March 19, 2024

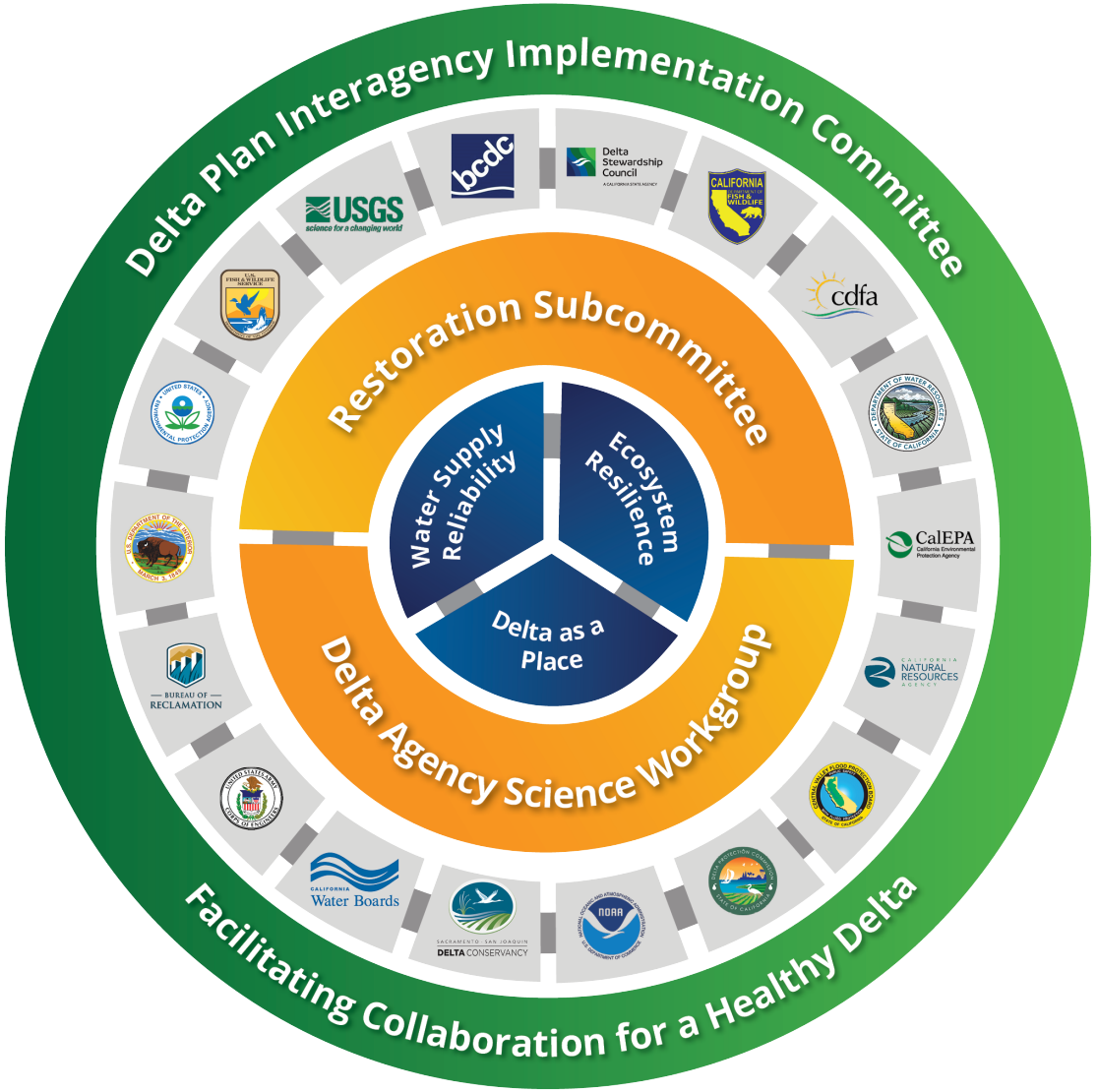
Delta Agency Science Workgroup

Dr. Lisamarie Windham-Myers, Interim
Delta Lead Scientist

Delta Plan Interagency Implementation Committee

DELTA STEWARDSHIP COUNCIL

Welcome


Delta Plan Interagency Implementation Committee
Restoration Subcommittee
Water Supply Reliability
Ecosystem Resilience
Delta as a Place
Delta Agency Science Workgroup
Facilitating Collaboration for a Healthy Delta
bcdc
Delta Stewardship Council
USGS
science for a changing world
CALIFORNIA FISH & WILDLIFE
cdfa
CalEPA
California Environmental Protection Agency
CALIFORNIA NATURAL RESOURCES AGENCY
BUREAU OF RECLAMATION
CALIFORNIA Water Boards
DELTA CONSERVANCY
NOAA

Delta Science Program

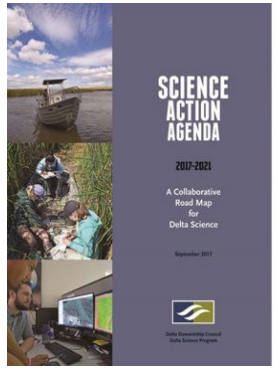
- **Mission:** provide the **best possible unbiased scientific information** to inform water and environmental decision-making in the Delta

Photo: Hans W. Paerl

Delta Science Program Core Functions

Our program is organized around core areas of our mission from the Delta Reform Act

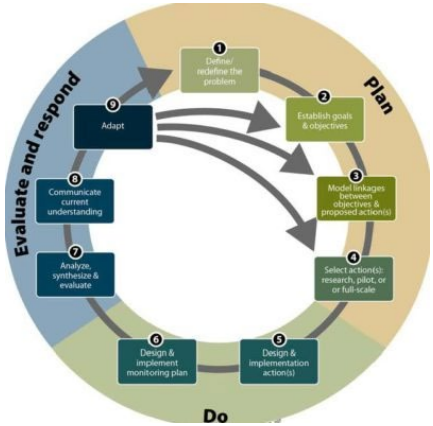
Leadership in Collaborative Science



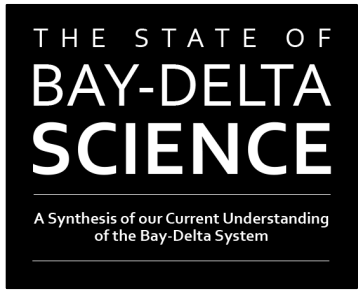
Science Funding

Science Communication

Adaptive Management Support



Synthesis



Support for the Independent Science Board

Peer Review & Advice

Why Harmful Algal Blooms?

- Concerns that blooms will increase in frequency and severity due to ongoing drought and climate change
- **No HABs monitoring is consistently conducted or funded**
- Although sampling occurs, there is a need for increased coordination amongst many groups working on HABs in the Delta

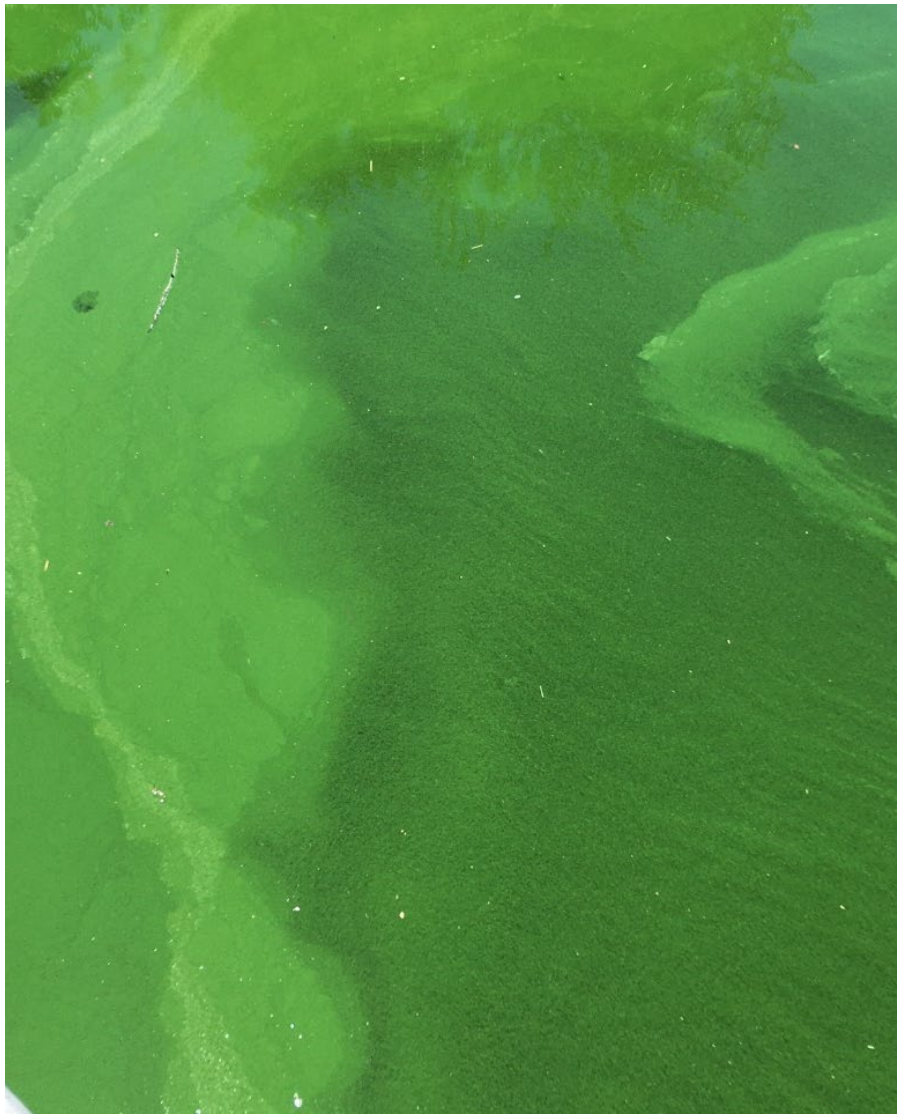


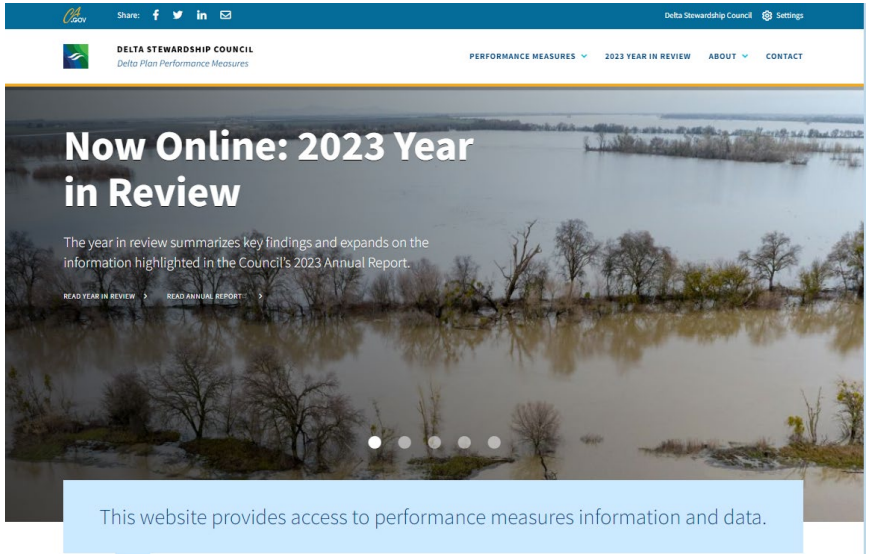
Photo by Janis Cooke, CVRWQCB

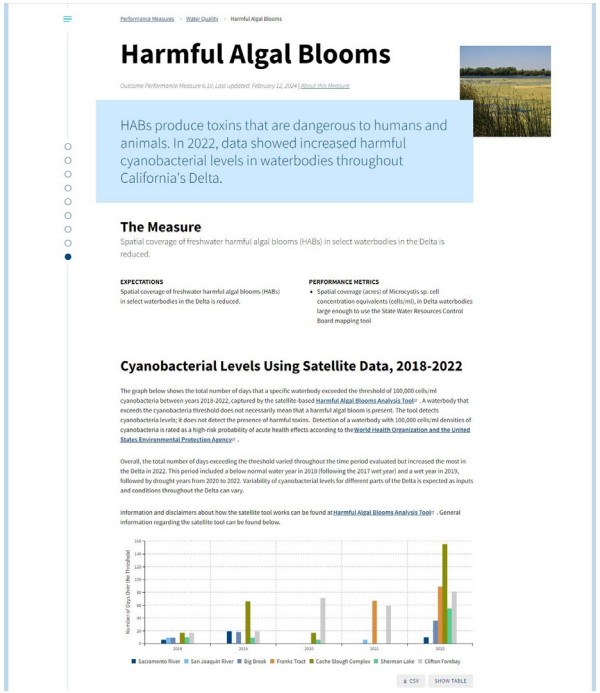
Delta Plan

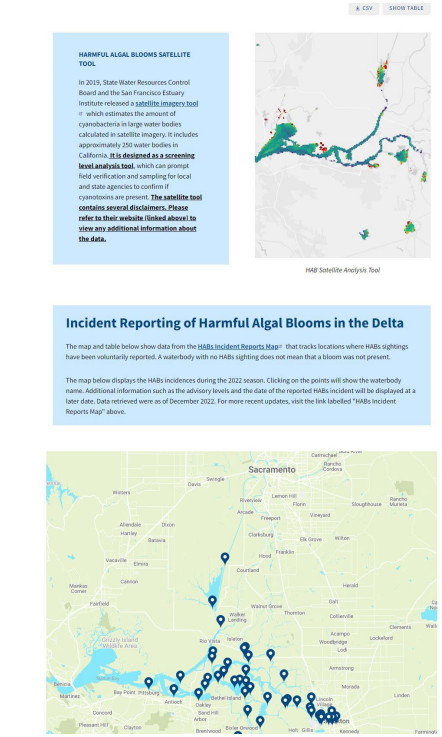
HABs Performance Measure

- “Spatial coverage of freshwater HABs in select waterbodies in the Delta is reduced.”

- Additional information: Viewperformance.deltacouncil.ca.gov

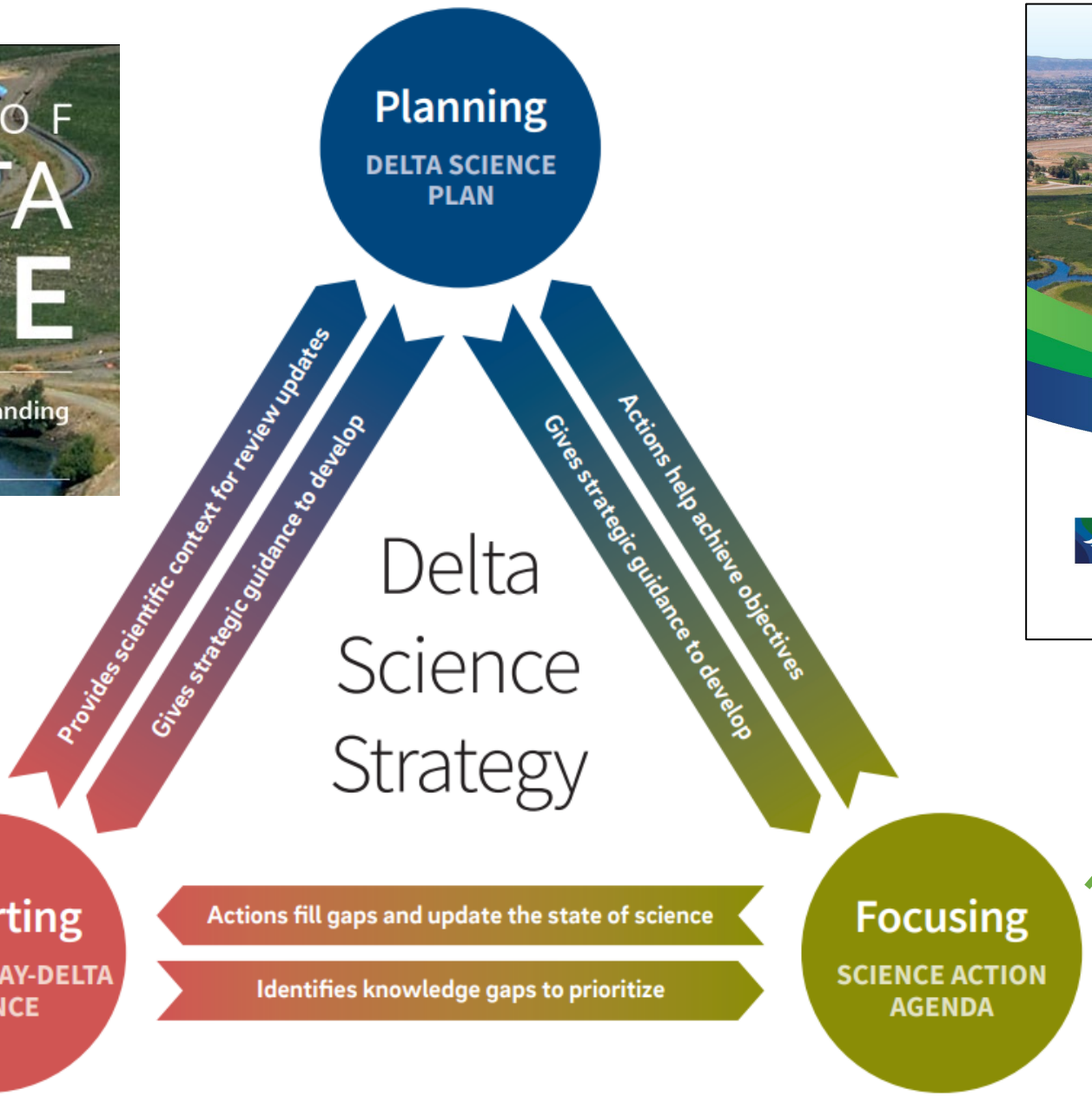


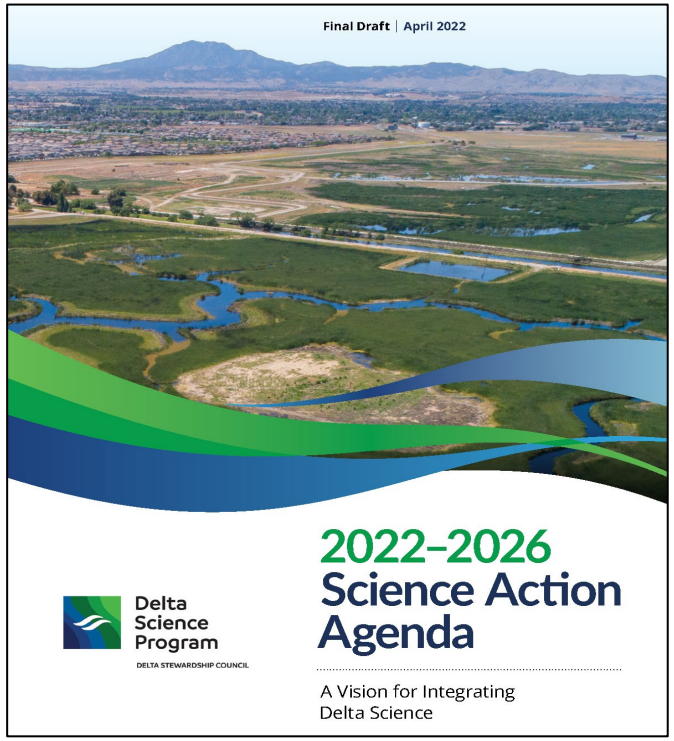




HABs in the Delta Science Strategy and Estuary Blueprint

December 2022 edition features HABs synthesis (Bay-Delta geographic focus)





Two priority science actions in 2022-2026 Science Action Agenda address HABs research needs

Delta CHABs Monitoring Strategy

- Request by the Central Valley Regional Water Quality Control Board and the California Department of Fish and Wildlife in 2021
- Hosted public workshop November 2022 to hear from community members
- Further engagement with Tribes and Environmental Justice experts held in fall 2023
- Kickoff workgroup for community collaboration started January 2024

Department of Water Resources · State of California

Restore the Delta · For a Healthy Estuary and Community

DWR · USBR · USFWS · SWRCB · CDFW · USEPA · USACE · NMFS · USGS

Interagency Ecological Program

Cooperative Ecological Investigations Since 1970

USGS science for a changing world

California Water Boards

State Water Resources Control Board · Regional Water Quality Control Boards

California Department of Fish & Wildlife

Delta Science Program

Delta Stewardship Council

Delta Plan Interagency Implementation Committee

DELTA STEWARDSHIP COUNCIL

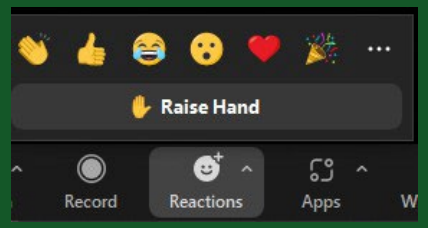
Don't hear anything?
Try adjusting your "Audio Settings"

Delta Agency Science Workshop Meeting

March 19, 2024

- Please raise your hand if you wish to speak / for any questions or comments
- Any technical issues or as an alternative way to provide public comment:
  - email engage@deltacouncil.ca.gov or…
  - call/text **(916) 902-6459**

- If participating via Zoom's online platform, use the "raise hand" feature to indicate you would like to comment.



- If participating by telephone, dial *9 to raise your hand

Today's Speakers – Delta CHABs Monitoring Strategy

- Dr. Mine Berg
  Senior Environmental Scientist
  Environmental Science Associates

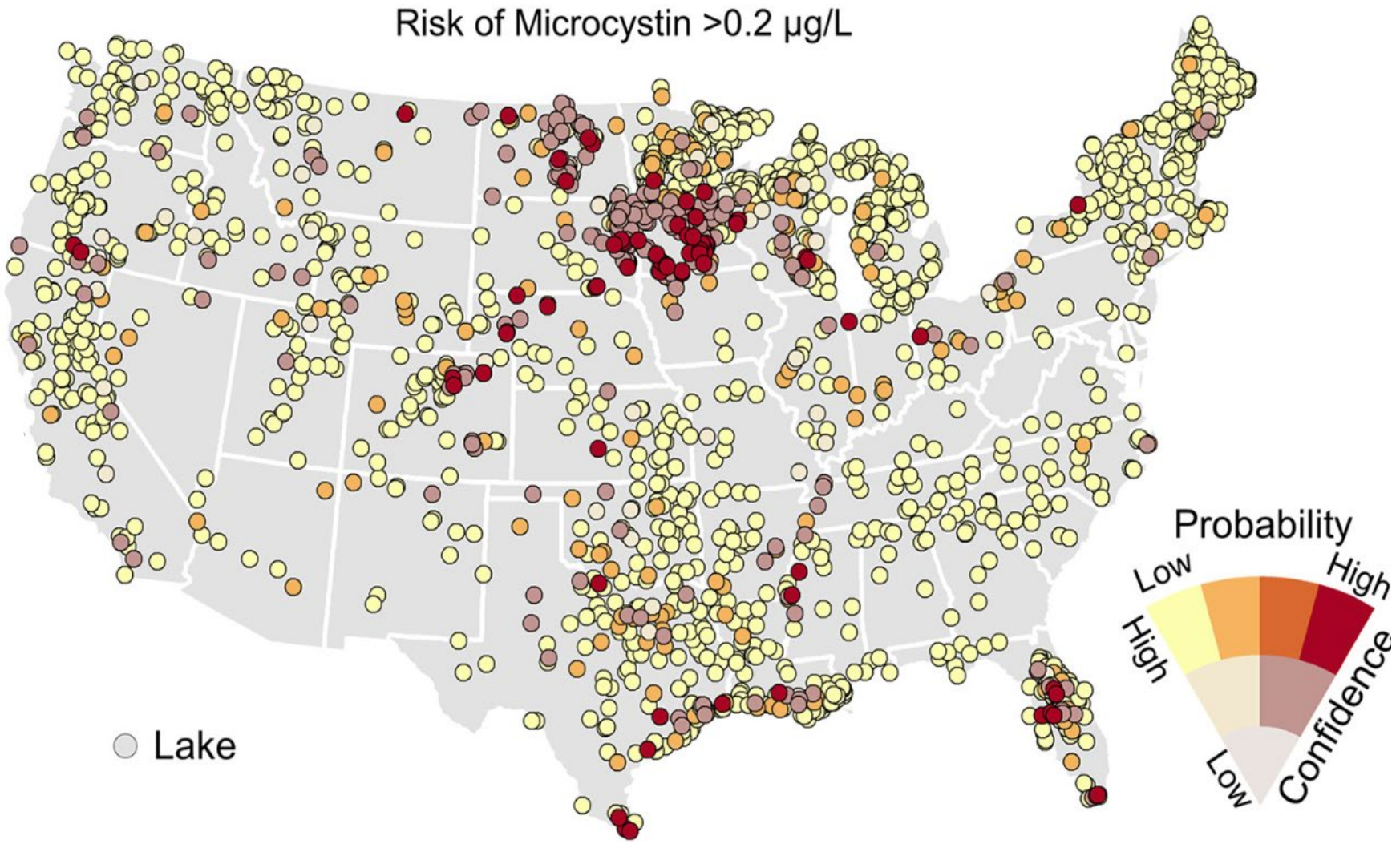
- Tricia Lee
  Senior Environmental Scientist
  Delta Science Program

- Dr. Ellen Preece
  Senior Environmental Scientist
  Department of Water Resources

Introduction to HABs

Dr. Mine Berg

Cyanobacterial Harmful Algal Blooms (CHABs)



Handler et al./ Science of the Total Environment (2023)

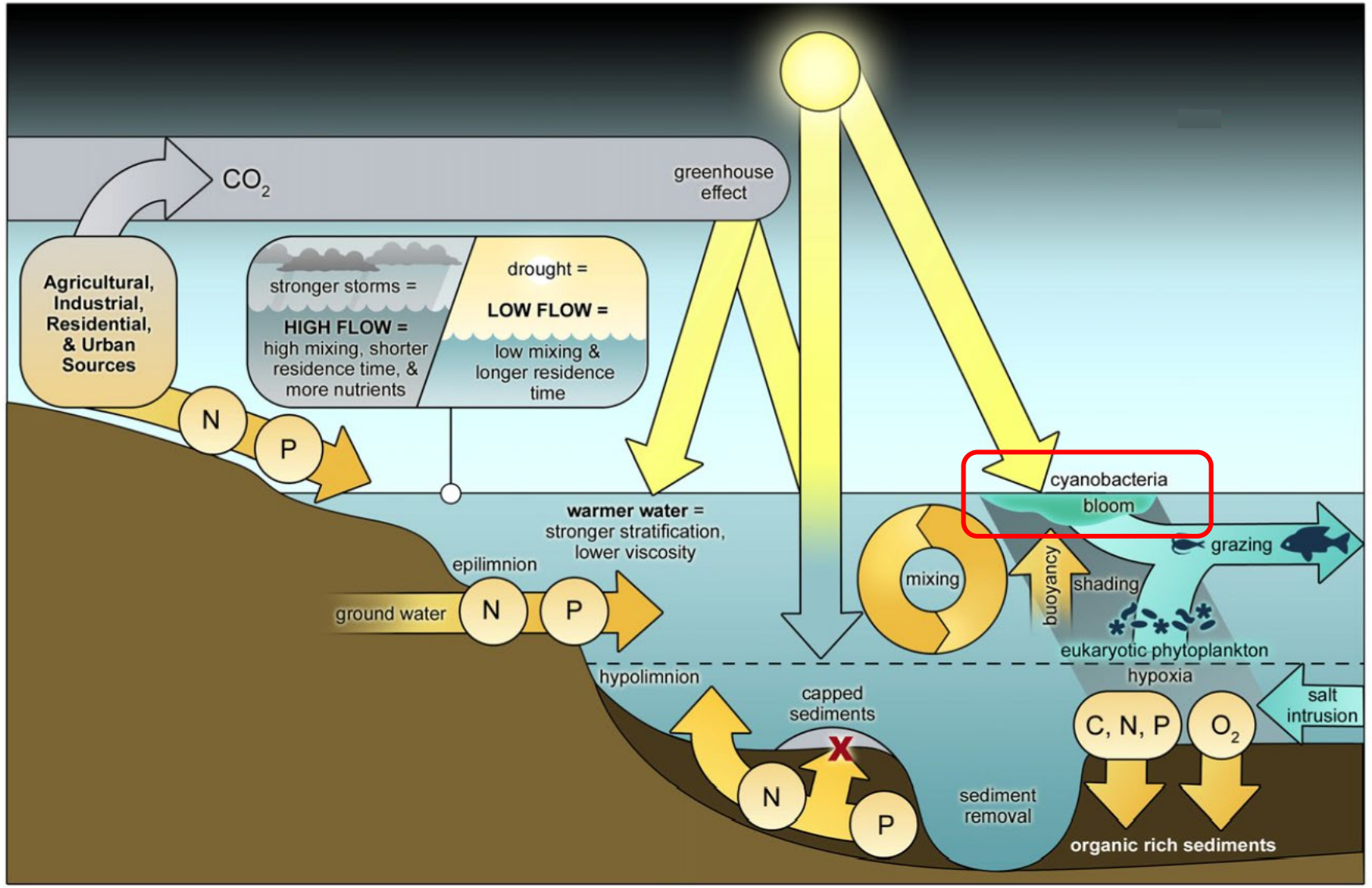
Drivers of CHABs

Environmental Drivers

- Drought
- Low flow
- Longer residence time
- Stronger stratification
- Calm water
- Warmer water
- Low mixing

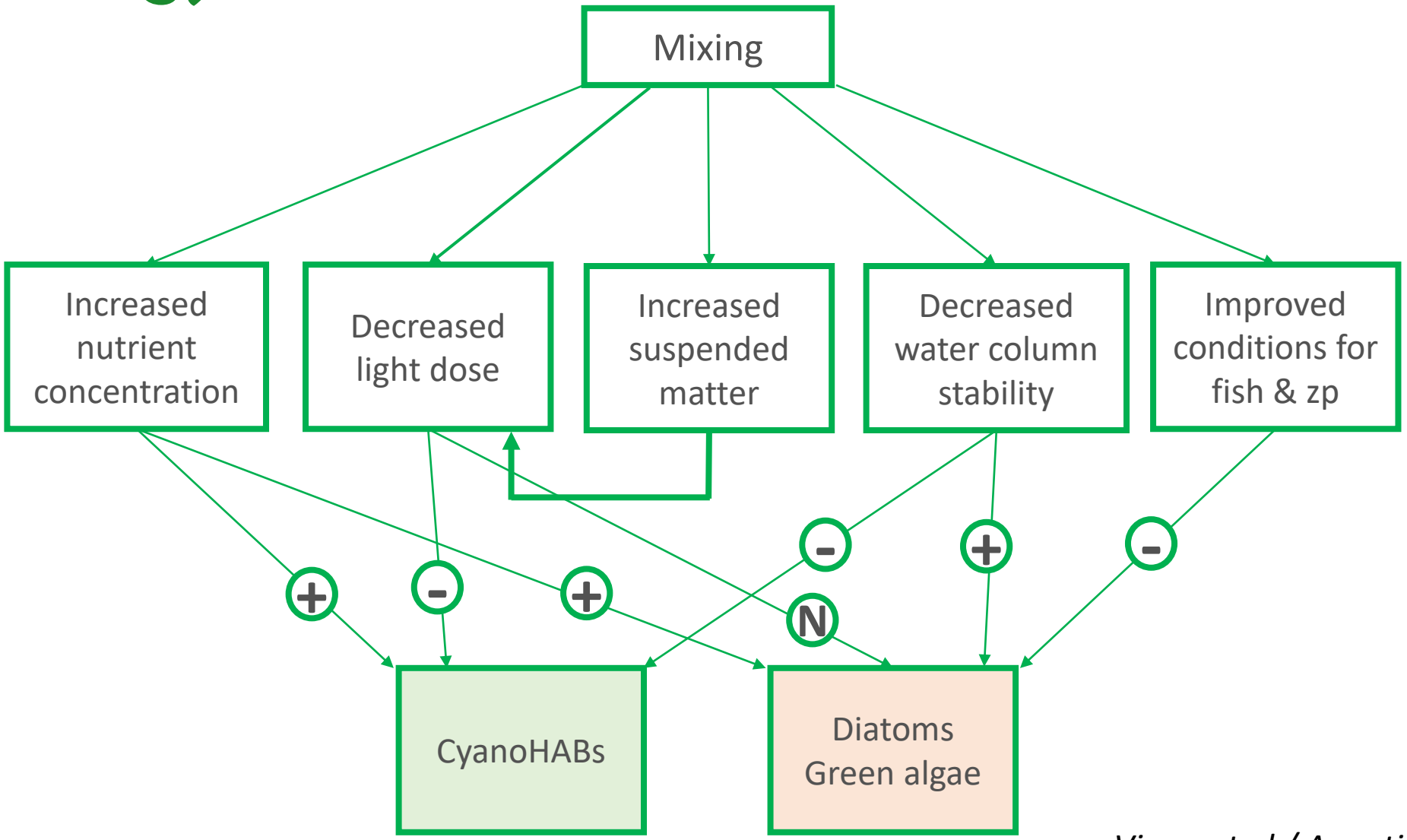
Physiological drivers

- High-light acclimated
- Low photosynthetic efficiency
- Buoyancy regulation



Paerl et al. / Science of the Total Environment (2011)

Interaction between mixing and CHAB species physiology



Visser et al / Aquatic Ecology (2015)

CHABs in the Sacramento-San Joaquin Delta

Characteristics

- Tidally influenced
- High riverine sediment transport
- High suspended sediment concentrations
- Relatively high flow
- Well mixed

Dominant CHABs in the Delta

Microcystis

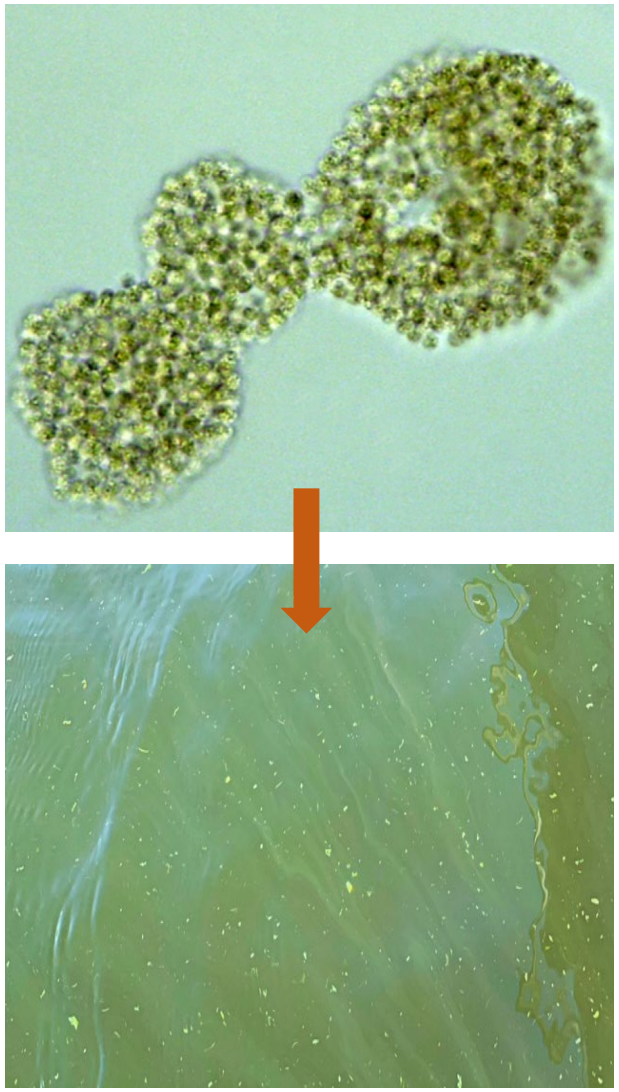


Photo by Ellen Preece

Dolichospermum

Photo by Ted Flynn

Aphanizomenon

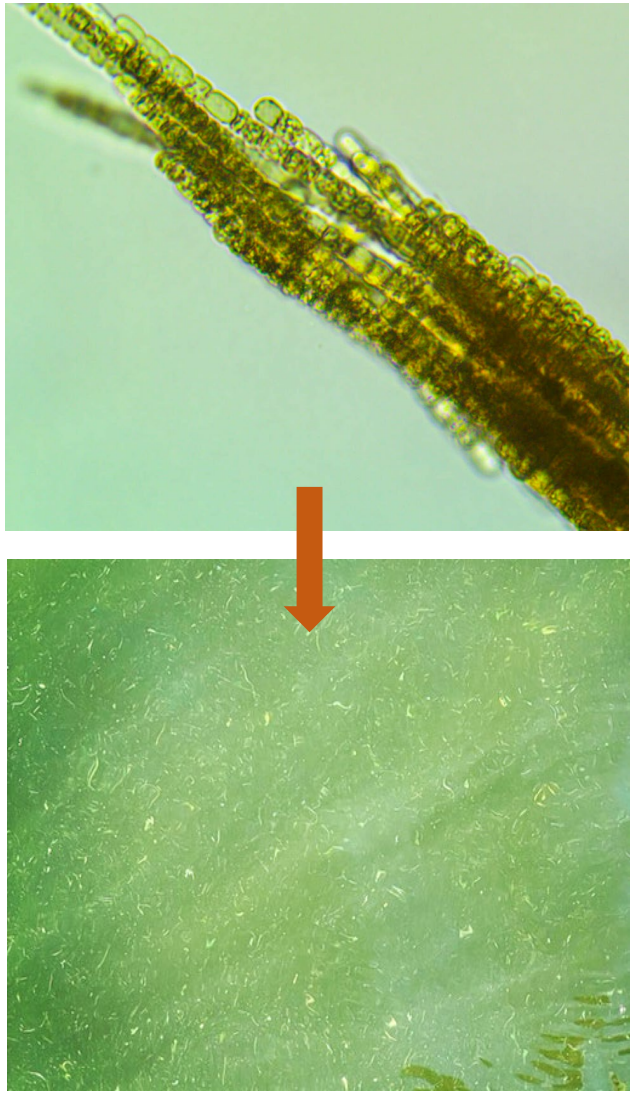
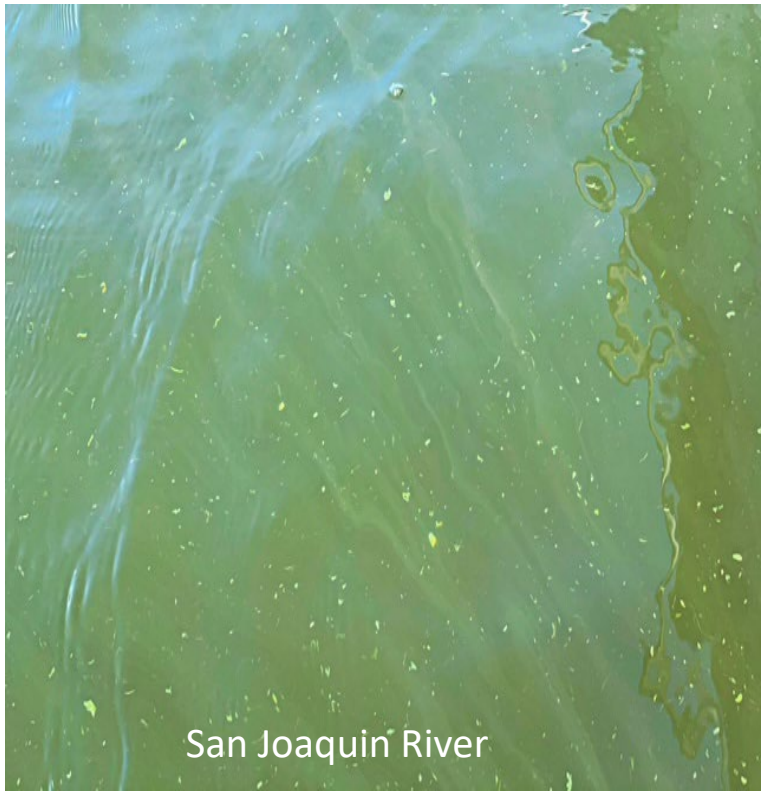


Photo by Ellen Preece

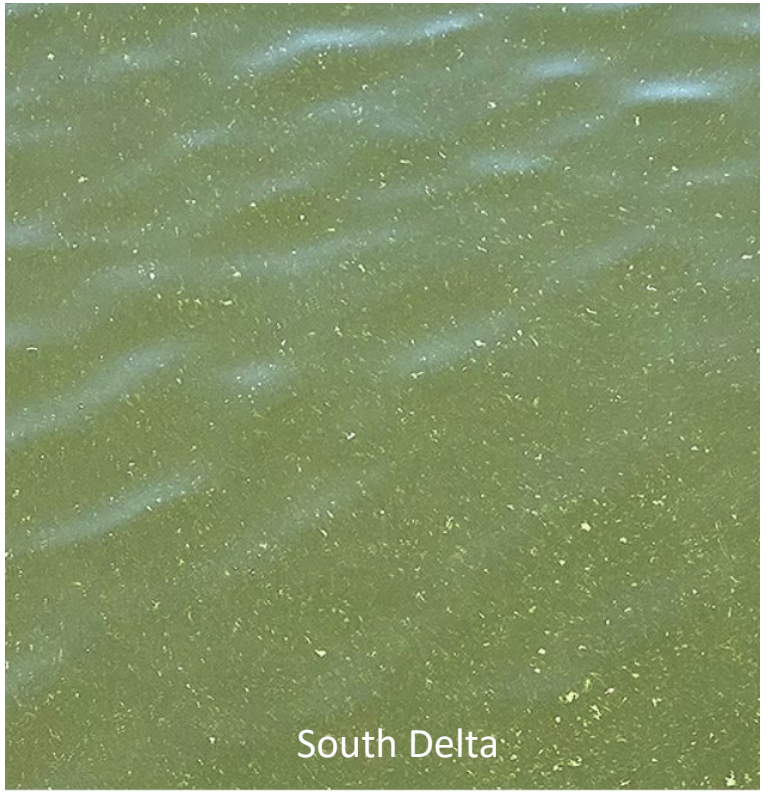
Microcystis Lettuce Morphologies

A. Dense

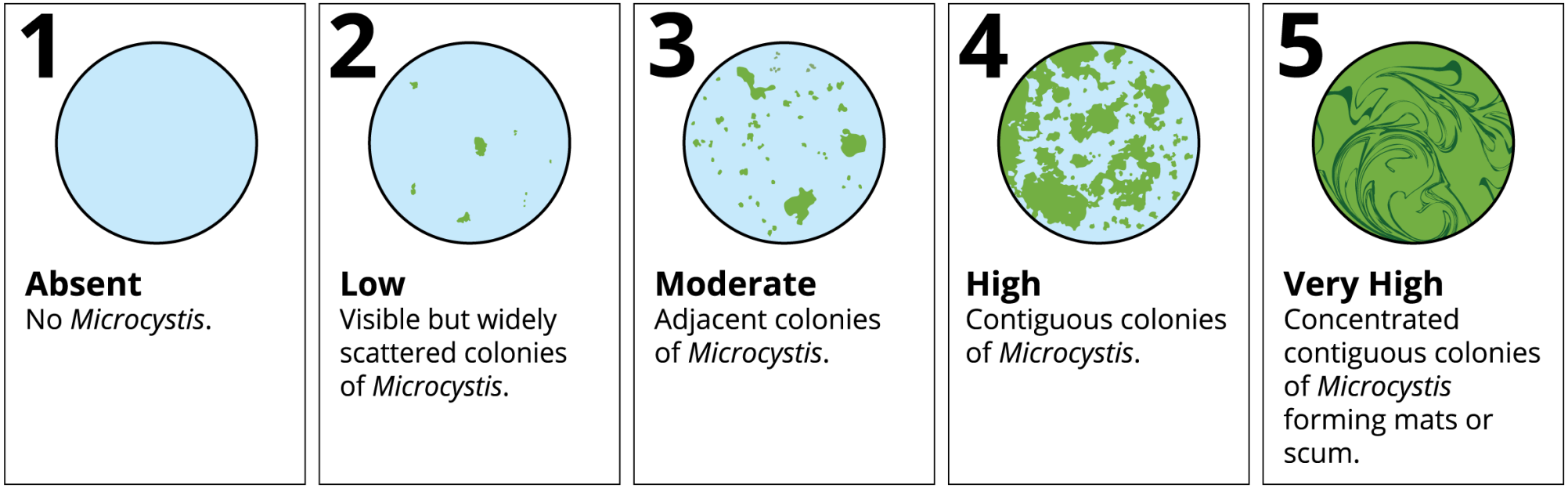
B. Sparse



C. Intermediate



Microcystis Visual Index (MVI) Method



Visual Ranking of *Microcystis* colony density in water

- Performed by ranking density of colonies in water from 1 (absent) to 5 (concentrated)
- Collected with bucket and by looking over the side
- Prone to observer bias
- Samples collected by three agencies throughout the Delta since 2007

Different conditions driving densities of *Microcystis*

A. Dense

Marinas & dead-end channels

- Low flow
- Calmer and warmer water
- Deeper euphotic zone relative to total depth

B. Sparse

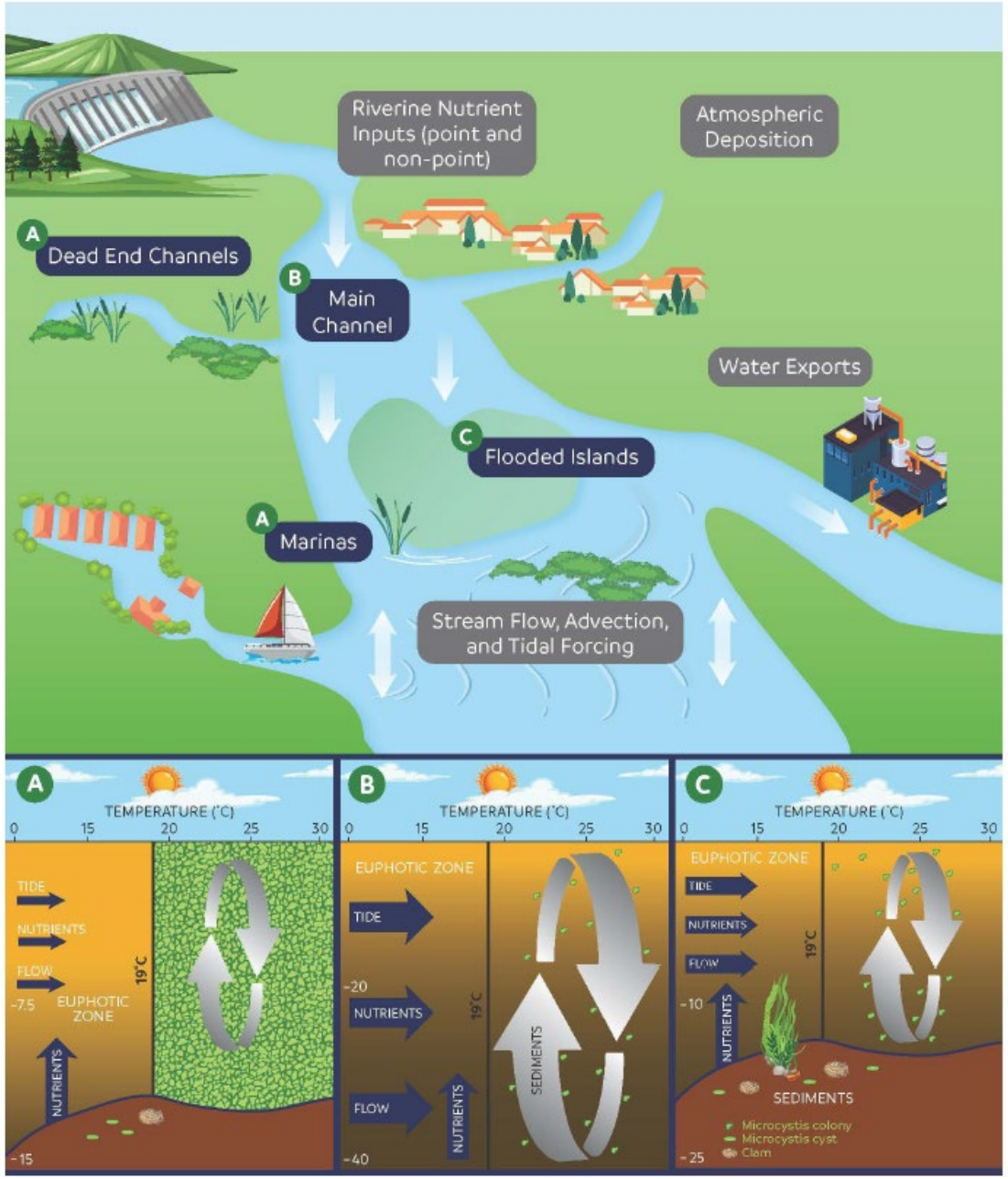
Main channels

- High flow
- Well mixed
- Shallow euphotic zone relative to total depth

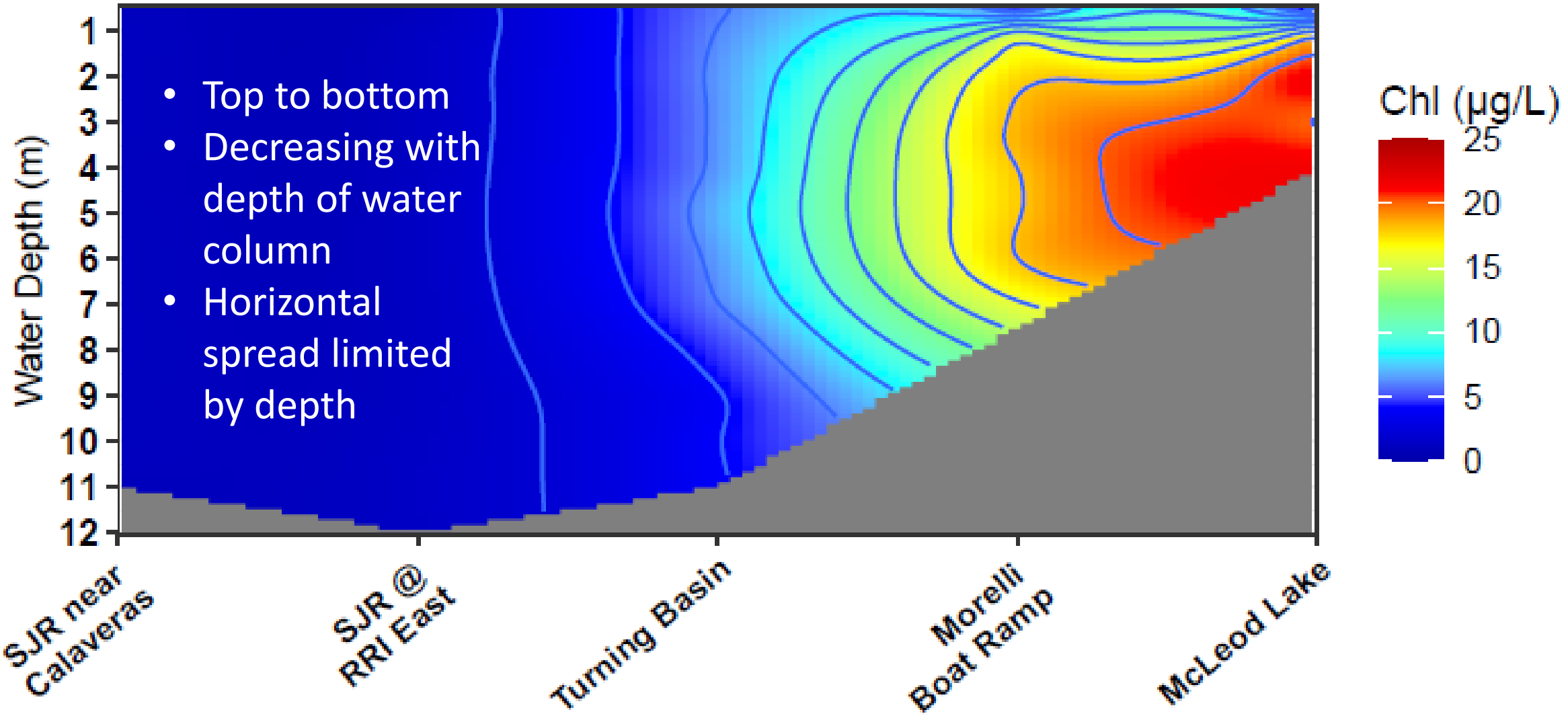
C. Intermediate

Flooded islands

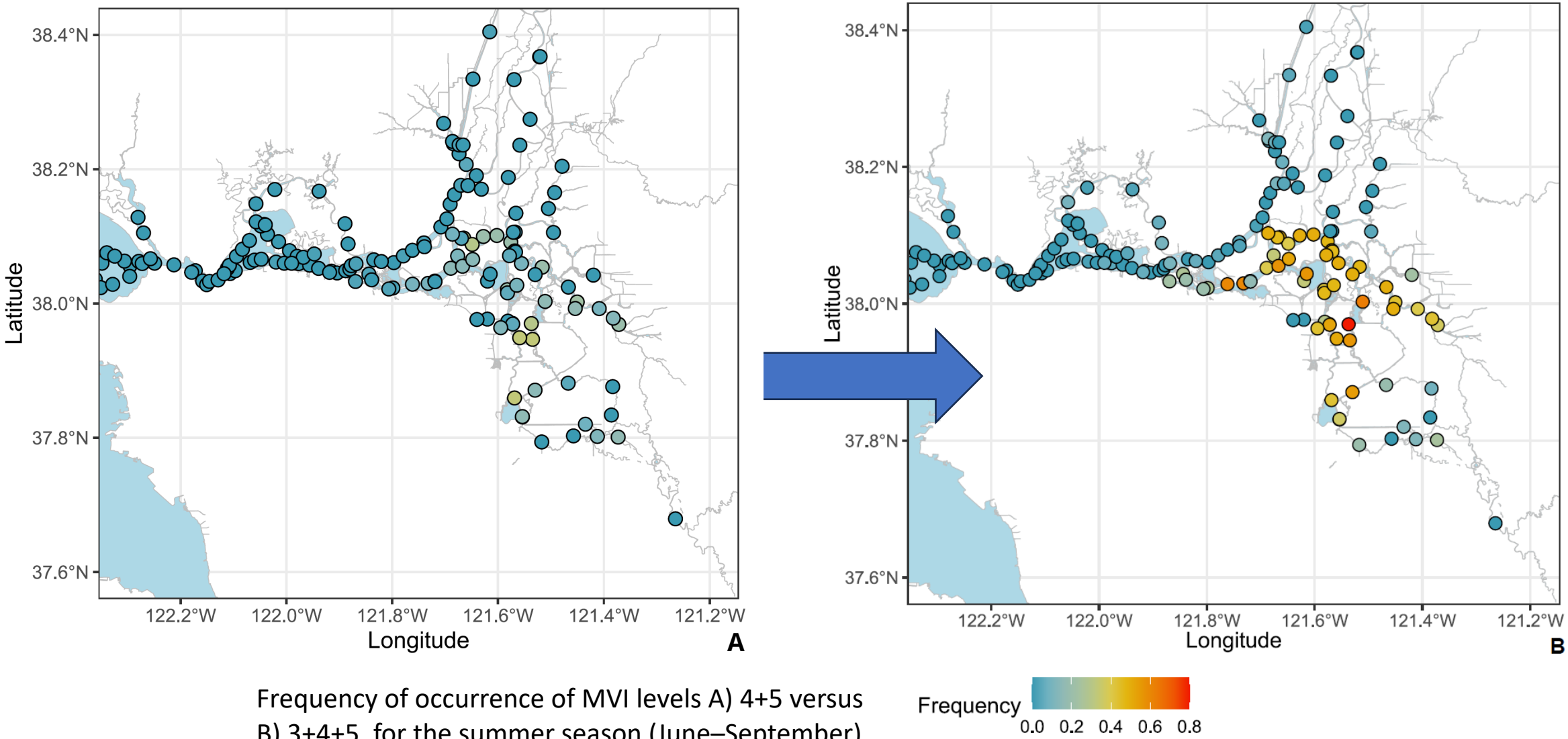
- High flow
- Well mixed
- Deeper euphotic zone relative to total depth



Vertical and horizontal chlorophyll distribution during a *Microcystis* bloom



Locations with high vs moderate MVI observations



Frequency of occurrence of MVI levels A) 4+5 versus B) 3+4+5, for the summer season (June–September) and recent time period (years 2017–2022)

Introduction to CHABs Topic Discussion

Delta Plan Interagency Implementation Committee

DELTA STEWARDSHIP COUNCIL

Knowledge Gaps and Collaboration Opportunities

Tricia Lee

Delta Plan Interagency Implementation Committee

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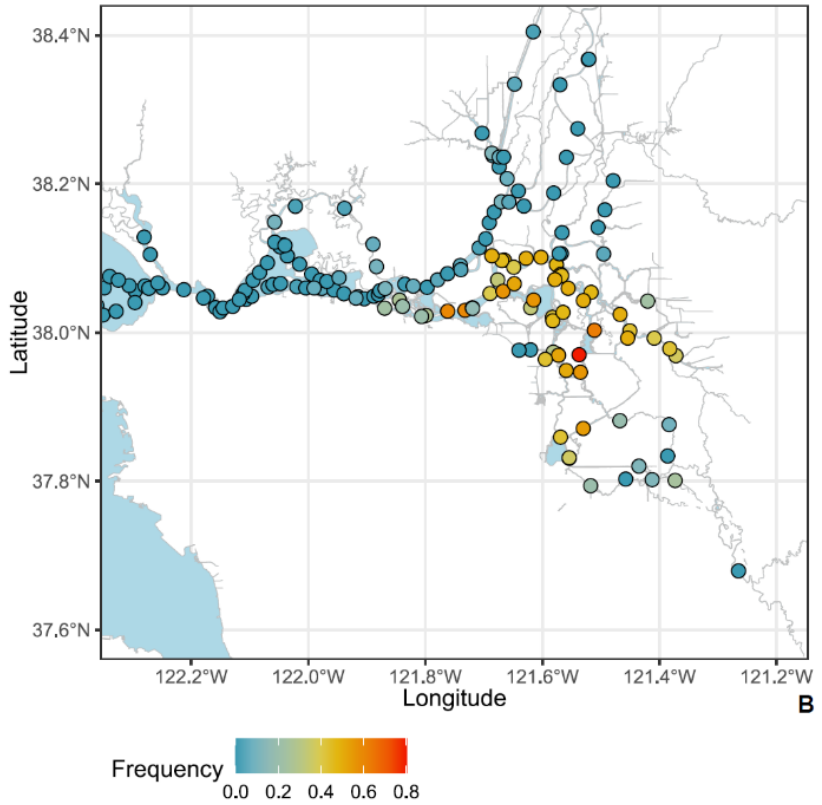
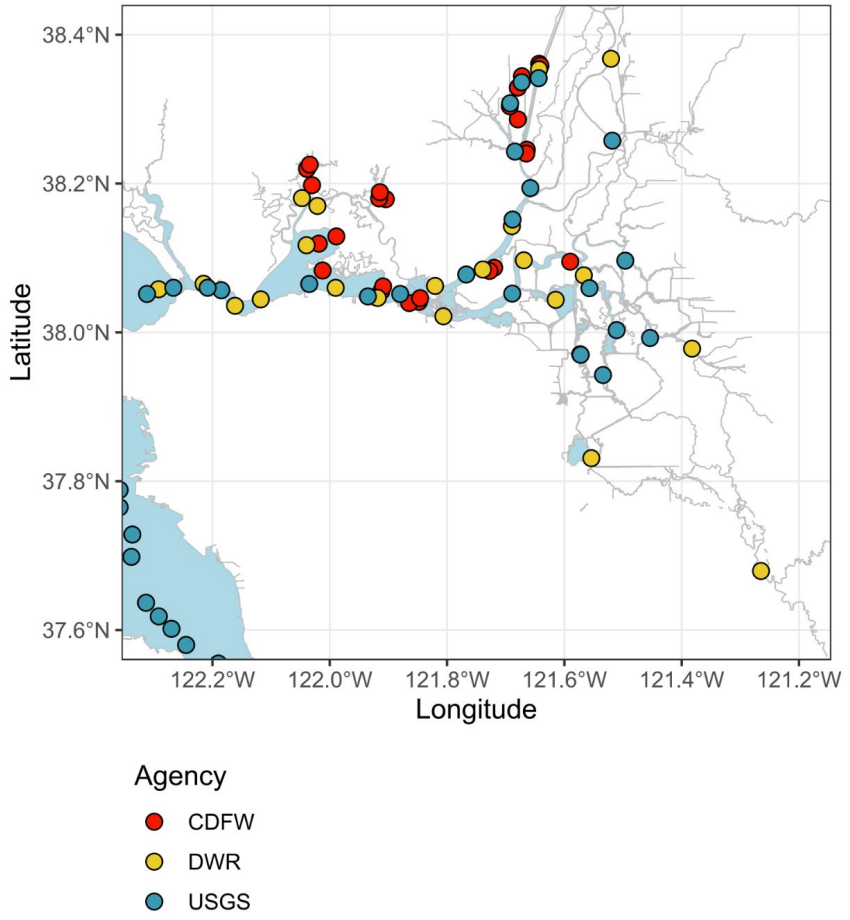
Incidence of Microcystis and Regularly Monitored Sites



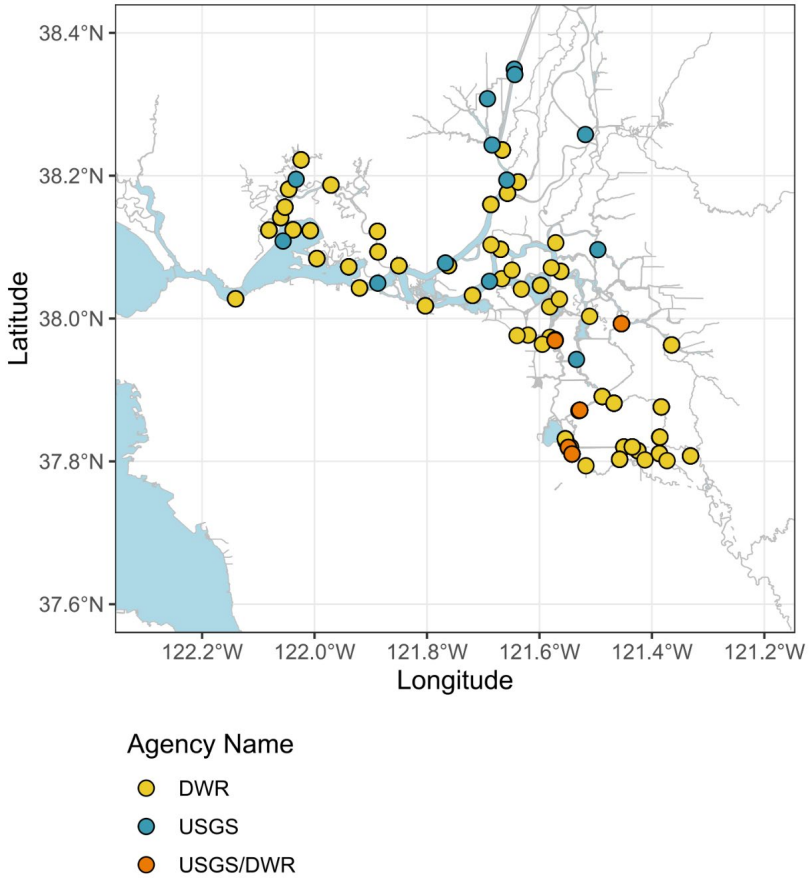
Frequency of occurrence of MVI levels 3+4+5, for the summer season (June–September) and recent time period (years 2017–2022) for individual stations in the Delta



Phyto ID Sites

Need for Delta Cyanobacterial HABs Monitoring Strategy

- Current Delta CHAB monitoring is not adequately coordinated
- Important variables are understood, including nutrients, temperature, residence time
- However, we lack detailed information about CHAB status and trends and drivers
- This knowledge is needed to implement mitigation measures or adequately forecast CHABs



Map of continuous water quality stations that measured pH, dissolved oxygen, electrical conductivity, temperature, and chlorophyll.

Data and Collaboration Gaps

Data Gaps	Collaboration Gaps
• Broader water quality monitoring does not inform CHAB dynamics and mitigation strategies • No standardized suite of methods and analyses for CHABs	• Agency data collection can be better coordinated

• Despite general understanding of drivers, less understanding of
  • specific changes in the environment that could impact CHABs (i.e., site-specific processes, climate change)
  • interaction of drivers to cause CHABs
	• Data is not publicly available in an accessible format
	• No formal mechanism to collaborate with interested parties and communities

• Not enough information or funding to realistically implement mitigation measures or adequately forecast CHABs	

Collaboration and Data Gaps Topic Discussion

Delta Plan Interagency Implementation Committee

DELTA STEWARDSHIP COUNCIL

Goals, Objectives, and Recommendations

Dr. Ellen Preece

1

DEFINE PROBLEM

There is a need for a collaborative and cohesive Delta cyanobacteria harmful algal bloom (CHAB) monitoring strategy

2

IDENTIFY DATA AND COLLABORATION GAPS

- Lack of routine monitoring
- Data only available for limited locations
- Need better understanding of drivers and interaction of drivers
- Collaboration gap amoung state agencies
- No mechanism for collaboration
- Need standardized monitoring, easily accessible data, and training opportunities

3

DEFINE GOALS AND OBJECTIVES

1. Enhance collaboration
2. Identify management questions and goals
3. Develop monitoring program
4. Develop collaborative reporting protocols
5. Identify a data sharing platform

4

IMPLEMENT RECOMMENDATIONS

- Accomplishable over a 3-5 year time period
- Focus on water quality management decisions
- Leverage other projects when possible
- Will need funding and partner buy-in to accomplish all recommendations

5

LEARN AND ADAPT

As knowledge base increases due to implementation of the strategy, the structure proposed can be iteratively applied to evaluate progress toward defined management goals and to inform adjustments to the strategy, as needed.

Monitoring Strategy Goals

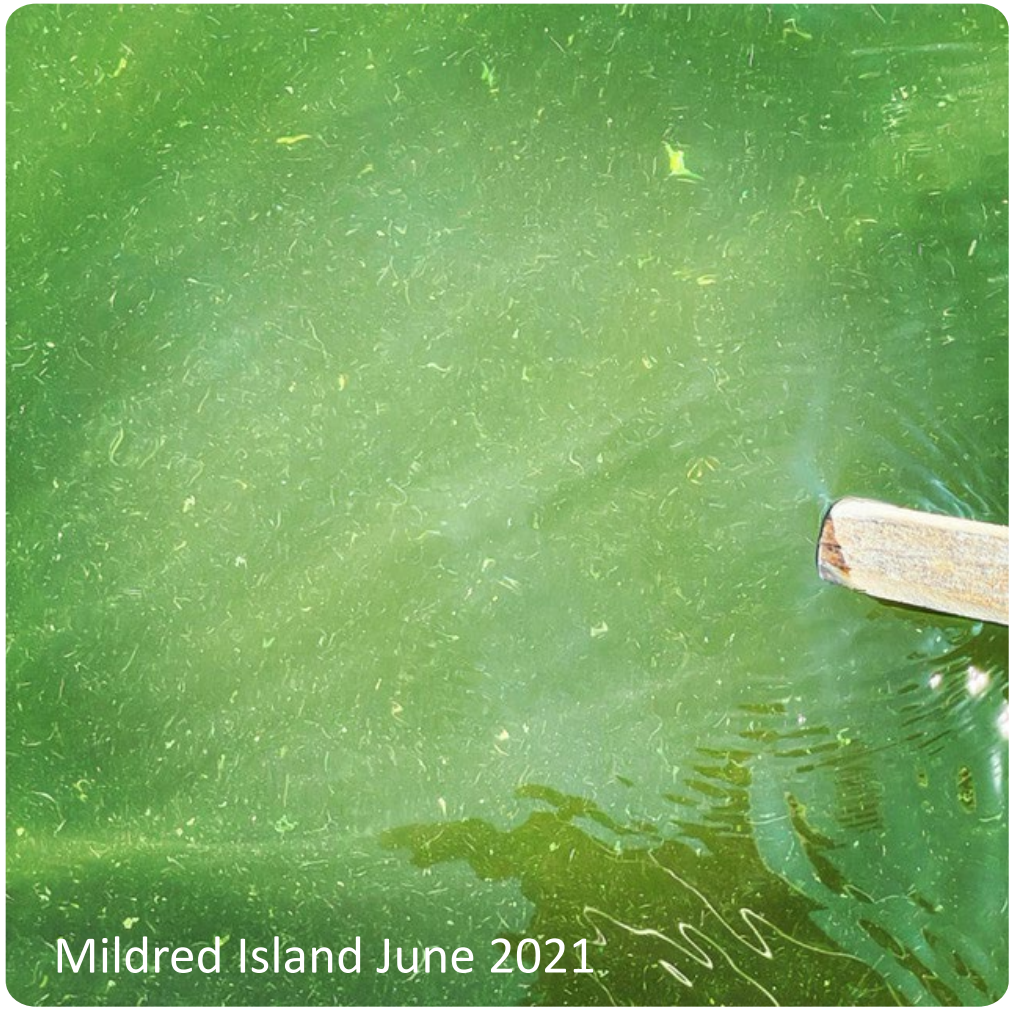
Goal 1: Enhance Delta CHAB Collaboration

Goal 2: Identify monitoring question, goals, and objectives

Goal 3: Develop a Delta CHAB monitoring program

Goal 4: Develop collaborative reporting protocols

Goal 5: Utilize a data sharing platform



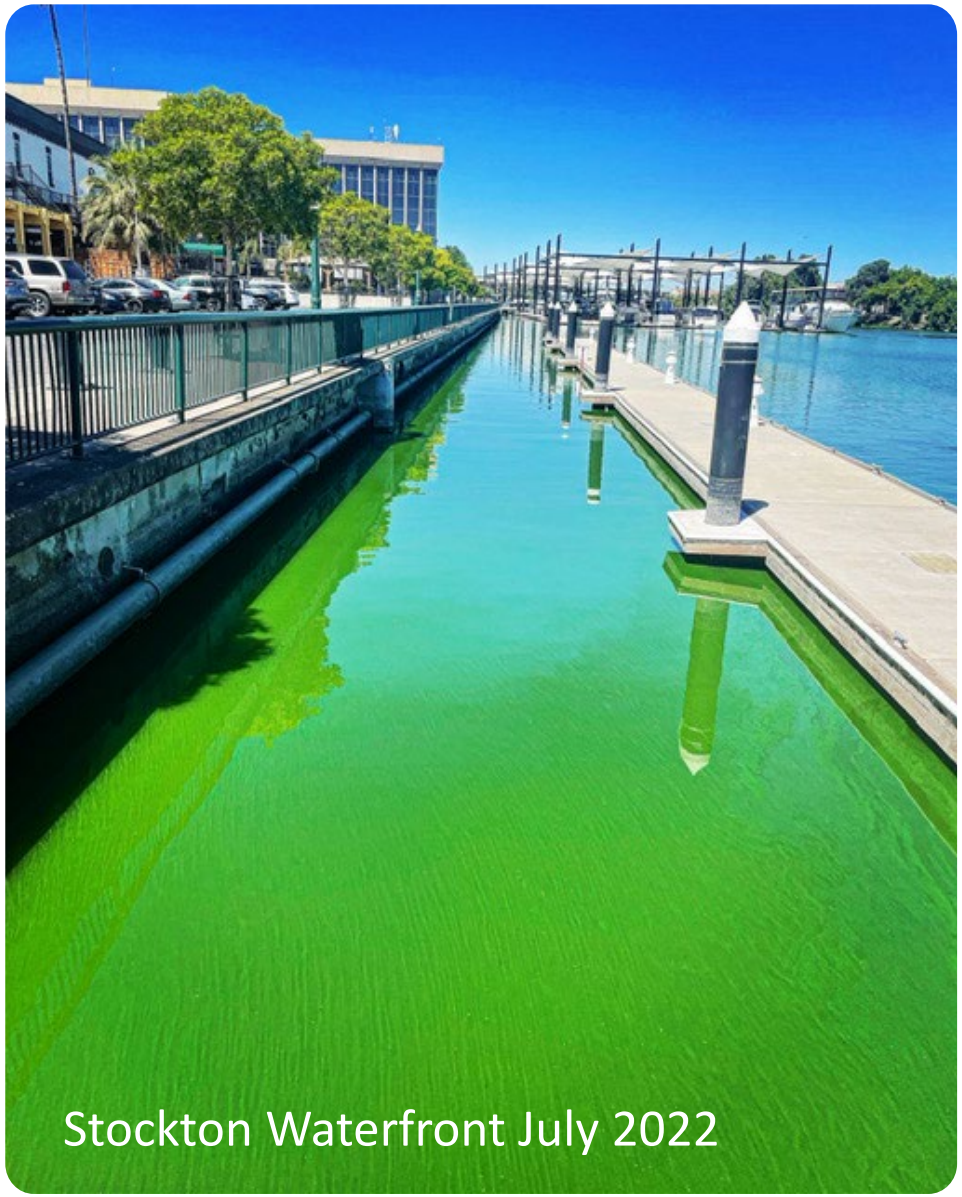
Goal 1: Enhance Delta CHAB Collaboration

- Objective 1-1 Organize collaborative approach to implement Delta CHAB Strategy
- Objective 1-2 Promote coordination, collaboration, and communication among agency and community partners
- Objective 1-3 Identify mechanisms to ensure sustainability of long-term Delta CHAB monitoring and collaboration.

Goal 1: Enhance Delta CHAB Collaboration

Recommendation 1.5 Hold an annual meeting focused specifically on Delta CHABs

- To capture the different needs of the various agencies, dischargers, Tribes, and partner organizations, the Delta CHAB Monitoring Strategy will need to be implemented in a collaborative and coordinated manner.
- Hosting an annual meeting for Delta CHABs allows ongoing coordination amongst various interested parties.



Goal 2: Identify monitoring questions, goals, and objectives

- Objective 2-1 Identify how monitoring results will be used by decision makers
- Objective 2-2 Consider data and monitoring gaps needed to answer management priorities
- Objective 2-3 Determine how to prioritize questions and goals

Goal 2: Identify monitoring questions, goals, and objectives

Recommendation 2.1 Consider the amount and type of monitoring information needed by managers to support decision making

Category	Management question (large/regional spatial scale)	Example of decisions that are supported by the monitoring	Management question (small/localized monitoring scale)	Examples of decisions that are support by the monitoring
Status	What is the overall magnitude and spatial extent of CHABs within the Delta region?	• Prioritize waterbodies or hydrologically distinct areas; • Inform status and trends report to the public	Are CHABs degrading water quality in this area of the Delta and what is the timing of when CHABs occur?	• Public health advisory posting; • Inform changes to compliance monitoring

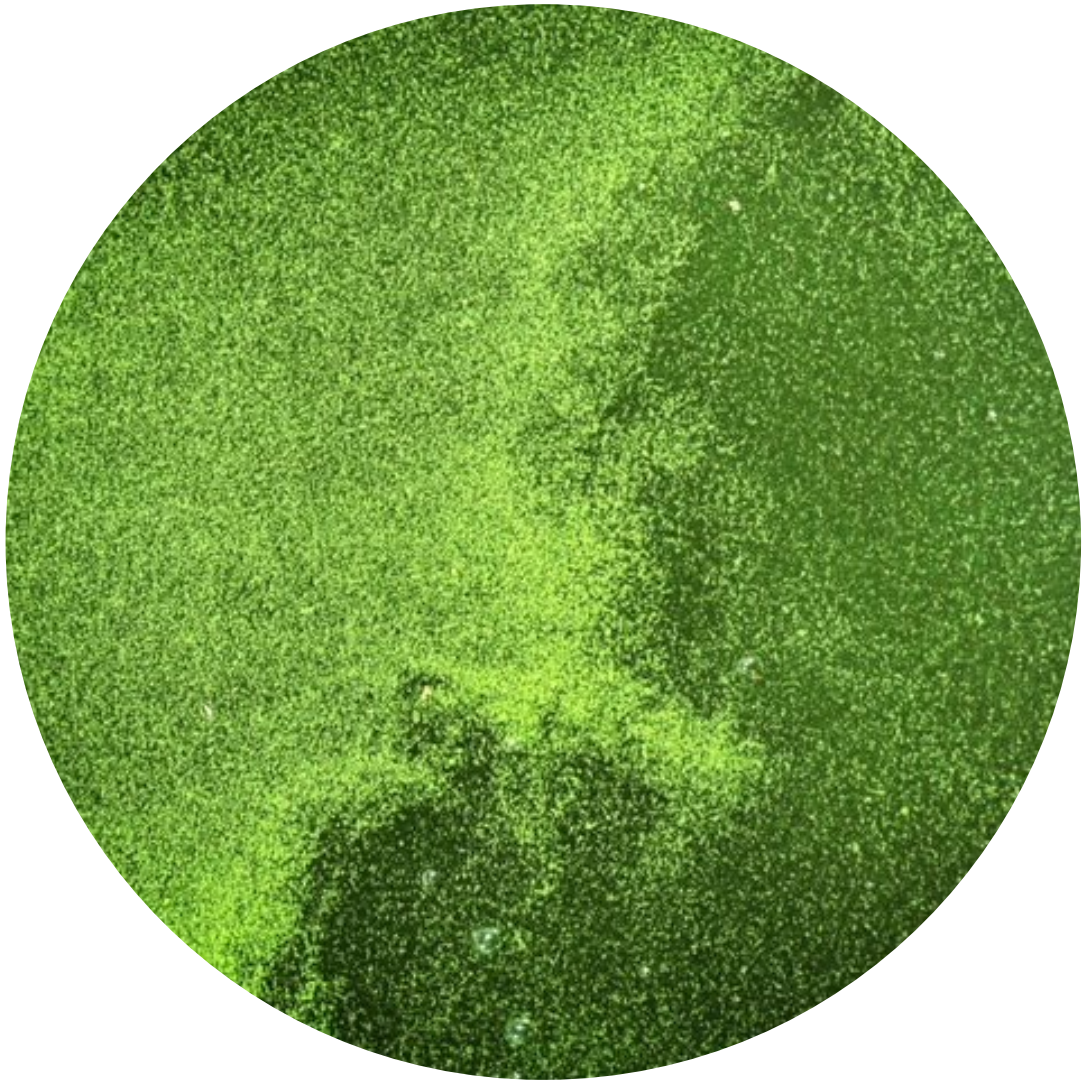
Goal 3: Develop a Delta CHAB monitoring program

Objective 3-1 Identify specific monitoring program(s) needed to achieve the management questions and goals

- Objective 3-2 Identify priority monitoring parameters, locations, sampling period/frequency, and methods for the monitoring program(s)

- Objective 3-3 Create implementation guidance for Delta CHAB monitoring

- Objective 3-4 Synergize Delta CHAB monitoring with ongoing HAB efforts



Goal 3: Develop a Delta CHAB monitoring program

Recommendation 3.1 Based on the goals and objectives developed in Goal 2 identify monitoring programs and special studies needed to achieve outcomes

Management Question	Geographic	Spatial, temporal, frequency	Metrics	Data	Additional Considerations
Which hydrologically distinct areas of the Delta are at risk of experiencing CHABs?	• Identify locations known for having CHABs • Identify locations that may be prone to CHABs based on hydrologic characteristics	• Identify sampling frequency to capture bloom development • Consider the number of samples needed to represent distinct areas	• Select relevant driver data for chosen site	• Do methods and SOPs meet data management and quality control measures to be used for management decisions?	• How much data is needed to inform management decisions? • How can this work be leveraged with ongoing routine water quality monitoring?

Goal 4: Develop collaborative reporting protocols

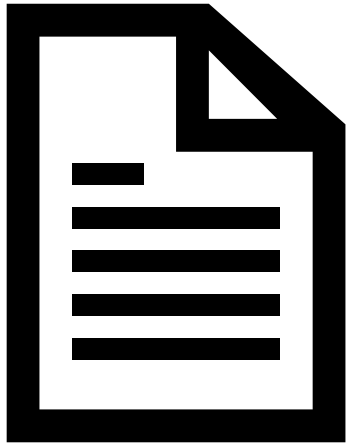
- Objective 4-1 Validate and standardize current methods used for monitoring CHABs
- Objective 4-2 Develop protocols for accurate and timely reporting

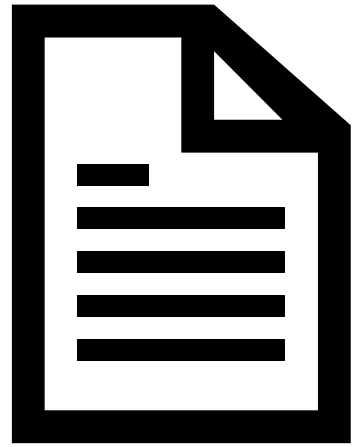
Stockton Waterfront July 2022

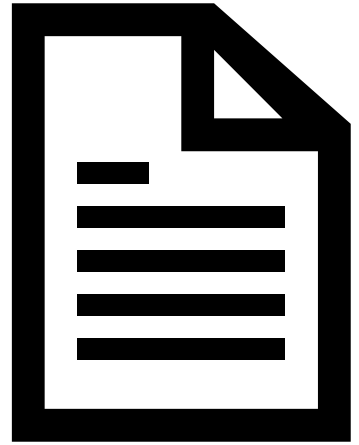
Goal 4: Develop collaborative reporting protocols

Recommendation 4.1 Compare, review, and standardize sampling and laboratory methods

Standardizing protocols and laboratory analysis across the Delta is important for ensuring that monitoring data collected by different groups are consistent and comparable







Goal 5: Utilize a data sharing platform

- Objective 5-1 Identify existing CHAB and HAB data repository platforms
- Objective 5-2 Explore how to integrate Delta CHAB monitoring data with existing data repositories
- Objective 5-3 Develop protocols to make CHAB data accessible and available to all

Goal 5: Utilize a data sharing platform

- *Recommendation 5.2 Coordinate with the NOAA MERHAB data dashboard*

Table 1. List of data streams that will be integrated into decision support tool dashboards. Bold text indicates new data streams generated by the MERHAB project.

Entity	Type	Locations	Data
Continuous data			
SFEI	**Continuous data Mooring**	Shoal moorings	fCHL, temp, turbidity
USGS	Continuous data mooring	San Mateo and Dumbarton Bridges	Temp, conductivity, turbidity
USGS	Continuous data Mooring	Suisun Bay, Confluence	fCHL, temp, turbidity, nitrate, conductivity
NOAA	Station	Alameda island	Tides, temperature, wind speed
Discrete data			
NMS	Discrete	Shoals	Nutrients, chl-*a*, phytoplankton
DWR EMP	Discrete	San Pablo and Suisun Bay	Nutrients, chl-a, phytoplankton
USGS Peterson	Discrete	Lower South Bay to Sacramento River	Nutrients, chl-*a*, phytoplankton
SF Baykeeper	**Community Science Microscopy**	East Bay	Phytoplankton
CDPH	Discrete	Pacific Ocean	Mussel toxins and phytoplankton
Remote sensing			
Sentinel 3 OLCI	**Remote sensing**	Bay	Chl-*a*
Sentinel 2 MSI	**Remote sensing**	Delta	Chl-*a*, cyanobacteria

Implementation of Delta CHAB strategy

- Leverage MERHAB
- State Water Board funding USGS to develop monitoring design(s)
- Delta Stewardship Council will continue hosting collaborative work groups to implement pieces of the strategy
- 19 special studies are recommended that various groups could choose to lead

Goals, Objectives, and Recommendations Topic Discussion

Delta Plan Interagency Implementation Committee

DELTA STEWARDSHIP COUNCIL

15 Minute Break

Delta Plan Interagency Implementation Committee

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Next Steps

Tricia Lee

Delta Plan Interagency Implementation Committee

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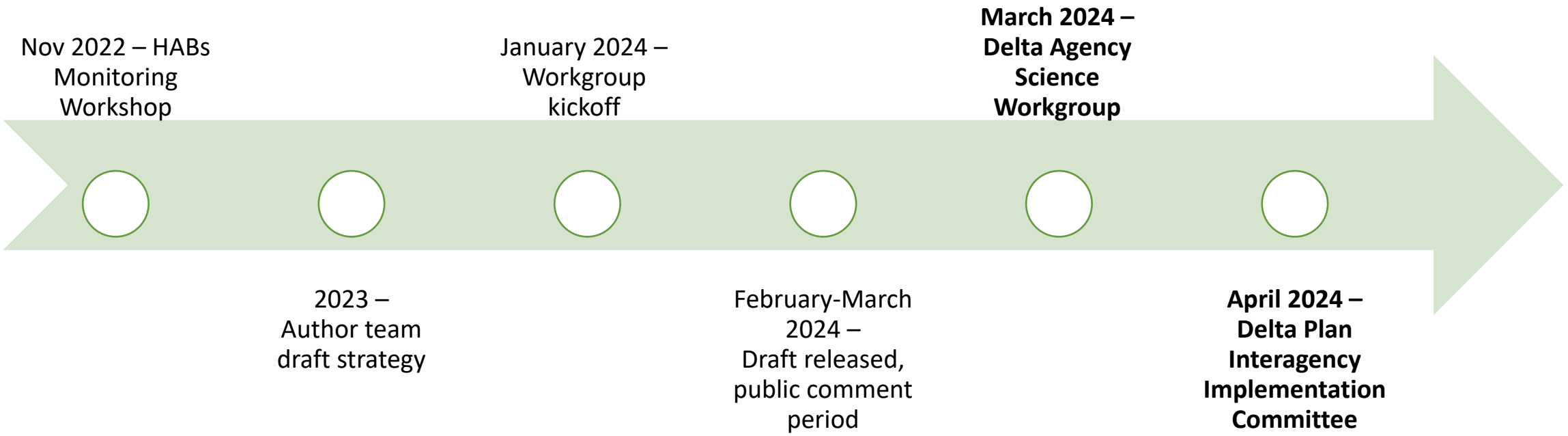
Timeline


Nov 2022 – HABs Monitoring Workshop
2023 – Author team draft strategy
January 2024 – Workgroup kickoff
February-March 2024 – Draft released, public comment period
March 2024 – Delta Agency Science Workgroup
April 2024 – Delta Plan Interagency Implementation Committee

Delta Plan Interagency Implementation Committee (April 15)

- Present on elements of the strategy
- Share major feedback and edits from public comment period and Delta Agency Science Workgroup
- Ask for endorsement

Next Steps

Recommendation 1.1 Identify co-chairs of mechanism for someone to lead coordination and implementation of the Delta CHAB Strategy

Recommendation 1.2 Form advisory committee to develop final goals, questions, and monitoring strategy

- If the strategy is endorsed by DPIIC, a working group will be convened by the Delta Science Program shortly after to implement these first recommendations. These working groups will be used as a vehicle for implementation and create a shared responsibility amongst interested groups.

Next Steps Discussion

Open Discussion and Questions

Public Comment

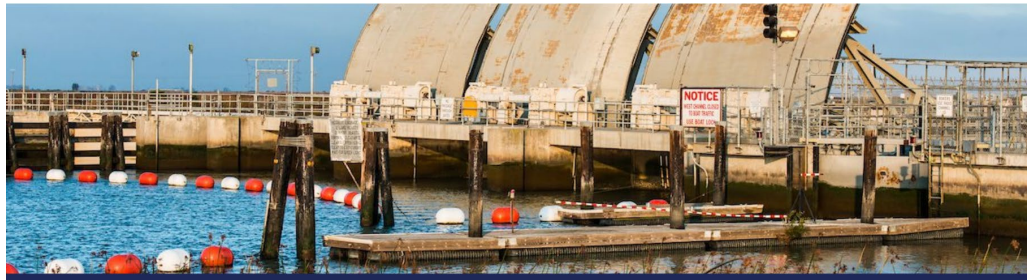
Delta Plan Interagency Implementation Committee

DELTA STEWARDSHIP COUNCIL

Other DASW Announcements

Dr. Lisamarie Windham-Myers

Salinity Management Workshop – March 26-27



Salinity Management Workshop 2024

March 26-27, 2024

9:00 AM-3:30 PM

Zoom

#salinitymanagement

Day 1: March 26

1. **PLENARY**: Welcome, overview, and opening remarks
2. **KEYNOTE PRESENTATION**: Salinity management challenges and opportunities
3. **BREAKOUT GROUPS**: Building conceptual models of salinity management actions, their tradeoffs, and key uncertainties
4. **BREAKOUT GROUPS**: Creating "actor maps" to visually depict the key groups and individuals that are affected by salinity management
5. **PRESENTATION**: The state of salinity modeling in the Delta

Day 2: March 27

1. **PRESENTATION**: Delta salinity during drought: Modeling salinity management from regional response to statewide scales
2. **BREAKOUT GROUPS**: Providing feedback on important metrics and ways to visualize modeling results and discussing tradeoffs and concerns
3. **PRESENTATION**: Co-design and modeling
4. **BREAKOUT GROUPS** : Discussing what should be prioritized in future research and modeling efforts
5. **WORKSHOP WRAP-UP**: Discussion of the next steps

For more information, visit: https://deltacouncil.ca.gov/events

Public Comment

Delta Plan Interagency Implementation Committee

DELTA STEWARDSHIP COUNCIL

General Public Comment

This comment period is for comments on matters that are not on the agenda and are within the subject matter jurisdiction of the Subcommittee.

Public comment on the Delta CHABs Monitoring Strategy can also be submitted via email to: collaborativescience@deltacouncil.ca.gov or mailed to the following address by 5:00 PM on March 28, 2024, to be considered for the final monitoring strategy.

Delta Science Program
715 P Street, 15-300
Sacramento, CA 95814

Meeting Adjourned

Thank you

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