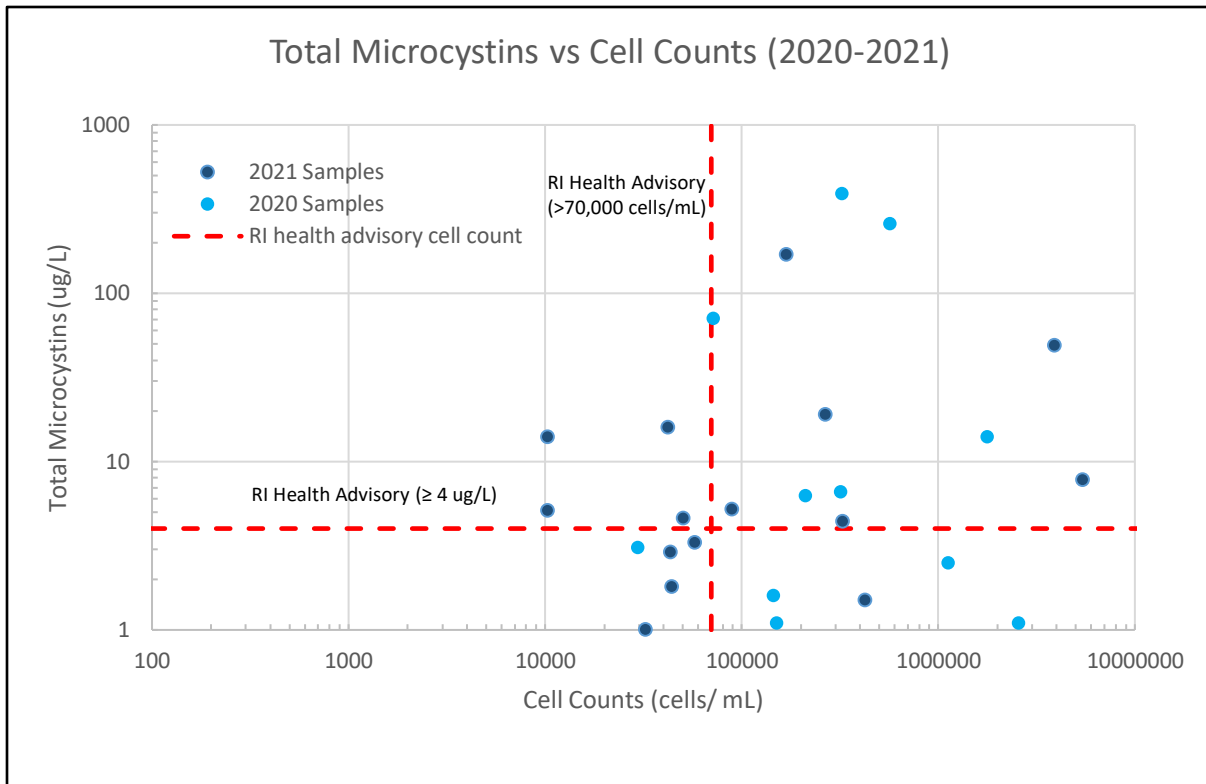


Figure 1: Total microcystin concentration vs. cell density estimations in 2020-2021. Non-detect data not included.

Cyanobacteria colonies were detected in 70% (57 out of 81) of samples collected. *Woronichina* was the predominant genera of cyanobacteria across all sampling results in both 2020 and 2021 (Figures 2 and 3). *Aphanizomenon* was second in highest genera for 2021 at 27% of the total. Anatoxins were detected in 5% (4 of the 81) samples.

In 2020, RIDOH started making the distinction between single filament, and bundled *Aphanizomenon*, which is important due to the different conversion factors which can make the difference between issuing or not issuing an advisory. The different composition of cyanobacteria genera will lead to varying microbial antagonists. This will affect the conditions under which cyanobacteria will thrive for different waterbodies. These results demonstrate the degree of variation in cyanobacteria blooms from year to year and the difficulties associated with predicting blooms.

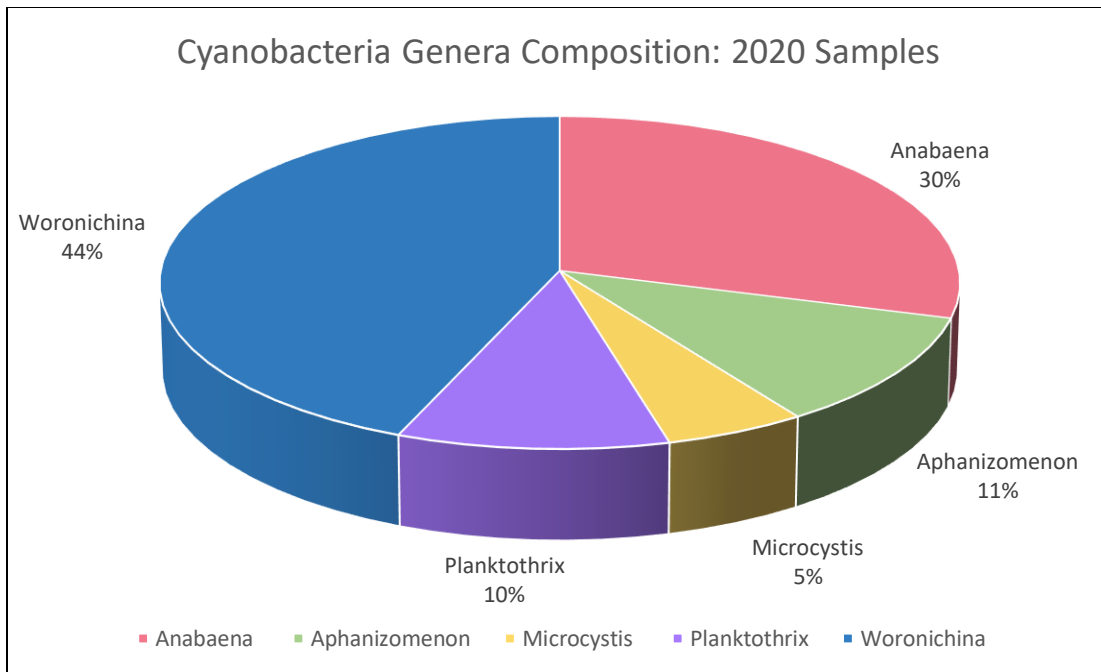


Figure 2: Percentage of each genera of cyanobacteria based on all samples analyzed.

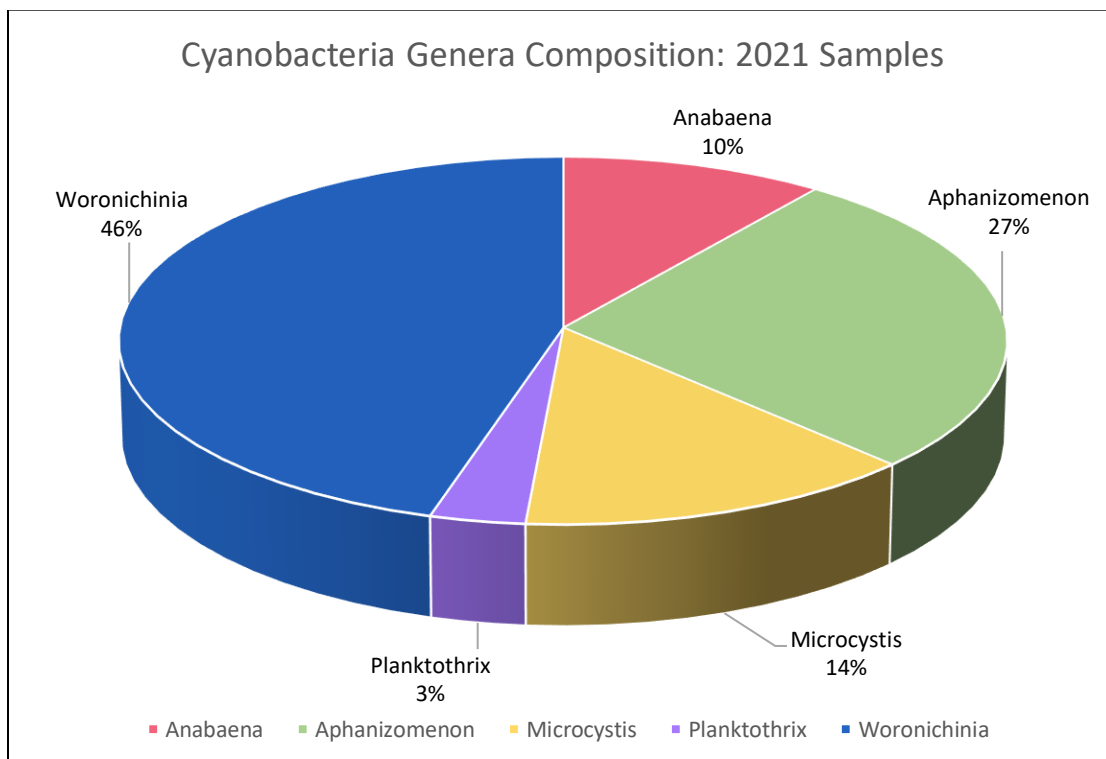



Figure 3: Percentage of each genera of cyanobacteria based on all samples analyzed.

Appendix A

Table 1A: Results for cyanobacteria monitoring of Almy Pond in 2021

Almy Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 6/8/2021 
6/8/2021	Cloudy, pea soup color	Microcystins: n.d. Anatoxin: 3.2	Anabaena: 270 Aphanizomenon single: 9400	269,410*	
6/21/2021	Cloudy, pea soup color	Microcystins: n.d. Anatoxin: 3.5	Anabaena: 490 Aphanizomenon bundle: 30 Microcystis: 20	22,470	
7/6/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
7/20/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
8/3/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
8/16/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
8/31/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
9/15/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
11/1/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
11/16/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
12/7/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
12/14/2021	Cloudy, pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	

*Health Advisory Issued; **Exceedance of Threshold.**

Table 2A: Results for cyanobacteria monitoring of Barney Pond in 2021


Barney Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 6/30/2021
6/30/2021	Extensive algae. Couldn't discern cyano but very possible. Boat ramp sample.	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 10 Woronichinia: 40	Boat ramp sample: 11,400	
6/30/2021	Shoreline sample.	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	

Table 3A: Results for cyanobacteria monitoring of Bellville Pond in 2021



Bellville Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 7/27/2021
7/27/2021	Near dam	Microcystins: n.d. Anatoxin: n.d.	Planktothrix: 160	4,480	
7/27/2021	Reports of cyano at boat ramp	Microcystins: n.d. Anatoxin: n.d.	Woronichinia: 10	2,500	

Table 4A: Results for cyanobacteria monitoring of Blackamore Pond in 2021

Blackamore Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 11/30/2021
6/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
6/22/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/7/2021	-	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 240 Woronichinia: 220	88,600*	
7/19/2021	Looked like bloom still present	No Sample Taken	No Sample Taken	No Sample Taken	
8/2/2021	Bloom present but looks like green algae	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
8/17/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 120 Aphanizomenon single: 380 Aphanizomenon bundle: 30 Microcystis: 10	23,200	
9/1/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 550 Aphanizomenon single: 12,960 Aphanizomenon bundle: 40 Woronichinia: 40	396,730*	
9/14/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/12/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/15/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/30/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
12/14/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	

*Health Advisory Issued; Exceedance of Threshold.

Table 5A: Results for cyanobacteria monitoring of Boone Lake in 2021



Boone Lake					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 10/12/2021
10/12/2021	Sample brought to DEM to look at under microscope	No Sample Analyzed	No Sample Analyzed	No Sample Analyzed	

Table 6A: Results for cyanobacteria monitoring of Brickyard Pond in 2021

Brickyard Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 8/31/2021
8/31/2021	Fish are staying near the surface where the algae is less dense	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 80 Aphanizomenon single: 79,000 Microcystis: 1500	2,423,840*	
9/15/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 10 Aphanizomenon single: 110 Microcystis: 10	4,710	
9/28/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
10/12/2021	-	No Sample Taken	No Sample Taken		
10/28/2021	-	No Sample Taken	No Sample Taken		

*Health Advisory Issued; Exceedance of Threshold.

Table 7A: Results for cyanobacteria monitoring of Carbuncle Pond in 2021


Carbuncle Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 10/7/2021
7/21/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 1100	25,300	
7/28/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 720	16,560	
10/7/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 570	13,110	
10/29/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 700 Microcystis: 10	17,500	

Table 8A: Results for cyanobacteria monitoring of Central Pond in 2021


Central Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 10/12/2021
7/21/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/28/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/29/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	

Table 9A: Results for cyanobacteria monitoring of Echo Lake (Pascoag) in 2021




Echo Lake					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph: 7/23/2021
7/23/2021	Reports of dog becoming ill from water	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
7/23/2021	Reports of dog becoming ill from water	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
7/23/2021	Reports of dog becoming ill from water	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	

Table 10A: Results for cyanobacteria monitoring of Georgiaville Pond in 2021

Georgiaville Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
6/22/2021	-	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 10 Planktothrix: 160 Woronichinia: 40	603,100*	
7/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/19/2021	Didn't appear to be cyano	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
8/2/2021	Looks clear, some turbidity	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
8/17/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
8/31/2021	Looks clear	No Sample Taken	No Sample Taken	No Sample Taken	
9/14/2021	Some detritus but it didn't look like cyano	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/13/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	


*Health Advisory Issued; Exceedance of Threshold.

Table 11A: Results for cyanobacteria monitoring of J.L. Curran Reservoir in 2021

J.L. Curran Reservoir					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
6/21/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/7/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 12,000 Aphanizomenon bundle: 2,000	836,000*	
7/19/2021	Seems cyano still present	No Sample Taken	No Sample Taken	No Sample Taken	
8/2/2021	Bloom is gone, still turbid	Microcystins: n.d. Anatoxin: n.d.	Aphanizomenon single: 280	7,840	
8/17/2021	-	Microcystins: n.d. Anatoxin: n.d.	Aphanizomenon single: 430	12,040	
9/1/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/14/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/13/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	


*Health Advisory Issued; Exceedance of Threshold.

Table 12A: Results for cyanobacteria monitoring of Johnson’s Pond (Flat River) in 2021

Johnson’s Pond (Flat River Reservoir)					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
9/17/2021	Only visible at response sites but not at access points. Sample was off Racoon Run	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 10	230	
9/17/2021	Sample was off Sharon Drive	Microcystins: 16* Anatoxin: n.d.	Anabaena: 180 Microcystis: 270	41,940	
11/2/2021	Sample was off Island Drive Bridge	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 140 Microcystis: 50	10,220	
11/2/2021	Sample was off Sharon Drive	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
11/16/2021	Sample was off Island Drive Bridge	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 1,700	39,100	
11/16/2021	Sample was off Sharon Drive	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
11/30/2021	Sample was off Island Drive Bridge	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	

*Health Advisory Issued; Exceedance of Threshold.

Table 13A: Results for cyanobacteria monitoring of Larkin Pond in 2021

Larkin Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
8/10/2021	Not widespread but seems like cyano	Microcystins: 4.4* Anatoxin: n.d.	Anabaena: 20 Microcystis: 2,300 Woronichinia: 10	324,960*	
8/12/2021	Kingston looked clear but some tint and turbidity	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 390	54,600	
8/12/2021	Camp Hoffman Dock looked like a bloom	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 250	35,000	
8/12/2021	Hoffman #2	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 240	33,600	
8/12/2021	Hoffman #3	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 10	1,400	
8/12/2021	Hoffman #4	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
9/1/2021	Some green tint	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 230	32,200	

*Health Advisory Issued; Exceedance of Threshold.

Table 14A: Results for cyanobacteria monitoring of Little Pond (Warwick) in 2021


Little Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/7/2021	Fish swimming	No Sample Taken	No Sample Taken	No Sample Taken	
6/22/2021		No Sample Taken	No Sample Taken	No Sample Taken	
7/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/19/2021	Looks clear	No Sample Taken	No Sample Taken	No Sample Taken	
8/2/2021	Clear	No Sample Taken	No Sample Taken	No Sample Taken	
8/12/2021	Didn't appear to be a bloom but took a sample due to response call	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 30	4,200	
8/17/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/1/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/14/2021	Clear	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/13/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	

Table 15A: Results for cyanobacteria monitoring of Mashapaug Pond in 2021

Mashapaug Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
6/22/2021	-	Microcystins: 1.8 Anatoxin: n.d.	Anabaena: 130 Microcystis: 60 Woronichinia: 130	43,890	
7/7/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 820 Aphanizomenon bundle: 710 Woronichinia: 100	242,660*	
7/19/2021	Bloom present	No Sample Taken	No Sample Taken	No Sample Taken	
8/2/2021	Turbid & pea soup color	No Sample Taken	No Sample Taken	No Sample Taken	
8/17/2021	Advisory	No Sample Taken	No Sample Taken	No Sample Taken	
9/1/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/14/2021	Green chunks on surface	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/12/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/15/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/30/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	


*Health Advisory Issued; Exceedance of Threshold.

Table 16A: Results for cyanobacteria monitoring of Lower Melville Pond in 2021

Lower Melville Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/8/2021	Some green algae	No Sample Taken	No Sample Taken	No Sample Taken	
6/21/2021	Orange bloom	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
7/6/2021	Mostly covered	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 460 Aphanizomenon bundle: 180	60,980	
7/14/2021	Green tint and streaks on surface	Microcystins: 1.5 Anatoxin: n.d.	Anabaena: 3,900 Aphanizomenon bundle: 190 Aphanizomenon single: 660 Microcystis: 70 Woronichinia: 1,000	421,180*	
7/20/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
8/3/2021	Looks much better than last time, however bloom still evident	No Sample Taken	No Sample Taken	No Sample Taken	
8/16/2021	Already advisory	No Sample Taken	No Sample Taken	No Sample Taken	
8/31/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/15/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/29/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/20/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/16/2021	Clear	No Sample Taken	No Sample Taken	No Sample Taken	
12/1/2021	Some small clumps in shallow cove; waterfowl	No Sample Taken	No Sample Taken	No Sample Taken	
12/14/2021	Small clumps at inlet, watermeal	No Sample Taken	No Sample Taken	No Sample Taken	


*Health Advisory Issued; Exceedance of Threshold.

Table 17A: Results for cyanobacteria monitoring of Upper Melville Pond in 2021

Upper Melville Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/8/2021	Some green algae & detritus	No Sample Taken	No Sample Taken	No Sample Taken	
6/21/2021	Green algae	Microcystins: n.d. Anatoxin: n.d.	Woronichinia: 10	2,500	
7/6/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/14/2021	Green tint plus streaks on surface	Microcystins: 7.8* Anatoxin: n.d.	Anabaena: 14,000 Aphanizomenon bundle: 40 Aphanizomenon single: 140 Microcystis: 2,400 Woronichinia: 19,000	5,423,120*	
7/20/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
8/3/2021	Looks better than last time, still green tint however not as apparent	No Sample Taken	No Sample Taken	No Sample Taken	
8/16/2021	Already advisory	No Sample Taken	No Sample Taken	No Sample Taken	
8/31/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/15/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/29/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/20/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/16/2021	Clear	No Sample Taken	No Sample Taken	No Sample Taken	
12/1/2021	Some small clumps in shallow cove; waterfowl	No Sample Taken	No Sample Taken	No Sample Taken	
12/14/2021	Small clumps at inlet, watermeal	No Sample Taken	No Sample Taken	No Sample Taken	


*Health Advisory Issued; Exceedance of Threshold.

Table 18A: Results for cyanobacteria monitoring of Sachem Pond in 2021

Sachem Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
8/10/2021	Green paint and streaks on surface. Small clumps.	Microcystins: *5.1 Anatoxin: n.d.	Anabaena: 20 Microcystis: 70	10,260	


*Health Advisory Issued; Exceedance of Threshold.

Table 19A: Results for cyanobacteria monitoring of Slack Reservoir in 2021

Slack Reservoir					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
6/22/2021	Live fish, clear water	No Sample Taken	No Sample Taken	No Sample Taken	
7/7/2021	Sampled cove across bathrooms	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 10	1,400	
7/19/2021	Streaks on water	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 10	230	
8/3/2021	Looks clear, people swimming	Microcystins: 49* Anatoxin: 1.0	Anabaena: 30,000 Microcystis: 1,400 Woronichinia: 12,000	3,886,000*	
8/17/2021	Slight brown/green tint to water	Microcystins: n.d. Anatoxin: n.d.	Woronichinia: 60	15,000	
8/31/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/14/2021	Some streams, maybe detritus	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
9/27/2021	Little beach had large bloom	No Sample Taken	No Sample Taken	No Sample Taken	
10/13/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/15/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	

*Health Advisory Issued; Exceedance of Threshold.

Table 20A: Results for cyanobacteria monitoring of Spectacle Pond in 2021

Spectacle Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
6/22/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/7/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 640 Aphanizomenon bundle: 890 Woronichinia: 90	286,420*	
7/19/2021	Bloom still present	No Sample Taken	No Sample Taken	No Sample Taken	
8/2/2021	Bloom still present	No Sample Taken	No Sample Taken	No Sample Taken	
8/17/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/1/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/14/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/16/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/30/2021	Clear	No Sample Taken	No Sample Taken	No Sample Taken	
12/14/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	

*Health Advisory Issued; Exceedance of Threshold.

Table 21A: Results for cyanobacteria monitoring of Stafford Pond in 2021



Stafford Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/8/2021	Ducks swimming	No Sample Taken	No Sample Taken	No Sample Taken	
6/21/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/6/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/20/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
8/3/2021	Slight tint of green (very light) might just be result of cloudy/overcast day. Took sample just to be safe	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
8/16/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
8/31/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/15/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
10/12/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/28/2021	Clear	No Sample Taken	No Sample Taken	No Sample Taken	

Table 22A: Results for cyanobacteria monitoring of Tiogue Lake in 2021

Tiogue Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
8/16/2021	Many clumps in swimming area	Microcystins: 4.6* Anatoxin: n.d.	Microcystis: 360	50,400	
9/1/2021	-	Microcystins: 2.9 Anatoxin: n.d.	Microcystis: 310	43,400	
9/14/2021	Clear	Microcystins: n.d. Anatoxin: n.d.	Microcystis: 60	8,400	

*Health Advisory Issued; Exceedance of Threshold.

Table 23A: Results for cyanobacteria monitoring of Turner Reservoir 2021




Turner Reservoir					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/8/2021	Some lily pads	No Sample Taken	No Sample Taken	No Sample Taken	
6/21/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/6/2021	A lot of duckweed	No Sample Taken	No Sample Taken	No Sample Taken	
7/20/2021	A lot of duckweed/watermeal	Microcystins: n.d. Anatoxin: n.d.	Planktothrix: 20	560	
8/3/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
8/16/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
8/31/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	
9/15/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/12/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/28/2021	No blooms	No Sample Taken	No Sample Taken	No Sample Taken	

Table 24A: Results for cyanobacteria monitoring of Warwick Pond in 2021

Warwick Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
6/7/2021	Fish swimming, clear	No Sample Taken	No Sample Taken	No Sample Taken	
6/22/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/7/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
7/19/2021	Looks clear	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 100 Aphanizomenon bundle: 2200 Planktothrix: 50	619,700*	
8/2/2021	Looked turbid & tinted green	No Sample Taken	No Sample Taken	No Sample Taken	
8/17/2021	Signs posted	Microcystins: n.d. Anatoxin: n.d.	Aphanizomenon single: 2000	56,000	
9/1/2021	No blooms	Microcystins: n.d. Anatoxin: n.d.	Aphanizomenon single: 790	22,120	
9/14/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	-	Microcystins: n.d. Anatoxin: n.d.	Aphanizomenon single: 590	19,740	
10/7/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 580 Microcystis: 4100 Planktothrix: 50 Aphanizomenon single: 20	600,400*	
10/25/2021	Mostly clear, some turbidity	No Sample Taken	No Sample Taken	No Sample Taken	
11/15/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 20	460	
11/30/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	


*Health Advisory Issued; Exceedance of Threshold.

Table 25A: Results for cyanobacteria monitoring of Wenscott Reservoir in 2021

Wenscott Reservoir					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
8/3/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 580 Microcystis: 2,300	326,830*	
8/17/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
8/31/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/14/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
9/27/2021	A little floating green algae; streaks near beach	No Sample Taken	No Sample Taken	No Sample Taken	
10/13/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
10/25/2021	-	No Sample Taken	No Sample Taken	No Sample Taken	
11/2/2021	Along beach shore	No Sample Taken	No Sample Taken	No Sample Taken	
11/15/2021	-	Microcystins: n.d. Anatoxin: n.d.	Anabaena: 250	5,750	
11/30/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	

*Health Advisory Issued; Exceedance of Threshold.

Table 26A: Results for cyanobacteria monitoring of Worden’s Pond in 2021

Worden’s Pond					
Date	Observations	Toxin Levels (ug/L)	Colony Count (colonies/mL)	Cell Count Total (cells/mL)	Photograph:
9/27/2021	A little floating green algae; streaks near beach	Microcystins: 170*	Microcystis: 1,200	168,000*	
11/2/2021	Along beach shore	Anatoxin: n.d.	n.d.	n.d.	
11/15/2021	-	Microcystins: n.d. Anatoxin: n.d.	n.d.	n.d.	

*Health Advisory Issued; Exceedance of Threshold.

Links to waterbody access points on Google Maps:

Northern RI ponds: <https://goo.gl/maps/Fn2LbwQLLZT2>

Newport ponds: <https://goo.gl/maps/M6fS7V47eNH2>

Cranston area ponds: <https://goo.gl/maps/1Y8njpdWCHG2>