# Harmful Algal Bloom (HAB) Lady Bird Lake 2019

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# The City's Response to HAB 2019

## Response Initiation and Timeline

## What we know as of Today

## How are we keeping people informed?

- **Media, Engagement, On-site**

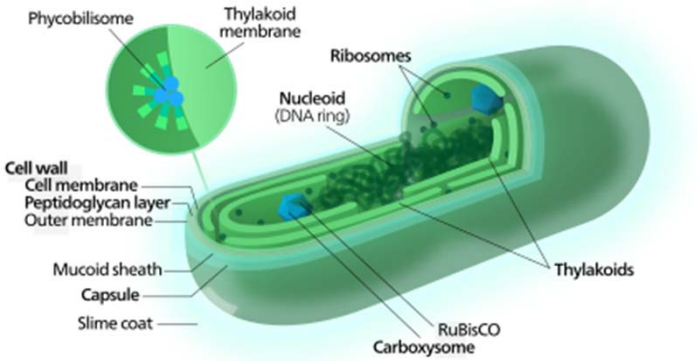
## How will we move forward into the future

- **Short term scenarios and process**
- **Long term scenarios and process changes**

# What is a "Harmful Algal Bloom" (HAB)

## An algae bloom event where toxins are produced

- **Most commonly occur with Cyanobacteria**




## What's a cyanobacteria?

- **Primitive! Over 3 *billion* years old**
- **First photosynthetic organisms; changed Earth's atmosphere**

## Some capable of producing geosmin, 2-methylisoborneol (MIB), and toxins

# Cyanobacteria Species and Toxins

## There are a lot of cyanobacteria species

- **Over 6,000 estimated species (less than half characterized)**

## Species may produce a toxin from four main groups

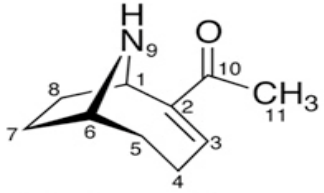
- **Anatoxin-a (neurotoxin)**
- **Cylindrospermopsin (cytotoxicity, liver/kidney toxicity)**
- **Microcystin (hepatotoxin)**
- **Saxitoxin (neurotoxin)**

## Drinking water standards

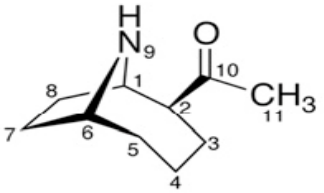
- **EPA – microcystins 0.3 μg/L; Cylindrospermopsin 0.7 μg/L**
- **States – Anatoxin-a 0.7 – 20 μg/L; Saxitoxin – 0.3 – 3 μg/L**

## A lot of toxin variants!

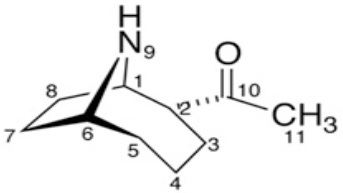
- **For example, over 100 types of microcystin structurally ID'd**




(+)-Anatoxin-a




*cis*-Dihydroanatoxin-a




*trans*-Dihydroanatoxin-a

# HAB types

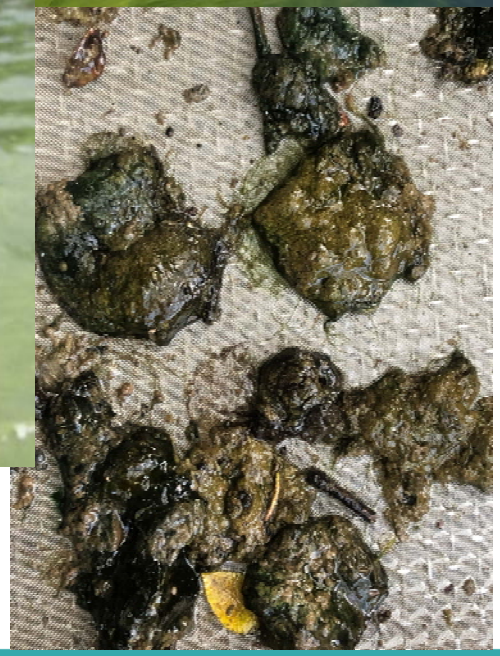
## Planktonic (free floating)

## (Most common)

**Lake Erie**

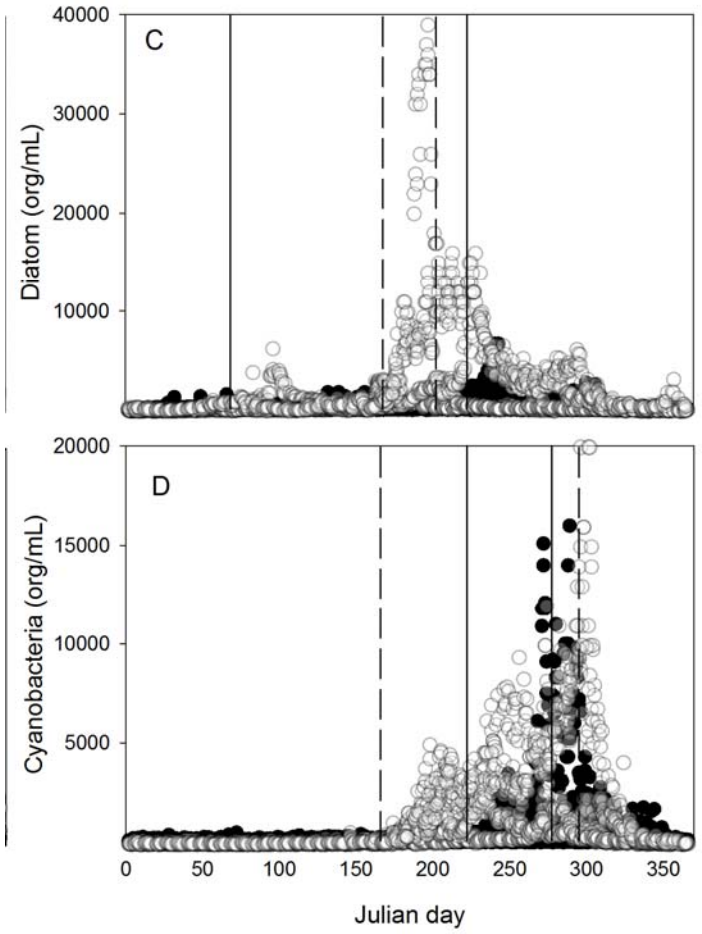
## Cohesive mats (benthic or floating

**Lady Bird**



# Drivers

## Cyanobacteria growth follows regular seasonal cycles



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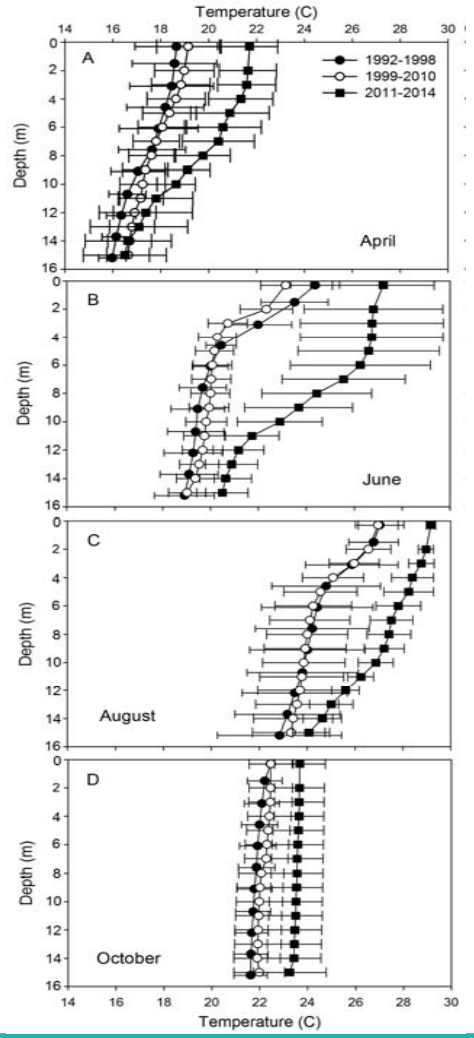

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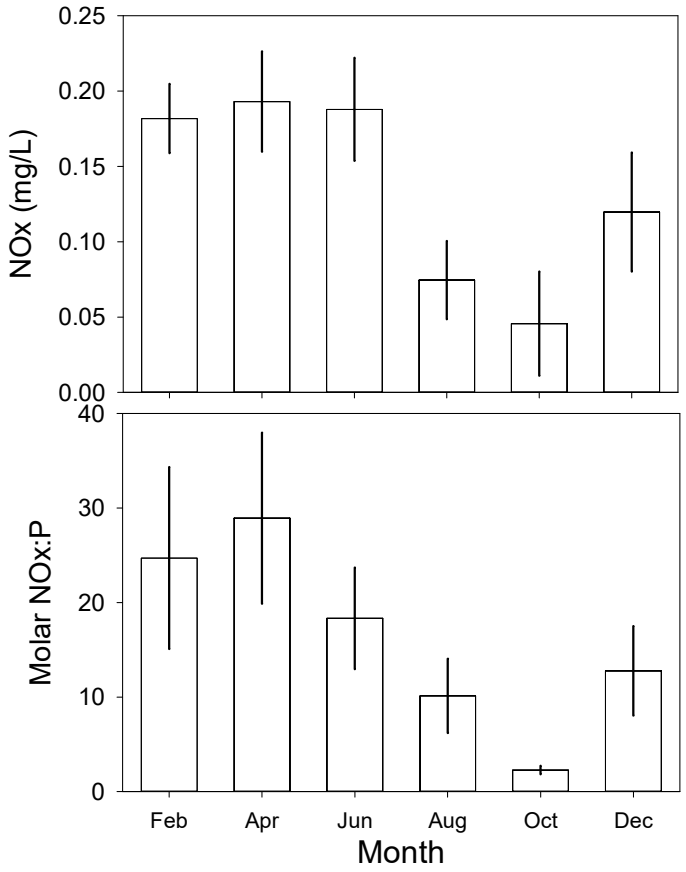
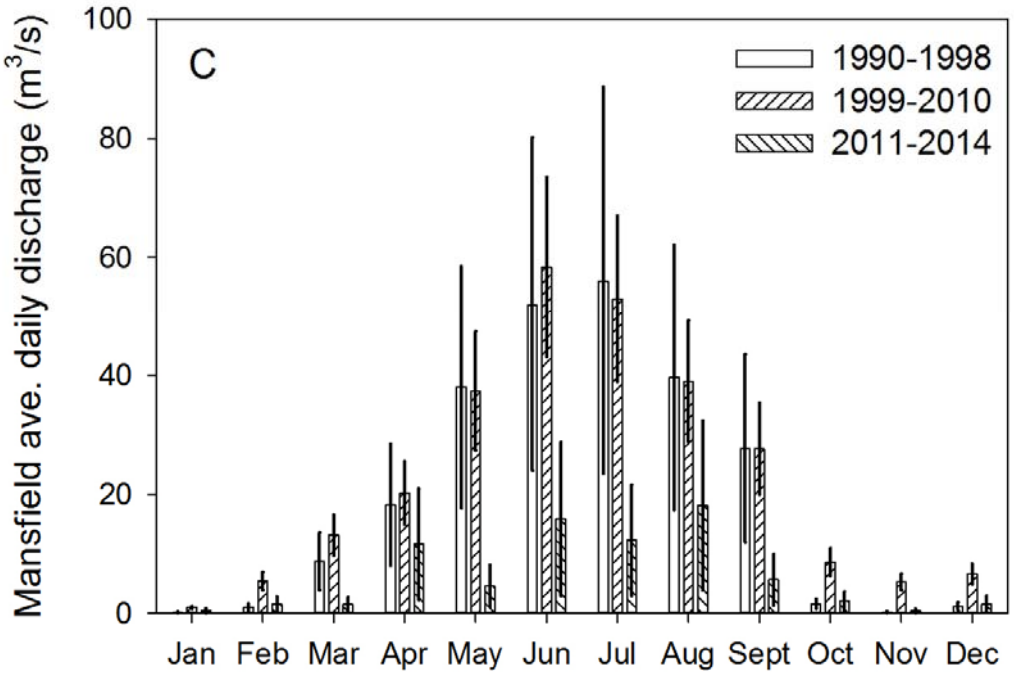
- **Warm temperatures**
- **Nutrient thresholds**



# Drivers

## Cyanobacteria growth follows regular seasonal cycles

- **Warm temperatures**
- **Nutrient thresholds**
- **Low flows, water column stability**



# Cyanobacteria Presence = HAB Event?

## Seasonal patterns and models were for Lake Austin phytoplankton (Bellinger et al. 2018)

- **No toxins associated with previous planktonic blooms when tested (Bellinger 2018)**

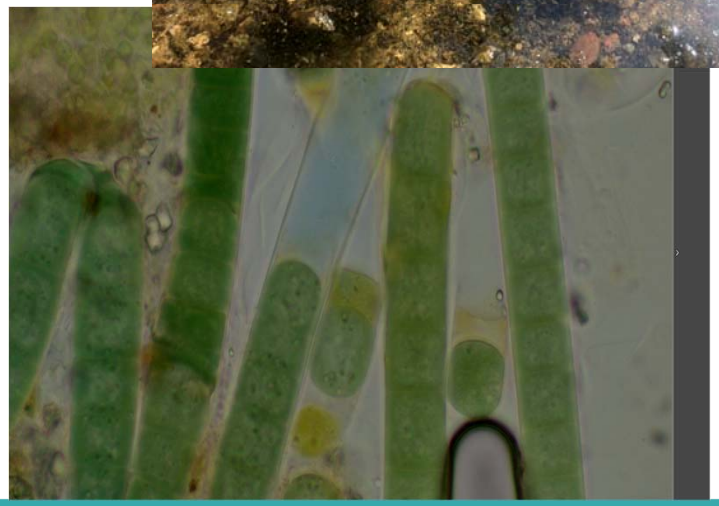
## Not all species that can produce toxins are actively producing toxins (some species may not even have the potential)

## Meaning, without direct testing, cannot know for certain if a HAB is present

- **HAB events *tend* to occur in systems with highly elevated nutrient concentrations**

# What Happened in 2019?

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



**Species in the Order Oscillatorialles**

- Many known toxin producers in this group

**Within algae mats dihydroanatoxin dominant**

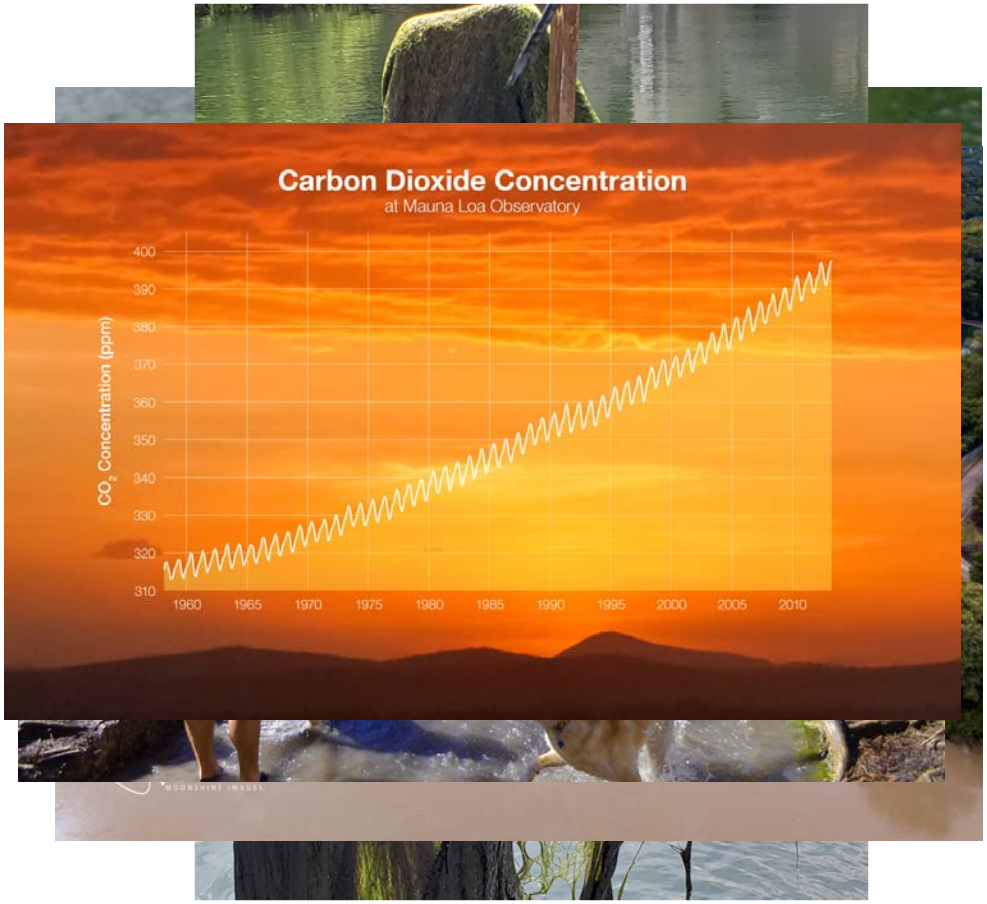
**Contents = <1 – 5.3 μg/g wet weight (what does that mean??)**

- California action level for acute mat intake by a dog – 0.3 mg/kg DW
- Currently working on normalizing units

# What Made 2019 Different?

## Aforementioned drivers still apply, but why a benthic HAB event?

- **Zebra mussels? (new)**
  - Different benthic algal mat last year
- **Larger flooding, runoff, depositional events? (new)**
- **Dog waste? (old)**
- **Climate change? (new)**



# Next Steps

## Awareness!

- For the public: Communication about algae blooms, drivers, interacting with algae, what is and is not (potentially) harmful
- For WPD: With this year's HAB, benthic algae will be screened during critical times of year to ensure public safety

## New Collaborations and Research Needs

- Partners: University of Texas, Texas A&M – Corpus Christi
- Develop additional models, alter sampling strategy during "critical" bloom period
- Test influence of new drivers (e.g., spring rains/sediment loading)
- Look at mitigation approaches (e.g., flushing)

# Questions?