



**Developing a Harmful Algae Bloom (HAB)  
Monitoring Program**  
Montana Lakes Conference 2023

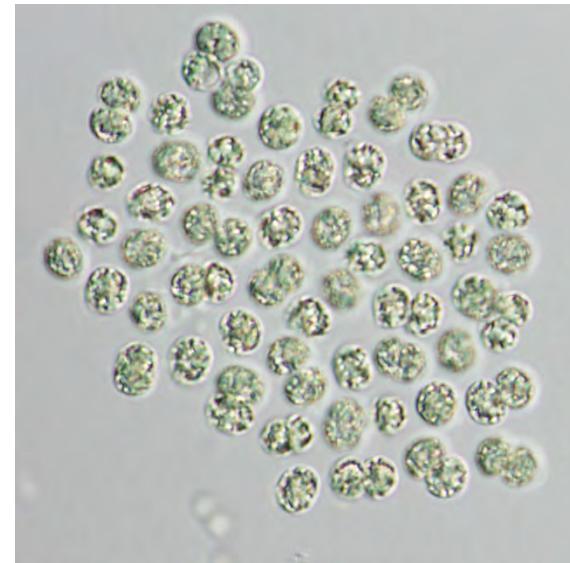
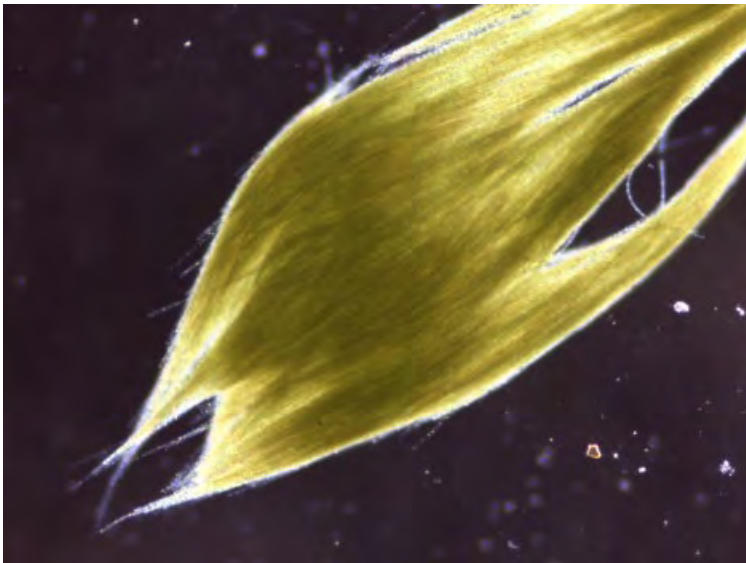
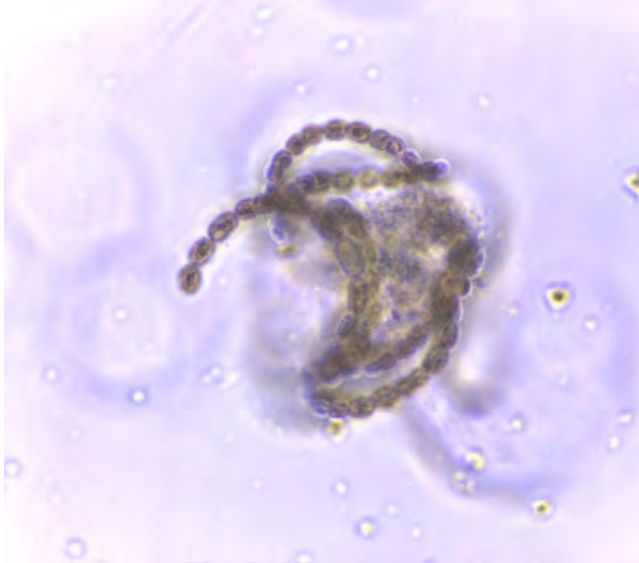


- Harmful Algae Blooms or HABs are proliferations of blue-green algae (cyanobacteria) that occur on a waterbody and have the potential to release toxins into the environment.
- Cyanobacteria blooms can come in many shapes and forms, and may or may not become toxic depending on species composition and environmental factors.

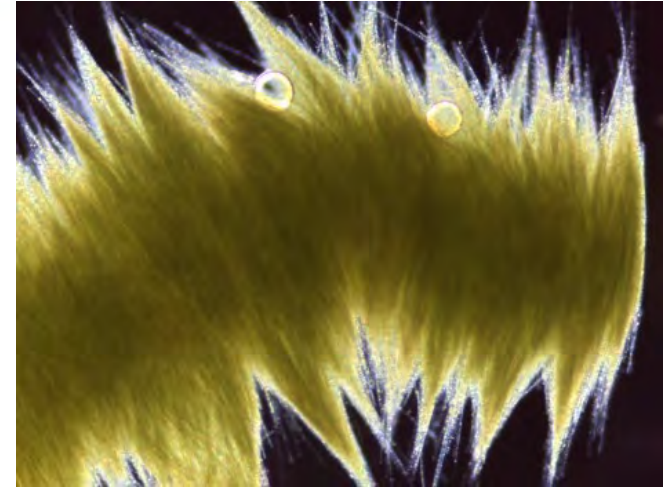




# Common Species of Cyanobacteria



- Cyanobacteria toxins may cause illness and in some cases death if ingested.
- The severity of symptoms is based on toxin concentrations in the water and the amount of water that is ingested.
- Pets, livestock, and small children are most susceptible to algae toxin poisoning, but algae toxins can affect anyone.



## Deadly algae closes bay at Hebgen Lake

By LARRY WILLS  
Chronicle Staff Writer

Rainbow Bay at Hebgen Lake has been ordered closed to water recreation after the discovery of a deadly nerve poison from algae.

The action was ordered today by the county health department and the Forest Service, in the wake of five mysterious dog deaths at the Rainbow Point Campground beach.

Late Wednesday, Dr. Jim E. Cuder, a MSU microbiology professor, insisted the poison as a neurotoxin that can kill mice within three minutes.

The dogs that died at the campground all suffered con-

prohibited in the bay for the protection of the vacationers there, officials said.

No humans have reportedly been hurt by drinking it water.

Cuder's report indicated the neurotoxin was linked to a blue-green algae bloom. "The toxicity seems to be associated with the algae; the toxicity of algae free water was not detected."

He also said that boiling the water does not get rid of it toxin.

As to the possibility of harming adults, Cuder said, "It is known about the effects of these toxins. However, a disease known as paralytic shellfish poisoning is

Monday afternoon  
tonight 43, high Monday  
Chance of precipitation 20  
today, 34 per cent tonight

## All Hebgen water called unfit for consumption

Although portions of Hebgen Lake are not apparently affected by the toxic algae bloom that has killed animals in the area, all water from the lake "should be considered unfit for human or animal consumption," according to the county sanitarian's office.

Eric Armstrong, spokesman for the office, said his office will be posting signs along new areas where the algae appears, and he said boaters should avoid any concentrations that they may find floating in the lake.

Grayling Arm, a reach extending from the north side of the lake, is closed to skiing, and

— dogs and cattle — have died after drinking lake water. Analysis has traced the deadly element to a product of blue-green algae blooming in the lake.

Armstrong said the toxic agent, a kind of nerve poison, does not affect fish, and fish taken from the lake may be considered safe to eat.

A number of agencies and monitoring groups

7/8/1977

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## CHRONICLE

7/3/1977

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## Algae still a riddle

By LARRY WILLS  
Chronicle Staff Writer

Hebgen Lake is being com-  
test tube as  
not out

for cattle and dog deaths in the past week and a half. The Forest Service is conducting four tests a week of the algae itself and the narrow ways that connect Grayling Arm with the body of the lake. Some have already been

Sanitarian Rick Armstrong was to take representatives of the Montana Water Quality Department to that agency's ways to abate. Also due at a team of re University. The Fish

uninhabitable for trout. Joel Shouse of the Blue Ribbons—water-quality study group, said his organization is supporting an immediate study. He said he will ask to pledge

visual observation Butte Lookout. Shouse said moving out of Arm, there is it may not be deeper and when in the t would dim. The dis algae here develop

## Cows found dead at Hebgen Lake

The discovery of 14 dead cows at Hebgen Lake Thursday night has led to an extension of the closure on swimming and water skiing at the Rainbow Bay portion of the lake, officials reported at 1 p.m. today.

They extended the closure to include the entire Grayling arm of the lake.

They also urged people not to

BOZEMAN DAILY CHRONICLE  
Bozeman, MT 59715  
(D-9, 403, S-10, 278)  
JUN 10 1987

SUPERIOR CLIPPING SERVICE  
BILLINGS, MT 59105-0789

## Algae bloom kills Hebgen area cows

Seventeen cattle died Tuesday from toxic algae on the north side of the Grayling Arm of Hebgen Lake, Gallatin County Health Officer Dr. Edward King said today.

King said the county is posting warning signs at

## State warns people on water with algae

The state Health Department Saturday warned people to keep small children, pets and livestock away from water with algae in it, in the wake of a rash of cattle and dog deaths at Hebgen Lake.

The statement warned that any water that looks like pea soup and has the characteristics of algae bloom could be dangerous.

The announcement followed the deaths of 14 cattle that were discovered Thursday night at Hebgen. The cattle apparently died after drinking the water which had algae in it, officials said. The blue-green algae in bloom creates a deadly nerve poison that can kill a mouse in as little as three minutes.

The state Water Quality Bureau was asking ranchers to send water samples to Helena on any suspicious stock watering ponds to see if their water was contaminated.

The samples should be sent to the Water Quality Bureau, Department of Health and Environmental Sciences, Capital Station, Helena.

The health department blamed the algae danger on this year's drought, and said the situation in previous years had been prevented by a higher streamflow.

The algae at Hebgen has concentrated on the downwind, or east side of the lake. Six dogs reportedly died after drinking water at the Rainbow Point beach, and algae accumulations have been reported in the Grayling Arm, north of the Rainbow Point Campground.

The Fish and Game Department warned that algae concentrations have been common



# Starting a HAB Monitoring Program

- What are your objectives?
  - Response monitoring
  - Compliance monitoring
  - Seasonal tracking
  - Research
- What are your resources?
  - Staff time
  - Funding for analysis
  - Funding for more high-tech approaches
- Who are your water users, partners, and regulators?
- What is your acceptable level of risk?

- NorthWestern Energy developed a Toxic Algae Plan for Hebgen Reservoir in 2000 in response to ongoing HAB issues.
- This plan was developed in conjunction with local, state, and federal agency partners and is updated annually.
- Annual coordination meetings occur with all partners before the HAB season starts.

## Hebgen Reservoir Toxic Algae Plan



**NorthWestern**  
**Energy**

*Delivering a Bright Future*

In cooperation with the Gallatin County Health Department,  
Montana Department of Environmental Quality, Montana  
Fish Wildlife and Parks, and the US Forest Service





**Table 1. Algal toxicity levels in relation to Action Plan stages.**

<b>Algal Toxin</b>	<b>Action Plan Stage 1</b>	<b>Action Plan Stage 2</b>	<b>Action Plan Stage 3</b>
Anatoxin-a	Non-Detect	Detection - 8 µg/L	> 8 µg/L
Microcystin	8 µg/L	8 µg/L - 20 µg/L	> 20 µg/L

***Action Plan Stage 1: Public Notice** – Informational signs are placed around the lake every year in May, and a mailing is sent to all lakeshore owners & USFS Lease holders to remind them that there have been toxic blooms in the past and to look for potential algal blooms while at the lake.*

***Action Plan Stage 2: Warning** - Public/Media is notified and Warning signs are put up around the lake that a toxic algal bloom has been detected. GCCHD recommends people not swim in the lake and pets/livestock be kept from entering the lake or drinking lake water.*

***Action Plan Stage 3: Closure/Danger** – This will always be event specific and GCCHD will decide what action needs to be taken at that time (closure, use limitations etc.), notify the public/media and direct appropriate signage be placed as needed.*

- Use signage to help promote public awareness of HABs and the risks associated with them.



WELCOME TO

## Rainbow Point at Hebgen Reservoir

Harmful algal blooms commonly occur on Hebgen Reservoir. *Water may be unsafe for people and pets.*



**Avoid all contact with water that :**

- Looks like spilled paint or pea soup
- Is discolored green and/or blue
- Has globs, surface films or scums



Submit photo reports and learn more information by visiting **HAB.mt.gov**



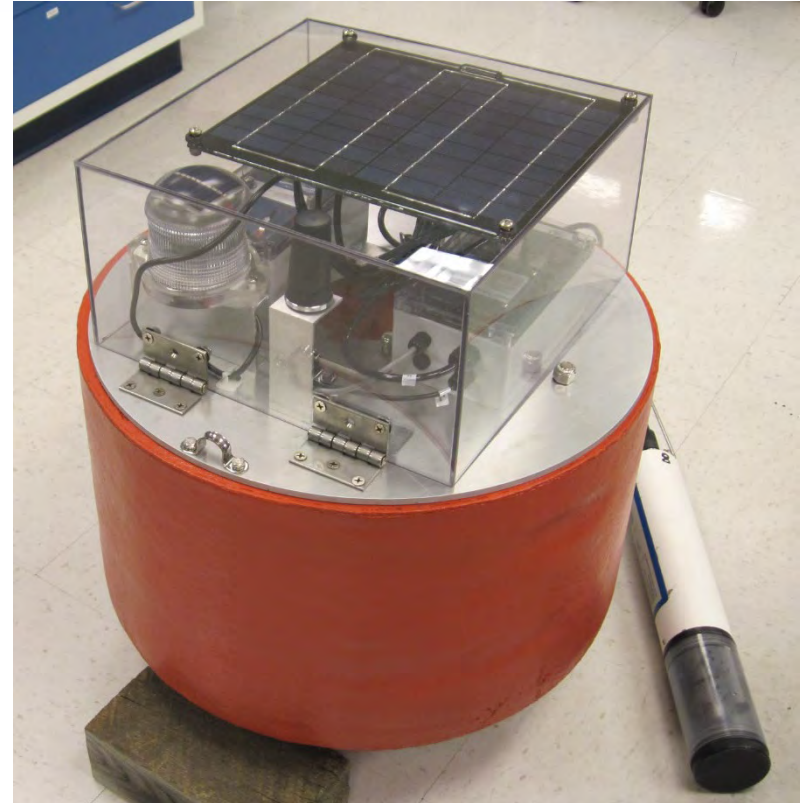


- Visual monitoring at regular intervals throughout the summer at public beaches and marinas.
  - Note visual observations of algae growth.
  - Take photos at each location to document the current conditions.
- These visual observations may or may not capture a HAB depending on timing and weather conditions.



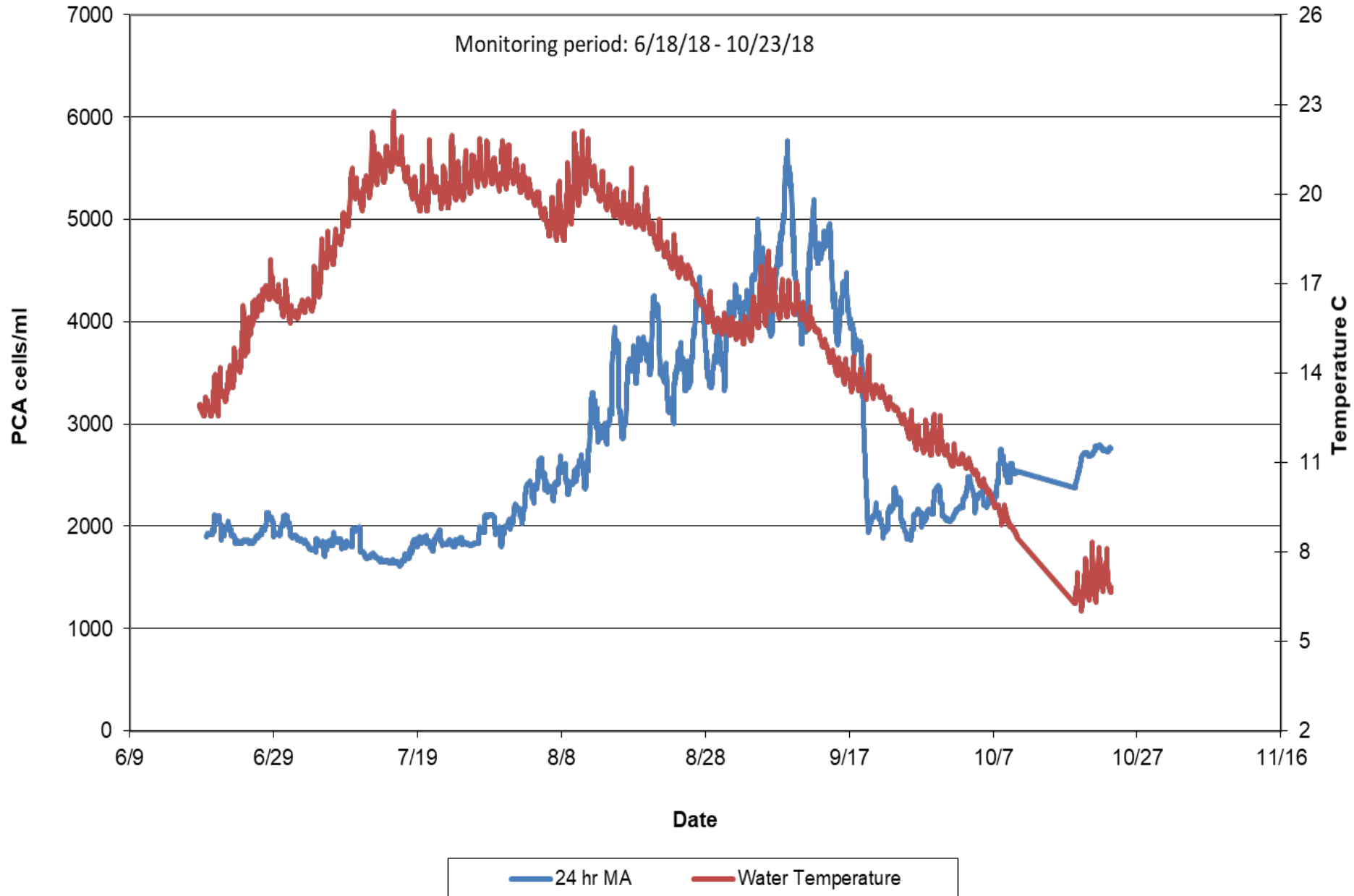
# A More High-Tech Approach

- Ambient monitoring buoys can be deployed to collect water quality data and phycocyanin levels.
- Data can be transmitted real-time via a solar-powered cellular modem to help you track water quality and phycocyanin levels throughout the season.
- Data can be compared from year to year to see if any trends emerge.
- Phycocyanin measurements are useful, but they do not quantify toxins.



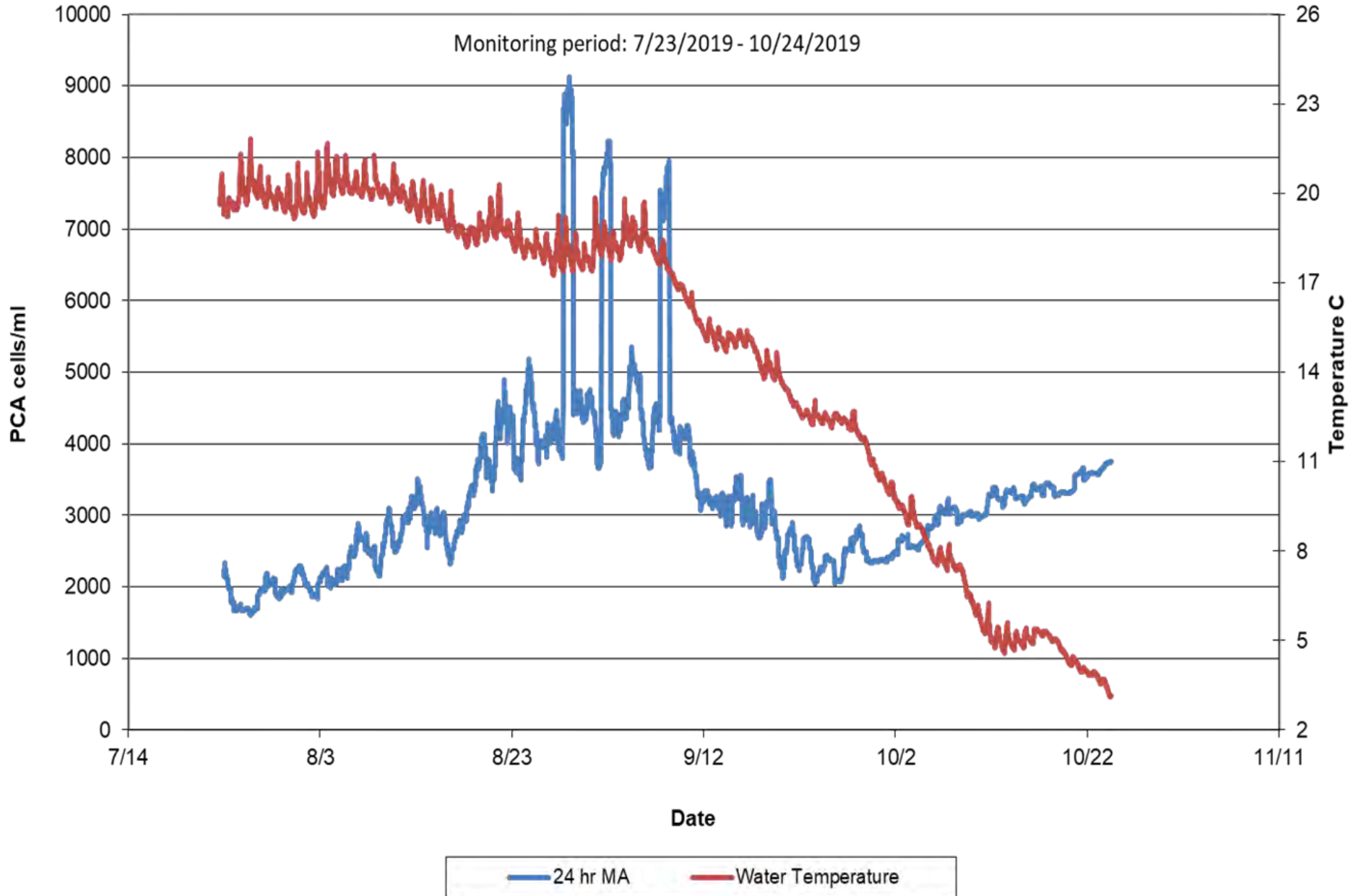
# 2018 Grayling Arm Cells/ml 24hr Moving Average and Water Temperature

The 24 hour moving average is plotted at the end of the 24 hr period. Values equal to 2000000 were removed from the moving average calculation. The sensor measures phycocyanin (PCA) pigment which is specific for cyanobacteria.



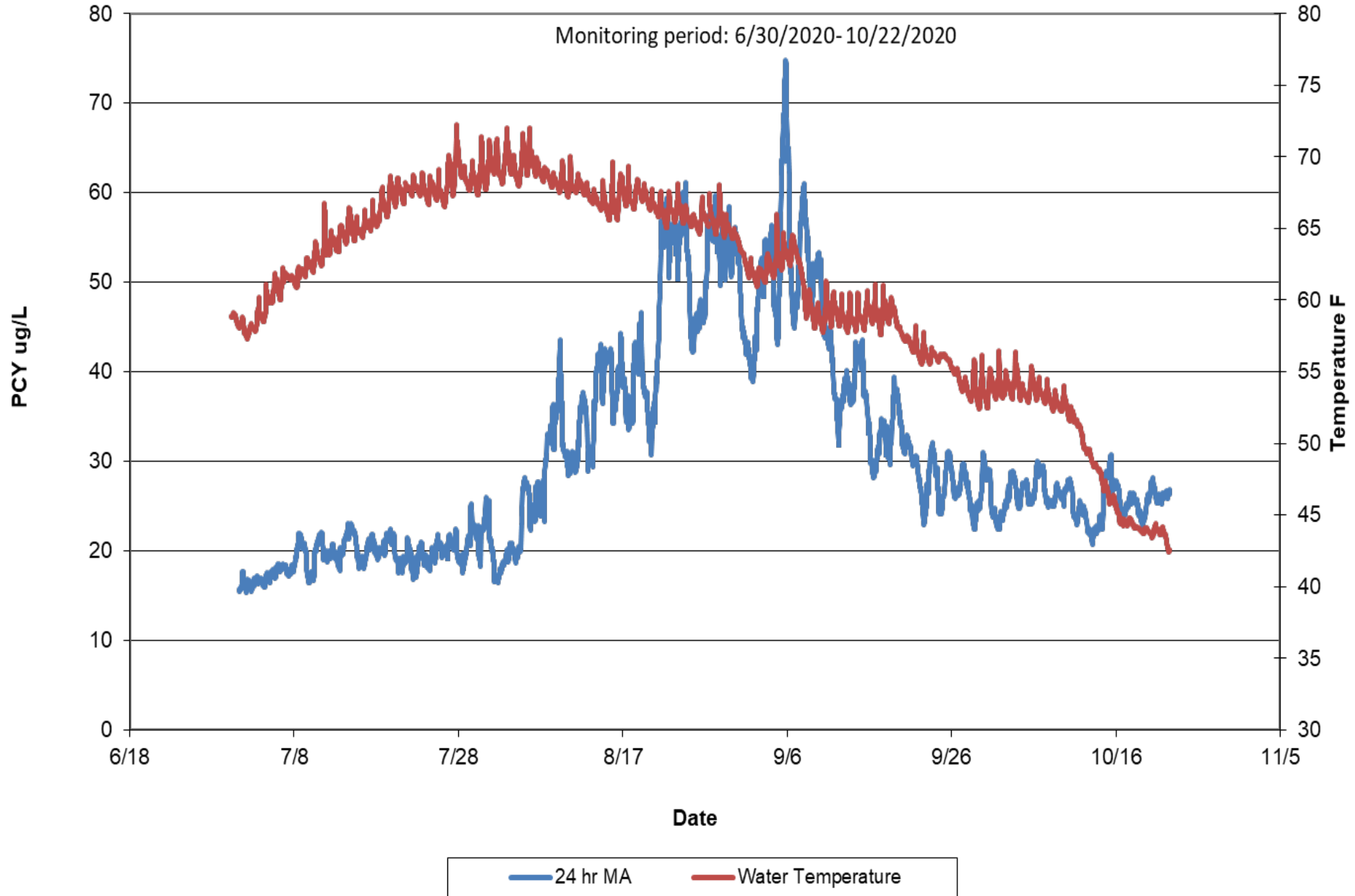
## 2019 Grayling Arm Cells/ml 24hr Moving Average and Water Temperature

The 24 hour moving average is plotted at the end of the 24 hr period. Values equal to 2000000 were removed from the moving average calculation. The sensor measures phycocyanin (PCA) pigment which is specific for cyanobacteria.



## 2020 Grayling Arm ug/L 24hr Moving Average and Water Temperature

The 24 hour moving average is plotted at the end of the 24 hr period. Values >200 ug/L were removed from the moving average calculation. The sensor measures phycocyanin (PCY) pigment which is specific for cyanobacteria.





# Identifying When a HAB Becomes Toxic

- So you've discovered a HAB. How do you know if it's toxic?
- The only way to know for sure is to test for toxicity by using a field test or laboratory methods.
- Live cyanobacteria cells may have toxins, but those typically aren't released into the environment until the cell dies.

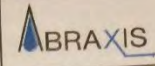




# Identifying When a HAB Becomes Toxic

## Anatoxin-a Strip Test

Immunochromatographic Strip Test for the Detection of Anatoxin-a\* in Drinking and Recreational Waters



Anatoxin-a 9/27/16

A Quake Lake

B Kirkwood

C Cattle Guard Beach

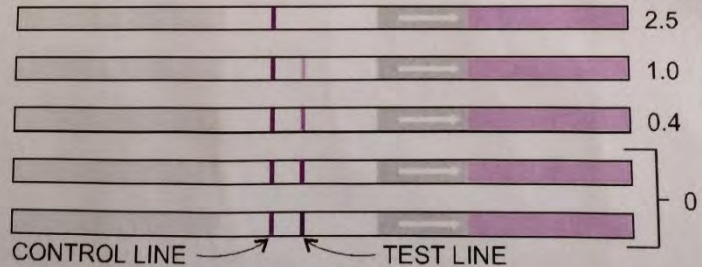
D HAPPY HOUR

E YELLOWSTONE HOLIDAY

- If a monitoring site is dominated by known toxin producing cyanobacteria, collect a water sample and test using Abraxis<sup>®</sup> field test strip for the appropriate toxin test (Microcystin, Anatoxin-a, etc.).
- If you don't know which species of cyanobacteria are present, send a live or preserved sample into a qualified lab for identification.

## 7. Interpret

ppb



INTERPRET TEST



- Depending on the level of resolution you need, you can choose to send in a live sample to a laboratory for speciation and toxin quantification.
- Laboratory analysis is expensive, but when it comes to public health and decision-making, the benefits outweigh the costs.
- To maintain sample integrity, samples should be kept out of direct sunlight, refrigerated and shipped on ice overnight to the receiving lab.
- Please consult with the lab prior to sampling and shipping as to the preferred sampling containers and methodologies.

- The State of Montana has a statewide HAB reporting website that allows the public to upload reports and photos of HABs.

<http://HAB.mt.gov>

- These reports are displayed on an interactive map which conveys this information to the public quickly and efficiently.

PUBLIC HEALTH & SAFETY:  
HARMFUL ALGAL BLOOMS

[CLICK HERE TO REPORT A  
POSSIBLE HARMFUL  
ALGAL BLOOM OR VIEW  
CURRENT REPORTS](#)

(Recommend Firefox or Chrome)




# Harmful Algal Blooms in Montana

These are public reports of algal blooms that may, or may not, have been confirmed by experts as harmful. Most reports will be evaluated and advisories (caution or closure) may be issued. However, It is often impossible to determine if toxins are present at any specific time. Err on the side of caution and use your best judgement to determine if the water is safe for recreation.



- Current Advisories
- 2021
- 2020
- 2019
- 2018
- 2017
- Montana Harmful Algal Bloom Website
- ☰




Nevada Creek Reservoir

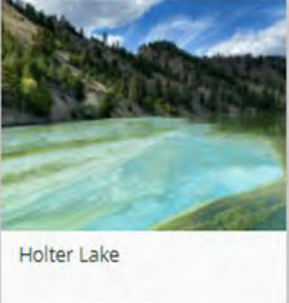


Lake Mary Ronan

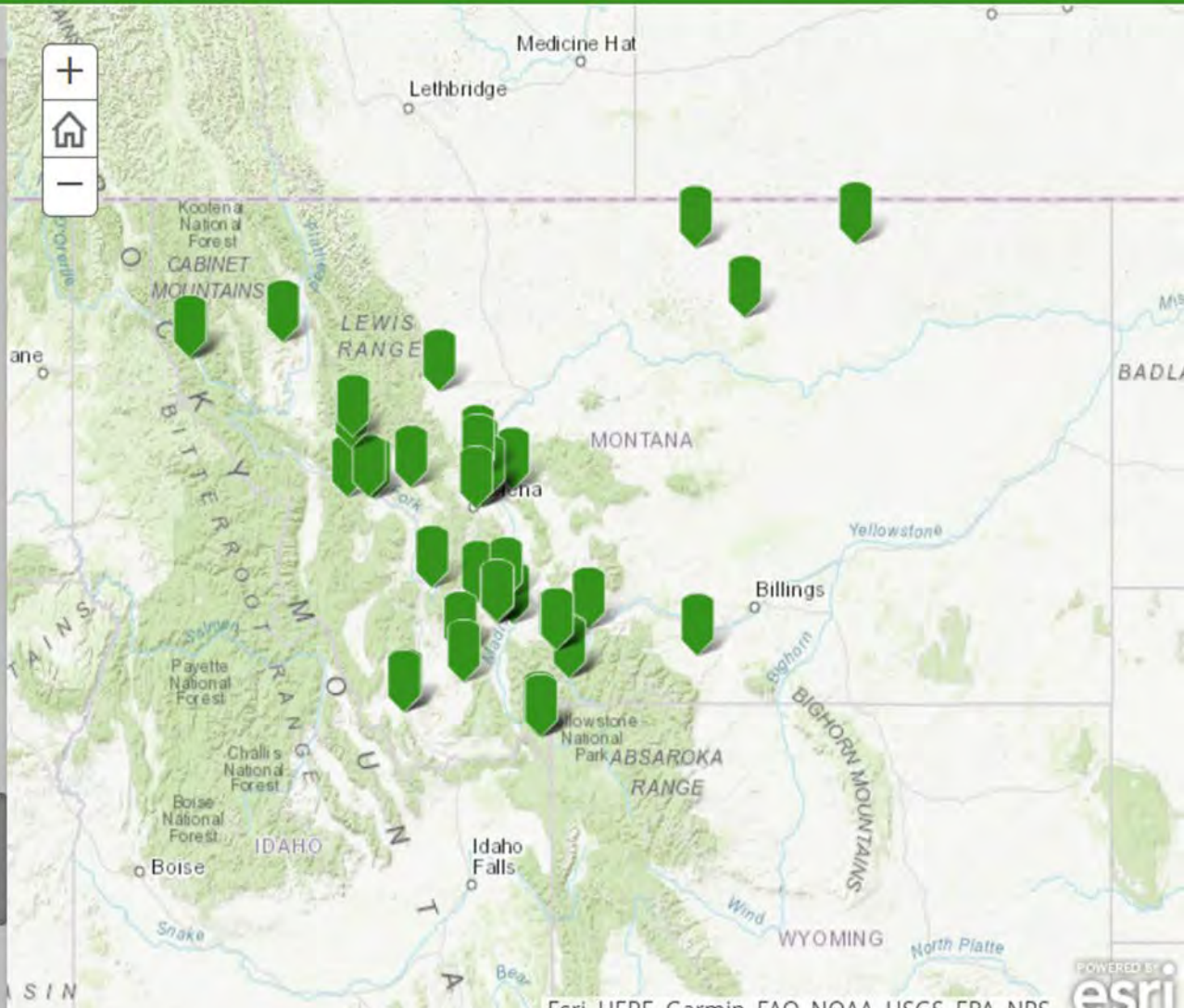
Noxon Reservoir



Hauser Lake



Holter Lake



# Response Example - 2020 Shoreline Closure

- Extremely high Anatoxin-a concentrations prompted the USFS to close the shoreline at Rainbow Point (230 ppb).
- USFS, NorthWestern, and Gallatin County issued press releases notifying the public of the closure.
- Closure signs were posted at public access sites on Rainbow Point.
- Results and photos were reported to <http://HAB.mt.gov>
- Weather patterns changed and a rain storm diluted the HAB down to non-detectable levels the following week. No negative health effects were reported in relation to this HAB.



**CLOSURE**

**TOXIC ALGAE PRESENT**

**RAINBOW POINT SHORELINE IS CLOSED**

Until further notice:

DO NOT swim or recreate in water

DO NOT water ski, jet ski, or paddle board

DO NOT drink water

Keep all pets, livestock, and horses away from water

Fishing not advised

Boating not advised

Call your doctor or veterinarian immediately if you or your animals have sudden or unexplained sickness or signs of poisoning

Report new algae blooms to: [hab.mt.gov](http://hab.mt.gov) or 1-888-849-2938

Sign posted by: \_\_\_\_\_

DEQ Montana Department of Environmental Quality

Gallatin County Health Department

MONTANA DPHHS



- Physical signage at public access points educates the public on the dangers of HABs and can direct them on how to report HABs online.
- Long-term monitoring data can be used to determine “high-risk” periods for HABs on a particular waterbody.
- Ambient monitoring data can be coupled with weekly visual monitoring and public HAB reports to inform reservoir managers of potential HABs.
- Environmental conditions can and do change quickly.



- Low-tech visual monitoring approaches have their merits, but they can be labor intensive and represent just a snapshot in time.
- High-tech approaches can be blended with low-tech monitoring approaches to fill in data gaps and help us see the whole picture. Be aware that these high-tech approaches can't do everything and they also have their limitations.
- Setting up a good communication plan before the HAB season starts is crucial to success.
- When it comes to public health, use every communication avenue possible to clearly convey your message:
  - Press release
  - Social media
  - Physical signage
  - Interactive web maps



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