The 2015 Ohio River Algal Bloom and its lasting effects on the Mid-Atlantic

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Outline

- HAB Background
- Ohio River Bloom
- Impact of Ohio River Bloom
  - WV HAB Response Plan
- Future of HABs

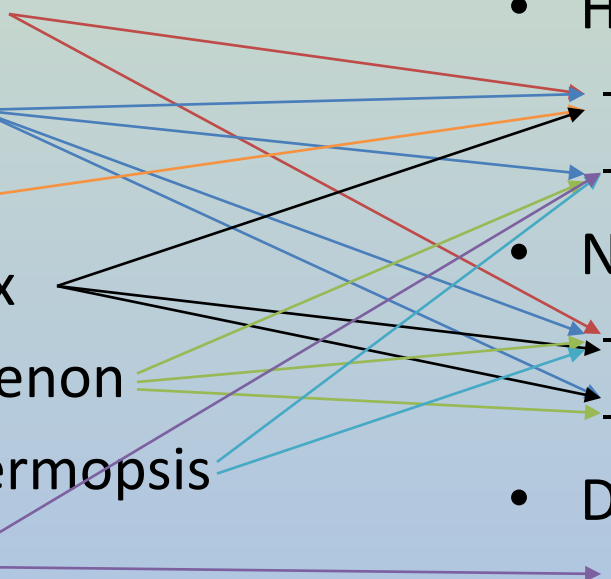
What is a HAB?

- A harmful algal bloom (HAB) is the overgrowth of algae, typically refers to those that produce toxins.
- Most common HABs are Cyanobacteria or Blue-Green Algae.
- HABs may be composed of many different algae but dominated by cyanobacteria
- Often described looking like spilled paint

RM 260. Upstream of Point Pleasant, WV
Kyger Power Plant

Cyanobacteria

- Microcystis
- Anabaena
- Nostoc
- Planktothrix
- Aphanizomenon
- Cylindrospermopsis
- Lyngbya



Toxins

- Hepatoxins
  - Microcystins
  - Cylindrospermopsins
- Neurotoxins
  - Anatoxins
  - Saxitons
- Dermatoxins
  - Lyngbyatoxin

How bad are HABs?

- Depends.....
  - Many species with different toxicities
  - Just because there is a bloom does not mean toxins are produced
  - Likelihood of contact and ingestion
- Environmental concerns
  - Die off of algae can lead to anoxic conditions which can lead to fish kills

Implications of a bloom

- Health Hazard
  - Especially for drinking water facilities
  - Also for contact recreation on lakes and rivers
- Financial Hazard
  - If there is an algal problem then people may not vacation there
  - Clean up, mostly for cleaning drinking water
- Environmental Impacts

Where are we likely to see blooms?

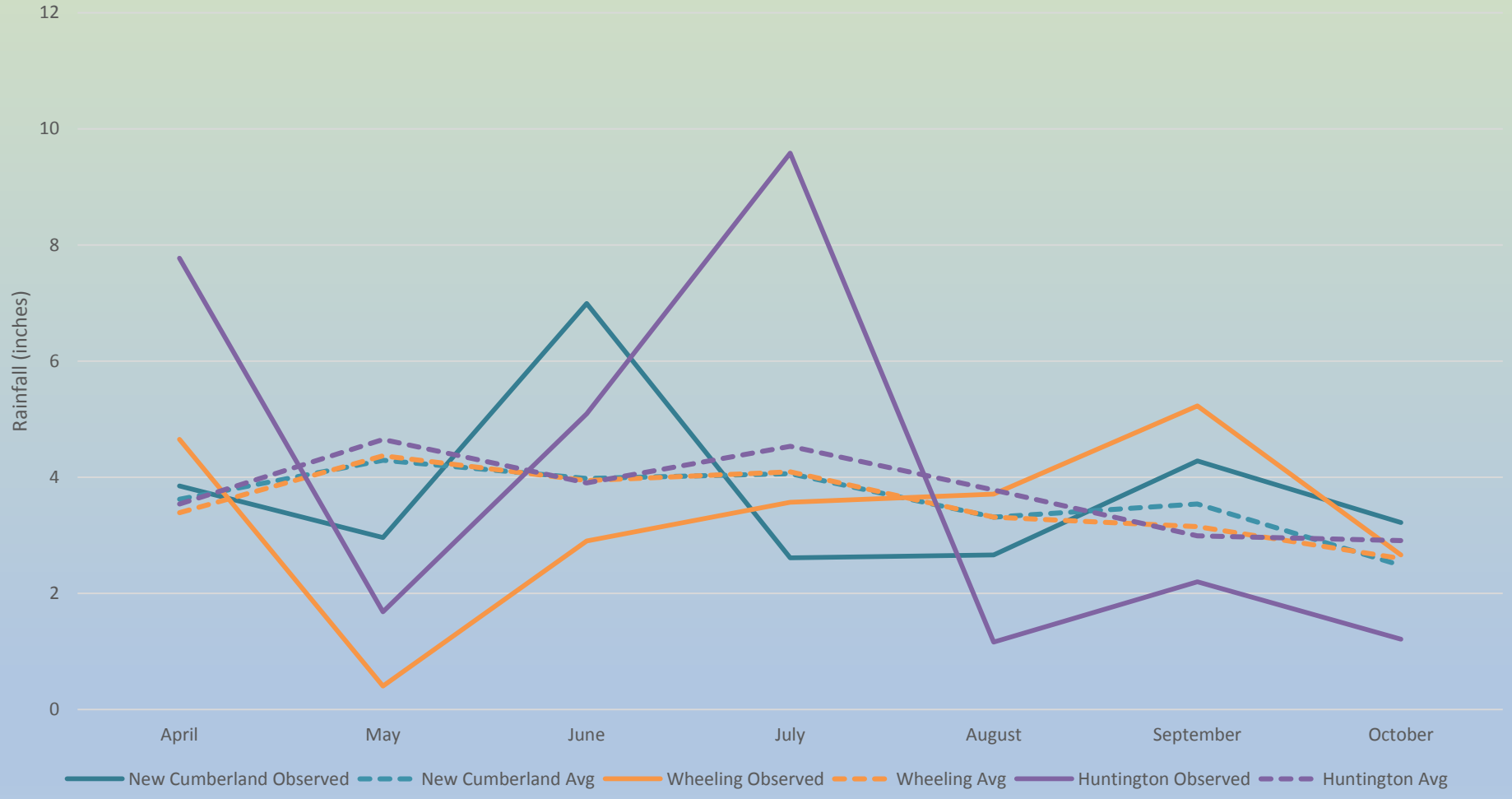
- Slow moving water
- High nutrients
- Lots of sunlight

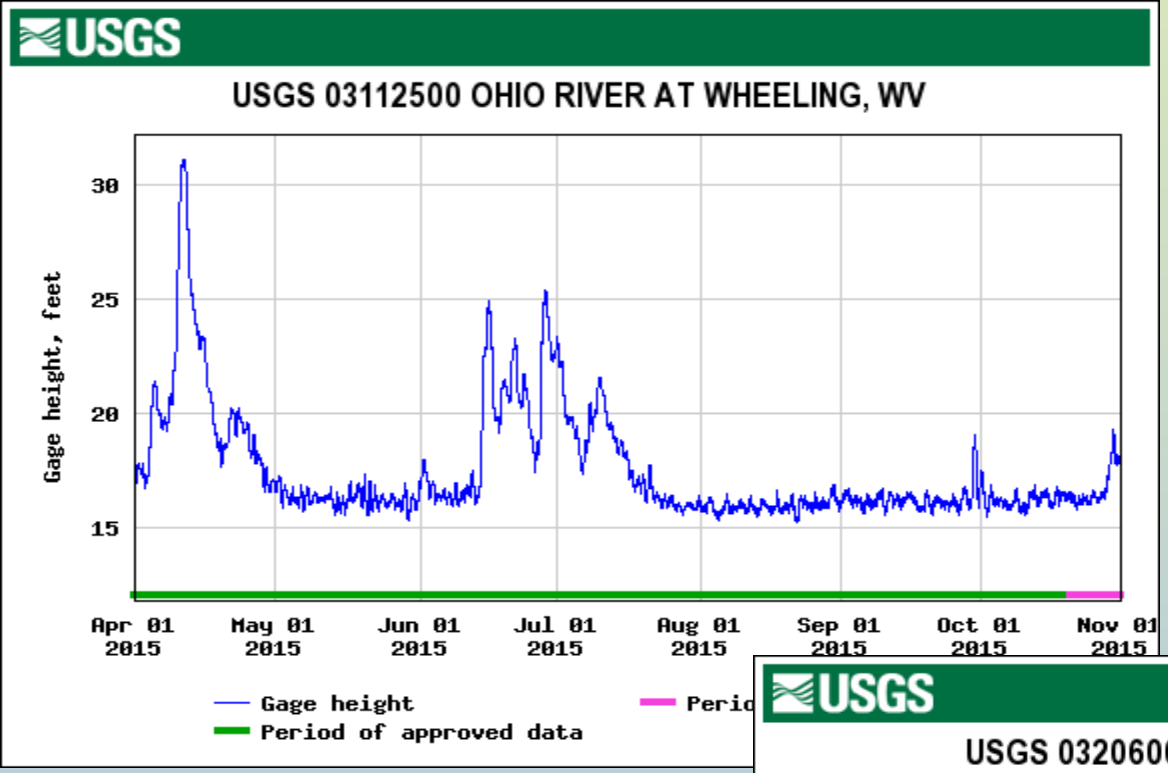
Ohio River

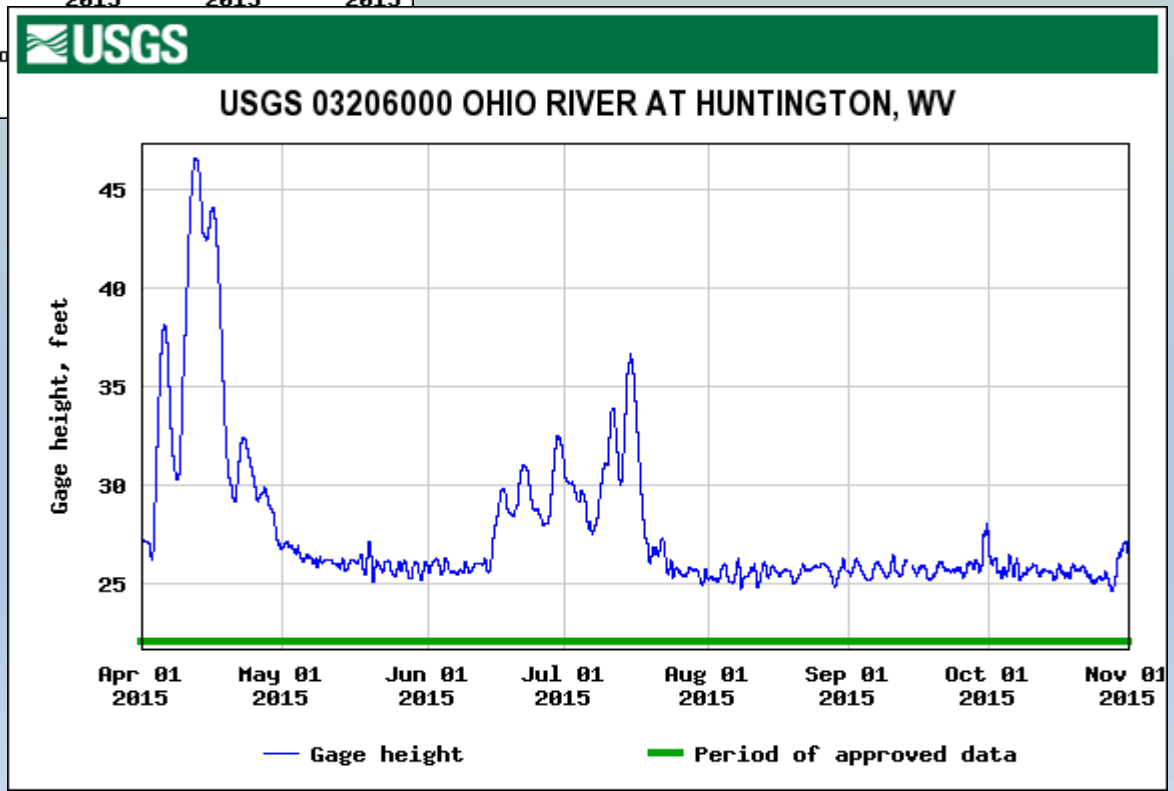
- Large bloom
  - About 500-600 miles affected
- Affected recreation
- Affected drinking water facilities
  - Financial impacts not health impacts
- Lasted from mid August to mid October

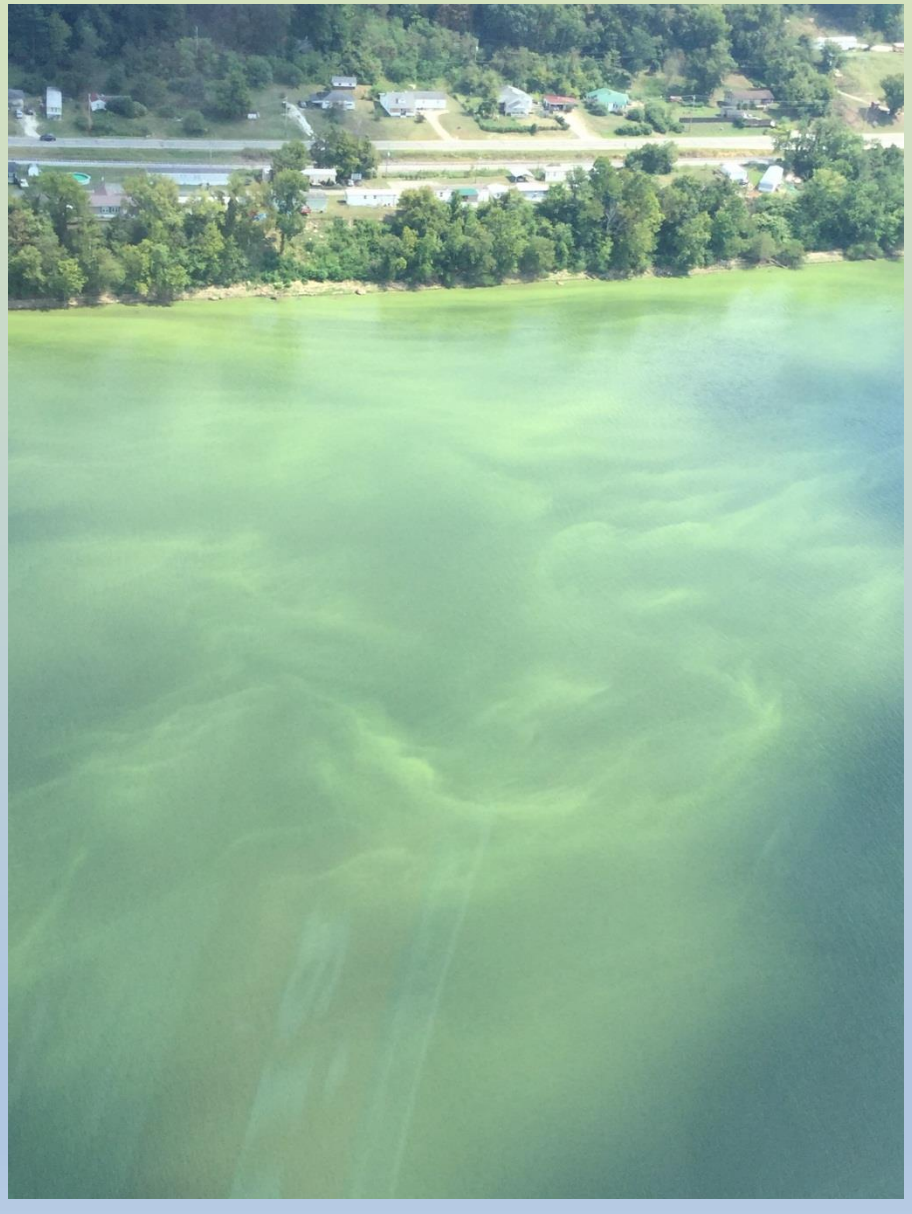

Pittsburgh
Wheeling
Parkersburg
Cincinnati
Madison
Huntington
Louisville
Evansville
Owensboro
Paducah
Locations with high toxins
Sample Locations

Rainfall along Ohio River 2015




USGS
USGS 03112500 OHIO RIVER AT WHEELING, WV
Gage height, feet
30
25
20
15
Apr 01 2015
May 01 2015
Jun 01 2015
Jul 01 2015
Aug 01 2015
Sep 01 2015
Oct 01 2015
Nov 01 2015
Gage height
Period of approved data


USGS
USGS 03206000 OHIO RIVER AT HUNTINGTON, WV
Gage height, feet
45
40
35
30
25
Apr 01 2015
May 01 2015
Jun 01 2015
Jul 01 2015
Aug 01 2015
Sep 01 2015
Oct 01 2015
Nov 01 2015
Gage height
Period of approved data



RM 298. Just upstream of Ninemile Ck (WV). Near Lesage, WV

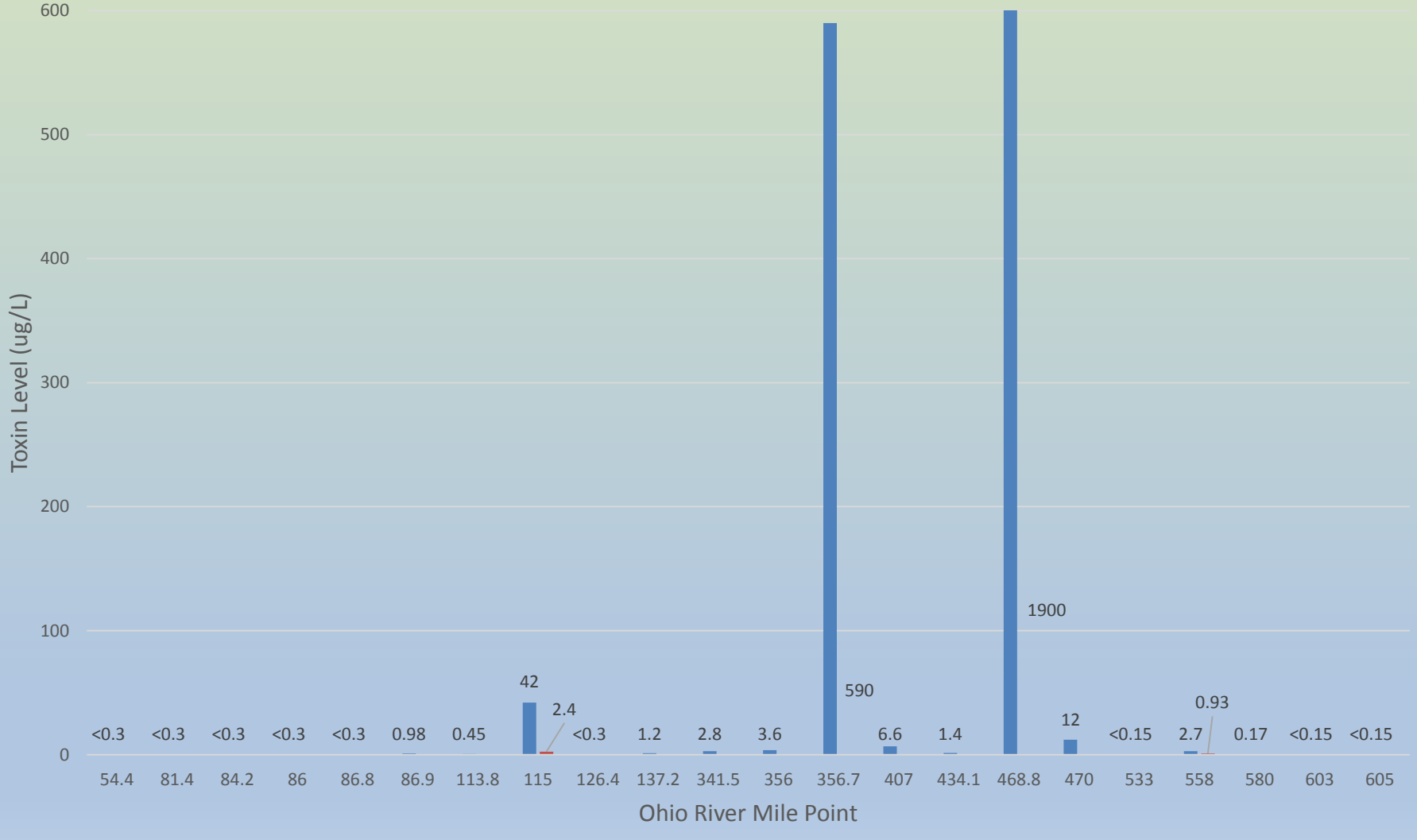
Cyanobacteria Found

- Microcystis aeruginosa
  - Dominant
- Aphanizomenon
- Woronichinia
- Chroococcus microscopicus

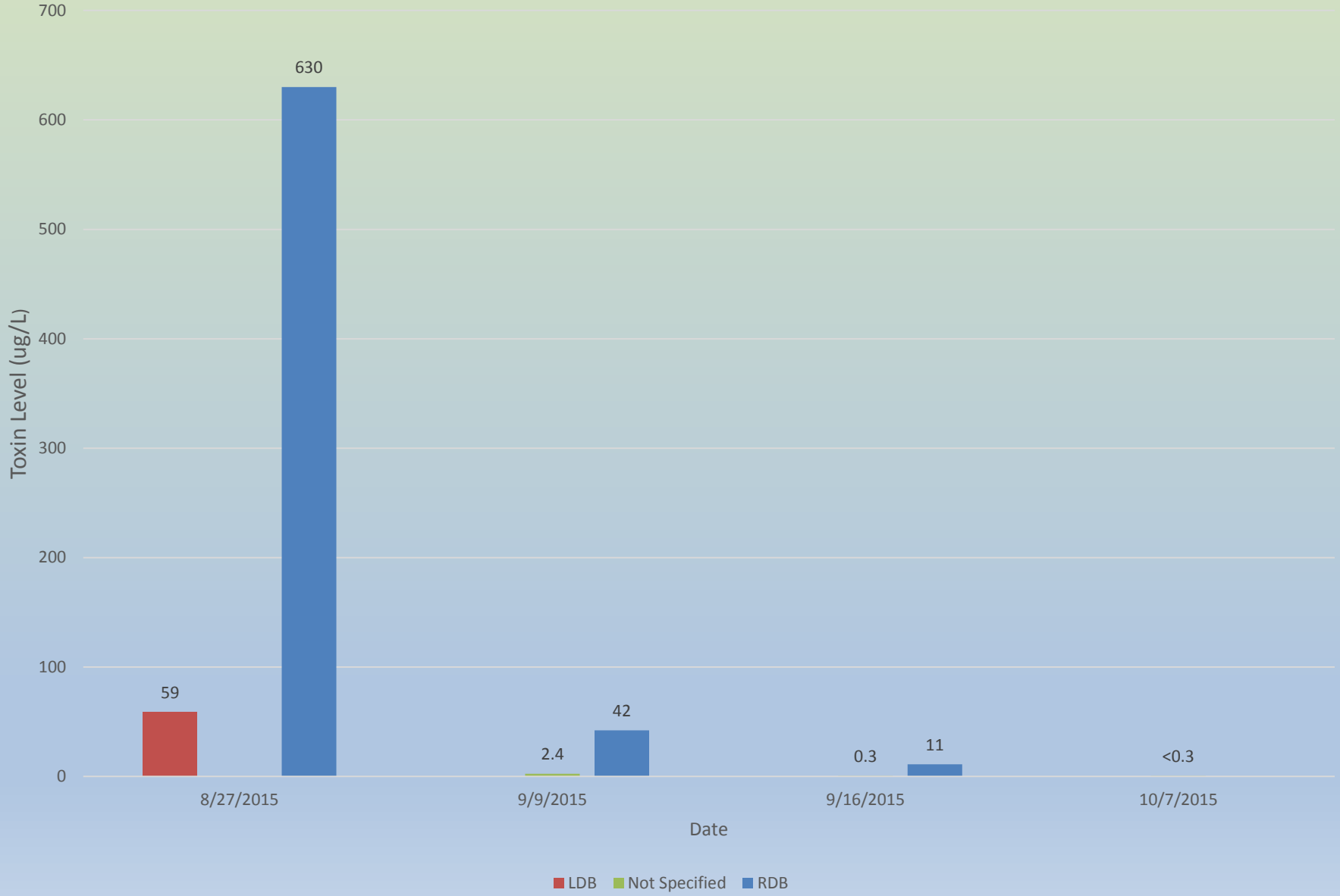
Toxin Levels

- Highest seen RM 468.8 on Sept 9th
  - 1900 ug/L
- Varied across throughout river and from bank to bank

Toxin levels in the Ohio River on September 9, 2015



Algal Toxins in the Ohio River at Mile Point 115



Impact of Ohio River Bloom on Mid-Atlantic

- Brought national attention to HABs and brought it to our doorstep.
  - Not much of a HAB history
  - Also had bloom on COE lake R.D. Bailey
- WV is working on a multi-agency response plan
- Looking at other states for lessons
  - Most states in Mid-Atlantic do not have a freshwater monitoring or response plan
  - Several states have partial programs
    - Monitoring in certain areas where HABs have historically occurred
    - Monitoring in bays and along coast
    - Protocols and websites don't appear to be up to date

- Good things
  - Most states have a great start for making a statewide protocol
  - We all have a great model from the Ohio EPA for recreational waters and drinking water protocols

R.D. Bailey Lake

- Reported on October 1, 2015
- Dominated by Limnoraphis birgei (Lyngbya)
  - Not a known toxin producer
  - One filament of Psuedanabaena
- All ELISA tests showed non-detect for toxins


2015/10/01

West Virginia HAB Response Plan

- Statewide program and multi agency plan
  - WVDEP, WVDNR, USACOE, DHHR, Local Health Department
- Using OH EPA HAB Recreational Response Strategy
- Toxin levels of 6 ug/L for caution and 20 ug/L for no contact advisory
- Bloom procedure
  - Once bloom is reported and identified then advisory is posted based on toxin results
  - Bloom is monitored until two consecutive samples show acceptable toxin levels
  - Focus on beaches and areas of high contact

In progress…

- The plan in a work in progress
  - Still unsure of reporting process from public
    - Spill hotline?
  - Who handles the bloom monitoring?
    - State parks
    - COE lakes
    - DEP
    - Private lakes
  - Algae Iders
  - Lab to handle toxin analysis
  - Training for “first responders”
- Growing season 2016
- Extend to drinking water protocol in the future

Corrective Action

- Monitor, monitor, and then monitor some more
- No “quick fix”. Nature needs to run its course
- Best practice is to alert the public
  - Signage
  - Media
  - Website maintenance

Climate Change

- Warmer water temps
  - Cyanobacteria prefers warmer water
  - Leads to stratification where algae can thrive
- Salinity
  - May lead to more droughts causing freshwater to become saltier. Marine algae could invade freshwater

- Higher Carbon Dioxide levels
  - Algae need carbon dioxide so increased carbon dioxide can lead to more algae
- Strong storms
  - Climate change can lead to more severe storms with increased rainfall leading to high nutrient loads

- Sea level rises
  - Leads to a more shallow and stable coast
- Coastal Upwelling
  - winds push surface water offshore and deep water moves towards the coast, bringing nutrients from the ocean floor to the surface

Predicting HABs

- Monitoring for nutrients
- Hard to predict
  - Weather dependent
  - Can show up in unexpected places
    - Sutton Lake
    - R.D. Bailey
      - Not listed for nutrients

Conclusion

- The magnitude of the Ohio River algae bloom left a lasting impression of WV and highlighted the need for a plan
- Hopefully more states follow
  - Having a plan before you need it, is better than needing a plan and not having it

Questions?

References

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- http://www.usclimatedata.com/climate/united-states/us
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