The Proposed Changes to HAB Monitoring Rules

Colin P. White
Manager, Emerging Contaminants Section
Division of Drinking and Ground Waters
Ohio EPA

Ohio Environmental Protection Agency

Background: Ohio HAB Response

2010: Ohio EPA began incident-response sampling for cyanotoxins

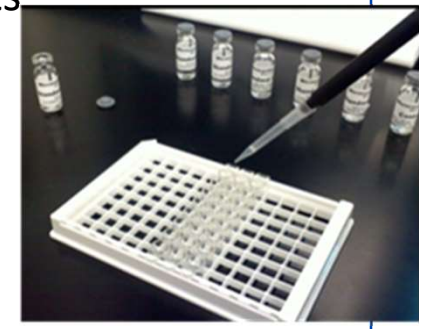
2011: Ohio EPA/ODNR/ODH created Ohio HAB Response Strategy

2013 & 2014: Drinking Water advisories due to microcystins, first finished water saxitoxins detection in 2013 (below threshold)

2015: USEPA Established Health Advisories for Microcystins and Cylindrospermopsin & Ohio Senate Bill 1 passed

2016: HAB Monitoring and Treatment Rules Effective June, 2016:

- OAC Chapter 3745-90: epa.ohio.gov/ddagw/rules.aspx
- Microcystins and Cyanobacteria Screening Monitoring Requirements
- Lab Certification (ELISA and qPCR)
- Treatment technique requirements



2018: First finished water cylindrospermopsin and anatoxin-a detections (below HALs & Ohio EPA thresholds)

2020: Begin 5-year rule review process

Ohio Environmental Protection Agency

HAB Rule Monitoring Requirements- Public Water Systems

Total Microcystins (ELISA)

- May-October
  - Weekly raw/finished water
- November-April
  - Biweekly raw water only
- If purchasing SW from out of state
  - Weekly finished water microcystins monitoring required (year-round)

Reduced monitoring for eligible systems

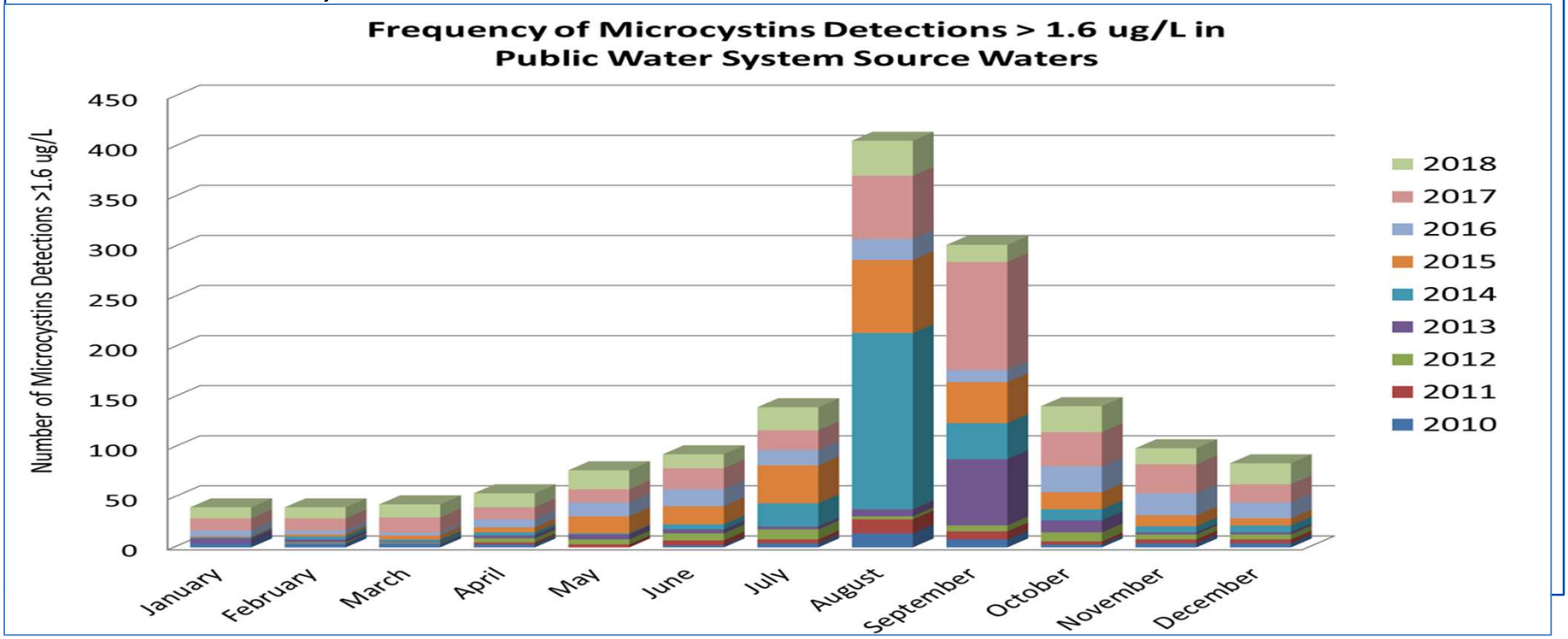
Cyanobacteria Screening (qPCR)

- Genetic test
  - Triggers follow up sampling by Ohio EPA for other cyanotoxins

Ohio Environmental Protection Agency

MC Data

- ~113 SW PWS
  - Microcystins data totals since 2016:
    - 25,422 (raw and finished) compliance
    - 29,953 with additional data



- OH represents 877 (3.1%) results and 103 PWS of UCMR4
- 9,462 OH-EP results (33.8%) of UCMR4
  - 16% when only considering '18-'20

Contaminant	MRL (µg/L)	Reference Concentration (µg/L)	Total number of results
germanium	0.3	NA	33,930
manganese	0.4	300	33,928
alpha-hexachlorocyclohexane	0.01	0.006 / 0.6[1]	33,254
chlorpyrifos	0.03	2	33,258
dimethipin	0.2	140	33,254
ethoprop	0.03	1.14 / 114[1]	33,245
oxyfluorfen	0.05	200	33,252
profenofos	0.3	0.3	33,252
tebuconazole	0.2	190	33,250
total permethrin	0.04	3.344 / 334.4[1]	33,258
tribufos	0.07	0.6	33,234
butylated hydroxyanisole	0.03	NA	33,640
o-toluidine	0.007	NA	33,685
quinoline	0.02	0.01 / 1[1]	33,632
1-butanol	2.0	700	33,757
2-methoxyethanol	0.4	NA	33,761
2-propen-1-ol	0.5	35	33,760
"total microcystins"	0.3	0.3 / 1.6[3]	27,936
microcystin-LA	0.008	0.3 / 1.6[3]	4[4]

Ohio Environmental Protection Agency

qPCR

- qPCR multiplex:
  - ~10,600 genes (RT+SP) raw only
  - Gene association with toxins?

Ohio Environmental Protection Agency

Important Note

This HAB season will be the same as last year

Ohio Environmental Protection Agency

Rule Timeline

- Finalize formatting and sign-off
- Release for IPR (30 day comment period)
  - Rules, BIA
  - Response to comments
- Original File (OF) June 1, 2021
- Public hearing 31-40 days post OF date
- Final File
- Effective as soon as possible

Ohio Environmental Protection Agency

Ohio EPA Drinking Water Action Levels

Drinking Water Thresholds	Microcystins (µg/L)	Anatoxin-a (µg/L)	Cylindrospermopsin (µg/L)	Saxitoxins (µg/L)
Do Not Drink- Children under 6 and bottle-fed infants	0.3	0.3	0.7	0.3
Do Not Drink- Children 6 and older and adults	1.6	1.6	3.0	1.6

Not proposed to change

Ohio Environmental Protection Agency

Monitoring Schedules and Triggers

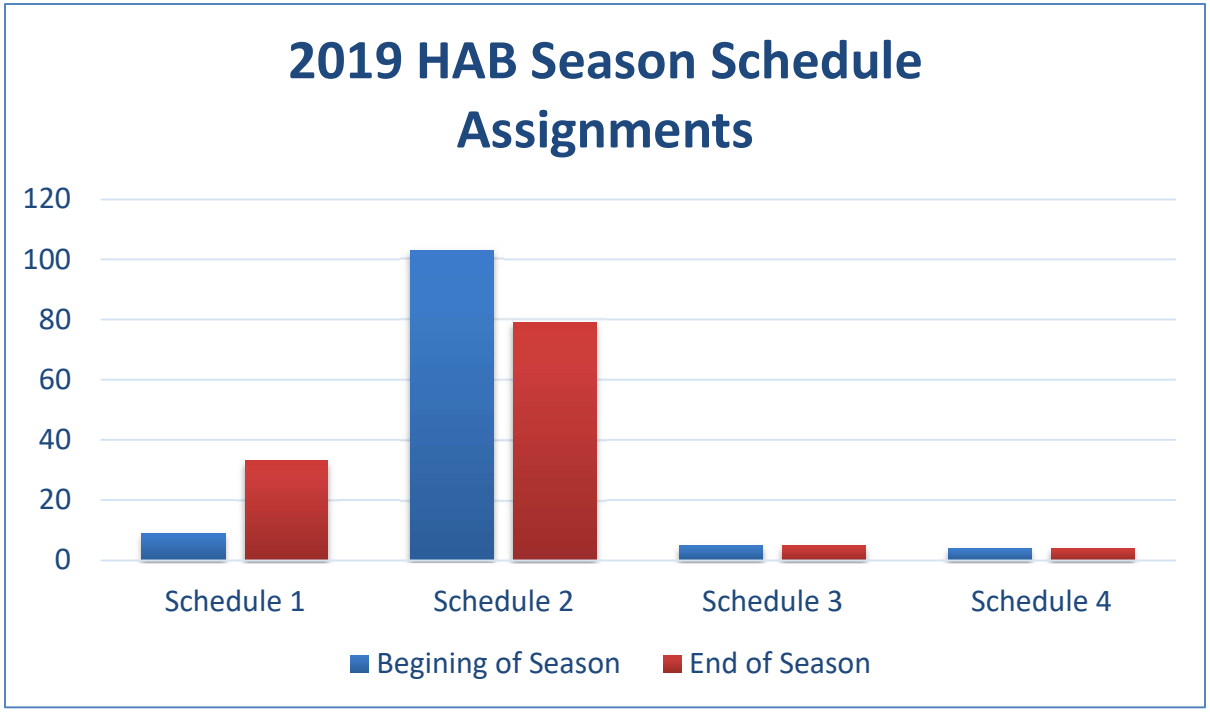
Microcystins and Cyanobacteria Screening Monitoring Requirements HAB Season (First FULL week of May through October)		
Schedule	**Monitoring Requirements**	**Additional Sampling Triggers**
1	Biweekly qPCR screening; AND Weekly raw/finished microcystins (paired with biweekly screening sample)	Increased monitoring would be triggered by finished water microcystins detections or raw water detections greater than 5 µg/L (see "All Schedules," below).
2	Biweekly qPCR screening; AND Biweekly raw water microcystins collected on alternate week of qPCR screening (not paired)	**If microcystins are detected in the raw water:** • PWS must collect raw and finished water sample within 24 hours of receiving the result and complete analysis within five days. If PWS voluntarily collected a paired finished water sample with their initial raw water sample, an additional set of raw and finished samples is not required until the following week unless raw is greater than 5 µg/L or a finished water detection triggers more immediate sampling (see "All Schedules" below). • PWS will be changed to Schedule 1 requirements for the remainder of the season. If the PWS has at least four consecutive weeks of non-detect microcystins sampling results, and mcyE is less than 5 gene counts/µL during that same time period, the PWS can send an e-mail to their HAB coordinator requesting a transition back to schedule 2 monitoring. **If mcyE are detected in raw water greater than 5 gene counts per µL:** • PWS must collect raw/finished water microcystins sample within 24 hours of receiving the result and complete analysis within five days. • If microcystins are not detected, the PWS will remain on Schedule 2 monitoring requirements. • If microcystins are detected in either the raw or finished water, the PWS will be changed to Schedule 1 monitoring requirements for the remainder of the season. If the PWS has at least four consecutive weeks of non-detect microcystins sampling results, and mcyE is less than 5 gene counts/µL during that same time period, the PWS can send an e-mail to their HAB coordinator requesting a transition back to schedule 2 monitoring.
3	Monthly qPCR screening	**If mcyE genes are detected:** • PWS must collect raw/finished water microcystins sample within 24 hours and complete analysis within five days. • If microcystins are not detected (only mcyE genes are detected), PWS transitions to Schedule 2 monitoring. • If microcystins are detected in the raw or finished water, the PWS will switch to Schedule 1 monitoring for remainder of the season. If the PWS has at least four consecutive weeks of non-detect microcystins sampling results, and mcyE is less than 5 gene counts/µL during that same time period, the PWS can send an e-mail to their HAB coordinator requesting a transition to schedule 2 monitoring.
4	Weekly finished water microcystins	Increased monitoring would be triggered by finished water microcystins detections (see "All Schedules," below).

All Schedules		**If sxtA or cyrA genes are detected in the raw water:**
		• PWS must notify Ohio EPA no later than the end of the next business day per OAC Rule 3745-89-08. Ohio EPA also recommends written or verbal results be communicated as soon as possible to ensure timely Ohio EPA follow up.
		
		If microcystins are detected in raw water greater than 5 µg/L:
		• PWS must begin sampling raw/finished water microcystins three days per week beginning no later than the week following the receipt of the results in exceedance.
		• PWS may resume routine monitoring (Schedule 1) if ALL the following occur:
		  ○ Raw water microcystins concentrations are less than or equal to 5 µg/L in two consecutive samples collected at least one day apart.
		  ○ Microcystins are not detected in finished water and not detected in distribution samples (if collected) during that same time period.
		
		If microcystins are detected in finished water or distribution samples (reported value ≤0.3-0.34 ug/L):
		• PWS must begin sampling raw/finished water microcystins daily and complete analysis within 24 hours of sample collection beginning the day after receiving results.
		• PWS may resume routine monitoring (Schedule 1) if microcystins are not detected in two consecutive finished water daily samples AND raw water microcystins are less than or equal to 5 µg/L during that same time period
		• PWS may transition to raw/finished water sampling three days per week as outlined above if microcystins are not detected in two consecutive finished water daily samples AND raw water microcystins are greater than 5 µg/L in either of the samples during that same time period.
		
		If microcystins are detected in finished water greater than 0.3 µg/L (reported value ≥0.35 ug/L):
		• All the conditions described above for finished water detections apply.
		• PWS must collect one resample of raw/finished water within 24 hours of action level exceedance and collect an additional repeat sample of raw/finished water within 24 hours of resample. Analysis must be completed within 24 hours in each case. Resamples and repeats satisfy daily sampling requirements outlined above.
		• If microcystins are greater than 0.3 µg/L in either resample or repeat, PWS must notify all consecutive systems within three hours of receiving results. PWS and consecutive systems must, within 24 hours of receiving results, collect samples from representative distribution points established in the contingency plan and complete analysis within 24 hours. Additional distribution sampling may be required.

Ohio Environmental Protection Agency

Scheduling

- 2020 third year reduced monitoring was offered
- Beginning Season Schedules Assigned
- 7 systems requested to return to Schedule 2



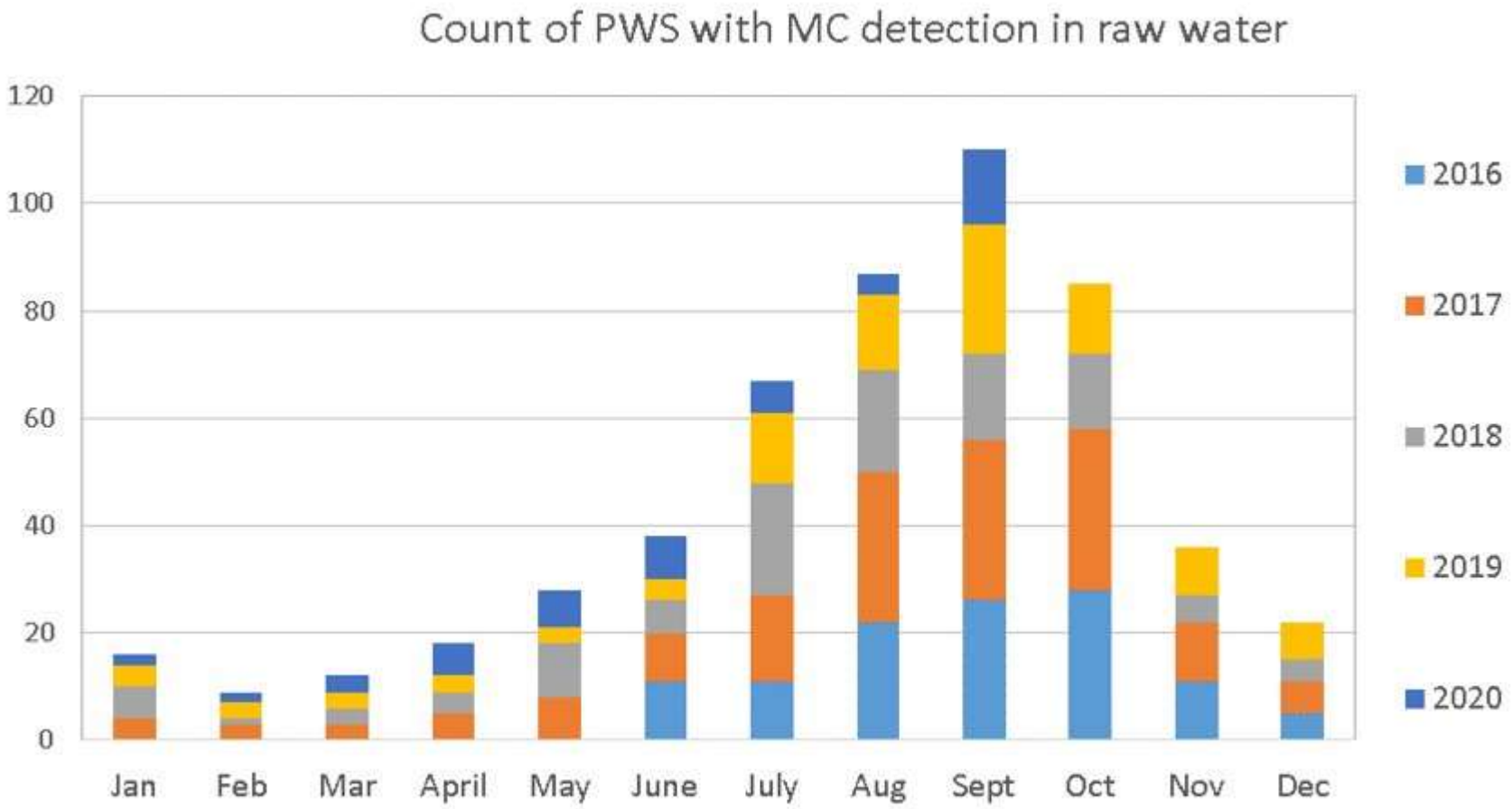
Ohio Environmental Protection Agency

Proposal

- Codify Schedule 2 in rule as routine monitoring
- All begin on this from Off-Season
- Will still include trigger to increase monitoring upon detections in raw or finished

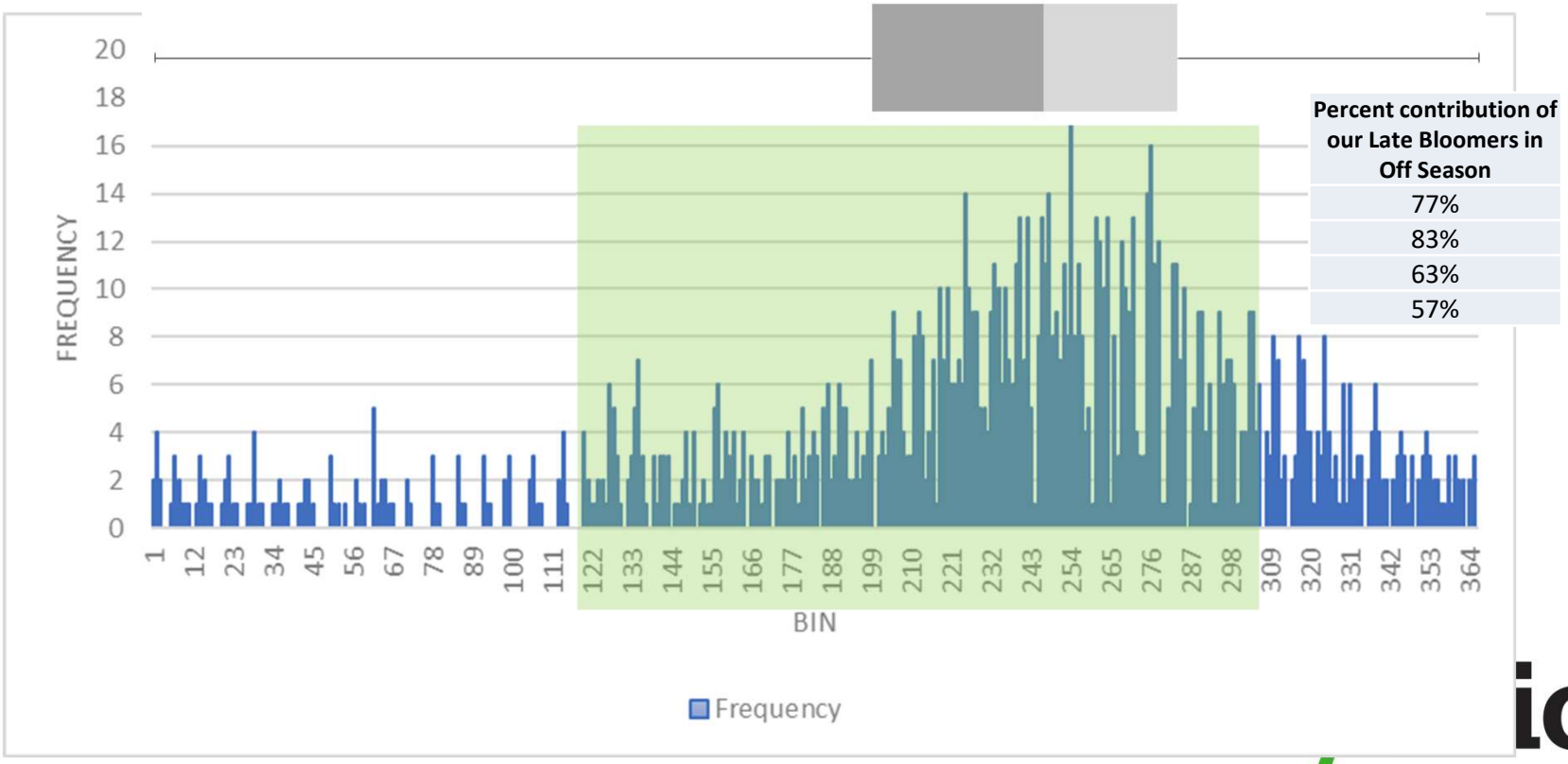
Ohio Environmental Protection Agency

MC detections since 2016



Detections to date

- Day 231, 245 and 254 represent the mean, median and mode
- 1 SD inclusive of 1st and 3rd Q.



Ohio Environmental Protection Agency

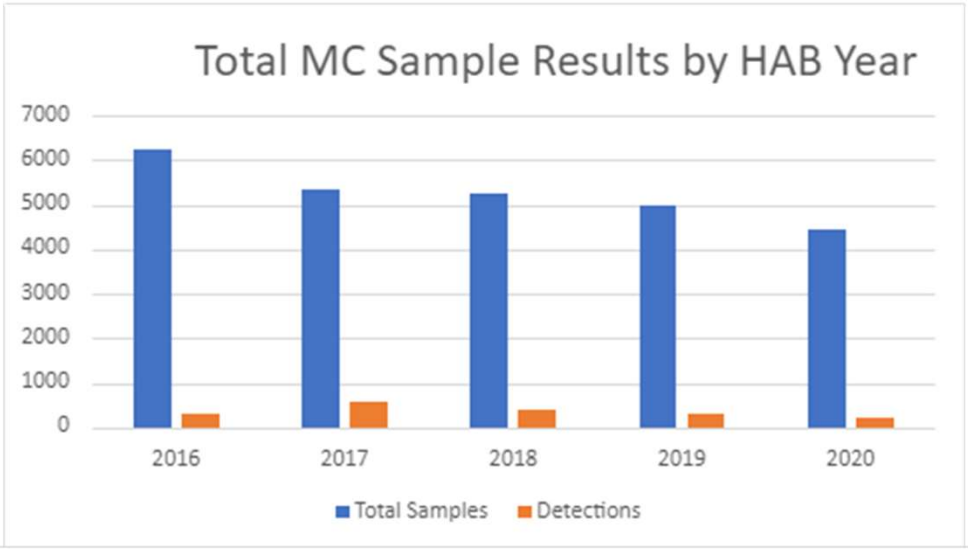
Proposal

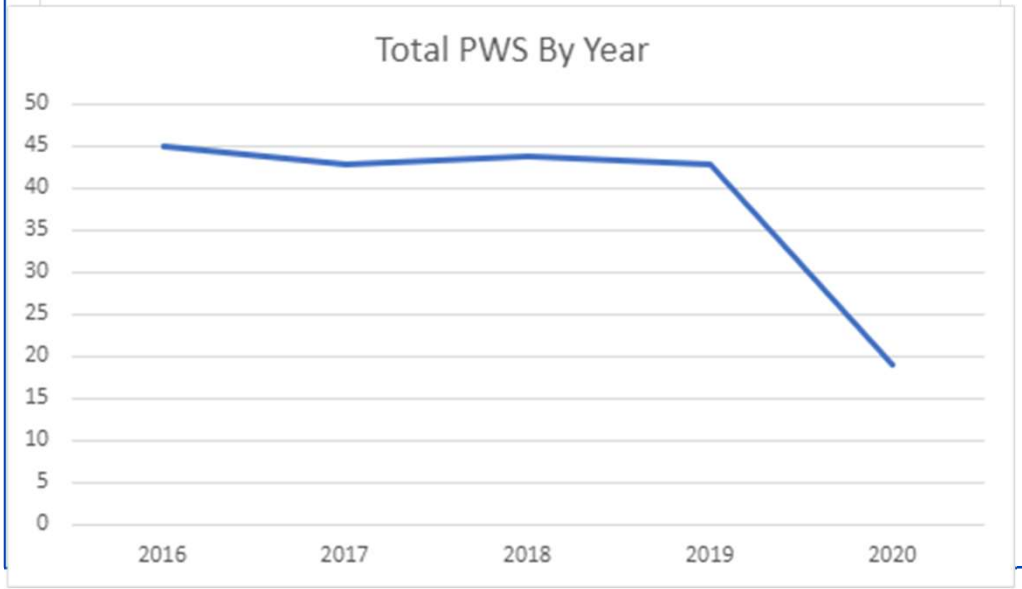
Based on the data, we propose that HAB Season will be more protective if it slides by 1 month

- Redefine 'HAB Season'
  - Currently begins first full week May
  - The proposed rule changes this to the first full week of June
  - The proposed start date for Off Season would be the first full week of December

Ohio Environmental Protection Agency

Historical Microcystins Detections





25,000+ samples

- 1,783 detections
- 7% detection rate/year across avg 43 PWS (36% of SWTP)/yr
- 87% of raw data <RL
- 96% of raw data <1.6 ppb

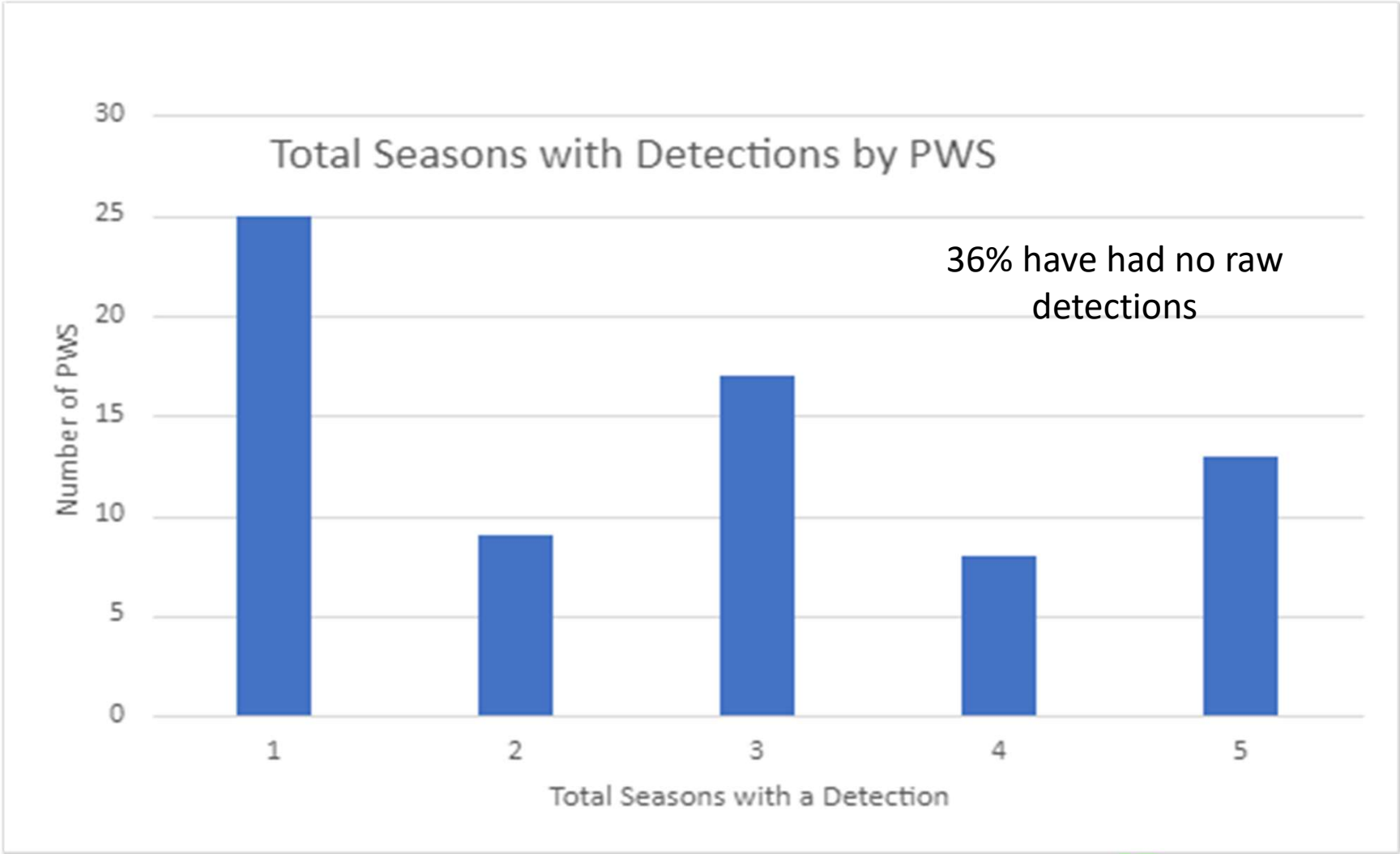
Only 4 FW detections (2016-2020)

- No advisories needed

# of PWS with detections have been stable to 2019

Ohio Environmental Protection Agency

Years with Detections



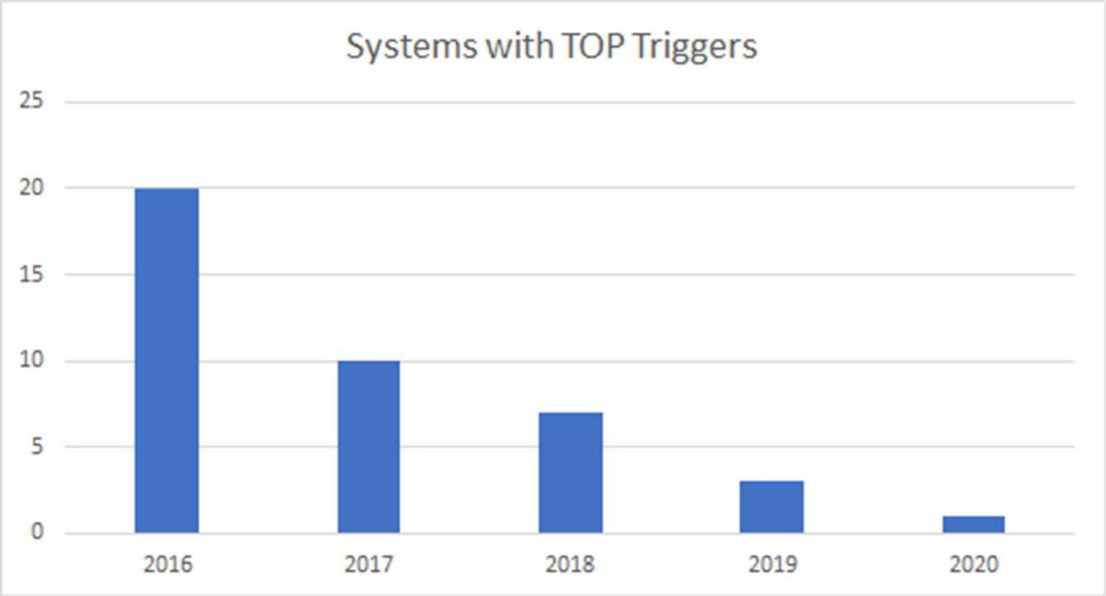
Ohio Environmental Protection Agency

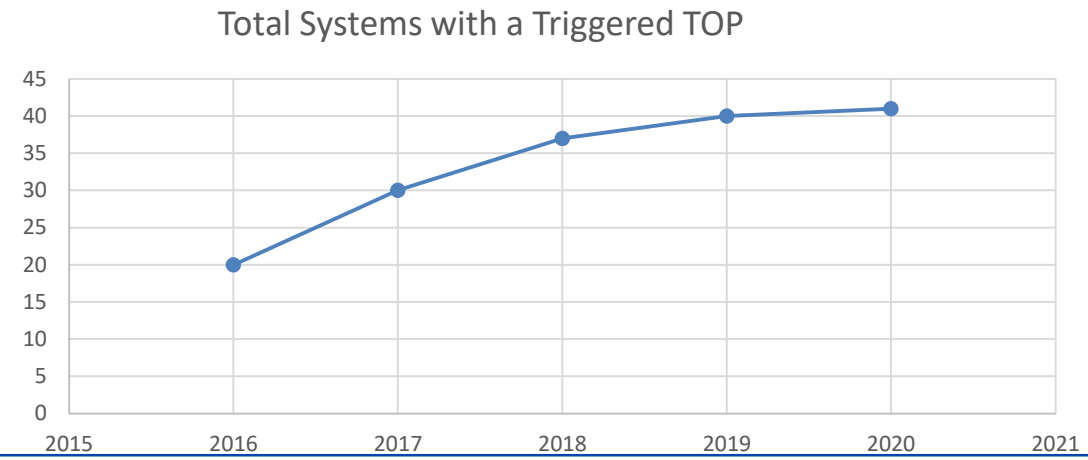
Proposal

- For Off-Season monitoring, coupled with the change in definition:
  - Monitor MC in finished water
    - Once every 2 weeks
  - Triggers to increased MC monitoring:
    - FW trigger→3x a week (no longer daily)
  - No Cyanobacteria Screening
    - Removes gene trigger

Ohio Environmental Protection Agency

TOPs are Important



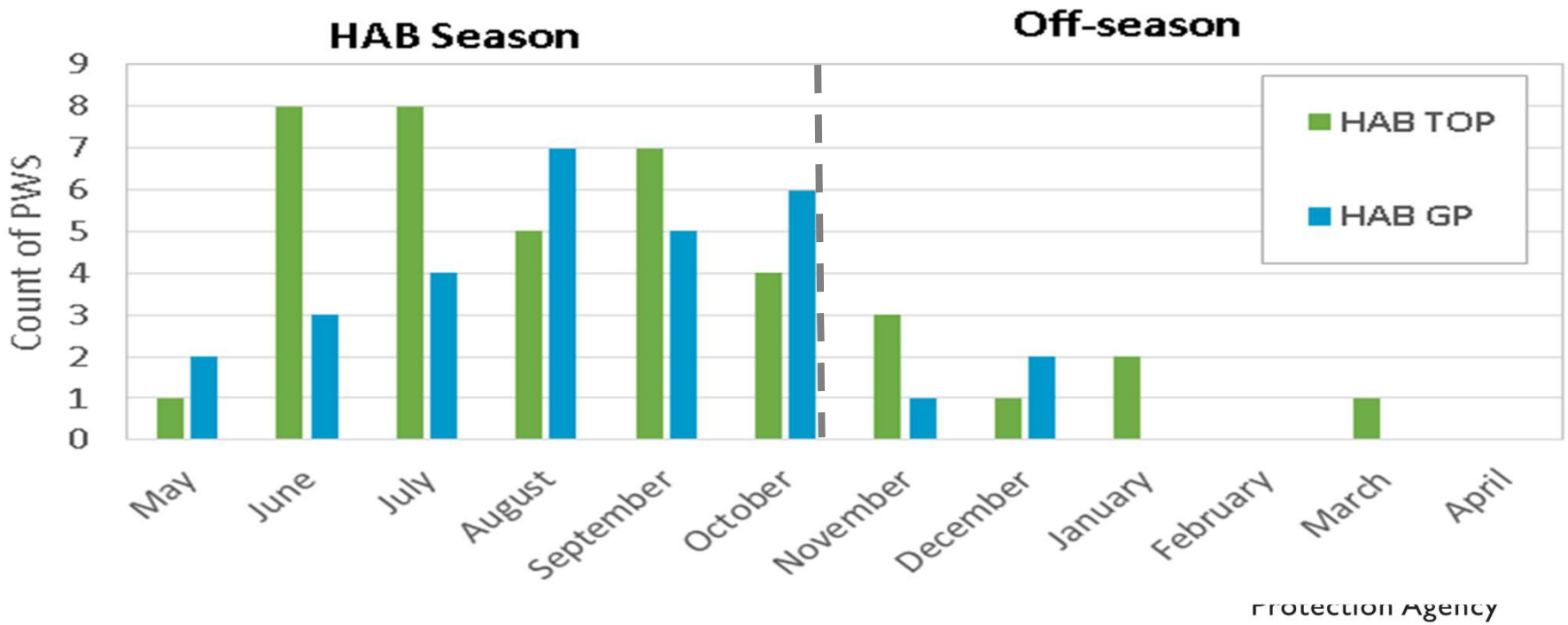


- Required in original rule
- Treatment optimization protocols prevent FW detections
- Trigger rate beginning to slow
- ~38 submitted without triggering

Ohio Environmental Protection Agency

Treatment Technique Trigger

- HAB Treatment Optimization Protocols triggered during off-season months:
- HAB General Plans 7 **PWS** (18%)
- General Plans triggered during off-season months:
  - **3 PWS** (10%)

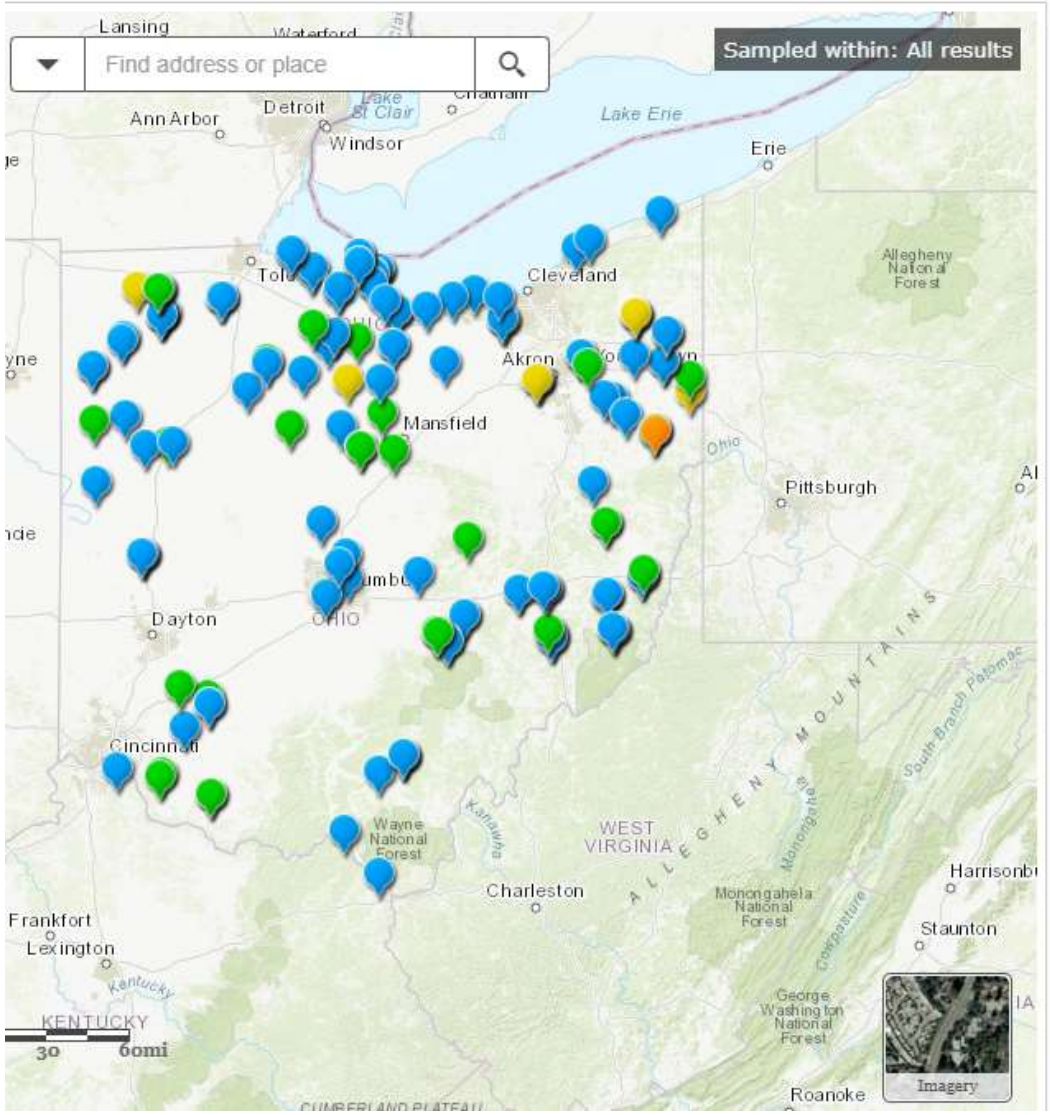


Proposal

- The success of the TOP and template materials available justify the following proposal:
  - Require TOPs from all systems
    - Timeframe?
  - Annual review of the TOP for all systems
    - What does this look like?

Ohio Environmental Protection Agency

Saxitoxins are an Emerging Issue



Legend | Sampling Results | Numeric Thresholds | About this site

Use the radio buttons to select a toxin or to filter by date range and site type.

Type of Toxin Sampled:
○ Microcystins ◉ Saxitoxin ○ Cylindrospermopsin ○ Anatoxin-a

Time period:
○ 7 days ○ 14 days ○ 30 days ○ 90 days ○ 1 year ◉ All

Type of Sampling Site:
○ PWS Finished Drinking Water ◉ PWS Raw Water Intakes
○ Lakes & Reservoirs ○ Rivers ○ All site types

Range of Toxin Concentrations

	Microcystins	Saxitoxin	Cylindro-spermopsin	Anatoxin-a
	µg/l	µg/l	µg/l	µg/l
	not-detected	not-detected	not-detected	not-detected
	detect - 0.29	detect - 0.19	detect - 0.69	detect - 19.99
	0.3 - 1.59	0.2 - 0.79	0.7 - 2.99	20 - 79.99
	1.6 - 19.99	0.8 - 2.99	3.0 - 19.99	80 - 299.99
	>= 20.0	>= 3.0	>= 20.0	>= 300

Concentration Units µg/l - micrograms per liter

Site Type by Shape

Public Water System Finished Water Lakes & Reservoirs

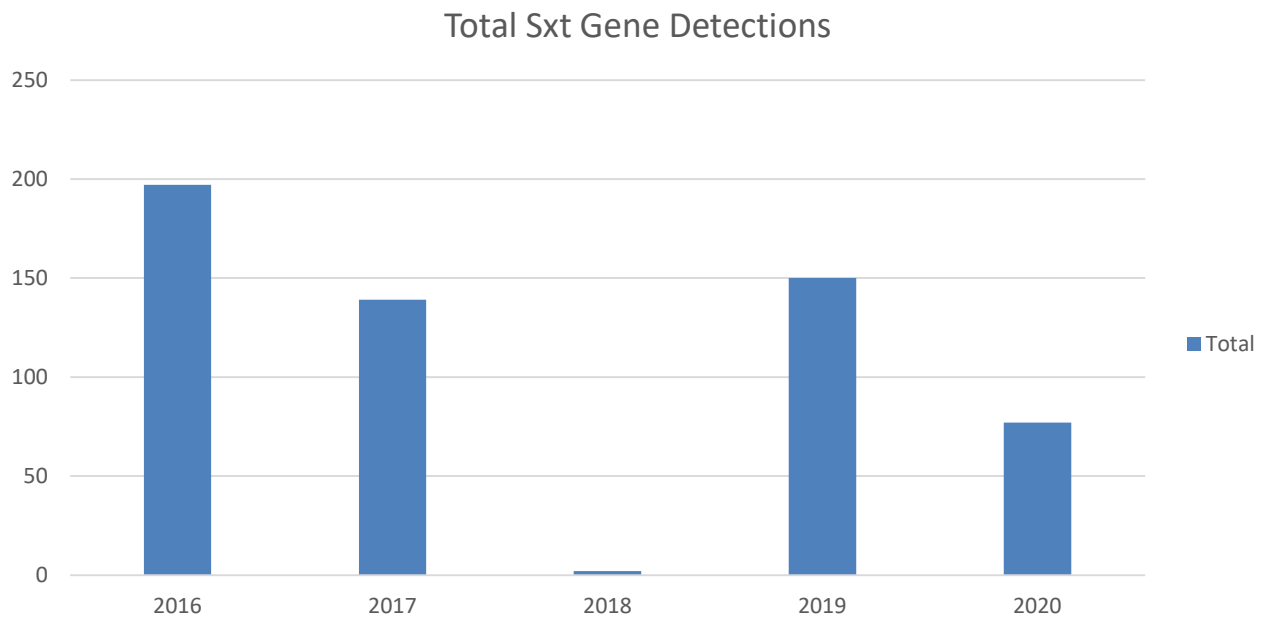
Ohio Environmental Protection Agency

Saxitoxins (2016-2020)

- 69 PWS with gene detections Ohio EPA performs sampling and analysis
  - Gene detections can be persistent
- 34 systems with RW sax detections
- 10 systems with confirmed FW sax detections
  - All <50% of AL, 9 <21% of the AL
- Saxitoxins detected in GUI well at 1 PWS.

Ohio Environmental Protection Agency

Saxitoxins



- Discovered SXT Gene not labelled in kit
- Issue corrected by end of July 2019
- Samples analyzed with affects kits invalidated

Ohio Environmental Protection Agency

Cyanobacteria Screening (qPCR)

- Gene association with toxins (2016-2020):
  - <MRL sax gene, >MRL sax ~50 samples(17 PWS)
  - Cylindro have had 5 gene detection (1 raw/finished detection)
- Lab turnaround times
- Analytical and manufacturing issues

Ohio Environmental Protection Agency

Proposal

- Re-define ‘Cyanobacteria Screening’
  - Expand definition to include a semi-quantitative alternative to qPCR
  - ELISA based measure of cyanotoxins Cylindro and Sax
  - Finished water sampling point bi-weekly during HAB Season
  - Currently 16-18 wells for a standard curve then samples in duplicate
  - New method establishes a threshold with comparison to a negative and single positive control

Ohio Environmental Protection Agency

Important Note

- With the proposal to monitor FW only in Off-Season a method change is likely.
- Microcystins ADDA-ELISA 701.0
  - Minor change in sample processing
  - Lower Reporting Limit (RL)
    - Currently 0.3 ug/L
    - Reviewed MDLs and most analysts already meet the new RL
    - Implementation time

Ohio Environmental Protection Agency

Proposal

Make the rule consistent with other rules relative to lab reporting violations:

- Lab failure to report on time will not result in a violation for the PWS
- This violation will be for labs
- Removes the PN requirement on the PWS for this type of violation

Ohio Environmental Protection Agency

Important Note

<u>This HAB season will be the same as last year</u>

The changes discussed did not cover every proposed change

Ohio Environmental Protection Agency

Other HAB things

- Recreation Strategy updated in 2020
  - Conducting outreach in April
- Division of Materials and Waste Management
  - Land application of lime drinking water treatment material
  - Upcoming outreach to lime systems to attend webinar on compliance with this permit

Ohio Environmental Protection Agency

Thank you

Colin P. White

colin.white@epa.ohio.gov

614-955-8802

Ohio Environmental Protection Agency