



Harmful Algal Bloom (HAB): Lady Bird Lake



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Agenda

- **HAB Background**
- **Review of 2019 HAB**
- **2020 Plan**
- **Feedback and Questions**



What is a “Harmful Algal Bloom?”

It occurs when algae produces toxins

- **Most commonly occur with Cyanobacteria (blue-green algae)**



HAB types

Planktonic (free floating)
(Most common)

Lake Erie



Cohesive mats (benthic or floating)

Lady Bird





Cyanobacteria Toxins

Species may produce a toxin from four main groups

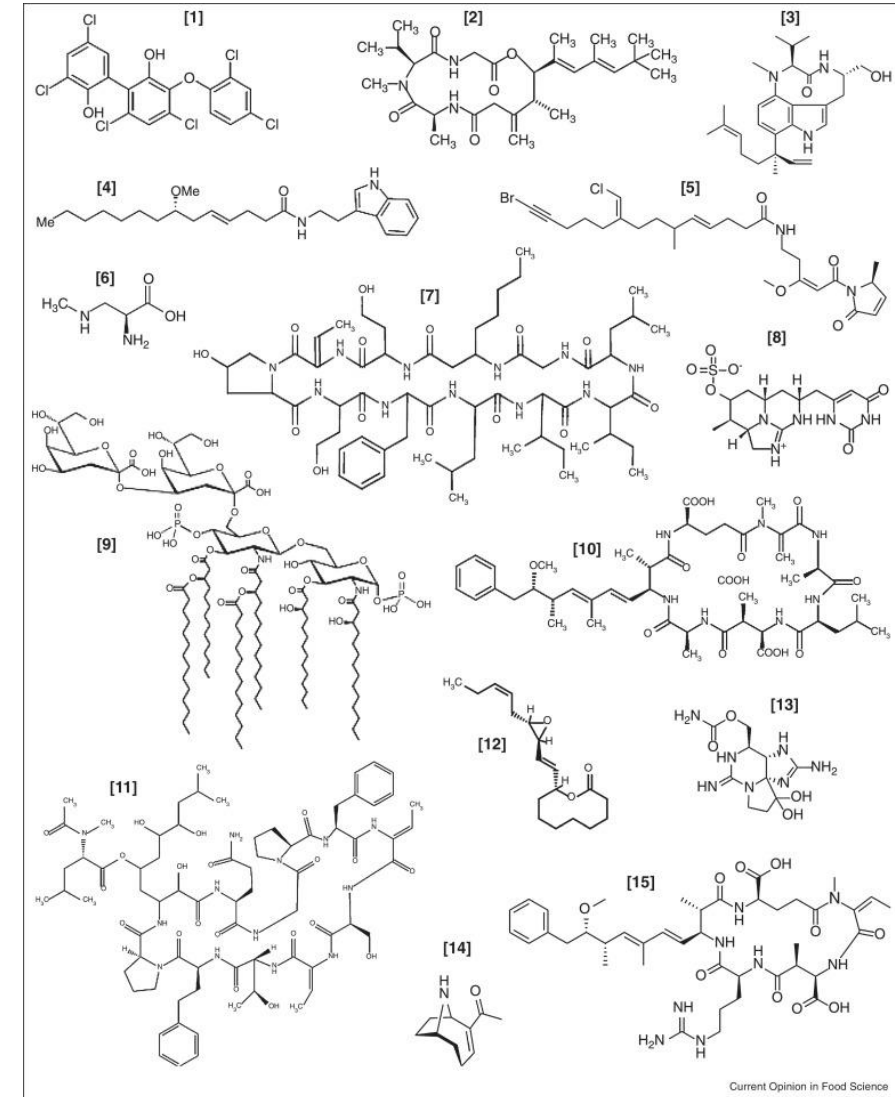
- **Anatoxin-a (neurotoxin)**
- **Cylindrospermopsin (cytotoxicity, liver/kidney toxicity)**
- **Microcystin (hepatotoxin)**
- **Saxitoxin (neurotoxin)**

Drinking water standards

- **EPA – microcystins 0.3 µg/L; Cylindrospermopsin 0.7 µg/L**
- **States – Anatoxin-a 0.7 – 20 µg/L; Saxitoxin – 0.3 – 3 µg/L**

A lot of toxin variants!

- **For example, over 100 types of microcystin structurally ID'd**





HAB E(a)ffects



Human and animal health

Economic

Perception

Health Impacts of Cyanotoxins



Note: Not all cyanotoxins lead to all of these health impacts. These listed impacts are caused by microcystins or cylindrospermopsin, the two cyanotoxins that EPA has issued Health Advisories for.

IN HUMANS

Brain

- Source:** Ingestion
Symptoms:
- Headache
 - Incoherent speech
 - Drowsiness
 - Loss of coordination

Respiratory System

- Source:** Inhalation
Symptoms:
- Dry cough
 - Pneumonia
 - Sore throat
 - Shortness of breath
 - Loss of coordination

Digestive System

- Source:** Ingestion, drinking contaminated water, or eating contaminated fish
Symptoms:
- Abdominal pain
 - Nausea
 - Vomiting
 - Diarrhea
 - Stomach cramps



Body

- Source:** Contact, e.g. swimming
Symptoms:
- Irritation in eyes, nose, and throat
 - Blistering around the mouth
 - Skin rash, including tingling, burning and numbness
 - Fever
 - Muscle aches (from ingestion)
 - Weakness (from ingestion)

Organs

- Source:** Ingestion
Symptoms:
- Kidney damage
 - Abnormal kidney function
 - Liver inflammation

Nervous System

- Source:** Ingestion
Symptoms:
- Tingling
 - Burning
 - Numbness

IN PETS

Symptoms:

- Vomiting
- Fatigue
- Shortness of breath
- Difficulty breathing
- Coughing
- Convulsions
- Liver failure
- Respiratory paralysis leading to death





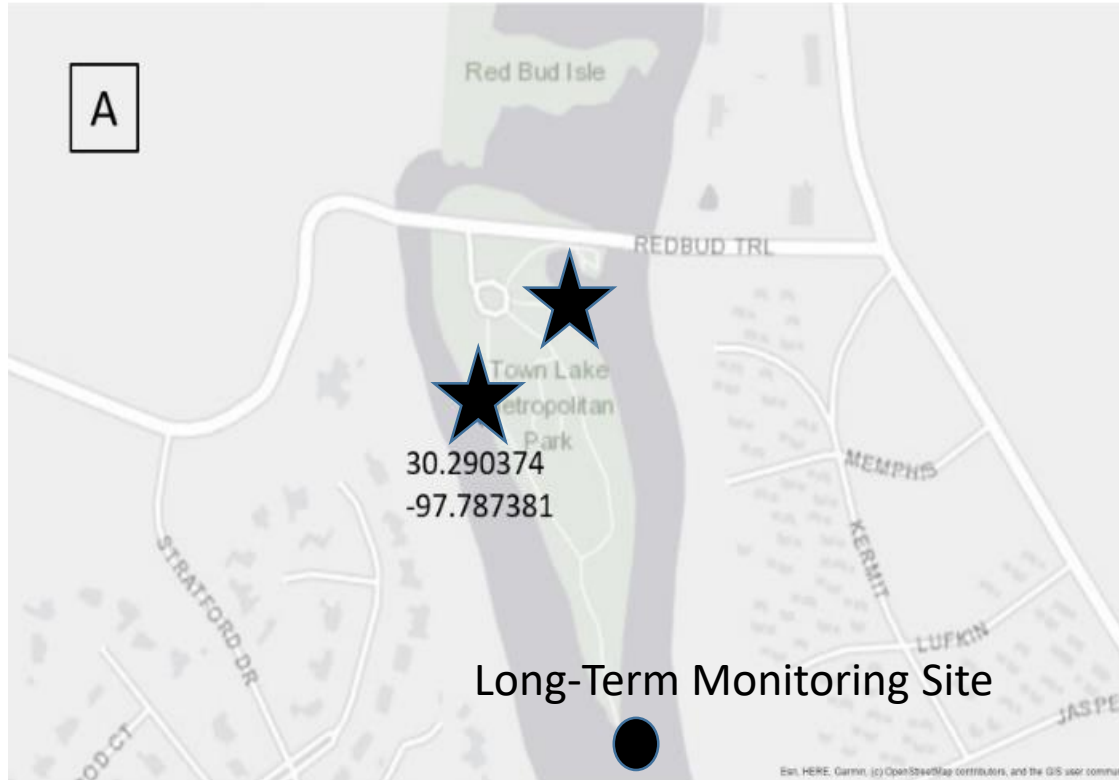
What Happened in 2019?

Lady Bird, specifically Red Bud and Auditorium shores, experienced benthic-surface HAB event

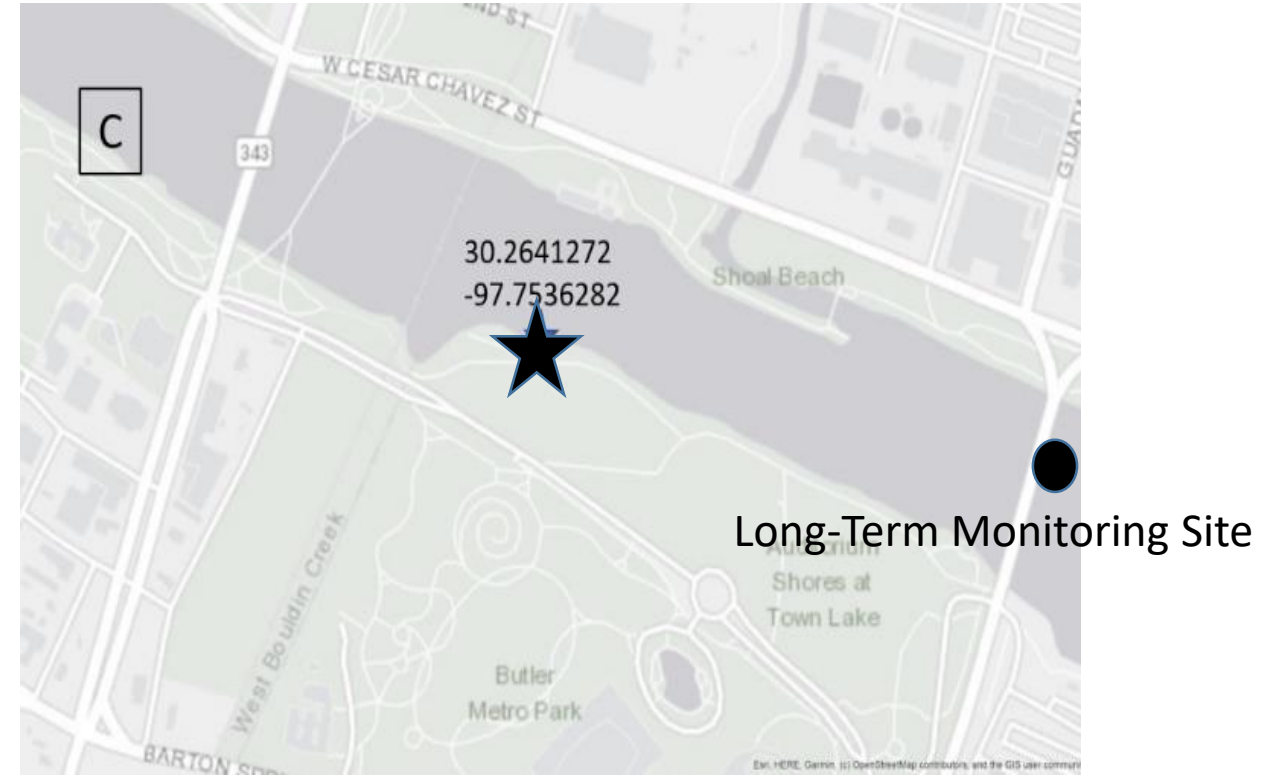




Locations



Red Bud Isle (below Tom Miller Dam)



Auditorium Shores (across from Downtown)



The City's Response to 2019 HAB

Response Initiation and Timeline

- **Fast! Samples collected first weekend dog deaths reported, parks/launches closed, signage up, media engaged**

How we kept people informed?

- **Media, social media, on-site signage**

How we monitored

- **Approx. bi-weekly sampling of water quality and mats to determine nutrient dynamics at sites, duration of bloom**



The 2019 Bloom

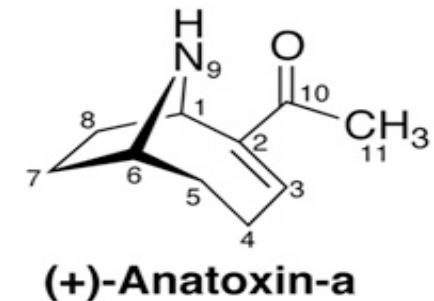
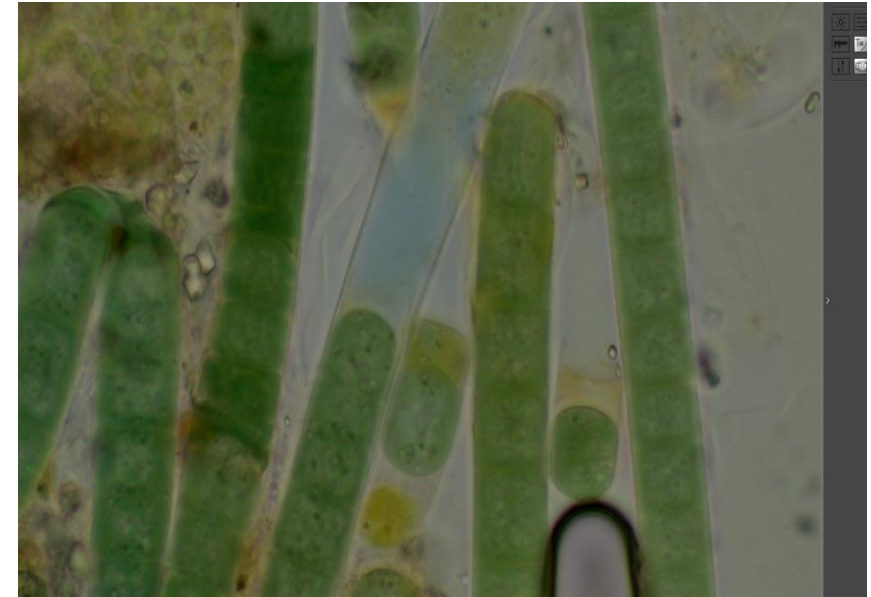
Species in the Order Oscillatoriales

- Many known toxin producers in this group
- UT developing species database

Within algae mats dihydroanatoxin dominant

Contents = <1 – >130 ng/g wet weight mat (or 0.13 mg/kg)

- State and federal guidelines and criteria have been developed for water (i.e., ug/L concentrations)
- Means that there is no guidance as to what is a “safe” level of toxin present
- Toxicology study suggested 0.3 mg/kg acute toxicity for dogs





The 2019 Bloom

Water Temps

- **>30°C weekend of dog deaths**

Nutrients

- **Abundant Nitrogen (esp NH₃??) and Phosphorus**
- **Distinct water quality @RB compared to previous years**

Data period	Site name and ID (n)	TSS (mg/L)	NH3 (ug/L)	Nox (ug/L)	TKN (ug/L)	TN (ug/L)	TP (ug/L)	N:P
2019	Red Bud West 1996 (4)	n/a	41.1 ± 7.7	111.0 ± 42.2	401.0 ± 28.7	513.5 ± 40.6	26.0 ± 20.8	87.1 ± 72.7
	Auditorium Shores 1252 (4)	n/a	24.1 ± 20.3	396.0 ± 148.0	404.5 ± 56.5	798.3 ± 200.9	17.7 ± 6.5	119.1 ± 74.3
2016-2018	Red Bud 5 (9)	2.6 ± 0.9	10.8 ± 8.3	130.8 ± 81.5	424.6 ± 133.6	555.4 ± 119.2	12.6 ± 9.3	125.4 ± 47.0
2019	Red Bud 5 (5)	2.1 ± 1.1	21.5 ± 22.0	477.9 ± 622.0	370.8 ± 56.1	848.7 ± 621.2	29.6 ± 17.2	81.3 ± 66.6
2016-2018	1st St. 2 (9)	3.7 ± 2.0	20.4 ± 37.3	247.1 ± 208.5	485.9 ± 206.0	733.0 ± 275.5	13.4 ± 8.2	153.5 ± 83.4
2019	1st St. 2 (5)	1.9 ± 0.4	16.1 ± 11.1	434.6 ± 184.0	388.4 ± 33.2	823.0 ± 213.2	15.7 ± 11.7	160.1 ± 75.5

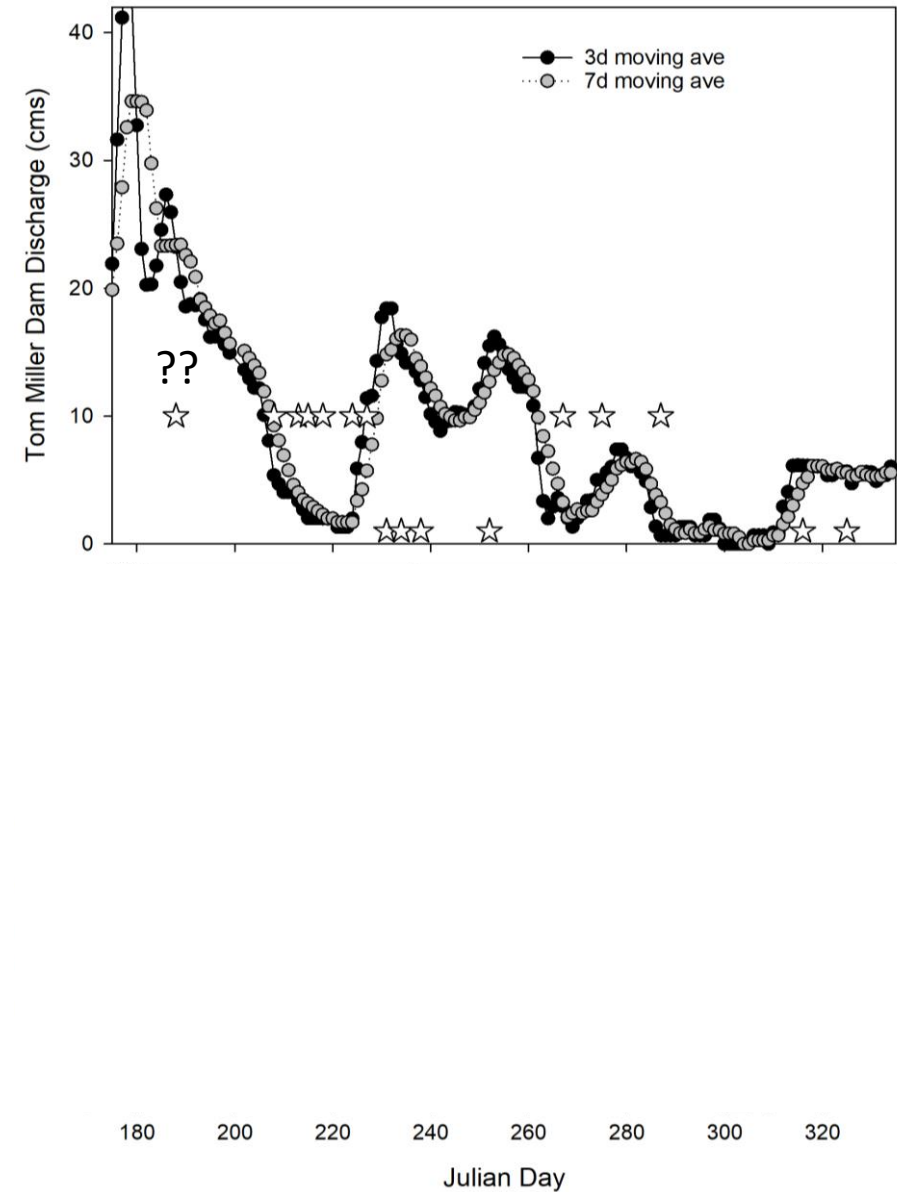


The 2019 Bloom



Discharge rates

- Late July drop in discharge coincided with bloom and toxins event

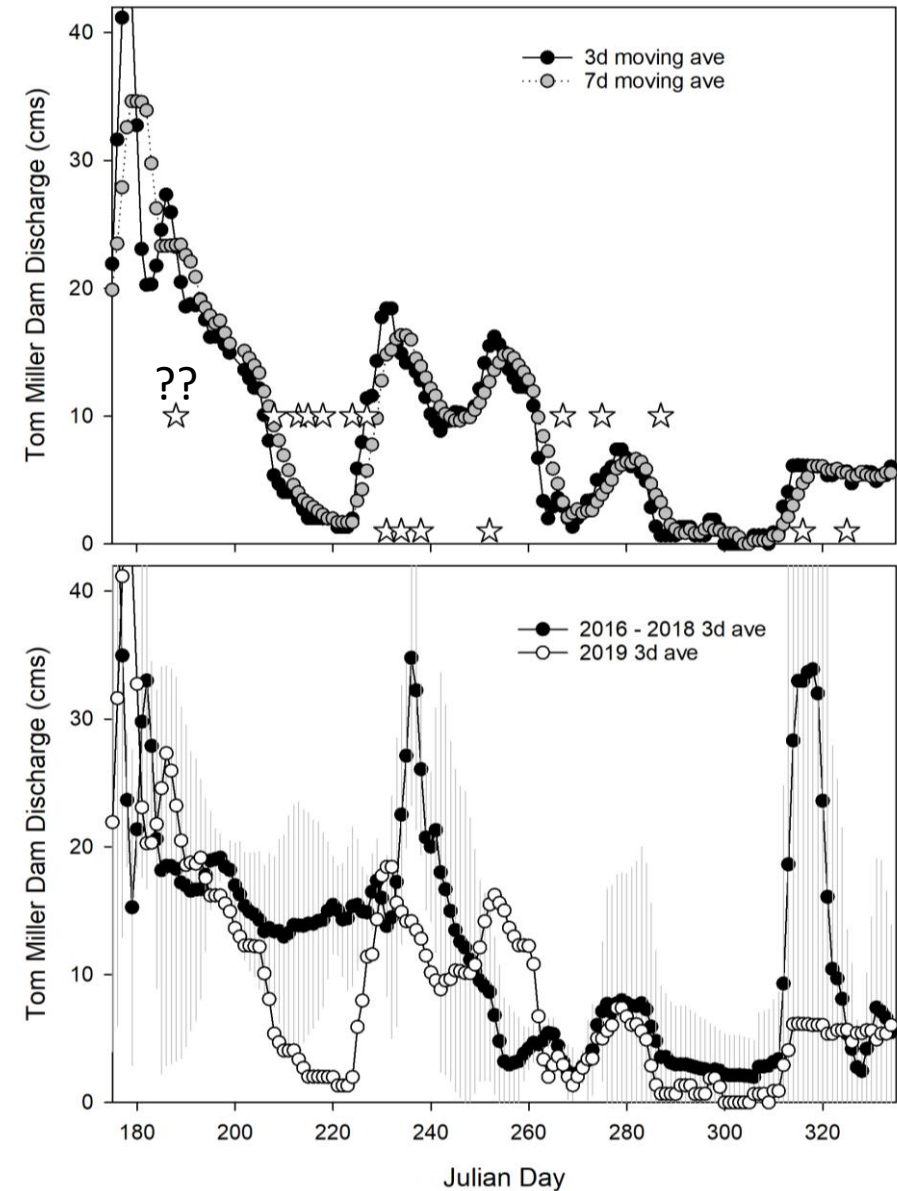




The 2019 Bloom

Discharge rates

- Late July drop in discharge coincided with bloom and toxins event
- Ave was lower than previous 3-year period

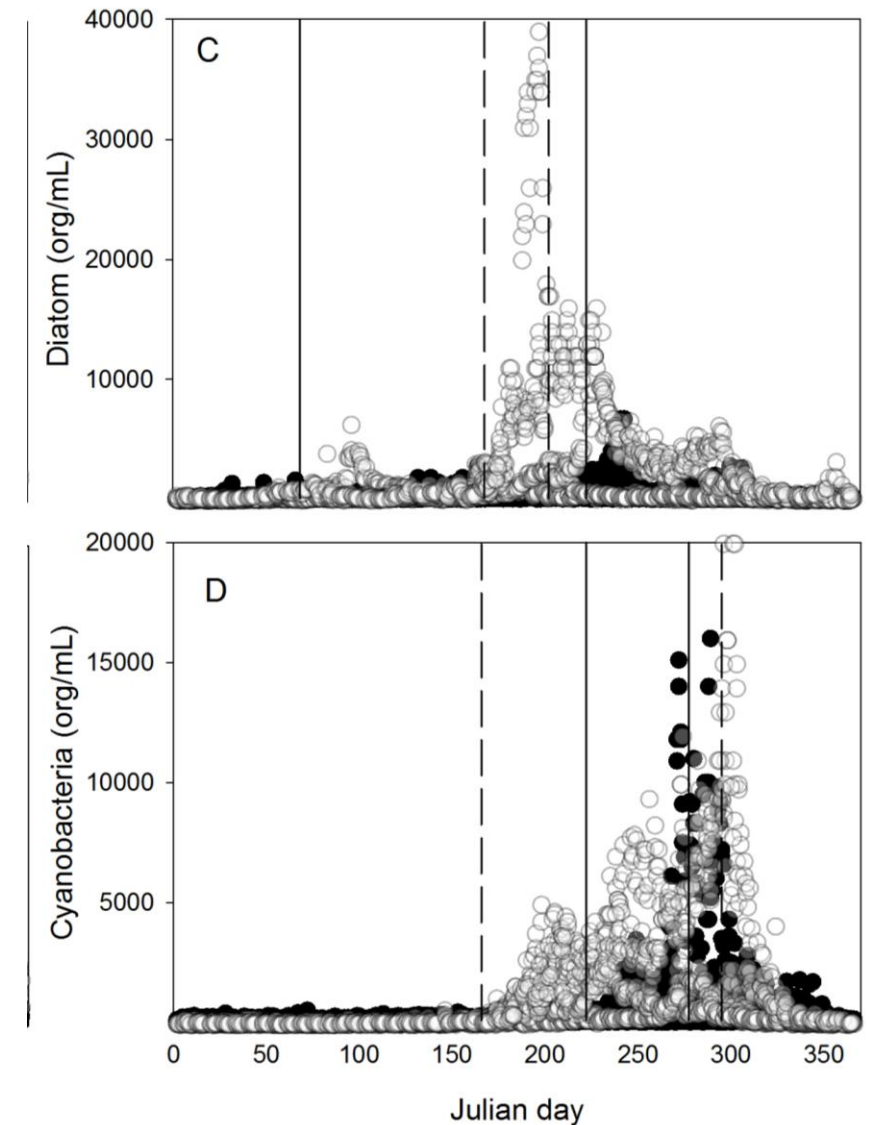




Cyano. Pop. Drivers

Cyanobacteria growth follows regular seasonal cycles

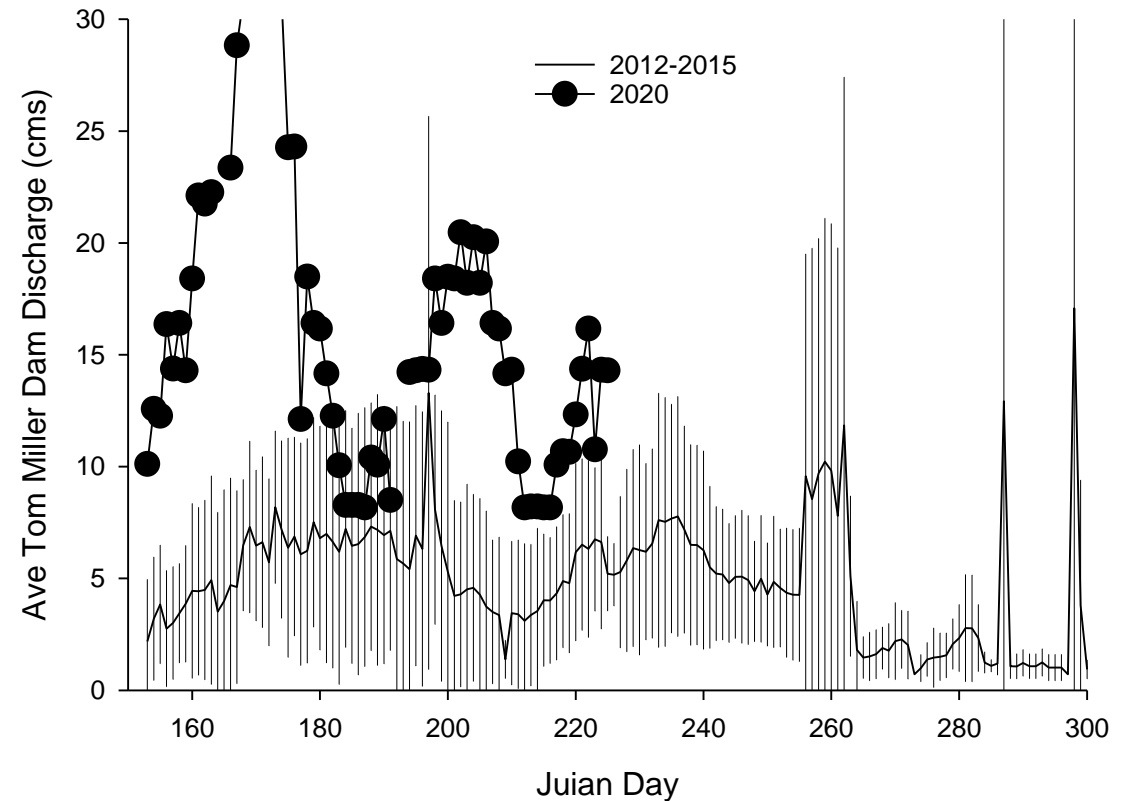
- **Late summer – hot, low flows, lack of rain**
- **Add in nutrients – recipe for a bloom**





What Made 2019 Different?

- **Zebra mussels? (new)**
 - Alter water chemistry
 - Promote dense benthic growth
- **Large flooding, runoff, depositional events? (new)**
 - Altered sediment and water chemistry?
- **Climate change? (new)**
- **Dog waste? (old)**
- **Low flows (old)**
 - But now coupled with new drivers!





Monitoring Plan 2020

Routine Monitoring

- **9 times per year at 3 fixed sites for water chemistry**
- **Purpose is to see long-term trends**

HAB Monitoring

- **Began in June at 4 sites**
- **Collaboration with UT**
 - DNA fingerprinting, toxin ID and content
- **Water quality**
 - Nutrients, water temp, pH
- **Tracking discharge velocities through LBL**



Some (new) Data

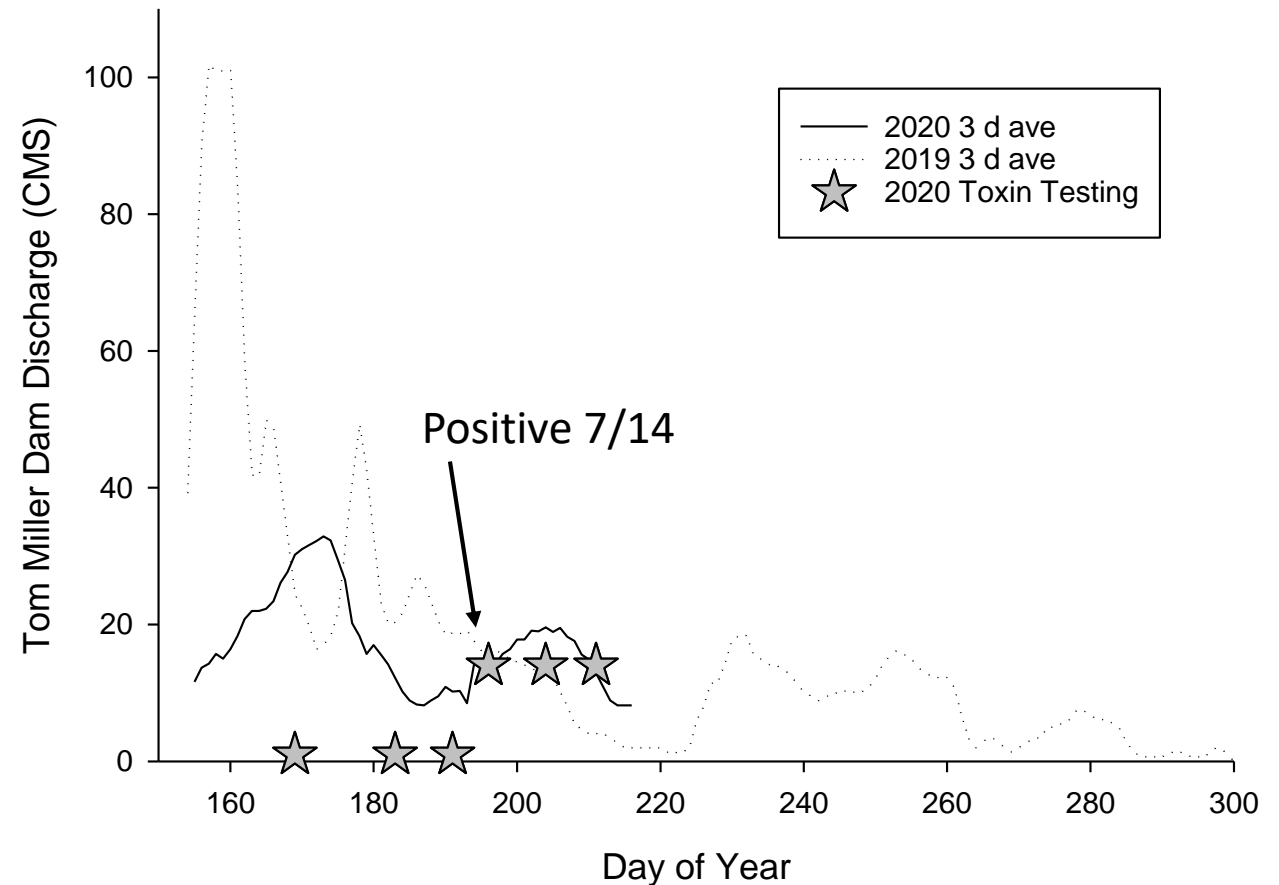
How about in 2020?

Similar cyanobacteria appear to be present (matching observations with 2019 DNA library)

Toxins identified earlier

Discharges declined earlier than in 2019

Nutrients still abundant





Communication Plan 2020



Signage around Lady Bird Lake

Engage Key Stakeholders

- **Other CoA Depts (PARD, AW, APH) and Partner Agencies (LCRA)**
- **Concessionaires, the Trail Foundation**
- **Veterinary Associations, Austin Pets Alive**
- **Downtown Austin Alliance, Austin Visitors Bureau**

Engage Media and Social Media

- **Continue to work with media partners w/occasional news release**
- **Announce initial monitoring, changes in risk status using Facebook, Twitter, and Next door, listservs**

CAUTION: DOG OWNERS

Harmful Algae May Be Present

WINTER	SPRING	SUMMER	FALL
LOW RISK No harmful algae expected winter through spring.		INCREASED RISK Harmful algae blooms possible summer through fall due to high temperatures and low water flow.	
		HIGH RISK Occurs when toxins are detected in algae.	

- Owners assume illness risks by allowing dogs in water.
- Keep dogs away from floating algae mats.
- Rinse dogs after contact with lake water.
- If dog becomes sick, go to a veterinarian immediately and then report it to 3-1-1.



HARMFUL ALGAE CHARACTERISTICS

Location: Floating in mats on surface
Color: Most commonly blue/cyan, dark green, brown, black

More information at austintexas.gov/algae
Ordinance 640611-C People are not allowed to swim in Lady Bird Lake.

 To report issues, please call 3-1-1 or a service request via the 3-1-1 mobile app.



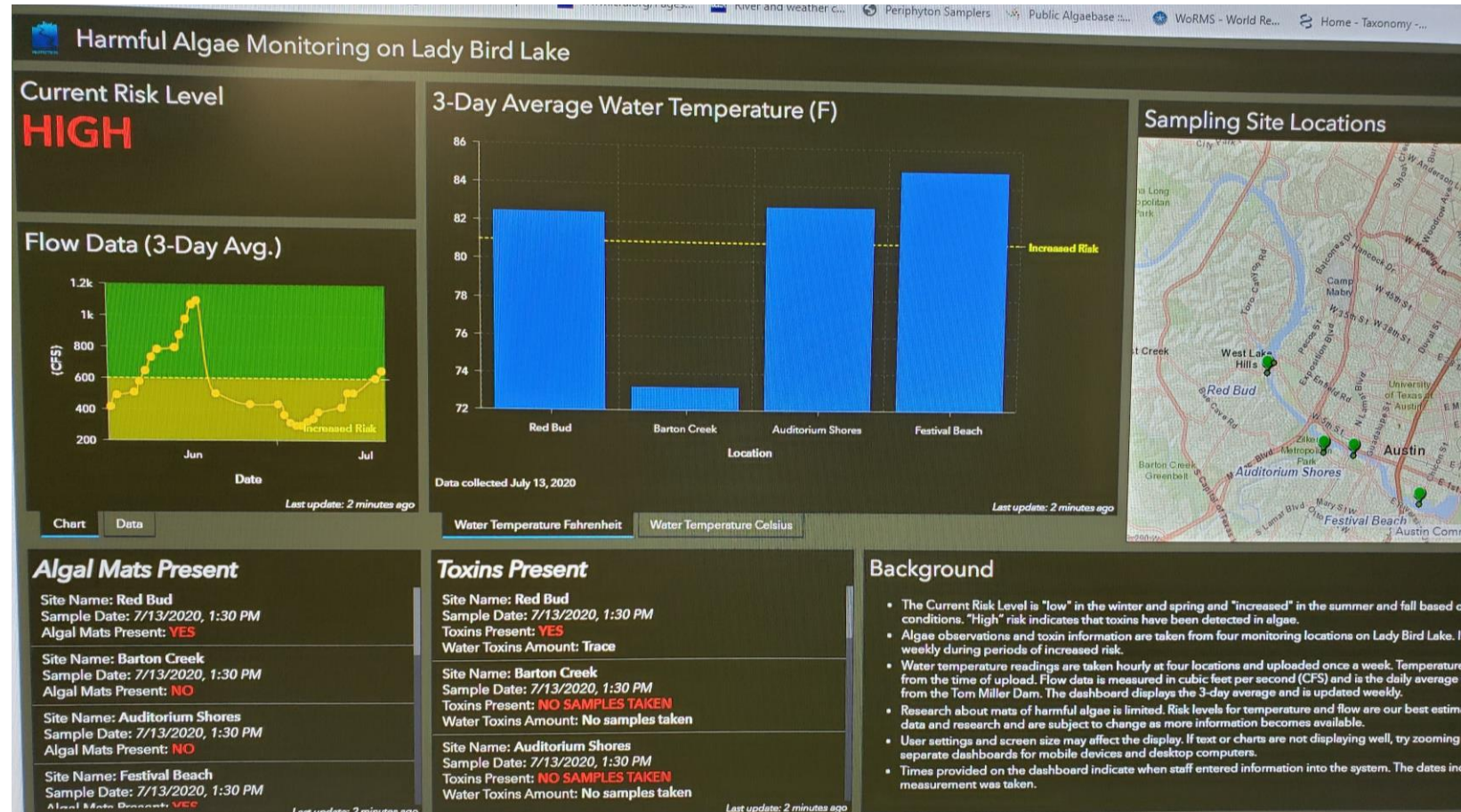


Website



Most current information at austintexas.gov/algae

- Current status – low, increased, or high risk
- Summary of test results for toxins
- Information about algae present on the lake
- Information about temperatures and flow





Questions?

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