

Keeping
Smith
Mountain
Lake
Clean & Safe

Citizen Science Programs at Smith Mountain Lake

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Smith Mountain Lake Association Volunteers and
Board Members

Virginia Water Monitoring Council Conference
September 30, 2025



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Agenda

- What is Citizen Science?
- Orientation to Smith Mountain Lake & SMLA
- Key Citizen Science Programs at SMLA
 - Water Quality Monitoring
 - Save Our Streams
 - Dock Watch
- Conclusions and Considerations

What is Citizen Science?

There is no one definition, but some common attributes

- Engages volunteers
 - People who are not tasked with carrying out research as part of their paid work
- Harnesses curiosity, concern, observations and the power of crowds
- Covers a large area
- Addresses a politically relevant issue
- Provides feedback to citizen volunteers
- Quickly makes data available to the public

Definition from the National Oceanic and Atmospheric Administration (NOAA)

Citizen Science is defined as a form of open collaboration where members of the public participate in the scientific process to address real-world problems in ways that include identifying research questions, collecting and analyzing data, interpreting results, making new discoveries, developing technologies and applications and solving complex problems.

Smith Mountain Lake

22,000-acre reservoir created by impounding the Roanoke River in the 1960s for the generation of electricity.
Lakeside community of more than 20,000
40 miles long, 500+ miles of shoreline
Average depth of 55 feet and depths exceeding 200 feet near the dam

Two primary branches: 1) the Roanoke River arm, which includes the cities of Roanoke and Salem in its watershed, and 2) the Blackwater River arm, which is generally rural and has more agricultural land uses.



Year-to-date, 8-1-2025



200+

Volunteers



30,000+

Volunteer Hours



900+

Members



\$177,000

Funding

+

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Smith Mountain Lake Association

Since 1969, SMLA has been the steward of Smith Mountain Lake with a mission to protect the water of Smith Mountain Lake and promote safe recreation.

Lake Quality Council
CLEAN

Water Safety Council
SAFE

Water Quality
Monitoring

Save our Streams

Dock Watch

Buffer Landscaping

Invasive Species

Septic Education

Fish Habitat

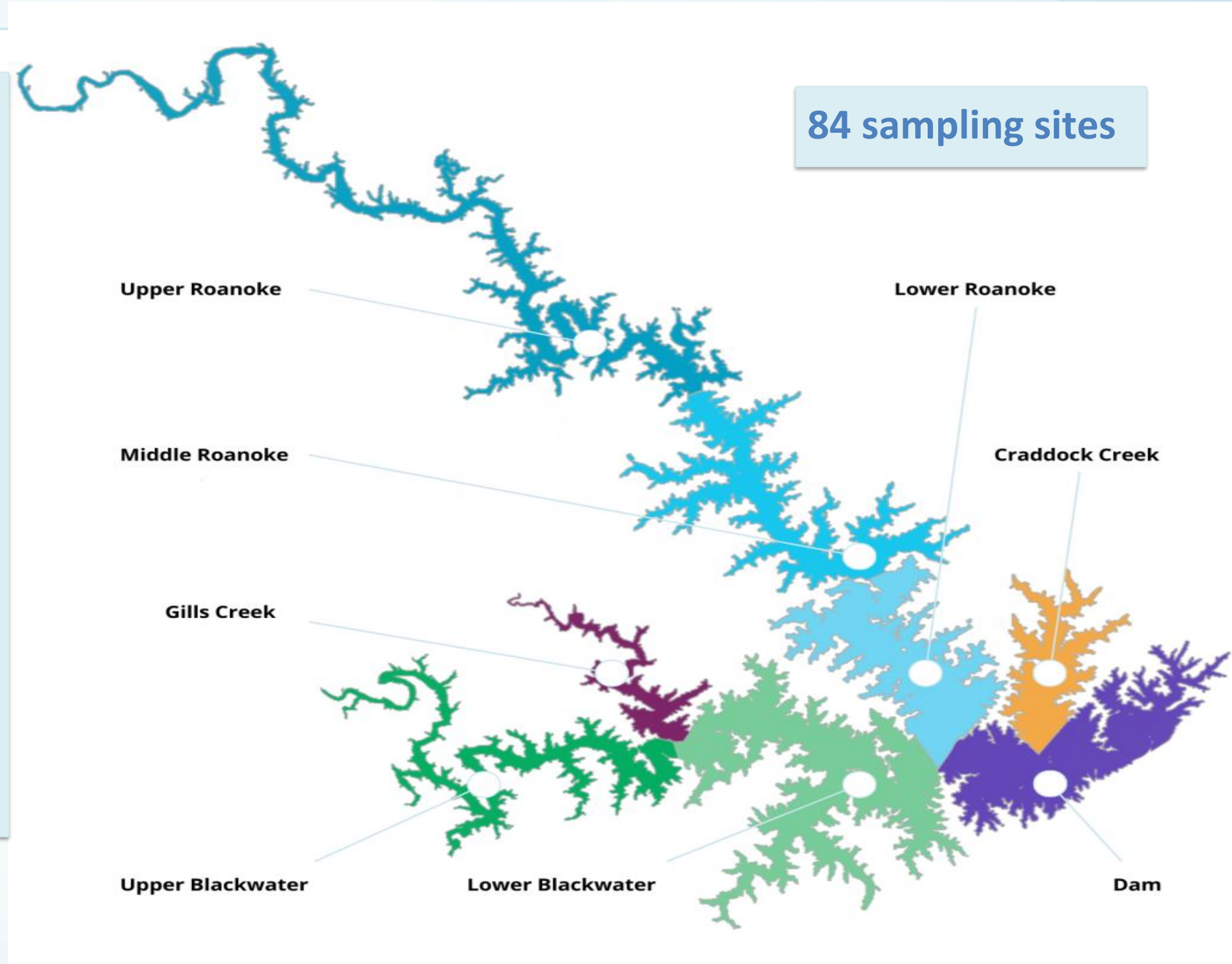
Citizen
Science



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SMLA Water Quality Monitoring

- Partnership between SMLA and Ferrum College.
- Has operated since 1987.
- Roughly 50 citizen volunteers collect samples on the lake every two weeks in the summer.
- The highest water quality is typically found in areas farthest downstream such as those closest to the dam, and lower water quality is found in the uppermost sections of the lake.





Almost 40 Years of Water Quality Monitoring

39
YEARS IN
OPERATION

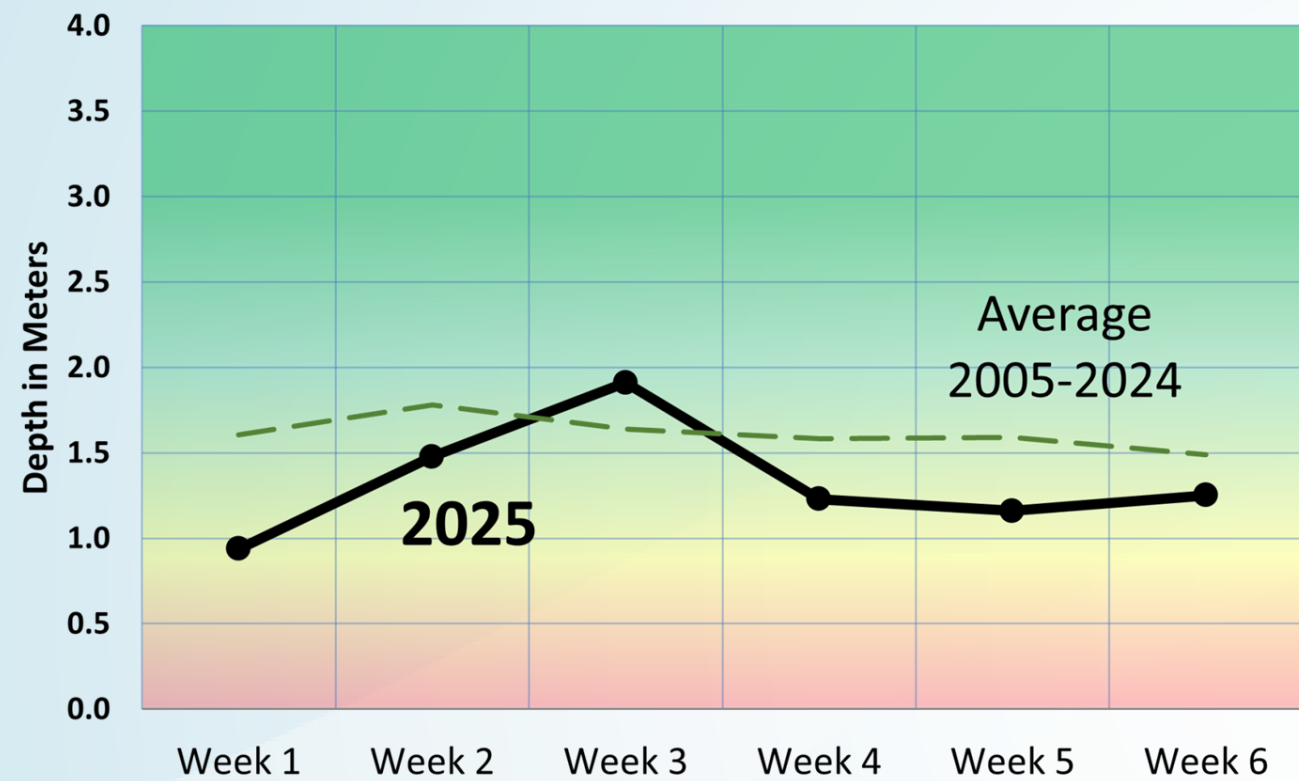
56
WATER SAMPLE
COLLECTION
SITES

8
4
WATER CLARITY
READING
SITES



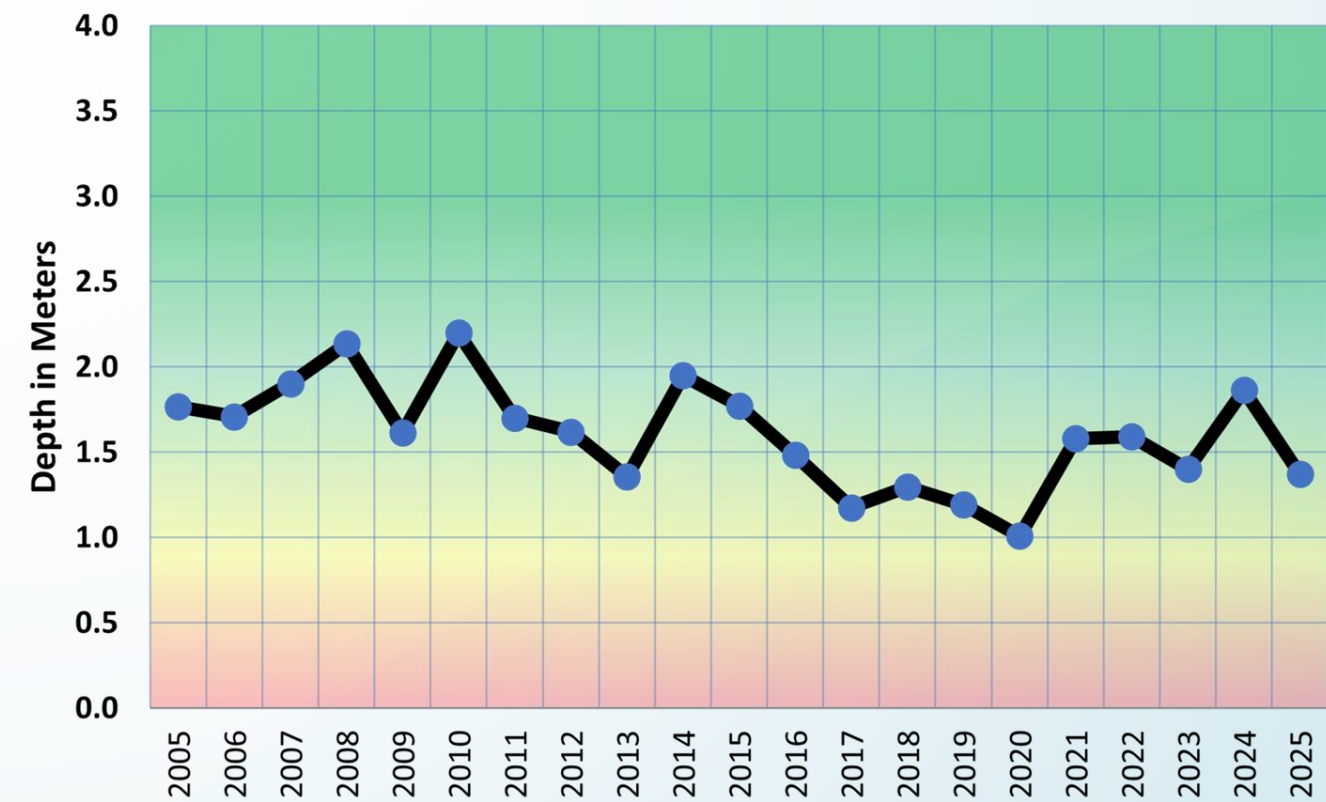
Lake Zone Data Reporting

Weekly Trend - Water Clarity



Upper Blackwater

20-Year Trend - Water Clarity

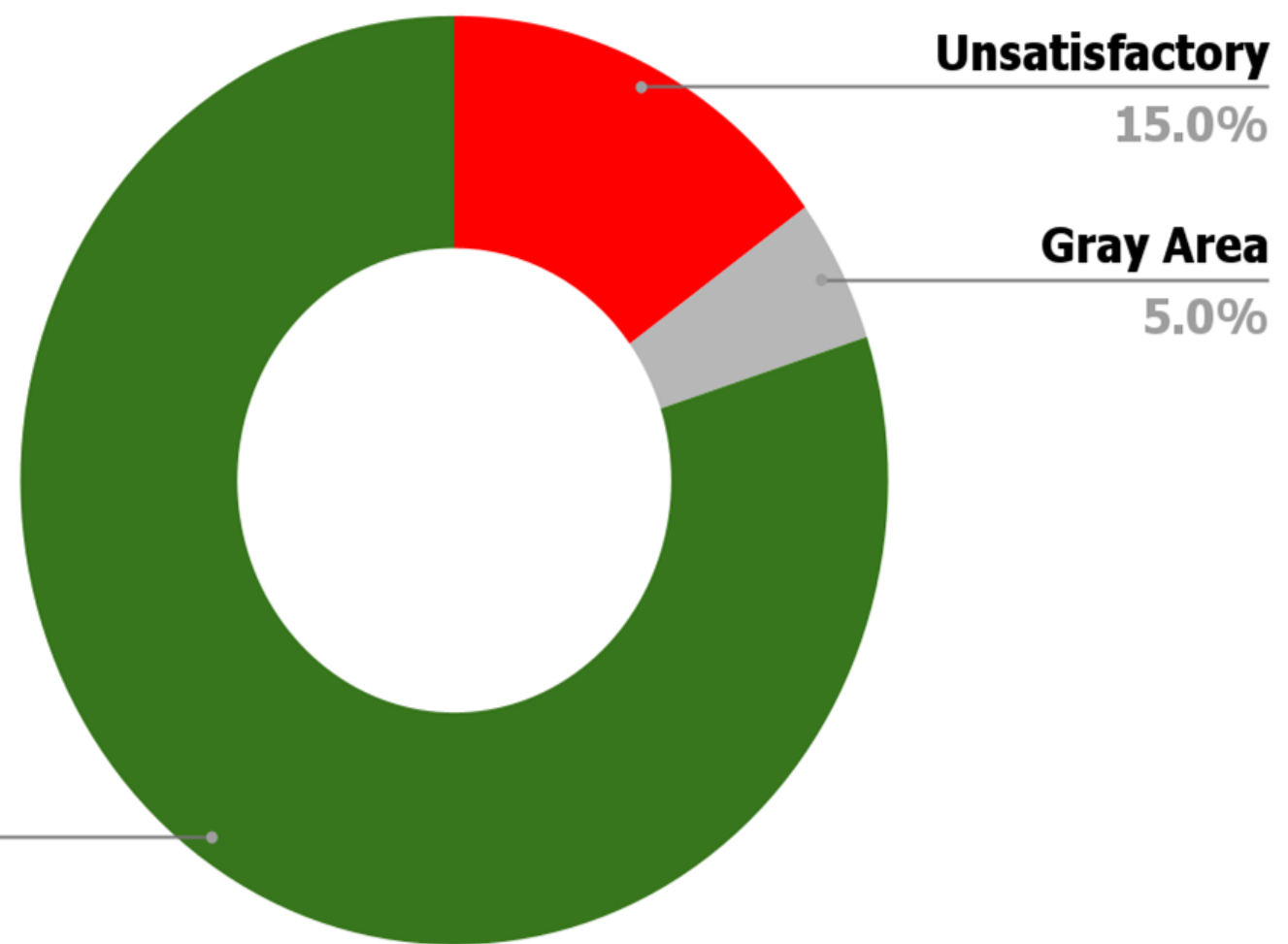


Save Our Streams (SOS)

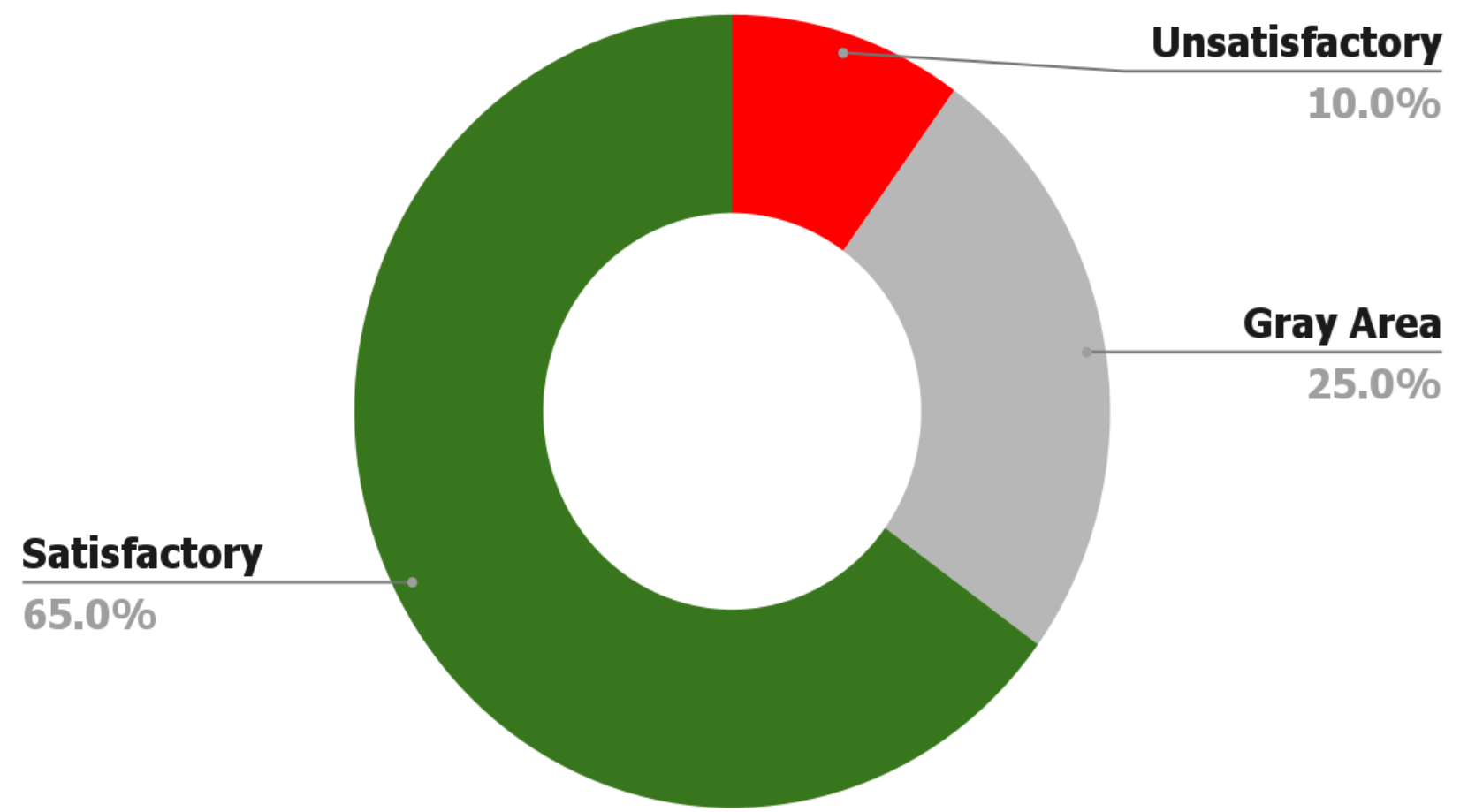
- Partnership among SMLA, Virginia SOS Program and the Blue Ridge Foothills and Lakes Chapter of the VA Master Naturalist Program.
- Twice a year, certified volunteers collect and identify freshwater aquatic macroinvertebrates from key streams flowing into the lake.
- Factors like weather events, temperature, and insect hatches can affect scores.
- The data collected is entered into the Virginia SOS database and used by the State Department of Environmental Quality to assess the overall quality of Virginia's streams and rivers and used to identify deficiencies that may need to be addressed.

SOS Findings

Spring 2025 Findings



2024 Results



Stream Health Scoring

- 0-7 Unsatisfactory
- 8 Unable to Determine (gray area)
- 9-12 Satisfactory

Dock Watch Program

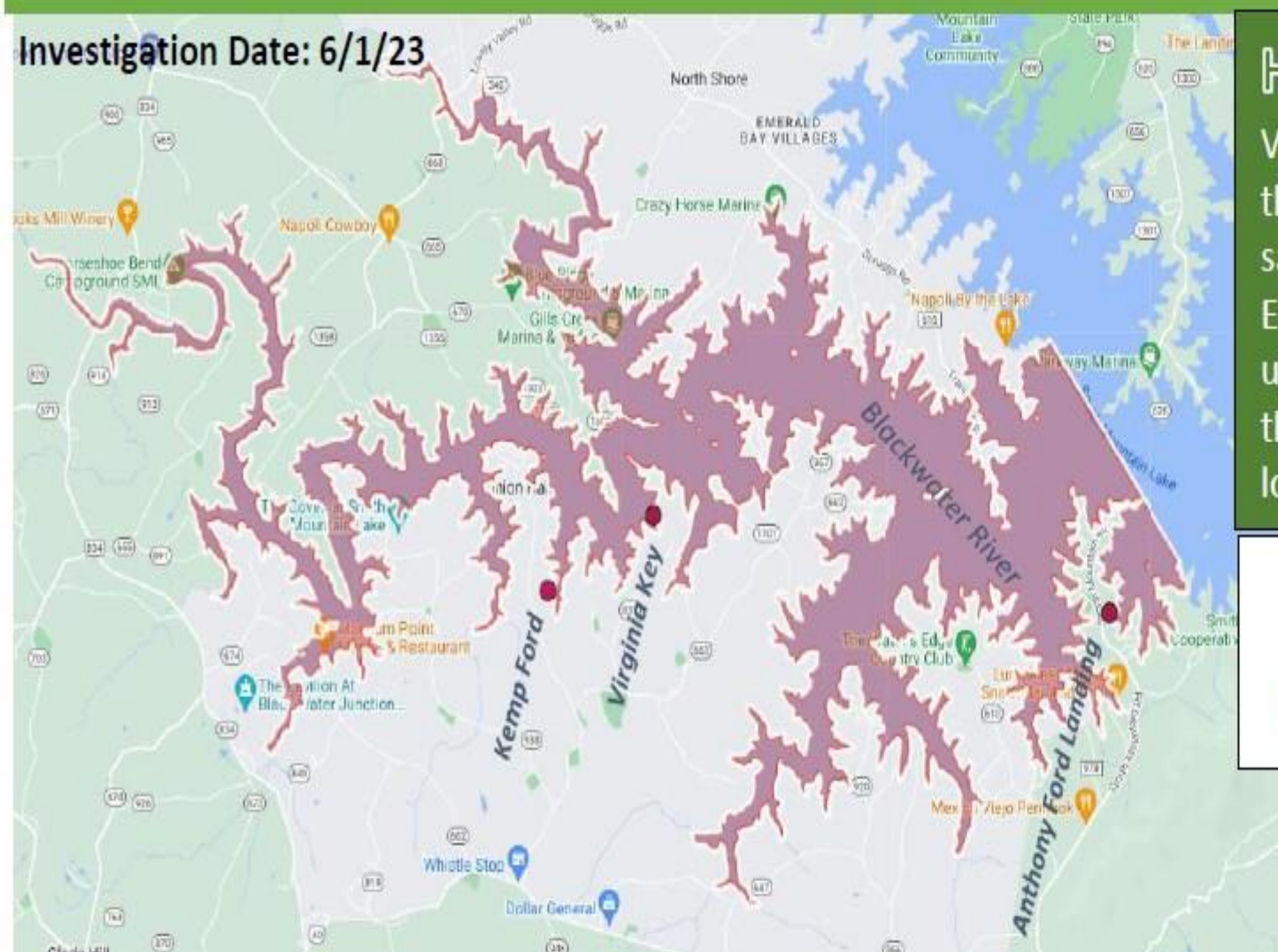
- In 2023 there were >70 reports of conditions that could have been Harmful Algal Bloom (HAB) related and several confirmed HAB areas.
- > 1/3 of the lake was under a swimming advisory.

Smith Mountain Lake – Blackwater River Harmful Algae Bloom (HAB) Status Report

Issued: Tuesday 6/6/2023

Next Issue: week of 6/26/2023 (weather dependent)

Investigation Date: 6/1/23



HELPFUL TIP:

Visit www.SwimHealthyVa.com and click on the Harmful Algae Bloom Map to review sample results near you.

Expand the map using the symbol in the upper right hand map title bar, then click on the magnifying glass. You can search my location name or address.

-  Harmful algae (cyanobacteria) concentrations at unsafe levels
-  Lake area of HAB swimming advisory

What is a HAB?



An algal bloom was defined as “the rapid growth of a species or number of species of algae.” (DEQ 2021)

Harmful algal blooms were defined as blooms that have “algae and cyanobacteria that produce toxins that may adversely affect human health through ingestion of contaminated water or shellfish (DEQ 2021).”

Because of their ability to photosynthesize and the bluish-green color of many cyanobacterial blooms, cyanobacteria are often referred to as “blue-green algae,” even though they are not algae and their blooms are not always blue-green in color.

Cyanobacteria at SML

- Within SML, both algae and cyanobacteria occur naturally.
- Some species of cyanobacteria can produce toxins.
- Conditions that support the formation of HABs include:
 - warm, stagnant water
 - nutrients (phosphorus and nitrogen)
 - access to sunlight



Impacts of Harmful Algal Blooms at SML

Economic



SML's tourism, businesses and residents generate significant direct county revenue; up to 65% depending on County.

2023 Visit Data indicates a 10% loss from HAB area.

6 marinas, 5 restaurants & untold seasonal businesses directly affected.

Fear

Distrust & Disregard
of Swimming Advisory



Safety



Increased congestion and boater-related incidents.
Illness reports may have been attributable to exposure to HAB conditions.



Where did the Dock Watch concept come from?



The SMLA Dock Watch program operates as part of a broader community-driven network of volunteers nationwide dedicated to monitoring phytoplankton and harmful algal blooms (HABs).



The Phytoplankton Monitoring Network is managed by the National Centers for Coastal Ocean Science (NCCOS) under the National Oceanic and Atmospheric Administration (NOAA).



NCCOS provided initial training for Dock Watch volunteers and supplied SMLA with one of the microscopes used in our laboratory.



Data collected by SMLA Dock Watch is submitted to the national Phytoplankton Monitoring Network database.

What is the Dock Watch Program?

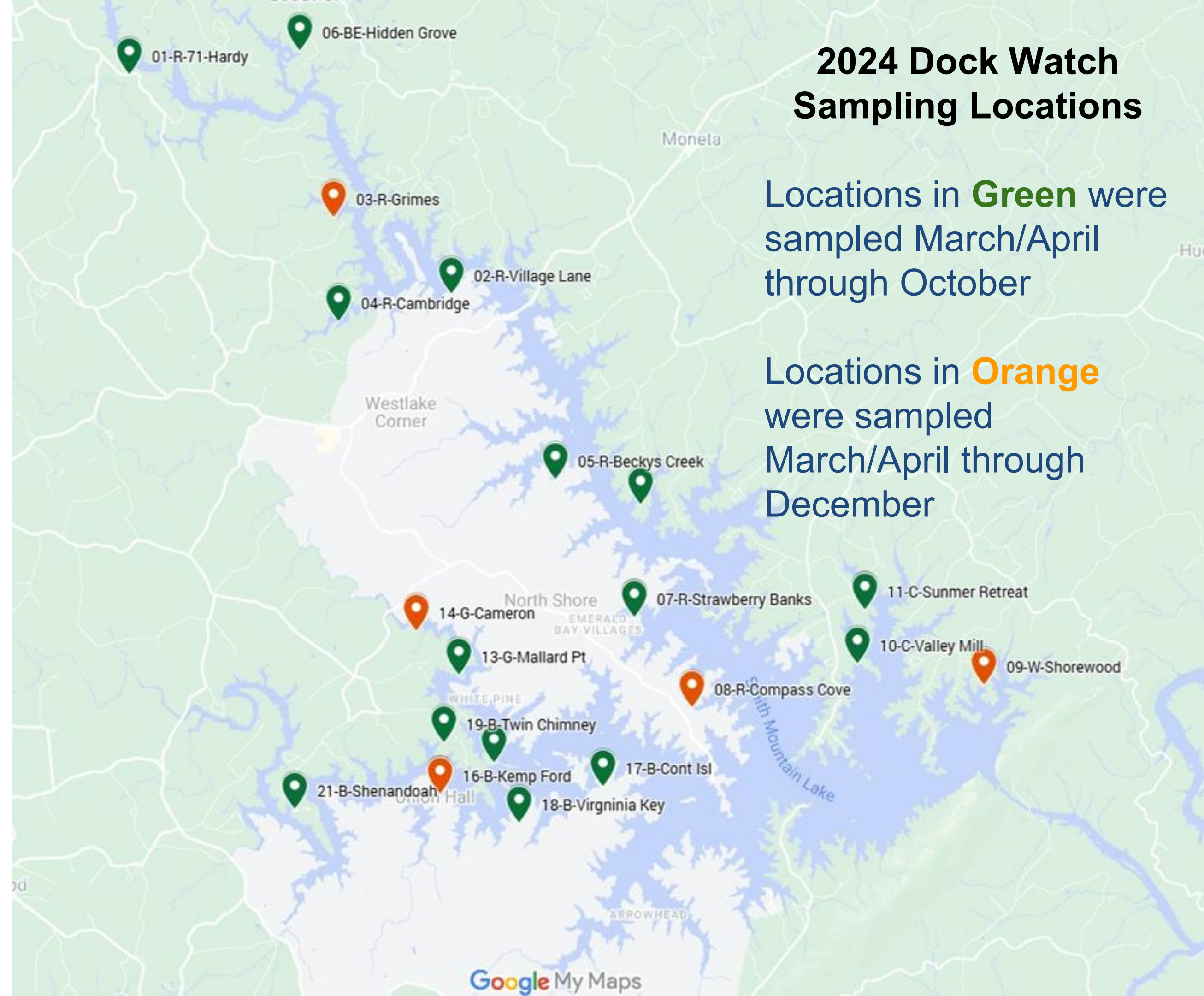
A Citizen Science community-based network of over 40 volunteers who collect data at 22 dock locations around SML.

An effort by SMLA to improve our understanding of cyanobacteria presence spatially and temporally in SML.

2024 Dock Watch Sampling Locations

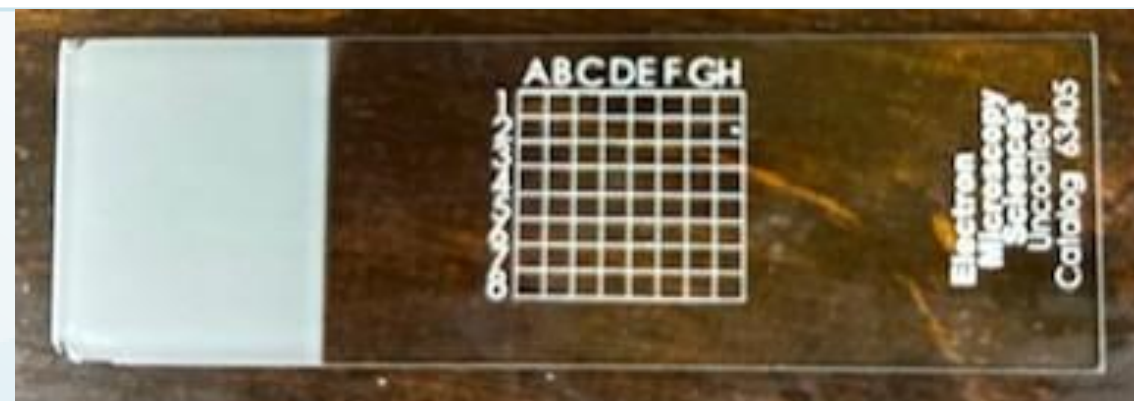
Locations in **Green** were sampled March/April through October

Locations in **Orange** were sampled March/April through December



What data is collected by Dock Watch Volunteers?

- Sample Date and Time
- Water Temperature
- Air Temperature
- Weather conditions
- Wind Speed and Direction
- Water State (added in 2025)
- Water Clarity as measured with a Secchi Disk
- Water Depth (added in 2025)
- Water Samples are analyzed in the lab for:
 - Phycocyanin Measurement
 - Presence of target Cyanobacteria



Lab Analysis: Name: _____ Date: _____ Time: _____
Data Entry: ☐ NOAA Phytoplankton Monitoring Network ☐ SMLA Dock Watch Spreadsheet

 **SMLA Dock Watch**
Phytoplankton Monitoring Network
2025 Field Data Sheet 

Sampling Site: _____ Name: _____
Sample Date: _____ Sample Time: _____
Phycocyanin Reading (RFU): _____ If RFU is > 25 retain sample and notify dockwatch@smlassociation.org
Secchi Reading (# of segments): _____ Water Depth (# of segments): _____
Air Temp (°C): _____ Water Temp (°C): _____

Wind Direction	Wind Speed	Weather	Water State
☐ N	☐ 0-5	☐ Sunny	☐ Clear
☐ NE	☐ 5-10	☐ Partly Cloudy	☐ Stained
☐ E	☐ 10-15	☐ Mostly Cloudy	☐ Cloudy
☐ SE	☐ 15-20	☐ Cloudy	☐ Debris
☐ S	☐ 20-25	☐ Foggy	☐ Bloom
☐ SW	☐ > 25	☐ Rain	☐ Other: _____
☐ W			
☐ NW			

Target Species Screening

	None	# of grids	
Aphanizomenon	☐		Collect Photos of Targets or Unidentified Potential Targets. Use the tablet or your cell phone for photos. Alert dockwatch@smlassociation.org if you collect photos.
Microcystis	☐		
Dolichospermum	☐		
Planktothrix	☐		
Raphidiopsis	☐		

Use the space on the back of this sheet for any miscellaneous dockside observations such as water color, odor, development activity, etc and/or any lab observations (different species).

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2024 Dock Watch Program Results

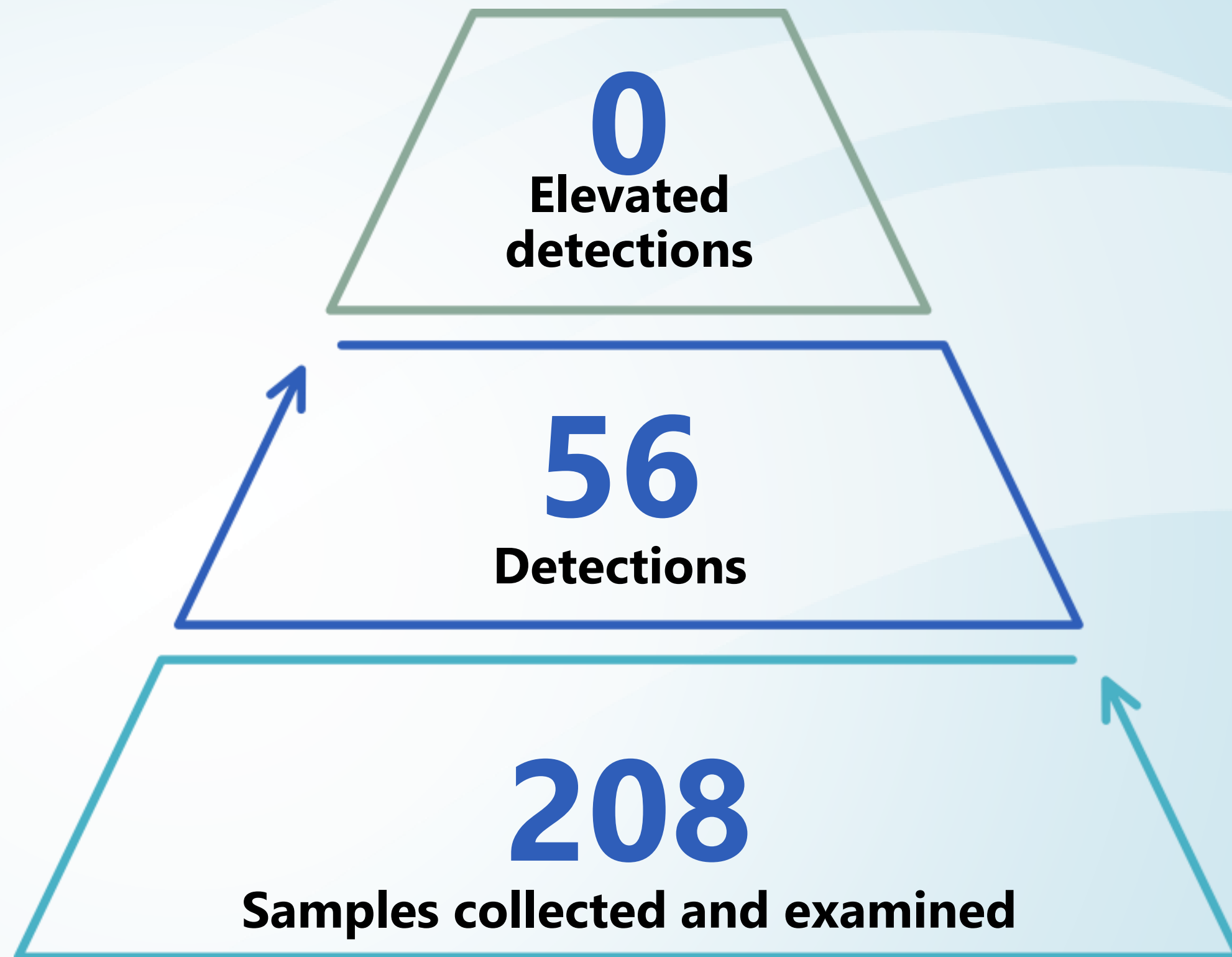
- 291 samples collected and analyzed across 20 docks
- 115 cyanobacteria detections in 90/291 samples

	Presence Detected	Elevated Presence Detected (≥ 60% of the slide grids)
<i>Aphanizomenon</i>	17	0
<i>Microcystis</i>	11	0
<i>Dolichospermum</i>	3	0
<i>Planktothrix</i>	6	0
<i>Raphidiopsis</i>	59	19



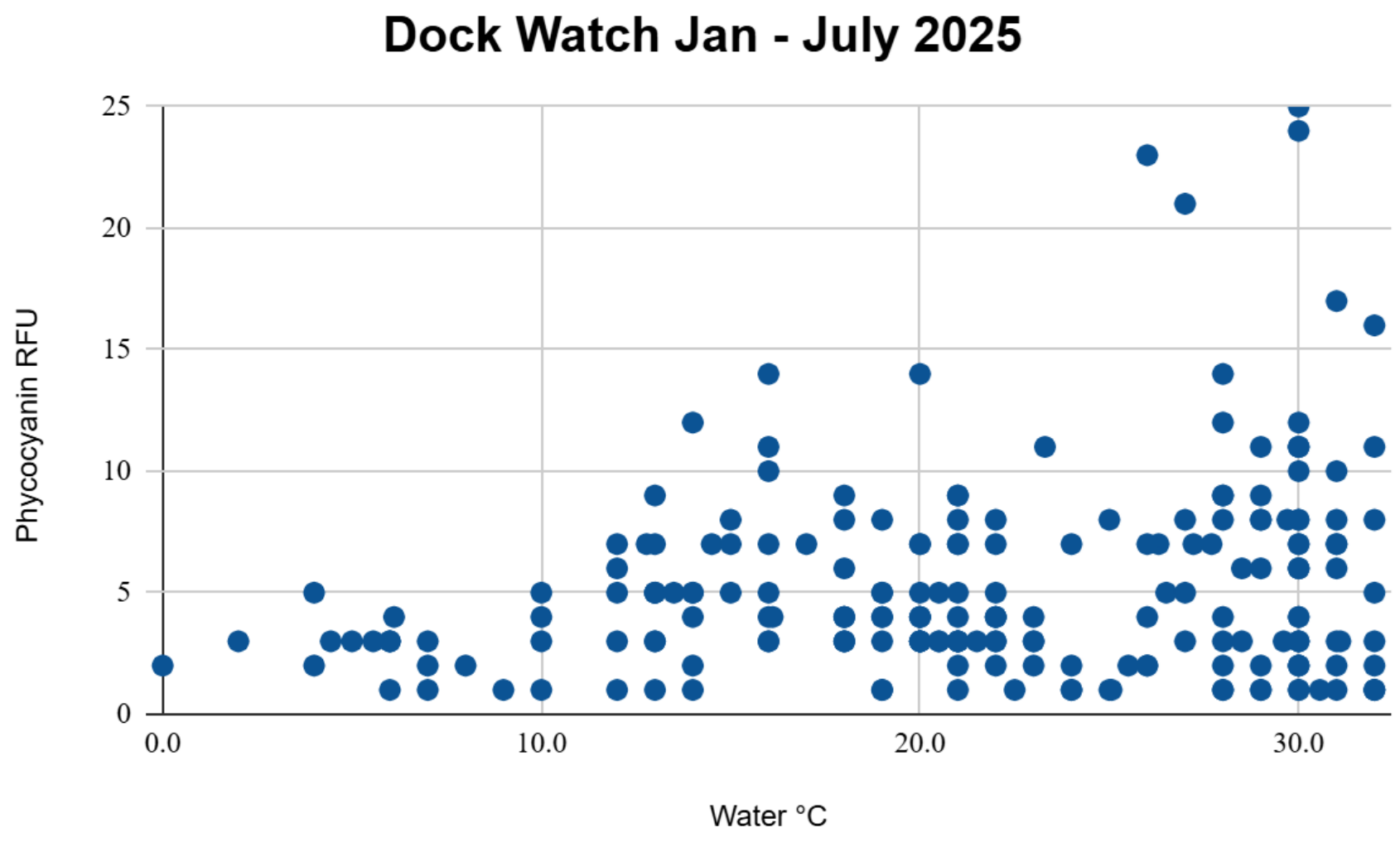
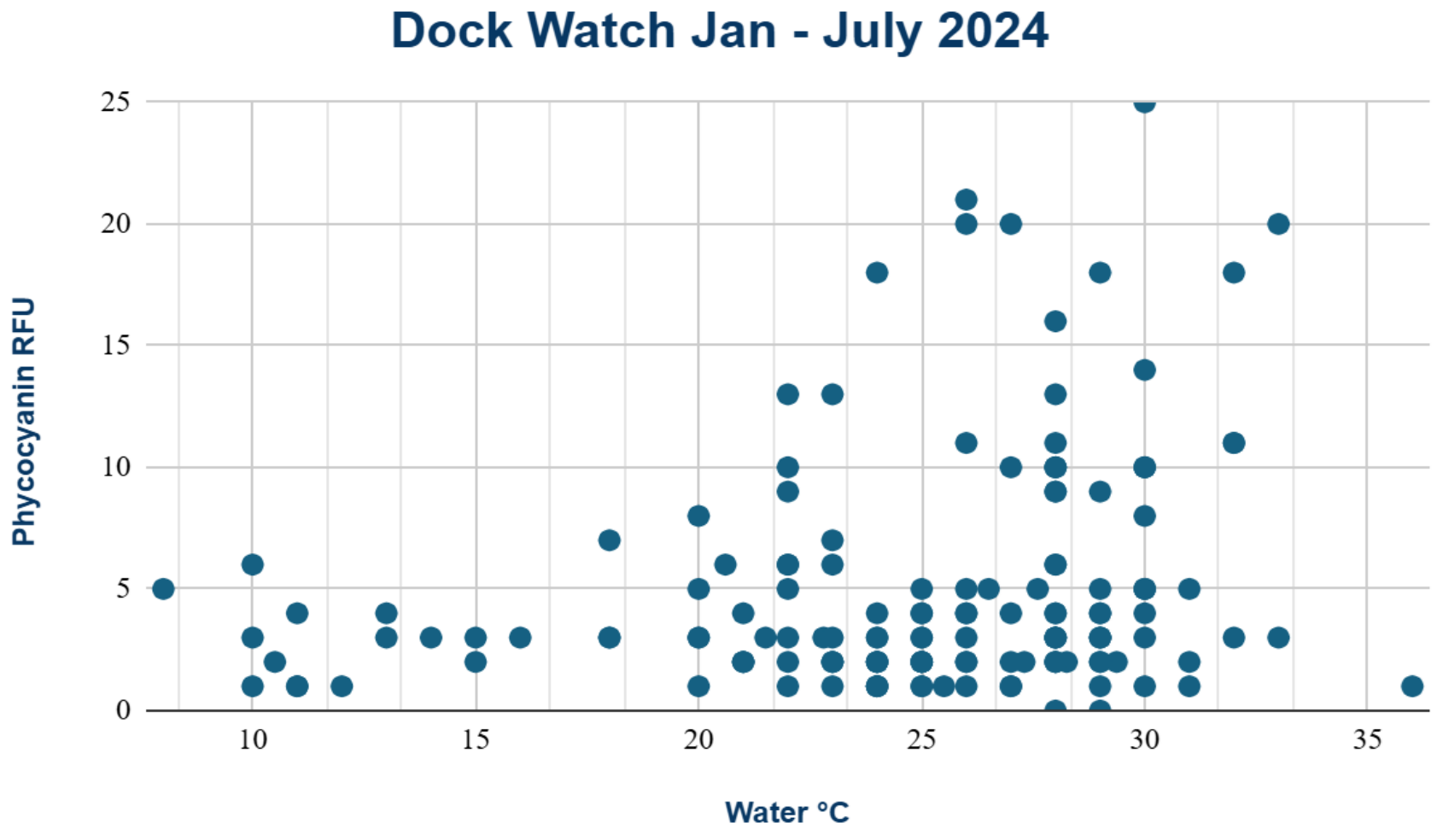
2025 Dock Watch CYANOBACTERIA DETECTIONS

(Jan - July preliminary)



Relationship between Phycocyanin Levels and Water Temperature

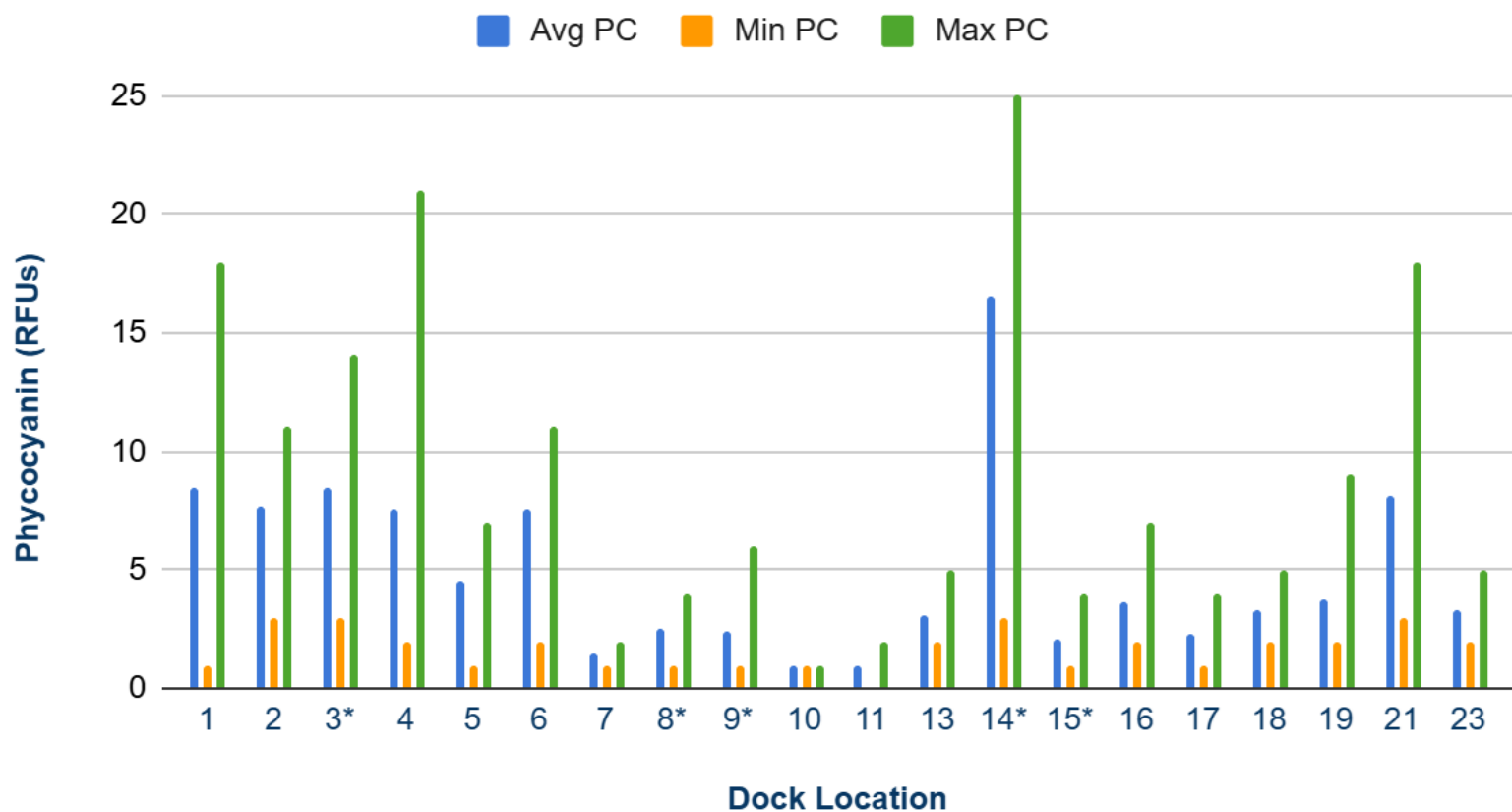
Phycocyanin is a pigment that only cyanobacteria emit.



As water temperatures warm, phytoplankton become more numerous.

Phycocyanin Levels by Dock Location

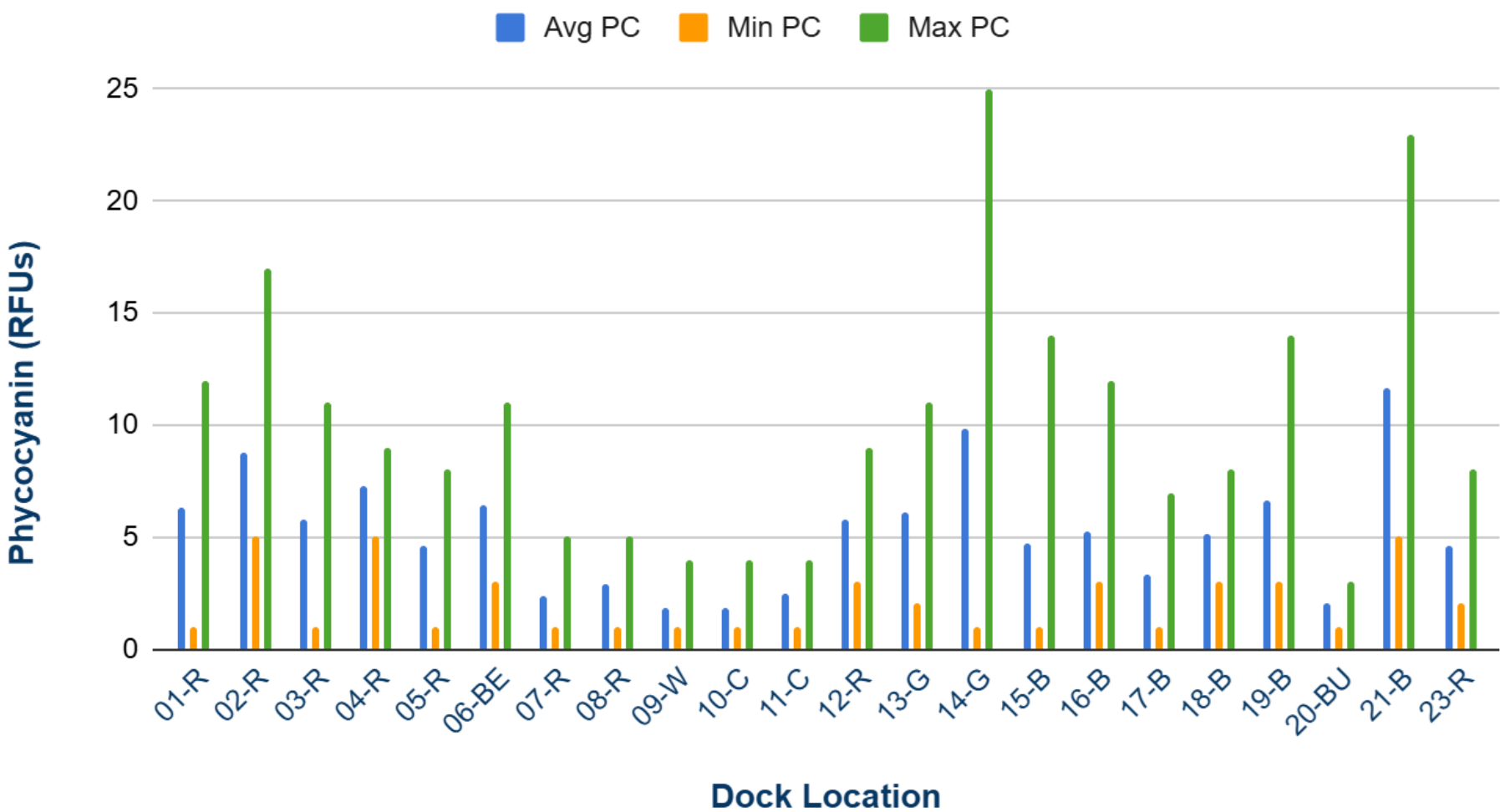
Dock Watch Jan - July 2024: Phycocyanin Measurements



Phycocyanin measures vary by location and time of year.

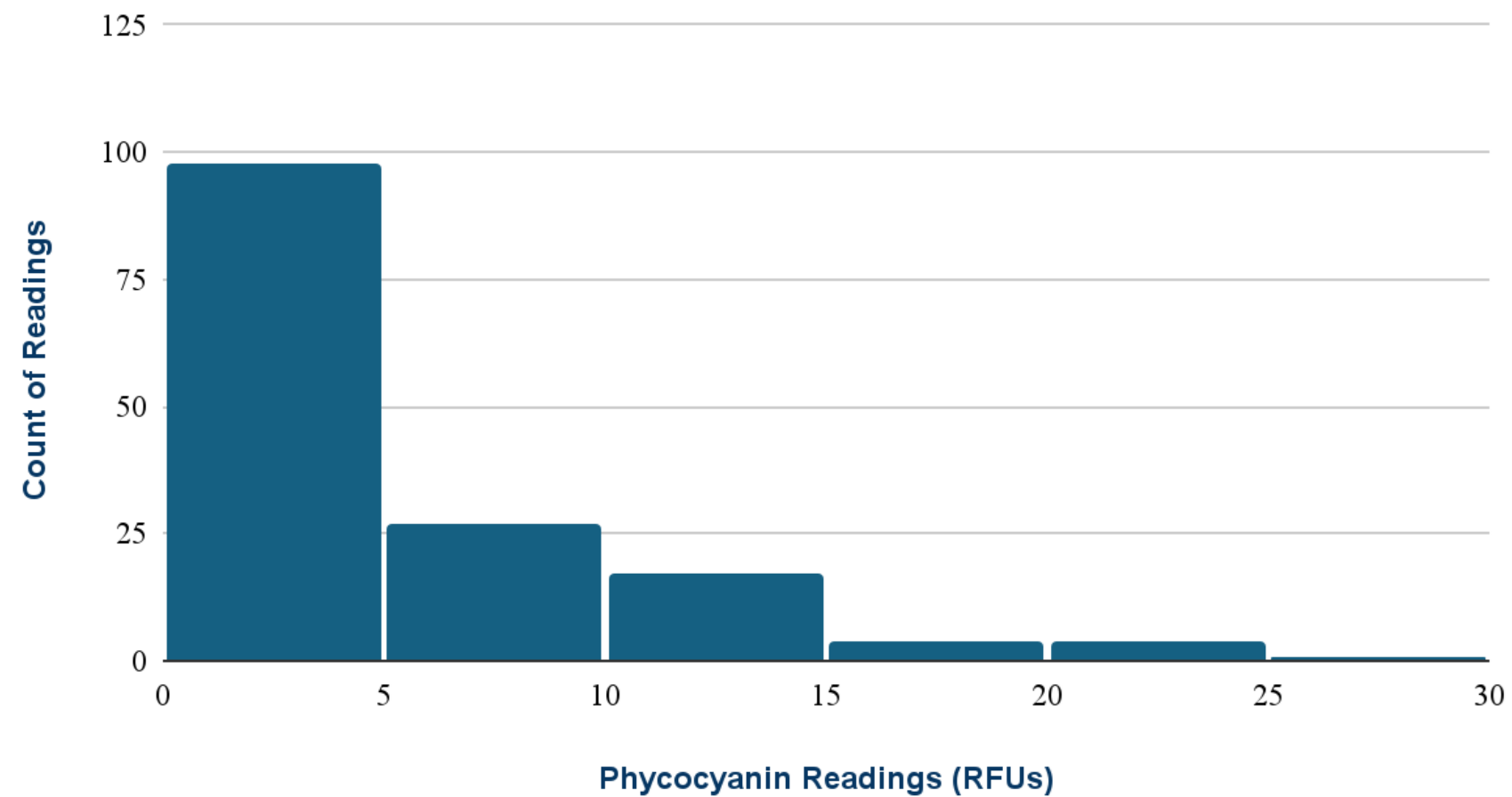


Dock Watch Jan - July 2025: Phycocyanin Measurements

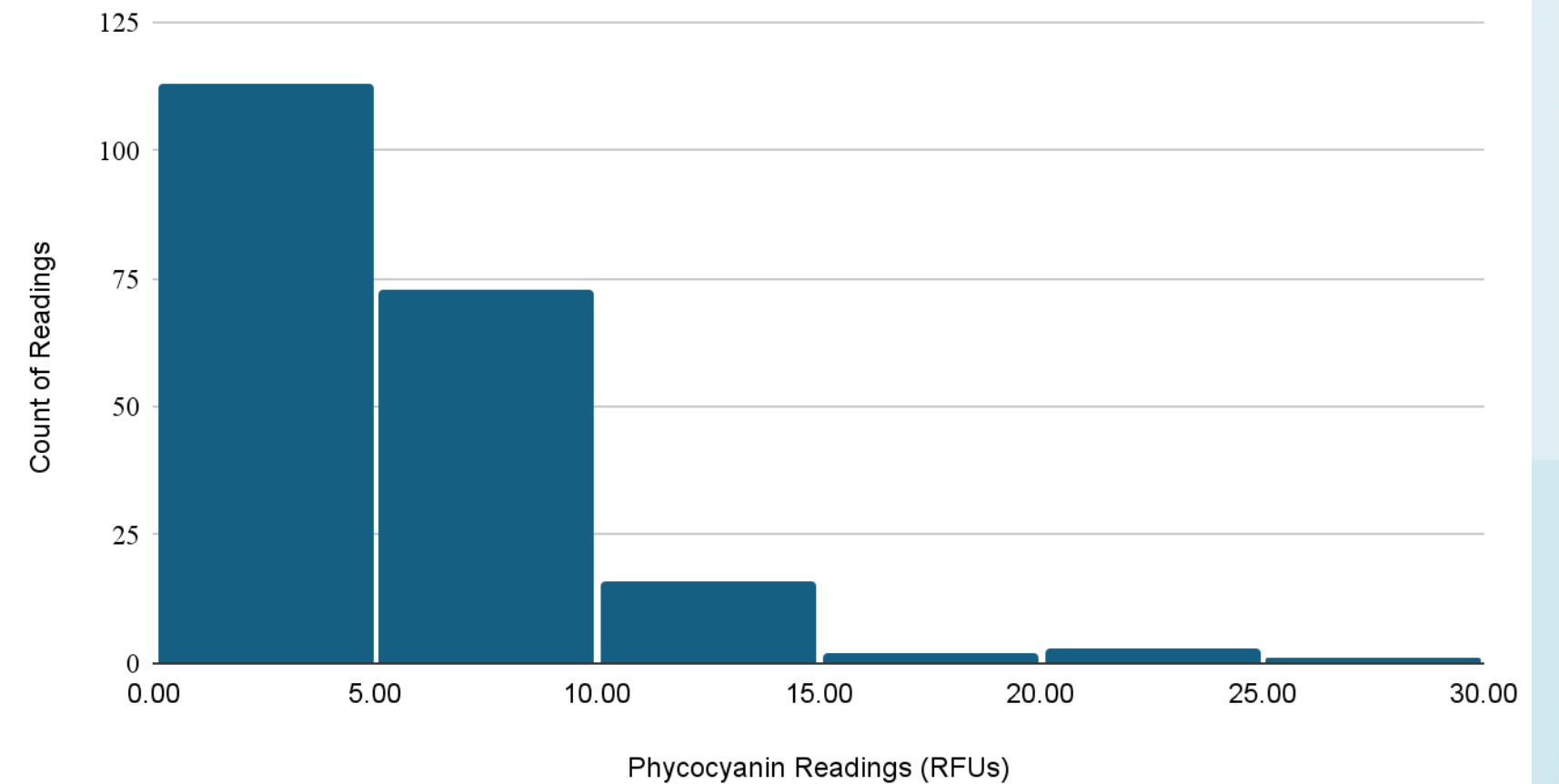


Distribution of Phycocyanin Readings

Dock Watch Jan - July 2024 Histogram of Phycocyanin Readings



Dock Watch Jan - July 2025 Histogram of Phycocyanin Readings



The majority of samples had a phycocyanin reading of < 10 during Jan to July in both 2024 & 2025.

Conclusions & Considerations

Citizen scientists are powerful observers and advocates

- Cross disciplinary across various science disciplines and sectors of society
- Bring increased innovation and creativity
- Serve as early warning signs to flag when more in-depth analysis may be warranted
- Broaden your geographic range and time series

Consider partnerships with NGOs that have strong citizen science programs

- Broadens your reach, engages the public
- May help compensate for staffing and funding shortages

Identify the right place for citizen science programs

- Long term data series
- Mutually beneficial

All scientific research methods have biases & limitations - it is important to acknowledge them

Questions?

Citizen science offers the power of science to everyone, and the power of everyone to science.

Caren Cooper, author of Citizen Science: How Ordinary People are Changing the Face of Discovery

