

Harmful Algae Blooms

Why Do They Occur?
How Can We Control Them?

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Thanks To



**NEW JERSEY
HIGHLANDS
COALITION**

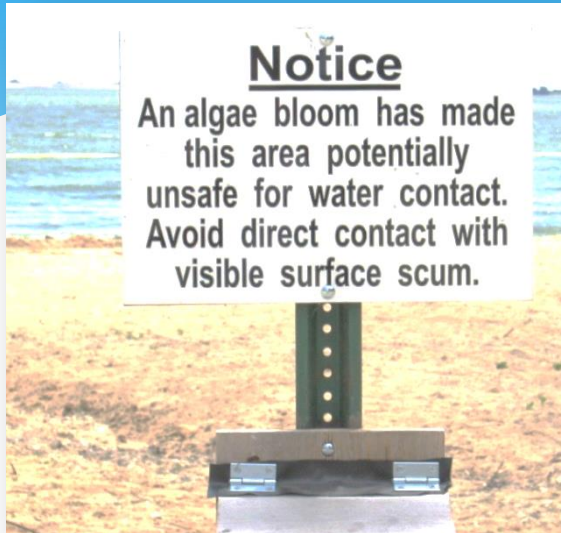


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Harmful Algae Blooms (HABs)



**What Are They?
Why Do They Occur?
What Can We Do?**

What's A HAB

Harmful Algae Blooms

- Nothing new...public / policy makers catching up to science.
- Intense cyanobacteria (bluegreen algae) blooms that generate very high concentrations of cyanotoxins.
- HABs impact the recreational use, ecology and water quality of lakes.
- High concentrations of cyanotoxins can impact the health of humans, pets, and livestock.

Tell me More About Cyanobacteria!

- They are prokaryotes... not eukaryotes (such as algae)... lack membrane encased organelles or mitochondria.
- However, they can photosynthesize.
- Thus share properties of both bacteria and algae.

What Makes Them So Unique?

- Many can assimilate atmospheric nitrogen... providing an unlimited source of N.
- Biologically adept at assimilating organic phosphorus, better than “good algae”.
- Many can regulate position in water column.
- Many do well in low light conditions.
- Selectively rejected as food source by filter feeders and zooplankton.
- Some produce cyanotoxins.

Cyanotoxins

- Not produced to directly harm humans, pets and livestock.
- Cyanotoxins create a competitive advantage over “good algae”.
- Some toxins “ooze” out of healthy cyanobacteria.
- But large amounts are released when cyanobacteria die.
- Relatively stable and slow to biodegrade.



The Paradox of Copper Sulfate Treatments

- Copper based algaecide treatments can be part of a HAB management strategy.
- But should not be the “go to” solution.
- Reliance on CuSO_4 only creates an environment that much more conducive for more cyanobacteria growth...blooms returns often that much more intense.
- May temporarily relieve bloom conditions but can actually exacerbate problem.
- Largescale algaecide treatments lead to the rapid release of large amounts of cyanotoxins and organic phosphorus.
- Treatments also kill off “good algae” and zooplankton, rapid die off can depress oxygen levels leading to a fish kill.

The “Bad Guys”

- Microcystis
- Planktothrix
- Anabaena
- Aphanizomenon
- Anacapsa
- Lyngbya
- Gloeotrichia



Tell Me More About Cyanotoxins!

- Different types of cyanotoxins
 - Microcystin-LR
 - Cylindrospermopsin
 - Anatoxin -a
 - Saxitoxins
 - Anatoxin-a(S)

These of greatest interest and concern in freshwater ecosystems

Tell Me More About Cyanotoxins!

- Exposure ... drinking or contact recreational activities.
- Even at low concentrations, recreational contact may cause skin rashes (even for dogs and livestock), ear/throat infections and gastrointestinal distress.
- Increased attention being given to possible links between cyanotoxins and neurodegenerative diseases (Parkinson's, ALS, and Alzheimer's).

Why Do HABs Occur?

This Is Nothing New

- Cyanobacteria blooms are not a new phenomena, been occurring for millennia.
- But public becoming better educated and more aware of the WQ problems and health risks they pose.



The Common Denominators

- Excessive nutrient loading (especially Phosphorus)...runoff the major source.
- High water column concentrations of Total Phosphorus.
- Warm water temperatures.
- Plenty of sunlight for photosynthesis.

Lake Eutrophication

- Increased nutrient loading leads to increase in productivity and production of organic carbon.
- For lakes, this means more algae...including cyanobacteria.



Phosphorus – The Primary Driver of Eutrophication

- For the lakes, ponds and reservoirs of NJ, phosphorus is typically the “limiting nutrient” or “nutrient of concern”.
- Add more phosphorus...get more productivity.
- Only need a little phosphorus to stimulate “too much” productivity...0.04 mg/L
- 1lb phosphorus can create 1,000 lbs of algae!

Eutrophic Lakes Are Not Dead Lakes

Rather They
Are Lakes That
Needs to Go
On a
Phosphorus
Diet



The bad news...most of NJ's lakes are eutrophic
and most are susceptible to a HAB

Eutrophic Lake - “A”



**Not
Too
Bad**

Eutrophic Lake - “B”



**Not
Too
Good**

How To Control Eutrophication and Limit HABs

***Don't Just Treat or React to
The Symptom....***

***Identify and Correct the
Cause***



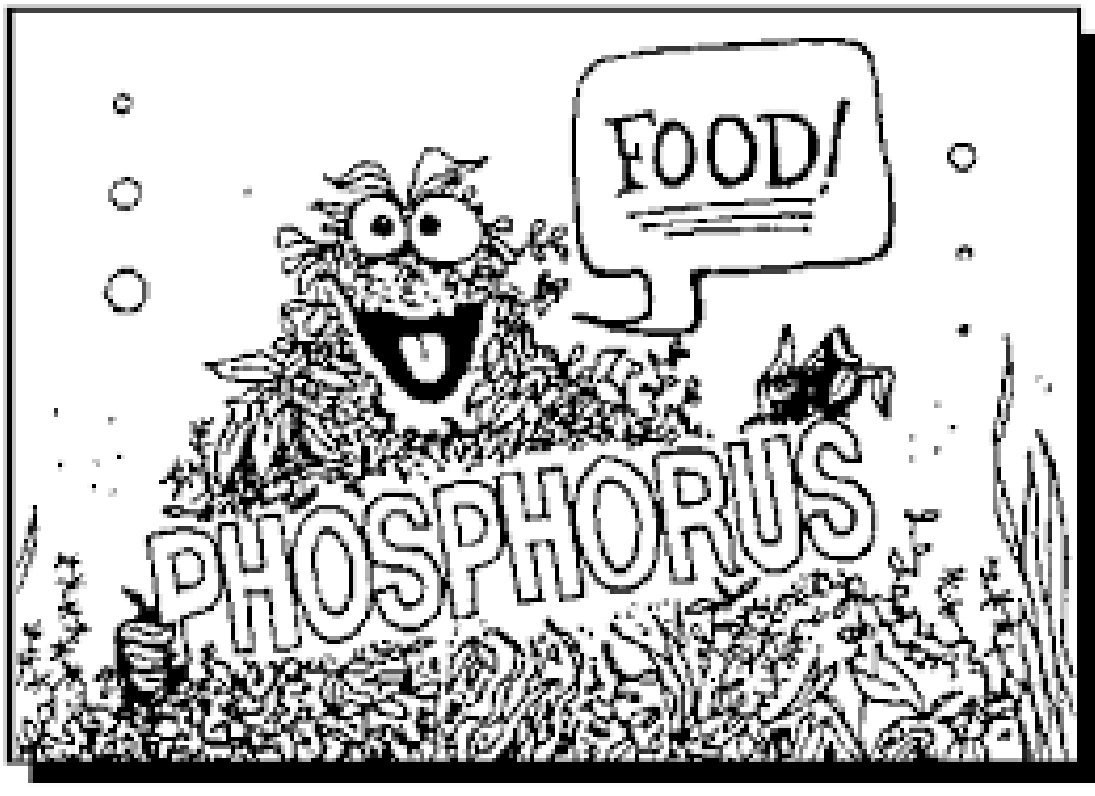
You Wouldn't Build A
House Without A Plan

Successful Lake
Management
Requires a
Technically Sound
Management Plan

Controlling Eutrophication and HABs

- Plan needs to identify causes of lake's eutrophication and HAB development.
 - Plan needs to accurately assess lake's biological, chemical, hydrologic and physical interactions...all of which affect HAB development.
 - Priority element is accurate identification and quantification of sources and timing of phosphorus loading.
-

If Phosphorus Is The Problem...Where Is It Coming From?



Phosphorus Sources

Phosphorus inputs vary seasonally and may originate from both internal and external sources.

- In-lake (internal)
 - Sediment release and recycling
 - Decomposition of organic material (algae, weeds, fish, etc.)
- External
 - Stormwater runoff (direct and indirect)
 - Septic systems and wastewater
 - Rainfall
 - Waterfowl

Restoration and Management Plan

A comprehensive, data backed plan consists of:

- Reactive actions
- Proactive / preventative actions
- In-lake management measures
- Watershed management measures



For the majority (80%) of lakes, watershed management is the foundation of the plan because it addresses the root cause of eutrophication and its problems



A Lake is a Reflection of Its Watershed

NALMS....2008

For Most Lakes Stormwater Is The Driver

- Directly affects the amount and timing of phosphorus loading.
- Indirectly affects lake's thermal properties, water column stability and mixing dynamics.
- Source of legacy loads tied to internal loading.
- Indirectly affects septic loading due to effect on groundwater elevation.
- As such, successful lake management and HAB prevention/control must involve systematic stormwater management and emphasize phosphorus load reduction.

Stormwater Management

Residential/Lake Community Scale

- Impervious surface runoff
- Lawn fertilizer
- Pet Waste

Regional Scale

- Regional development
- Agriculture
- Active construction sites
- Eroding stream bed and bank



In Summary

In Summary...HABs

- HABs are not a new thing.
- Frequency and severity of HABs is increasing.
- At very high densities, cyanobacteria negatively affect health of humans, pets and livestock.
- NJ's lakes are phosphorus rich and therefore susceptible to HABs...Key to preventing HABs is phosphorus management.
- Copper sulfate is not the primary solution and can actually worsen conditions and intensify HABs and their impacts.

Our Goal



For More Information on HABs

- NJDEP -

<https://www.state.nj.us/dep/wms/HABS.html>

<https://www.state.nj.us/dep/wms/bfbm/download/NJHABResponseStrategy.pdf>

- NALMS.org

<https://www.nalms.org/home/nalms-inland-hab-program/>

- NYSDEC –

<https://www.dec.ny.gov/chemical/77118.html>

https://www.dec.ny.gov/docs/water_pdf/habsbrochure.pdf

For More Information on HABs

EPA and Others...

- <https://www.epa.gov/nutrientpollution/harmful-algal-blooms>
- <http://oceanservice.noaa.gov/hazards/hab/>
- <http://www.cdc.gov/nceh/hsb/hab/>
- <http://www2.epa.gov/nutrientpollution/harmful-algal-blooms>
- <https://www.health.state.mn.us/diseases/hab/hab.pdf>

Thank You....

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