

LAKE ST. CLAIR CLEAN WATER INITIATIVE
INTRA-COUNTY DRAINAGE BOARD
MARCH 13, 2023
10:30 A.M.
AGENDA

**NOTE: THIS MEETING WILL BE HELD IN PERSON WITH TELECONFERENCE
OPTION FOR PUBLIC**

**Call in Number: 1-224-990-0182
Access Code: 927 405 823**

	Page
1. Call of meeting to order and roll call	
2. Approval of Agenda for March 13, 2023	
3. Approval of Minutes for September 14, 2020	3
4. Public Participation	
5. Lyngbya in Lake St. Clair Study/USACE Grant Agreement – Jeff Bednar	5
Motion: To approve the Lungbya study grant agreement with the US Army Corps of Engineers and authorize up to a \$200,000 two year local cost share utilizing County Drain Match Funds.	
6. Adjourn	

22

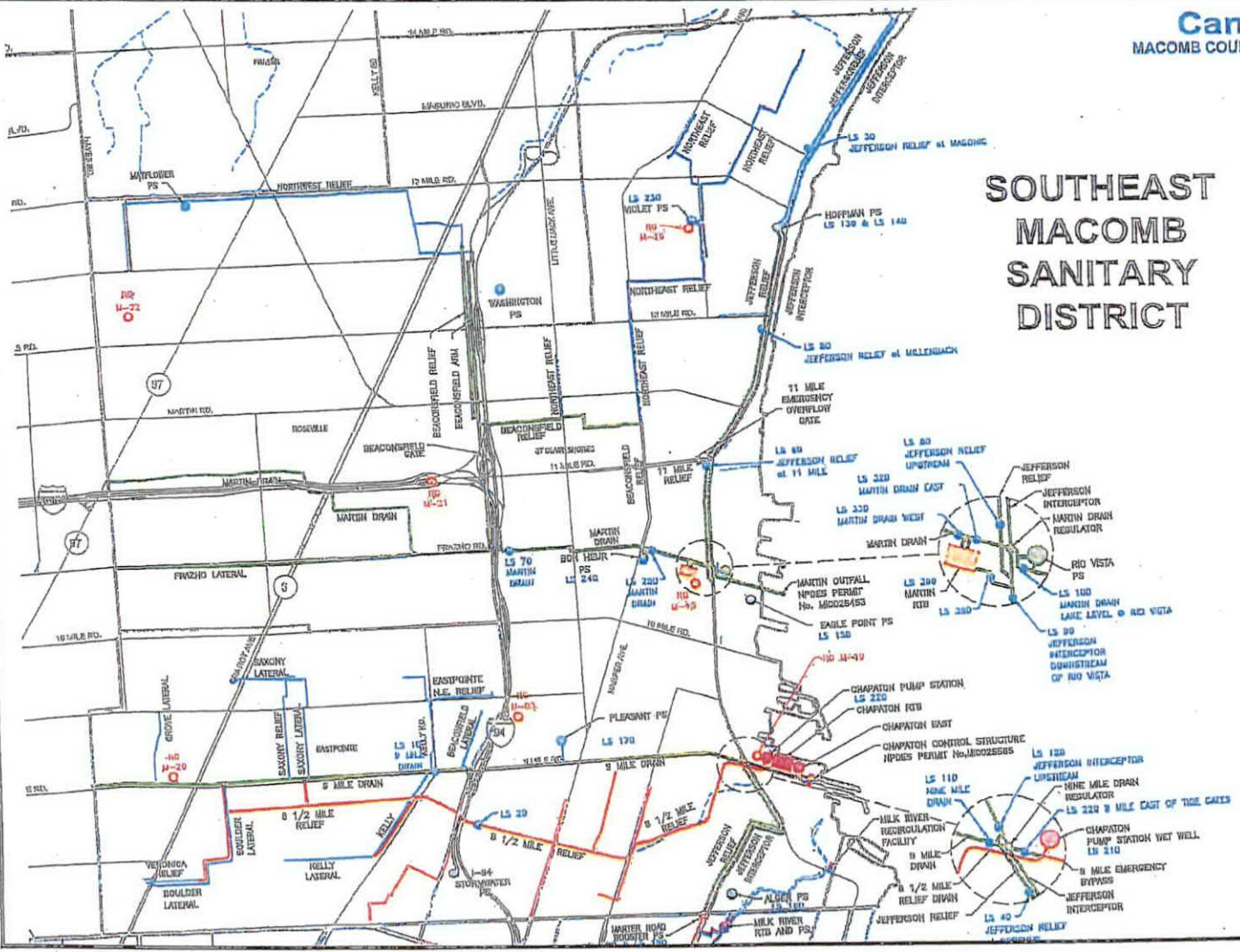
Candice S. Miller
MACOMB COUNTY PUBLIC WORKS COMMISSIONER



SOUTHEAST MACOMB SANITARY DISTRICT

- JURISDICTION LEGEND**
(AS OF DATE OF PUBLICATION)
- 1/2 MILE RELIEF DRAIN DRAINAGE DISTRICT
 - SOUTHEAST MACOMB COUNTY WASTEWATER DISPOSAL SYSTEM
 - MARTIN SANITARY DIVERSION DISTRICT
 - SOUTHEAST MACOMB SANITARY DISTRICT
 - LOCAL MUNICIPALITY
 - OTHER

- LEGEND**
- PUMP STATION
 - FLOW CONTROL STRUCTURE
 - RTD
 - GRAVITY INTERCEPTOR
 - LEVEL SENSOR
 - RAIN GAUGE



Revised July 25, 2018
fitch

An adjourned meeting of the Intra-County Drainage Board for the **LAKE ST. CLAIR CLEAN WATER INITIATIVE INTRA-COUNTY DRAIN** was held via telephone conference per the State of Michigan Executive Order due to the COVID-19 pandemic, on September 14, 2020, at 10:22 A.M.

PRESENT: Brian Baker, Acting Chair
Veronica Klinefelt, Member
Bryan Santo, Member

ALSO PRESENT: Harold Haugh, Joe Romano, Robert Mijac, Macomb County Board of Commissioners; Stephen Downing, Construction & Maintenance Manager, Bruce Manning, Financial Manager, Tom Stockel, Construction Engineer, Jeff Bednar P.E., Environmental Resources Manager, Vince Astorino, Operations & Flow Manager, Kellie Kource, Drain Account Specialist, Karen Czernel, Deputy, Norb Franz, Communications Manager, Macomb County Public Works

The meeting was called to order by the Acting Chair, Brian Baker. A motion was made by Ms. Klinefelt, supported by Mr. Santo to approve the agenda as presented.

Adopted: YEAS: 3
NAYS: 0

Minutes of the meeting of January 13, 2020 were presented. A motion was made by Mr. Santo, supported by Ms. Klinefelt to approve the minutes as presented.

Adopted: YEAS: 3
NAYS: 0

The meeting was opened to public participation, then closed, there being no comments from the public.

Mr. Baker updated the board that a letter was sent to officials in St. Clair Shores, Roseville, and Eastpointe making them aware of the potential to refinance the 2013 Bonds to a lower interest rate saving \$321,000.

A motion was made by Ms. Klinefelt, supported by Mr. Santo to approve the resolution authorizing the Lake St. Clair Clean Water Initiative (St. Clair Shores – Roseville – Eastpointe) Drainage District Refunding Bonds.

Adopted: YEAS: 3
NAYS: 0

A motion to receive and file the financial report given by Mr. Manning was made by Ms. Klinefelt and supported by Mr. Santo.

Adopted: YEAS: 3
NAYS: 0

There being no further business, it was moved by Ms. Klinefelt, supported by Mr. Santo, that the meeting of the Lake St. Clair Clean Water Initiative Intra-County Drain Board be adjourned.

Adopted: YEAS: 3
NAYS: 0

The meeting was adjourned at 10:26 a.m.



Brian Baker, Acting Chair
Macomb County Public Works Chief Deputy

STATE OF MICHIGAN
COUNTY OF MACOMB

I certify that the foregoing is a true and correct copy of proceedings taking by the Intra-County Drainage Board for the Drainage District shown on the attached set of minutes, on September 14, 2020 the original of which is on file in the Public Works Commissioner's Office. Public notice of the meeting was given pursuant to Act No. 267, Public Acts of Michigan, 1975, including, in the case of a special or rescheduled meeting or a meeting secured for more than 36 hours, notice by posting at least 18 hours prior to the time set for the meeting.



Brian Baker, Acting Chair
Macomb County Public Works Chief Deputy

DATED: 9/14/20



Candice S. Miller

Public Works Commissioner
Macomb County

Memo

To: Lake St. Clair CWI Drain Board

From: Jeffrey H. Bednar, PE
Environmental Resources Manager

Date: March 8, 2023

Re: *Microseria Wollei* Study

Lyngbya or what is now known as *Microseira wollei* is a cyanobacteria that can form dense “free-floating” mats in lakes and other waterbodies. These mats can produce compounds that give off a noxious odor and may be harmful to human and ecological health. Growths of *M. wollei* found in Lake St. Clair and have worsened over the last 10 to 15 years. Macomb County stakeholders are now seeking answers regarding causes, potential risks and solutions to these growths.

In response, our office has reached out to the US Army Corps of Engineers (USACE) to utilize the Planning Assistance to States (PAS) program to fund a study of *Microseira wollei* in Lake St. Clair.

The project team will include the USACE Engineer Research and Development Center (ERDC) and Macomb County Public Works Office staff.

The two-year project will involve field sampling and research along with the following tasks:

1. Collaborate with researchers and develop a community of knowledge and practice to better understand the ecological and human health risks.
2. Conduct field sampling to confirm *M. wollei* “hot spots.”
3. Develop a regional database and conduct a literature review to fill potential data gaps, refine future sampling efforts, and inform other tasks related to the study.
4. Conduct additional field sampling to refine locations of growth and matting in the lake. This task will also investigate potential drivers for the spread of *M. wollei*.
5. An adaptive management plan will be created that will include technical documents that can be used to understand, predict, react to and manage *M. wollei* on Lake St. Clair.

Estimated cost for the two years of the project totals \$400,000 with half, or \$200,000, coming from the County as the non-federal partner per PAS program requirements. Each one-year PAS agreement is for \$200,000, so the annual non-federal partner share is \$100,000. It is expected some of the cost share requirement will be provided through in-kind staff participation in project elements such as sample collection, meetings and document review.

Staff requests authorization to execute the first year project agreement, including the required cost share. Upon authorization, the project could begin this spring.

AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
MACOMB COUNTY PUBLIC WORKS OFFICE, MICHIGAN
FOR THE PROVISION OF CERTAIN TECHNICAL ASSISTANCE

THIS AGREEMENT is entered into this ___ day of _____, _____, by and between the Department of the Army (hereinafter the "Government"), represented by the District Commander for the Detroit District (hereinafter the "District Commander") and Macomb County Public Works Office, Michigan (hereinafter the "Non-Federal Sponsor"), represented by the Macomb County Public Works Commissioner.

WITNESSETH, THAT:

WHEREAS, Section 22 of the Water Resources Development Act of 1974, as amended (42 U.S.C. 1962d-16), authorizes the Secretary of the Army to provide technical assistance related to the management of State water resources (hereinafter "Technical Assistance") to a State or non-Federal interest working with a State and to establish and collect fees for the purpose of recovering 50 percent of the costs of such assistance except that Secretary may accept and expend non-Federal funds provided that are in excess of such fee; and

WHEREAS, the Government and the Non-Federal Sponsor have the full authority and capability to perform in accordance with the terms of this Agreement.

NOW, THEREFORE, the parties agree as follows:

1. The Government shall provide Technical Assistance in accordance with the attached Scope of Work, and any modifications thereto, that specifies the scope, cost, and schedule for activities and tasks. In carrying out its obligations under this Agreement, the Non-Federal Sponsor shall comply with all the requirements of applicable Federal laws and implementing regulations.

2. The Non-Federal Sponsor shall provide 50 percent of the costs of providing the Technical Assistance in accordance with the provisions of this paragraph. As of the effective date of this Agreement, the costs of providing the Technical Assistance are projected to be \$200,000, with the Government's share of such costs projected to be \$100,000 and the Non-Federal Sponsor's share of such costs projected to be \$100,000.

a. No later than 15 calendar days after the effective date of this Agreement, the Non-Federal Sponsor shall provide the full amount of its share of costs by delivering a check payable to "FAO, USAED, Detroit District (H7)" to the District Commander or by providing an Electronic Funds Transfer of such required funds in accordance with procedures established by the Government.

b. If the Government determines at any time that additional funds are needed from the Non-Federal Sponsor to cover the Non-Federal Sponsor's costs of the Technical Assistance, the Government shall provide the Non-Federal Sponsor with written notice of the amount of additional funds required. Within 60 calendar days of such notice, the Non-Federal Sponsor shall provide the Government with the full amount of such additional funds.

c. Following provision of the Technical Assistance and resolution of any relevant claims and appeals, the Government shall conduct a final accounting and furnish the Non-Federal Sponsor with the written results of such final accounting. Should the final accounting determine that additional funds are required from the Non-Federal Sponsor, the Non-Federal Sponsor, within 60 calendar days of written notice from the Government, shall provide the Government with the full amount of such additional funds. Should the final accounting determine that the Non-Federal Sponsor has provided funds in excess of its required amount, the Government shall refund the excess amount, subject to the availability of funds. Such final accounting does not limit the Non-Federal Sponsor's responsibility to pay its share of costs, including contract claims or any other liability that may become known after the final accounting.

3. In addition to its required cost share, the Non-Federal Sponsor may determine that it is in its best interests to provide additional funds for the Technical Assistance. Additional funds provided under this paragraph and obligated by the Government are not included in calculating the Non-Federal Sponsor's required cost share and are not eligible for credit or repayment.

4. The Non-Federal Sponsor shall not use Federal program funds to meet any of its obligations under this Agreement unless the Federal agency providing the funds verifies in writing that the funds are authorized to be used for the provision of the Technical Assistance. Federal program funds are those funds provided by a Federal agency, plus any non-Federal contribution required as a matching share therefor.

5. Upon 30 calendar days written notice to the other party, either party may elect, without penalty, to suspend or terminate the provision of Technical Assistance under this Agreement. Any suspension or termination shall not relieve the parties of liability for any obligation incurred.

6. The parties agree to use their best efforts to resolve any dispute in an informal fashion through consultation and communication. If the parties cannot resolve the dispute through negotiation, they may agree to a mutually acceptable method of non-binding alternative dispute resolution with a qualified third party acceptable to the parties. Each party shall pay an equal share of any costs for the services provided by such a third party as such costs are incurred. The existence of a dispute shall not excuse the parties from performance pursuant to this Agreement.

7. In the exercise of their respective rights and obligations under this Agreement, the Government and the Non-Federal Sponsor each act in an independent capacity, and neither is to be considered the officer, agent, or employee of the other. Neither party shall provide, without the consent of the other party, any contractor with a release that waives or purports to waive any rights a party may have to seek relief or redress against that contractor.

8. Any notice, request, demand, or other communication required or permitted to be given under this Agreement shall be deemed to have been duly given if in writing and delivered personally or mailed by certified mail, with return receipt, as shown below. A party may change the recipient or address for such communications by giving written notice to the other party in the manner provided in this paragraph.

If to the Non-Federal Sponsor:

Jeff Bednar, Environmental Resources Manager
Macomb County Public Works Office
10 South Main Street, 8th Floor
Mount Clemens, MI 48043

If to the Government:

Commander, Detroit District
US Army Corps of Engineers
477 Michigan Avenue
Detroit, MI 48226

9. To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.

10. Nothing in this Agreement is intended, nor may be construed, to create any rights, confer any benefits, or relieve any liability, of any kind whatsoever in any third person not a party to this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the District Commander.

DEPARTMENT OF THE ARMY

MACOMB COUNTY PUBLIC WORKS OFFICE,
MICHIGAN

BY: _____
Brett M. Boyle
Lieutenant Colonel, U.S. Army
District Engineer

BY: _____
Candice S. Miller
Macomb County Public Works Commissioner

DATE: _____

DATE: _____

CERTIFICATE OF AUTHORITY

I, _____, do hereby certify that I am the principal legal officer for Macomb County Public Works Office, Michigan, that Macomb County Public Works Office, Michigan is a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and Macomb County Public Works Office, Michigan in connection with the Characterization and Adaptive Management of Microseira (formerly Lyngbya) wollei in Lake St. Clair PAS Study, and to pay damages, if necessary, in the event of the failure to perform in accordance with the terms of this Agreement, as required by Section 221 of Public Law 91-611, as amended (42 U.S.C. 1962d-5b), and that the person who executed this Agreement on behalf of Macomb County Public Works Office, Michigan acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification this _____ day of _____ 20__.

Non-Federal Sponsor's Attorney's Typed name:
Non-Federal Sponsor's Attorney's Title in Full:

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Candice S. Miller,
Macomb County Public Works Commissioner
Macomb County Public Works Office, Michigan

DATE: _____

**NON-FEDERAL SPONSOR'S
SELF-CERTIFICATION OF FINANCIAL CAPABILITY
FOR AGREEMENTS**

I, _____, do hereby certify that I am the Chief Financial Officer of Macomb County Public Works Office, Michigan (the "Non-Federal Sponsor"); that I am aware of the financial obligations of the Non-Federal Sponsor for the Characterization and Adaptive Management of Microseira (formerly Lyngbya) wollei in Lake St. Clair PAS Study; and that the Non-Federal Sponsor has the financial capability to satisfy the Non-Federal Sponsor's obligations under the Characterization and Adaptive Management of Microseira (formerly Lyngbya) wollei in Lake St. Clair PAS Study.

IN WITNESS WHEREOF, I have made and executed this certification this _____ day of _____, _____.

BY: _____

TITLE: _____

DATE: _____

SCOPE OF STUDY

SECTION 22, PLANNING ASSISTANCE TO STATES

CHARACTERIZATION AND ADAPTIVE MANAGEMENT OF MICROSEIRA (FORMERLY LYNGBYA) WOLLEI IN LAKE ST. CLAIR PAS STUDY

FISCAL YEAR 2023

TITLE: Characterization and Adaptive Management of *Microseira* (formerly *Lyngbya*) *wollei* in Lake St. Clair PAS Study

COST SHARING: 50% - FED, 50% - NONFED

DATE OF REQUEST JUSTIFICATION: 3 May 2022

PROJECT SPONSOR: Macomb County Public Works Office, Michigan (Macomb County)

EXECUTIVE SUMMARY: *Microseira wollei* (new taxonomically accepted name for *Lyngbya wollei*), can form dense sediment-associated or “free-floating” mats. These mats can produce compounds that give off a noxious odor and may be harmful to human and ecological health. Growths of *M. wollei* are present within Lake St. Clair and have worsened over the last 10 to 15 years. Shoreline property owners are now seeking answers regarding causes, potential risks and solutions to these growths.

This scope of work (SOW) captures field sampling and research to be conducted within two phases (Phase 1: 2023 and Phase 2: 2024). In Phase 1, two tasks will be completed with the goal of reporting the “state-of-the-science” for *M. wollei* in Lake St. Clair including the spatial and temporal extent of growths, potential environmental triggers driving growths and potential ecological and human health risks. For Task 1, a meeting will be organized and held to collaborate with researchers and develop a community of practice for further resource collaboration. For Task 2, confirmatory field sampling will be conducted to confirm *M. wollei* “hot spots”, a regional database will be developed using data compiled from collaborators (Task 1) and a literature review will be completed to fill potential data gaps. Using the data compiled from field sampling and data compilation efforts (2023), tasks for 2024 (Phase 2) will be further refined. Task 3 will generally consist of field sampling during the recreational season to further inform locations of *M. wollei* and potential environmental drivers for these growths. Task 4 will consist of an adaptive management plan. At the end of year 2024 (completion of Phase 2), the Detroit District, regulators and stakeholders (e.g., Macomb County) will have technical documents that can be used to understand, predict, react to and manage proliferations of *M. wollei* on Lake St. Clair.

PURPOSE: The goal of this research is to characterize and outline an adaptive management plan for *Microseira* (formerly *Lyngbya*) *wollei* within Lake St. Clair. Characterization of the algal issue is the first step towards an adaptive management plan that will help the Detroit District, regulators, and stakeholders (e.g., Macomb County) understand, predict, react to, and manage proliferations of *M. wollei*.

The State of Michigan currently has the Michigan's Aquatic Invasive Species (AIS) State Management Plan (SMP) 2013 Update for Prevention, Detection, and Management in Michigan Waters. It is a cooperative effort of the Michigan Department of Environmental Quality Michigan (now the Department of Environment, Great Lakes, and Energy (EGLE), Department of Natural Resources, Michigan Department of Agriculture and Rural Development, and Michigan Department of Transportation. This AIS SMP identifies strategic actions in categories including legislative and policy, regulation (including compliance, enforcement, and inspection), information and education, research and monitoring, and early detection and rapid response (EDRR). The four goals addressed by the SMP are: Goal I: Prevent new introductions of AIS into Michigan waters. Goal II: Limit the dispersal of established populations of AIS throughout Michigan waters. Goal III: Develop a statewide interagency EDRR Program to address new invasions of AIS. Goal IV: Manage and control AIS to minimize the harmful environmental, economic, and public health effects resulting from established populations. Goals I and II focus on preventing new introductions and limiting the dispersal of AIS throughout Michigan waters (Great Lakes and inland waters). Goal III concentrates on EDRR by addressing the critical period between introduction and establishment of a new AIS population when the focus of management must shift rapidly from prevention to control, containment, and eradication. Goal IV addresses the management and control of AIS to minimize the harmful environmental, economic, and public health effects resulting from established populations. This PAS Study will help with many of these four goals, and with updating the next State of Michigan AIS SMP. Macomb County supports the MI AIS SMP and aligns to it within county boundaries.

BACKGROUND: Lake St. Clair is a shallow 1,114 km² polymictic lake with an average depth of approximately 3 m (EGLE 2022; McKindles et al. 2020). The Lake is located on the border of Michigan, US and Ontario, CA. Nutrient concentrations within the lake likely range widely as it receives two distinct water inputs. Water inputs from the northwest are characteristically low in nutrients and conversely, water inputs from the southwest are characteristically nutrient rich as this water originates in a watershed dominated by agriculture (>80%) (McKiddles et al. 2020). Areas within Lake St. Clair also receive inputs from sewer overflows from highly developed counties around Detroit on the northwestern side of the lake.

In 1984, algae within Lake St. Clair had been dominated by diatoms and chrysophytes (Sprules 1991). However, cyanobacteria (not identified to genus) were present within algal assemblages and ranged from <1% to 20% depending on location and time of year. In May 2010, large algal mats (presumably *M. wollei*) were observed on the northwest side of the Lake (outside of Detroit) along a beach at the Metropark (Vijayavel et al. 2013). Currently, management within the Metropark beach, involves the physical removal and mounding of *M. wollei* growths approximately a half mile from the beach where they decay (MDEQ 2016).

Results from statewide algal bloom tracking in Michigan from 2015-2017, continue to indicate high levels of *M. wollei* incidences in Macomb County on the northwest portion of Lake St. Clair. *M. wollei* growths have worsened over the last 10 to 15 years with dense proliferations of the alga located within small coves and along the shoreline. The *M. wollei* growths have grown so dense in places that boat docks and recreational areas are unusable (Pamplin and Carr 2022). Shoreline property owners are now seeking answers regarding causes, potential risks and solutions to *M. wollei* growths (Russel 2022).

M. wollei is a prokaryotic cyanobacterium that can produce dense bi-phasic mats, taste-and-odor compounds, dermatotoxins and neurotoxins (Calomeni et al. 2015, 2018) and subsequently can impede critical water resource uses (e.g., recreation, property values) (Anderson et al. 2019). *M. wollei* is the new (2017) taxonomically accepted name for *Lyngbya wollei*. This cyanobacterium was renamed because of the establishment of a new phylogenetically distinct genus, *Microseira* from *Lyngbya* (Kenins 2017). Observed ecological impacts from *M. wollei* mats include decreased densities of beneficial zooplankton, altered activities of acetylcholinesterase and glutathione-S-transferase in amphipods, and avoidance responses in fish (e.g. *Pimephales promelas*) (Mastin et al., 2002). *M. wollei* have been shown to produce algal toxins (saxitoxin analogues) that have putative human health risks. Recent data suggests that these toxins are relatively stable in drying mats of *M. wollei* and can be released into the water column if mats are resubmerged (Metz et al. 2022).

OBJECTIVES:

Therefore, the specific objectives of this study are to:

1. Define the spatial and temporal extent of *M. wollei* distribution (Task 1, 2, 3)
2. Investigate potential environmental factors driving the proliferations (Task 1, 2, 3)
3. Define ecological and human health risks (Task 2)
4. Identify mitigation solutions that are informed by risk-based information (Task 4)
5. Develop an algal adaptive management plan to aid stakeholders for future *M. wollei* issues in Lake St. Clair (Task 4)

NOTE: The Estimated Study Cost table below is an estimate only and may not be a final cost. While the project was planned out in detail, the actual costs incurred during the study may vary. Phase 1 is estimated to cost \$200,000 and Phase 2 is estimated to cost \$200,000. This agreement is only for Phase 1. The Phase 2 agreement will be routed in late 2023 so it is fully executed and funded at the beginning of calendar year 2024. There should be some overlap between the two Phases.

SCHEDULE: The study effort should be fully completed within 18 months, assuming the timely execution of the PAS Agreement and funding is received in a timely manner. Some funding from one task may be moved to another task, if needed and agreed upon by USACE and Macomb County.

ESTIMATED STUDY COSTS:

Task	DESCRIPTION	Federal Funds	Sponsor's Funds (cash)	Task Total
1	Collaboration with Researchers	\$21,500	\$21,500	\$43,000
2	Initial 2023 Field Sampling, Initial Database, and Literature Review	\$50,000	\$20,000	\$100,000
3	2024 Field Sampling			Phase 2
4	Develop Adaptive Management Plan			Phase 2
5	USACE Project Management and Administration	\$28,500	\$28,500	\$57,000
Total		\$100,000	\$100,000	\$200,000
FEDERAL Dollars		\$100,000	\$0	\$100,000
SPONSOR Dollars		\$0	\$100,000	\$100,000

WORK TO BE PERFORMED: The following sections provide added detail for each task completed by the USACE, and ERDC-EL.

Tasks:

1. Hold a meeting (virtual or in-person) to collaborate with researchers working within the Great Lakes on *M. wollei* issues (2023).
 - a. **Deliverable** – a proceedings report detailing the past, current, or planned regional research efforts that can inform *M. wollei* issues and solutions. Establish a Community of Practice (CoP) that can be a resource for collaboration.
2. Conduct confirmatory field sampling, exploratory data analyses of a regional database and a literature review to fill potential data gaps on the timing, distribution, potential causes and risks from *M. wollei* (2023).
 - a. **Deliverable** – a regional database capturing current *M. wollei* monitoring data related to timing, distribution and potential contributors to growth with available data from federal, state and local partners.
 - b. **Deliverable** - a manuscript or technical report detailing the exploratory data analyses using the database and literature review
3. Conduct field sampling during the recreational season to fill data gaps related to *M. wollei* location, biomass, and potential environmental drivers (2024).
 - a. **Deliverable** – a data package containing waypoints, positive identification of *M. wollei*, water quality parameters (i.e., pH, conductivity, dissolved oxygen,

temperature), biomass estimation and toxin analysis. A manuscript describing the results from lake surveys.

4. Develop an adaptive management plan for Lake St. Clair to manage *M. wollei* (2024).
 - a. **Deliverable** – a technical report outlining the adaptive management plan.
5. Detroit District Project Management and Administration. This task will occur in Phase 1 and then an additional task will be added for Phase 2.

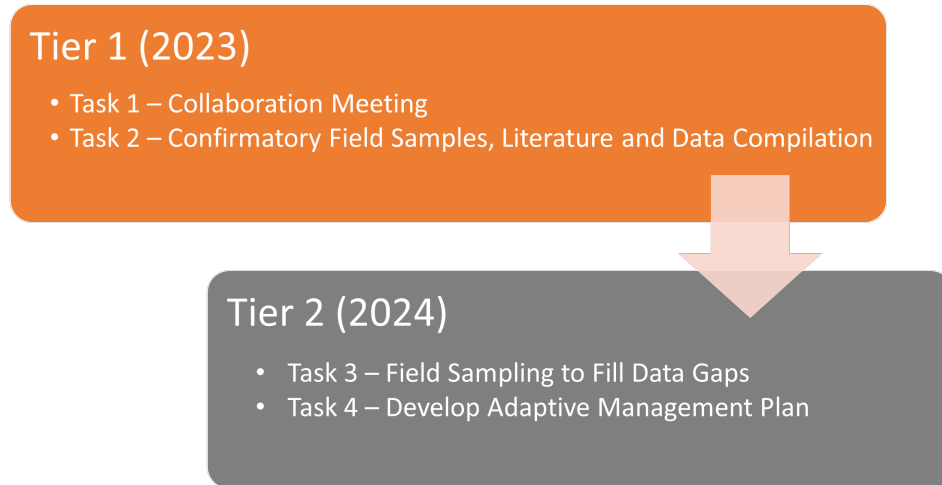


Figure 1. Tiered process for planned research tasks.

Task 1: In collaboration with the existing federal, state, and local partners, the project team will organize a meeting to collaborate and discuss data availability relevant to *M. wollei* management that is being collected from federal, state and local partners. The deliverable will include a proceedings report detailing the past, current, or planned regional research efforts that can inform *M. wollei* issues and solutions. Additionally, if there is interest from the regional stakeholders, a Community of Practice (CoP) will be defined that can be a resource for future collaboration.

Task 2: The project team will 1) conduct confirmatory field sampling, 2) conduct exploratory data analyses informed by Task 1, and 3) review the existing data, including peer-reviewed articles in scientific journals and books, as well as “gray literature” (e.g., technical reports, government documents, and white papers) to inform the temporal and spatial extent of *M. wollei* distribution in addition to reported cell densities, mat thickness, microbial abundance, and associated toxins (if data are available). The research team will develop a field sampling plan based on potential “hot spots” identified in Task 1. Confirmatory field sampling will help the research team better understand spatial and temporal aspects of the growths. Using data compiled with the help of collaborators from Task 1, an initial database will be developed. Existing data and hydrodynamic and other models will be used to inform environmental conditions contributing to *M. wollei* abundance. These data will be used to develop a conceptual model to define environmental factors, stressors, exposure pathways, and receptors of concern

(see Figure 2 as an example). The reported approaches for detection of *M. wollei* will be reviewed and inform options for quantifying density and viability response parameters in subsequent tasks.

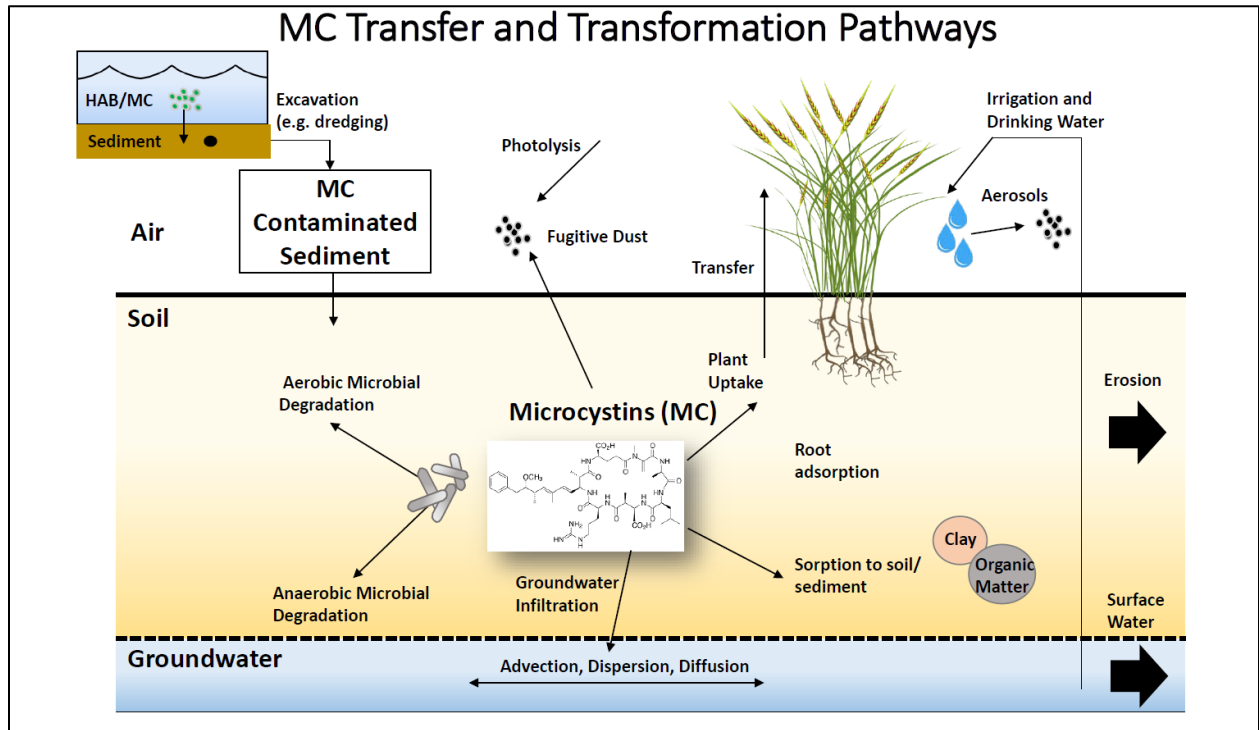


Figure 2. Example conceptual model of algal toxin transfer and transformation pathways in an environmental system (from McQueen et al. 2020).

Additionally, the relationships of *M. wollei* with respect to a water body's bathymetry, wind and water currents, temperature, turbidity, and light attenuation will be reviewed to help inform and predict potential environmental drivers. Identifying these data gaps (site conditions, temporal and spatial extent, etc.) will support the development of site sampling and inform the experimental design of Task 3 and the subsequent field collection of representative sediments. The results of the technical review will be documented in a technical report or manuscript.

Objective at the end of Year 1 (2023) – the goal would be to have a dataset and subsequent report documenting the ‘state-of-the-science’ for *M. wollei* in Lake St. Clair. These data would then be used to inform focused research in 2024 to decrease key areas of uncertainty (Task 3; 2024) and development of an adaptive management strategy specific to the region (Task 4; 2024).

Task 3: Based on results from Tasks 1 and 2, field sampling will be conducted to fill data gaps and decrease uncertainties in defining the spatial and temporal extent of *M. wollei* distribution. Additionally, predictive environmental parameters identified in Task 1 and 2 that could aid understanding primary growth drivers (e.g., light attenuation, nutrients, etc.) will be further investigated during this task. Results of this task include a data package containing waypoints, positive identification of *M. wollei*, biomass estimation and toxin analysis. Data from Task 3 will be summarized in a manuscript or technical report.

Task 3 will be informed by the prior tasks, but potential focuses could include:

- Investigation of practicality of using remote sensing to inform nearshore or shoreline covering of *M. wollei* (e.g., potential collaboration with Molly Reif - Research Geographer at ERDC-EL)
- Field visit and subsequent sampling survey to define areas of concern

Task 4: Based on results from Tasks 1-3, an adaptive management plan for Lake St. Clair will be developed. This plan will include the following topics:

- Approaches for early detection and monitoring *M. wollei*
 - Detection methods, environmental drivers, early warning systems
- Define ecological and human health risks
 - Identify stressors (e.g., cell density, toxins)
 - Identify exposure pathways and receptors of concern
- Identify priority areas in Lake St. Clair for management
 - Define regions of concern based on socio-economic or risk-based data
- Identify mitigation approaches

Approaches for risk management will be defined based on long-term and short-term options. In this context, long-term approaches are those applied to large scales (e.g., watershed) over the course of decades (e.g., watershed nutrient mitigation). Short-term approaches are applied locally (e.g., beach or portion of lake) for immediate alteration of exposures and restoration of water resource uses. Approaches will be identified based on peer-reviewed data to support interpretations of relative effectiveness, scalability, durability, and availability.

In Task 4, high-level comparisons of potential outcomes associated with different management decisions (i.e., no action vs. action) will be defined and discussed. The goal of this section is to provide relevant data and other information that can help water resource managers identify risk management approaches for Lake St. Clair. The approach will be adaptive and informed by regional adaptive management approaches (See Figure 2).

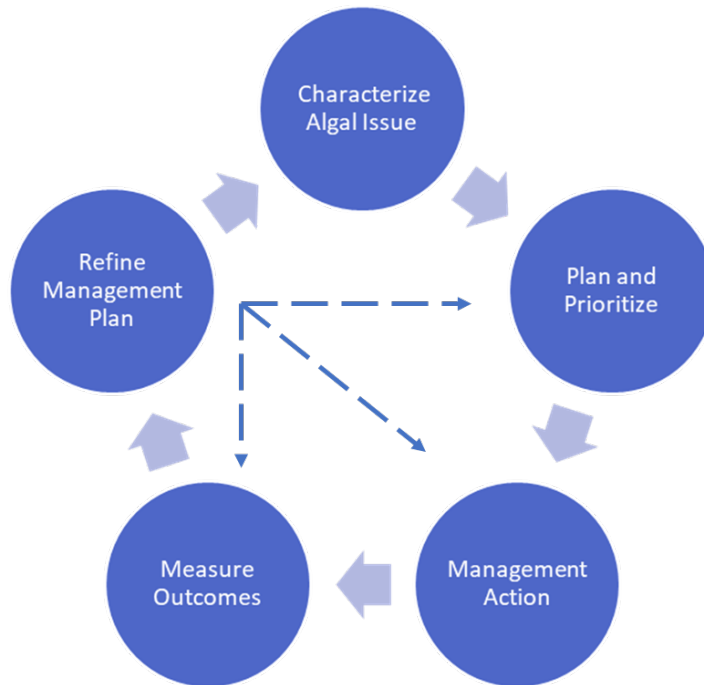


Figure 2 Adaptive Management Approach - Modified from Michigan’s Adaptive Management Plan for Lake Erie (State of Michigan 2021)

Task 5: This task will be performed by USACE Detroit District. This task involves the overall management of the project including: attending monthly project meetings; upward reporting on the project’s status; meeting coordination and preparing and monitoring project schedules and finances. The USACE Project Manager (PM) will be the primary point-of-contact (POC) and lead for the project.

Monthly progress meetings shall take place during the project period and will include small-group management meetings. The purpose of the small-group management meetings is to direct and coordinate the Government and Macomb County work effort towards successful and timely completion. The attendees will include appropriate project representatives from USACE and Macomb County.

ERDC Project Team:

Project Team Member	Laboratory	Project Role
Alyssa Calomeni, Ph.D.	ERDC-EL	Principle Investigator
Andrew McQueen, Ph.D.	ERDC-EL	Co-Principle Investigator
Todd Slack, Ph.D.	ERDC-EL	Project Oversight
Afrachanna Butler, Ph.D.	ERDC-EL	Physical Scientist
Catherine Thomas, Ph.D.	ERDC-EL	Biologist
Anthony Bednar, Ph.D.	ERDC-EL	Chemist

Potential Partners:

Table 1. Potential partners for Task 1 coordination

Name	Organization	Contact
Donna Kashian, Ph.D.	Wayne State University	dkashian@wayne.edu
Carol Miller	Wayne State University	ab1421@wayne.edu
Kevin Goodwin	EGLE	goodwink@michigan.gov
Josh Tellier	EGLE	tellierj@michigan.gov
May Evans, Ph.D.	USGS	maevans@usgs.gov

Michigan Department of Environment, Great Lakes, and Energy (EGLE)

Schedule:

Table 1. Task Gantt Chart		2023				2024			
Task	Description	Mar	Apr - Jun	July - Sept	Oct - Dec	Jan - Mar	Apr - Jun	July - Sept	Oct - Dec
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Collaborative workshop with researchers working within Lake St. Clair on <i>M. wollei</i> issues	Blue	Blue	Blue	Blue				
1	Deliverable - Workshop proceedings paper		Blue	Blue	Orange				
2	Consolidate and synthesize data from the field, literature and collaborators		Blue	Blue	Blue				
2	Deliverable - Technical report or manuscript summarizing results				Orange				
3	Conduct field sampling during the recreational season to fill data gaps related to <i>M. wollei</i>					Blue	Blue	Blue	
3	Mobilization and sampling					Blue	Blue	Blue	
3	Sample analysis							Blue	Blue
3	Deliverable - data package and manuscript								Orange

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