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
Rainfall along Ohio River 2015

- New Cumberland Observed
- New Cumberland Avg
- Wheeling Observed
- Wheeling Avg
- Huntington Observed
- Huntington Avg
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 9\textsuperscript{th}
  – 1900 \text{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

Toxin Level (ug/L)

Date                       Algal Toxins
8/27/2015                   59
9/9/2015                    2.4
9/16/2015                   0.3
10/7/2015                   <0.3
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 Limnorphis birgei (Lyngbya)
  – Not a known toxin producer
  – One filament of Psuedanabaena
• All ELISA tests showed non-detect for toxins
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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