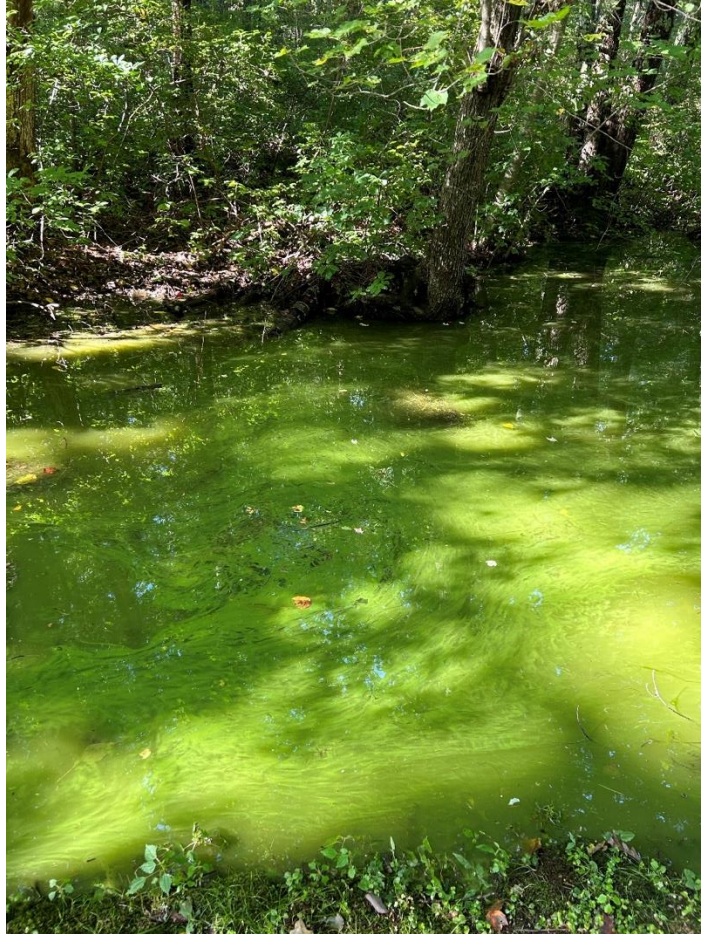


Cyanobacteria Monitoring Program 2023 Report

Summer – Fall 2023



Waterman Reservoir, Gloucester, R.I. – September 2023

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



Table of Contents

Introduction	1
Methods.....	2
Results	6
Conclusions and Future Plans.....	12
References	15
Appendix A.....	16

List of Tables

Table 1. List of waterbodies evaluated for cyanobacteria blooms during 2023 season.....	3
Table 2: List of cyanotoxins analyzed and advisory threshold.	6
Table 3: List of cyanobacteria genera identified by the Rhode Island State Health Laboratory.	6
Table 4: Conversion of cyanobacteria genera colony count to cell count.	6
Table 5. Advisories issued during 2023 cyanobacteria monitoring season.	7
Table 6. List of samples exceeding total microcystin advisory threshold (4.0 ug/L).	9
Table 7. Samples exceeding cell count advisory threshold (70,000 cells/mL).	10
Table 8. Summary of selected results from the RI Cyanobacteria Monitoring Program, 2017 to 2023. ...	12
Table 9: Results of 2023 cyanobacteria monitoring for Almy Pond, Newport RI.	17
Table 10. Results of 2023 cyanobacteria monitoring for Blackamore Pond, Cranston RI.	18
Table 11: Results of 2023 cyanobacteria monitoring for Boone Lake, Exeter RI.....	20
Table 12: Results of 2023 cyanobacteria monitoring for Browning Mill Pond, Exeter RI.....	21
Table 13: Results of 2023 cyanobacteria monitoring for Carbuncle Pond, Coventry RI.....	22
Table 14: Results of 2023 cyanobacteria monitoring for Central Pond, East Providence RI.	23
Table 15: Results of 2023 cyanobacteria monitoring for Coomer Lake, Glocester RI.	24
Table 16: Results of 2023 cyanobacteria monitoring for Cunliff Lake, Roger Williams Park, Providence RI.	25
Table 17: Results of 2023 cyanobacteria monitoring for Edgewood Lake, Roger Williams Park, Providence RI.	26
Table 18: Results of 2023 cyanobacteria monitoring for Elm Lake, Roger Williams Park, Providence RI. .	27
Table 19: Results of 2023 cyanobacteria monitoring for Frenchtown Nature Preserve Pond, East Greenwich RI.....	28
Table 20: Results of 2023 cyanobacteria monitoring for Georgiaville Pond, Smithfield RI.	29
Table 21: Results of 2023 cyanobacteria monitoring for Indian Lake, South Kingstown RI.	30
Table 22: Results of 2023 cyanobacteria monitoring for J.L. Curran Upper Reservoir, Cranston RI.	31
Table 23: Results of 2023 cyanobacteria monitoring for Johnson's Pond, Coventry RI.	32
Table 24: Results of 2023 cyanobacteria monitoring for Larkin Pond, South Kingstown RI.....	33
Table 25: Results of 2023 cyanobacteria monitoring for Little Pond, Warwick RI.	34
Table 26: Results of 2023 cyanobacteria monitoring for Lower Melville Pond, Portsmouth RI.....	35

Table 27: Results of 2023 cyanobacteria monitoring for Maple Lake, Charlestown RI.	37
Table 28: Results of 2023 cyanobacteria monitoring for Mashapaug Pond, Cranston RI.	38
Table 29: Results of 2023 cyanobacteria monitoring for Mishnock Lake, West Greenwich RI.	40
Table 30: Results of cyanobacteria monitoring for Pascoag Reservoir, Burrillville RI.	41
Table 31: Results of 2023 cyanobacteria monitoring for Pleasure Lake, Roger Williams Park, Providence RI.	42
Table 32: Results of 2023 cyanobacteria monitoring for Polo Lake, Roger Williams Park, Providence RI.	43
Table 33: Results of cyanobacteria monitoring for Roosevelt Lake, Roger Williams Park, Providence RI.	44
Table 34: Results of 2023 cyanobacteria monitoring for Slack Reservoir, Smithfield/Johnston RI.	45
Table 35: Results of 2023 cyanobacteria monitoring for Spectacle Pond, Cranston RI.	48
Table 36: Results of 2023 cyanobacteria monitoring for Stafford Pond, Tiverton RI.	50
Table 37: Results of 2023 cyanobacteria monitoring for Stump Pond, Smithfield RI.	51
Table 38: Results of 2023 cyanobacteria monitoring for Tiogue Lake, Coventry RI.	52
Table 39: Results of 2023 cyanobacteria monitoring for Turner Reservoir, East Providence RI.	55
Table 40: Results of 2023 cyanobacteria monitoring for unnamed pond off Littlebrook Road, Westerly RI.	56
Table 41: Results of 2023 cyanobacteria monitoring for Upper Melville Pond, Portsmouth RI.	57
Table 42: Results of 2023 cyanobacteria monitoring for Warwick Pond, Warwick RI.	59
Table 43: Results of 2023 cyanobacteria monitoring for Waterman Reservoir, Glocester RI.	60
Table 44: Results of 2023 cyanobacteria monitoring for Wenscott Reservoir, North Providence RI.	61
Table 45: Results of 2023 cyanobacteria monitoring for Willow Lake, Roger Williams Park, Providence RI.	64
Table 46: Results of 2023 cyanobacteria monitoring for Worden Pond, South Kingstown RI.	65

List of Figures

Figure 1. Map of waterbodies monitored during 2023 cyanobacteria season.....	5
Figure 2. Distribution of total microcystin concentrations in 2023 samples.	9
Figure 3. Distribution of cyanobacteria cell counts in 2023 samples.....	11
Figure 4. Cyanobacteria cell count and total microcystin concentration using data from 2011 to 2023. .	11
Figure 5. Number of waterbodies monitored from 2017 to 2023 (excluding 2019).	13
Figure 6. Number of advisories issued from 2017 to 2023 (excluding 2019).	13
Figure 7. Total number of samples collected and number of samples exceeding advisory thresholds from 2017 to 2023 (excluding 2019).	14

Introduction

Cyanobacteria (blue-green algae) are microscopic, photosynthetic bacteria naturally found in waterbodies. These organisms either attach to a substance 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. These factors include light availability, alteration of water flow, water temperature, pH, and excess nutrients.

Some freshwater cyanobacterial blooms can produce highly potent toxins, known as cyanotoxins. These toxins can potentially cause health risks for humans as well as wildlife, pets, and livestock. Cyanotoxins are produced and contained within the cyanobacterial cells (intracellular). The release of these toxins in an algal bloom into the surrounding water occurs mostly during cell death and lysis (i.e., cell rupture). Some cyanobacteria species are capable of releasing toxins (extracellular) into the water without cell rupture or death.

The Rhode Island Department of Health (RIDOH) and the Rhode Island Department of Environmental Management's Office of Water Resources (RIDEM OWR) work cooperatively to monitor for the presence of cyanobacteria blooms, evaluate the potential risk to the public, and issue advisories notifying the public of health concerns. The agencies jointly issue health/recreational advisories when any of the following three thresholds are met:

- Evidence of a visible cyanobacteria scum, mat, or pond/lake-wide cyanobacteria bloom.
- Cyanobacteria cell count exceeding 70,000 cells/mL.
- Toxin (Microcystins-LR) level of lysed cells meeting or exceeding 4.0 ppb ($\mu\text{g/L}$)

The advisories recommend that individuals avoid 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.

RIDEM OWR receives reports annually about nuisance algal conditions and potential cyanobacteria blooms from the municipal staff, lake and watershed associations, and the broader public. RIDEM began monitoring for cyanobacteria in 2011, with biweekly monitoring for ponds that frequently bloom beginning in 2017.

From 2011 to 2023, 45 waterbodies have had advisories issued with an average of approximately 15 waterbodies per year. Nine of the 45 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 2023, RIDEM OWR monitored 32 waterbodies. This report provides a summary of the results of the 2023 cyanobacteria monitoring program. Previous year's reports, as well as a table listing all advisories from 2011-present, are located at RIDEM OWR's [Cyanobacteria homepage](#).

Methods

RIDEM OWR's [Freshwater Harmful Algal Bloom Monitoring Quality Assurance Project Plan \(QAPP\)](#) describes in detail the field and analytical methods and Quality Assurance/Quality Control procedures related to this sampling program. The QAPP was approved by EPA in 2018. QAPP addenda are generated annually to update the list of regularly monitored waterbodies.

The first field visit of the 2023 season occurred on April 27th, 2023, while the last field visit occurred on December 21st, 2023. During each visit, a field sheet was filled out and photographs were taken, regardless of whether a bloom was observed. The field sheet documented information about location, extent and physical appearance of blooms, weather conditions, any active recreation occurring at the waterbody, and presence/absence of any dead or distressed fish or wildlife. In 2023, a hand-held fluorometer was used to measure chlorophyll-a concentration during each visit.

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. A list of the ponds visited in 2023 and access locations for each pond are provided in **Table 1**. A map of the pond locations throughout the state is provided in **Figure 1**. Waterbodies listed as "Routine Biweekly Monitoring" were selected for monitoring at the start of the 2023 season due to having a history of frequent cyanobacteria blooms in previous years. These waterbodies were visited approximately every two weeks from early June through October. "Response" waterbodies were visited in response to calls or emails from the public.

Samples were submitted to the Rhode Island State Health Laboratory in Providence 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) (**Table 4**). Since there are no criteria for issuing an advisory based on colony counts, estimating cell counts from colony counts allows for more thorough identification of potentially harmful blooms.

Cyanotoxin concentration, colony count, cell count estimation, and visual observations of the bloom were evaluated by RIDEM OWR and RIDOH staff, and an advisory was issued if any of the advisory thresholds were met. If an advisory was issued for a waterbody because of a response visit, the waterbody was subsequently added to the routine biweekly monitoring list for the rest of the season.

Advisories generally remained in place unless two successive and representative sampling rounds conducted one week apart achieved cell count and toxin levels below the threshold concentrations. After the end of the recreation season (typically early November), visual assessments were conducted to lift the remaining advisories in place. If the visual assessment indicated that the bloom had subsided, the advisory was lifted. Since there is no guarantee that toxins are not present without confirmatory

sampling and laboratory analysis the public was advised to continue to exercise caution around these waters.

Biweekly monitoring summaries describing conditions during field visits were generated and distributed to relevant RIDEM and RIDOH staff. The biweekly summaries, photographs, copies of field sheets, chain of custody forms, and laboratory data reports are filed in hard copy and electronically with RIDEM OWR in the Providence office.

Table 1. List of waterbodies evaluated for cyanobacteria blooms during 2023 season.

Monitoring Program Type	Name	Town	Waterbody ID	Primary Access
Routine Biweekly Monitoring	Almy Pond	Newport	RI0010047L-01	Off Coggeshall Ave on Southern Side
	Blackamore Pond	Cranston	RI0006018L-06	On Winter Street at the Boat Ramp
	Central Pond	East Providence	RI0004009L-01A	On Newman Ave
	Georgiaville Pond	Smithfield	RI0002007L-02	From public beach on Stillwater Rd
	J.L. Curran Upper Reservoir	Cranston	RI0006016L-02	Off Seven Mile Rd. (boat launch area)
	Larkin Pond	South Kingstown	RI0008039L-11	From Camp Hoffman and Kingston's Camp Beach
	Little Pond	Warwick	RI0007024L-01	Behind Warwick Veteran Junior High School
	Lower Melville Pond	Portsmouth	RI0007029L-01	Near gate at the end of Smith Rd
	Mashapaug Pond	Cranston	RI0006017L-06	From the boat launch at JT Owens Park
	Slack Reservoir	Smithfield/Johnston	RI0002007L-03	At public beach off Greenlake Dr or Terrace Dr
	Spectacle Pond	Cranston	RI0006017L-07	Behind Twin Oaks Restaurant
	Stafford Pond	Tiverton	RI0007037L-01	At DEM Boat Ramp on Stillwater Rd
	Tiogue Lake	Coventry	RI0006014L-02	At Briar Point Beach
	Turner Reservoir	East Providence	RI0004009L-01B	Off Newman Ave
	Upper Melville Pond	Portsmouth	RI0007029L-01	Near elementary school at fishing dock
	Warwick Pond	Warwick	RI0007024L-02	At the boat launch on Wells Ave
Wenscott Reservoir	North Providence	RI0003008L-05	Across from the Twin Rivers Building on Douglas Pike and Gov. Notte Park	

Monitoring Program Type	Name	Town	Waterbody ID	Primary Access
Response	Boone Lake	Exeter	RI0008040L-14	Off West Shore Drive
	Browning Mill Pond	Exeter	RI0008040L-13	Public beach off Arcadia Rd
	Carbuncle Pond	Coventry	RI0005011L-01	Carbuncle Pond Management Area
	Coomer Lake	Glocester	RI0006015L-08	At Marion Irons Beach on Snake Hill Rd
	Frenchtown Pond	East Greenwich	None	At Frenchtown Park and Frye Nature Preserve
	Indian Lake	South Kingstown	RI0010045L-04	At the State Boat Launch and private beach off Tomahawk Trail South
	Johnson's Pond	Coventry	RI0006013L-01	At Zeke's Bridge on Harkney Hill Rd
	Maple Lake	Charlestown	RI0008039L-22	Off Maple Lake Farm Rd
	Mishnock Lake	West Greenwich	RI0006014L-01	Off Lake Shore Dr
	Pascoag Reservoir	Burrillville	RI0001002L-03	At DEM Boat Launch on Widow Smith Rd
	Roger Williams Park Ponds	Providence	RI0006017L-05	Off FC Greene Memorial Blvd/Natural History Ave
	Stump Pond	Smithfield	RI0002007L-08	Off Farnum Pike and Log Rd
	Unnamed Pond off Littlebrook Road	Westerly	None	Off Littlebrook Rd
	Waterman Reservoir	Glocester	RI0002007L-04	Off Pine Ledge Rd
Worden Pond	South Kingstown	RI0008039L-07	At State Boat Launch on Wordens Pond Rd	

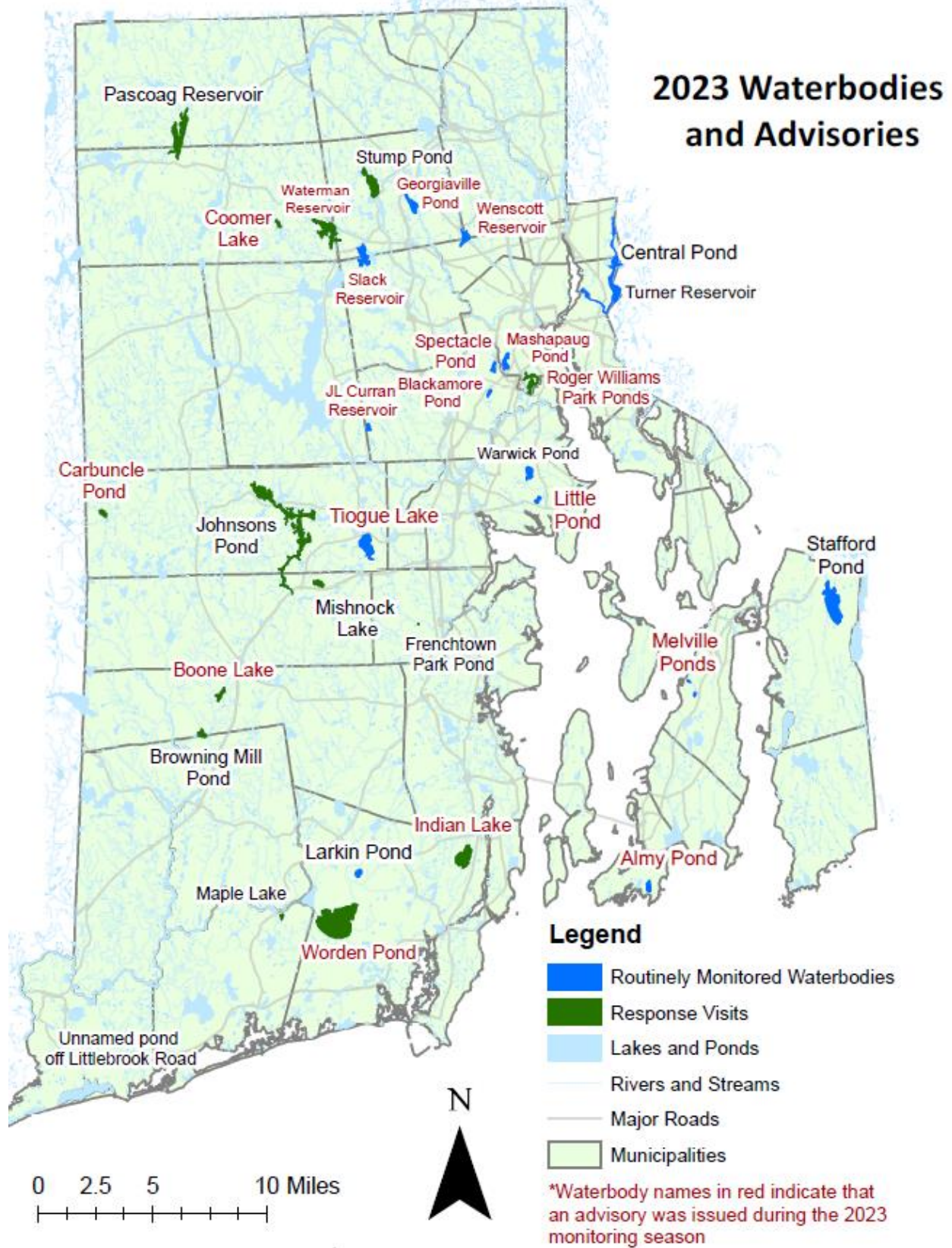


Figure 1. Map of waterbodies monitored during 2023 cyanobacteria season.

Table 2: List of cyanotoxins analyzed and advisory threshold.

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

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

Genera	Threshold for Issuance of Advisory
Anabaena	>70,000 cells/mL (Total Cyanobacteria)
Aphanizomenon	
Cylindrospermopsis	
Microcystis	
Nodularia	
Woronichinia	
Planktothrix	

Table 4: Conversion of cyanobacteria genera colony count to cell count.

	Cell Count Estimation					
	Anabaena	Aphanizomenon (Single)	Aphanizomenon (Bundle)	Microcystis	Planktothrix	Woronichinia
Conversion Factor ¹	X 23	X 28	X 280	X 140	X 28	X 250

¹ Multiply number of colonies by conversion to get estimate of cell count.

Results

In 2023, RIDEM OWR conducted routine biweekly cyanobacteria monitoring of 17 waterbodies from approximately mid-May through November (**Table 1**). Additional monitoring of 15 waterbodies was done in response to calls or emails from the public, municipal staff, watershed associations, park and beach staff, or other RIDEM staff about potential cyanobacteria blooms.

The field visits led to the issuance of 24 advisories for cyanobacteria blooms, 17 of which were a result of routine monitoring (**Table 5**). Response visits resulted in the issuance of seven advisories.

Table 5. Advisories issued during 2023 cyanobacteria monitoring season.

Waterbody	Town	Date Advisory Posted	Date Advisory Lifted	Basis for Advisory	Routine or Response Visit
Almy Pond	Newport	6/5/2023	- ¹	Cell Count	Routine
Tiogue Lake	Coventry	6/13/2023	6/29/2023	Cell Count and Toxins	Routine
		8/18/2023	9/29/2023		
		11/3/2023	12/5/2023		
Boone Lake	Exeter	7/11/2023	8/1/2023	Cell Count	Response
Slack Reservoir	Smithfield/Johnston	7/11/2023	8/1/2023	Cell Count and Toxins	Routine
		9/5/2023	11/14/2023	Cell Count	
Upper Melville Pond	Portsmouth	7/11/2023	11/28/2023	Cell Count	Routine
Blackamore Pond	Cranston	7/14/2023	12/22/2023	Cell Count and Toxins	Routine
Georgiaville Pond	Smithfield	7/14/2023	9/29/2023	Cell Count	Routine
Spectacle Pond	Cranston	7/28/2023	8/25/2023	Cell Count	Routine
		10/6/2023	-	Cell Count and Toxins	
Wenscott Reservoir	North Providence	7/28/2023	11/17/2023	Cell Count and Toxins	Routine
J.L. Curran Upper Reservoir	Cranston	8/15/2023	9/8/2023	Cell Count	Routine
		11/3/2023	-		
Coomer Lake	Glocester	8/18/2023	9/29/2023	Cell Count and Toxins	Response
Roger Williams Park Ponds	Providence	8/18/2023	-	Cell Count and Toxins	Response
Waterman Reservoir	Glocester	9/7/2023	12/22/2023	Cell Count	Response
Lower Melville Pond	Portsmouth	9/21/2023	11/28/2023	Cell Count and Toxins	Routine
Mashapaug Pond	Cranston	10/6/2023	-	Cell Count	Routine
Little Pond	Warwick	10/6/2023	12/22/2023	Cell Count and Toxins	Routine
Carbuncle Pond	Coventry	10/12/2023	11/28/2023	Cell Count	Response
Worden Pond	South Kingstown	11/3/2023	11/17/2023	Cell Count and Toxins	Response
Indian Lake	South Kingstown	11/20/2023	12/22/2023	Toxins	Response

A total of 86 cyanobacteria samples were collected from 25 waterbodies throughout the state. Of the 86 samples, 26 supported the initial issuance of an advisory, 29 did not exceed the advisory thresholds and therefore did not result in the issuance of an advisory, and 31 were collected as follow-up samples to lift advisories.

¹ Indicates that the advisory remained in place at the end of 2023.

Five advisories remained in place at the end of the 2023 monitoring season. The last round of follow-up sampling to lift advisories was conducted on November 16th, 2023. After this date, visual assessments were conducted in November and December to lift the remaining advisories in place, if possible. Advisories were lifted if the visual assessment showed no signs of a cyanobacteria scum, mat, or bloom. Advisories were not lifted for J.L Curran Upper Reservoir, Mashapaug Pond, Spectacle Pond, Roger Williams Park Ponds, and Almy Pond. These five ponds still displayed evidence of a cyanobacteria bloom during the last visual assessment in December.

The highest detected total microcystin concentration was 450 ug/L in Worden Pond from a sample collected on October 30th, 2023. The highest cyanobacteria cell count was 9,600,800 cells/mL in Blackamore Pond from a sample collected on July 11th, 2023. The total microcystin advisory threshold of 4.0 ug/L was exceeded in 13 samples from 10 different waterbodies (**Table 6, Figure 2**). The cell count advisory threshold of 70,000 cells/mL was exceeded in 27 samples from 18 different waterbodies (**Table 7, Figure 3**).

Potentially toxigenic species *Anabaena*, *Aphanizomenon*, *Microcystis*, *Planktothrix*, and *Woronichinia* were identified in 61 of the 86 samples collected (71%). The most commonly identified genus was *Anabaena* which was present in 50 of the 86 samples (58%), followed by *Microcystis* in 31 samples (36%), *Aphanizomenon* in 20 samples (23%), *Woronichinia* in 16 samples (19%) and *Planktothrix* in 7 samples (8%). **Figure 4** shows the relationship between cell density and microcystin concentration from data collected between 2011 through 2023.

Table 6. List of samples exceeding total microcystin advisory threshold (4.0 ug/L).

Waterbody	Town	Sampling Date	Total Microcystins (ug/L)
Tiogue Lake	Coventry	6/9/2023	36.0
Slack Reservoir	Smithfield/Johnston	7/6/2023	290.0
Blackamore Pond	Cranston	7/11/2023	18.0
Wenscott Reservoir	North Providence	7/28/2023	7.1
Coomer Lake	Glocester	8/16/2023	4.1
Willow Lake-RWP	Providence	8/17/2023	11.0
Tiogue Lake	Coventry	8/21/2023	12.0
Wenscott Reservoir	North Providence	9/5/2023	42.0
Lower Melville Pond	Portsmouth	9/20/2023	8.5
Spectacle Pond	Cranston	10/3/2023	8.6
Little Pond	Warwick	10/4/2023	43.0
Worden Pond	South Kingstown	10/30/2023	450.0
Tiogue Lake	Coventry	11/1/2023	24.0

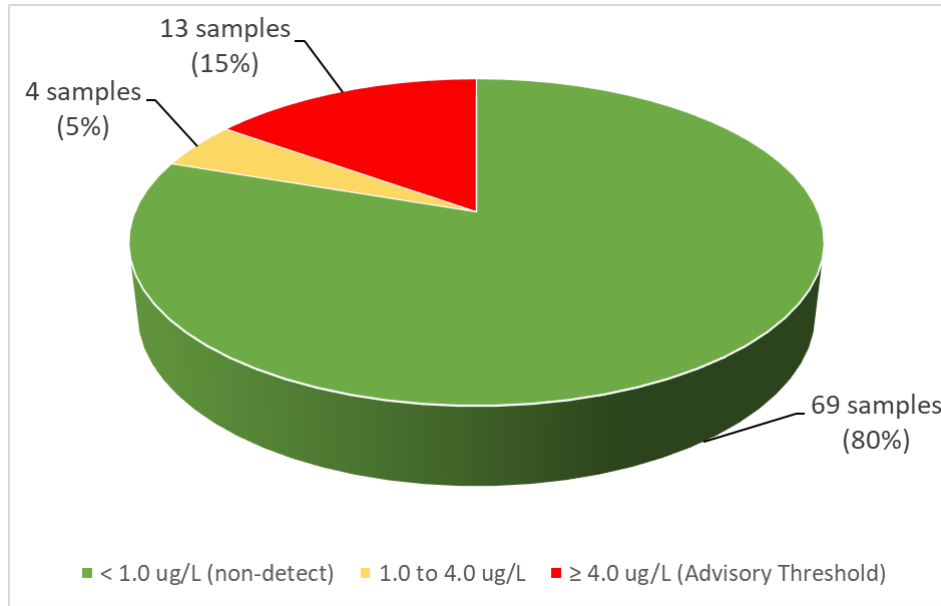


Figure 2. Distribution of total microcystin concentrations in 2023 samples.

Table 7. Samples exceeding cell count advisory threshold (70,000 cells/mL).

Waterbody	Town	Sampling Date	Total Cell Count (cells/mL)
Almy Pond	Newport	5/31/2023	411,600
Tiogue Lake	Coventry	6/9/2023	470,600
Upper Melville Pond	Portsmouth	7/6/2023	1,487,220
Slack Reservoir	Smithfield/Johnston	7/6/2023	767,000
Boone Lake	Exeter	7/7/2023	276,000
Boone Lake	Exeter	7/7/2023	299,000
Blackamore Pond	Cranston	7/11/2023	9,600,800
Georgiaville Pond	Coventry	7/11/2023	109,890
Spectacle Pond	Cranston	7/26/2023	844,200
Wenscott Reservoir	North Providence	7/28/2023	614,100
J.L. Curran Upper Reservoir	Cranston	8/9/2023	92,130
Coomer Lake	Glocester	8/16/2023	1,181,300
Willow Lake-RWP	Providence	8/17/2023	670,100
Tiogue Lake	Coventry	8/21/2023	330,400
Slack Reservoir	Smithfield/Johnston	8/29/2023	3,644,000
Waterman Reservoir	Glocester	8/31/2023	554,200
Slack Reservoir	Smithfield/Johnston	9/5/2023	6,622,880
Wenscott Reservoir	North Providence	9/5/2023	1,698,050
Lower Melville Pond	Portsmouth	9/20/2023	990,900
Mashapaug Pond	Cranston	10/3/2023	900,020
Spectacle Pond	Cranston	10/3/2023	9,330,800
Wenscott Reservoir	North Providence	10/3/2023	629,900
Little Pond	Warwick	10/4/2023	150,810
Carbuncle Pond	Coventry	10/10/2023	788,500
Worden Pond	South Kingstown	10/30/2023	75,600
J.L. Curran Upper Reservoir	Cranston	11/1/2023	74,590
Tiogue Lake	Coventry	11/1/2023	3,122,000

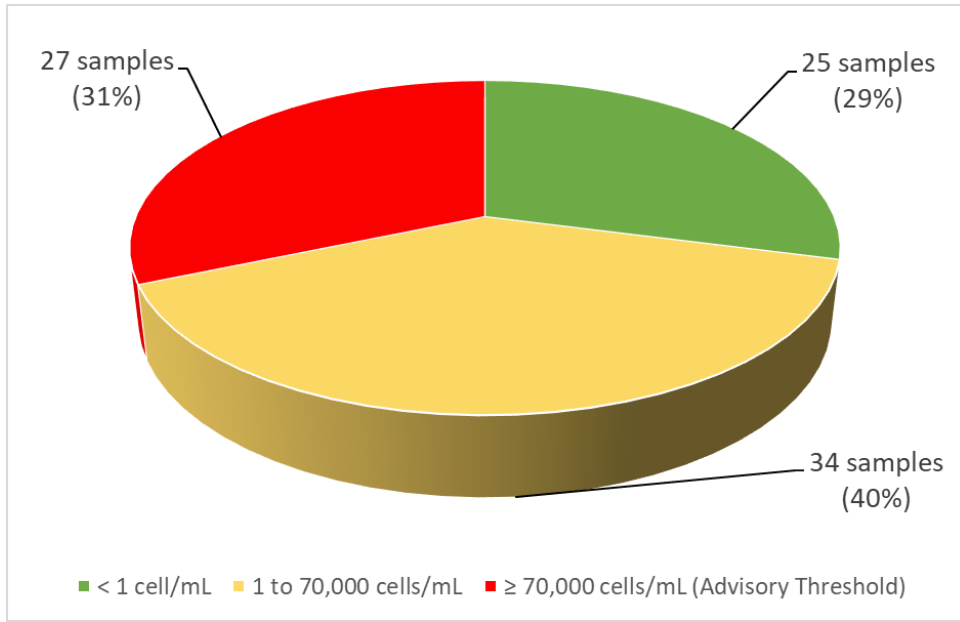


Figure 3. Distribution of cyanobacteria cell counts in 2023 samples.

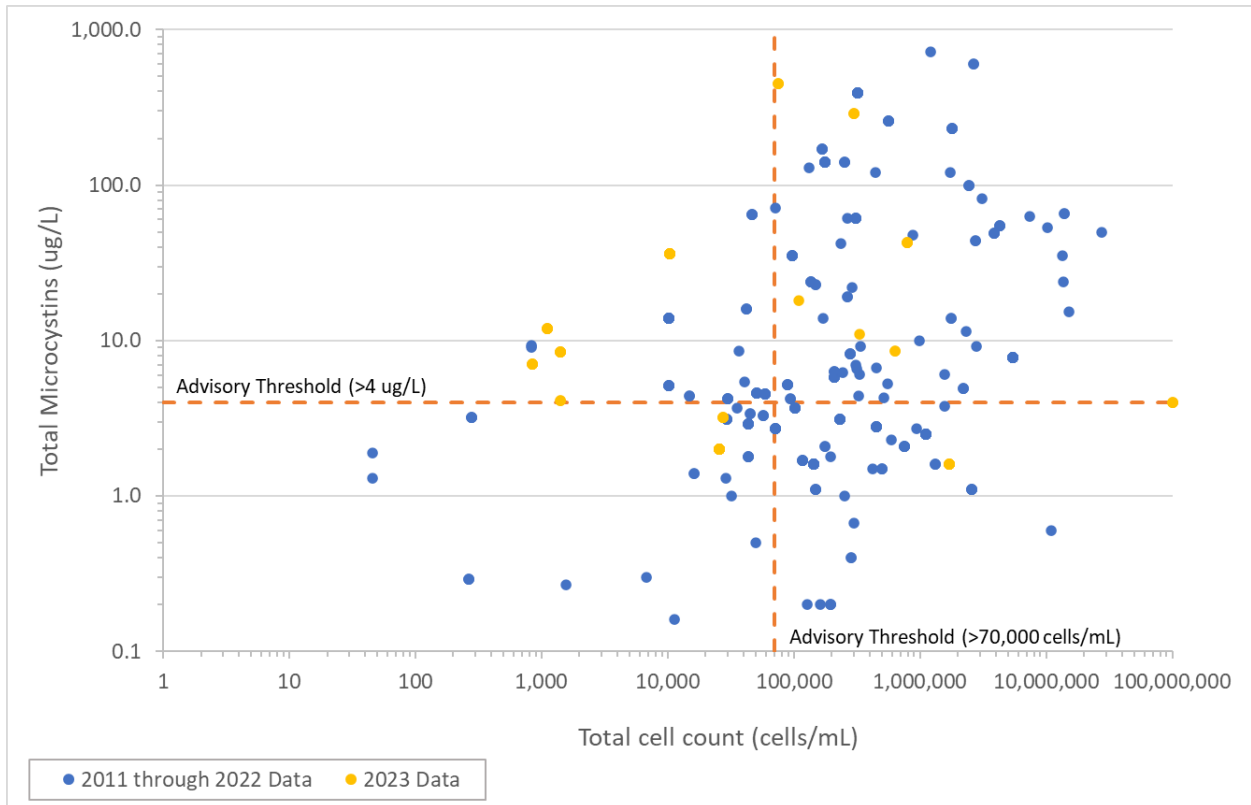


Figure 4. Cyanobacteria cell count and total microcystin concentration using data from 2011 to 2023.

Conclusions and Future Plans

The results of the 2023 cyanobacteria monitoring season are consistent with previous years.

Table 8 and **Figures 5** through **7** summarize the results of the cyanobacteria monitoring program since routine biweekly monitoring began in 2017 (except for 2019 when only response visits were done). It is notable that the 2023 monitoring season resulted in the highest number of advisories to date (24 advisories: **Figure 6**). Five of those advisories remained in place at the end of December, which is also the highest number to date of advisories remaining in place at the end of a season.

Table 8. Summary of selected results from the RI Cyanobacteria Monitoring Program, 2017 to 2023.

	2017	2018	2020	2021	2022	2023
Date of first advisory	7/5/17	6/8/18	6/24/20	6/12/21	6/10/22	6/5/23
Date last advisory lifted	12/29/2017	12/8/2018	12/31/2020	Two in place as of 12/31/2021	One in place as of 12/31/2022	Five in place as of 12/31/2023
Highest total microcystin concentration (ug/L)	600	53	260	170	720	450
Waterbody with the highest total microcystin concentration	Slack Reservoir	Slack Reservoir	Slack Reservoir	Worden Pond	Spring Lake	Worden Pond

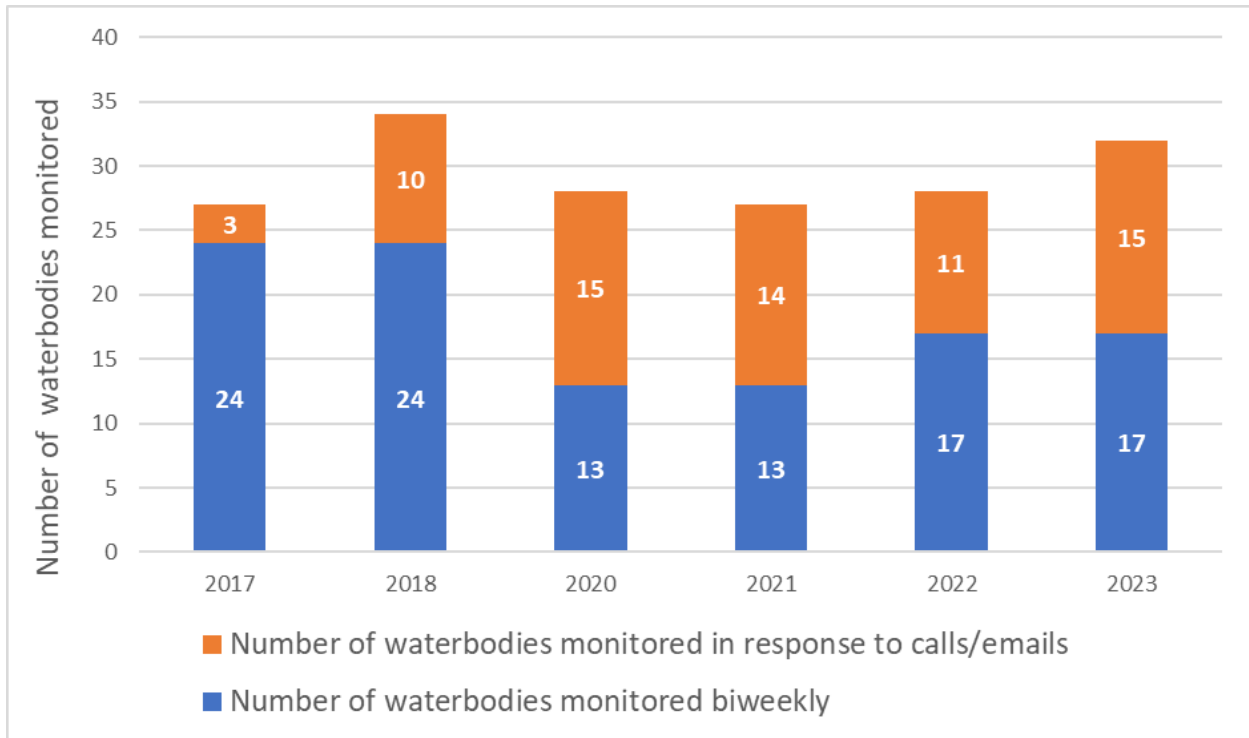


Figure 5. Number of waterbodies monitored from 2017 to 2023 (excluding 2019).

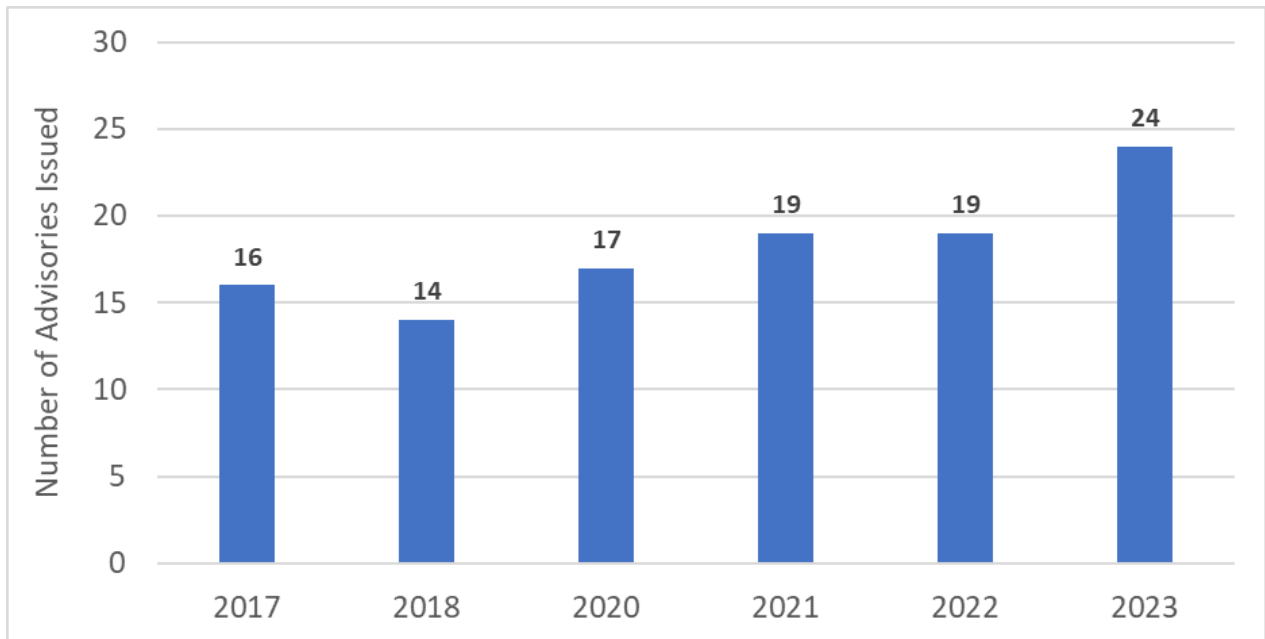


Figure 6. Number of advisories issued from 2017 to 2023 (excluding 2019).

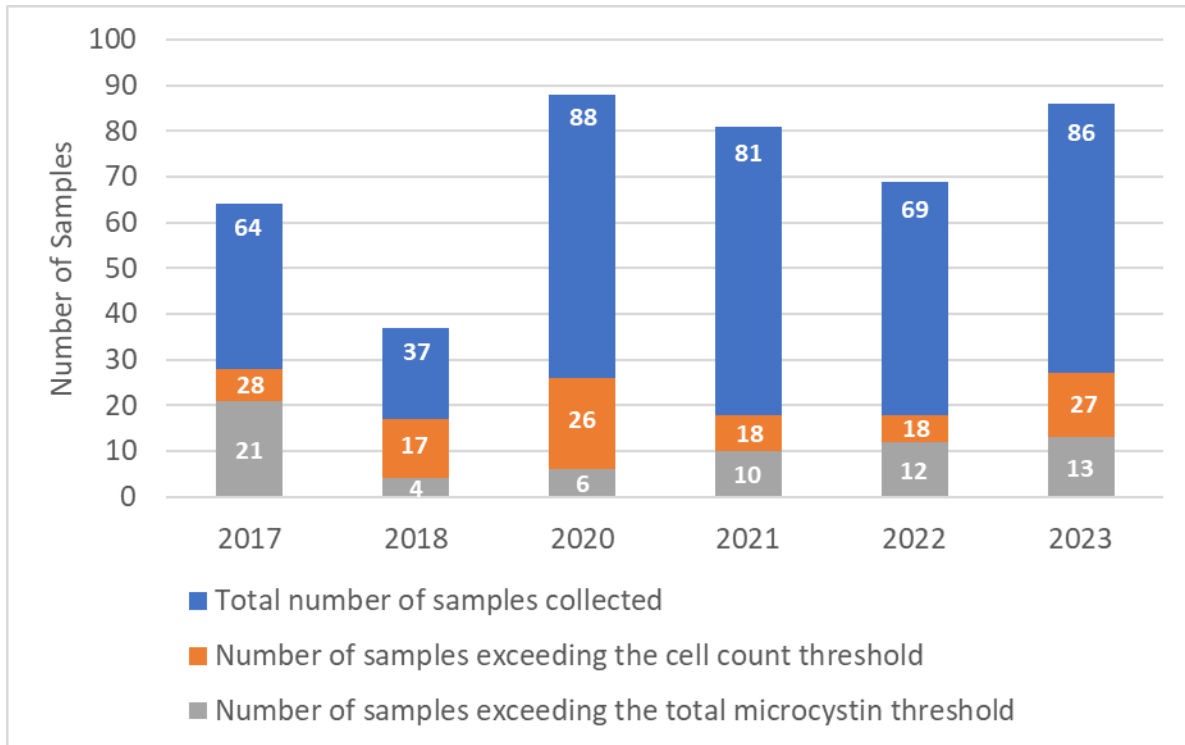


Figure 7. Total number of samples collected and number of samples exceeding advisory thresholds from 2017 to 2023 (excluding 2019).

Routine, biweekly monitoring of the waterbodies that experience frequent cyanobacteria blooms continues to be an important means for identifying active blooms. Seventeen (17) of the 24 advisories issued in 2023 resulted from routine monitoring efforts and similar results were seen in previous years in which RIDEM OWR conducted routine biweekly monitoring. Public involvement and awareness are still crucial to identifying problematic cyanobacteria blooms but relying solely on the public to report blooms would likely result in many blooms going undetected which could in-turn increase the potential for contact with these waterbodies resulting in cyanobacteria-related health effects to the public and/or pets.

Follow-up sampling conducted this season for the purpose of lifting advisories continues to highlight the complicated nature of cyanobacteria blooms and the difficulties associated with issuing and rescinding advisories in a timely manner. On some ponds, blooms subsided then re-emerged over periods of days or weeks (for example Tiogue Lake and Slack Reservoir).

RIDEM OWR continues to note that some cyanobacteria blooms have persisted into the late fall and early winter, likely in-part due to prolonged warm temperatures. Out of an abundance of caution and due to the potential for secondary recreation (i.e., boating, fishing) to occur into the fall and winter, since 2015 any advisories that remain in effect on November 1st have been kept in place if no follow-up sampling has occurred. Visual assessments are conducted to lift advisories if follow-up sampling cannot be done, but without sampling there is no guarantee

that toxins are not present, so the public is encouraged to remain cautious around these waters.

Cyanobacteria blooms are expected to become more frequent and abundant with climate change as water temperatures increase (Paerl and Huisman 2008). Climate change is also causing an increase in extreme precipitation events, which provides more opportunities to transport nutrients into waterways, which supports cyanobacteria growth. Boone Lake (Exeter), Coomer Lake (Glocester) and Indian Lake (South Kingstown) were issued advisories for the first time since the cyanobacteria monitoring program began in 2011.

The continuation of the cyanobacteria monitoring program in future years will be essential to protect the public health of Rhode Islanders from cyanobacteria blooms. RIDEM OWR and RIDOH plan to continue biweekly and response cyanobacteria monitoring/sampling during the 2024 recreation season with support of a seasonal intern if funding is available.

References


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

Paerl HW, Huisman J (2008). "Blooms like it hot". *Science* 320(5872): 57-58.

Appendix A


Monitoring and Sampling Summary for 2023 Waterbodies

Table 9: Results of 2023 cyanobacteria monitoring for Almy Pond, Newport RI.

Almy Pond – Newport					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
5/31/2023	Pond-wide bloom present. Water is pea soup-like in appearance with green specks along the surface. One sample was collected for analysis. Advisory posted 6/5/2023.	ND	Aphanizomenon: 14,600 Microcystis: 20	411,600	 <p>Picture Taken: 5/31/2023</p>
6/14/2023	Pond-wide bloom still present.				
6/28/2023	Pond-wide bloom still present.				
7/12/2023	Pond-wide bloom still present.				
7/25/2023	Pond-wide bloom still present.				
8/10/2023	Pond-wide bloom still present.				
8/23/2023	Pond-wide bloom still present.				
9/6/2023	Pond-wide bloom still present.				
9/20/2023	Pond-wide bloom still present.				
10/5/2023	Pond-wide bloom still present with paint-like streaks.				
10/17/2023	Pond-wide bloom still present.				
10/31/2023	Pond-wide bloom still present.				
11/14/2023	Pond-wide bloom still present.				
12/14/2023	No bloom present.				
12/21/2023	Murky, green-colored water present. Advisory was kept in place based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 10. Results of 2023 cyanobacteria monitoring for Blackamore Pond, Cranston RI.

Blackamore Pond - Cranston					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	 <p>Picture Taken: 8/09/2023</p>
5/30/2023	No bloom present.				
6/13/2023	No bloom present.				
6/27/2023	No bloom present.				
7/11/2023	Bright green streaks present along the shoreline. One sample was collected for analysis. Advisory Posted 7/14/2023.	Microcystins: 18 Anatoxin: 22	Microcystis: 340 Woronichinia: 3,800 Planktothrix: 1,900	9,600,800	
7/26/2023	Bloom is now beginning to be pond-wide. Shoreline has paint-like bloom.				
8/9/2023	Bloom is now pond-wide and water is dark green.				
8/22/2023	Pond-wide bloom still present.				
9/5/2023	Pond-wide bloom still present.				
9/19/2023	Water is no longer pea soup-like pond-wide; streaks remain at the boat ramp.				
10/4/2023	Paint-like bloom present along the boat ramp.				
10/18/2023	Paint-like bloom present along the boat ramp.				
11/1/2023	Pea soup appearance now gone; some green streaks remain at the boat launch.				

Blackamore Pond-continued					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
12/12/2023	Green streaks present at edges of pond.				
12/20/2023	No bloom present. Advisory lifted 12/22/2023 based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded.

Table 11: Results of 2023 cyanobacteria monitoring for Boone Lake, Exeter RI.


Boone Lake - Exeter				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
7/7/2023 *Response Call*	West Shore Drive: Bright green streaks present in cove. One sample collected and submitted for analysis. Advisory Posted 7/11/2023.	Anatoxin: 2.2	Anabaena: 12,000	276,000
	East Shore Drive: Bubbling scum present at a private dock East One sample collected for analysis. Advisory Posted 7/11/2023.	Anatoxin: 8.0	Anabaena: 13,000	299,000
7/20/2023	West Shore Drive: Bloom appears to be gone. First sample to lift the advisory was collected.	ND	ND	ND
	East Shore Drive: Bloom appears to be gone. First sample was collected to lift the advisory.	ND	ND	ND
7/28/2023	West Shore Drive: No bloom present, second sample collected to lift the advisory. Advisory Lifted 8/1/2023.	ND	Anabaena: 70	36,800
	East Shore Drive: No bloom present, second sample collected to lift the advisory. Advisory Lifted 8/1/2023.	ND	ND	ND



Picture Taken: 7/7/2023


Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 12: Results of 2023 cyanobacteria monitoring for Browning Mill Pond, Exeter RI.

Browning Mill Pond - Exeter					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
6/14/2023 *Response Call*	Sample collected at Browning Mill Pond due to a reported illness after swimming in the waterbody.	ND	ND	ND	 <p>Picture Taken: 7/7/2023</p>

ND = non-detect.

Table 13: Results of 2023 cyanobacteria monitoring for Carbuncle Pond, Coventry RI.

Carbuncle Pond- Coventry					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
10/10/2023 *Response Call*	Sample collected at Carbuncle Pond due to reports of a cyanobacteria bloom over the weekend. One sample was collected from the shoreline due to the presence of brown streaks with bright green clumps. Advisory Posted 10/10/2023.	ND	Anabaena: 27,000 Woronichinia: 670	788,500	 <p>Picture Taken: 10/10/2023</p>
11/16/2023	Blooms appears limited to the shoreline by the fishing dock. One sample collected.	ND	ND	ND	
11/28/2023	No bloom present. Advisory lifted on 11/28/2023 based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 14: Results of 2023 cyanobacteria monitoring for Central Pond, East Providence RI.




Central Pond – East Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	 <p>Picture Taken: 7/25/2023</p>
5/31/2023	No bloom present.				
6/14/2023	No bloom present.				
6/28/2023	No bloom present.				
7/12/2023	No bloom present.				
7/25/2023	No bloom present.				
8/10/2023	No bloom present.				
8/23/2023	No bloom present.				
9/6/2023	No bloom present.				
9/20/2023	No bloom present.				
10/5/2023	No bloom present.				
10/17/2023	No bloom present.				
10/31/2023	No bloom present.				

Table 15: Results of 2023 cyanobacteria monitoring for Coomer Lake, Glocester RI.

Coomer Lake - Glocester					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
8/16/2023 *Response Call*	Cyanobacteria seen along the shoreline of Marion Irons Beach. Bloom was in the form of bright green streaks along the shore. One sample was collected for analysis and an advisory was posted on 8/18/2023.	Microcystins: 4.1 Anatoxin: 1.8	Anabaena: 48,000 Microcystis: 320 Woronichinia: 130	1,181,300	 <p>Picture Taken: 8/16/2023</p>
8/22/2023	Bright green bloom has dissipated, but brown streaks remain along the shoreline.				
9/5/2023	Bubbling scum and green streaks along the shoreline remain.				
9/19/2023	Water is clear of bloom; one sample was collected to begin the lifting process.	ND	ND	ND	
9/26/2023	Visited to collect a second sample to lift the advisory. Water was clear of any bloom. Advisory lifted 9/29/23.	ND	Microcystis: 10	1,400	


Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 16: Results of 2023 cyanobacteria monitoring for Cunliff Lake, Roger Williams Park, Providence RI.

Cunliff Lake, Roger Williams Park - Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
12/12/2023	Advisory was put in place for all Roger Williams Park Ponds on 8/18/2023. Pond was visited in December to see if the advisory could be lifted. No bloom present.				 <p>Picture Taken: 12/20/2023</p>
12/20/2023	Dots/clumps of cyanobacteria are present in the water. Advisory kept in place based on visual assessment.				


Red text indicates advisory in place and/or threshold exceeded.

Table 17: Results of 2023 cyanobacteria monitoring for Edgewood Lake, Roger Williams Park, Providence RI.

Edgewood Lake, Roger Williams Park-Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
12/12/2023	Advisory was put in place for all Roger Williams Park Ponds on 8/18/2023. Pond was visited in December to see if the advisory could be lifted. No bloom present.				 <p>Picture Taken: 12/20/2023</p>
12/20/2023	Dots/clumps of cyanobacteria are present in the water. Advisory kept in place based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded.

Table 18: Results of 2023 cyanobacteria monitoring for Elm Lake, Roger Williams Park, Providence RI.

Elm Lake, Roger Williams Park-Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
12/12/2023	Advisory was put in place for all Roger Williams Park Ponds on 8/18/2023. Pond was visited in December to see if the advisory could be lifted. No bloom present.				 <p>Picture Taken: 12/20/2023</p>
12/20/2023	Dots/clumps of cyanobacteria are present along the shoreline. Advisory kept in place based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded.

Table 19: Results of 2023 cyanobacteria monitoring for Frenchtown Nature Preserve Pond, East Greenwich RI.


Frenchtown Park Pond – East Greenwich					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
9/7/2023 *Response Call*	Pictures taken on 9/6/23 showed paint-like bloom on the northern side of the pond. When visiting on 9/7, bloom was gone.				 <p>Picture Taken: 9/7/2023</p>

Table 20: Results of 2023 cyanobacteria monitoring for Georgiaville Pond, Smithfield RI.


Georgiaville Pond- Smithfield				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
5/30/2023	No bloom present.			
6/13/2023	No bloom present.			
6/27/2023	Small bright green clumps along the shoreline of the boat ramp. One sample was collected for analysis.	ND	Planktothrix: 1,600	44,800
7/11/2023	Clumps are now larger and more frequent throughout the water column. One sample was collected for analysis. Advisory posted 7/14/2023.	Microcystins: 2 Anatoxin: 1.1	Anabaena: 30 Microcystis: 140 Planktothrix: 3,200	109,890
7/26/2023	Bloom still present.			
8/9/2023	Bloom still present.			
8/22/2023	Bloom still present.			
9/5/2023	Bloom still present.			
9/20/2023	Bloom is gone, one sample was collected to lift the advisory.	ND	ND	ND
9/26/2023	Visited to collect second sample to lift the advisory. Water was clear of any bloom, advisory lifted 9/29/23.	ND	ND	ND
10/4/2023	No bloom present.			
10/18/2023	Green streaks present, one sample collected.	ND	ND	ND
11/1/2023	No bloom present.			



Picture Taken: 7/11/2023.

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

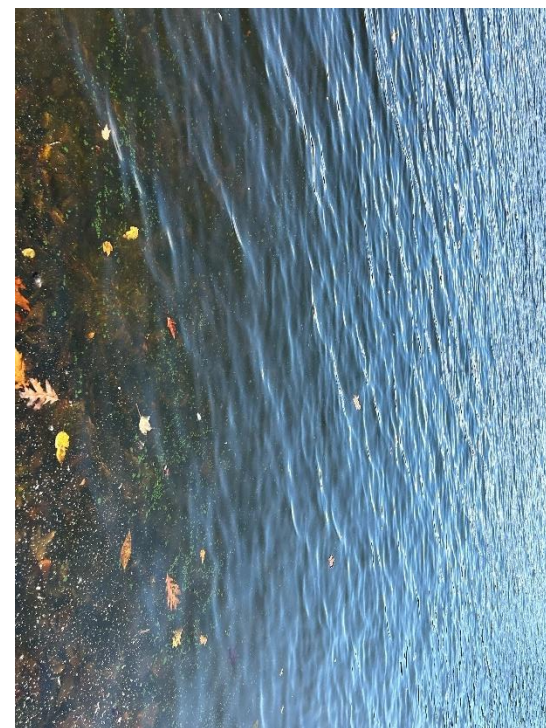
Table 21: Results of 2023 cyanobacteria monitoring for Indian Lake, South Kingstown RI.

Indian Lake- South Kingstown					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
11/16/2023 *Response Call*	Dots/clumps in the water and bright blue streaks on the surface. The bloom is concentrated at the shoreline but extends outward into the lake with dots throughout the water column. One sample collected. Advisory put in place on 11/20/2023 based on visual appearance and anatoxin levels.	Anatoxin: 8.9	ND	46,000	 <p>Picture taken: 11/16/2023</p>
12/14/2023	No bloom present.				
12/21/2023	No bloom present. Advisory lifted on 12/22/2023 based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 22: Results of 2023 cyanobacteria monitoring for J.L. Curran Upper Reservoir, Cranston RI.

J.L. Curran Upper Reservoir - Cranston				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
5/30/2023	No bloom present.			
6/13/2023	No bloom present.			
6/27/2023	No bloom present.			
7/11/2023	No bloom present.			
7/26/2023	No bloom present.			
8/9/2023	Water is pea soup-like in appearance pond-wide. One sample was collected. Advisory posted 8/15/2023.	ND	Anabaena: 110 Aphanizomenon: 3,200	92,130
8/22/2023	Pond-wide bloom seems to have cleared. One sample was collected to begin the lifting process.	ND	Aphanizomenon: 40	1,120
9/5/2023	No bloom present. Second sample was collected to lift the advisory. Advisory was lifted 9/8/2023.	ND	Anabaena: 30 Aphanizomenon: 10	3,490
9/19/2023	No bloom present.			
10/4/2023	No bloom present.			
10/18/2023	No bloom present.			
11/1/2023	Green specks are present pond-wide. One sample was collected. Advisory Posted 11/3/2023.	ND	Anabaena: 30 Microcystis: 10 Woronichinia: 10 Aphanizomenon: 2,500	74,590



Picture Taken: 11/1/2023

J.L. Curran Upper Reservoir-continued.				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
11/14/2023	Bloom is still present along shoreline.			
12/14/2023	Bloom is still present along shoreline.			
12/20/2023	Bloom is still present. Advisory remained in place at the end of 2023 based on visual assessment.			


Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 23: Results of 2023 cyanobacteria monitoring for Johnson's Pond, Coventry RI.

Johnson's Pond – Coventry				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
6/6/2023 *Response Call*	Reports of suspicious looking algae at a private residence off Shippy Cove Rd. Algae was determined to not be cyanobacteria.			


Picture Taken: 6/6/2023

Table 24: Results of 2023 cyanobacteria monitoring for Larkin Pond, South Kingstown RI.

Larkin Pond – South Kingstown					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
5/31/2023	No bloom present.				
6/14/2023	No bloom present.				
6/28/2023	No bloom present.				
7/12/2023	No bloom present.				
7/25/2023	No bloom present.				
8/10/2023	No bloom present.				
8/23/2023	No bloom present.				
9/6/2023	No bloom present.				
9/20/2023	No bloom present.				
10/5/2023	No bloom present.				
10/17/2023	No bloom present.				
10/31/2023	No bloom present.				

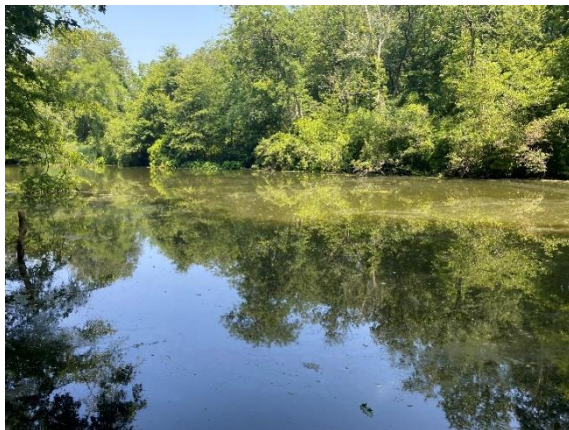
Picture Taken: 6/14/2023

Table 25: Results of 2023 cyanobacteria monitoring for Little Pond, Warwick RI.

Little Pond – Warwick					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
5/31/2023	No bloom present.				 <p>Picture Taken: 8/10/2023</p>
6/14/2023	No bloom present.				
6/28/2023	No bloom present.				
7/12/2023	No bloom present.				
7/25/2023	No bloom present.				
8/10/2023	No bloom present.				
8/23/2023	No bloom present.				
9/6/2023	No bloom present.				
9/20/2023	No bloom present.				
10/5/2023	Light green streaks are present along the shoreline. One sample was collected. Advisory posted 10/6/2023.	Microcystins: 43	Anabaena: 470 Microcystis: 1,000	150,000	
10/17/2023	Small green clumps present along the shoreline.				
10/31/2023	Small green clumps present along the shoreline.				
12/14/2023	No bloom present.				
12/20/2023	No bloom present. Advisory lifted on 12/22/2023 based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded.

Table 26: Results of 2023 cyanobacteria monitoring for Lower Melville Pond, Portsmouth RI.

Lower Melville Pond – Portsmouth					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
5/31/2023	No bloom present.				 <p>Picture Taken: 7/6/2023</p>
6/14/2023	No bloom present.				
6/28/2023	No bloom present.				
7/6/2023 *Response Call*	Pond-wide bloom reported, water is pea soup-like in appearance. One sample collected for analysis.	Anatoxin: 3	Anabaena: 1,900 Aphanizomenon: 40	54,900	
7/12/2023	Pond-wide bloom still is present, one sample collected for analysis.	ND	Anabaena: 110 Aphanizomenon: 160	7,010	
7/25/2023	No bloom present.				
8/10/2023	Yellow foam is present at the stream outlet. Water is also pea soup-like in appearance. One sample was collected for analysis.	ND	Anabaena: 110 Aphanizomenon: 20	8,130	
8/23/2023	Waterbody is pea soup-like in appearance.	ND	Anabaena: 170 Aphanizomenon: 130 Microcystis: 10 Woronichinia: 10	32,170	
9/6/2023	No bloom present.				

Lower Melville Pond – continued.				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
9/20/2023	Water is green pond-wide with paint-like streaks throughout the waterbody. One sample was collected, advisory posted 9/21/2023	Anatoxin: 0.89 Microcystin: 8.5	Anabaena: 1,300 Aphanizomenon: 280 Microcystis: 590 Woronichinia: 3,200	990,900
10/04/2023	Pond-wide bloom still present.			
10/17/2023	Pond-wide bloom still present.			
10/31/2023	Pond-wide bloom still present.			
11/14/2023	No bloom present.			
11/28/2023	No bloom present. Advisory lifted on 11/28/2023 based on visual assessment.			

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 27: Results of 2023 cyanobacteria monitoring for Maple Lake, Charlestown RI.



Maple Lake – Charlestown					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
8/29/2023 *Response Call*	Suspected cyanobacteria bloom present. Large green “blobs” are floating throughout the water column. Waterbody is a private residence so testing was not performed but information was provided to the resident about avoiding contact until the bloom dissipates.				 <p>Picture Taken: 8/29/2023</p>

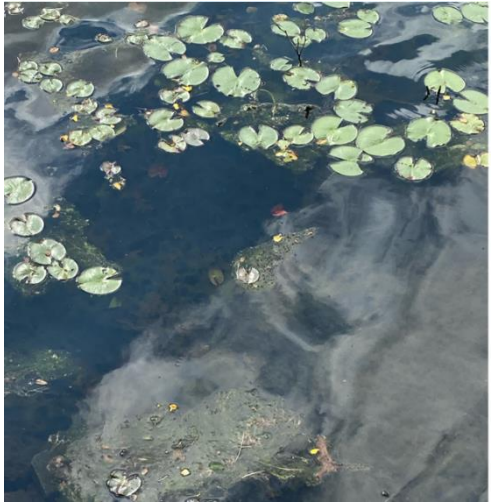
Table 28: Results of 2023 cyanobacteria monitoring for Mashapaug Pond, Cranston RI.

Mashapaug Pond – Cranston					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
5/30/2023	No bloom present.				
6/13/2023	Water is pea soup-like in appearance pond-wide, one sample was collected.	ND	Anabaena: 150 Aphanizomenon: 250	10,450	 <p>Picture Taken: 8/22/2023</p>
6/27/2023	No bloom present.				
7/11/2023	Waterbody is pea soup-like in appearance, one sample collected.	ND	Anabaena: 700 Aphanizomenon: 290 Microcystis: 10	25,620	
7/26/2023	No bloom present.				
8/9/2023	No bloom present.				
8/22/2023	Water is pea soup-like in appearance pond-wide, one sample collected.	ND	Anabaena: 710 Microcystis: 20 Woronichinia: 70 Planktothrix: 160	41,110	

Mashapaug Pond - continued.				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
9/5/2023	No bloom present.			
9/19/2023	No bloom present.			
10/3/2023	Paint-like streaks present. One Sample collected. Advisory Posted 10/6/2023.	Anatoxin: 0.81	Anabaena: 3,900 Microcystis: 5,600 Aphanizomenon: 940	
10/18/2023	Paint-like bloom present pond-wide.			
11/1/2023	Pond-wide bloom still present.			
12/12/2023	Small dots/clumps and strands on top of the water.			
12/20/2023	Dots/clumps present in the water along the shoreline. Advisory kept in place based on visual assessment.			

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 29: Results of 2023 cyanobacteria monitoring for Mishnock Lake, West Greenwich RI.

Mishnock Lake – West Greenwich					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
6/19/2023 *Response Call*	Reports of hairy algae along the shoreline of a private residence on 6/18/2023. One sample was collected for analysis.	ND	Anabaena: 80	1,840	 <p>Picture Taken: 6/19/2023</p>

ND = non-detect.

Table 30: Results of cyanobacteria monitoring for Pascoag Reservoir, Burrillville RI.




Pascoag Reservoir - Burrillville					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
9/12/2023 *Response Call*	Bloom spotted at a private beach. Due to no access at the beach, a sample was collected at the DEM Boat Launch. Small bright green specks floating on the surface as well as bright green streaks along the shoreline across the water body. One sample was collected.	Anatoxin: 2.8	Anabaena: 360	8,280	 <p>Picture Taken: 9/12/2023</p>

Table 31: Results of 2023 cyanobacteria monitoring for Pleasure Lake, Roger Williams Park, Providence RI.

Pleasure Lake, Roger Williams Park-Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
12/12/2023	Advisory was put in place for all Roger Williams Park Ponds on 8/18/2023. Pond was visited in December to see if the advisory could be lifted. No bloom present.				 <p>Picture Taken: 12/20/2023</p>
12/20/2023	Dots/clumps of cyanobacteria are present in the water. Advisory kept in place based on visual assessment.				


Red text indicates advisory in place and/or threshold exceeded.

Table 32: Results of 2023 cyanobacteria monitoring for Polo Lake, Roger Williams Park, Providence RI.

Polo Lake, Roger Williams Park-Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
12/12/2023	Advisory was put in place for all Roger Williams Park Ponds on 8/18/2023. Pond was visited in December to see if the advisory could be lifted. No bloom present.				 <p>Picture Taken: 12/20/2023</p>
12/20/2023	Dots/clumps and hairy, silky strands of cyanobacteria are present at the edge of the waterbody on the surface and in the water column. Advisory kept in place based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded.

Table 33: Results of cyanobacteria monitoring for Roosevelt Lake, Roger Williams Park, Providence RI.

Roosevelt Lake, Roger Williams Park – Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
7/21/2023	Water was experiencing a paint-like bloom with green streaks along the dam. One sample was collected.	ND	Anabaena: 690 Microcystis: 280	55,070	 <p>Picture Taken: 7/21/2023</p>
7/28/2023	Bloom is still present, one sample collected.	ND	Anabaena: 50	1,150	
12/12/2023	Advisory was put in place for all Roger Williams Park Ponds on 8/18/2023. Pond was visited in December to see if the advisory could be lifted. Dots/clumps of cyanobacteria are present near the rock wall along the shoreline.				
12/20/2023	Dots/clumps of cyanobacteria are present on the surface and in the water column. Advisory kept in place based on visual assessment.				

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 34: Results of 2023 cyanobacteria monitoring for Slack Reservoir, Smithfield/Johnston RI

Slack Reservoir – Greenville				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
5/30/2023	No bloom present.			
6/13/2023	No bloom present.			
6/27/2023	No bloom present.			
7/6/2023 *Response Call*	Bloom reported at “Little Beach” off Terrace Drive. One sample was collected. Advisory for Little Beach posted 7/11/2023.	Microcystins: 290 Anatoxin: 2.6	Anabaena: 23,000 Microcystis: 1,700	767,000
7/11/2023	No bloom present at the Town Beach (Greenlake Drive). One sample was collected at the Town Beach since Little Beach is under advisory.	ND	ND	ND
7/20/2023	Little Beach: No bloom present, first sample was collected to lift the advisory.	ND	ND	ND
	Town Beach: No bloom present, first sample was collected to lift the advisory.	ND	Planktothrix: 10	280
7/26/2023	Bloom at Little Beach has returned as streaks on the water’s surface along the shoreline. No samples were collected.			



Picture Taken: 9/5/2023

Slack Reservoir- continued				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
7/28/2023	Little Beach: No bloom present. Second sample to lift the advisory was collected. Advisory was lifted 8/1/2023.	ND	ND	ND
	Town Beach: No bloom present. Second sample to lift the advisory was collected. Advisory was lifted 8/1/2023.	ND	ND	ND
8/16/2023	No bloom present.			
8/22/2023	No bloom present.			
8/29/2023 *Response Call*	Little Beach: Paint-like bloom was reported. One sample was collected. Advisory for Little Beach posted 9/5/2023.	Microcystins: 3.2 Anatoxin: 0.98	Anabaena: 28,000 Woronichinia: 12,000	3,644,000
	Town Beach: Water is mostly clear with some green streaking along the shoreline. One sample was collected.	ND	Woronichinia: 110	27,500
9/5/2023	Paint-like bloom is present along the shoreline of the Town Beach. One sample was collected. The advisory was extended to the whole waterbody.	Microcystins: 1.6 Anatoxin: 2.1	Anabaena: 560 Microcystis: 24,000 Woronichinia: 13,000	6,622,880

Slack Reservoir-continued				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
9/19/2023	Bloom is still present at Little Beach. No bloom present at the Town Beach.			
10/03/2023	Bloom is still present at both Little Beach and the Town Beach. Streaks are present at Little Beach and a paint-like bloom is present at Town Beach.			
10/18/2023	Bloom is still present at both Little Beach and Town Beach. Paint-like specks along the shoreline.			
11/1/2023	Bloom is gone at both Town Beach and Little Beach. One sample was collected at Town Beach to begin the lifting process.	ND	Anabaena: 10	230
11/7/2023	Second sample collected to lift the advisory. Advisory Lifted 11/14/23.	ND	Anabaena: 10	230

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 35: Results of 2023 cyanobacteria monitoring for Spectacle Pond, Cranston RI.

Spectacle Pond – Cranston				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
5/30/2023	No bloom present.			
6/13/2023	No bloom present.			
6/27/2023	No bloom present.			
7/11/2023	Waterbody is pea soup-like in appearance pond-wide. One sample was collected.	ND	Anabaena: 770	17,710
7/26/2023	Paint-like bloom is present along the shoreline. The rest of the waterbody is dark green color, resembling pea soup. One sample was collected for analysis. Advisory posted 7/28/2023.	Microcystins: 1.2	Anabaena: 35,000 Microcystis: 280	844,200
8/9/2023	Paint-like bloom is no longer present, water appears clear and free of bloom. One sample was collected to begin the lifting process.	ND	Anabaena: 830	19,090
8/22/2023	Water is clear of any bloom. Second sample to lift the advisory was collected. Advisory lifted 8/25/2023.	ND	Anabaena: 700 Aphanizomenon: 40 Microcystis: 20 Woronichinia: 60 Planktothrix: 30	35,860



Picture Taken: 7/26/2023

Spectacle Pond-continued				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
9/5/2023	No bloom present.			
9/19/2023	No bloom present.			
10/3/2023	Pond-wide bloom present with paint-like bloom along the shoreline. One sample was collected, advisory posted 10/6/2023.	Microcystins: 8.6	Anabaena: >100,000 Microcystis: 220 Woronichinia: 28,000	>9,330,800
10/18/2023	Bright green paint-like bloom is present along the shoreline.			
11/1/2023	No bloom present.			
12/12/2023	Dots/clumps of cyanobacteria are mixed in with the leaves along the shoreline. Advisory kept in place based on visual assessment.			

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 36: Results of 2023 cyanobacteria monitoring for Stafford Pond, Tiverton RI.


Stafford Pond – Tiverton				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
5/31/2023	No bloom present.			
6/14/2023	No bloom present.			
6/28/2023	No bloom present.			
7/12/2023	No bloom present.			
7/25/2023	No bloom present.			
8/10/2023	No bloom present.			
8/23/2023	No bloom present.			
9/6/2023	No bloom present.			
9/20/2023	No bloom present.			
10/4/2023	No bloom present.			
10/17/2023	No bloom present.			
10/31/2023	No bloom present.			
11/14/2023	Dots/clumps of cyanobacteria and a spilled paint appearance is present along the shoreline. One sample was collected.	ND	ND	ND



Picture Taken: 11/14/2023

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 37: Results of 2023 cyanobacteria monitoring for Stump Pond, Smithfield RI.

Stump Pond – Smithfield					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
10/10/2023 *Response Call*	A bloom was reported over the weekend. Bright green specks along the surface of the water were noted during the field visit. One sample was collected near the spillway.	ND	ND	ND	 <p>Picture Taken: 10/10/2023</p>

ND = non-detect.

Table 38: Results of 2023 cyanobacteria monitoring for Tiogue Lake, Coventry RI.

Tiogue Lake – Coventry				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
5/30/2023	No bloom present.			
6/9/2023 *Response Call*	Bloom reported off Mohawk Street. Water appeared bright green with streaks. One sample collected. Advisory posted 6/13/2023.	Microcystins: 36 Anatoxin: 25	Anabaena: 19,000 Microcystis: 240	470,600
6/13/2023	Sample collected at Briar Point Beach to check for toxins. Bloom is still present off Mohawk Street.	ND	Anabaena: 140 Aphanizomenon: 190	3,220
6/20/2023	Mohawk Street: No bloom is present. One sample collected to begin lifting the advisory.	ND	Anabaena: 40 Microcystis: 10	2,320
	Briar Point Beach: No bloom is present. One sample collected to begin lifting the advisory.	ND	ND	ND
6/27/2023	Mohawk Street: No bloom is present. Second sample collected to lift the advisory. Advisory lifted 6/29/2023.	ND	ND	ND
	Briar Point Beach: No bloom is present. Second sample collected to lift the advisory. Advisory lifted 6/29/2023.	ND	ND	ND
7/11/2023	No bloom present.			
7/26/2023	No bloom present.			



Picture Taken: 6/9/2023

Tiogue Lake- continued.				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
8/17/2023 *Response Call*	Briar Point Beach: A bloom was reported at the beach, green specks/dots were noted along the shoreline. One sample was collected.	ND	Microcystis: 10	1,400
	Cove between Harrington Rd and Briar Point Ave: more dense green specks/dots are present. One sample was collected. Advisory issued for this location on 8/18/2023.	Microcystins: 12	Anabaena: 2,800 Microcystis: 1,900	330,400
8/22/2023	No bloom present at Briar Point Beach. Cove between Harrington Rd. and Briar Point Ave is pea soup-like in appearance.			
9/5/2023	No bloom present at Briar Point Beach. Cove between Harrington Rd. and Briar Point Ave. is pea soup-like in appearance but seems to be improving.			
9/19/2023	No bloom present at the cove between Harrington Rd. and Briar Point Ave. One sample was collected to begin the lifting process.	ND	Anabaena: 10	230

Tiogue Lake-continued				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
9/26/2023	Visited to collect a second sample to lift the advisory. Water was clear of any bloom. Advisory lifted 9/29/23.	ND	ND	ND
10/3/2023	No bloom present.			
10/18/2023	No bloom present.			
11/1/2023	Small paint-like area is present along the shoreline at Briar Point Beach and washed up on the sand. One sample was collected. Advisory Posted 11/3/2023.	Microcystins: 24	Anabaena: 14,000 Microcystis: 20,000	3,122,00
11/14/2023	No bloom is present.			
12/4/2023	No bloom is present. Advisory lifted 12/5/2023 based on visual assessment.			

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 39: Results of 2023 cyanobacteria monitoring for Turner Reservoir, East Providence RI.

Turner Reservoir – East Providence				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
5/31/2023	No bloom present.			
6/14/2023	Bubbling streaks are present along the shoreline. One sample collected to test for toxins only.	ND		
6/28/2023	No bloom present.			
7/12/2023	No bloom present.			
7/25/2023	Water is cloudy and green with brown streaks along the surface. One sample was collected at the boat launch.	Anatoxin: 1.1	Anabaena: 100 Aphanizomenon: 10	2,310
8/10/2023	No bloom present.			
8/23/2023	No bloom present.			
9/6/2023	No bloom present.			
9/20/2023	No bloom present.			
10/04/2023	No bloom present.			
10/17/2023	No bloom present.			
10/31/2023	No bloom present.			



Picture Taken: 7/25/2023

ND = non-detect.

Table 40: Results of 2023 cyanobacteria monitoring for unnamed pond off Littlebrook Road, Westerly RI.



Unnamed pond off Littlebrook Road – Westerly					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
4/27/2023 *Response call*	A bloom was reported at a small unnamed pond in Westerly. A pond-wide bloom is present with streaks on the water surface and a spilled paint appearance. A sample was not submitted since it is a private residence, but information was provided to the resident about avoiding contact until the bloom dissipates.				 <p>Picture Taken: 4/27/2023</p>

Table 41: Results of 2023 cyanobacteria monitoring for Upper Melville Pond, Portsmouth RI.

Upper Melville Pond – Portsmouth					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
5/31/2023	Water is pea soup-like in appearance with bubbling scum and streaks on the surface. One sample collected at the fishing dock.	ND	ND	ND	 <p>Picture Taken: 8/20/2023</p>
6/14/2023	No bloom present.				
6/28/2023	No bloom present.				
7/6/2023 *Response Call*	Water is pea soup-like in appearance; one sample was collected at the shoreline. Advisory Posted 7/11/2023.	ND	Anabaena: 140 Aphanizomenon: 5,300	1,487,220	
7/12/2023	Water is pea soup-like in appearance with green specks on the surface.				
7/25/2023	Water is pea soup-like in appearance with bubbling scum.				
8/10/2023	Pond-wide bloom is still present.				
8/23/2023	Pond-wide bloom is still present.				
9/6/2023	Water is pea soup-like in appearance with bubbling scum, green specks on the surface, and green streaks.				

Upper Melville Pond-continued				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
9/20/2023	Water is green pond-wide with paint-like streaks near the fishing dock.			
10/4/2023	Pond-wide bloom is still present with the addition of paint-like areas along the shoreline.			
10/17/2023	Pond-wide bloom is present, paint-like bloom is now gone; water is now a murky green/brown color.			
10/31/2023	Pond-wide bloom is still present.			
11/14/2023	No bloom is present.			
11/28/2023	No bloom is present. Advisory lifted 11/28/2023 based on visual assessment.			

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 42: Results of 2023 cyanobacteria monitoring for Warwick Pond, Warwick RI.


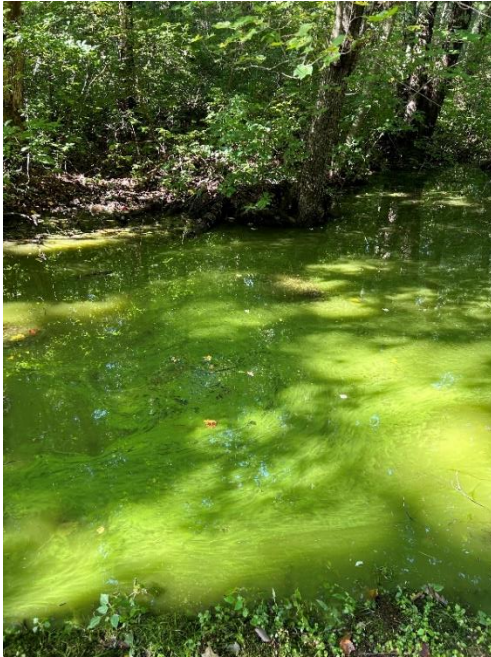

Warwick Pond- Warwick					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	 <p>Picture Taken: 8/10/2023.</p>
5/31/2023	No bloom present.				
6/14/2023	No bloom present.				
6/28/2023	No bloom present.				
7/12/2023	No bloom present.				
7/25/2023	No bloom present.				
8/10/2023	No bloom present.				
8/23/2023	No bloom present.				
9/6/2023	No bloom present.				
9/20/2023	No bloom present.				
10/4/2023	No bloom present.				
10/17/2023	No bloom present.				
10/31/2023	No bloom present.				

Table 43: Results of 2023 cyanobacteria monitoring for Waterman Reservoir, Gloucester RI.

Waterman Reservoir - Gloucester					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
8/31/2023 *Response Call*	Bloom reported in a cove off Pine Ledge Rd. Water was pea soup-like in appearance within the cove, expanding out into the main part of the reservoir. One sample was collected at this cove, while visual inspections were done around the waterbody. Multiple blooms were seen. Advisory Posted 9/7/2023.	ND	Microcystis: 30 Woronichinia: 2,200	554,200	 <p>Picture Taken: 9/19/2023</p>
9/19/2023	Follow up visit conducted due to reports of the bloom being gone, however the bloom was still present off Pine Ledge Rd. Bloom was bright green and looked like spilled paint.				
10/3/2023	Multiple blooms are present around the reservoir.				
10/18/2023	Multiple blooms are present around the reservoir				
11/1/2023	Bloom is still present off Pine Ledge Rd.				
12/14/2023	No bloom present.				
12/20/2023	No bloom present. Advisory lifted based on visual assessment on 12/22/2023.				

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 44: Results of 2023 cyanobacteria monitoring for Wenscott Reservoir, North Providence RI.


Wenscott Reservoir – North Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
5/30/2023	No bloom present.				
6/13/2023	No bloom present.				
6/26/2023	No bloom present.				
7/11/2023	Gov. Notte Park is clear of bloom, however, the reservoir on the western side of Douglas Pike is pea soup-like in appearance. One sample collected from the western half of the reservoir.	ND	Anabaena: 1,200 Microcystis: 170	51,400	 <p>Picture Taken: 9/5/2023</p>
7/26/2023	Gov. Notte Park beach is clear, the reservoir west of Douglas Pike looks worse. One sample was collected from the western half of the reservoir. Advisory Posted 7/28/2023.	Microcystins: 7.1 Anatoxin: 0.66	Anabaena: 2,700 Microcystis: 1,800 Woronichinia: 1,200	614,100	
8/3/2023 *Response Call*	Report of a bloom at the Gov. Notte Park beach but seems to have dissipated at time of visit. One sample collected at the beach.	ND	Anabaena: 30	840	
8/9/2023	Gov. Notte Park is clear of bloom, but the reservoir on the western side of Douglas Pike is still experiencing a bloom.				

Wenscott Reservoir-continued				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
8/22/2023	No bloom present at Gov. Notte Park. Bloom is still present in the reservoir on the western side of Douglas Pike.			
9/5/2023	Paint-like bloom is present along the shoreline of Gov. Notte Park beach. One sample collected at the beach; reservoir on the western side of Douglas Pike is still pea soup-like in appearance. Advisory expanded to both portions of the reservoir.	Microcystins: 42 Anatoxin: 6.4	Anabaena: 150 Microcystis: 140 Woronichinia: 6,700	1,698,050
9/19/2023	Water at Gov. Notte Park beach is clear. First sample collected to begin the lifting process.	ND	Anabaena: 40 Microcystis: 10	2,320
9/26/2023	Second sample to lift the advisory was collected. Water at Gov. Notte Park beach was clear.	ND	Anabaena: 250	5,750
10/3/2023	Gov. Notte Park side of the reservoir is experiencing paint-like specks on the surface. One sample collected; advisory remains in place.	ND	Anabaena: 24,000 Microcystis: 360 Woronichinia: 110	629,900

Wenscott Reservoir-continued				
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)
10/18/2023	Bloom still present at Gov. Notte Park along the shoreline of the beach.			
11/1/2023	Bloom at Gov. Notte Park beach is now gone. One sample was collected to begin the lifting process.	ND	ND	ND
11/7/2023	Second sample collected to lift the advisory, water is clear of any bloom. Advisory lifted 11/14/2023.	ND	ND	ND


Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 45: Results of 2023 cyanobacteria monitoring for Willow Lake, Roger Williams Park, Providence RI.

Willow Lake, Roger Williams Park, Providence					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
8/17/2023	Report from The Nature Conservancy (TNC) that a bloom is present on Willow Lake and other Roger Williams Park Ponds. The lake has a green color with large areas near the shoreline. TNC collected one sample which RIDEM OWR brought to the lab for analysis. Advisory put in place for all Roger Williams Park Ponds on 8/18/2023.	11	Anabaena: 20,000 Aphanizomenon: 100 Microcystis: 1500	670,100	 <p>Picture Taken: 12/20/2023</p>
12/12/2023	Pond revisited to see if the advisory could be lifted. No bloom present.				
12/20/2023	Streaks of cyanobacteria are present near the swan boat launch. The advisory was kept in place based on the visual assessment.				

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.

Table 46: Results of 2023 cyanobacteria monitoring for Worden Pond, South Kingstown RI.

Worden Pond, South Kingston					
Date	Observation	Toxin Concentration (µg/L)	Colony Count (colonies/mL)	Total Cell Count (cells/mL)	
10/30/2023 *Response Call*	Bloom reported along the east side of the pond. When visit was conducted, a small paint-like bloom was present near the State boat launch off Wordens Pond Rd. One sample was collected. Advisory Posted 11/3/2023.	Microcystins: 450 Anatoxin: 5	Microcystis: 540	75,600	 <p>Picture Taken: 10/30/2023</p>
11/7/2023	Bloom is now gone; one sample was collected at the boat launch to begin the lifting process.	ND	ND	ND	
11/14/2023	Water is clear. Second sample was collected to lift the advisory. Advisory lifted 11/17/2023.	ND	Anabaena: 60	1,380	

Red text indicates advisory in place and/or threshold exceeded. ND = non-detect.