



# 2022 LakeForecast Water Quality Monitoring Results

## Overview

In 2022, our volunteers embarked on the 10<sup>th</sup> season of LakeForecast water quality monitoring. This work involved collecting nearshore condition reports at piers, beaches, parks, and access points around the five Yahara lakes. From May through September, volunteers measured water clarity, recorded air and water temperature, identified the presence of green algae and cyanobacteria, and noted additional visual observations. Reports are entered into the LakeForecast app where all data are updated in real time.

This initiative would not be possible if it were not for the dedication of all our volunteers. Volunteer efforts better inform the community about changing water quality conditions while improving our understanding of evolving lake dynamics. Their work also helps share important public health information with the greater community.

## Program Highlights

- 87 nearshore and 7 offshore monitoring stations covering all five Yahara lakes (Figure 1)
- All 25 public beaches monitored at least twice a week
- 96 volunteers contributing 2,094 LakeForecast condition reports
- Algal toxin testing at 7 sites in partnership with UW-Engineering
- Partnership with BloomOptix to pilot rapid cyanobacteria detection using digital microscopes
- Partnership with Friends of Lake Kegonsa Society (FOLKS) to add 6 new monitoring sites
- Volunteer appreciation night at Christy's Landing

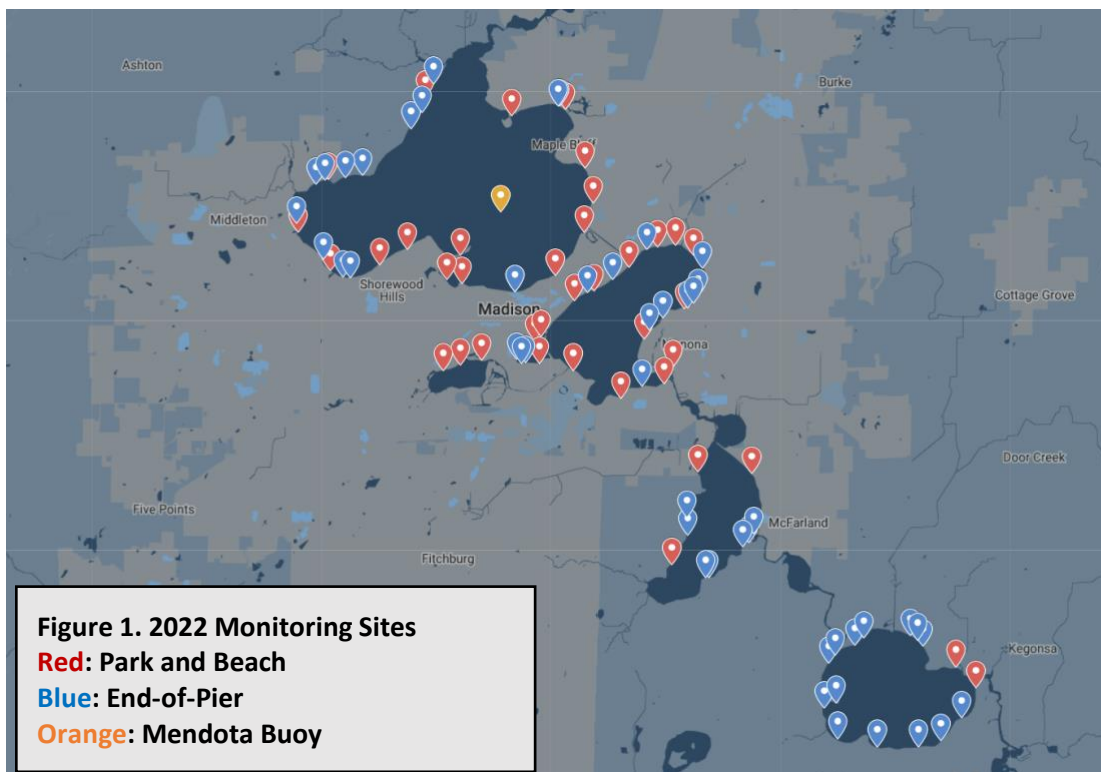


Table 1. Nearshore and offshore LakeForecast monitoring outcomes by year

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Monitoring Stations	10	46	58	79	69	79	72	71	85	94
Volunteers	9	43	57	68	73	87	77	87	101	96
Volunteer Hours	224	446	463	610	539	725	544	603	593	579
Condition Reports	204	940	1,260	1,698	1,966	2,661	2,045	2,306	2,105	2,094

## Water Quality Drivers & Observations

### Rainfall

*“If the amount of streamflow was the same every year, it is estimated that phosphorus inputs to Lake Mendota would have decreased by about 36% over the last 30 years. This indicates that land management practices are effective, but that wet weather and more runoff can more than offset the benefits of those practices.”*

Source: Yahara CLEAN Compact’s *RENEW THE BLUE: A Community Guide for Cleaner Lakes & Beaches in the Yahara Watershed* (2022)

Based on weather gauge data from the Dane County Regional Airport, rainfall totals for 2022 (shown as green bars in Figure 2) revealed a dry start to the season followed by a return to above-normal conditions from July-September. May and June were particularly dry months with only 2.54 and 4.02 inches of rainfall, respectively. Additionally, May and June experienced only one day each of rainfall greater than 0.50 inches. The large “gully washing” rain events were minimal this spring, perhaps contributing to less early season runoff.

The second half of the summer was significantly wetter with July, August, and September seeing totals above Normal (5.42, 5.76, and 3.95 inches, respectively). It is well documented that early-season rainfall delivers the most phosphorus runoff to the lakes. Consequently, low May and June rainfall totals may have helped moderate total phosphorus contributions for the year.

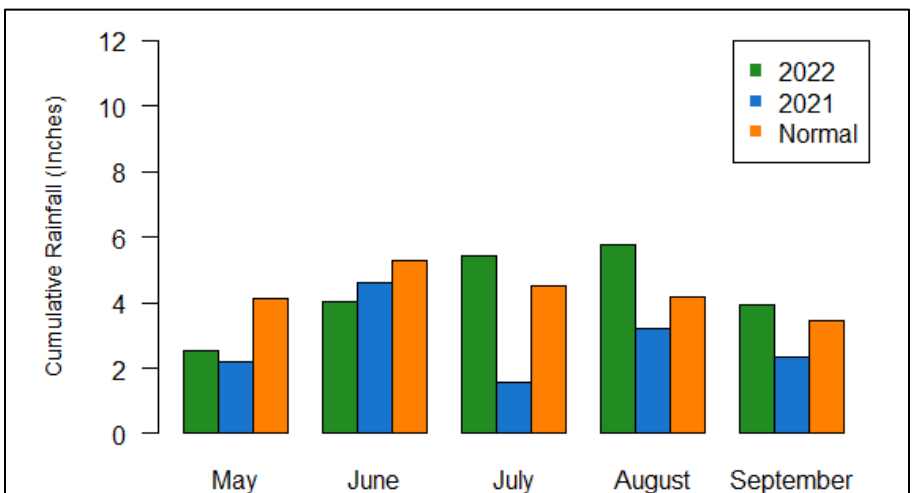


Figure 2. Rainfall totals depicted for 2022, 2021, and Normal

## Lake Ice

The winter leading into the 2022 summer monitoring season was relatively warm, with Lake Mendota freezing for 85 days, only nine days longer than the previous year when it froze for 76 days. For reference, the median duration of ice cover on Lake Mendota is 103 days as measured over the last 167 seasons.

A shorter winter leads to warmer temperatures earlier in the year, effectively creating a longer growing season for algae and aquatic plant life. Warmer winters can also lead to greater runoff and phosphorus delivery when wet precipitation falls across frozen soils. Rather than soak into the ground, rainfall can more easily generate runoff that carries manure and other contaminants toward receiving waterbodies.

## Algal Blooms

In documenting cyanobacteria blooms, we continued to use the same method first utilized in 2018. This approach tallies for each lake the number of days when one or more strong\* cyanobacteria blooms are reported. By comparing the number of 'algal days' to the total number of unique sampling days for each lake, we can generate a percentage that better represents the number of blooms witnessed each year (Figure 3). For example, Lake Monona volunteers reported strong evidence of cyanobacteria on 15.2% of all monitored days in 2021. This method lessens over reporting in situations when different monitors report the same algal bloom.

*\*A "strong" cyanobacteria bloom is defined as surface accumulation covering most of the sampling site.*

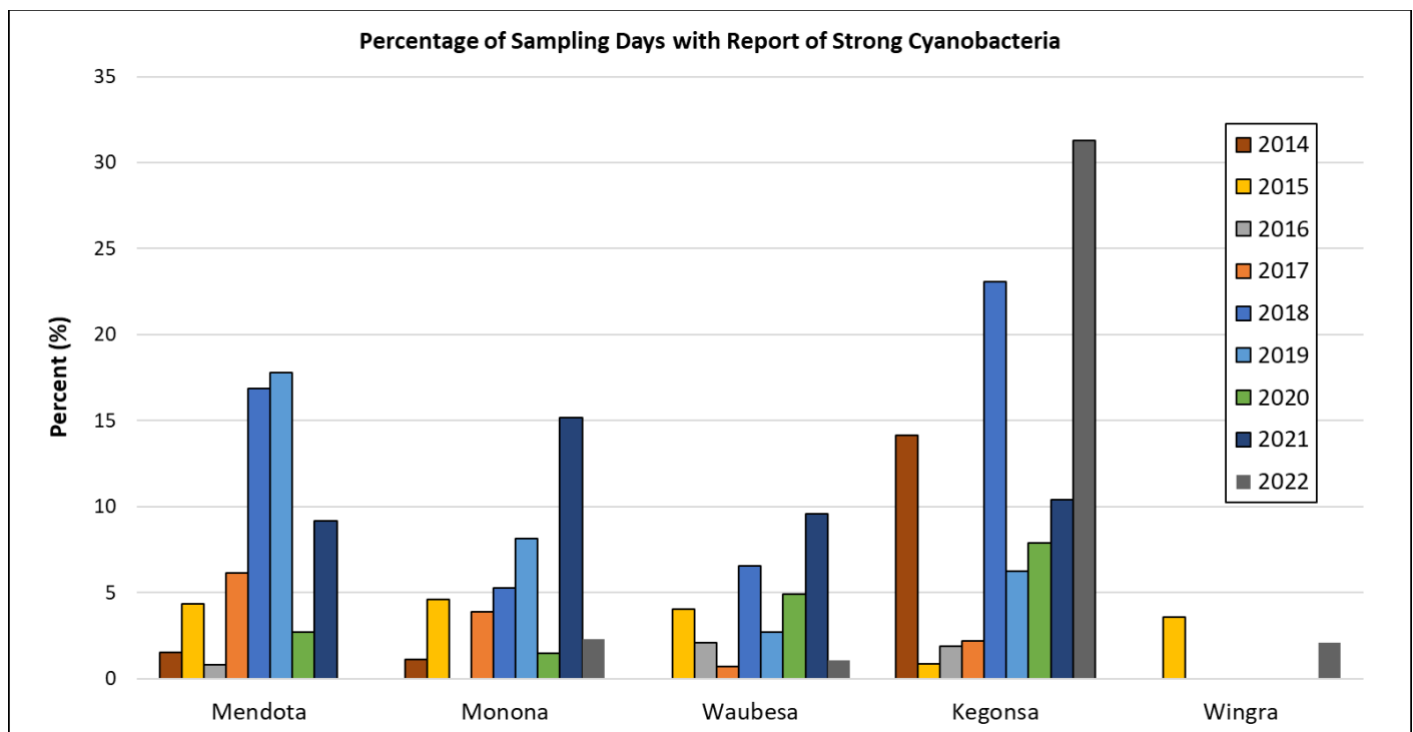


Figure 3. Percentage of all unique sampling days with one or more reports of strong cyanobacteria

Compared to 2021, monitors documented less “strong evidence” of cyanobacteria blooms on all lakes except Kegonsa (Figure 3). Mendota, Monona, and Waubesa had some of the lowest reports of strong algal blooms on record. For the first time since LakeForecast nearshore monitoring began in 2014, Lake Mendota lasted the entire season without a single report of a strong cyanobacteria bloom. On the whole, the Yahara lakes chain

had a positive summer in terms of cyanobacteria presence.

In stark contrast, Lake Kegonsa volunteers surpassed the all-time high and identified strong blooms on 31% of all sample days. Lake Wingra remained consistent with only one day of strong cyanobacteria reported in early July. The monthly breakdown in Table 2 shows a fairly

Table 2: Number of days with one or more reports of strong cyanobacteria blooms each month across all lakes

Month	2015	2016	2017	2018	2019	2020	2021	2022	Total
May	3	0	0	4	1	0	1	0	9
June	9	5	10	25	12	8	12	10	89
July	3	1	9	18	6	9	27	11	84
August	2	0	2	15	13	6	9	15	62
September	0	0	1	14	13	0	9	10	47

consistent trend June-September. However, it's important to note that the significant majority of the reports come from Lake Kegonsa.

Taking a closer look at Lake Kegonsa's data, we can surmise one potential explanation for the notable increase in cyanobacteria reports. This year, Lake Kegonsa added 6 new volunteers to their roster to improve the spatial coverage of monitoring efforts. These additional sites result in an overall increase in reporting frequency. In other words, there are more eyes on the lake to catch blooms when they are happening. One new site in particular is located in an area that is geographically more prone to wind driven algal accumulation. 53% of all strong reports of cyanobacteria on Lake Kegonsa came from a single location on the south side of Colladay Point. While there are likely many variables contributing to the increased algal bloom presence on Kegonsa, it's important to consider the variations in sampling frequency.

## Clarity

Table 3 shows average clarity calculated from May 1 to September 30, 2022, relative to the median clarity for all years. Compared to 2021, all lakes except Kegonsa showed a marked improvement in average water clarity and fell within the ‘good’ water clarity designation as represented in Figure 5. Lakes Monona and Wingra reported particularly high average water clarity that was greater than their respective long-term medians. Lake Kegonsa, despite the challenges of increased cyanobacteria sightings, reported similar average clarity to last year and only slightly less than the 2015-2022 median.

Table 3: Average clarity on each lake since 2015 relative to long-term median clarity readings (units shown in cm as measured by a 120-cm turbidity tube)

Lake	2015	2016	2017	2018	2019	2020	2021	2022	Median (2015-2022)
Mendota	84.7	95.7	89.7	95	92.4	92.9	80.7	87.8	92.4
Monona	94.5	100.6	100	102.8	82.5	92.6	84.1	101.6	94.5
Wingra	107.3	102.8	70.5	81.5	75.1	100.9	102	111.3	100.9
Waubesa	90.4	95.5	91	99	85.5	86.2	80	82.35	90.4
Kegonsa	85.7	77.5	85.6	78.6	84.7	67.7	79.2	78.9	79.2

As depicted in Figure 4 below, average clarity for most lakes generally decreases throughout the summer with a peak decline in August. Lakes Monona and Wingra deviated from this trend by exhibiting relatively high clarity readings throughout the season. Like previous years, Lake Kegonsa's shallower depth combined with its low-elevation landscape position within the watershed likely contributed to its lower clarity readings.

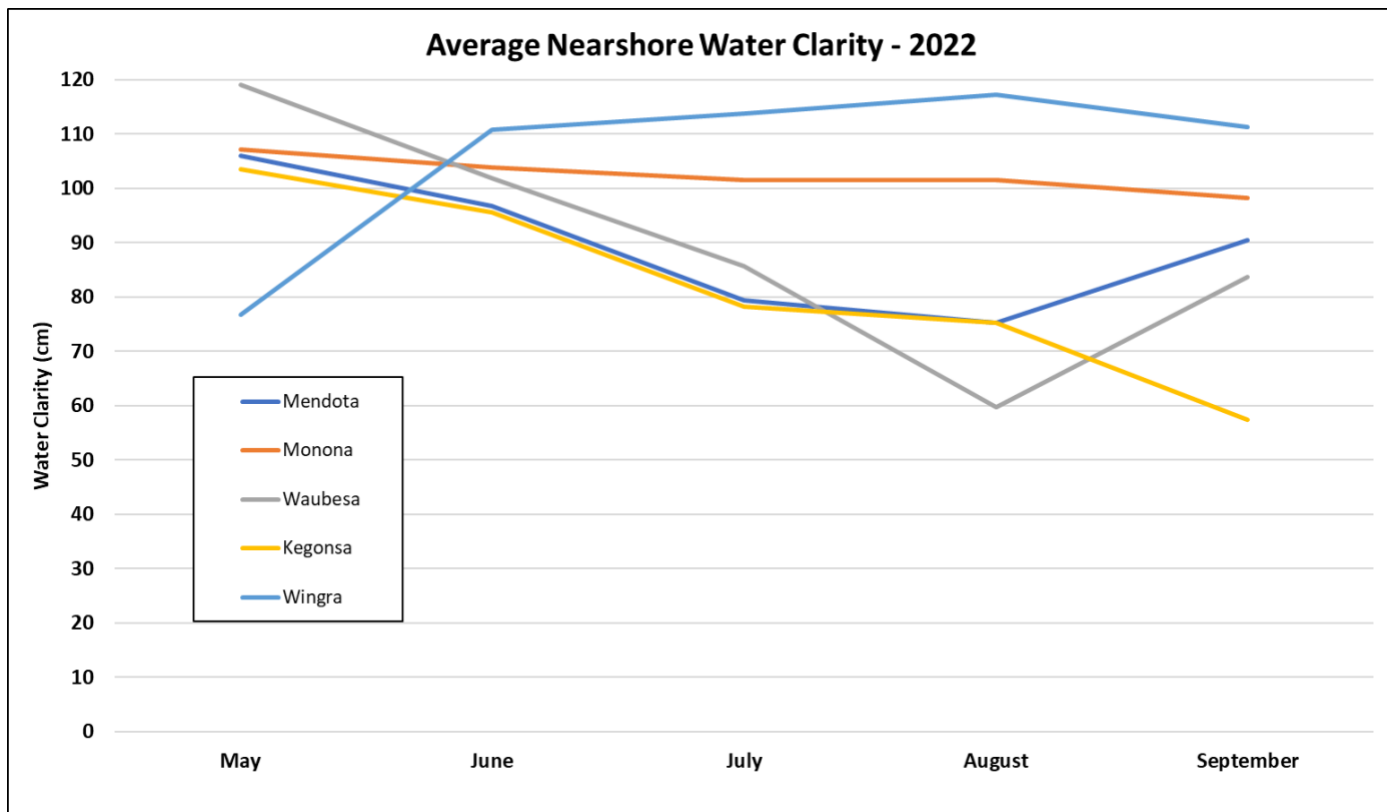


Figure 4. 2022 average water clarity by month for each lake. 120 cm is the maximum clarity reading measured by the turbidity tube.

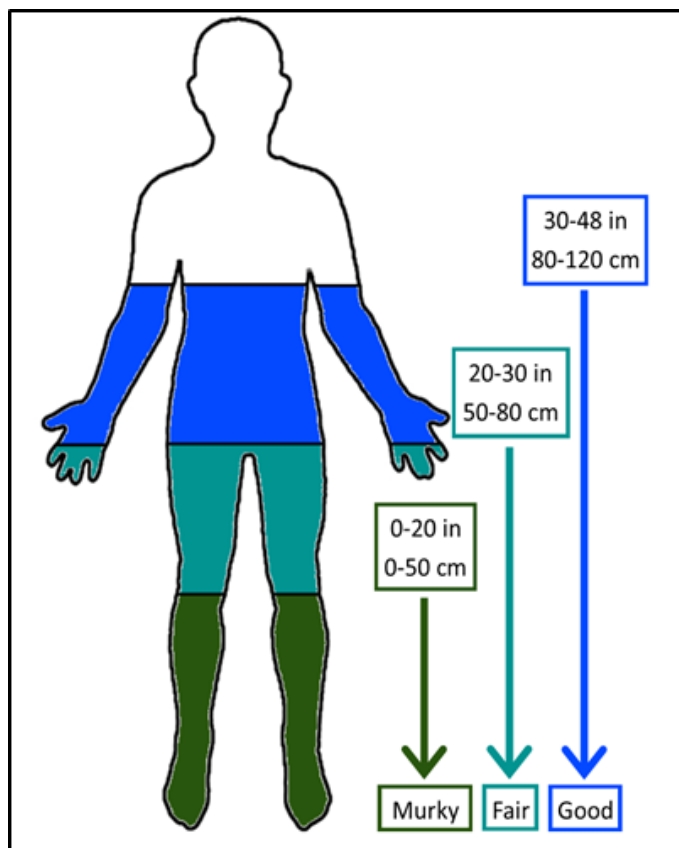


Figure 5. At what depths can you see your toes? We created this human representation to help visualize how a lake's water clarity conditions relate to measurements on a transparency tube.

During the 2022 monitoring season, low spring rainfall volume and intensity coincided with good

water clarity and few strong cyanobacteria blooms on all lakes except for Lake Kegonsa. This aligns with our understanding of how rainfall drives phosphorus delivery to the lakes, fueling algal blooms. However, it's important to remember precipitation patterns alone are insufficient to explain condition reports seen throughout the spring and summer. Long-term climate trends, the timing of larger rain events, impacts of invasive species, the effect of watershed conservation practices, and random spatial variability make it difficult to identify whole-lake patterns of water quality. There can also be long lag times between watershed actions that reduce phosphorus and lake response.

Data collected by LakeForecast volunteers offer a valuable tool to help us better understand ever-changing lake conditions. Real-time reports allow the public to track conditions on each lake as they vary across time and space. They also provide an early warning system as potentially harmful cyanobacterial blooms develop and dissipate.

Please see [\*Fundamental Concepts on Water Quality of the Yahara Chain of Lakes \(Mendota, Monona, Wingra, Waubesa, and Kegonsa\)\*](#) for an excellent summary of our current understanding of lake dynamics. These concepts and understandings are also presented in [\*RENEW THE BLUE: A Community Guide for Cleaner Lakes & Beaches in the Yahara Watershed\*](#) (2022).

## Thank You!

Clean Lakes Alliance wishes to recognize the following volunteer LakeForecast monitors for their many contributions to the success of this program:

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Jim & Joan Cordray  
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### Lake Monona

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Bob Bertera  
Carolyn Betz  
Brittingham Boats  
Kari Brock  
Mary Crenny  
Sarah Fix  
Kaelin Fontaine  
Amie Francisco  
Steve Gordon  
Rachel Groman  
Chris and Jennifer Henderson  
Lindsey Klicko  
Mel McCartney  
Elaine Meier  
Cheryl Namyst  
Joy Newmann  
Michael Oleniczak  
Zach Redding  
David Schroder  
Tom Smith  
Jan Van Vleck  
Ken Walz  
Sam Warfel  
Amy Wencel  
Gwen Eudey  
Luke Wynn  
Madison Wynn

### Lake Waubesa

Kitty Brussock  
Cassy Cooley  
Mike Horn  
Mark Jung  
Woody Kneppreth Terri  
Lefebvre & Joe  
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Robert Montgomery  
Kimberly Rios  
Mike Schmidt  
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### Lake Wingra

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Sally Lehner  
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