

# Harmful Algal Blooms Surveillance Models in New York State and Honeoye Lake

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# Let's start with some terms...

- Systematic- regular (defined intervals) surveillance and/or monitoring
- Periodic- occasional surveillance and/or monitoring
- Surveillance- visual (including digital photos) assessment of conditions, describing blooms using DEC definition of BGA bloom conditions. Can involve use of standardized (DEC) bloom field forms
- Monitoring- sample collection of blooms, as part of or independent of surveillance
- Suspicious- visual evidence consistent with BGA bloom; not confirmed through laboratory analysis
- Confirmed- laboratory analysis that verifies BGA in bloom quantities



# HAB surveillance models:

## Systematic surveillance and monitoring of entire shoreline- CSLAP model

- Volunteer surveillance and monitoring
- Systematic (biweekly) open water samples and evaluation of shoreline conditions; periodic sampling of apparent shoreline BGA blooms
- Confirmation of BGA and toxins
- Monitoring/shipping costs assumed by DEC/lake assn
- Most effective primarily in smaller lakes (although all lakes participate)



# HAB surveillance models:

## Systematic surveillance of entire shoreline, monitoring of select sites- Honeoye model



- Volunteer/professional surveillance and monitoring
- Periodic open water samples and shoreline blooms only when BGA apparent
- Confirmation of BGA and toxins
- Monitoring costs- DEC; shipping costs- lake assn (local sponsor)
- Requires substantial surveillance and monitoring commitment





# HAB surveillance models:

## Periodic evaluation and reporting of BGA blooms- public/other lakes model



- Public surveillance and monitoring
- “Unsolicited” (reactive) surveillance/visual/on-line reporting of potential blooms
- Sampling materials may be provided by DEC if BGA apparent
- Monitoring costs- DEC (if supplies provided) or lake assn (if not “endorsed” by lake assn); shipping costs- lake assn (local sponsor)



# HAB surveillance models:

## No monitoring option

- Public surveillance only
- Public reports (visual/on-line reporting) of potential blooms
- No sampling of blooms- all reports cited as “suspicious”
- Default for most NY lakes, particularly large lakes



# What does data mean...?

- “Suspicious” = unverified but credible visual evidence of BGA bloom
- “Confirmed” = BGA blooms with:
  - BG chlorophyll  $> 30 \text{ ug/l}$ ; or
  - Total chl.a  $> 50 \text{ ug/l}$  with microscopy showing BGA dominance
- “Confirmed with high toxins” =
  - Shoreline Microcystin-LR  $> 20 \text{ ug/l}$
  - Open water MC-LR  $> 10 \text{ ug/l}$
  - Other “high” toxins based on evaluation by DEC, DOH, others





# Honeoye Lake



- 1,805 acres in the Finger Lakes region
- Eutrophic lake
- Shallow stratified lake
- Supports many uses, including potable water, swimming beaches
- Multiple public access points
- Long history of blooms (well documented in recent years)





# Honeoye Lake

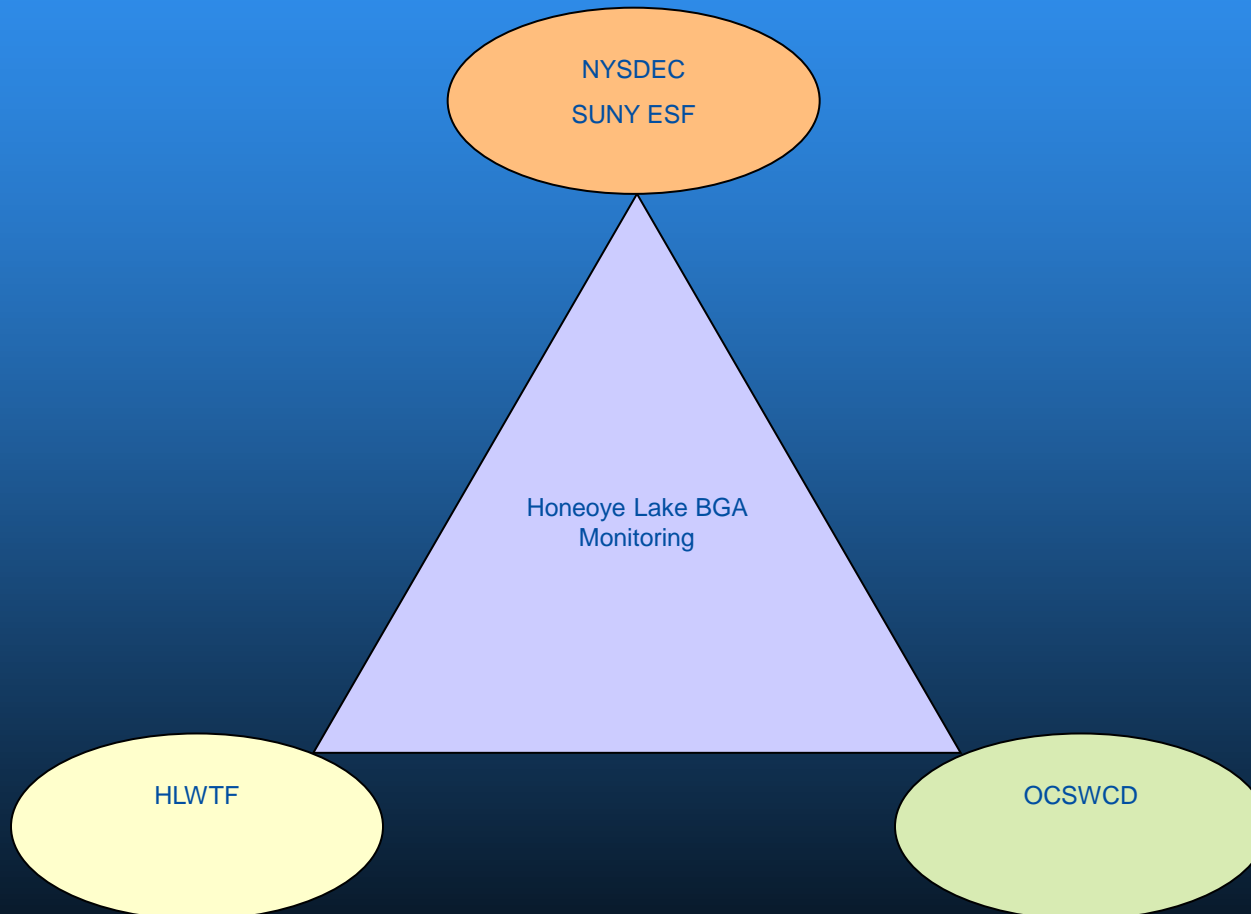
## Blue-Green Algae Monitoring



- Started July 2013 at the request of NYSDEC
  - 2014 Weekly June through mid October
  - Very positive feedback from recreational lake users
- BGA - Blue-Green Algae



# Three Way Partnership



NYS Department of Environmental Conservation



# Rapidly Changing BGA Conditions



# Our BGA Monitoring Process

- Weekly Monday Morning BGA Monitoring
  - June through mid October
  - Have about 12 regular sites that we monitor
  - Take pictures at each of these sites weekly
  - Take open water blue-green algae sample weekly
  - Take two near shore blue-green algae samples weekly
  - Send blue-green algae samples to SUNY ESF for testing
  - Send DEC two e-mail reports with pictures weekly
- Weekly Friday visual only blue-green algae monitoring





# Weekly Monday e-mail Example

Scott,

Bill, Dorothy, and I spent about an hour and a half on Honeoye Lake this morning (Monday 9/15) collecting our weekly water quality data and three blue-green algae samples. The algae present varied from very light to medium in the water column at all of our monitoring Locations. There were several isolated near shore areas with visible BGA surface blooms that were not there last Friday afternoon. We have had a lake turn over event since last Monday 9/8.

The Secchi disk reading was 1.5 meters a reduction of 0.75 meters from last Monday 9/8. The water column was very well mixed from the surface to 9 meters. Temperature and DO did not vary at any depth. The surface water temperature was 20.0 C a decrease of 2.9 C since last Monday 9/8. The wind was about 5-7 MPH from the South. Air temperature 50 F.

We took blue-green algae samples at these three (3) monitoring locations (Open water, Deyo Drive, & South West Shores):

- 001 Open water - Our deep water quality data collection location had a medium amount of algae in water column. No surface algae scum.
- 002 Deyo Drive (NE Shore) - Medium algae in the water column. Surface algae in the near shore areas.
- 005 South West Shores (SW Shore) - Medium algae in the water column. Surface algae in the near shore areas.

Pictures from our normal weekly surveillance locations:

- 003 North Shore Drive - A medium amount of algae in the water column. No surface algae scum.
- 004 Inlet (South End) - Very light algae in the water column. No surface algae scum. Sky blue water!
- 006 Our house (West Shore) - Medium algae in the water column. Surface algae in the near shore areas.
- 007 Sandy Bottom Swimming Beach (North Shore) - Light algae in water column. No surface algae scum. Water turbid due to South wind.

\*\*\*\*\*

Bill shipped our three (3) samples to your test lab in Syracuse using your revised sample bottle labels and new reporting form.

Our assessment of the extent and severity of Honeoye Lake's BGA bloom this morning (9/15), based on our visual observations, would be "small localized" with severity pending your BGA screening test results. We expect that the samples that we took at NE & SW Shore near shore areas will test well above your BGA bloom criteria of 30 ug/l. We plan to monitor these near shore locations with surface algae blooms as the week progresses. We will keep you posted.

All the normal caveats apply; results from BGA test are below your BGA bloom criteria, toxin test are below WHO levels, and there are no expanded BGA blooms reported.

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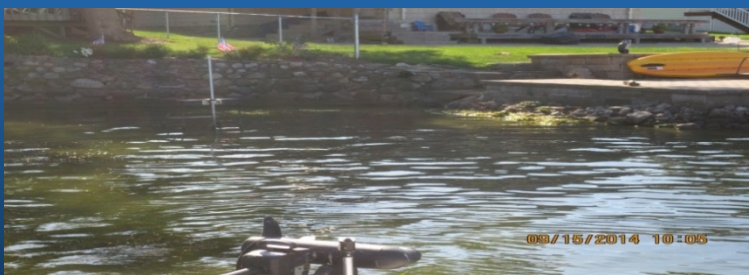
Thanks again!

...Terry

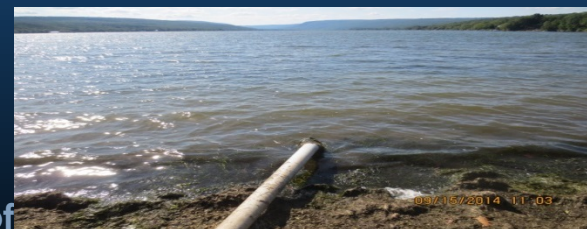


# Weekly Monday e-mail Pictures

## Monitoring Locations



## Surveillance Locations



Department of

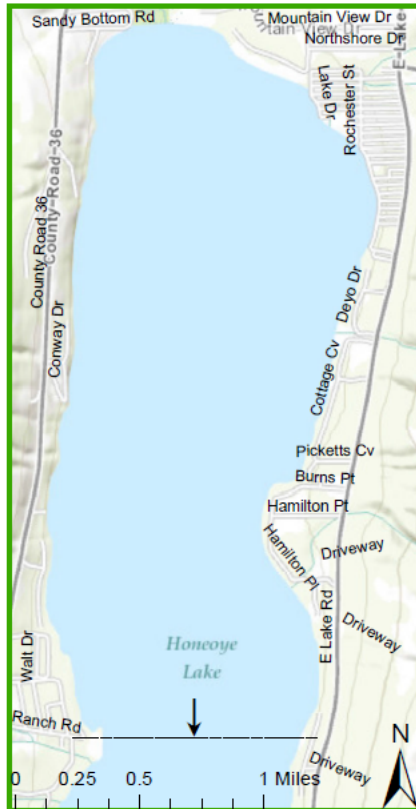


# Honeoye Lake HAB form



## CSLAP - Honeoye Lake Harmful Algal Bloom Sample Data Sheet

Please fill out this form everytime you sample.  
Indicate the location, size, and extent of bloom by outlining on the map.  
Label accordingly using the pictures and descriptions to the right.  
Do this for any and all blooms on the lake and  
Mark with the corresponding Sample ID # (eg. 1, 2, 3)



Sample ID 1: \_\_\_\_\_  
Sample ID 2: \_\_\_\_\_  
Sample ID 3: \_\_\_\_\_  
Date: \_\_\_\_\_  
Sampler Name: \_\_\_\_\_  
Description of bloom (if applicable): \_\_\_\_\_



How Extensive is the Bloom at each  
sampling location?  
(match Sample ID #'s to extent):  
☐ Small Localized (few properties)  
☐ Large localized (many properties)  
☐ Widespread/lakewide

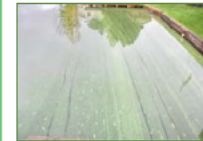
Collect



A. Spilled paint appearance  
on surface



B. Pea soup appearance  
within the water

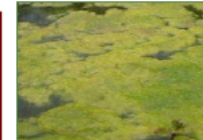


C. Streaks (usually green)  
on the water



D. Green dots or clumps  
on/in the water

Do not collect



E. Bubbling scums on  
the lake surface



F. Slight greenish or brownish  
tint to the water

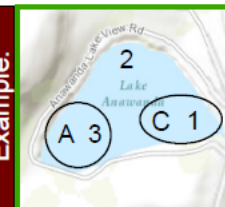


G. Duckweed or watermeal

H. Other

I. No evidence of bloom  
anywhere on lake (collect  
sample from shoreline site  
only on instruction from  
DEC or FOLA)

Example:



# BGA Monitoring Effort

- Honeoye Lake has ~10 miles of shoreline
- One hour to make a complete surveillance run and collect 3 blue-green algae samples (2 volunteer hours)
- Write our weekly e-mail with pictures (0.5 volunteer hours)
- Soil & Water staff person time to collect samples, prepare forms, and ship samples (2-3 Soil & Water staff hours)
- Consume about 2.5 gallons of gas per surveillance run (2.5 X \$5 = \$12.50)
- Estimated boat maintenance costs related to BGA surveillance (~\$300 / 25% of \$1,200 annual maintenance)





# Summary of Honeoye Lake HAB Monitoring and Surveillance Program

- Surveillance seasons:
  - 2014: June 2 to October 31, 1-2x per week (Monday, Friday)
  - 2013: July 1 to October 7, 1x per week (early in week)
  - 2012: Aug 2 to September 12, event-based
- Sampling seasons:
  - 2014: June 2 to October 16, weekly (Monday)
  - 2013: July 17 to October 7, weekly (Monday)
  - 2012: no samples collected
- Number and sites of HAB samples
  - 2014: 58 samples; 18 open water, 40 shoreline
  - 2013: 26 samples, 8 open water, 18 shoreline



# Applying the model to other lakes-

## What do you need?

- Infrastructure
  - Local surveillance team- partnership among SWCD, lake association/residents, public works best
  - Laboratory- SUNY ESF, SUNY Stonybrook, others
  - “Interpreters”- DEC, local/state DOH
- Logistics
  - Supplies- Sampling bottles, gloves, coolers
  - Sampling Instructions- what is and isn’t a bloom, how to collect samples, how to ship samples, how to frame an image
  - Delineation of responsibilities- who does what
  - Lots of commitment- increasing as waterbody size increases



# What did we learn?



# Summary of Honeoye Lake BGA Results

<b>2013 Site</b>	<b>BGA Mean (n) / Summer Mean</b>	<b>Max BGA</b>	<b>% &gt; DEC Bloom Criteria Year / Summer</b>
Open water	12.1 (8) / 18.1	47.9	13% / 20%
Deyo Drive	6193 (8) / 9810	23490	88% / 80%
SW shores	3018 (1) / 3018	3018	100% / 100%
Other	6211 (9) / 9295	48380	67% / 71%

<b>2014 Site</b>	<b>BGA Mean (n) / Summer Mean</b>	<b>Max BGA</b>	<b>% &gt; DEC Bloom Criteria Year / Summer</b>
Open water	10.7 (18) / 9.0	65.5	11% / 8%
Deyo Drive	2254 (14) / 2837	29790	36% / 36%
SW shores	1610 (15) / 1470	15960	47% / 45%
Other	2138 (11) / 2933	21540	27% / 30%





# Summary of Honeoye Lake Toxin Results

<b>2013 Site</b>	<b>MC Mean/ Summer Mean</b>	<b>Max MC</b>	<b>% &gt; 1 ug/l MC Year / Summer</b>	<b>% &gt; 20 ug/l MC Year / Summer</b>
Open water	12.9 / 10.4	23.0	88%/100%	25%/20%
Deyo Drive	1303 / 2045	9028	100%/ 100%	63%/80%
SW shores	28.3 /28.3	28.3	100%/ 100%	100%/100%
Other	476 / 700	3900	100%/ 100%	63%/50%

<b>2014 Site</b>	<b>MC Mean/ Summer Mean</b>	<b>Max MC</b>	<b>% &gt; 1 ug/l MC Year / Summer</b>	<b>% &gt; 20 ug/l MC Year / Summer</b>
Open water	<0.60 / <0.60	<0.60	0% / 0%	0% / 0%
Deyo Drive	0.70 / 0.80	6.3	7% / 9%	0% / 0%
SW shores	0.60 / 0.70	2.6	13% / 18%	0% / 0%
Other	0.40 / 0.40	1.5	9% / 10%	0% / 0%





08/12/2013 08:24



07/14/2014 10:09





09/14/2013 12:44





08/07/2013 10:21





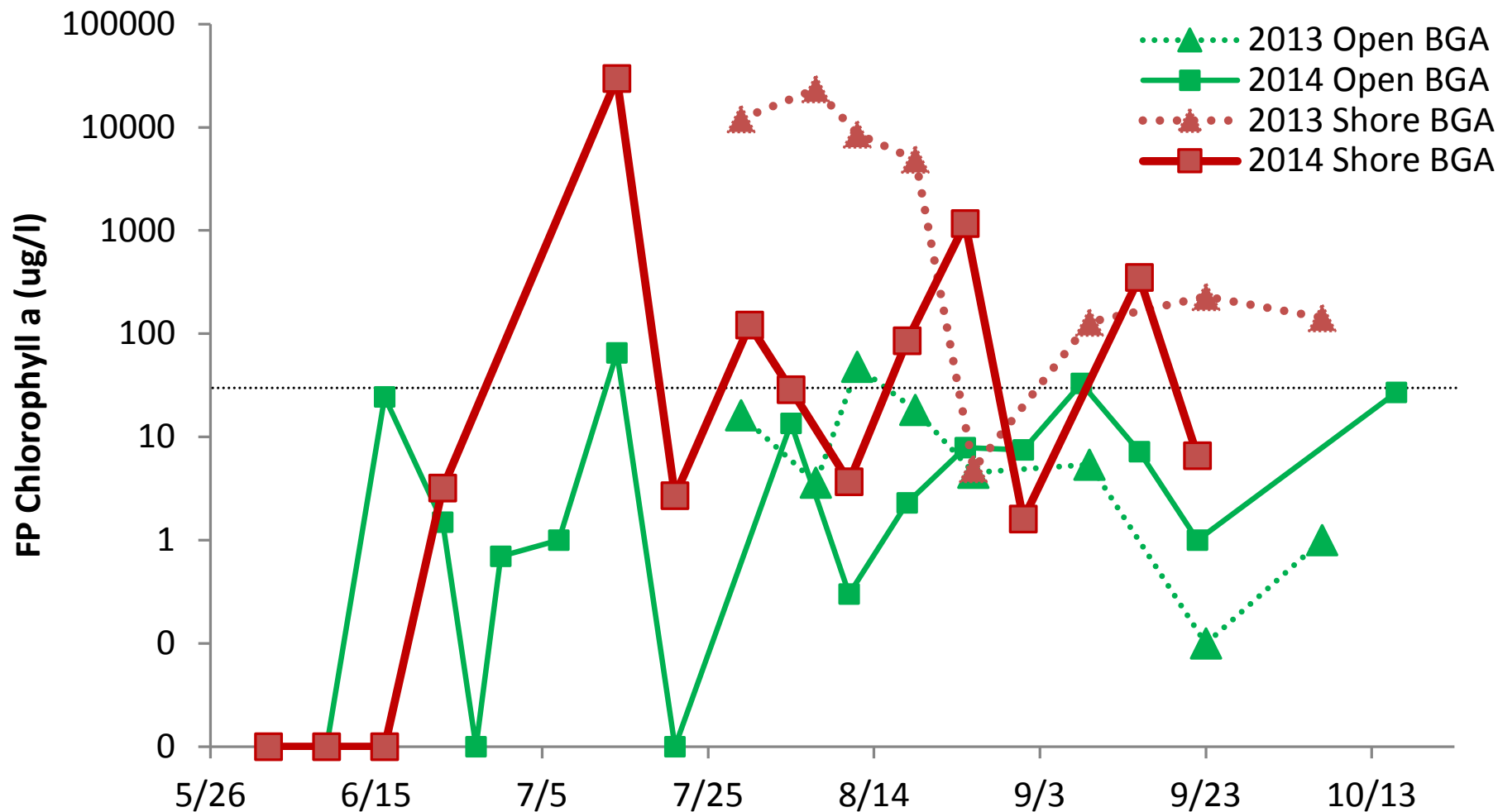
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08/12/2013 09:04

# Open Water vs. Shoreline

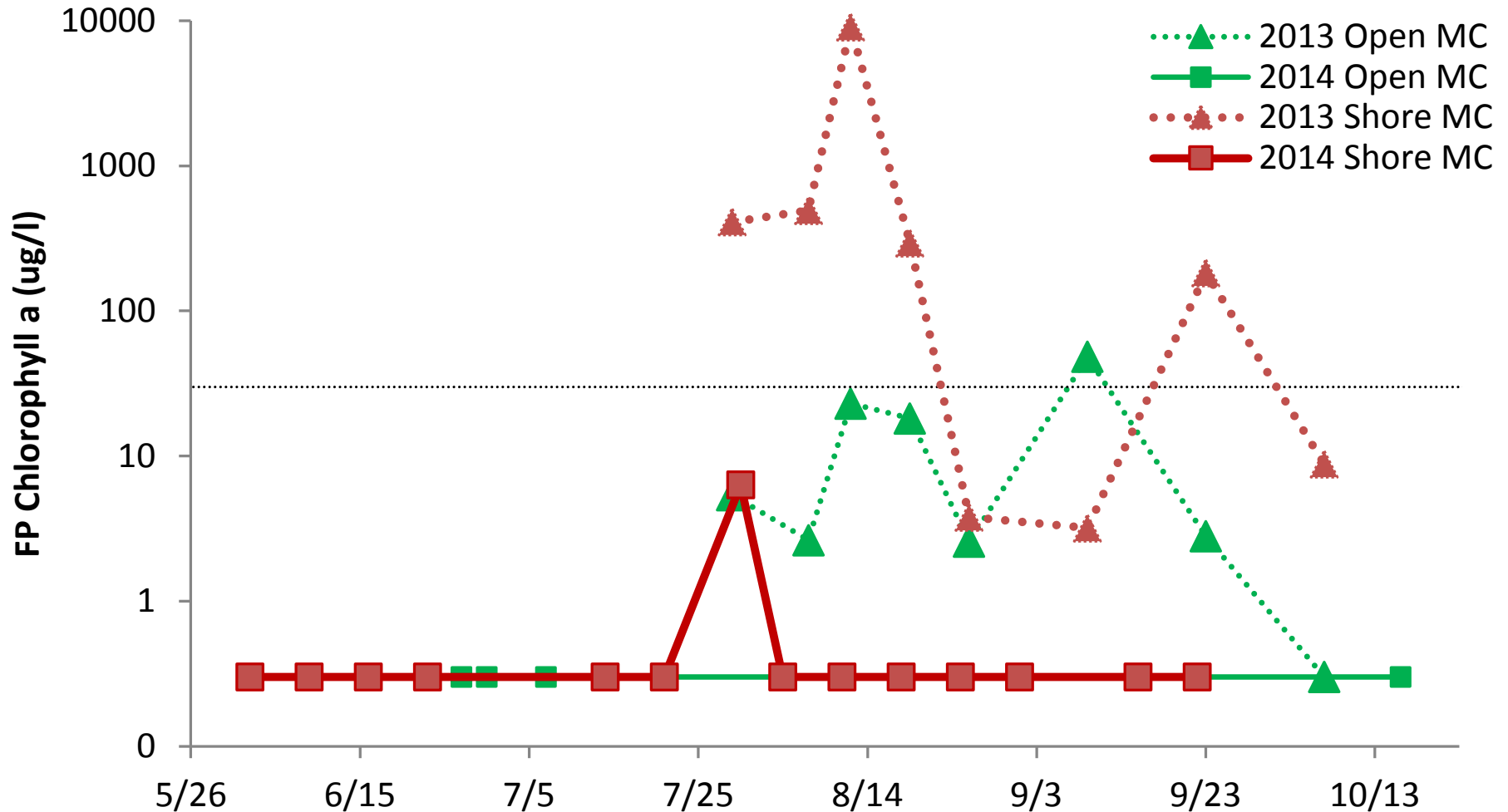


- Shoreline and open water cycles asynchronous for BGA and toxins
- BGA and toxin cycles within sites may be 1-2 weeks offset





# Open Water vs. Shoreline



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- BGA and toxin cycles within sites may be 1-2 weeks offset

