Michigan's
Lake Erie Domestic Action Plan

UPDATE

Taking Action On Lake Erie

May 2025

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

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Acknowledgement:

This document has been prepared by the state's Domestic Action Plan (DAP) Team, a senior management working group from the Michigan Quality of Life Departments including Agriculture and Rural Development; Environment, Great Lakes, and Energy; and, Natural Resources. Deserving of acknowledgment is the tremendous technical support by agency staff who have assisted with the development and implementation of the DAP Update.

We would also like to acknowledge and thank the Western Lake Erie Basin Community Advisory Group and those best positioned to drive and implement changes, including Conservation Districts, communities, landowners and producers, universities, nonprofits, philanthropies, and the private sector. These partnerships have supported the state in our efforts to seek smart solutions to the phosphorus loading challenge and provided important input and feedback into the development of the DAP Update.

How to cite:

State of Michigan, 2025. Michigan's Lake Erie Domestic Action Plan Update. Prepared by Michigan Department of Agriculture and Rural Development; Department of Environment, Great Lakes, and Energy; and, Michigan Department of Natural Resources, 63 pp.

Executive Summary

Lake Erie is a critical natural resource for the state of Michigan. Since 2018, major progress has been made to reduce Michigan's point source phosphorus loading into Lake Erie, allowing the state to meet its interim 20 percent nutrient reduction goal by 2020. However, considerable challenges remain in reducing nonpoint source (NPS) phosphorus loading from the Western Lake Erie Basin (WLEB) rural landscape.

To overcome these challenges, the Michigan Department of Agriculture and Rural Development (MDARD) supports developing new innovative approaches and partnerships to accelerate conservation planning and implementation. In support of the governor's MI Healthy Climate Plan, the Fiscal Year 2024 budget includes a total $13 million investment to support soil health, climate smart agriculture practices, and regenerative agriculture. These priority areas are not solely about building stronger, more diverse agricultural systems and resilient rural economies; they also place a specific focus on improved environmental outcomes. The Michigan Departments of Natural Resources (DNR) and Environment, Great Lakes, and Energy (EGLE) continue to focus their partnership on implementing other land management programs, including supporting strategic watershed management planning and implementation, creating and restoring wetlands in rural areas, and expanding green stormwater infrastructure to better manage stormwater in urban centers of the WLEB.

This Domestic Action Plan (DAP) Update provides a status report on progress from Michigan's 2018 DAP release. The DAP Update also describes actions for the 2024-2028 cycle to move the state closer to its goal of a sustained 40 percent reduction in phosphorus loads from the 2008 loading baseline to improve the ecosystem health, biodiversity, and beneficial human uses of Lake Erie.

Success with Point Source Reductions

Point sources of pollution originate from discrete, identifiable locations, allowing for monitoring and regulation. Point sources of phosphorus include wastewater treatment facilities and concentrated animal feeding operations.

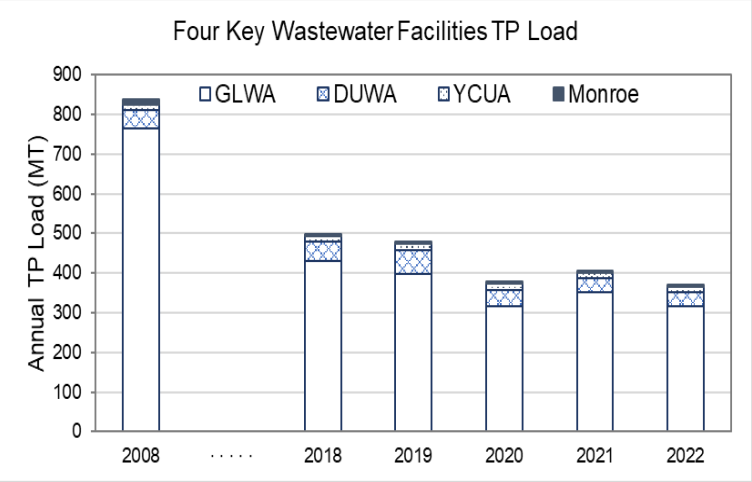
Compared to the 2008 baseline phosphorus load data, Michigan achieved the interim goal of reducing phosphorus loads by 20 percent primarily because of point source discharge reductions at the Great Lakes Water Authority (GLWA) facility (previously referenced in the Michigan 2018 DAP as the Detroit Water and Sewerage Department or DWSD) and three other key treatment plants. These reductions are especially attributable to GLWA, the Detroit region's primary municipal wastewater service provider, where annual total phosphorus (TP) loads have been reduced by over 55 percent. For the four key facilities – GLWA, Downriver Wastewater Treatment Facility (DUWA), Ypsilanti Community Utility Authority Wastewater Treatment Plant (YCUA), and Monroe Metro Wastewater Treatment Plant - the five-year average reduction for the previous DAP period (2018-22) was 406 metric ton (MT) TP, which equates to a 23 percent reduction of the total Michigan 2008 load. Considering enhanced controls made at DUWA since 2019, the three-year reduction average (2020-2022) was 447 MT TP, or just over 25 percent of the total Michigan load. Except for Monroe, these point source facilities

discharge to the Detroit River. These point source reductions in phosphorus loading to Lake Erie are the result of major improvements in facility operations and stricter permit requirements. This demonstrates the positive impacts of infrastructure and operational investments made by ratepayers and taxpayers are showing big results.

TAKING ACTION ON LAKE ERIE

Michigan has reduced phosphorus limits at four key wastewater treatment facilities that discharge the majority of the total phosphorus load to the Detroit River.

Total phosphorus loadings from the four key facilities – Great Lakes Water Authority Water Resource Reclamation Facility (GLWA), Downriver (DUWA) Wastewater Treatment Facility, Ypsilanti Community Utility Authority (YCUA) Wastewater Treatment Plant, and Monroe Metro Wastewater Treatment Plant (Monroe), for water years 2008 (baseline year) and 2018



Building on successes, EGLE – Water Resources Division established a framework for achieving the 0.5 mg/L TP effluent limit (i.e., a growing season average) at all 25 major publicly owned wastewater treatment facilities located within the WLEB, as called for in the Great Lakes Water Quality Agreement (GLWQA). To facilitate lower TP effluent limits, EGLE developed a Phosphorus Removal Guidance Document for Wastewater Utilities. Despite this success with point source reductions, reducing NPS phosphorus loading remains a challenge.

Challenges with Nonpoint Source Reductions

Reductions of nonpoint source (NPS) phosphorus loads since 2008 have not been substantial due to a variety of challenges. The River Raisin met the 40 percent TP load reduction goal (103 MT/yr) only once in 2021 over the previous DAP five-year period (2018-2023). Spring TP loads for the River Raisin have been below the 40 percent reduction target (50 MT) in three of the 14 years spanning water years 2009-2022 relative to the 2008 baseline year. Over the same period in Michigan's Upper Maumee River tributaries, the 40 percent reduction goal (119 MT/yr) was also met once in 2021, and the 20 percent target was met in three years (2018, 2021, 2022). In both watersheds, 2021 was considered a dryer year. Additional analyses of contributing factors, such as flows over the five-year interval, are planned or underway to better understand nutrient dynamics in the system.

Michigan will not meet the ambitious 40 percent TP load reduction target for NPS phosphorus called for in the 2015 Western Basin of Lake Erie Collaborative Agreement. The report, *The Cost to Meet Water Quality Goals in the Western Basin of Lake Erie* (2023), indicates despite millions of dollars in

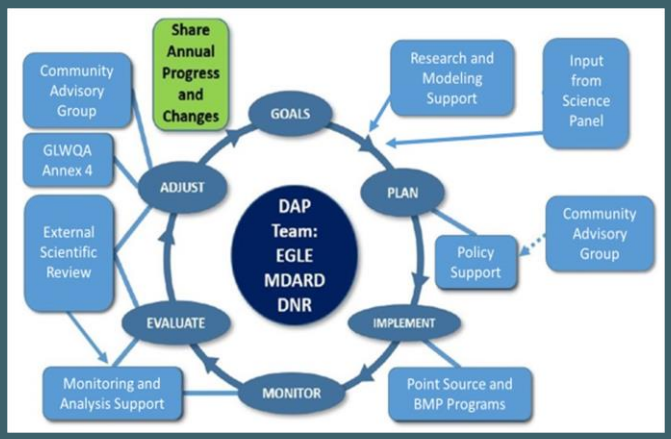
federal and state funding that have been invested in conservation, water quality issues persist in the Western Basin. In addition, technical challenges in dealing with increasing precipitation and runoff, optimizing artificial drainage, and improving nutrient management practices remain. The legacy of drained and degraded wetlands in southeast Michigan is an inherited reality without a quick fix. Finally, increasing collaboration, accountability, and efficiencies of federal, state, and private conservation programs to accelerate NPS load reductions continues to be a challenge and a priority.

Progress in Adaptive Management Support

Adaptive management is a structured process for making decisions and implementing management efforts while learning about what actions are most effective. It is especially well suited for making progress on complex environmental problems such as those that impact Lake Erie. Since 2018, the state has developed and begun implementation of an effective adaptive management program that uses the best available science and lessons learned from natural and designed experiments to improve the impact of conservation investments.

ADAPTIVE MANAGEMENT

Active adaptive management begins with goal setting (Step 1) and moves clockwise through the planning (Step 2), implementing (Step 3), monitoring (Step 4), evaluation (Step 5), and adjustment phases (Step 6).



The program implements plans, evaluates their effectiveness, and adjusts on annual to multi-year timescales, with input from technical experts and key interested groups along the way, to reduce uncertainty and accelerate progress on NPS load reductions over the next five years. The state has invested in, or advised on research, monitoring, modeling, and technological innovation that is allowing better decisions to be made over time, with the right tools, data, and analysis available to inform those decisions. Partnerships with those best positioned to drive and implement changes, including Conservation Districts (CDs), communities, landowners and producers, universities, nonprofits, philanthropies, and the private sector, have allowed the state to seek smart solutions to the phosphorus loading challenge. Finally, the state has greatly expanded the channels for communication, feedback, and discussion of options by formalizing a large WLEB Community Advisory Group and an expert WLEB Science Panel, along with other communication investments.

Western Lake Erie Basin Community Advisory Group and Science Panel Engagement

The Michigan DAP Team, which consists of management staff from MDARD, EGLE, and DNR, has committed to improving and increasing outreach to the public through a WLEB Community Advisory Group that includes producers/growers, CDs, environmental advocacy and justice groups, producer associations, farm businesses, lake businesses, business associations, regional planners,

municipalities, utilities, and watershed councils. The purpose of the WLEB Community Advisory Group is to promote an understanding of phosphorus in the WLEB and related conservation efforts. This is occurring through information sharing and providing a forum for feedback on the DAP adaptive management process and strategy to continue progress toward Michigan's phosphorus management goals for Lake Erie. With support from the University of Michigan Water Center, these groups have provided a broad conduit for public input and scientific advice, especially for the adaptive management planning components of Michigan's DAP.

As part of the adaptive management process, the framework and projects outlined in *Michigan's Adaptive Management Plan to Reduce Phosphorus Loading into Lake Erie* (2021) were evaluated in 2023 by the expert WLEB Science Panel to provide the DAP Team and state agencies with input, feedback, and recommendations on how to improve them. The WLEB Science Panel responded to a set of charge questions from the DAP Team and agency staff to review ongoing research and actions taking place in the Michigan portion of the WLEB and advise on necessary changes or course corrections to achieve a 40 percent reduction in TP loading into the WLEB. The WLEB Science Panel recommendations are incorporated throughout this update.

Accelerating Future Progress

The state agencies and the DAP Team are committed to supporting the implementation of voluntary agricultural conservation practices with a priority focus to achieve water quality outcomes through reducing the risk of nutrient and sediment loss into waterways, tracking and monitoring implementation efforts, and providing technical and financial support to producers and landowners in the WLEB. MDARD, EGLE, and DNR are prioritizing regenerative agriculture and climate smart conservation practices that maintain or increase farm productivity while improving soil health, nutrient retention, and increasing soil carbon. The overarching goal is to support economically, environmentally, and socially sustainable agricultural production that keeps ecosystem services provided by well-managed agricultural lands and wetlands in focus.

Strategy 1: Implement and Track Conservation Practices

Strategy 2: Measure Water Quality Results

Strategy 3: Conduct Research and Improve Modeling

Strategy 4: Expand Outreach and Education

Strategy 5: Maintain and Expand Collaboration

Monitoring implementation and water quality in Michigan's portion of the WLEB is being greatly expanded to allow resources to be directed toward where the biggest problems exist while improving understanding of how phosphorus moves from fields to the lake. The state's overall approach to reducing phosphorus loading to Lake Erie over the next five years (2024-2028) can be summarized by the following five strategies. Although these strategies apply mostly to NPS reduction programs overseen by MDARD, they also apply to EGLE and DNR programs that are addressing areas such as point source management and wetland restoration. The close coordination of complementary programs across state agencies, as well as across state and provincial borders, may be one of the most impactful results of the DAP process.

Purpose and Background

Lake Erie remains a critical natural resource for the state of Michigan, other states and the Province of Ontario, and a top priority for the DAP Team, which consists of senior management staff from the Michigan departments of Agriculture and Rural Development (MDARD); Natural Resources (DNR); and Environment, Great Lakes, and Energy (EGLE), collectively known as the Quality of Life agencies (QOL).

Michigan's 2018 DAP presented actions by state agencies, communities, and residents to help restore the health of the Lake Erie ecosystem. Michigan's DAP described goals and actions that aligned with: 1) the 2015 Western Basin of Lake Erie Collaborative Agreement (Collaborative Agreement); and 2) meeting the nutrient-related ecosystem goals for Lake Erie under Annex 4 (Nutrients) of the 2012 Great Lakes Water Quality Agreement. Ecosystem goals for Lake Erie include working toward a reduction in harmful algal blooms (HABs) in the Western Basin, decreasing the size of the low-oxygen hypoxic area in the Central Basin, and reducing excess growth of macroalgae like *Cladophora* in the Eastern Basin.

Phosphorus is a key driver of HABs that threaten human health, the environment, and the economy. The blue-green algal blooms seen in the WLEB produce harmful toxins, and decomposition of algal biomass throughout the Lake creates low-oxygen "dead zones."

Annex 4 of the GLWQA identifies phosphorus loads needed to maintain healthy algal populations in Lake Erie and establishes reduction targets to achieve these levels.

Over the last five years, the QOL agencies and partners have made significant progress towards the 40 percent reduction target primarily through major point source load reductions. The Great Lakes Water Authority (GLWA) Water Resource Recovery Facility (WRRF), Downriver Utility Wastewater Authority (DUWA), Ypsilanti Community Utility Authority (YCUA), and Monroe Metropolitan Treatment Plant have reduced annual loadings by at least 410 metric tons (MT) out of the 705 MT TP reduction target for Michigan's total portion of the WLEB, which includes the Detroit River Central Basin point source targets combined with the WLEB NPS targets.

While four of the key wastewater facilities in the state's portion of the WLEB were responsible for Michigan achieving the 20 percent phosphorus loading reduction goal by 2020, the 40 percent reduction target will not be achieved by 2025. Moving forward, new approaches are necessary to realize progress from agricultural contributions. The state is laser-focused on accelerating conservation in the right places across the WLEB watersheds with programs and projects defining success through realistic and achievable water quality outcomes to restore the health of the Lake Erie ecosystem.

Michigan's Adaptive Management Plan to Reduce Phosphorus Loading into Lake Erie (AMP) formalized the strategic approach to accelerating progress under Michigan's 2018 DAP. This DAP Update provide highlights on how far Michigan has come in the first DAP five-year cycle (2018-2023), and where the state is headed over the next DAP five-year cycle (2024-2028).

Goals and Objectives

As outlined in the 2018 Michigan DAP, the following ecosystem goals for Lake Erie are established through the Annex 4 Subcommittee process:

- Minimize the extent of hypoxic zones in the waters of the central basin of Lake Erie. Reduce TP entering the Western and Central Basins of Lake Erie by 40 percent - 3,316 MT from the U.S. and 212 MT from Canada - to achieve an annual load of 6,000 MT to the Central Basin
- Maintain algal species consistent with healthy aquatic ecosystems in the nearshore waters of the Western and Central Basins of Lake Erie. For the Western Basin, this means conditions similar to those observed in mid-year blooms in 2004 or 2012, 90 percent of the time. Reduce spring total and soluble reactive phosphorus (SRP) loads by 40 percent from the following watersheds: in Canada, the Thames River and Leamington tributaries; and in the U.S., the Maumee, River Raisin, Portage River, Toussaint Creek, Sandusky River, and Huron River (Ohio)
- Maintain cyanobacteria biomass at levels that do not produce concentrations of toxins which pose a threat to human or ecosystem health in the waters of the Western Basin of Lake Erie. Reduce spring total and SRP loads from the Maumee River in the U.S. by 40 percent

Priority Task Objectives

The QOL agencies are committed under the Collaborative Agreement, and subsequent Whitmer Administration Executive Directive 2019-14, to reduce the nutrient loadings from the following tributaries and associated watersheds by 20 percent by 2020, and 40 percent by 2025, based on 2008 load estimates established by Annex 4 Subcommittee:

- TP loads from the Detroit River (Central Basin Annex 4 Subcommittee Goal)
- Spring TP and SRP loads from the River Raisin (Western Basin Annex 4 Subcommittee Goal)
- Spring TP and SRP loading contributions from the Upper Maumee River (Western Basin Annex 4 Subcommittee Goals)

Specifically, EGLE is responsible for addressing point source reductions, MDARD and EGLE are responsible for addressing agricultural NPS reductions in the River Raisin and Upper Maumee River Watersheds, and DNR is responsible for protecting and restoring wetlands throughout the WLEB.

The following Priority Task Objectives were established in the Michigan 2018 DAP to ensure Michigan fully contributes to meeting the larger ecosystem goals established under the Annex 4 Subcommittee process. Activities planned and implemented over the last DAP five-year cycle (2018-2023) for each Priority Task Objective below are highlighted throughout the DAP Update and included in Appendix A. The 2018 Priority Task Objectives will be re-evaluated over the next DAP five-year cycle (2024-2028).

Michigan's 10 Priority Task Objectives Outlined in the 2018 DAP:

1. Maintain the reductions achieved in the GLWA WRRF discharge because of the tightened permit limits
2. Achieve reductions in phosphorus discharged from DUWA and continue reductions at Ypsilanti Community Utility Authority Wastewater Treatment Plant (WWTP)
3. Identify priority areas in Michigan's portion of the Maumee River Watershed for phosphorus reductions. Identify and implement priority actions to reduce phosphorus loads from Michigan's portion of the Maumee River Watershed
4. Support and invest in research to better understand the causes of HABs, including invasive mussels and SRP (urban and rural sources), and how these factors increase/decrease HAB events
5. Utilize research and field demonstrations to identify the suite of best management practices (BMPs) that work collectively to reduce both TP and SRP at the field-scale implementation level
6. Implement phosphorus control actions in the River Raisin Watershed to achieve the target load reductions
7. Maintain and expand partnerships to provide valuable technical and financial assistance to producers
8. Increase and maintain Michigan Agriculture Environmental Assurance Program (MAEAP) practice implementation and verification for long-term water quality improvement
9. Improve and increase outreach to the public and producers to promote understanding of the WLEB and good conservation practices by initiating new targeted outreach campaigns, workshops, field demonstrations, and information sharing
10. Promote wetland restoration and other land management initiatives to reduce phosphorus loading

Compared to 2008 baseline phosphorus load data, Michigan has achieved the interim goal of reducing phosphorus loads by 20 percent compared to 2008 baseline data as called for in the Collaborative Agreement primarily because of point source discharge reductions at the GLWA facility (previously referenced in the Michigan 2018 DAP as the Detroit Water and Sewerage Department or DWSD) and three other key treatment plants. However, reductions of NPS phosphorus loads since 2008 have not been substantial and Michigan will not meet the 40 percent reduction in total TP load reduction for NPS phosphorus by 2025.

The QOL agencies and the DAP Team remain committed to supporting the implementation of voluntary conservation practice adoption that will help to reduce the risk of nutrient and sediment loss into waterways, tracking and monitoring implementation efforts, and providing technical and financial support to producers and landowners in the WLEB. MDARD, EGLE, and DNR are prioritizing regenerative agriculture and climate smart conservation practices that maintain or increase farm

productivity while improving soil health, nutrient retention, and increasing soil carbon. The overarching goal is to support economically, environmentally, and socially sustainable agriculture production that keeps ecosystem services provided by well-managed agricultural lands and wetlands in focus.

Monitoring of conservation practice implementation and water quality in Michigan's portion the Lake Erie watershed is being greatly expanded to allow resources to be directed towards areas with the most significant problems. While the state has built a solid foundation for setting and working towards long-term goals, it also continues to invest in short-term success wins and to leverage the investments by partners who are seeking the same goal.

Appendices A (DAP Task Tracking Table) and Appendix B (Two-Year Work Plan) outline state and partner projects being planned and implemented in the WLEB to achieve the DAP Priority Task Objectives. Previous 2018 DAP metrics will not be carried forward into the next DAP five-year cycle (2024-2028) as the state is developing new agricultural NPS outcomes and metrics for the WLEB with a focus on smaller subwatersheds in the WLEB (see Strategic Planning in WLEB Priority Subwatersheds section).

Updated Load Allocations

The starting point for establishing the 2008 water year (October 1 to September 30) baseline loading and 40 percent load reduction goals were the preliminary annual TP load allocations established under the Annex 4 Subcommittee process, which is led by the U.S. Environmental Protection Agency (USEPA) and the Canada Water Agency (USEPA, 2018), and were based on estimates from Maccoux et al. (2016) and prior work by Chapra and Dolan (2012). As described in the GLWQA U.S. Action Plan for Lake Erie (2018), the initial TP load allocation estimates were subject to potential future refinement, especially for tributaries with relatively lower confidence or limited data supporting the estimates.

Baseline loads for Michigan's tributaries within the Upper Maumee River Watershed were revised based on Ohio's recently approved Maumee Watershed Nutrient Total Maximum Daily Load (TMDL), which better accounted for variability in loading rates revealed by additional analyses completed after the Annex 4 Subcommittee targets were set. The total Upper Maumee River load remains the same, however a portion previously attributed to Michigan was found to be originating from Ohio. The updated NPS TP load allocations for the Upper Maumee River Watershed, including the Bean Creek and St. Joseph River watersheds, were modified to reflect new information, which corresponds to a new load of 199 MT (compared with 267 MT previously) corresponding to a reduction of 40 MT needed to achieve a 20 percent reduction of TP and an 80 MT reduction to achieve a 40 percent reduction of TP (Table 1).

The baseline TP loading for areas outside of the Upper Maumee River and River Raisin Watersheds included the Huron River watershed and relatively smaller drainage areas downstream of the Detroit River mouth and considered direct drainage watersheds (USEPA, 2018). The TP load allocations for these tributaries were grouped into a single category with an overall load reduction of approximately 37 MT to meet a 20 percent reduction goal and approximately 74 MT reduction of TP to achieve a 40

percent goal (Table 1). No SRP load reduction targets have been set for the River Raisin or the Upper Maumee River. Continued research and water quality monitoring in subwatersheds of the River Raisin is needed as concentrations at the mouth are currently low compared to other WLEB watersheds. More years of water quality monitoring data are needed in the Upper Maumee River including in the St. Joseph and Bean Creek Watersheds.

Table 1: Michigan's Annual Total Phosphorus load reduction goals.

Detroit River

Location	2008 Baseline TP Load (MT)	20 Percent TP Reduction Amount (MT)	40 Percent TP Reduction Amount (MT)	Target TP Load (MT)
Detroit River at the mouth (U.S. portion)[1]	1261	252.2	504.4	756.6

Western Lake Erie Basin Watersheds

Location	2008 Baseline TP Load (MT)	20 Percent TP Reduction Amount (MT)	40 Percent TP Reduction Amount (MT)	Target TP Load (MT)
River Raisin at the USGS and NCWQR monitoring location[2]	172	34.4	68.8	103.2
Upper Maumee River tributaries (Michigan portion)[3]	199	39.8	79.6	119.4
Other Michigan Western Basin tributaries and direct drainage areas[4]	130	26.0	52.0	78.0
WLEB Subtotal	**501**	**100.2**	**200.4**	**300.6**
Total Michigan Allocation	**1762**	**352.4**	**704.8**	**1057.2**

1 – Detroit River 2008 baseline load was determined from the Annex 4 process (USEPA 2018, Maccoux et al. 2016).
2 – River Raisin 2008 baseline load as reported by the NCWQR at Heidelberg University for its monitoring location upstream of Monroe, Michigan which coincides with U.S. Geological Survey (USGS) station #04176500 National Center for Water Quality Research (NCWQR 2022).
3 – Michigan's Maumee River tributaries (i.e., the St. Joseph River and Bean Creek) 2008 baseline load was updated based on Ohio's TMDL for the Maumee River. Annual load was estimated from the spring load by applying a scale factor according to the ratio of spring-to-annual NPS loading.
4 – Tributaries include the Huron River, Swan Creek, Stony Creek, Otter Creek, and several other small tributaries and direct drainages to the WLEB. Annual loads were determined following the Annex 4 Subcommittee process (USEPA 2018, Maccoux et al. 2016) with improved estimates for direct drainages that were previously lumped with the River Raisin complex loads.

For clarification purposes only, during the process of establishing initial TP load allocations for Michigan, the Annex 4 Subcommittee determined the River Raisin Watershed TP load allocation of 262 MT by using the Maccoux et al. (2016) method, which included the River Raisin Watershed plus areas directly draining to Lake Erie from outside the watershed. As reported in Michigan's 2018 DAP, the state adopted a River Raisin baseline TP load of 172 MT based on Heidelberg University's National Center for Water Quality Research (NCWQR) water quality monitoring station located upstream from Lake Erie with the intention of using that monitored load to provide an entire watershed value.

The difference between the two methods used equates to approximately 90 MT, which is now accounted for in the category "Other Michigan Western Basin Tributaries and Direct Drainage Areas." The difference has been acknowledged by the two parties and has been resolved. The DAP Team and the USEPA will continue to track progress using the Heidelberg monitoring station values specific to the River Raisin Watershed.

In summary, Table 1 shows approximately two-thirds of the 40 percent amount will come from point source reductions (i.e., ~504 MT) and the remaining one-third will come from NPS reductions (200 MT).

Achieving Nutrient Reduction Goals

Relative to the 2008 baseline (764 MT), the most substantial progress to date has been the reduction of point source loads. Annual point source TP loads, including GLWA, are measured as part of the National Pollutant Discharge Elimination System (NPDES) discharge monitoring reporting requirements. Through the NPDES program in cooperation with four key WWTPs, Michigan exceeded the 20 percent load reduction interim goal, reducing the total Michigan load by 25 percent through point sources alone.

These reductions are especially attributable to GLWA, the Detroit region's primary municipal wastewater service provider, where annual TP loads (2008-2022 average) have been reduced by over 55 percent. For the four key facilities – GLWA, DUWA, YCUA, and Monroe - the five-year average reduction for the previous DAP period (2018-22) was 406 MT TP, which equates to a 23 percent reduction of the total Michigan 2008 load. Considering enhanced controls made at DUWA since 2019, the three-year reduction average (2020-2022) was 447 MT TP, or just over 25 percent of the total Michigan load (Figure 1). Except for Monroe, these point source facilities discharge to the Detroit River.

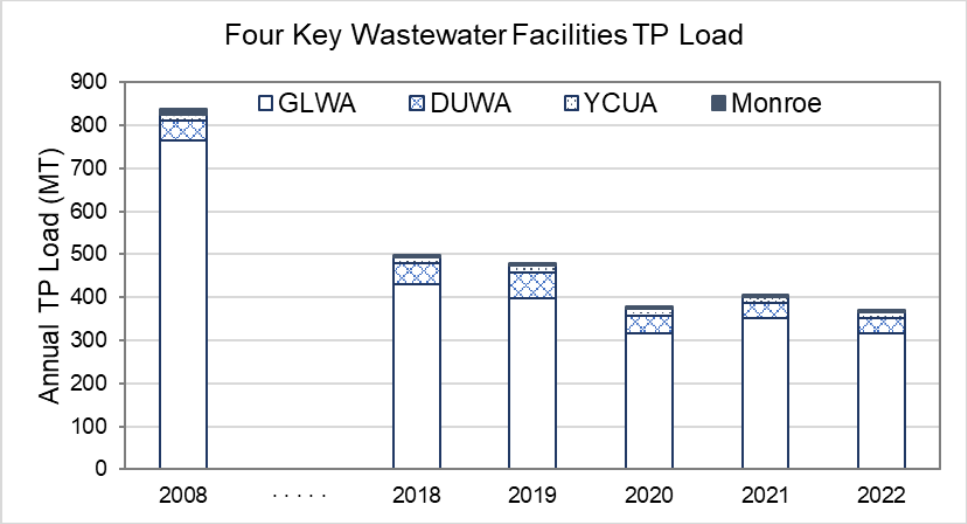


Figure 1. Total phosphorus loadings from the four key facilities – Great Lakes Water Authority Water Resource Reclamation Facility (GLWA), Downriver Wastewater Treatment Facility (DUWA), Ypsilanti Community Utility Authority Wastewater Treatment Plant (YCUA), and Monroe Metro Wastewater Treatment Plan (Monroe), for water years 2008 (baseline year) and 2018–2022.

Figures 2 and 3 present estimates of the TP annual loads for the River Raisin Watershed and Michigan's tributaries of the Upper Maumee River Watershed. Unlike the Detroit River, the River Raisin and Upper Maumee River watersheds are dominated by NPS of phosphorus, which account for over 95 percent of the total TP loads. Annual NPS TP loads are impacted by several factors, including both landscape management actions and weather, but are typically highly correlated with annual streamflow volumes which in turn are correlated with annual precipitation amounts, as illustrated by the runoff plots in the figures. Relative to point sources, annual TP loading from NPS is therefore typically more variable from year to year.

The River Raisin met the 40 percent TP load reduction goal only once (2021) over the previous DAP five-year period (Figure 2). Over the same period in Michigan's Upper Maumee River tributaries, the 40 percent reduction goal was met once (2021), and the 20 percent target was met in three years (2018, 2021, 2022). In both watersheds, 2021 was considered a dryer year. Appendix C includes detailed water quality monitoring summaries for the River Raisin and the Upper Maumee River Watersheds.

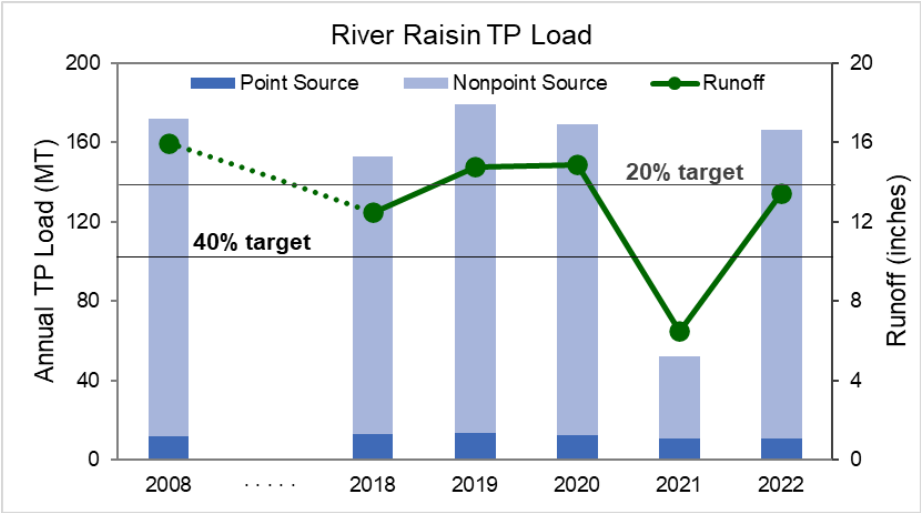


Figure 2. Estimated annual (water year) point source and NPS TP loads for the River Raisin Watershed for the 2008 baseline year and 2018-2022.

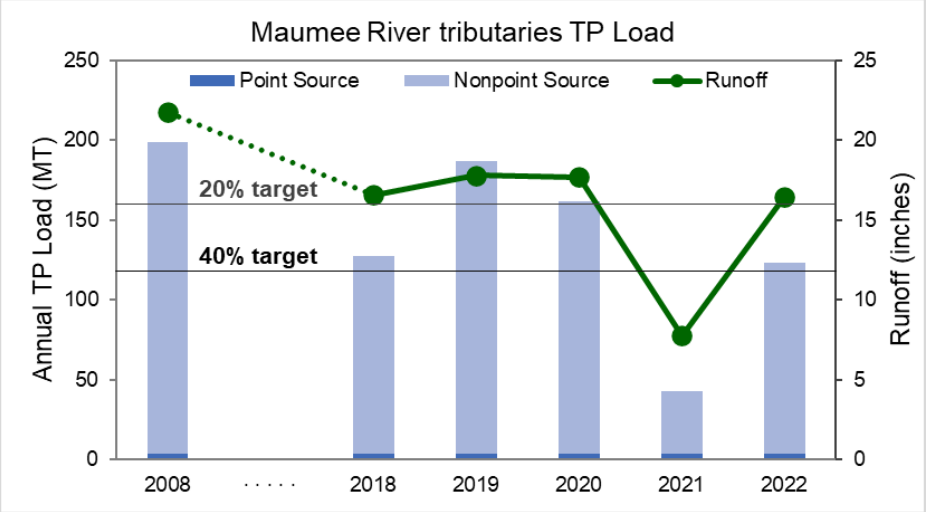


Figure 3. Estimated annual (water year) point source and NPS TP loads for Michigan's Upper Maumee River tributaries for the 2008 baseline year and 2018-2022.

Achieving and Maintaining Reduction Targets Under Changing Precipitation and River Water Flows

The occasions where the 40 percent TP load reduction target across all Michigan sources were met tend to coincide with water years when streamflow volumes were relatively lower. Historically, spring precipitation and runoff were relatively steady in southeast Michigan and northwest Ohio from 1983 through 1997, with only four years substantially above the 60-year average for rainfall and discharge (Joosse and Baker, 2011). From 2008 through 2019, spring rainfall and discharge were consistently above average, with only 2012 and 2016 below average (Rowland et al., 2019). Spring rainfall and discharge were exceptionally high in 2011, 2015, and 2019, with comparably large summer algal blooms (Sayers et al., 2019), except in 2019 when excessive rainfall impeded spring planting (Guo et al., 2020). The largest percentage of the overall spring load often comes in just three to five large storms.

Since 2019, spring rainfall and flows have been closer to average; however, some studies in the Lake Erie Basin have projected continued increases in spring precipitation (Culbertson et al., 2016) and overall storm intensity (i.e., more rainfall coming in fewer storms; Great Lakes Integrated Sciences and Assessments Center, 2025) as we approach the end of the 21st century. Rainfall events that exceed 0.8 inches (20 mm) have been forecast to increase in annual frequency by approximately 50 percent and the frequency of events that exceed 1.3 inches (30 mm) could be expected to double (Tetra Tech, 2020).

Achieving and Maintaining Reduction Targets by Adaptively Managing the Landscape

Michigan's portion of the WLEB consists of 2,510,822 million acres. The Upper Maumee River and the River Raisin Watersheds, as the two priority watersheds, together consist of 1,877,881 million acres. While some progress has been made to implement conservation actions in the years since the 2018 DAP, phosphorus loads have yet to decline, which indicates Michigan and other binational jurisdictions still have a long way to go to meet the targets set through the Annex 4 Subcommittee process.

Specifically, more work is needed to address agricultural NPS reductions in the WLEB. The state remains committed and focused on the adaptive management approach to maximize environmental outcomes and economic benefits of conservation practice adoption. The QOL agencies are committed to this process and are actively working with partners to strategically prioritize planning and implementation actions. This approach includes using existing state and federal programmatic technical and financial assistance to support increased conservation practice adoption of effective conservation practices and continued funding to partners to develop and implement 319-approved Watershed Management Plans (WMPs). Figure 4 shows approximately 75 percent of Michigan's portion of the WLEB is covered by 319-approved WMPs.

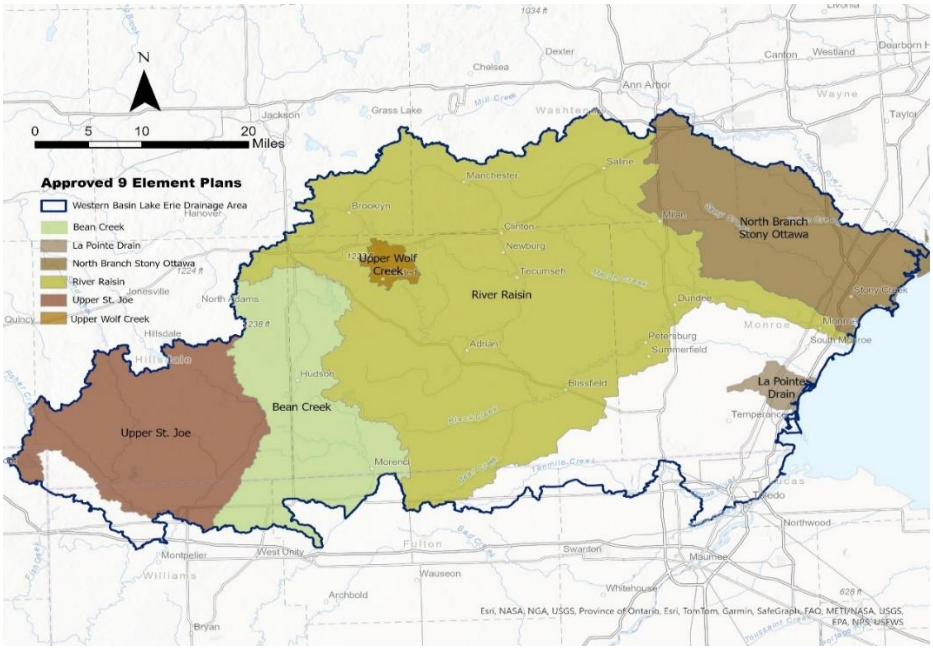


Figure 4. Map of 319-approved WMPs in the WLEB.

MDARD is also supporting new innovative approaches and partnerships to accelerate conservation planning and implementation. In support of the governor's MI Healthy Climate Plan, the Fiscal Year (FY) 2024 budget includes a total $13 million investment to support soil health, climate smart agricultural practices, and regenerative agriculture. These priority areas are not solely about building stronger, more diverse agricultural systems and resilient rural economies; they also place a specific focus on improved environmental outcomes.

The investments in soil health to improve water quality are a notable shift in MDARD's efforts to tackle nutrient losses. Managing agricultural systems to improve water holding capacity and rainfall infiltration, while enhancing biological cycling to reduce the need for fertilizer inputs, is a paradigm shift in nutrient management for MDARD. Regenerative agriculture principles have been shown to not only reduce nutrient losses but mitigate the impacts of extreme weather – all while prioritizing market-driven agricultural diversity that can power rural communities.

EGLE continues to promote and support nutrient management and a suite of conservation practices that reduce nutrient runoff and soil erosion. EGLE also continues to further develop and facilitate the implementation of an agriculture inventory process that prioritizes potential locations for conservation practices (see State Conservation Program section for more details regarding the agricultural inventory process). DNR continues to focus on implementing other land management programs, specially creating and/or restoring wetlands in rural areas of the WLEB.

The Alliance for the Great Lakes (AGL) and Ohio Environmental Council authored a study in 2023 titled, *The Cost to Meet Water Quality Goals in the Western Basin of Lake Erie*. This study estimated the number and cost of agriculture conservation practices necessary to achieve the 40 percent TP reduction goal. The analysis found two to four in-field BMPs (i.e., stacked practices) would need to be maintained on virtually all agricultural acres in the Lake Erie watershed. Additionally, in-field conservation practices alone were determined insufficient to meet water quality objectives and the adoption of structural and semi-permanent practices would need to increase significantly.

Understanding, predicting, and tracking nutrient loads from the WLEB watershed is difficult. This is due to the complex drivers of nutrient loss within subwatersheds including cropping systems, farm management, nutrient cycling, and variable weather patterns described above. MDARD is working with EGLE and other partners to better understand the scale of implementation needed in the WLEB to comply with the Annex 4 Subcommittee nutrient load reduction goal commitments and will continue to take a strategic approach described below that includes implementing agricultural inventories and expanding water quality monitoring efforts to better track progress toward achieving environmental outcomes.

Strategic Planning in WLEB Priority Subwatersheds

Conservation programs for agricultural NPS have historically taken a broad approach to delivery, being open to all eligible applicants. The state is aware, some locations, are more prone to phosphorus loss, soil erosion, and higher runoff volume (Sharpley et al. 2001). Studies indicate when compared to a random implementation approach, conservation practices focused on higher priority locations can lead to greater reductions in nutrient loss at lower costs (Bosch et al. 2013; Diebel et al., 2008). Starting with the priority watersheds, the state is utilizing the agricultural inventory process as the primary planning approach to identify locations that may receive higher returns on conservation investments.

Agricultural Inventory Process

To facilitate the adaptive management approach, the DAP Team identified discrete areas in the WLEB to focus key efforts to better understand if and how implementation efforts are making a difference in reducing phosphorus loads. The five priority Hydrologic Unit Codes (HUC)-12 subwatersheds selected include: Headwaters Saline River (HUC 041000020401), S.S. LaPointe Drain (HUC 041000010201), Lime Creek (HUC 041000060105), Nile Ditch (HUC 041000020303), and Stony Creek-South Branch River Raisin (HUC 041000020202) (Figure 5).

The HUC-12 subwatersheds and the landscape features are identified in Table 2. These subwatersheds were selected for more focused and accelerated activities including completing agricultural inventories, finer-scale water quality monitoring, prioritized conservation practice implementation, and assessing the costs associated with full implementation to achieve a 40 percent TP reduction goal.

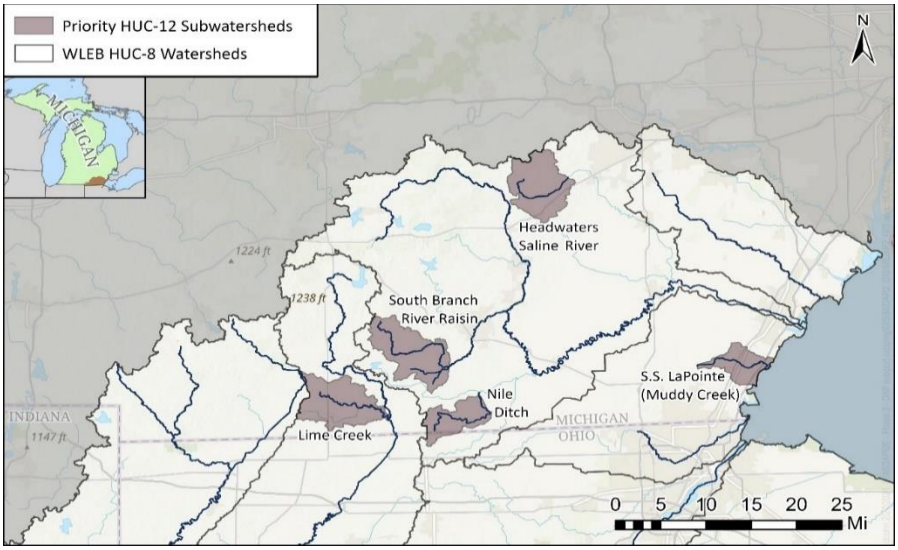


Figure 5. Map of the five WLEB priority HUC-12 subwatersheds: Lime Creek; Stony Creek, South Branch River Raisin; Nile Ditch; S.S. LaPointe Drain (Muddy Creek); and the Headwaters Saline River.

Table 2. WLEB five priority HUC - 12 subwatersheds, the associated HUC-8 priority watershed, and landscape features.

Priority HUC-12 Subwatershed	Priority HUC-8 Watershed	Subwatershed Landscape Features
Stony Creek, South Branch River Raisin	River Raisin	Livestock operations and manure application are prevalent.
Nile Ditch	River Raisin	Little to no livestock operations and commercial fertilizer use is dominant.
Lime Creek	Bean Creek	Known for high phosphorus levels and has an *E. coli* TMDL in place and a 319-approved WMP.
S.S. LaPointe Drain	Lake Erie Direct Drainage	Direct drainage to Lake Erie and has a 319-approved WMP plan.
Headwaters Saline River	River Raisin	Headwaters areas where a buffer easement purchase pilot project along designated county drains is underway.

The agricultural inventory process includes three components. The first component is a desktop analysis, which identifies individual agricultural field boundaries, fields that are next to waterbodies and if those fields have filter strips, fields having the potential for Concentrated Animal Feeding Operations (CAFO) manure to be applied based on issued permits, and the location of livestock operations in a watershed. The second component is a field inventory to document how each field is being farmed. This includes documenting for each field the type of crop grown, the fall tillage practices, the percentage of crop residue remaining after spring planting, and the use of cover crops. The third component is the ACPF tool, which is a modeling component that uses LiDAR derived digital elevation models to identify where water flows across the landscape, identifies the slopes within each field and where conservation practices may be necessary to reduce soil erosion, sedimentation, and nutrient loses to surface waters.

The state began to implement the agricultural inventory work in 2020, with the Lime Creek, Silver Creek and Covell Drain agricultural inventory process outlined in the Bean Creek 319-approved WMP. Some of this work is being completed in partnership with the Environmental Working Group with support from the Erb Family Foundation. To date, the agricultural inventory process has been fully completed on 10 of the 75 HUC-12 subwatersheds in the WLEB (Figure 6). To date, the ACPF component has been completed on 51 HUC-12 subwatersheds with the intent to complete the process on all remaining HUC-12 subwatersheds by the end of 2025. Updates to the agricultural inventory process will be highlighted in the annual DAP Update.

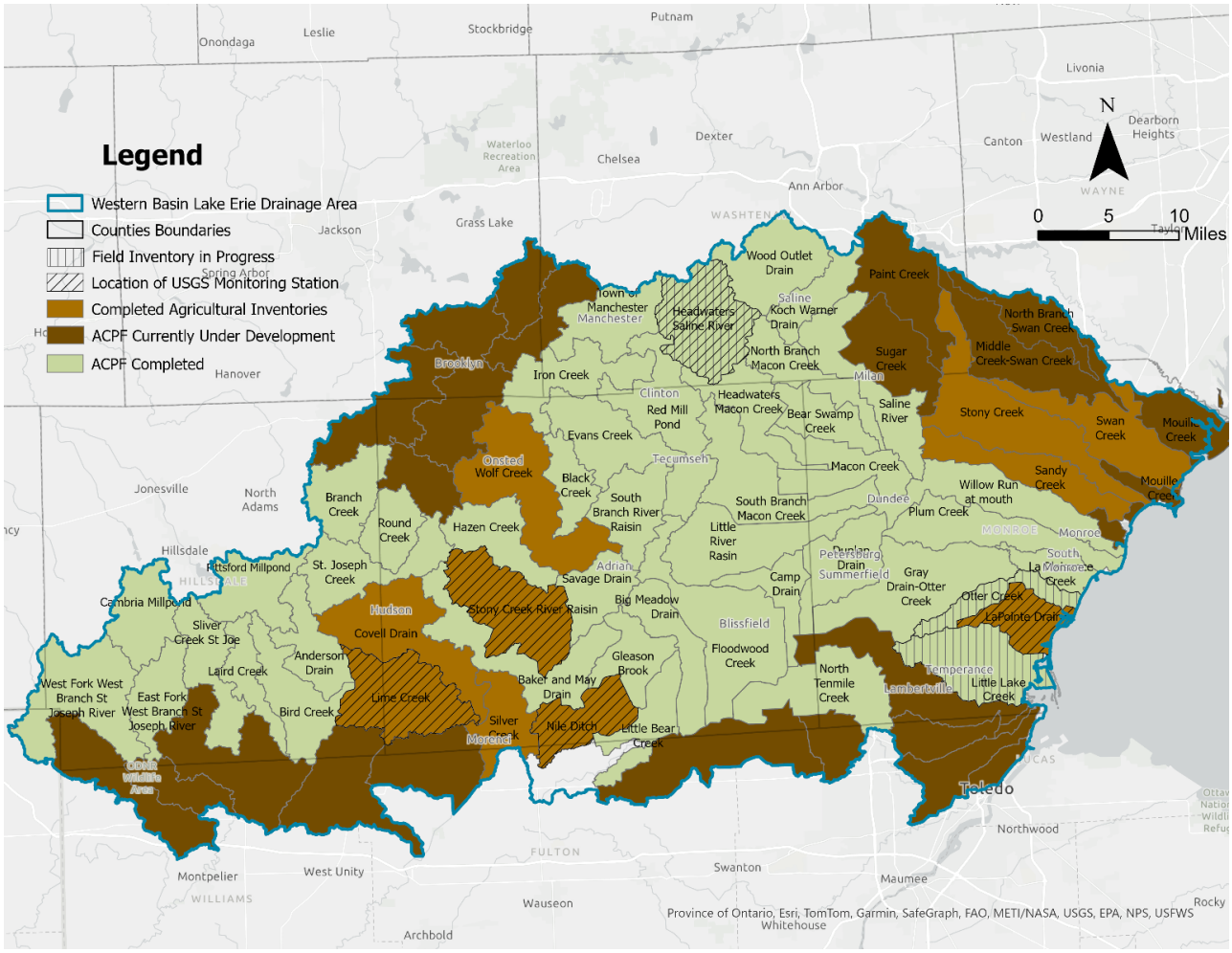


Figure 6. Status of the ACPF in Michigan's WLEB five priority subwatersheds (hatched marked), and other subwatersheds where the ACPF was completed or currently being run, including the completed and in progress agricultural inventory subwatersheds.

Meeting Water Quality Goals Assessment

The Magnitude and Cost of BMP Implementation: Strategic Planning for Michigan's Priority Subwatersheds (2024) methodology, with additional input from the QOL agencies, was used to assess and estimate the impact of conservation practice scenarios in the five priority HUC-12 subwatersheds. The datasets used in the technical analysis included output from the ACPF, Cropland Data Layer, results from field-by-field agricultural inventories, and a desktop analyses of existing structural BMPs and livestock operation locations. The analysis also included estimating a baseline phosphorus load for each agricultural field informed by the Soil and Water Assessment Tool (SWAT), constructing hypothetical BMP scenarios tailored to the local landscape, and estimating the phosphorus load reduction and annualized costs associated with each conservation practice implementation scenario.

Working Hypothesis

The WLEB ACPF and agricultural inventories will make it possible to more effectively place and fund BMPs that improve water quality.

A critical component of the analysis was a field prioritization process, which involved using the agricultural inventory results and other information to give each field a score based on its risk of elevated phosphorus loading to the drainage system and eventually Lake Erie (Figure 7). This prioritization process does not definitively indicate there are nutrient runoff problems at high-priority sites but rather guides Conservation Specialists on where to initially focus outreach and collaborate with producers and landowners to identify conservation solutions if needed.

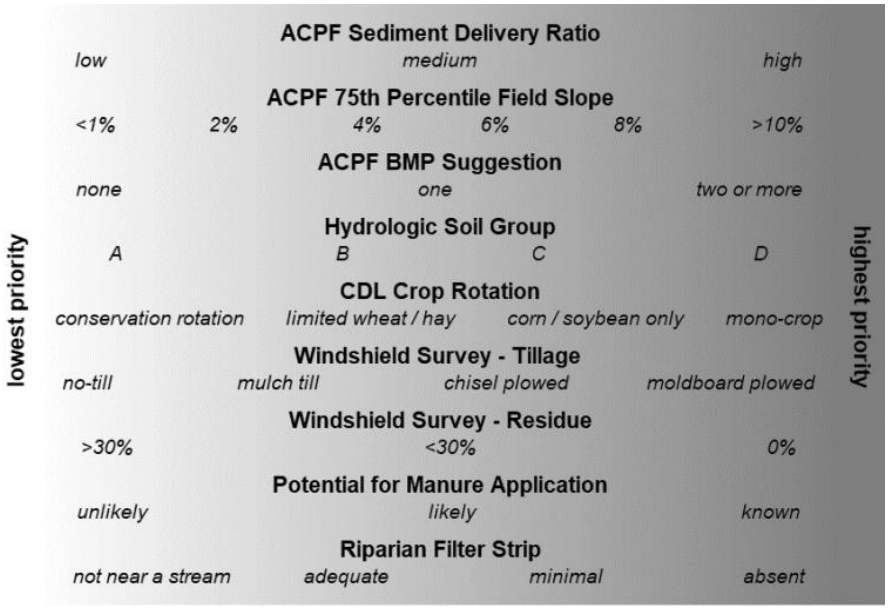


Figure 7. Illustration of the decision matrix used in the process to prioritize fields, based on work by EGLE.

Results of the field prioritization analysis are shown in Figures 8 through 11. In addition to informing which fields have a greater potential for elevated TP loading, the field prioritization results were used when constructing the hypothetical conservation scenarios that combine annual in-field BMPs (no-till, cover crops, conservation crop rotation, and precision nutrient management) and structural BMPs (grassed waterways, constructed wetlands, water and sediment control basins, riparian filter strips, and drainage water management) at a magnitude needed to achieve 40 percent phosphorus reduction goals. The scenarios sought to optimize the cost-effectiveness of conservation spending by stacking multiple conservation practices on the areas identified from the field prioritization process as having the highest TP loading probability, thereby achieving greater TP reductions than a randomized implementation strategy.

The assessment for the five priority subwatersheds indicated two to three stacked in-field conservation practices implemented on the majority of cropland and adoption of multiple types of structural BMPs would be necessary to achieve the desired TP reduction goal. The assessment found TP load reductions on the order of 45-49 percent could be achieved for $8.6-9.3 million per year for the five watersheds combined.

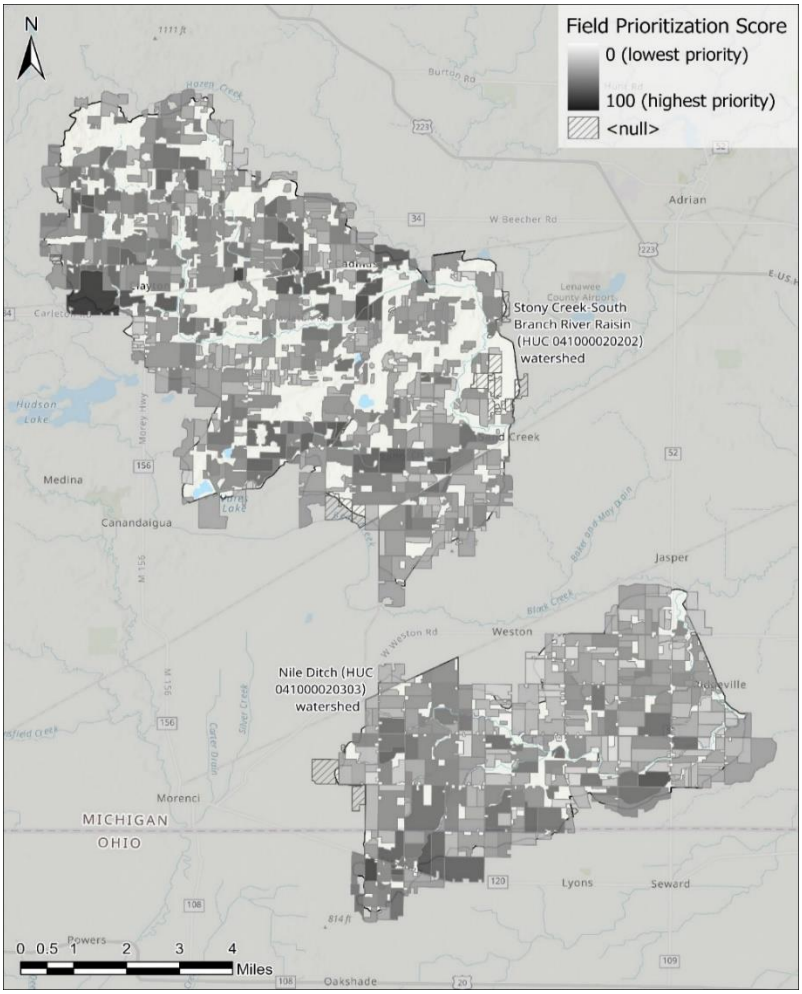


Figure 8. Results of field prioritization analysis for the Nile Ditch and Stony Creek-South Branch River Raisin priority subwatersheds showing low to high phosphorus risk potential conducted by AGL.

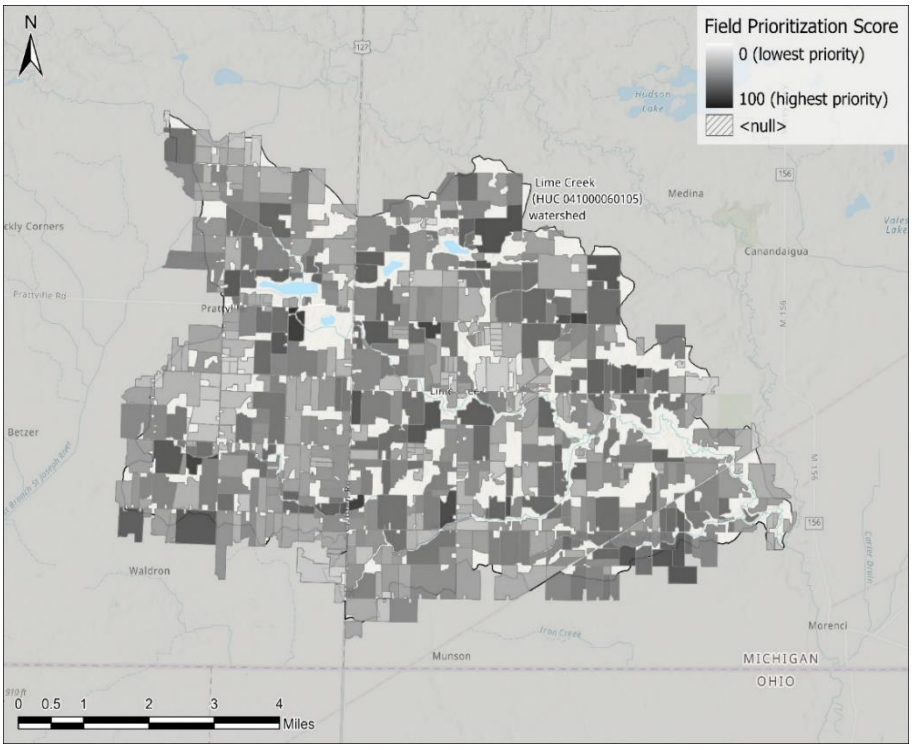


Figure 9. Results of field prioritization analysis for the Lime Creek priority subwatershed showing low to high phosphorus risk potential conducted by AGL.

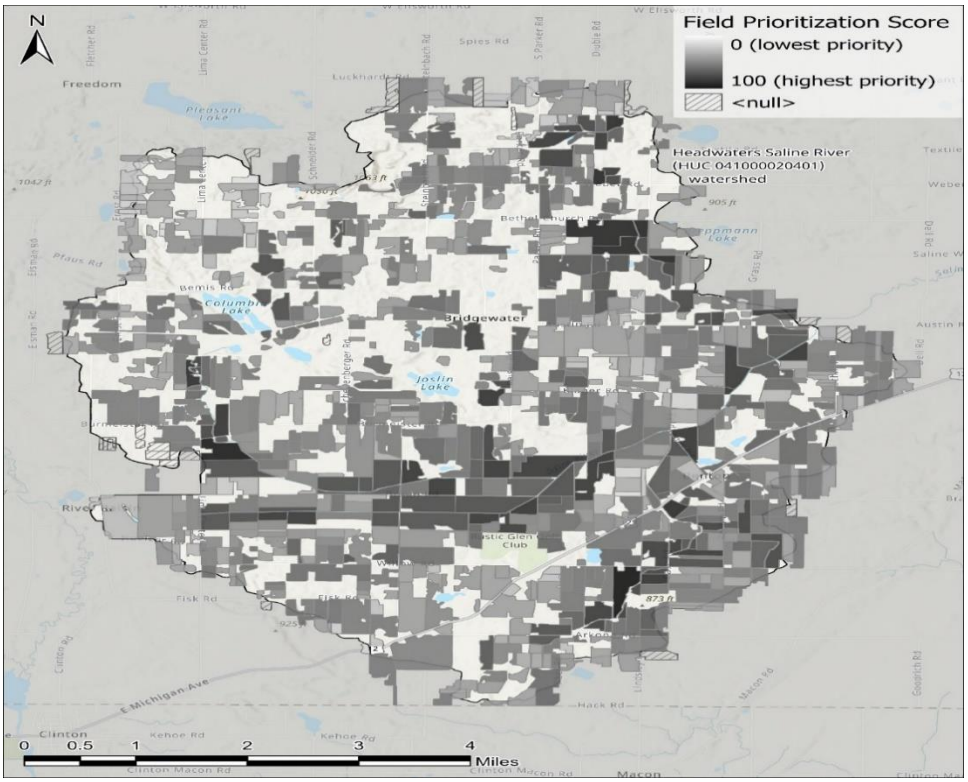


Figure 10. Results of field prioritization analysis for the Headwaters Saline River priority subwatershed showing low to high phosphorus risk potential conducted by AGL.

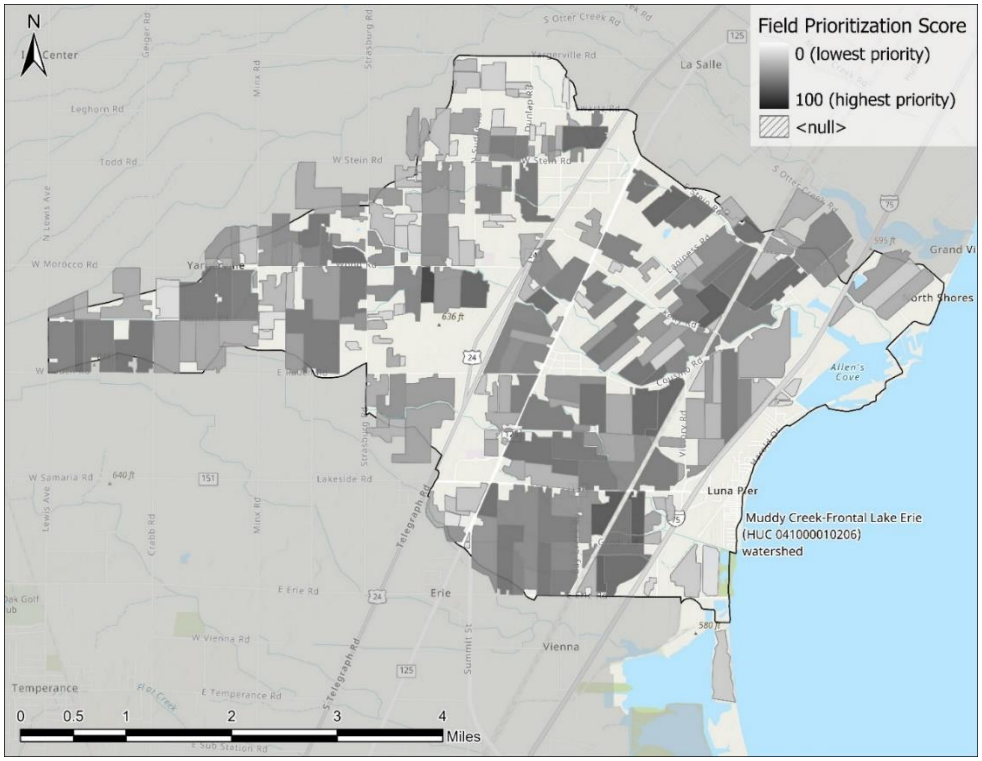


Figure 11. Results of field prioritization analysis for the S.S. LaPointe Drain priority subwatershed showing low to high phosphorus risk potential conducted by AGL.

Implementation of conservation practices on such a scale necessary to meet the 40 percent reduction target requires producers' and landowners' willingness to adopt them. A prioritized versus random conservation practice implementation approach using available information from the ACPF, agricultural inventory, and SWAT models ensures available funds are spent more efficiently to control NPS phosphorus pollution. Even with federal and state support for nutrient reduction programs widespread implementation of conservation practices will need time to be integrated. Installation of natural features such as wetlands will take time to move through the proposal, design, permitting, and construction phases.

Education and outreach approaches and resulting changes in producer and landowner behavior will take time to be fully realized. The Michigan 2021 AMP identifies several known challenges to accelerating and tracking conservation adoption, including:

- Pinpointing the ideal locations for the impact of BMP placement at the field- and watershed-scales to optimize water quality benefits
- Overcoming cultural barriers to adoption that may prevent the implementation of inventory knowledge
- Potential for rapid change in practices may cause inventories to become outdated
- Privacy concerns may create obstacles to inventory data collection and use

Anticipated responses in rivers and lakes will continue to be slow due to the significant changes required to reduce nutrient loading from agricultural landscapes. Nevertheless, increasing the effectiveness of federal, state, and private conservation program delivery to incentivize and accelerate NPS load reductions remains a priority.

Meeting Water Quality Goals Strategic Framework

The Meeting Water Quality Goals assessment project described above was used to inform the development of a strategic framework for the WLEB. The following five strategies provide a "recipe" for achieving desired phosphorus reductions based on the best available science, agency staff and community input, and recommendations from the 2023 WLEB Science Panel. This framework is serving as the basis for the development of a five-year WLEB Strategic Plan that is currently in development.

Strategy 1: Implement and track conservation practices

The state is committed to implementing and tracking state, federal, and other conservation programs and practices implemented in the basin. The specific programs and practices that will be tracked are currently in development and will be made public through the Michigan State University - Institute for Water Research (MSU-IWR) Great Lakes Watershed Management System (GLWMS) - Nutrient Tracking Dashboard (Figure 12). The purpose of the Nutrient Tracking Dashboard is to enable QOL agencies and other partners (e.g., Natural Resources Conservation Service [NRCS] and Farm Service Agency [FSA]) to assess, quantify, and track nutrient and sediment reduction estimates towards an annual 200 MT NPS reduction target for Michigan's portion of the WLEB.

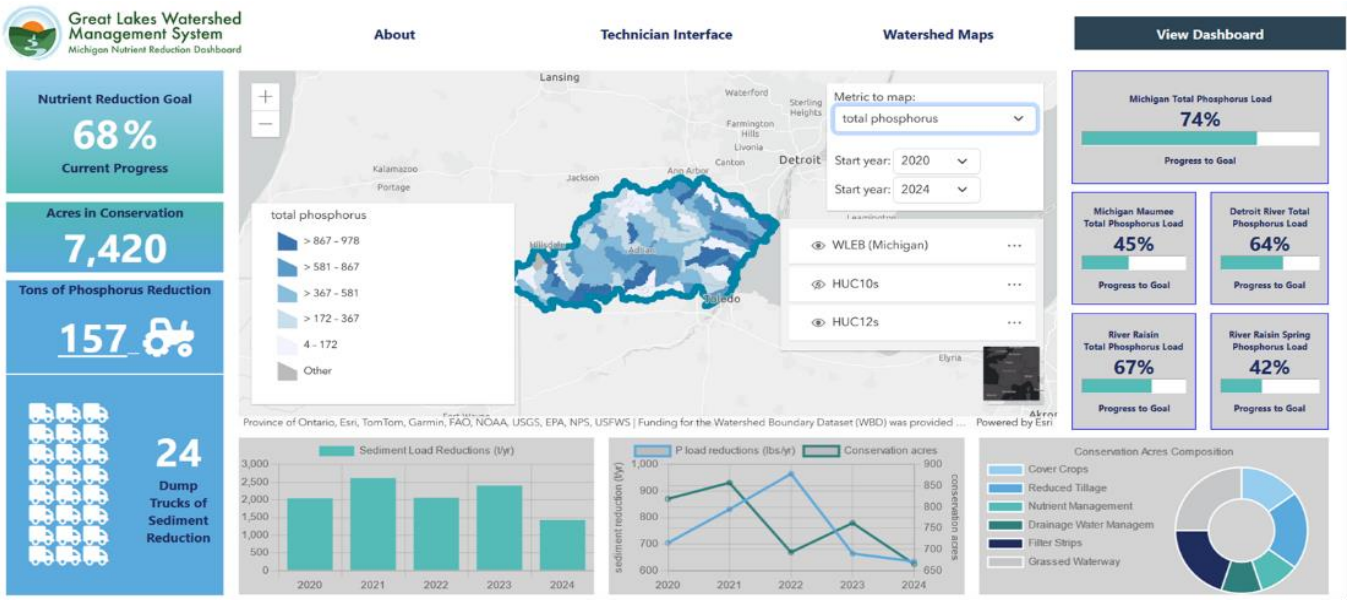


Figure 12. Schematic of the GLWMS interactive Nutrient Tracking Dashboard. The dashboard will document historical, current, and projected progress across conservation practices, metrics and goals.

The following conservation practices compose a suite of potential BMPs for implementation and tracking through the GLWMS - Nutrient Tracking Dashboard based on research and modeling of field-specific characteristics:

- Nutrient management (subsurface application of phosphorus into the root zone using rates based on soil test phosphorus recommendations)
- Cover crops (diverse, year-round, or at minimum overwintering)
- Conservation crop rotation (diversify with small grains or forage, increase length of rotation)
- No-till or practices that minimize soil disturbance
- Filter or buffer strips (designed at a sufficient size to reduce phosphorus, planted with right type of vegetation, and allowing for biomass removal)
- Wetlands (with a two-day minimum residence time, continuous flow, and of sufficient size to serve as phosphorus sink)
- Prairie strips and grassed waterways
- Water and sediment control basins

To address water quality issues, landowners and producers can also incorporate a controlled drainage structure, so nutrients are not immediately lost from the landscape. To improve farm profitability and limit nutrient loss, producers may consider the use of precision technology for variable-rate fertilizer application and planting. To increase carbon sequestration, producers could take the most marginal and lowest-producing land out of production to grow perennialized systems such as permanent buffers or prairie strips (Basso et al., 2019; Fowler et al., 2024). Overall, the core of regenerative principles and practices is rooted in responsible resource use, supporting the health of soils, increased productivity, promoting rural prosperity, and achieving positive environmental outcomes (Charles, 2023).

Strategy 2: Measure the results

The state and partners need to better understand the impact of the drivers of nutrient transport and the connection between land management decisions and water quality outcomes. Understanding this connection will allow QOL agencies, partners, and practitioners to better focus conservation and land management practices to meet phosphorus reduction goals set for Michigan's portion of the WLEB. MDARD has partnered with the AGL to expand the water quality monitoring network in the WLEB in and around the five priority subwatersheds (Figure 13). The program will be implemented over a five-year period (2024-2029) and will include monitoring for TP and SRP, nitrogen, turbidity, and total suspended solids.

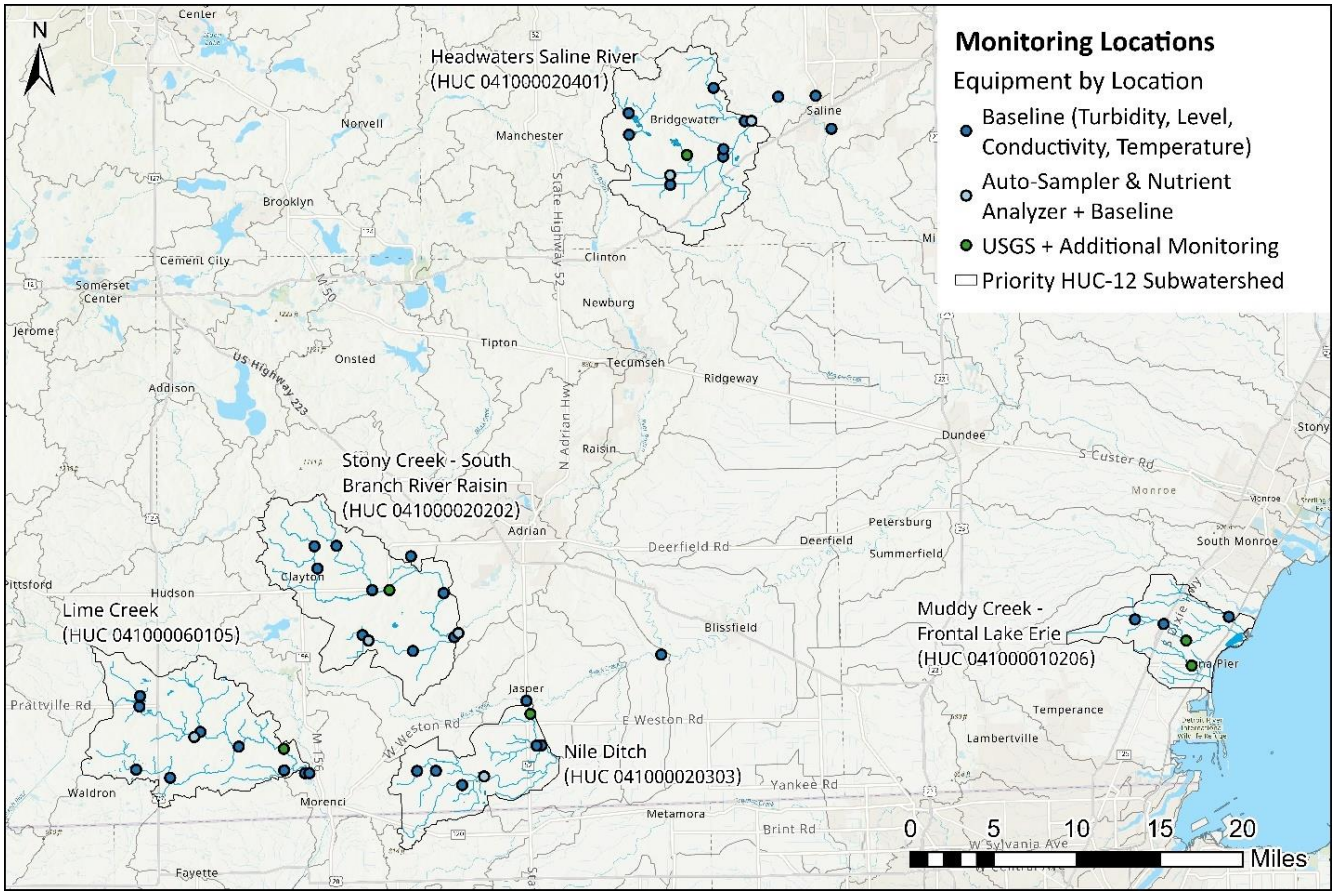


Figure 13. Map of proposed expanded water quality monitoring site locations within or near the five priority HUC-12 subwatersheds identified by AGL and the state.

MDARD and EGLE continue to fund and support the operation of U.S. Geological Survey (USGS) gaging stations in the priority HUC-12 subwatersheds. The agencies also worked with MSU-IWR and partners to develop a WLEB Water Quality Monitoring Strategy that focused on outlining past and current monitoring information and articulates the necessary location and scale of monitoring needed to fill gaps. The Monitoring Strategy also describes existing monitoring capacity at the state and federal level, identifies additional data collection necessary to achieve a representative picture of water quality at different watershed scales, and includes a Water Sampling Location Decision Matrix for prioritizing future water quality monitoring locations in the WLEB (Appendix D, Figure D-1).

Strategy 3: Conduct research and modeling

As acknowledged in the WLEB Science Panel report, the state's understanding of what, where, when, and how to reduce phosphorus loading is incomplete. To fill this knowledge gap, the state is supporting watershed and in-field research programs related to the intersection between hydrology and agricultural phosphorus loading, including overland flow and tile line sources. The state will continue to look for opportunities to support on-farm research to better understand the types of in-field regenerative and soil health conservation practices, and edge-of-field controlled drainage conservation practices that may address both TP and SRP sources.

The WLEB Science Panel also recommended the state take full advantage of the rich body of geospatial data being assembled for the Michigan portion of the WLEB to support management decisions. MDARD is funding the expansion of the GLWMS to integrate new monitoring data collected to inform and calibrate the existing River Raisin Watershed SWAT model, collaborating with Ohio modelers to include the Upper Maumee River Watershed in the GLWMS, and creating a new SWAT model for the Ottawa-Stony direct drainage watershed to Lake Erie for inclusion in the GLWMS. These newly updated models will provide coverage for Michigan's entire portion of the WLEB and will be used by the state to predict the effectiveness and environmental impact of land use and land management practices.

Strategy 4: Expand outreach and education

Sharing knowledge is essential to achieving program adoption, public awareness, and political support. The state will continue to support increased producer education, leveraging data from social and behavioral sciences focused on the long-term benefits of conservation practices, and will evaluate the effectiveness of engagement, outreach, and education strategies. For example, MDARD's new Regenerative Agriculture Program is providing funding through the Conservation Technical Assistance Program to CDs across the state. Conservation Technicians will perform tasks geared towards educating producers about regenerative agriculture and soil health practices that fit their operation.

The 2023 WLEB Science Panel recommended that local outreach, engagement, and program promotion efforts should include ongoing socio-behavioral monitoring and evaluation (e.g., attitudes, perceived norms) and designs for future, more enhanced monitoring, as well as evaluation efforts to identify strategies that effectively expand the implementation of conservation behaviors. This includes clear goal and objective setting during the planning phase, implementation of multiple strategies, monitoring, evaluation, and periodic reassessment of outreach goals and objectives.

To address this need, the QOL agencies are supporting a 2025 WLEB Science Panel to recommendations for a mixed methods approach that the QOL agencies could use to conduct program evaluation and monitor social indicators of behavioral change to iteratively inform adaptive management of engagement and outreach efforts and implementation programs in the WLEB.

Strategy 5: Maintain and expand collaboration

Collective knowledge, resources, and data sharing are essential to address the above strategies. The state, through Michigan's DAP task tracking efforts (Appendix A) will continue to identify and track conservation implementation by agencies and conservation partners (e.g., county drain commissioner's offices, agriculture organizations with producer members, non-governmental organizations [NGOs], universities, CDs, private sector consultants, and service providers) working on agricultural phosphorus loading reductions in the WLEB.

To improve the coordination and collaboration of partners and based on feedback from MDARD, EGLE, and the WLEB Community Advisory Group, an improved Database for WLEB Nutrient Reduction Projects tracking database is being developed in partnership with the U-M Water Center and an interdisciplinary team of Dow Sustainability Fellows (i.e., U-M Master's students). The database will include all publicly available information (adhering to privacy considerations) of state and partner projects (based on their willingness to share information) being implemented to mitigate nutrient pollution in Michigan's portion of the WLEB, including but not limited to:

- Research
- Conservation practice implementation
- Field demonstrations
- Monitoring
- Modeling
- Outreach and engagement

The goal of this database is to improve coordination, encourage collaboration, and facilitate resource sharing. The database will be used to create an interactive web map that showcases efforts across the WLEB, serving as a tool for residents, organizations, philanthropies, researchers, and governmental agencies to use to improve collaboration and inform decision-making. The interactive web map will be linked to the GLWMS - Nutrient Tracking Dashboard.

The 2023 WLEB Science Panel also recommended the state implement participatory research projects with producers and food system stakeholders to further explore barriers and opportunities for expanding conservation agriculture focusing primarily on in-field practices described under Strategy 1 and support participatory research (e.g., Reimer et al., 2023) centered on:

- Markets to support conservation agriculture
- Expanded conservation programs that support long-term use of practices
- Strengthened social and professional networks
- Improved human capital to successfully implement conservation approaches

Agricultural Nutrient Best Management Voluntary Practices Pilot Program

The Michigan Public Act 87 of 2021 appropriated $25 million in one-time general funds, for the Agricultural Nutrient Best Management Voluntary Practices Pilot Program to be encumbered by the end of FY 2026. The program is focused on water quality improvements and funds may be expended for any of the following: grants, cost sharing, or other incentives towards the implementation of priority practices; soil or water quality testing; associated equipment and structures; technical support; and education outreach and training.

Projects funded to date include:

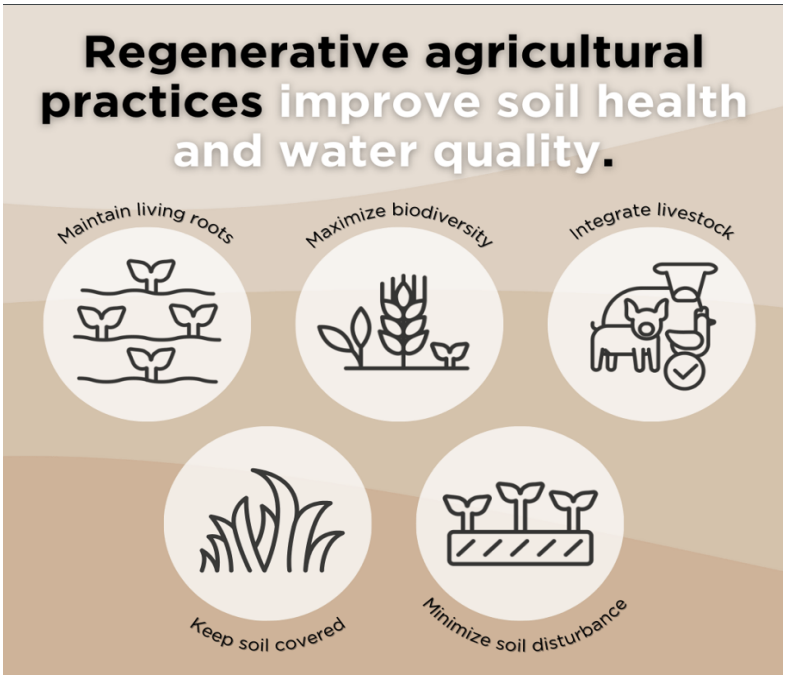
- Western Lake Erie Basin Performance-based Conservation Adoption Program; MSU-IWR; $11,983,107; Timeline: 6/1/25 - 5/31/2032; see State Conservation Programs section
- Healthy Soils, Healthy Waters: Understanding the Outcomes of Improved Soil Health to Accelerate Conservation in the WLEB; U-M; $4,013,324; Timeline: 7/1/24 - 4/30/2029; see Ongoing and Planned Watershed and In-Lake Research section
- WLEB Expanded Water Quality Monitoring Program; AGL; $4,861,534; Timeline: 3/1/24 - 9/30/28; see Strategy 2: Measure the results section
- Deployment of USGS gage station in the headwaters of the Saline River; EGLE; $313,357; Timeline: 10/1/23 - 9/30/27; see Appendix C: Water Quality Monitoring Summaries
- Great Lakes Watershed Management System – Nutrient Tracking Dashboard; MSU-IWR $305,638; Timeline: 4/1/2023 - 9/30/2026; see Strategy 1: Implement and track conservation practices section
- Investigating Cover Crop Planting Methods for Establishment Success; Michigan State University Extension (MSUE); $55,692; Timeline: 6/1/24 – 12/31/25; see Ongoing and Planned Watershed and In-Lake Research section
- Drainage Water Management Edge-of-Field Research Project; MSU-IWR; $1,157,858; Timeline: 12/21/22 - 12/31/25; see Ongoing and Planned Watershed and In-Lake Research section
- Stony Creek Community Conservation: A Watershed Management Plan for Stony Creek (South Branch River Raisin); U-M School of Environment and Sustainability (U-M SEAS); $25,000; Timeline: 6/1/23 - 4/31/24; see Nonpoint Source Reductions section
- The Magnitude and Cost of BMP Implementation: Strategic Planning for Michigan's Priority Subwatersheds; AGL; $53,600; Timeline: 11/8/23 - 3/31/24; see Meeting Water Quality Goals Assessment section

MDARD continues to evaluate projects and leverage these funds which are meant to augment current federal programming options. The use of ACPF and agricultural inventory process are being used to help prioritize conservation practice implementation and to inform where the Voluntary Practices Pilot Program conservation dollars can be best invested.

Agricultural Climate Resiliency Program and Regenerative Agriculture Program

In support of MDARD's new strategic approach in the WLEB, and to support the Governor's Michigan Healthy Climate Plan, Public Act 119 of 2023 included a total $13 million appropriation for an Agricultural Climate Resiliency Program and Regenerative Agriculture Program to support soil health, climate-smart agriculture practices, and regenerative agriculture (see Michigan Healthy Climate Plan section). Specifically, the program will promote the usage and implementation of regenerative agricultural farming practices and new technologies related to environmental sustainability, including measures to address the impacts of climate change. MSU received $6 million of the $13 million as pass-through funding from MDARD in FY 2024 to conduct research and increase staffing to support their agricultural climate resiliency work.

The MDARD Regenerative Agriculture Program will also fund six new full-time positions statewide dedicated to promoting soil health by working one-on-one with producers and landowners on opportunities to implement regenerative agriculture practices and allow MDARD to work with partner organizations to build "farmer-to-farmer networks." This approach will focus on disseminating regenerative and climate-smart practices and principles. These priority actions are not just about building stronger agricultural systems and resilient rural economics but place a specific focus on improved environmental outcomes in the WLEB.



A working definition of regenerative agriculture principles and practices as defined by the Regenerative Agriculture Program states: "Regenerative agriculture is an active approach to land management driven by the goal of improving soil health. Rather than a rigid set of rules, it embraces a blend of sustainable farming methods tailored to each farmer's needs. By adopting regenerative agricultural practices, farmers and landowners can be profitable while restoring healthy soils and safeguarding the state's natural resources for future generations."

Active Adaptive Management Planning and Implementation

Michigan's AMP (2021) serves as a companion document to Michigan's 2018 DAP and as a standalone framework. The state is transitioning from a "passive" to an "active" adaptive management process to meet DAP goals and is implementing a more formal active adaptive management structure (Figure 14). The six-step process of active adaptive management provides for the use of scientific outcomes and experimentation to guide the best direction for achieving phosphorus reductions in the basin.

Active adaptive management begins with goals (Step 1) to frame the desired management outcome with a list of knowns related to the information surrounding the issue. With active adaptive management, a plausible list of solutions or actions is developed (Step 2) that is intended to achieve the stated goal and implement measurable management actions (Step 3). A strong monitoring effort (Step 4) is required to track outcomes, frame uncertainty, and provide the basis for understanding progress (Step 5). As such, adaptive management is an active learning process where objectives, strategies, and actions may be adjusted as the knowns, uncertainties, and understandings advance (Step 6).

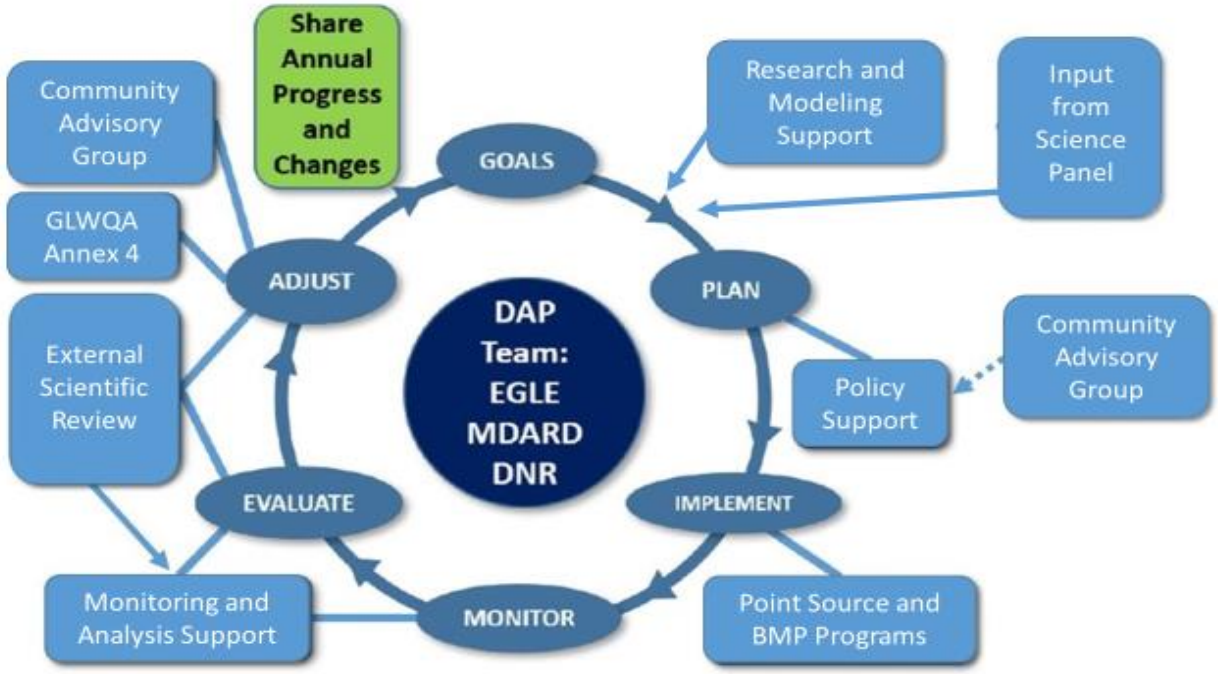


Figure 14. Updated conceptual governance and support structure for Michigan DAP adaptive management cycle. The process of active adaptive management begins with goal setting and moves clockwise through the planning, implementing, monitoring, evaluation, and adjustment phases. Credit: Original graphic from Michigan's Adaptive Management Plan modified by Dr. Stephen Hamilton, member of the 2023 WLEB Science Panel.

The goal of the adaptive management approach is to use a science-driven approach to improve the effectiveness of actions, accelerate progress, enhance coordination with partners, and leverage resources to gain water quality improvements in the system. The DAP Team began the process of establishing this framework in 2021 and is in the set-up phase of the adaptive management framework (Figure 15). The DAP Team, through engaging the 2023 WLEB Science Panel, undertook the first adaptive management evaluation to assess the process. The 2023 WLEB Science Panel assessment and recommendations report can be found at: https://graham.umich.edu/wleb.

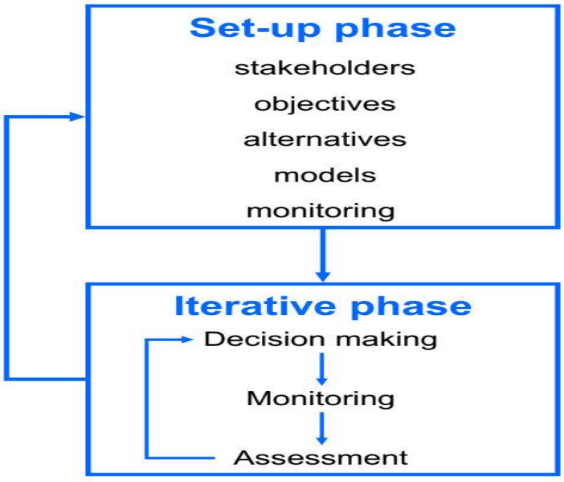


Figure 15. Two-phase learning in adaptive management (Reproduced from Williams, 2011).

Michigan's AMP (2021) identified how the process of managing loading reduction could be structured to improve the way actions are planned, implemented, evaluated, and refined over time. Since its release, Michigan's 2018 DAP and 2021 AMP project approaches and other actions have been implemented. Major examples of addressing gaps in the adaptive management cycle phases (Figure 14) include:

- Updating WLEB SWAT models to inform adaptive management planning and implementation decision making (Steps 1 through 3 - Research and Modelling Support; Plan Phase through Implementation Phase)
- Establishment of a WLEB Community Advisory Group and Science Panel to improve external engagement, transparency, and effectiveness of projects and programs (Steps 1, 2 and 6- Input from Science Panel and Community Advisory Group; Goal Phase, Plan Phase, and Adjust Phase)
- Maintaining point source permit compliance (Step 3 - Point Source Program Implementation; Implement Phase)
- Utilizing the ACPF and agricultural inventory effort to inform federal and state conservation program implementation (Step 3 - BMP Program Implementation; Implement Phase)
- Expanding water quality monitoring in key geographies in the WLEB to establish baseline conditions and track progress towards environmental outcomes (Steps 4 and 5 - Monitoring and Analysis Support; Monitor Phase and Evaluate Phase)

In terms of challenges to moving beyond the set-up phase of the adaptive management process, the DAP Team recognized obstacles, including:

- 'Wicked' problems such as phosphorus nutrient pollution spanning two countries
- Staff and agencies cover multiple mission areas beyond just the DAP efforts
- Complex stakeholder communities
- Gaps in data, process understanding, and technical support for adaptive management

Despite these obstacles, the adaptive management approach has been improved and is expected to move from the "set-up phase" to the "iterative phase" in the next five-year DAP cycle (2024-2028).

"WICKED PROBLEMS"

"**Wicked Problems**" are particularly complex issues that are challenging to address. While there are often many apparent and seemingly connected symptoms, the underlying cause(s) are either not known or fully acknowledged. As a result, without a clear and shared understanding of the cause(s), it is difficult to agree on appropriate corrective action(s). "Wicked Problems" are best tackled through shared or joint problem analysis and solution development.

Adapted from: Michigan Sea Grant

WLEB Community Advisory Group and Science Panel

The DAP Team is committed to improved and increased outreach to the public, including producers/landowners, to promote an understanding of phosphorus in the WLEB and related conservation efforts. This is occurring through information sharing and providing a forum for feedback on the DAP adaptive management process. Engagement with the WLEB Community Advisory Group and WLEB Science Panel began during summer 2023. The WLEB Community Advisory Group is a multi-sector group comprised of people representing various sectoral perspectives – public, private, and non-governmental – from the watershed.

The WLEB Science Panel composition will change as the DAP Team identifies key social and natural science-based questions whose answers will help advance the work. The 2023 WLEB Science Panel goals were to help the DAP Team take action by further developing key projects, identifying policy and research gaps, and designing an adaptive strategy to move toward Michigan's phosphorus management goals for Lake Erie.

Adaptive Management Projects:

The DAP Team will establish an external stakeholder advisory group to provide input and feedback on the adaptive management process.

- Establish an external, science-based stakeholder advisory body to provide input and feedback on the adaptive management process (Task 9e)
- Develop social-based metrics with assistance from social science experts to better understand public and farmer perception (Task 9d)

Working hypothesis: An improved external advisory structure for DAP implementation and evaluation will increase trust, collaboration, investment, and sustained adoption of practices.

Together, the WLEB Community Advisory Group and WLEB Science Panel are providing a broad conduit for public input and scientific advice, especially for the adaptive management planning components of Michigan's DAP. This effort is funded by an Erb Family Foundation grant to the U-M Water Center with support from the QOL agencies. Staff at the U-M Water Center work collaboratively with the DAP Team to manage and support both groups.

The next steps for the WLEB Community Advisory Group and Science Panel will be to continue to meet as a whole group in person twice a year. One meeting each year may be combined with an annual State of the WLEB Conference. Small group meetings will be scheduled, as needed, to maintain a sense of community and address specific needs raised by the WLEB Community Advisory Group, WLEB Science Panel, and DAP Team. To learn about current activities, visit the WLEB Community Advisory Group meetings and events web page: https://graham.umich.edu/wleb.

Point Source Reductions

The following section highlights work being planned, implemented, and tracked to achieve the Point Source Loading Reductions Priority Task Objectives (additional projects are detailed in Appendix A):

- Priority Task Objective 1: Maintain the phosphorus reductions achieved in the GLWA discharge due in part to the more stringent TP effluent limits placed in the NPDES permit in 2013
- Priority Task Objective 2: Achieve reductions in phosphorus discharged from the DUWA and continue reductions at YCUA WWTP

Working Hypothesis

Improving understanding of phosphorus speciation in effluent may make it possible to optimize treatment operations and seasonal approaches to reduce SRP versus TP across all WWTPs.

Municipal Wastewater Treatment Plants

Michigan addresses point source reductions of phosphorus through the NPDES permit program. Michigan's 2018 DAP called for maintaining more stringent NPDES TP effluent limits for the three key WWTPs (i.e., priority major treatment facilities) that discharge to the Detroit River and one key WWTP that discharges to the River Raisin (Figures 1 and 16).

The NPDES permit program also requires the communities in the WWTPs service areas to maintain compliance with Municipal Separate Storm Sewer System (MS4) and biosolid permits. The GLWA also continues to achieve the Long-term Combined Sewer Overflow Control Program (LTCSOCP). The GLWA Combined Sewer Overflows account for approximately three percent of the phosphorus loading to the Detroit River, factsheet.

Point Source Loading Reduction Adaptive Management Project:

EGLE will partner with the GLWA to design and fund a study to evaluate SRP discharge quality as a function of the level of municipal treatment, including secondary treated, primary treatment, Combined Sewer Outflow (CSO) Retention Treatment Basins, and untreated CSOs (Task 4f).

Working hypothesis: Improving understanding of phosphorus speciation in effluent will make it possible to optimize treatment operations and seasonal approaches to reduce SRP versus TP.

To date, all four key WWTPs are complying with NPDES-related permits, and the GLWA is meeting the LTCSOCP. Though significant work remains to meet water quality standards, implementation of the LTCSOCP has reduced the untreated combined sewer overflow discharge from around 25 billion gallons per year (BGY) in 1993 to 1-2 BGY today. For the four key WWTPs, the current TP effluent limits are 0.7 milligrams per liter (mg/L) monthly average, and 0.6 mg/L growing season average (April–September is considered the growing season), which were achieved through the permit re-issuance cycle as follows:

- 2008 - YCUA WWTP (completed before 2008, not counted in reductions)
- 2017 - GLWA Detroit WRRF
- 2020 - DUWA
- 2021 - Monroe Metro WWTF

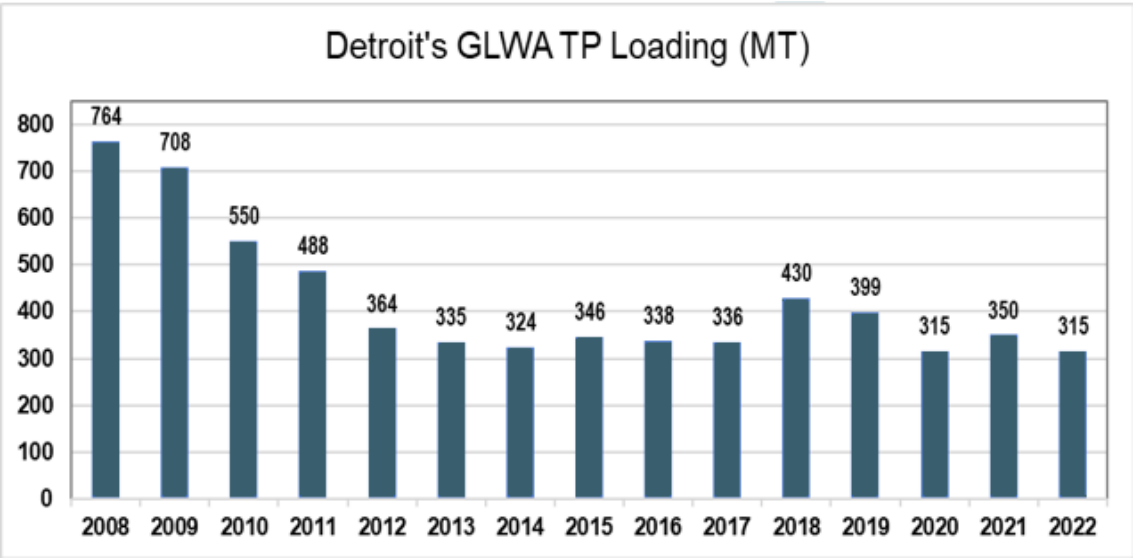


Figure 16. City of Detroit Great Lakes Water Authority TP loading from 2008 through 2022.

Moving forward, Michigan is working toward additional controls to ensure the intent of the GLWQA is met (i.e., TP concentration of 0.5 mg/L) and is necessary to meet USEPA Region V NPDES permit requirements. For the four key facilities identified above, the final TP limit is 0.5 mg/L growing season average from April through September though there will be study conditions to evaluate if there are concerns meeting the lower limits and continued compliance with the 0.7 mg/L monthly average limit (all year).

There are 21 additional major WWTPs to the Detroit River and downstream, including facilities that discharge treated wastewater to the Rouge River, Maumee River tributaries, Huron River (Michigan), River Raisin, and other direct tributaries to WLEB. Michigan identified 12 additional major WWTPs with current TP limits of 1.0 mg/L monthly average. For these major WWTPs, the new TP limits will be as follows, with appropriate schedules of compliance to meet these limits:

- 0.8 mg/L monthly average - October through March
- 0.7 mg/L monthly average - April through September
- 0.5 mg/L growing season average - April through September

Nine of the major WWTPs are already meeting these more stringent controls (Figure 17). For the remaining 12 major WWTPs and the four key facilities, Michigan will introduce these additional controls as part of the NPDES permit reissuance cycle, which varies by watershed basin over the next five years. EGLE expects the additional controls at major WWTPs will be reasonable and cost-effective with operational controls in lieu of large capital expenses. Operation controls can include adjustments to precipitation equipment, adjustments to secondary processes, evaluation of local limits under Industrial Pretreatment Programs, and evaluation of impacts resulting from infiltration and inflow to collection systems. EGLE worked with Moonshot Missions, with funding from the Great Lakes Protection Fund, to develop the Phosphorus Removal Guidance Document for Wastewater Utilities to help wastewater utilities in the WLEB best optimize their treatment processes for phosphorus removal. For more information on point source activities in the WLEB visit MiEnviro Portal.

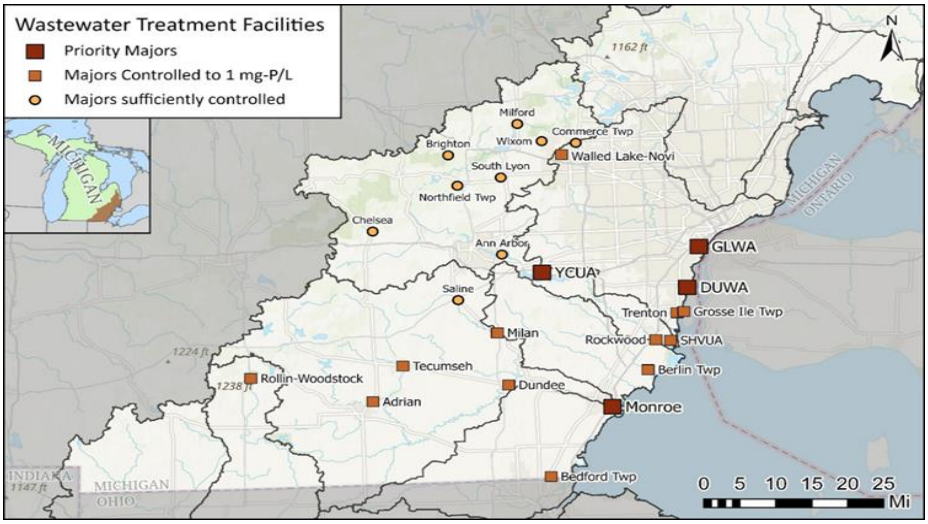


Figure 17. Map of major point source WWTPs, including priority majors (GLWA, DUWA, YCUA, and Monroe), 12 majors currently controlled to 1 mg/L phosphorus (P), and 9 majors currently controlled to 0.5 mg/L phosphorus growing season average.

Concentrated Animal Feeding Operations General Permit

Livestock operations produce waste which can become a significant source of nutrients in runoff depending on how the waste is managed (Raff and Meyer, 2022; Burkholder et al., 2007). CAFOs are considered point sources and are regulated under the NPDES permit program. In 2020, EGLE reissued the CAFO General Permit with additional controls to be more protective of water quality, as described in the Michigan AMP (2021). Briefly, examples of additional controls included: avoiding land application during winter months, when the ground is frozen or snow-covered, and when rain is forecasted; implementation of buffers and setbacks; lower soil test phosphorus thresholds for application; and modified monitoring, tracking, and reporting requirements for waste application.

The 2020 CAFO General Permit was legally challenged after it was issued. In July 2024, the Michigan Supreme Court upheld the state's authority related to the General Permit. In August 2024, petitioners filed a motion for rehearing with the Michigan Supreme Court. The Michigan Supreme Court denied the motion for rehearing on October 11, 2024. EGLE received a final decision and order on the contested case hearing from the Administrative Law Judge on January 13, 2025. EGLE is currently awaiting a decision from the EGLE Director to adopt, remand, modify, or reverse, in whole or in part a final decision and that opinion becomes the final decision of the department.

Recognizing the need to consider climate change adaptation and mitigation measures to accomplish the goal of minimizing the detrimental effects of climate change on Michigan's water resources, the EGLE Water Resource Division recently drafted a Climate Change Implementation Plan. The Plan recommends continuing discussions with NRCS to address wet weather and climate resiliency for CAFOs and engaging stakeholders to identify opportunities to manage CAFO waste to withstand climate change throughout the 21st century and optimize waste handling during dry conditions. Updates will be highlighted moving forward in the annual DAP Update.

Additional Point Sources

In addition to required wastewater NPDES permits, WWTP facilities are required to have an NPDES permit for the management of biosolids (i.e., solid waste leftover after treatment) generated at the facility. The communities these facilities serve are also required to have MS4 NPDES permits to reduce the discharge of pollutants in stormwater to surface waters of the state. An MS4 is a system of drainage (e.g., roads, storm drains, pipes, and ditches) that is not a combined sewer or part of a WWTP. The MS4 permit requires communities to have a program to identify and eliminate illicit discharges, which can reduce unseen discharges of sewage that result (e.g., cross-connections and failing onsite disposal systems).

Another MS4 requirement is to maintain, or restore, stable hydrology associated with new and redevelopment projects, known as post-construction controls. Efforts are underway in all MS4 communities to reduce overall stormwater discharges by the implementation of GSI projects and other actions to decrease urban runoff and increase infiltration of precipitation. While these programs have the potential to reduce phosphorus loads, the DAP Team does not propose additional tasks or monitoring beyond what is accomplished through the respective compliance and enforcement programs, which are reported through the MiEnviro Portal.

Nonpoint Source Reductions

The following section highlights work being planned, implemented, and tracked to achieve the following NPS Watershed Management Priority Task Objectives (additional projects are detailed in Appendix A):

- Priority Task Objective 3: Identify priority areas in Michigan's portion of the Maumee River Watershed for phosphorus reductions. Identify and implement priority actions to reduce phosphorus loads from Michigan's portion of the Maumee River Watershed
- Priority Task Objective 4: Support and invest in research to better understand the causes of HABs, including invasive mussels and SRP, and how these factors increase/decrease HAB events
- Priority Task Objective 5: Use research and field demonstrations to identify the suite of BMPs that work collectively to reduce both TP and SRP at the field implementation level
- Priority Task Objective 6: Implement phosphorus control actions in the River Raisin Watershed to achieve the target load reductions

While progress has been made over the last five years, current conservation programs have not resulted in significant changes in water quality. More technical and financial resources, and research-backed outreach methods to increase adoption are needed to accelerate conservation in the WLEB. The 2023 WLEB Science Panel recommended the state increase the capacity of government agencies, local CDs, and other conservation partners to leverage social and behavioral sciences, expand use of the agricultural inventory process to document current practice adoption, and support locally led producer and landowner engagement.

The state and partners are moving in this direction but will need additional support from external experts in conservation innovation and behavioral science research. The following is a summary of state conservation programs and NPS-related adaptive management projects being implemented in the WLEB, including highlighting program results to date, challenges faced, and next steps planned for the next DAP cycle.

State Conservation Programs

WLEB Performance-based Conservation Adoption Program

MDARD has partnered with MSU-IWR, the MSU Center for Regenerative Agriculture, AGL, and other partners to implement a ~$12 million, seven-year (2025-2032) performance-based conservation program in the WLEB. This program will offer new strategies for allocating resources that are needed that maximize outcomes by focusing on performance. This program will enroll producers in conservation practices but, unlike traditional cost-share programs, will compensate producers based on water quality improvements – primarily reductions in phosphorus.

Specifically, the program will enhance the existing conservation delivery by building a network of supply chain organizations to enroll producers and promote the program among their clientele. The program will generate an expanded conservation outcomes package which adds ecosystem services

considerations (e.g., groundwater recharge, pollinator habitat, carbon sequestration, soil health, and runoff reduction/storage) to the pricing thresholds determined for conservation practices that will lead to the greatest reduction of phosphorus.

Producers often cite the lack of defined markets for crops grown more sustainably and/or crops incorporated into more diversified rotations as a long-term barrier for adoption. This is particularly important within the small grain market. To overcome this, the program will develop an incentive structure (pilot) that connects producers with entities like Star of the West Milling to help demonstrate the long-term market potential of shifting production practices.

The project team will also develop an integrated modeling approach that combines existing WLEB SWAT modeling and yield sustainability model and mapping. The Yield Stability model uses satellite imagery and other physical data to examine annual yield stability over a given agricultural field. Yield stability mapping will help determine return on investment for planting and managing various parts of the field. It can help illustrate to producers where it may be more profitable or beneficial to pull certain parts of the field out of production and into conservation.

Combining SWAT and Yield Stability modelling will result in an outreach tool that partners can use to broaden the conversation with producers and increases the opportunity to install more conservation practices, reduce nutrient losses, and improve ecosystem services. All of the benefits resulting from this performance-based conservation delivery program will be quantified and tracked via the GLWMS - Nutrient Tracking Dashboard.

Legacy Phosphorus

Examples of legacy phosphorus include phosphorus accumulated in soils because of historical fertilization practices, phosphorus residing in stream sediments because of its translocation (in sediment-bound and in dissolved form) from upstream sites, and even phosphorus transported through groundwater systems.

[Source: USDA Legacy Phosphorus Project. Released on April 24, 2023]

Watershed Management Plan Planning and Implementation

EGLE's NPS Program supports planning and implementation practices to reduce NPS of nutrients to surface waters and has prioritized the WLEB pass-through grants funded under 319-approved WMPs and the Clean Michigan Initiative. The program is focused on reducing the amount of "legacy phosphorus" in crop fields and implementing practices to maximize crop uptake of applied phosphorus, which will minimize phosphorus loss to surface waters.

Types of conservation practices include:

- Nutrient management strategies, such as using lower soil test phosphorus thresholds to determine when phosphorus applications are necessary and precision nutrient management technology (e.g., one to two-acre soil test grid sampling with variable rate fertilizer and/or manure application technology)
- Soil erosion control practices, including implementing cover crops, reduced tillage, filter strips, grassed waterways
- Soil health conservation practices including implementing diverse crop rotations, no-till, and multi-species cover crops to improve soil health while reducing soil erosion, reducing runoff, and reducing the need for phosphorus applications
- Minimize and/or treat cropland runoff using conservation practices such as filter strips, saturated buffers, drainage water management (DWM), and treating tile line discharges

Michigan has made progress in supporting watershed management planning and implementation of BMPs in the WLEB. On the planning side, in addition to the agricultural inventory process discussed above, the Bean Creek WMP was approved in 2019, and the Upper Wolf Creek and the Ottawa Stony North were approved in the fall of 2024. Over the last DAP cycle (2018-2023), the NPS Program awarded over $3.3 million in implementation grants in the WLEB, some of which are still in progress. These projects have resulted in numerous benefits, to date including but not limited to the:

- Permanent conservation easements on the Upper River Raisin (87 total acres on three parcels; 16 acres of wetlands; 4,310 linear feet of riparian frontage)
- Nutrient management on approximately 30,000 acres (estimated phosphorus reduction approximately 5,000 lb./yr.)
- 118 tile line control structures and four saturated buffers, managing 2,402 acres of cropland
- 28.5 acres of filter strips along 11 miles of waterway
- 41 blind inlets, filtering 243 acres of cropland
- 3,200 acres of cover crops and 8,200 no-till/strip-till planting

Examples of projects currently being explored include: a field-by-field demonstration on utilizing lower soil test phosphorus thresholds coupled with an incentive framework; installation of grassed waterways, water and sediment control basins, and grade stabilization structures; implementation of BMPs to build soil health through no-till/strip till, cover crops, and diversified crop rotations; track implementation efforts and progress toward meeting phosphorus reduction targets. Conservation practice implementation and associated load reduction estimates will be tracked through the GLWMS - Nutrient Tracking Dashboard.

In partnership with the four CDs located within the WLEB, EGLE was recently awarded GLRI funding for three implementation projects to incentivize and pilot agricultural conservation practices. While plans are still being finalized, the Conservation Districts will begin rolling out these projects in early 2025. Consistent with Task 7f (Appendix A), EGLE will report on progress made under these projects.

Soil Health Investment Program

With $2,185,000 in funding from FY 2025 GLRI Focus Area 3 – Nearshore Health and NPS, EGLE's NPS Program will implement a four-year program to offer financial and technical assistance to producers in the WLEB for a range of conservation practice activities, including:

- Development and implementation of field-scale nutrient management strategies
- Installation of in-field structural practices designed to control soil erosion
- Implementation of edge-of field drainage water management practices
- Implementation of soil health conservation practices

Priority will be given to fields located within the five priority sub-watersheds (Figure 5), fields identified through the ACPF and agricultural inventory process, and fields where multiple conservation practices can be stacked. Conservation practice implementation and estimated nutrient reductions will be tracking via the GLWMS - Nutrient Tracking Dashboard.

Phosphorus Threshold Reduction Pilot

With $800,000 in funding from FY 25 GLRI Focus Area 3 – Nearshore Health and NPS, EGLE's NPS Program is expanding upon a successful ongoing pilot with Lenawee CD to now include the entire WLEB. The $800,000, three-year project will provide incentive payments to producers to utilize lower soil test phosphorus threshold limits (10 parts per million [ppm]). Enrollees will follow nutrient management plans for three to five years to demonstrate the impact on crop yields, profit per acre and soil phosphorus concentrations after multiple growing seasons. The goal of the expanded pilot is to assist the producer in determining whether additional commercial fertilizer application is necessary and if lower soil test phosphorus thresholds impact profit per acre. If there are no negative impacts on the profit per acre it is expected that producers will continue to use the lower threshold in their operation, which could overtime reduce phosphorus in the soil profile and lessen the potential of runoff into surface waters.

Michigan Agriculture Environmental Assurance Program

The following section highlights work being planned, implemented, and tracked to achieve the following MAEAP Priority Task Objectives (additional projects are detailed in Appendix A):

- Priority Task Objective 7: Maintain and expand partnerships to provide valuable technical and financial assistance to farmers
- Priority Task Objective 8: Increase and maintain MAEAP practice implementation for long-term water quality improvement

Adaptive Management Projects:
To better understand how MAEAP is being adopted across the WLEB priority watersheds, MDARD is proposing to specifically identify and track the number of BMPs implemented in the following:

- Bean Creek Watershed (Task 3f)
- St. Joseph River Watershed (Task 3g)
- River Raisin Watershed (Task 6e)

Focusing on tracking progress made in these watersheds will assist MDARD with setting quantifiable MAEAP goals and focus additional MAEAP efforts in areas of greatest environmental risk.

In FY 2023, Governor Whitmer approved Michigan Senate Bill 494 (2022). This bill extends the annual Freshwater Protection Fund fee for registered fertilizer and pesticide products from FY 2021 to FY 2025. The approved legislation continues the $1/ton fertilizer fee and $270 pesticide registration freshwater fee generating millions of dollars annually towards MAEAP. MAEAP is a program that helps farms, of all sizes and all commodities, voluntarily minimize agricultural pollution risks. MAEAP technicians, now called Conservation Technicians, at CDs focus on recommending a suite of conservation practices to address the needs of a specific site. MAEAP has risk assessment tools, or A-Systs tools, that Conservation Technicians work with producers and landowners to incentivize conservation actions and BMP implementation.

For example, MAEAP participating producers have a mandatory educational component requiring a minimum of two hours of environmental education for participating producers. Producers then work with their local Conservation Technician to complete a Farm-A-Syst risk assessment on their farm, tailored to the types of crops grown. The Farm-A-Syst tool looks comprehensively at all practices the farm uses to produce a crop, including soil sampling protocols, nutrient management planning, tillage, erosion calculations from wind and water, residue management, chemical and nutrient applications, cover crops, buffers, yield goals, and other regenerative agriculture practices.

The farming practices, procedures, and protocols are measured against MAEAP standards and based on the measurements receive a high, medium, or low-risk score. The Conservation Technician then develops an action plan that outlines for the producer what action is needed to address items that did not meet MAEAP standards. Farms must also meet Michigan Right-to-Farm Program guidelines and comply with state and federal laws. Action plan items may also include bringing farms into compliance when necessary.

A variety of factors can impact the selection of conservation practices and effectiveness of a BMP implemented under MAEAP including but not limited to soil type, slope, and current farm management. Incentives that provide financial support to the producer are available through a variety of federal, state, and local programs. Once a producer has completed the management practices identified for reducing environmental risk on the farm, the producer can request third-party verification by MDARD staff.

Verification by MDARD staff involves reviewing the A-Syst document with the producer. If the risks were deemed to be addressed and meet MAEAP standards, the farm is eligible for verification and

the resulting legislated certainties. The producer also may have a MAEAP sign for display. Verification is good for five years and can occur in all or one of four systems: Cropping, Farmstead, Livestock, or Forest, Wetlands, and Habitat. If the producer has not addressed all the risks in the action plan, or additional risks are identified, the MDARD verifier will work with them to make the necessary corrections so verification can be obtained.

Currently, there are 115 Cropping System verifications in the WLEB. This totals 59,154 acres, which is approximately six percent of the farmland in Michigan's portion of the WLEB. Over the past five years, the trend value of MAEAP verifications has stayed relatively consistent. More analysis of the MAEAP data is underway. Specifically, MDARD is prioritizing research to understand the ability to more accurately measure conservation practice impact relative to water quality outcomes and MAEAP as a beneficial management tool that is part of the overall solution in the WLEB.

Saline River Drain Easement Purchase Pilot Project

Many producers along county and intercounty drains in the WLEB currently farm up to the edge of the drain with little to no buffer between the field planting and the waterway. The Saline River Drain Easement Purchase Pilot project was started in 2022 with funding from the GLRI Focus Area 3 – Nearshore Health and NPS. Implementing the pilot is potentially the first part of a multi-phase project designed to permanently protect up to 10 acres of buffers in the headwaters area of the Saline River Watershed, which is a priority HUC-12 subwatershed.

The project builds off similar successful piloted drain easement projects implemented in Monroe and Saginaw counties. The GIS-based buffer inventory and decision support system interface was developed. The project steering committee conducted property evaluations of potential buffer areas, explored methods to incentivize practices, and had determined an easement incentive based on the assessed value of lands. The project team also developed permanency language for easements to be recorded with the Washtenaw County Water Resources Commission's Office.

In addition to the buffer decision support tool, the project used existing research, the ACPF, and SWAT modeling to estimate sediment load reduction of buffer enrolled in the pilot. The calculated sediment reduction was based on the width and length of the proposed buffer strip, along with the drainage area contributing to each buffer. All buffers enrolled in the pilot will be tracked through the GLWMS - Nutrient Tracking Dashboard.

Although progress has been made with the development of a process to delineate the drainage areas for proposed permanent buffers in the study area watershed, the project team has encountered the difficulty of attracting landowners to participate.

Working Hypothesis

Buffer establishment of sufficient size to achieve substantial sediment reductions and other benefits (e.g., habitat, carbon storage) can be identified, appropriate land can be acquired, and sufficient funds for construction, maintenance, monitoring will be available, and sites will consistently capture and retain sediment, and consequently phosphorus, as expected.

Concerns expressed include:

- The permanency of the land being taken out of production
- The loss of the long-term profit/yield of the buffer area currently in production
- The compensation amount for the buffer area as land values in Washtenaw County continue to rise
- Having access to equipment if the producer does not currently hay harvestable buffers

To date, approximately nine acres have been enrolled in the pilot. After completion of the pilot, partners will assess the project success and may or may not seek additional funding for broader scale implementation in the Saline River Watershed or in other areas of the WLEB.

Community Conservation: A Watershed Conservation Plan for Stony Creek

In early 2023, MDARD funded a U-M School for Environment and Sustainability (U-M SEAS) Master's Project Team (Team) to develop a Watershed Conservation Plan (Conservation Plan). The Team's objectives were to identify and elevate agricultural conservation barriers and provide recommendations to overcome these challenges and build community support for more strategic engagement and implementation. The Team selected the Stony Creek, South Branch River Raisin (Stony Creek) subwatershed because it is fully within Lenawee County, has had limited prior conservation planning, and is served by Lenawee CD, which is a well-respected WLEB CD.

Stony Creek Watershed Conservation Plan Committee Vision: To build as sense of community around local land stewardship, soil health, and water quality.

Stony Creek Watershed Conservation Plan Committee Mission: We believe in conservation and community. In order to improve local water quality, we will develop an actionable watershed conservation plan for the Stony Creek (South Branch River Raisin) subwatershed. We work to create a model for lasting water quality improvements within our community by increasing agricultural BMP adoption and improving community awareness of conservation practices and benefits.

The Team explored the perceptions of agricultural conservation among local stakeholders and producers and identified "barriers and motivators" to adoption of conservation practices in a voluntary context. In addition to considerable literature-based research, the Team carried out three separate field research efforts: stakeholder interviews and qualitative analysis, field-level phosphorus risk analysis using GIS and Agricultural Inventory data, and focus-group-style research via a steering committee convened to guide the development of the Conservation Plan. The Team's research findings resulted in three key themes including the following:

1. Socio-cultural influences and personal attitudes factor heavily in producer decision-making around BMP adoption
2. Simplicity and specificity of conservation programming play a significant role in adoption rates of conservation practices
3. Financial incentives are necessary but not alone sufficient for improving BMP adoption rates

The Team connected their research findings to concepts of barriers and motivators for BMP adoption in the Stony Creek Subwatershed. These barriers and motivators were then used as the foundation for several recommendations to the steering committee, state agencies, local governments, and NGOs working on conservation adoption in Stony Creek. The key recommendation that bridges the themes of the project is that the Lenawee CD is the preferred vector for conservation programming across several dimensions and should be leveraged to increase BMP adoption with significant increases in financial and administrative support. Additionally, barriers to conservation were categorized as economic, social/cultural, and bureaucratic, with each category reflecting the research conducted by the Team.

Based on these barriers and motivators, the steering committee developed five key recommendations for improving BMP adoption in Stony Creek:

1. Increase and stabilize funding and support for Lenawee CD
2. Improve accessibility and simplicity of conservation programming
3. Improve information and education efforts in Stony Creek concerning BMPs
4. Enhance avenues for collaboration between producer communities, trusted organizations, and stakeholders to engage with incentive-based policies
5. Develop a strategic approach to attract and retain younger producers in rural farming communities

The Watershed Conservation Plan also contains resources for producers and community members in the form of lists of applicable conservation incentive programs and local agricultural conservation organizations that can provide technical and financial assistance to support producers and Stony Creek communities. The U-M SEAS Team research and Watershed Conservation Plan were finalized in early 2024 and can be accessed on the U-M SEAS capstone project website.

Federal Conservation Programs

Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program or CREP is a formal partnership between MDARD and FSA and has a long history of implementation in the River Raisin Watershed, which was historically one of three priority CREP watersheds in the Michigan (i.e., River Raisin, Macatawa, and Saginaw Bay). Michigan's CREP program began in 2000 and ran until 2016 when the program was put into suspension due to a lack of state funding to provide the state's matching contributions. CREP was funded by the Michigan Legislature in FY 2022 allowing the state to reinstate the program in April 2022. MDARD received $4.4 million in one-time funding for cost share and other incentives to meet Michigan's cash match requirements of CREP. This funding was estimated to buy 15,000-17,000 acres of new and re-enrolled CREP contracts. The new CREP agreement between MDARD and FSA for the three CREP priority watersheds combined has a goal of enrolling 80,000 acres and has an end date September 30, 2032.

In 2021, CREP was expanded from just the River Rasin Watershed to include the entire WLEB. Additional water quality incentives are included for producers in the WLEB on top of what is typically provided by FSA through Conservation Reserve Program (CRP). In exchange for cost share, land rental, and other incentive payments landowners agree to install conservation practices on eligible farmland and maintain those practices for 15 years.

In addition to the $4.4 million in one-time funding, MDARD has committed approximately $500,000 annually from the state budget for program administration and implementation. This funding is used to cover staff salary working on CREP and grants to partners assisting with promotion and implementation. This funding has been used to leverage as much as $45 million in federal USDA funding. Based on current enrollment the state would need $20-25 million to reach the enrollment cap of 80,000 acres, which would leverage $100 - 125 million in federal funding for all three priority watersheds (i.e., WLEB, Saginaw, Macatawa).

Between FY 2022 and FY 2025, MDARD issued grants to WLEB CDs to employ technicians to promote CREP and assist landowners with enrollment, practice planning, design, and installation. Over this time, MDARD also issued grants to MSUE to provide technician training and the development of promotional material for the program including township-scale maps of sediment loading risk for the Michigan portion of the WLEB. This effort resulted more than 250 new or re-enrollment contracts establishing 486 conservation practices on nearly 3,000 acres across all three watersheds.

The expected nutrient reduction outcomes of the Michigan CREP with enrollment of 80,000 acres in conservation practices, and at full enrollment annually, is expected to reduce sediment entering rivers and streams by 52,000 tons; reduce phosphorus entering rivers and streams by 52,000 pounds; reduce nitrogen entering rivers and streams by 105,000 pounds; and sequester 60,000 MT of carbon. These goals apply to all three priority watersheds in Michigan as data on all the three are currently combined and not tracked separately. At the end of FY 2024, Michigan CREP had a total of 1,523 new and existing contracts equaling 17,433 acres enrolled, including 7,031 acres in the WLEB. For the WLEB, conservation practices established on this acreage resulted in the reduction of approximately 14,439 tons of sediment, 19,622 pounds of phosphorus, and 57,444 pounds of nitrogen from entering rivers and streams and sequestered approximately 6,834 metric tons of carbon.

Regional Conservation Partnership Program

The five-year Regional Conservation Partnership Program (RCPP) provides funding to producers to install a variety of conservation practices to keep nutrients on fields and improve water quality. Michigan led the first *2015 Tri-State WLEB Phosphorus Reduction Initiative* RCPP in partnership with Ohio and Indiana. Accomplishments of the 2015 RCPP included the development of a unified brand promoting conservation systems in the WLEB with numerous outreach and education events held showcasing emerging technologies and approaches to improve water quality and soil health, involving more than 17,000 participants across the tri-states.

The program realized reduction of sediment and nutrient loading in the WLEB through more than 250 new NRCS contracts implementing more than 60 different practices and applied to over 100,000 acres. This included more than 68,000 acres of cover crops and 47,000 acres of nutrient management. Additionally, more than 650 MAEAP risk assessments were conducted, and new acreage covered by nutrient management on MAEAP verified farms totaled more than 164,000 acres. Several demonstration farms, monitoring sites, and research projects were established throughout the WLEB allowing for new approaches to be evaluated and showcased, many of which are ongoing with data still being collected.

The second *Tri-State Collaboration Effort* RCPP is being led by Indiana State Department of Agriculture and provides $7.78 million in Farm Bill funding to help protect water quality in the WLEB. This current program began September 2021 and runs through 2026. Michigan's $2.1 million in funding prioritizes practice implementation in the five priority subwatersheds within Michigan's portion of the WLEB. However, all agricultural lands within Michigan's portion of the WLEB are eligible to apply. Eligible practices include, but are not limited to, filter strips, cover crops, nutrient management plans, DWM, and more. The focus is on offering producers and landowners' financial assistance for conservation practice implementation and working with partners to educate landowners on the importance of soil health and decreased nutrient loading.

The second RCPP had a slow start due to the length of time it took for partners to get project agreements in place with NRCS. Signups in FY 2023 and 2024 resulted in only nine applications submitted from Michigan totaling approximately $725,000. Indiana had a similar level of interest, however, Ohio had 20 applications submitted totaling $1.6 million. MDARD worked with the Michigan partners to help promote the program and during FY 2025 signup saw a dramatic increase with 25 applications submitted totaling approximately $3 million, which exceeded the available funding by nearly $2 million.

In terms of expected interest in the current RCPP, and based on past results of the first RCPP, the state knows how many applications were applied for and funded, and what practices were installed through RCPP. It is very likely more conservation was implemented then otherwise would have happened without the RCPP project simply because the traditional Environmental Quality Incentives Program Farm Bill funding is oversubscribed every year and applicants had to compete against other applicants across the entire state for funding. Because this funding was dedicated to the WLEB, there was less competition and more funding available for producers in the region, meaning more applications got funded and more conservation was installed.

The current RCPP has an end date of September 30, 2026. Indiana is considering a one-year, no cost extension to give themselves more time to utilize the funding available. Another option would be to shift the remaining funds to Ohio and Michigan to fund more applications. If more funding becomes available, MDARD will use the ACPF, agricultural inventory data, and other ranking measures to strategically prioritize high risk fields in the five priority subwatersheds. Currently, there are no plans to pursue a third Tri-State RCPP project.

Land Management

The following section highlights work being planned, implemented, and tracked to achieve the following Land Management Priority Task Objective (additional projects are detailed in Appendix A):

- Priority Task Objective 10: Promote wetland restoration and land management initiatives to reduce phosphorus loading

Wetland Restoration

Wetland restoration, in addition to agricultural conservation practices, offers a valuable tool for reducing the amount of phosphorus delivered to Lake Erie. Restored wetlands provide exceptional ecosystem services and assist in decreasing water runoff rates and thereby have potential to reduce the amount of phosphorus available through biological filtering processes (Currie et al., 2017). Wetlands can also provide co-benefits including flood resilience, wildlife habitat, and total sediment retention, regulating base flows and supporting groundwater recharge (Kadykalo and Findlay 2016; Land et al. 2016; Golden et al. 2015; Williams and Tufford, 2015).

In 2019, recognizing restored wetlands could be part of the solution for Lake Erie, the QOL agencies, led by the DNR, devised a pathway to develop a WLEB-specific pilot project to demonstrate the role of wetlands in addressing the phosphorus issues. The purpose of the pilot project is to demonstrate wetland restoration in Michigan can help reduce nutrient loading in WLEB. Other benefits include the restoration of wildlife habitat, especially for migrating waterfowl and songbirds (Fournier et al., 2021), and additional public land access in an area of the state with limited public lands. Specific outcomes of this pilot project are to:

Adaptive Management Projects:

Develop innovative strategies to enhance wetland restoration, green infrastructure, and other land management planning and implementation efforts in Southeast Michigan (Task 10a).

- Wetland restoration pilot in the WLEB (Task 10e)
- Continue to support green stormwater infrastructure implementation projects in SEMI through pass-through grants and technical assistance (Task 10f)

- Acquire low-yield farmland to develop a pilot wetland restoration site that will function as a DNR state game area
- Develop and implement restoration design plans that will achieve a significant phosphorus loading reduction at the site
- Inform future wetland restoration processes with additional partners by translating lessons learned from this pilot and projects in other states to inform Michigan's investments to achieve phosphorus reduction goals

Funding for this project was uniquely obtained by a successful Natural Resource Trust Fund grant combined with funding from the GLRI and American Rescue Plan Act (ARPA). The project team including DNR, MDARD, EGLE, Ducks Unlimited (DU), and LimnoTech built a site selection model to identify potentially restorable wetlands with a high likelihood of providing phosphorus reduction and

of meeting DNR's management goals (e.g. habitat for wildlife, recreation opportunities). The project team then conducted outreach and coordinated with MAEAP and CD technicians including farmer-led workshops and trainings to identify wetlands in the WLEB with a priority focus on the five priority HUC-12 subwatesheds. Through outreach, the project team identified interested parties who owned low yield farmland.

The project team exceeded their goal of 80 acres by purchasing more than 300 acres in the Stony Creek, South Branch River Raisin subwatershed for the pilot wetland. Baseline monitoring at the site began Spring 2024. The project team is working closely with monitoring team in Ohio to leverage lessons learned from H2Ohio Initiative and the Army Corp of Engineer's phosphorus optimal demonstration project. The project team is also learning from projects in Iowa, Maryland, and Ontario where wetlands are being used as structural conservation practices to manage excess nutrients. Monitoring is anticipated to extend for several years following construction if suitable funding can be secured.

As part of the adaptive management process, it is important to capture challenges and lessons learned to inform the need to course correct. The project team identified the importance of developing conservation messaging that identifies with producers. Plant assimilation, chemical binding, physical burial, and restoring watershed hydrology are all mechanisms the project team has come to understand are important for phosphorus storage in the watershed and decoupling phosphorus movement in the watershed from spring algal bloom timing.

Working Hypothesis

Wetland and green stormwater infrastructure restoration sites of sufficient size to achieve substantial phosphorus reductions and other benefits (habitat, carbon storage) can be identified, appropriate land can be acquired, and sufficient funds for construction, maintenance, and monitoring will be available, and restored sites will consistently capture and retain nutrients as expected.

In addition to pilot project underway in the WLEB, the DNR received a legislative appropriation of $10 million of ARPA funds to create the Wetland Conservation Program (WCP) focused on protecting and restoring wetlands in the Lake Erie and Saginaw Bay Watersheds. Of those funds, $4 million was used to solicit projects put forward by conservation partners and communities in these geographies.

Through a competitive process, DU was selected to administer the WCP and assist in project development. WCP projects selected will need to be completed by December 31, 2026. Funded projects will have a 25-year life expectancy and require the ability for the DNR or DU to access property for future monitoring of nutrient reductions and habitat value.

State-Managed Lands

DNR staff conducted an initial review of the state land holdings and facilities in the WLEB through a GIS landscape assessment followed by on-site visits. The DNR will quantify the uses of those lands and identify locations that potentially contribute to phosphorus loading in Lake Erie and conduct an

evaluation of the magnitude of any potential contributions. The final product from this effort will be recommendations to DNR divisions on actions to reduce any phosphorus loading that may be occurring from management of state lands or facilities in the WLEB. This work expected to be complete by July 2025. The status of the project will be provided in the annual DAP Update.

Green Stormwater Infrastructure Implementation in Southeast Michigan

The Southeast Michigan Council of Governments (SEMCOG) has been working strategically with local communities in Southeast Michigan to drive GSI implementation. SEMCOG was awarded two GLRI pass-through grants from the USEPA, which resulted in the funding of 14 GSI implementation projects across Southeast Michigan. These projects are instrumental in advancing GSI and promoting local stormwater management in partnership with 13 communities in Southeast Michigan, such as Clinton Township, the City of Madison Heights, Independence Township, and many more. Projects are strategically located to reduce annual runoff by an estimated 12 million gallons within the Southeast Michigan portion of the WLEB (Figure 22).

The second phase GLRI project continues this vital work, pushing forward GSI techniques that focus on green infrastructure investment in underserved communities and highlight how our pass-through dollars can help build capacity for local governments to do this work. An illustrative graphic showcases the implemented and planned locations of these initiatives, highlighting their substantial regional impact (Figure 18).

This vital contribution significantly advances the Green Infrastructure Plan for Southeast Michigan. Amidst these green endeavors, the Greening of Detroit, a nonprofit with a legacy of tree planting, recently secured a historic $10 million federal grant from the U.S. Forest Service's Urban and Community Forest Program. This grant is powering Greening's mission to expand Detroit's urban canopy, providing benefits like improved air quality and climate change mitigation, aligning seamlessly with SEMCOG's efforts. In Southeast Michigan, SEMCOG's dedication to green initiatives, combined with the GLRI projects, coastal resilience efforts, and the Greening of Detroit's urban forestry, paints a vibrant picture of a more sustainable, resilient future - one green initiative at a time.

In 2024, SEMCOG was also selected to receive $4.2 million from the USEPA's Great Lakes Environmental Justice Program Grant for the project titled: *Advancing Environmental Quality of Life in Underserved Communities*. This program will allocate funds through a subaward process to implement GSI projects that specifically reduce stormwater runoff volume, reduce untreated stormwater runoff, and help build and connect Southeast Michigan's green infrastructure network. SEMCOG will partner with the CWP to provide technical assistance to underserved communities that need help identifying green infrastructure opportunities within their community and applying for funding through the subaward process. The program will help to build capacity for more GSI implementation at the local level and will guide underserved communities in developing resilience strategies that serve the communities' needs in the face of climate change.

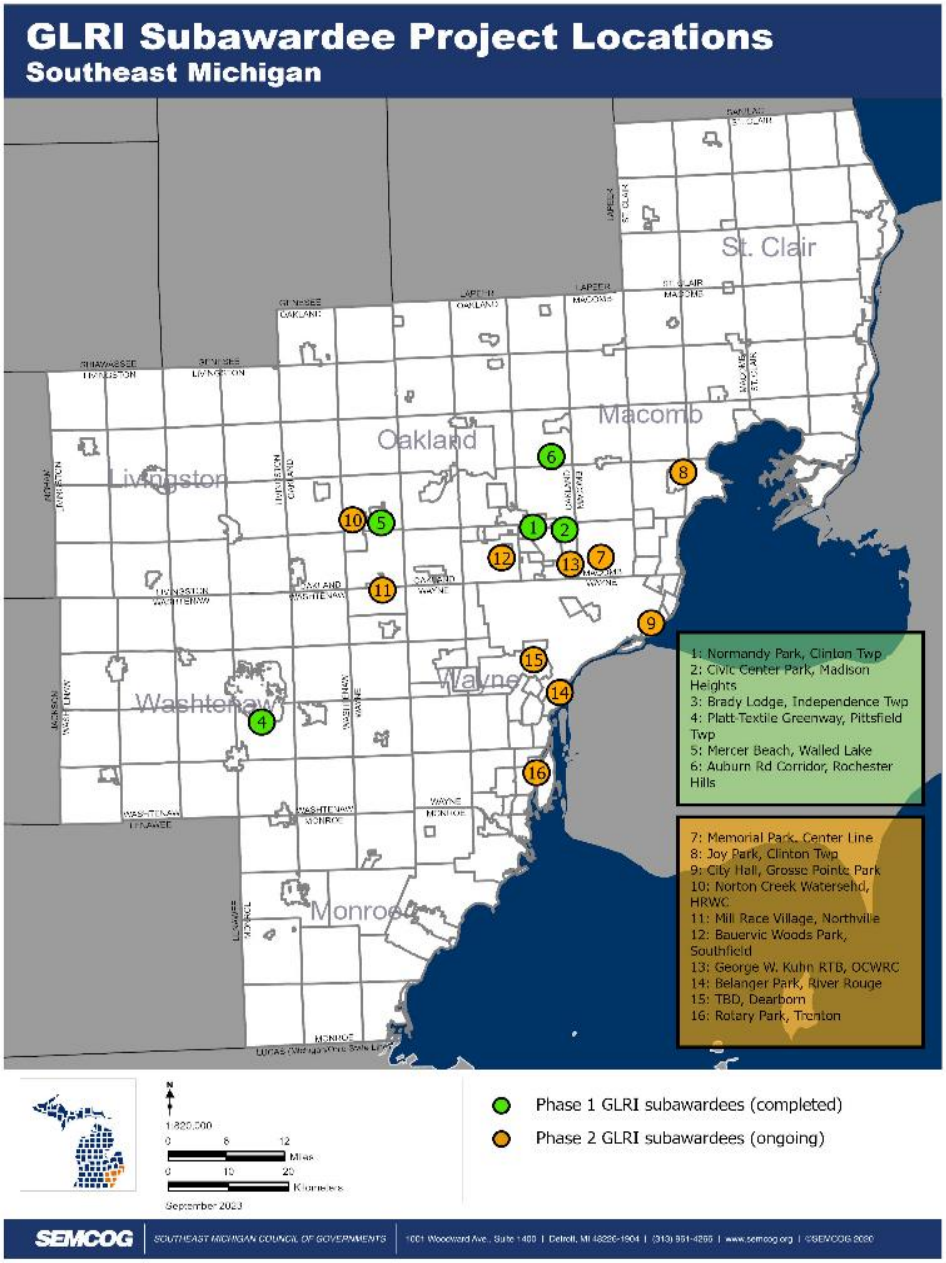


Figure 18. SEMCOG's GSI project locations. (Source: SEMCOG)

Policy Development

As stated in Michigan's AMP (2021), current regulatory authority under both the federal Clean Water Act and the state's Part 31 of the Natural Resources and Environmental Protection Act are limited for controlling agricultural NPS pollution. However, the DAP Team and QOL agencies will continue to explore new policies, regulations, and laws to reduce these sources. Implementing new regulatory restrictions on agricultural NPS pollution will, however, require additional administrative and/or legislative actions.

Michigan Healthy Climate Plan

In 2022 the Michigan Healthy Climate Plan (Climate Plan) was released which lays out a broad vision for meeting Michigan's commitment to achieve 100 percent economy-wide carbon neutrality by midcentury and to address environmental injustice related to climate. Agriculture plays an important role in addressing climate change and will work to protect Michigan's land and water for future generations. Protecting water quality is considered a priority in the Climate Plan. While natural and working lands are among the smallest contributors of greenhouse gas emissions, they can play an important role as a carbon sink. BMPs can improve soil health, store carbon, improve water quality, and reduce fertilizer needs (Rehman et al., 2022). Additionally, the installation and restoration of wetlands can help reduce greenhouse gas emissions and can provide water quality improvements as a co-benefit (Currie et al., 2017; Xu et al., 2019).

The Climate Plan highlights MDARD's policy for allowing producers to rent land for large-scale solar operations while maintaining preservation of farmland by suspending and extending agreements for an equivalent number of years to properties enrolled in the Michigan Farmland and Open Space Preservation Program (Public Act 116). The program enables a farm owner to enter into a development rights agreement with the state. The agreement is designed to ensure the land remains in an agricultural use for a minimum of 10 years and ensures the land is not developed in a non-agricultural use. In return for maintaining a permitted agricultural use on land enrolled in the program, the landowner may be entitled to certain income tax benefits. Land enrolled in the program is also exempt from special assessments for sanitary sewers, water, lights, or nonfarm drainage on land for which a development rights agreement or easement has been recorded.

MDARD also expanded the focus of its efforts to achieve economy-wide carbon neutrality by 2050 along with parallel goals in improving water quality, soil health, food security and access, among others. In 2023, the department took stock of climate efforts already implemented across the department and undertook actions to capture and quantify those efforts. In 2024 and beyond, the MDARD plans to evaluate current efforts to pinpoint where the department and partners can do more to achieve shared goals.

To support MDARD's efforts, the FY 2024 budget included $13 million in ongoing and one-time funds for the Agricultural Climate Resiliency Program and Regenerative Agriculture Program to support producers adopting BMPs to improve soil health, reduce chemical inputs, store carbon, and utilize greenhouse gas emissions while also protecting water quality. With this funding, MDARD is planning to implement a statewide approach to implementing regenerative agriculture principles such as grazing management, crop diversity, and reduced tillage as well as fund innovative research further enhancing the key principles of regenerative agriculture. Specific tactics to reach MDARD's goals:

- Implement best practices for managing working lands to restore soil health and store carbon, work with producers to utilize low-carbon equipment to producers, increase access to locally sourced agriculture, and reduce food waste
- Promoting climate-smart strategies like cover crops, conservation tillage, and precision agriculture can increase resiliency, improve soil health, store carbon, improve water quality, and reduce fertilizer needs

- Leveraging and encouraging the use of biochar and compost to reduce food waste and producer's reliance on synthetic fertilizers
- Supporting Michigan-grown food and agriculture products, urban agriculture, and community farmer's markets by promoting healthy local food systems and reduce emissions from transporting food

EGLE is also tasked with working to achieve the 2030 and 2050 targets set in the Climate Plan. Throughout implementation, EGLE centers on environmental justice. EGLE has numerous projects and initiatives to help decarbonize all sectors included in the Climate Plan such as cleaning the electric grid, electrifying vehicles and increasing public transit, repairing and decarbonizing homes and businesses, driving clean innovation in industry, and protecting Michigan's land and water. The Climate Plan includes the objectives of protecting our natural resources, mitigating the worst impacts of climate change, and protecting and improving the health of Michiganders. These objectives were used to guide the development of the Water Resources Division (WRD) draft Climate Change Implementation Plan (CCIP). When finalized, the CCIP includes adaptation strategies to begin planning for projected changes in Michigan's wet weather patterns.

The adaptation strategies in the CCIP can be categorized as requirements or recommendations. The requirements are focused on EGLE's WRD wet weather regulatory programs. The regulatory requirements are designed to increase infrastructure resiliency through incremental actions. These incremental actions are primarily focused on managing an increase in volume above the permitted design storm for the Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO), and MS4 programs.

This approach is intended to address aging wastewater/stormwater infrastructure installed in the 20th century but expected to manage 21st century storm events. Planning for additional volume at the time of infrastructure design allows for the responsible consideration of projected increases in precipitation to ensure the service or design life in the future. Further, by considering additional precipitation now, the risks associated with climate change can be reduced, including pollution prevention to protect water quality.

It is commonly understood that by controlling the volume of wet weather discharges, pollutants are reduced. Beyond the benefit of infrastructure resiliency, storing additional volume as identified in the CCIP is intended to reduce the discharge of pollutants, including nutrients. In this way, the CCIP aligns well with DAP priority objectives and will further bolster Michigan's efforts to reduce phosphorus loads from point sources. In addition to priority task objectives focused on maintaining and reducing phosphorus loads from key wastewater treatment plants, other municipal sources identified in the DAP (including CSOs, SSOs, and MS4s) will be reduced with progress under the CCIP. The CCIP also makes recommendations for increasing wet weather resiliency and reducing loads associated with CAFOs.

DNR's Michigan the Beautiful is one of five key natural and working lands strategies identified in the Climate Plan. The initiative aims to conserve, restore, and connect 30 percent of land and water by 2030 to build climate resilience, provide vital habitat for wildlife, and improve equitable access to

green spaces. DNR is working with TNC and other partners to lead this ambitious effort. The partnership established an advisory committee with multiple organizations, which met for the first time in June 2023. DNR hosted a Michigan the Beautiful Summit in October 2023 to hear from stakeholder groups. The DNR is also consulting directly with tribal governments and seeking input from tribal natural resources staff.

In May 2024, Public Sector Consultants facilitated a public outreach session at the MI Healthy Climate Conference to learn why conservation is important to Michiganders and what conservation actions could make a positive impact on communities across the state. This work continued with two online webinars and 15 additional in-person sessions across the state throughout August and September 2024. Public and advisory committee input will be integrated into a Pathways to Michigan the Beautiful report that will identify a suite of conservation actions on both natural and working lands that contribute to Michigan the Beautiful goals and the overall health of our lands and waters.

Siting solar on state lands offers an opportunity to work directly with communities, utility companies and clean energy developers by leveraging underutilized properties that can support the state's energy transition while minimizing land use conflicts. As Michigan continues to prioritize clean energy goals, evaluation of public lands for siting utility-scale solar is a forward-thinking solution that matches a need for acreage with shared responsibility across Michigan to meet the goals of the Michigan Healthy Climate Plan.

Septic System Programs and Policies

Septic systems (i.e., onsite wastewater disposal systems) are important forms of wastewater management that serve nearly half of Michigan's population, with approximately 1.37 million septic systems statewide. Septic systems must be properly maintained, however, to protect public health, the environment, and save money associated with costly repairs. Otherwise, failing septic systems have the potential to contribute bacterial and nutrient loads, as well as other contaminants, to groundwater and surface waters (Lusk et al., 2017; Sidhu et al., 2023).

Existing information suggests that septic system failures are common, along with related problems such as illicitly connected pipes from septic tanks or failing systems to a ditch or surface water. In the 2017-19 period, local health departments reported 4,420 failing septic systems on average per year statewide, representing approximately 25 percent of evaluations conducted (Michigan 2017-2019 Statewide Failed Sewage System Evaluation Summary Report, EGLE-DWEHD, 2023). There are also cases of failing septic systems that were significant contributors of raw sewage to tributaries in the WLEB that, with correction, led to vast improvements in surface water quality (see Elimination of Raw Human Sewage Discharges to a River Raisin Tributary, 2018).

The 2019 Michigan Statewide *E. coli* Total Maximum Daily Load and the more recent draft WMP for the Upper Wolf Creek (funded by the EGLE NPS program) both identify failing, aging, and poorly designed onsite wastewater systems as likely significant sources of *E. coli* in unsewered areas of the watershed. While estimates of phosphorus loads to the WLEB due to failing septic systems have not yet been calculated, the Ohio Maumee River Phosphorus TMDL estimates failing septic systems contribute two percent of the total spring load of phosphorus. Despite this potential proportion of the

overall phosphorus load, septic systems are an important source to manage to reduce nutrients and public health risks.

EGLE is engaged in the following ways to help ensure septic systems are properly managed and to reduce risks associated with public health and the environment:

- Failing Septic System Loan Program - Public Act 53 (2021) allocated $35 million to EGLE to administer a statewide loan program for failing septic systems. Through a Request for Proposals, EGLE contracted with Michigan Saves to implement the loan program, currently being developed. This loan program has two tiers:
    - Tier 1: Loans are for income-qualified homeowners, with one percent interest rates and 10-year terms. Approved loans cover all of the eligible expenses and allocation is first come, first serve basis. Tier 1 is funded through the revolving loan program
    - Tier 2: Property owners that do not qualify for Tier 1 can apply for standard market-based loans, not from the revolving loan program
- Statewide Sanitary Code Legislation - The Michigan Legislature is considering draft bills associated with establishing a statewide sanitary code. EGLE staff have and will continue to provide input and technical support in the development of potential legislation. It is expected the Legislature will take up the bills in committee hearings for discussion in 2024.
- EGLE-NPS WMP Implementation Grants - The EGLE NPS pass-thru grant program supports certain activities to address failing septic system, including information and education efforts and providing cost share to replace failing systems. To be eligible for cost share for replacing failing systems, there needs to be a proactive ordinance in place (such as a time-of-sale ordinance) or the project must be proactively identifying, inspecting and requiring replacement of failing septic systems. Failing septic systems must also be identified as a priority in the respective 319-approved WMP. See the EGLE - NPS Program website for more information.
- Onsite Wastewater Program - Local public health departments are the primary regulatory entities involved in the identification and correction of failing septic systems. The Onsite Wastewater Program is a required service for local health departments under Michigan's Public Health Code, Act 368 of 1978. The state contracts annually with local health departments and provides contract oversight through the Michigan Local Public Health Accreditation Program, along with direct consulting and training assistance to local health departments, as needed.
- Septic Smart Resources - Education and information are important aspects to increasing awareness and ensuring people have the know-how to manage septic systems. EGLE markets USEPA's Septic Smart program to make resources available online to property owners, industry practitioners, local units of government, and local organizations.

Manure Management

Applying manure to fields and recycling nutrients back for crop production is an important component of manure management and can provide soil health benefits. Doing this in an agronomically and environmentally sound manner is important for both short-term and long-term sustainability. Proper management of manure applications can also minimize nutrient losses. The Right to Farm Program (RTF) has the Manure Management and Utilization and the Nutrient Utilization Generally Accepted Agricultural and Management Practices (GAAMPs) that provide producers with a standard of conformance. This is used for nuisance mitigation such as odor, noise, dust, and environmental pollution. MAEAP standards are founded on the RTF GAAMPs and are used for verification of meeting the MAEAP standards that are scientifically evaluated BMPs. MAEAP offers a guidance document titled: *Manure Management: Getting Started* that offers information on good manure management practices.

MSUE in partnership with the Michigan Farm Bureau Family of Companies also offers a Michigan Manure Hauler Certification Program. The goals of the program are to:

- Prevent manure application problems before they occur
- Increase nutrient management plan implementation
- Demonstrate responsible manure application
- Increase the base level of manure management knowledge of all employees
- Improve professionalism among manure applicators

This voluntary program, incentivized by reductions in insurance premiums, leverages education and third-party equipment reviews to support farms and manure haulers in reducing risk when hauling or applying manure. An annual Manure Management Summit is also hosted by MSUE and Michigan Farm Bureau that provides updates on the science and best practices of manure management.

The 2023 Science Panel stated that certain types of conservation practices can help reduce manure surface runoff. For example, riparian buffer strips planted with perennial vegetation in key locations downstream of fields receiving fertilizer or manure applications are known to be effective in intercepting phosphorus in overland runoff. Native prairie plantings along streams or as "prairie strips" embedded within or beside farm fields are an effective regenerative conservation practice that reduces water, soil, and nutrient losses while enhancing biodiversity and have aesthetic appeal. Non-native vegetation such as grasses that colonize fallow strips can also reduce water, soil, and nutrient losses, and may not need as much maintenance as prairie plantings.

Livestock Waste Treatment for Phosphorus Distribution Pilot Project

Liquid slurry manure, in its conventional form, is difficult and uneconomical to transport long distances that can result in overapplication of manure on fields near livestock operations. Overapplication can lead to a buildup of nutrients on fields and potential for increased nutrient loads in runoff. To address this resource concern, the EGLE NPS Program has received $750,000 in funding from FY 2025 GLRI Focus Area 3 – Nearshore Health and NPS, to provide funding to a livestock operation in Lenawee County to pilot the implementation of solid/liquid manure treatment

technology to process manure and the attached phosphorus into a solid form that will allow it to be economically hauled and applied to crop fields that have lower soil test phosphorus levels and have a need for additional phosphorus applications for crop production. In addition, the removal of solids from the liquid manure will result in a liquid that can be applied to cropland during the growing season. This will allow the crop to better utilize the water and nutrients in the liquid waste and will reduce the application of liquid waste to cropland during late fall and early spring, reducing the risk of manure and nutrient losses to surface waters.

The EGLE's NPS Program will also continue to prioritize the WLEB for planning and implementation grant funding (Appendix A, Task 7f) with an emphasis on nutrient management, soil erosion control, soil health, and reducing and treating runoff from agricultural land. EGLE NPS staff will also continue to work proactively with CDs, watershed organizations, and other partners to develop and potentially grant projects that support the implementation of these priority conservation practices.

Evaluating Soil Test Phosphorus Levels and Manure Application Rates

Current guidelines for determining manure application rates to crop fields are based on the soil test phosphorus levels in each crop field and the amount of phosphorus in the manure (Culman et al., 2020). When soil test phosphorus levels reach 75 ppm (Bray P1), the amount of manure phosphorus that can be applied becomes limited based on crop removal rates. Once soil test phosphorus levels reach 150 ppm (Bray P1), manure can no longer be applied to the crop field.

As outlined in the AMP, an EGLE contractor researched the scientific basis for these guidelines. The research effort determined published peer-reviewed data is lacking, and application rates are not based on environmental or water quality considerations, in relation to dissolved phosphorus and particulate phosphorus losses to surface waters.

This standard is currently referenced in current CAFO permits, RTF Program GAAMPs, and the NRCS standard for nutrient management and considers variations in soil types and other critical farm-specific factors. Upon further evaluation, if it is determined the 75/150 standard is not protective of Michigan's water quality standards, EGLE and MDARD will work with partners and university researchers to establish standards that are protective of water quality and science-based to provide farmers with as much nutrient value as possible for manure applications.

Ongoing and Planned Watershed and In-Lake Research

Research that fills knowledge gaps and reduces uncertainties about how the watershed and lake processes can be managed most effectively is an important part of the adaptive management process. The QOL agencies are working with universities and other research organizations to improve understanding and prioritize uncertainty challenges associated with the watershed. The primary advances in filling knowledge gaps include a better understanding of the behavior of different forms of phosphorus on land and in the water (e.g., particulate versus soluble phosphorus, newly applied phosphorus versus older phosphorus in soil, and inputs of phosphorus from Lake Huron).

Working Hypothesis

Efforts to improve soil health across the WLEB will reduce input costs for producers, while enhancing water quality and climate change mitigation and adaptation, including reducing greenhouse gas emissions from agriculture.

The WLEB Science Panel recommended the state continue to support funding for research to address scientific uncertainties such as the effect of nitrogen on HABs, no-till or practices that minimize disturbance, and relative importance of tile drainage versus overland flow on phosphorus export, and funding is likely to come from a combination of sources. The state should encourage and support this kind of research to the maximum extent possible. The state is largely relying on the Annex 4 Subcommittee process, external partners, and the research community to conduct the needed research to fill knowledge gaps related to HABs in the open waters of the Western Basin of Lake Erie. MDARD and EGLE continue to take an active role to fill knowledge gaps related to conservation practice implementation on the landscape that will result in improved local water quality outcomes. Driving the research in these areas is the new MDARD Office of Agricultural Science and Research led by Dr. Laura Johnson. The DAP Team will continue to provide input and feedback on specific priority uncertainties as well as support and collaborate with the Annex 4 Subcommittee and the Office of the Science and Research, as appropriate. Summaries of related state, federal, and binational research projects are highlighted below.

Watershed and In-Field Research

Healthy Soils, Healthy Waters

Managing agricultural systems to improve water-holding capacity and rainfall infiltration, while enhancing biological processes that reduce the need for fertilizer inputs, is a paradigm shift in nutrient management for MDARD. Regenerative practices can reduce nutrient losses and emissions from agriculture – all while prioritizing the agricultural diversity that powers rural communities.

To better understand the outcomes of regenerative practices and improved soil health, an interdisciplinary project team led by U-M, including MDARD, MSU, AGL, Michigan Agriculture Advancement, and the Michigan Climate Smart Farm Project (MCSFP) is collaborating with producers in the WLEB to advance knowledge about soil health and water quality while supporting increased adoption of regenerative practices on farms.

The Healthy Soils, Healthy Waters project will integrate robust measures of soil health with metrics of nutrient use efficiency because practices that build soil health may not lead to measurable improvements in water quality if producers do not also reduce external nutrient inputs. Specifically, the project team will develop and refine regionally appropriate soil health indicators with a focus on biological indicators, including activity, composition, and function of the soil microbiome. The team will also monitor edge-of-field water quality for a subset of fields to improve the ability to predict water quality outcomes based on changes in management.

The following are expected outcomes:

- Increased knowledge of the complex relationship between management systems, soil health, and water quality
- New understanding of biological measures of soil health that predict soil nutrient conservation, including single assay microbiome profile data
- Valuable baseline data to support long-term monitoring and understanding of soil health in the WLEB, which could be used to advance climate smart agriculture goals
- Refined SWAT models that have better predictive capacity in future projects
- Improved partnerships and producer engagement strategies focused on regenerative practices in the WLEB
- Better guidelines for conservation programs and policies implemented by QOL agencies and other organizations

Working Hypothesis

In a controlled drainage system, management of tile drainage using water- level control structures reduce nutrient transport to receiving waters by reducing drainage discharge. In a saturated buffer system, a control structure diverts water into a buffer soil, increasing underground water residence time and contact with soils and plant roots.

Overall, this on-farm and interdisciplinary research will advance knowledge of links between regenerative agriculture and climate-smart practices, changes in soil health, and local water quality conditions. This novel approach will also inform MDARD's conservation programs in the WLEB and Michigan more broadly by developing guidelines for financial incentive programs that accelerate transitions to practices that simultaneously achieve social, economic, and environmental outcomes.

Drainage Water Management Edge-of-Field Research Project

MDARD and EGLE continue to fund and support a second round of an edge-of-field DWM project led by MSU to investigate phosphorus levels in drainage water as a function of water management (Frankenberger et al., 2024). Although controlled drainage has been documented to reduce dissolved reactive phosphorus transport off fields in an on-station replicated plot experiment (Nash et al. 2015), on-farm research for dissolved phosphorus reduction with *controlled* drainage is limited.

The DWM research project is located in Lenawee County at two on-farm sites with varying soil types. To date, MSU found significantly reduced nitrate loading with the management of tile drainage water, but SRP results were more complex, showing increased releases in 2021 and 2024 and decreased releases in 2022 and 2023. Additional years of monitoring are expected to provide better understanding of the factors controlling year-to-year variability in performance. Upon completion of the research project in 2025, a guidance document will be prepared to help producers create an on-farm Stormwater Drainage Management Plan. To learn more about controlled drainage and saturated buffers visit the Biosystems and Agricultural Engineering - Drainage webpage.

Investigating Cover Crop Planting Methods for Establishment Success

In 2021 AMP, "increasing cover crop acres" is listed as the second most important implementation action to reduce phosphorus loading from Michigan WLEB watersheds. One barrier Michigan farmers face in implementing cover crops is the short window for seeding cover crops following harvest of corn and soybeans, the cash crops planted in 80 percent of the harvested cropland acres in the WLEB (according to National Agricultural Statistics Service data on CropScape). Interseeding cover crops (Figure 19) into cash crops has the potential to expand the acres of cover crops. With the support from MDARD, MSUE will develop recommendations and advance education efforts about cover crop interseeding options.

Figure 19. A cover crops interseeded into corn. (Source: Christine Charles, MSUE)

The main components of the project include collecting field scale data from on-farm experiments and outreach with research findings. MSUE will work with producers and custom applicators in the WLEB to develop a series of demonstrations and research plots on farms in three WLEB watersheds. These demonstration plots will feature cover crop interseeding into soybean or corn by airplane, highboy, and unmanned aerial vehicles (UAV). The sites will also have UAV seeded plots featuring various cover crop species and seeding rates.

Data will be collected to compare cover crop establishment, winter survival, and nutrient uptake, as well as cash crop performance. The project will be completed with outreach which will share the experiment results through articles, bulletins, and interactive 360° video footage. MSUE will also develop recommendations for planting cover crops into a corn crop by UAV, plane, and field broadcast approaches and to educate producers on the best practices for interseeding cover crops into corn and soybean crops. The improved recommendation and increased on-farm education is anticipated to lead to increased acres of cover crops in the WLEB.

Field Level Research Demonstration Utilizing Lower Soil Phosphorus Thresholds

The reduced phosphorus application pilot program is being administered by the Lenawee CD with approximately $970,000 in funding from EGLE and is being implemented from 2019 to 2025. The goal of this innovative pilot program is to demonstrate how soil phosphorus concentrations, crop yields, and profit per acre are impacted when lower soil phosphorus thresholds are used to determine phosphorus application rates. Incentives for soil testing and retrofitting equipment are being provided for nutrient management practices that maximize the use of phosphorus by the crop and minimize the potential loss of phosphorus to surface waters.

The pilot program requires that nutrient management plans are followed for a minimum of three to five years to demonstrate the impact on crop yields, profit, and soil phosphorus concentrations after multiple growing seasons. Yield reduction payments are available to offset any profit that may be lost from lower crop yields. Results from the 2022 field season indicated if the producers had followed their normal phosphorus fertilizer application rates on the 536 acres enrolled in the program, they would have applied 47,706 pounds of Monoammonium Phosphate (MAP) fertilizer, which would have contained 10,816 pounds of phosphorus.

When following the lower soil test phosphorus threshold to determine phosphorus fertilizer application rates, the producers enrolled in the pilot only applied 7,356 pounds of MAP. The reduction in MAP fertilizer application, resulted in 9,148 fewer pounds of phosphorus being applied. Only 69 of the 536 acres had a yield reduction where less MAP was applied and the reduction in crop yield did not result in a reduction of profit per acre for the producer. No producers had to be compensated for a yield loss that resulted in a profit/acre loss.

Tile Drain Water Quality Monitoring with Producers

Since 2016, the MSU-IWR has documented water quality conditions in tile drainage in partnership with MDARD, Adrian College, WLEB CDs, the Erb Family Foundation, and participating producers within the WLEB. The main objective of this research has been to find ways to effectively engage producers in conservation using a feedback system in the form of grab sampling of tile drain discharge water. Grab samples and flow measurements are collected weekly and compiled into reports for producers.

Farmer Testimonial

You read these articles on cover crops and no-till and water control structures and you always think, 'Wow, I hope that works'... But now I can see on one of my own fields that it is working, and I can take what I learned from that field and duplicate it over my whole farm... all my acres.

[David Halsey, Lenawee County producer]

Additionally, in-depth interviews and surveys are used to explore producer awareness of nutrient losses and to better assist participants in adjusting farm practices could lead to more positive water quality outcomes. Interviews revealed access to field-specific data led to discussions regarding how producers could better address those losses. Producers have recognized previously unknown water quality concerns, felt more confident in the BMPs they already had in place, wanted to expand these practices onto additional acreage, and wanted to share their results at farmer-led meetings.

In-Lake Research

Lake Erie Cooperative Science and Monitoring Initiative

Binational in-lake research was implemented during the 2024 field year for Lake Erie, which was planned and conducted under the Lake Erie Lakewide Action and Management Plan and Binational Cooperative Science and Monitoring Initiative (CSMI) efforts. The DAP Team and state agency staff are providing input into the planning that is focused on addressing uncertainties and knowledge gaps that remain related to monitoring, modeling, and laboratory studies over the next five-year CSMI cycle.

Watershed and In-Lake Phosphorus Impacts

Although a variety of agricultural BMPs are widely used, their effectiveness at reducing phosphorus loading is not routinely well-constrained in models, and region-specific performance data and barriers to adoption are often lacking. The role of legacy phosphorus in overall loading to Lake Erie is an area of active research. Phosphorus already in fields and tributary sediments may delay ecosystem recovery, even after BMPs are widely adopted (Muenich et al., 2016; King et al., 2017). While undoubtedly important, legacy phosphorus stores may not preclude responses to lowered phosphorus inputs.

For example, analysis of 2019 phosphorus loads in the Maumee River in Ohio, which was a year with a wet spring resulted in 62 percent less phosphorus fertilization, showed a 29 percent reduction in SRP but no change in particulate phosphorus export compared to predictions. Thus, there was a

short-term SRP response to decreased phosphorus fertilization, though not in direct proportion to reduced inputs (Guo et al. 2020). Research to reduce uncertainty in Michigan's nutrient management decisions is ongoing.

Despite significant research, questions remain on how the lake will respond to decreased phosphorus loading. Some research suggests a decrease in phosphorus without a corresponding decrease in nitrogen will result in smaller but more toxic blooms (Hellweger et al., 2022), but there is no consensus on this prediction. The resulting 2019 bloom was smaller than expected based on the high flows and not more toxic than normal, which indicates improved fertilizer management will likely be effective at reducing the severity of Lake Erie's blooms.

Nutrient Loading from Lake Huron and the Detroit River

As referenced in the Michigan AMP (2021), questions remain about phosphorus loading and processing in the St. Clair-Detroit River System. The interaction of phosphorus in the Detroit River plume with spring diatom production and summer hypoxia (Stow et al., 2023) and cyanobacteria blooms in Lake Erie are not well understood. The diversity of cyanobacteria in river mouths and how they are linked with open lake blooms is also somewhat elusive at present (Crevecoeur et al., 2023).

Recent research (Bocaniov et al., 2023; Scavia, 2023) indicates Lake Huron phosphorus loads may have been significantly underestimated because resuspended sediment from the lake that enters the St. Clair River has not been recognized as a potential source to Lake Erie. This is due in part to the episodic nature of Lake Huron resuspension events and complex flows at the mouth of the Detroit River, which make taking representative samples and calculating loads there challenging. The portion of phosphorus coming from Lake Huron was thought to be 15 percent of the Detroit River load. More recent estimates, however, suggest Lake Huron may account for nearly half of the Detroit River load (Scavia, 2023). The U.S. Army Corps of Engineers (USACE) and U-M are undertaking an expanded field and modeling study to better understand this important loading source.

Research on Climate Change Impacts

New publications have examined the effects of climate change on tributary flow (Williams and King, 2020; Rowland et al., 2021) and current nutrient management strategies (Fraker et al., 2023). Increases in total precipitation and more frequent higher-magnitude rainfall events are expected to result in increased nutrient loading and HABs (Fraker et al., 2023). Increases in nutrient loading could be mitigated by the implementation of agricultural conservation practices (Fraker et al., 2023; Guo et al., 2020). Increased river flow coupled with decreased sediment load may result in decreased phosphorus sorption and a higher load of SRP entering Lake Erie (King et al., 2022b; Jarvie et al., 2017). Temperature increases could result in blooms starting earlier and growing larger if sufficient nutrients are available (Ho and Michalak, 2020; Fraker et al., 2023).

Great Lakes Center for Fresh Waters and Human Health

Great Lakes researchers at the U-M have been awarded a $6.5 million, five-year federal grant to host the Great Lakes Center for Fresh Waters and Human Health (the Center), which is a consortium of over 10 universities and agencies working in the Great Lakes Region. The Center is an effort to further our understanding of the critical risk that climate change, and resulting HABs, pose to

freshwater ecosystems and human health. The Center is organized around several overarching themes. The first is to resolve how climate change influences the occurrence of HABs and the transport of the toxins they produce. The second is to understand toxin production and how toxins impact health, through both airborne and waterborne exposure. For example, a major focus will be to assess health threats from aerosolized toxins, which can be inhaled by people on the water or in coastal communities. The third is to develop new technologies for enhanced monitoring and forecasting.

In collaboration with agency and community partners the Center's team will integrate findings into state-of-the-art forecasts and other data products that reach a wide stakeholder audience. A Community Engagement Core will connect Center science to relevant communities, promoting co-design of research and communication of research outcomes to stakeholders. The team will leverage the Center's research enterprise to recruit and train a diverse next generation of scientists in the field of oceans and human health, including support for graduate students and postdocs. The Center will advance inclusivity in all facets of research and engagement. Together, these research, engagement, and training activities will advance progress toward the stated goals of understanding and translating climate change effects on HAB events and their threats to human health in the Great Lakes Region.

Engagement and Outreach

The following section highlights the work being planned and implemented to achieve the Outreach to the Public and Farmers Priority Task Priority Task Objective (details of more projects in Appendix A):

- Priority Task Objective 9: Improve and increase outreach to the public and farmers to promote understanding of the basin and good conservation practices by initiating new targeted outreach campaigns, workshops, field demonstrations and information sharing

In partnership with U-M Water Center, the state is supporting an annual State of the WLEB Conference to share information and showcase DAP implementation activities with partners and the public. In addition to the conference, EGLE continues to maintain the Taking Action on Lake Erie webpage and U-M Water Center maintains a WLEB Advisory Group webpage. MDARD's new WLEB webpage will be dedicated to keeping the public informed on activities related to the WLEB effort.

In addition to increasing engagement and outreach efforts with the broader WLEB community, the following section highlights in-state and multi-state working groups agency staff are involved with that support outreach, policy development, and DAP-related planning and implementation efforts needed to achieve phosphorus reduction goals.

In-State Groups

Harmful Algal Blooms Interagency Workgroup

Responding to HABs is a collaborative effort at the local, state, and federal levels. Since 2018, this work has been coordinated through the Michigan Harmful Algal Bloom Interagency Workgroup:

- EGLE evaluates reports of suspected blooms, coordinates field visits consistent with response protocols to confirm the presence of cyanobacterial blooms and collects water samples for cyanotoxin testing as appropriate
- Cyanotoxin testing is conducted at the Michigan Department of Health and Human Services (MDHHS) Bureau of Laboratories, and MDHHS program staff communicate these results to the appropriate local health department
- MDHHS and local health departments work together to assess potential public health risks from a cyanobacterial bloom and its test results, communicate these results to stakeholders, and conduct investigations into any cyanobacterial bloom-associated human illnesses
- MDARD is responsible for cyanobacterial bloom-associated animal illness investigations
- These partners, along with the DNR and other agencies, meet routinely to develop and optimize environmental and public health response strategies, outreach, education, and interagency coordination for cyanobacterial blooms

In 2021, the workgroup determined additional capacity was needed to support assessments and testing of suspect cyanobacterial blooms. Starting in 2022, MDHHS and EGLE collaborated to fund, train, and support Michigan local health departments to conduct their own site visits, environmental assessments, and sample collection and testing for reports of suspect blooms that occur within their jurisdiction. Ten local health departments participated in 2022, and 11 participated in 2023. In 2022, local health departments conducted 42 site visits for 29 individual waterbodies, of which 90 percent were confirmed as having a cyanobacterial bloom. The average amount of time from when a report was initially received to when the initial site visit was conducted was 1.1 days, which indicated providing increased local capacity can result in timely responses.

As part of this effort and to collect information for public health response purposes (not scientific purposes), the Monroe County Health Department monitored Lake Erie beaches at William C. Sterling State Park and Luna Pier in 2022 and 2023 to better understand onshore microcystin levels and to inform recreational users. Of the 17 visits over the two-year period, 42 samples were positive for microcystin toxin (Table 6). When samples come back positive the health department issues a whole-body contact advisory to notify the public of the presence of a bloom and to recommend visitors and residents avoid water-related activities and keep pets from drinking or going into water where a bloom is visible. The Health Department maintains a webpage of current sampling events and results.

Table 6. Results from Monroe County Health Department monitoring of two beaches along the Lake Erie shoreline.

Activity	*2022*	*2023*	*Total*
Site visits	11	6	17
# samples collected	42	24	66
# and percent of samples positive for microcystin toxin	33 (79%)	9 (38%)	42 (64%)

WLEB Farmer-led Group

The WLEB Farmer-led Group (WLEB-FLG) is a project managed by MACD, in conjunction with Lenawee CD, Monroe CD, Washtenaw CD, and River Raisin Watershed Council. Funded by the Erb Family Foundation, the project's primary objectives have been to utilize social networking and locally based events among conservation-minded producers to help introduce new water quality and soil conservation programming participants to support phosphorus reduction goals in the WLEB.

In 2013, the WLEB-FLG formed, following a three-year grant from the National Fish and Wildlife Foundation, focused on offering boat outings on Lake Erie to show producers firsthand the impact of excessive phosphorus. The program was modeled after successful Farmer-Led Watershed Groups in Wisconsin and Iowa. In previous grant cycles, the WLEB-FLG offered cost-share programming to help further promote MAEAP verification for producers not interested in pursuing federal cost-share opportunities and worked to promote additional MAEAP verifications in the basin through field-day events, workshops, and other enrichment activities.

The WLEB-FLG hosts a website, www.waterqualityfarming.org, which serves as a clearing house of information for producers who might be interested in starting their conservation journey. Upcoming events, success stories, BMP videos, and other resources are available on this site in one convenient location. This effort is duplicated through the WLEB-FLG YouTube Channel, Facebook Page to maximize potential outreach through social media. In addition, WLEB-FLG has coordinated several local in-person networking groups to build relationships, share knowledge, and develop a greater sense of community among producers related to conservation practices.

Many of the resources shared through the WLEB-FLG website focus on the economic benefits of conservation and how most producers who have adopted cover cropping, buffer strips, and other practices have reduced their overall bottom line and increased profitability. Many producer participants have indicated economic messaging had the most significant impact on their decision to implement conservation practices in their operations.

As part of the previous grant cycle from 2020 to 2022, a study was conducted by Dr. Stephen Gasteyer (Shingne, Nowak, and Gasteyer et al., in draft), an Associate Professor at MSU's Department of Sociology to identify barriers, needs, and potential avenues for delivering conservation programming to young and women producers and Certified Crop Advisors (CCAs). The results of the study indicated two significant findings. First, the amount of young and women producers in the WLEB was too small for targeted marketing to have a substantial impact on phosphorus reduction goals in the WLEB. Second, CCAs often lack the training and knowledge-set to promote conservation programming to their clients successfully.

As part of the current three-year grant cycle (2023-2025), the WLEB-FLG is partnering with the Michigan Agri-Business Association to engage in multiple enrichment workshops with CCAs to provide conservation programming and producing print materials to distribute to clients on how they can become engaged with the Farmer-Led Group. The WLEB-FLG is also engaging in significant marketing efforts to reach early-majority adopters. These activities include billboards in strategic locations throughout the WLEB, targeting mailing campaigns using data purchased through a private

data-broker, and vinyl banners will be displayed at local co-ops, retail elevators, and other processing locations.

Lastly, with the Erb Family Foundation in the process of spending down their endowment, the WLEB-FLG is focused on expanding fund development opportunities to continue activities well into the future and continue to support overall phosphorus reductions in the WLEB. The WLEB-FLG will be working with a fund-development consultant to develop and implement a comprehensive fundraising strategy with the intent of establishing an endowment to fund the project in perpetuity. These activities will also involve fact-finding trips to Wisconsin, Iowa, and other states, to better duplicate successful engagement programs.

Michigan Conservation Partnership

The core partners in the Michigan Conservation Partnership (MCP) include the Conservation Districts Employees of Michigan (CEDM), MACD, QOL agencies, MSUE, MSU-IWR, FSA, and NRCS. These partners have a long history of working together to address soil, water, wildlife, and habitat issues. The MCP was formed to harness the collective skills, knowledge, and resources of the partnership while maintaining independent responsibilities.

The mission of the MCP is to strengthen the collective capacity of the member organizations and delivery system in Michigan to ensure healthy soil and land, clean and abundant water, and sustainable food and agriculture for future generations. The vision of the group is "*through communication, coordination, and cooperation Michigan's natural resources leaders enhance the conservation delivery system which leads to impactful actions, measurable outcomes and vibrant, thriving communities.*" The MCP has three key goals: Goal 1) Strengthen the conservation partnership and delivery system; Goal 2) Ensure healthy soil and land, clean and abundant water; and Goal 3) Sustainable food and agriculture for future generations.

The NRCS hosted the initial meeting to formalize the MCP at the NRCS State Office on February 21, 2020. The leadership for the four partners were present – NRCS, MDARD, CDEM and MACD. During COVID-19, the MCP moved to virtual meetings and has met each quarter since the August 2020. In the summer of 2021, the MCP organizations agreed to ask the other five organizations to join in the MCP and the first meeting with all nine entities occurred on February 9, 2022. Though envisioned as a statewide effort, the MCP has the WLEB as a priority focus area and will likely be used to pilot any new initiatives, approaches, or collaborations that the MCP wants to explore.

Multi-State Groups

Great Lakes Commission

Within its 2023-2027 Strategic Plan, the Great Lakes Commission (GLC), under the guidance of its member state and provincial representatives, continues its focus on activities supporting clean and safe water, including efforts to protect drinking water, advance prevention, and mitigation of HABs, and facilitate implementation of projects addressing NPS of water pollution, including nutrients.

Currently, GLC staff collaborate with state agencies and support the following through federal and foundation sources of funding:

- Through www.blueaccounting.org, the GLC assists Great Lakes states and provinces and federal partners by presenting Lake Erie phosphorus data prepared by the Annex 4 Subcommittee under the terms of the GLWQA
- The Great Lakes HABs Collaborative, a longstanding partnership between the GLC and the USGS Great Lakes Science Center, links the science and management community to better understand needs and research opportunities to advance HABs knowledge in the Great Lakes basin
- For over 30 years, the Great Lakes Sediment and Nutrient Reduction Program, a partnership with NRCS, has supported CDs and watershed organizations across the Great Lakes basin as those local leaders work to address sources of sedimentation and nutrient loss

The GLC also continues to maintain templates and protocols related to prior work on environmental markets. Federally funded projects included Fox P Trade in Wisconsin and the Erie P Market. The GLC's most recent work, Conservation Kick, developed a process for downstream drinking water systems or watershed councils to invest in upstream nutrient reductions by agricultural producers. Finally, GLC staff supported the Task Force on Nutrient Management, convened through the Great Lakes-St. Lawrence Legislative Caucus. With support from private philanthropy, the Task Force developed a suite of model policies and recommendations to expand Great Lakes legislators' knowledge of the complex factors driving nutrient inputs to the Great Lakes.

WLEB Collaborative

In addition to regular informal communications and being active participants in the Annex 4 Subcommittee, Michigan, Ohio, Indiana, and Ontario continue to look for opportunities to convene staff working on the DAPs to share information and lessons learned. Michigan has hosted the U.S. jurisdictions to share information on key aspects of the WLEB planning and implementation efforts underway through the DAPs. For example, during the half-day webinar held in September of 2022, Ohio presented on the implementation efforts under the H2Ohio Initiative and on the development of the Maumee River nutrient TMDL. Michigan presented on the ACPF, agricultural inventory efforts, and the Soil Test Phosphorus Levels and Manure Application Rates research project described above. Indiana provided the attendees with an overview of statewide nutrient reduction tracking system developed through the Indiana Conservation Partnership.

In the July and September of 2023, the state jurisdictions and Ontario DAP staff met to discuss the framing and content of messages related to the DAP updates. In October 2023, the three states and Ontario partnered to sponsor a 2024 International Association of Great Lakes Research conference session focused on bringing together practitioners, researchers, and knowledge bearers to share traditional knowledge and management insights to support actions that can effectively reduce phosphorus loads to Lake Erie and strengthen DAP inclusivity. In April 2024 the MDARD and EGLE participated on an interjurisdictional HABs Science and Policy Workshop in Ohio, organized by the

HABs Collaborative under the GLC. This workshop provided opportunities for leaders in HABs science, management, and policy to build a network to share knowledge and identify tangible steps toward filling knowledge gaps and accelerating positive change to address HABs in the Great Lakes basin.

Federal WLEB Partnership

The Federal WLEB Partnership is a tri-state partnership, including state and federal agency staff, Ohio Sea Grant and other partners, dedicated to enhancing land and water resource management in the basin to promote a healthy productive watershed and improve water quality. The Partnership is co-lead by USEPA, Ohio NRCS, and the USACE Buffalo District. The Federal WLEB Partnership meets at least twice per year and is committed to collaboration and consensus building - sharing resources and knowledge to link land use to water quality, support ongoing efforts, and identify new opportunities to enhance and improve the watershed.

2024-2028 DAP Next Steps

Annual reports will summarize progress made and highlight new programs and projects being planned and implemented to accelerate progress in the WLEB. The nutrient load reduction effort in Lake Erie is a coordinated effort that brings together the QOL agencies and partners to address a complex and important problem. Bringing the best science, the right resources, and the firm commitments to the challenge cannot help but produce additional positive and lasting results over the next five years. The QOL agencies are committed to making continued progress on nutrient load reduction to Lake Erie. Some of the major next steps in this effort will include the following:

- Maintain existing point source reduction successes and work with additional communities to further reduce wastewater nutrient loads
- Improve tracking and placement of agricultural conservation practice improvements and the resolution of monitoring of water quality to better link actions and impacts
- Move into design and construction phases of wetland restoration projects
- Supported targeted research to advance understanding of NPS nutrient loading processes and mitigation technologies and methods
- Continue to engage with the WLEB Community Advisory Group and future expert Science Panel members to guide adjustments in priorities and approaches to make the most progress as quickly as possible with available resources
- Continue to improve coordination with other states, federal agencies, and Canadian agencies

Ongoing research indicates the Lake Erie in-water ecosystem response will take time to fully recover due to lag time for nutrients already in the soils and moving through the system (King et al. 2017, Sharpley et al. 2013). Despite these challenges, the DAP Team and the QOL agencies are committed to the adaptive management framework for evaluating progress toward implementing the above key

actions and meeting Michigan-specific phosphorus reductions. Each agency will continue to track implementation actions as appropriate and reflect new efforts in Michigan's DAP two-year work plan (Appendix B).

Under this next five-year DAP cycle (2024-2028), the state is dedicated to achieving demonstrable water quality improvements and environmental outcomes in the WLEB and in Lake Erie. The state's investments in soil health and regenerative agriculture principles hold the promise to not only improve water quality but enhance the climate resiliency of our agriculture systems, while placing value on how and where food is grown. The state's commitment of resources and refocus on delivering longer-term conservation practice changes will accelerate the progress being made toward achieving the Annex 4 Subcommittee and Michigan DAP goals for nutrient reduction, and ultimately, a healthier Lake Erie.

Appendix A: DAP Priority Task Objective Tracking Table

Description: This table is organized by the 10 Priority Task Objectives defined in the 2018 DAP and details various projects and other activities lead by agencies and/or partners. Each task aligns with a Priority Task Objective, and the columns are defined by the following:

Task #: Project number assigned to specific task(s).

Task: Description of the specific task.

Who: Organization and partners responsible.

Start Date: The date when the task commences.

End Date: The anticipated task completion date.

Milestone: Key achievements within the task timeline.

Agency Reporting and Frequency: Entity providing task updates, where to find the reports or communications, and how often reports or communications are issued.

Status and Projections: Current task status and future expectations.

Challenges and Contingencies: Potential obstacles and/or alternative plans for potential obstacles.

This format fosters easy navigation and understanding of the state and partners activities that are helping to achieve nutrient reduction goals for the WLEB.

Priority Task Objective 1: Maintain the phosphorus reductions achieved in the GLWA discharge due in part to the more stringent TP effluent limits placed in the NPDES permit in 2013.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
1a	Achieve TP limits of 0.7 mg/l monthly average, and 0.5 mg/l growing season average (April – Sept.), using operational and/or low-cost capital expenditures. Add evaluation condition to permit reissuance to determine if POTW can reliably comply with new TP limits using operational / low-cost capital expenditures. Integrate final TP limits with permit reissuance.	EGLE GLWA	12/31/24	12/31/28	Implement in NPDES basin year; by FY 2027; Completed through NPDES Program DMRs and the NPDES permit term.	EGLE MiEnviro (formally MiWaters), Monthly.	Key facilities achieved phase 1 TP limits (0.7 mg/l monthly average, and 0.6 mg/l growing season average (April – Sept.) and are complying with NPDES permits.	Michigan will work through its compliance and enforcement process to address systemic non-compliance.
1c	Participate on bimonthly calls/meetings between EGLE and GLWA to ensure compliance with effluent limits and to discuss any issues.	EGLE, GLWA	1/1/24	12/31/28	Call frequency reassessed annually.	EGLE, Monthly.	Ongoing. Continues to provide a good forum to discuss challenges and progress.	N/A
1g	Participate on the Annex 4 (Nutrient) Subcommittee's Adaptive Management Task Team to understand the relative contribution of the Lake Huron nutrient load to the St. Clair-Detroit River System and the Central Basin of Lake Erie.	EGLE, MDARD	1/1/24	12/31/28	Incorporate relevant Annex 4 Subcommittee's Adaptive Management information into the DAP and AM Plans; as new information becomes available; Timeline TBD by the Annex 4 Subcommittee.	N/A	Recently formed Adaptive Management Team will collaborate and coordinate with state and provincial jurisdictions on shared adaptive management efforts.	Continue to participate in the Annex 4 Subcommittee process and will determine whether to course correct based on Michigan data.

Priority Task Objective 2: Achieve reductions in phosphorus discharged from the DUWA WWTP and continue reductions at YCUA WWTP.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
2a	Achieve TP limits of 0.7 mg/l monthly average, and 0.5 mg/l growing season average (April – Sept.), using operational and/or low-cost capital expenditures. Add evaluation condition to permit reissuance to determine if POTW can reliably comply with new TP limits using operational/low-cost capital expenditures. Integrate final TP limits with permit reissuance.	EGLE, DWUA	12/31/24	12/31/28	Implement in NPDES basin year; by FY 2027; Completed through NPDES Program DMRs and the NPDES permit term.	EGLE MiEnviro (formally MiWaters), Monthly.	Key facilities achieved phase 1 TP limits (0.7 mg/l monthly average, and 0.6 mg/l growing season average (April – Sept.)) and are complying with NPDES permits.	Michigan will work through its compliance and enforcement process to address systemic non-compliance.
2b	Achieve TP limits of 0.7 mg/l monthly average, and 0.5 mg/l growing season average (April – Sept.), using operational and/or low-cost capital expenditures. Add evaluation condition to permit reissuance to determine if POTW can reliably comply with new TP limits using operational/low-cost capital expenditures. Integrate final TP limits with permit reissuance.	EGLE, YUCA	12/31/26	12/31/31	Implement in NPDES basin year; by FY 2027; Completed through NPDES Program DMRs and the NPDES permit term.	EGLE MiEnviro (formally MiWaters), Monthly.	Key facilities achieved phase 1 TP limits (0.7 mg/l monthly average, and 0.6 mg/l growing season average (April – Sept.)) and are complying with NPDES permits.	Michigan will work through its compliance and enforcement process to address systemic non-compliance.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
2c	Achieve TP limits of 0.7 mg/l monthly average, and 0.5 mg/l growing season average (April – Sept.), using operational and/or low-cost capital expenditures. Add evaluation condition to permit reissuance to determine if POTW can reliably comply with new TP limits using operational/ low-cost capital expenditures. Integrate final TP limits with permit reissuance.	EGLE, city of Monroe	Permit reissue date	TBD - compliance schedule in reissued permit	Implement in NPDES basin year; by FY 2027; Completed through NPDES Program DMRs and the NPDES permit term.	EGLE MiEnviro (formally MiWaters), Monthly.	Key facilities achieved phase 1 TP limits (0.7 mg/l monthly average, and 0.6 mg/l growing season average (April – Sept.)) and are complying with NPDES permits.	Michigan will work through its compliance and enforcement process to address systemic non-compliance.
2d	WWTPs. Achieve TP limits of 0.7 mg/l monthly average, and 0.5 mg/l growing season average (April – Sept.) 0.8 mg/l (Oct-Mar), at 12 Major POTWs, using operational and/or low-cost capital expenditures.	EGLE 12 WWTPs: Trenton, Grosse Ile Twp, S. Huron Valley UA, Oakland Co - Walled Lk/Novi, Rockwood, Berlin Twp, Milan, Tecumseh, Adrian, Dundee, Bedford Twp, Rollin-Woodstock	1/1/24	12/31/28	Reissuance year varies by permittee. Compliance schedule established in new permits.	EGLE MiEnviro (formally MiWaters), Monthly.		Michigan will work through its compliance and enforcement process to address systemic non-compliance.

Priority Task Objective 3: Identify priority areas in Michigan's portion of the Maumee River Watershed for phosphorus reductions. Identify and implement priority actions to reduce phosphorus loads from Michigan's portion of the Maumee River Watershed.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
3c	Conduct additional monitoring as appropriate to evaluate P reduction success and identify additional target areas for reduction. Continue to support monitoring at five USGS gage stations - Lime Ck, Stony Ck, Nile Ditch, S.S. LaPointe Drain, and Heidelberg station on the River Raisin.	EGLE, USEPA, USGS, OH, IN	10/1/20	9/30/27	EGLE continues to work on a coordinated monitoring plan for the Maumee River Watershed. USGS will report data annually.	Monitoring data will be provided in Annual DAP Update.	Ongoing. Five gage stations have been installed in the Bean Creek and River Raisin Watersheds. Monitoring has continued since 2021 water year.	Continue funding to support continuous monitoring.
3d	WLEB Expanded Water Quality Monitoring Program.	MDARD, AGL, MSU, LimnoTech, EGLE	3/1/24	9/30/29	Gage stations deployed and operational.	MDARD Annual Report.	New project in 2024.	Continue funding to support continuous monitoring.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
3f	Identify and track the number of MAEAP verified acres out of total cropping acres in the Bean Creek Watershed.	MDARD	12/31/24	12/31/28	Measure acreage in MAEAP verified farms as a percent of total farmland acres. Tracked annually.	MDARD Legislative Report and MAEAP Database, MDARD Annual Report.	This project has been selected as part of the Adaptive Management process conducive to adaptive management. MAEAP Database improvements are ongoing. CD technicians continue to provide one-on-one technical assistance to farmers working through the MAEAP process.	Completion of revisions and improvements to the MAEAP database. MAEAP Technician turnover within CDs. Onboarding new MAEAP Technicians and getting them familiar with farms in their counties, MAEAP Standards and BMPs. Securing adequate funding for cost share and technical assistance to implement BMPs.
3h	Identify and track the number of MAEAP verified acres out of total cropping acres in the St. Joseph River Watershed.	MDARD	12/31/24	12/31/28	Measure acreage in MAEAP verified farms as a percent of total farmland acres. Tracked annually.	MDARD Legislative Report and MAEAP Database, MDARD Annual Report.	This project has been selected as part of the Adaptive Management process conducive to adaptive management. MAEAP Database improvements are ongoing. CD technicians continue to provide one-on-one technical assistance to farmers working through the MAEAP process.	Completion of revisions and improvements to the MAEAP database. MAEAP Technician turnover within CDs. Onboarding new MAEAP Technicians and getting them familiar with farms in their counties, MAEAP Standards and BMPs. Securing adequate funding for cost share and technical assistance to implement BMPs.
3j	St. Joe WLEB Phosphorus Reduction.	EGLE, MSUE	2/21/21	12/31/23	Implementation project to cost-share on no-till, cover crops, saturated buffer, and high-level nutrient management; 2021–2024.	EGLE - NPS Program Website, Annual.	Ongoing through 2024 BMPs to date: Cover crops: 1,234 acres; Nutrient Management: 931 acres; 1 Saturated Buffer demonstration.	Contract will be increased if certain milestones are met.

Priority Task Objective 4: Support and invest in research to better understand the causes of HABs, including invasive mussels and soluble reactive phosphorus, and how these factors increase/decrease HAB events.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
4a	Participate in the Great Lakes HAB Collaborative.	MDARD, GLC	1/1/24	12/31/28	HAB Collaborative produces outreach materials to inform jurisdictions and public on HAB state of science and management.	HAB Collaborative Website updates; Quarterly Newsletters.	Ongoing. EGLE staff currently serves on the HAB Collaborative steering committee.	N/A
4e	Participate on Annex 4 Subcommittee.	MDARD, EGLE	1/1/24	12/31/28	Annex 4 Subcommittee meets monthly via conference calls and two face-to-face meetings.	Annex 4 Subcommittee annual webinar.	Ongoing. The Annex 4 Subcommittee recently formed an Adaptive Management Team.	Clear understanding of jurisdictional roles and responsibilities.
4f	Design and implement a study to evaluate SRP discharge concentration and SRP:TP ratios as a function of level of municipal treatment, including secondary treated, primary treated, CSO Retention Treatment Basins, and untreated CSOs.	EGLE, GLWA	1/1/24	1/31/25	EGLE anticipates including in next GLWA permit reissuance.	EGLE MiEnviro (formally MiWaters).	Ongoing.	Current treatment plant design may not allow for adjustments that can substantially or affordably change bioavailability of phosphorus.

Priority Task Objective 5: Utilize research and field demonstrations to identify the suite of BMPs that work collectively to reduce both TP and SRP at the field implementation level.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
5a	Implement new MAEAP reporting and planning database to better track the cumulative impact of conservation practices across the watershed and county scale.	MDARD	1/1/24	12/31/28	MDARD refined the database used to track MAEAP acres and BMPs within the WLEB; Annual.	MDARD Legislative Report, Annual; MAEAP Database, Annual.	Ongoing.	Completion of MAEAP database.
5b	Expand MAEAP database through the addition of a spatial mapping decision-based tool to enable MAEAP technicians to demonstrate to producers' sensitive areas that are conducive to BMP installation.	MDARD	1/1/24	12/31/28	FY 2018 creation of spatial mapping decision-based tool. Implementation began in FY 2021.	MDARD Legislative Report, Annual; MAEAP Database, Annual.	Ongoing.	Completion of MAEAP database.
5c	Implement spatial mapping decision-based tool upgrades to database with MAEAP technicians.	MDARD	1/1/24	12/31/28	FY 2019 rolled-out tool to MAEAP technicians. Implementation began in FY 2021.	MDARD Legislative Report, Annual; and MAEAP Database, Annual.	Ongoing.	Completion of MAEAP database.
5d	Pursue new data and information about ecosystem dynamics, BMPs, and monitoring strategies through ongoing communications partners.	MDARD, EGLE, DNR, interested partners	1/1/24	12/31/28	Agency staff annually review, identify, and participate in research-oriented workshops, meetings, and conferences, Annual.	N/A	Ongoing. In 2019, agency staff participated in the planning of a binational, federally led Lake Erie Cooperative Science and Monitoring Initiative.	Partner activities, staff availability, competing priorities.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
5e	Phase I: Continue to support a study to evaluate the effectiveness of DWM control practices installed to reduce tile line discharges of nitrate, TP and SRP.	MDARD, EGLE, MSU	10/1/18	12/31/22	Multi-year edge-of-field study. Phase I: 2018-23, calibration, monitoring. Phase II: 2023-25, continued monitoring.	MSU publication.	Completed. This project has been selected as part of the AM process conducive to adaptive management. Ongoing - extended support for continued monitoring in 2023. Three monitoring sites (controlled drainage; variable-rate technology + controlled drainage; and controlled drainage + saturated buffer). 2021-22 results - see narrative section.	Data latency, quality assurance/quality control issues.
5e	Phase II: Design and implement a study to evaluate the effectiveness of DWM control practices installed to reduce tile line discharges of nitrate, TP and SRP.	MDARD, EGLE, MSU	12/31/22	12/31/25	Effective DWM BMPs are understood, first water year calibration of the system, second water year evaluation of practices has begun, 2018-2023.	MSU publication.	Ongoing. In 2020, project completed the calibration phase. This project has been selected as part of the Adaptive Management process conducive to adaptive management.	Data latency, quality assurance/quality control issues.
5f	Issue pass-through grants to reduce sediment and nutrient loads from the WLEB by implementing priority BMPs from approved WMPs.	EGLE, CDs, local partners	1/1/24	12/31/28	Issue NPS pass-through grant request for proposals, Annual.	EGLE NPS Program Website, Annual.	Ongoing. EGLE NPS funded grants for WMP's for: Upper Wolf Ck (River Raisin Watershed Council); Ottawa Stony North (Washtenaw CD) Both approved in fall of 2024.	Local capacity, adequate financial and technical assistance.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
5g	Reinstate CREP in the WLEB.	MDARD, NRCS, CDs, MSUE, FSA	3/4/22	9/30/27	Promote outreach, recruit enrollees, develop tracking metrics and monitor progress, Annual.	Annual Update.	CREP reinstated.	Secure additional funding from the Legislature that is adequate to fund the full 80,000-acre goal for all three priority watersheds.
5h	Determine the feasibility of implementing a regional commercial biodigester in the WLEB.	MDARD, EGLE, MSUE, interested partners	N/A	N/A	Creation of a commercial anaerobic digester would benefit the environment and create energy for the farm and/or grid. Project timeline has not been determined.	N/A	On hold.	Permitting, determining site selection alternatives.
5j	Soil test phosphorus literature review.	EGLE, MDARD, interested partners	1/1/24	12/31/28	Soil test phosphorus and manure application guidelines.	N/A	Results of initial literature review are summarized in the narrative section. Work with partners to determine if Michigan's 75-150 ppm soil phosphorus limits for manure application are protective of water quality.	CAFO permit, NRCS Standards, GAAMPs, and other external process considerations.
5k	Great Lakes Watershed Management System - Nutrient Tracking Dashboard.	MDARD, EGLE, MSU-IWR, interested partners	4/1/23	9/30/26	Public facing dashboard in 2024.	Annual Workload Report and Publication.	Project underway and following work plan timelines.	Ability to enter into data sharing agreements or other institutional arrangements to acquire BMP data.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
5l	Alliance for the Great Lakes - The Cost to Meet Water Quality Goals in the Western Basin of Lake Erie Phase I.	AGL, OH Environmental Council, LimnoTech, Delta Institute	2/7/22	2/14/23	N/A	N/A	Project completed.	N/A
5m	Alliance for the Great Lakes - The Cost to Meet Water Quality Goals in the Western Basin of Lake Erie PHII - Stony Creek, South Branch River Raisin and Nile Ditch HUC-12.	AGL, LimnoTech	2/20/23	12/31/23	ACPF outputs for two priority HUC-12 subwatersheds.	N/A	Project completed.	Funding and technician training using ACPF outputs, adequate outreach/ engagement training.
5n	Alliance & MDARD - The Magnitude and Cost of BMP Implementation: Strategic Planning for Michigan's Priority Subwatersheds - WLEB HUC-12 subwatershed metric development.	AGL, LimnoTech, MDARD	11/1/23	4/2/24	ACPF outputs for three priority HUC-12 subwatersheds.	N/A	Project completed.	Funding and technician training using ACPF outputs, adequate outreach/ engagement training.
5o	Conduct Agricultural Inventories in priority HUC-12 subwatersheds and throughout the WLEB, when possible.	EGLE, CDs, interested partners	1/1/24	12/31/28	Annual. Complete the Agricultural Conservation Planning Framework tool for all HUC-12 watersheds in the WLEB by the end of 2024.	EGLE- NPS Program Website, Annual.	Ongoing. The agricultural inventory process has been fully completed on 10 of the 75 HUC-12 subwatersheds in the WLEB. The ACPF component has been completed on 51 HUC-12 subwatersheds. All remaining HUC-12 subwatersheds by the end of 2025.	Funding and technical support to complete agricultural inventory phases of process.

Priority Task Objective 6: Implement phosphorus control actions in the River Raisin Watershed to achieve the target load reductions.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
6b	Achieve TP limits of 0.7 mg/l monthly average, and 0.5 mg/l growing season average (Apr – Sept.), using operational and/or low-cost capital expenditures. Add evaluation condition to permit reissuance to determine if POTW can reliably comply with new TP limits using operational / low-cost capital expenditures. Integrate final TP limits with permit reissuance.	EGLE, GLWA, DWUA, YUCA, Monroe	Permit reissue date	TBD - compliance schedule in reissued permit	Implement in NPDES basin year; by FY 2027. Completed through NPDES Program DMRs and the NPDES permit term.	EGLE MiEnviro (formally MiWaters), Monthly.	Key facilities achieved phase 1 TP limits (0.7 mg/l monthly average, and 0.6 mg/l growing season average (April – Sept.)) and are complying with NPDES permits.	Michigan will work through its compliance and enforcement process to address systemic non-compliance.
6e	Identify and track the number of MAEAP verified acres out of total cropping acres in the River Raisin Watershed.	MDARD	12/31/24	12/31/28	Measure acreage in MAEAP verified farms as a percent of total farmland acres, Annual.	MDARD Legislative Report and MAEAP Database, MDARD Annual Report.	New in 2020.	Completion of MAEAP database.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
6k	Implement Saline River Watershed Drain Easement Purchase Pilot.	MDARD, EGLE. Washtenaw County WRCO, Washtenaw County CD, MSU-IWR interested partners	10/1/22	9/30/25	Achieve permanent easements along a drain located in the Saline River Watershed, 2021-2024.	Annual DAP Update.	New in 2020. This project has been selected as part of the Adaptive Management process conducive to adaptive management.	Dependent on ability to increase enrollment and/or additional USEPA DAP funding.
6l	Develop WMP for the Wolf Creek Subwatershed.	River Raisin Watershed Council, interested partners	12/1/21	12/31/23	Develop a new WMP for the Upper Wolf Creek watershed, a tributary of the River Raisin.	EGLE - NPS Program Website, Annual.	Completed. Approved fall of 2024.	Local capacity to update WMP.
6n	The Michigan Climate Smart Farm Project.	Washtenaw County CD, MACD, MDARD	1/1/2023	12/31/27	Program development and working groups established in 2023.	N/A	Project underway.	Local capacity and engagement potential.
6o	Stony Creek Community Conservation: A Watershed Management Plan for Stony Creek (South Branch River Raisin).	UM-SEAS, MDARD	6/1/23	4/30/24	Completed Stony Creek, South Branch River Raisin, Watershed Conservation Plan	UM-SEAS project website.	Plan completed April 2024.	Access to ACPF data, willingness of producers, landowners, and community to engage in planning effort.
6p	Saline River Water Quality Monitoring Gaging Station deployment.	MDARD, EGLE, USGS	10/1/23	9/30/27	Gage station operational in Spring of 2024.	USGS gage station dashboard.	Spring 2024 installation complete.	Long-term funding to maintain station.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
6q	Healthy Soils, Healthy Waters: Understanding the Outcomes of Improved Soil Health to Accelerate Conservation in the WLEB.	MDARD, UM, MSU, AGL, MAA, Washtenaw CD	7/1/24	4/30/29	Participatory, on-farm research; analysis of soil health data for a broad suite of management systems and practices; edge-of-field monitoring, and field days.	Annual DAP Update.	Project underway.	Willingness of producers, landowners, and community to engage in project.

Priority Task Objective 7: Maintain and expand partnerships to provide valuable technical and financial assistance to farmers.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
7a	Support MAEAP Technicians in the WLEB.	MDARD, EGLE, DNR, CDs	1/1/24	12/31/28	Annually review the technical assistance need to expand, reduce, or target efforts.	MDARD Legislative Report, Annual.	Ongoing. The MAEAP provides eight grants to WLEB CDs. The four MAEAP Technicians and four Conservation Specialists creates the highest technician density in the state.	Legislative support for continued funding of MAEAP.
7b	Strengthen partnerships with the agricultural community to encourage more farmers to take action to protect water quality.	MDARD, EGLE, DNR, CDs, interested partners	1/1/24	12/31/28	Encourage grass roots producer involvement in education, incentives and decision-making.	N/A	Ongoing. Continue to work closely with technical service providers and CCA's to expand the reach of the program to producers.	Local capacity, adequate funding to complete technical assistance.
7c	Partner with USDA NRCS, MSUE, and other partners to offer training to MAEAP technicians.	MDARD, EGLE, DNR, MSUE, federal, partners, interested partners	10/1/23	9/30/24	Staff trained in risk assessment tools, nutrient management, manure management system plans, knowledge of BMPs, wetland conservation, communications, and landowner outreach, Annual.	N/A	Ongoing. MAEAP provides optional and mandatory trainings to improve technician's skills and competencies. In 2023, 20 core trainings were held statewide.	Local capacity, adequate funding to complete training.
7d	Coordinate partnerships through quarterly MDARD WLEB MAEAP Partnership meetings to	MDARD, EGLE, DNR, CDs	1/1/24	12/31/28	Host four meetings per year. Debrief on local efforts to review who is doing what, success	N/A	Ongoing. The team continues to meet quarterly to share information.	Local capacity, engagement barriers.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
	review technical assistance and resources available to producers.	interested partners			stories, and obstacles, quarterly meetings.			
7e	Partner to identify and secure additional funding for producers and landowners.	MDARD, interested partners	1/1/24	12/31/28	Seek additional partnership opportunities to provide technical and financial conservation assistance.	Annual MDARD Legislative Report.	Ongoing. MDARD continues to pursue cost share to both producers and technicians to increase BMP implementation.	Local capacity, adequate funding for cost share.
7f	Pursue and issue pass-through grants focused on farm conservation planning, livestock management strategies, wetland conservation, and drainage water management strategies in the WLEB.	MDARD, EGLE, DNR, interested partners	1/1/24	12/31/28	EGLE and MDARD pursues federal funding for BMP implementation, Annual; EGLE - NPS Program will release a request for proposals, Annual.	MDARD Legislative Report; Annual. EGLE – NPS Program Website; Annual DAP Update.	Ongoing. State agencies continue to pursue federal funds and continue to pass through funds annually.	Federal funds appropriated at the federal level.
7g	WLEB Conservation Specialists.	MDARD, WLEB CDs	10/1/24	9/31/25	All position filled.	N/A	Annual grant agreement between MDARD and WLEB CDs.	Local capacity, engagement barriers.

Priority Task Objective 8: Increase and maintain MAEAP practice implementation for long-term water quality improvement.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
8a	Identify and implement more incentives to expand participation in MAEAP through the MAEAP Advisory Council.	MDARD, MAEAP AC	1/1/24	12/31/28	Evaluate incentives and pilot projects, Annual.	MDARD Legislative Report, Annual.	Ongoing. The MAEAP AC has a standing Task Force that evaluates the program's direction, opportunities to expand the program, and provide input to the Council.	Local capacity, engagement barriers.
8b	Increase MAEAP cropland acres managed under NMPs.	MDARD, CDs	1/1/24	12/31/28	Increase total MAEAP NMP acreage on farms by 35,000 acres, Annual.	MDARD Legislative Report; Annual. EGLE NPS Program Website; Annual.	Ongoing. MAEAP verified acres in the WLEB increased from 15,356 acres in FY 2017 to 33,108 acres in FY 2020.	Local capacity, adequate funding for cost share and technical assistance.
8c	Identify and track the number of farms eligible for reverification and discuss during local MAEAP goal-setting meetings.	MDARD, CDs	1/1/24	12/31/28	MDARD and CDs continue to meet to determine the number of reverifications each year. This allows the program to maintain a reverification rate in excess of 85 percent.	MDARD Legislative Report; Annual.	Ongoing. MDARD and CDs continue to meet to determine the number of reverifications each year. This allows the program to maintain a reverification rate in excess of 85 percent.	Onboarding new MAEAP Technicians and getting them familiar with farms that need to be reverified.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
8d	MAEAP Technicians work one-on-one with producers to provide technical assistance and identify environmental risks and recommend and prioritize BMP installation.	MDARD, CDs	1/1/24	12/31/28	Track number of risk assessments, BMPS installed, and acreage impacted, Annual.	MDARD Legislative Report; Annual; and MAEAP Database; Annual.	Ongoing. CD technicians continue to provide one-on-one technical assistance to farmers working through the MAEAP process.	MAEAP Technician turnover within CDs. Onboarding new MAEAP Technicians and getting them familiar with MAEAP Standards and BMPs. Securing adequate funding for cost share and technical assistance to implement BMPs.

Priority Task Objective 9: Improve and increase outreach to the public and farmers to promote understanding of the basin and good conservation practices by initiating new targeted outreach campaigns, workshops, field demonstrations and information sharing.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
9c	Coordinate with partners to host on-farm field days, MAEAP Phase 1 educational events.	MDARD, CDs, MSUE, interested partners	1/1/24	12/31/28	Review attendance and impact of education to determine ongoing efforts, Annual.	MDARD Legislative Report and MAEAP Database, Annual.	Ongoing. MDARD, MSUE and local CDs continue to host field days to demonstrate BMPs to producers. In 2023, there were 11 Phase 1 training events held in the WLEB.	Local capacity, engagement barriers.
9d	Establish a functional external advisory body to provide input and feedback on the adaptive management process.	EGLE, MDARD, DNR, U-M Water Center, Erb Family Foundation	2/1/23	1/31/26	WLEB Community Advisory Group member stakeholder survey completed; Science Panel report completed.	Annual DAP Update.	WLEB Community Advisory Group and Science Panel formed and operating in summer of 2023. The 2024 Science Panel will focus on social science and indicators.	Need to ensure adequate stakeholder representation. Social science expertise, funding, study participation.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
9e	Develop social-based metrics to better understand public and producer perception.	U-M Water Center, EGLE, MDARD, DNR, interested partners	1/1/24	12/31/28	Implement surveys and additional outreach efforts such as public webinars, agency staff presentations at conferences, workshops, and other public engagement opportunities, Annual.	UM-WC Community Advisory Group Website; Annual DAP Update.	Under development, expected to be completed in early 2025.	Social science expertise, funding, study participation.
9f	Farmers Taking Action to Protect Water Quality in Western Lake Erie Basin Phase III.	MACD	1/1/23	12/31/26	Workshops with CCAs, billboards in strategic locations throughout the WLEB, targeting mailing campaigns.	WLEB Farmer-led Group website.	Ongoing. Planning underway.	Local capacity, engagement barriers.
9g	TNC WLEB & Saginaw Bay Priority Watershed Knowledge Exchange.	TNC, LimnoTech, MDARD	1/1/22	12/31/24	Meetings held 10/25/22, 3/2/23, 5/31/23.	TNC reporting.	Preliminary report due end of 2024.	Local capacity, engagement barriers.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
9h	Improve soil health on Michigan's agricultural lands in order to reduce nutrient runoff and improve water quality in the Great Lakes. Help to develop the infrastructure and network necessary to make soil health a significant priority within conservation programs and for state funding investments.	MEC, AGL, MACD, NWF, MiAA	6/1/23	5/31/25	Three primary outcomes: A robust and effective Soil Health Task Force; enhanced and engaged agricultural stakeholder network; educated and informed decision makers	Project group reports directly to Erb Family Foundation.	Letter to MDARD Director in Feb 2024 to request reinstatement of Soil Health Task Force; Underground Innovations conference in Feb 2024; Educating decisionmakers during 2024 budget meetings on importance of regenerative agriculture.	Local capacity, engagement barriers.
9i	HABs Chat.	MI Sea Grant, MSUE, County Health Depts, MDARD, EGLE	1/1/24	12/31/28	Quarterly meeting, annual webinar.	N/A	Ongoing. First public webinar scheduled for 3/6/24. Additional webinars held.	Engagement barriers, funding.
9j	Statewide Septic Code Legislation.	EGLE, MI Legislature	1/1/24	12/31/28	HB 4479 and 4480, and SB 299 and 300 introduced on April 27, 2023	MI Legislature.	EGLE staff provide input and technical state program insight on draft bills, as needed. Two draft bills (HB 4479, 4480 and SB 299, 300) are currently with the Legislature.	Requires legislation passage, program development and implementation.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
9k	Investigating Cover Crop Planting Methods for Establishment Success.	MDARD, MSUE	6/1/2024	12/31/26	Outreach products on the experiment results including articles, bulletins, and interactive 360° video footage.	Annual DAP Update.	Project underway.	Weather dependent.

Priority Task Objective 10: Promote wetland restoration and land management initiatives to reduce phosphorus loading.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
10a	Develop innovative strategies to enhance wetland restoration, and green stormwater infrastructure, and other land management planning and implementation efforts in SEMI.	EGLE, MDARD, DNR, SEMCOG, LUGs, NGOs, interested partners	1/1/24	12/31/28	Planning and implementing state, regional, and local planning and implementation efforts, Annual.	Annual DAP Update.	Ongoing. Will continue to pursue federal and state funding.	Local capacity, adequate financial and technical assistance.
10b	Work with agency staff to review BMPs implemented on state managed lands in the WLEB.	DNR	1/1/24	12/31/28	Assess state managed lands in the WLEB to understand the types of BMPs are, or could be, implemented to protect water quality, in development.	Annual DAP Update.	DNR staff conducting an initial review of the state land holdings and facilities in the WLEB through a GIS landscape assessment first and then in-person visits.	DNR GIS staff and funding availability to conduct project.
10c	Work with partners to pursue strategic conservation easements in coastal wetlands, riparian zones, and key wetland areas to improve groundwater infiltration, reduce runoff, and support	DNR, EGLE, MDARD, interested partners	1/1/24	12/31/28	External and internal funding opportunities will be shared with interested partners, Annual.	Annual DAP Update.	DNR ARPA $4 million request for projects to conduct wetland acquisition, restoration, enhancement, engineering plans for the WLEB and	Local capacity, adequate financial and technical assistance.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
	diverse aquatic and terrestrial biota.						Saginaw Bay watersheds.	
10e	Implement an agriculture wetland restoration pilot in the WLEB.	DNR, MDARD, EGLE	8/21/20	10/31/26	The wetlands constructed will capture agricultural runoff and be open to the public for recreational activities; Project proposal funded by the Michigan Natural Resources Trust Fund.	Annual DAP Update.	Ongoing. Location has been identified, appraisals requested, soils tested. Phase II construction funding sought through the GLRI.	Permitting, design alternatives.
10f	Continue to support green stormwater infrastructure implementation projects in SEMI through pass-through grants and technical assistance.	EGLE, SEMCOG, interested partners	10/1/22	12/31/24	SEMCOG Piloted green infrastructure projects are implemented on municipal lands, 2018-2021.	EGLE Annual updates.	Ongoing. 10 GSI projects in WLEB, est. 3-8 M gal. annual runoff reduction with emphasis in underserved communities. Sub-awards started in 2023.	Local capacity, adequate financial and technical assistance, permitting.
10h	Regional Conservation Partnership Program Tri-State Collaboration.	MDARD, OH, IN, NRCS, CDs, NGOs, interested partners	10/1/21	9/30/26	$2.1M in financial assistance through NRCS Farm Bill.	MDARD annual partner report including in-kind match and practice implementation outcomes.	Began in October 2021, ongoing through September 2026.	Local capacity, fund pool considerations, adequate financial and technical assistance and training.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
10j	Wetland Conservation Program - DNR WLEB and Saginaw Bay Water Quality Wetlands Program ARPA General Fund Appropriation.	DNR, DU, MDARD, EGLE, interested partners	2/28/23	12/31/26	Request for proposal opened 1/12/24; grant application due 3/11/24; project selection Spring 2024; project period Summer 2024; DNR project closeout 10/31/26.	DNR/DU press releases, articles, project meetings.	Project underway.	Local capacity, engagement barriers, land availability.
10k	Increasing Agricultural Conservation Adoption through Water Quality Sampling.	MSU, MDARD, WLEB CDs, Erb	4/1/22	4/30/25	Producer enrollment.	N/A	Project underway.	Local capacity, engagement barriers.
10l	Soil Health Incentives Made Simple Indiana, Ohio, and Michigan.	DU, Archer-Daniels-Midland Company, NFWF, NRCS	8/1/22	12/1/26	Incentivize producers in IN, MI, and OH to implement 175,000 acres of cover crops to improve water quality and wildlife habitats.	N/A	In 2022, 37,500 acres were enrolled in four-year agreements meeting the MI cap.	Goal met.
10m	MDARD $13M Agricultural Climate Resiliency Program and Regenerative Agriculture Program.	MDARD	10/1/23	9/30/26	Regen Ag staff hired for the WLEB.	Annual legislative report.	Program development underway.	Local capacity, engagement barriers.

Task No.	Task	Who	Start Date	End Date	Milestone	Agency Reporting Source & Frequency	Status & Projections	Challenges & Contingencies
10n	CAFO Permit.	Director of EGLE	1/1/20	TBD	Resolution of contested case.	EGLE reporting.	EGLE will work to resolve the contested case and reissue the 2020 General Permit. General Permit cannot be reissued until the contested case is resolved by the Director of EGLE. The final decision will be with the department.	Contested case process. Once the General Permit is issued, will work through its compliance and enforcement process to address systemic non-compliance.
10o	Launch Failing Septic System Loan Program.	EGLE-DWEHD, Michigan Saves, Local Health Depts.	1/1/24	9/30/26	EGLE to administer a statewide Failing Septic System Loan Program. Launch early 2024.	Michigan Saves will report to EGLE.	The program is under development.	Statewide program. Longevity of the program will depend on funding and program success.
10s	WLEB Performance-based Conservation Adoption Program.	MDARD, MSU-IWR, MSU-CRA, AGL, CDs, private sector, partners	2/1/25	5/31/32	Successful program enrollment.	Annual DAP Update.	Program in development.	Local capacity and engagement potential.

Appendix B: DAP Two-Year Work Plan Draft

Action(s)	Proposed Responsible Parties	Challenges & Contingencies	Expected Completion Date (Calendar Yr, Quarter)
Conduct virtual workshops, meetings, and webinars to review the DAP efforts, priority uncertainties, and proposed management options.	DAP Team, WLEB Community Advisory Group; Science Panel	Creation of advisory committees, Covid engagement restrictions.	2025, Q4
Determine adequacy of current monitoring, modeling, and data management and analysis programs to support management decisions.	DAP Team	Staff capacity to review adequacy.	2024, Q4
Task 1a. Reissue GLWA permit with 0.5 mg/L P growing season average evaluation condition.	EGLE, GLWA	Permit development and review process.	2024, Q4
Task 1c. Participate on bimonthly calls/meetings between EGLE and GLWA to ensure compliance with effluent limits and to discuss any issues.	EGLE, GLWA	NA	Ongoing
Task 1g. Participate on the Annex 4 (Nutrient) Subcommittee's Adaptive Management Task Team.	MDARD, EGLE	Clear understanding of jurisdictional roles and responsibilities.	2025, Q4
Task 2a. Reissue DWUA permit with 0.5 mg/L P growing season average evaluation condition.	EGLE, DWUA	Permit development and review process.	2024, Q4
Task 3c. Continue to support monitoring at 4 USGS gage stations - Lime Ck, Stony Ck, Nile Ditch, S.S. LaPointe, Heidelberg station on the River Raisin. Install Saline River headwaters gage station & commence monitoring.	EGLE, MDARD, USGS	Data latency. Logistics of installing / onboarding new gage station.	2027, Q4 2024, Q4
Task 3d. Expanded water quality monitoring program – Deploy equipment in HUC-12 priority subwatersheds and annual data summary.	MDARD, AGL, EGLE	Continue funding to support continuous monitoring.	2029, Q4

Action(s)	Proposed Responsible Parties	Challenges & Contingencies	Expected Completion Date (Calendar Yr, Quarter)
Task 3f. Identify and track the number of MAEAP verified acres out of total cropping acres in the Bean Creek Watershed.	MDARD	Completion of MAEAP database.	2024, Q4
Task 3g. Conduct Agricultural Inventories in priority HUC-12 sub-watersheds in the River Raisin and Bean Creek Watersheds.	EGLE, MDARD	Funding to complete agricultural inventory phases of process.	2025, Q4
Task 3h. Identify and track the number of MAEAP verified acres out of total cropping acres in the St. Joseph River Watershed.	MDARD	Completion of MAEAP database.	2024, Q4
Task 4f. Design and fund a study to evaluate SRP discharge quality as a function of level of municipal treatment, including secondary treated, primary treated, CSO Retention Treatment Basins, and untreated CSOs.	EGLE, GLWA	Data availability, site selection, funding.	2025, Q1
Task 5e. Design and implement a study to evaluate the effectiveness of DWM control practices installed to reduce tile line discharges of nitrates, TP and SRP.	EGLE, MDARD, MSU	Data latency, quality assurance/quality control issues.	2025, Q4
Task 5f. Issue annual RFP to support and administer active implementation grant projects: (1) Precision Nutrient Mgmt. & other BMPs. (2) Drainage Water Mgmt. (3) Soil erosion reduction strategies (4) Phosphorus removal treatment technology at tile outlets pilot.	EGLE Lenawee CD MSU Interested partners	Local capacity, adequate financial and technical assistance.	Ongoing 2024, Q4 2025, Q4 2024, Q4 2025, Q4
Task 5g. Reinstate Conservation Enhancement Reserve Program in the WLEB.	MDARD	Producer enrollment in program, NRCS processing of applications	2026, Q3

Action(s)	Proposed Responsible Parties	Challenges & Contingencies	Expected Completion Date (Calendar Yr, Quarter)
Task 5j. EGLE and MDARD will work with interested partners to develop an evaluation process to determine if Michigan's 75-150 ppm soil P limits for manure application, are protective of water quality.	EGLE, MDARD, Interested partners	CAFO permit; NRCS Standards, GAAMPs, external processes	2025, Q4
Task 5k. Great Lakes Watershed Management System - Nutrient Tracking Dashboard, public facing dashboard completed.	MDARD, MSU-IWR, EGLE	Ability to enter into data sharing agreements or other institutional arrangements.	2026, Q4
Task 5o. EGLE and MDARD staff to continue exploring satellite imagery data for cropping, tillage, and residue data ACPF under development for several HUC-12 watersheds, per status map CD Staff to conduct tillage/residue surveys.	EGLE, MDARD, Monroe, Lenawee, Hillsdale and Washtenaw CDs	Validation and accuracy of satellite imagery analysis. Funding and technical support to complete agricultural inventory phases of process. Local capacity, timing of surveys.	2024, Q4 2024, Q4 2024, Q2 2025, Q4
Task 6e. Identify and track the number of MAEAP verified acres out of total cropping acres in the River Raisin Watershed.	MDARD	Completion of MAEAP database.	2024, Q4
Task 6k. Implement Saline River Watershed Drain Easement Purchase Pilot.	MDARD, Washtenaw County Water Resources Commissioner's Office, Washtenaw County CD	Landowner interest in enrolling in program, additional funding.	2024, Q4
Taks 6o. Complete Stony Creek Community Conservation: A Watershed Management Plan for Stony Creek (South Branch River Raisin).	MDARD, UM-SEAS	Access to ACPF data, willingness of producers, landowners, and community to engage in planning effort.	2024, Q2
Taks 6p. Saline River Water Quality Monitoring Gaging Station deployment.	EGLE, MDARD, USGS	Equipment purchase, permitting.	2024, Q4

Action(s)	Proposed Responsible Parties	Challenges & Contingencies	Expected Completion Date (Calendar Yr, Quarter)
Task 6q. Understanding the Outcomes of Improved Soil Health to Accelerate Conservation in the WLEB.	MDARD, UM, MSU, AGL, MAA	Farmer engagement.	2029, Q2
Task 7f. Apply for GLRI Focus Area 3 funds (Nearshore Health & NPS) and Focus Area 5 (Foundations) funds CSMI, monitoring, assessment, and coordination.	MDARD, EGLE, CDs, County Health Depts., USEPA	Grant review and award process, federal funding.	2024, Q3
Task 7g. WLEB Conservation Specialists Strategic planning in the WLEB priority subwatersheds.	MDARD, DNR, CDs, EGLE, NWF	Technician turnover within CDs.	2024, Q2
Task 8c. Identify and track the number of farms eligible for reverification and discuss during local MAEAP goal-setting meetings.	MDARD, CDs	Onboarding new MAEAP Technicians and getting them familiar with farms that need to be reverified.	2024, Q4
Task 8d. MAEAP technicians work one-on-one with farmers to provide technical assistance and identify environmental risks and recommend and prioritize BMP installation.	MDARD	MAEAP Technician turnover within CDs. Onboarding new MAEAP Technicians and getting them familiar with MAEAP Standards and BMPs. Securing adequate funding for cost share and technical assistance to implement BMPs.	2024, Q4
Task 9d. Increase outreach to the public to promote understanding of the Lake Erie Basin ecosystem, good conservation practices, and progress being made to achieve nutrient reductions.	DAP Team, WLEB Community Advisory Group, QOL Communication Teams	Need to ensure adequate stakeholder representation.	2024, Q4
Task 9e. Develop social-based metrics to better understand public and farmer perception.	DAP Team Science Panel, NWF, WLEB Community Advisory Group	Social science expertise, funding, study participation.	2025 Q2
Task 9k. Investigating Cover Crop Planting Methods for Establishment Success	MDARD, MSUE	Weather dependent.	2026, Q1
Task 10e. Design and fund constructed wetland restoration pilot in the WLEB.	DNR, DU, MDARD, EGLE	Permitting, design alternatives.	2025, Q4

Action(s)	Proposed Responsible Parties	Challenges & Contingencies	Expected Completion Date (Calendar Yr, Quarter)
Task 10h. Regional Conservation Partnership Program Tri-State Collaboration.	MDARD, CDs, NRCS	Producer enrollment.	2024, Q1
Task 10j. Wetland Conservation Program - DNR $10M WLEB and Saginaw Bay Water Quality Wetlands Program ARPA General Fund Appropriation.	DNR, DU, MDARD, EGLE, partners	Local capacity, engagement barriers, land availability.	2026, Q4
Task 10k. Increasing Agricultural Conservation Adoption through Water Quality Sampling.	MDARD, MSU, WLEB CDs	Producer enrollment.	2026, Q4
Task 10o. Launch Failing Septic System Loan Program.	EGLE, Michigan Saves, County Health Depts	Development of statewide program.	2024, Q4
Task 10s. WLEB Performance-based Conservation Adoption Program.	MDARD, MSU-IWR, MSU-CRA, AGL, CDs, private sector, partners	Local capacity and engagement potential.	2032, Q3

Appendix C: Water Quality Monitoring Summaries

To know if phosphorus loads are moving in the right direction, there is a need to understand what is happening in the WLEB tributaries. It is recognized there are a range of uncertainties associated with the impact of BMPs on water quality. Further, with limited resources, there was a need to be selective about where and how to sample. Scale matters when it comes to determining cause and effect relationships, for example, whether changes in water quality are linked to changes on the landscape.

With GLRI support, Michigan contracted with the USGS to deploy four flow gage stations on HUC-12 subwatersheds in late 2020, which have been sampled for nutrients and other water quality parameters on a monthly basis with additional sampling during higher flow events (Figure C-1). The Headwaters Saline HUC-12 subwatershed flow gage station was added in 2024 with support from MDARD. In addition to the USGS gage stations and the Heidelberg monitoring station on the River Raisin, there are three USGS gage stations deployed in the Upper Maumee River tributaries. Water quality monitoring results for these gaging stations are summarized below and can be accessed through the USGS Current Water Data for Michigan portal. The state will continue to work with EPA, USGS, and other partners to secure long-term monitoring funding to support these and other water quality monitoring gaging stations.

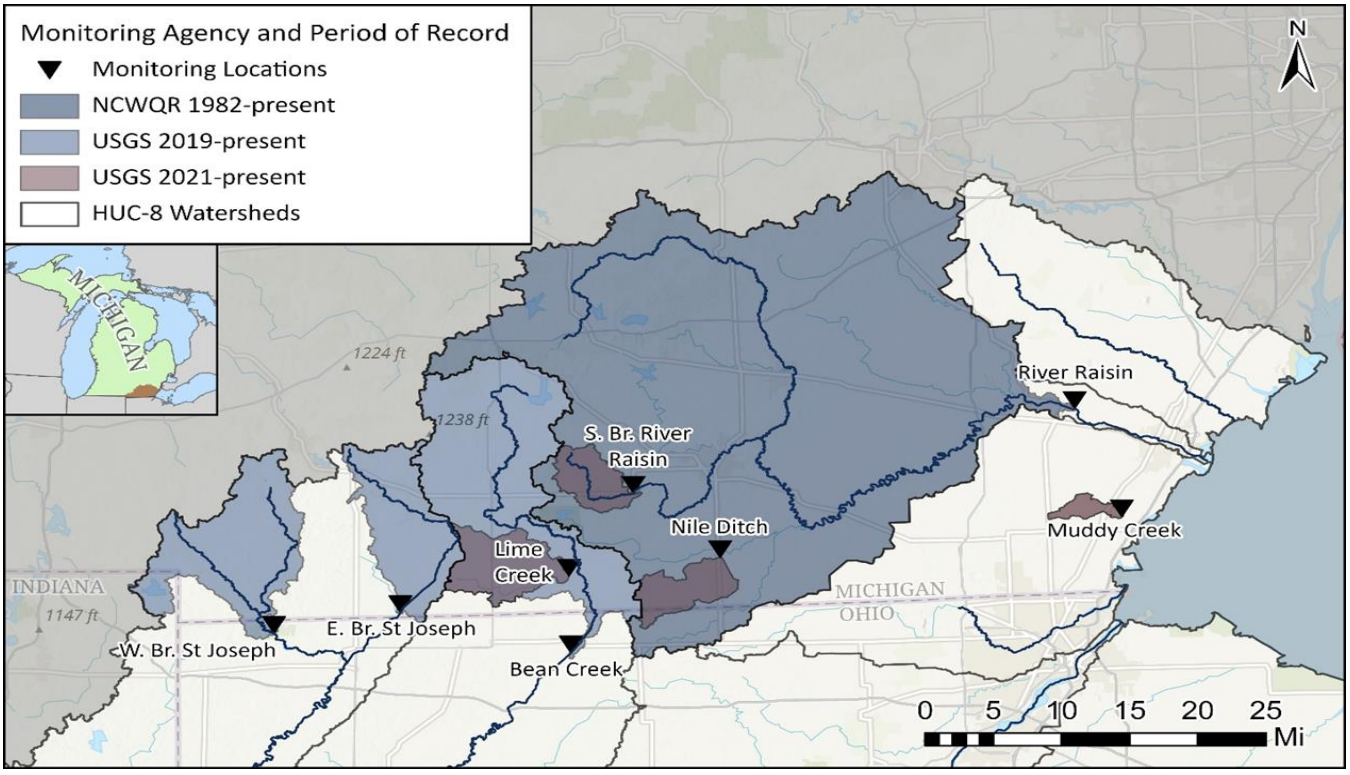


Figure C-1. Map of monitoring locations in the WLEB, including the Heidelberg NCWQR River Raisin long-term monitoring station (dark grey), three USGS stations monitoring Michigan's portion of the Maumee River Watershed (St. Joseph and Bean Creek, light blue), and four USGS gaging stations monitoring the five priority HUC-12 watersheds (dark purple).

River Raisin Watershed Water Quality Monitoring Summary

River Raisin annual TP loads have been below the 40 percent reduction target (103 MT/year) in six of the 14 years spanning water years 2009-2022 relative to the 2008 baseline year (Figure C-2). After experiencing a declining trend in the five-year moving average annual TP load due to relatively lower annual discharge volumes during the 2013-2016 period, the moving average subsequently increased and stabilized near the long-term average after four consecutive years (i.e., 2017-2020) with annual TP loads close to the 2008 baseline. More rigorous analysis of contributing factors, such as flows over this interval, would need to be conducted to draw any definitive conclusions.

Spring TP loads for the River Raisin have been below the 40 percent reduction target (50 MT) in three of the 14 years spanning water years 2009-2022 relative to the 2008 baseline year, but 2020 and 2022 have been essentially at, or just above, the target (Figure C-2). The five-year moving average in Spring TP loads is trending downward due to relatively lower loads in the most recent three years (2020-2022) compared to the previous three years (2017-2019).

Figure C-2. Annual (left) and spring (right) discharge volumes (top), TP loads (middle) and Dissolved Reactive Phosphorus (DRP) loads (bottom) at the River Raisin above Monroe, Michigan for the 2002-2022 period. Annual totals represent water years (October 1-September 30), and spring totals represent the March 1-July 31 period. Values were provided by Heidelberg University (NCWQR 2022).

Upper Maumee River Watershed Water Quality Monitoring Summary

Annual discharge volumes and TP loads for Bean Creek, East Branch St. Joseph River, and West Branch St. Joseph River monitoring stations near the Michigan-Ohio border are shown in Figure C-3 for water years 2019-2022. Like the River Raisin, annual discharge volumes and TP loads were relatively low in 2021 and higher in 2019, 2020, and 2022. Annual discharge volumes and TP loads for the four HUC-12 scale (or smaller) monitoring locations are shown in Table C-1 for water years 2021-2022. Load estimates were not available until November 2021, however, so water year 2021 represents 11 months rather than a full 12-month period. Like the other stations, these four stations also had lower discharge volumes and TP loads in water year 2021 compared to 2022.

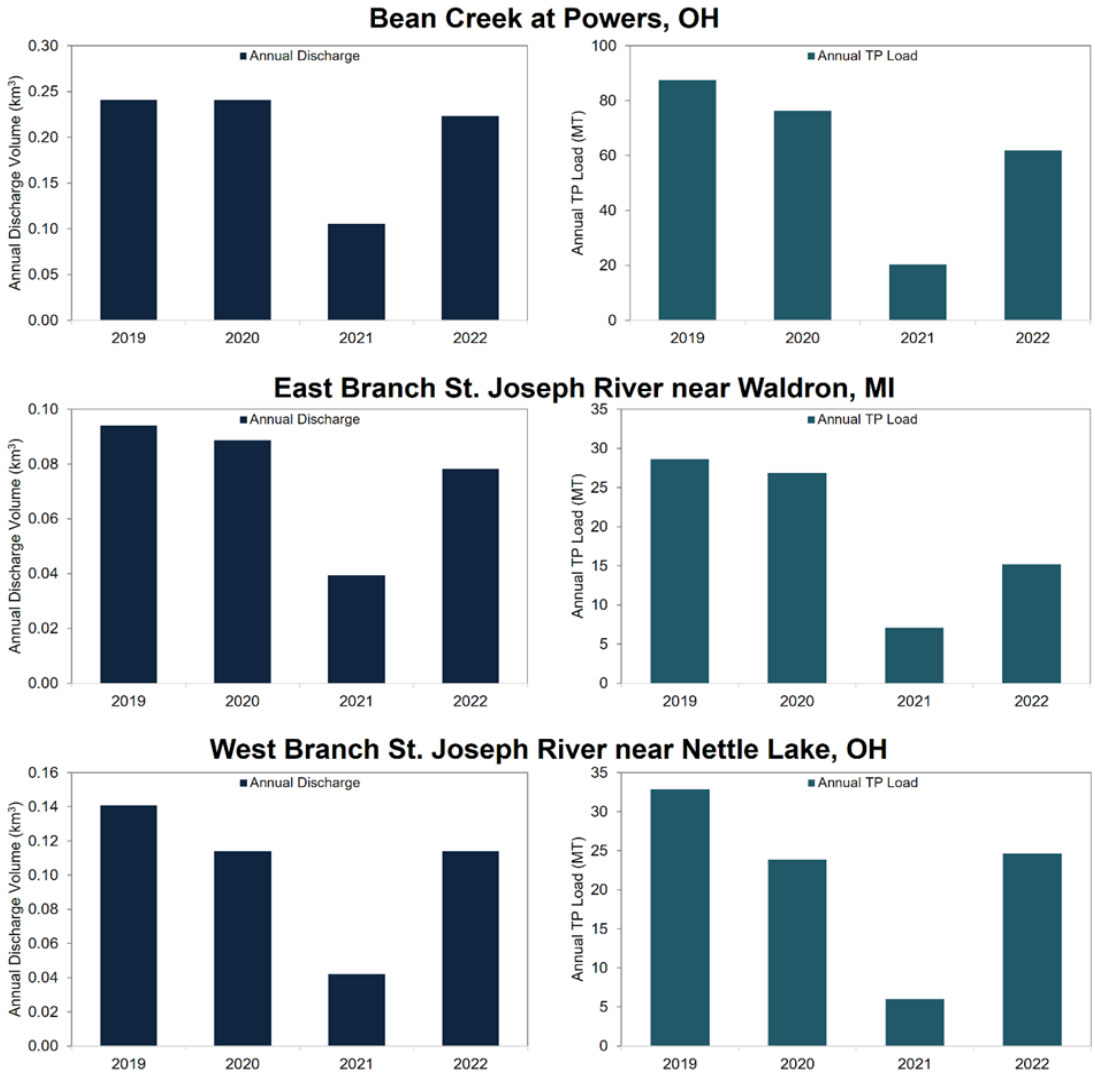


Figure C-3. Annual (water years, October 1-September 30) discharge volumes (left) and TP loads (right) for Bean Creek (top), East Branch St. Joseph River (middle) and West Branch St. Joseph River (bottom) for the 2019-2022 period. Values were provided by the USGS.

Table C-1. Absolute loading and relative loading information (per unit area yields and flow-weighted mean concentrations) for eight tributary monitoring locations draining majority or entirely Michigan landscape for water years 2021-2022.

Tributary (Location)	Area (sq mi)	Annual TP Load (MT/yr) WY2021	Annual TP Load (MT/yr) WY2022	Annual TP Yield (lb/ac/yr) WY2021	Annual TP Yield (lb/ac/yr) WY2022	FWMC (mg/L) WY2021	FWMC (mg/L) WY2022	Sampling Agency
River Raisin (Monroe, MI)	1042	52.1	166.0	0.17	0.55	0.12	0.18	NCWQR[1] (Heidelberg)
Bean Creek (Powers, OH)	206	20.27	61.91	0.34	1.04	0.19	0.27	USGS[2] Michigan
E. Br. St Joseph (Waldron, MI)	70.8	7.09	15.18	0.34	0.74	0.18	0.19	USGS Michigan
W. Br. St Joseph (Nettle Lake, OH)	101.8	6.01	24.61	0.20	0.83	0.14	0.21	USGS Michigan
Lime Creek (Morenci, MI)	37.3	4.78	13.64	0.44	1.26	0.27	0.34	USGS Michigan
Muddy Creek (Erie, MI)	6.0	0.50	1.02	0.28	0.58	0.21	0.26	USGS Michigan
Nile Ditch (Jasper, MI)	24.4	1.69	14.72	0.24	2.08	0.21	0.59	USGS Michigan
S. Br. River Raisin (Cadmus, MI)	22.8	3.44	7.99	0.52	1.21	0.31	0.37	USGS Michigan

[1]NCWQR = National Center for Water Quality Research (NCWQR) (Heidelberg)

[2]USGS – United States Geological Survey, Michigan

Appendix D: Water Sampling Location Decision Matrix

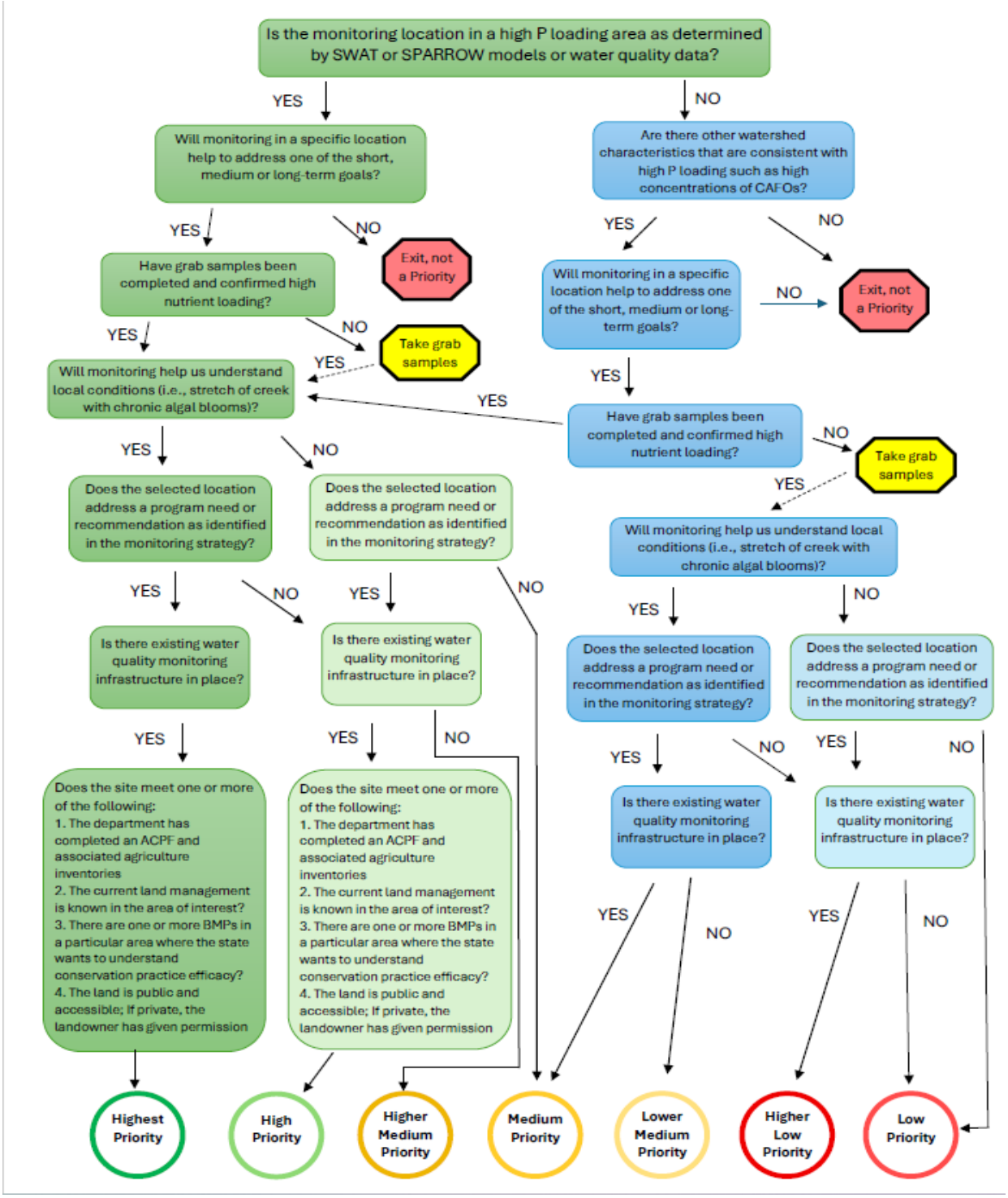


Figure D-1. WLEB Water Quality Monitoring Strategy water sampling location decision matrix for prioritizing water quality monitoring locations in the WLEB.

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Appendix F: DAP Update Acronyms and Initialisms

AC	Advisory Council (MAEAP)
ACPF	Agricultural Conservation Planning Framework
AGL	Alliance for the Great Lakes
AMP	Adaptive Management Plan
Annex 4	Nutrients Annex Subcommittee of the 2012 Great Lakes Water Quality Agreement
ARPA	American Rescue Plan Act
BGY	Billion Gallons Per Year
BMP	Best Management Practice
CAFO	Concentrated Animal Feeding Operation
CCA	Certified Crop Advisor
CCIP	Climate Change Implementation Plan (EGLE Water Resources Division)
CD	Conservation District
CEDM	Conservation Districts Employees of Michigan
CP	Conservation Practice
CRA	Center for Regenerative Agriculture (MSU)
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSO	Combined Sewer Overflow (or Outfall)
DAP	Domestic Action Plan
DNR	Michigan Department of Natural Resources
DU	Ducks Unlimited
DUWA	Downriver Utility Wastewater Authority
DWM	Drainage Water Management
DWSD	Detroit Water and Sewerage Department
ECCC	Environment and Climate Change Canada
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EQIP	Environmental Quality Incentives Program
FLG	Farmer-Led Group (MACD)
FSA	Farm Service Agency
FWMC	Flow-Weighted Mean Concentration
FY	Fiscal Year
GAAMPs	Generally Accepted Agricultural and Management Practices
GIS	Geographic Information System
GLC	Great Lakes Commission

GLEC	Great Lakes Executive Committee
GLERL	Great Lakes Environmental Research Laboratory (NOAA)
GLNPO	Great Lakes National Program Office (USEPA)
GLRI	Great Lakes Restoration Initiative
GLWA	Great Lakes Water Authority
GLWMS	Great Lakes Watershed Management System
GLWQA	Great Lakes Water Quality Agreement
GREEN	Growing Our Resiliency, Equity, and Economy with Nature (SEMCOG)
GSI	Green Stormwater Infrastructure
HAB	Harmful Algal Bloom
HB	House Bill
HUC	Hydrologic Unit Code
IWR	Institute of Water Research (MSU)
LEARN	Lake Erie and Aquatic Research Network
LLWFA	Landscape Level Wetland Functional Assessment
LTCSOCP	Long-term Combined Sewer Overflow Control Program
LUG	Local Unit of Government
MAA	Michigan Agriculture Advancement
MABA	Michigan Agri-Business Association
MACD	Michigan Association of Conservation Districts
MAEAP	Michigan Agriculture Environmental Assurance Program
MAP	Monoammonium Phosphate
MCP	Michigan Conservation Partnership
MCSFP	Michigan Climate Smart Farm Project
MDARD	Michigan Department of Agriculture and Rural Development
MDHHS	Michigan Department of Health and Human Services
MEC	Michigan Environmental Council
MS4	Municipal Separate Storm Sewer System
MSU	Michigan State University
MSUE	Michigan State University Extension
MT	Metric Ton
NCWQR	National Center for Water Quality Research
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source

NRCS	Natural Resources Conservation Service (USDA)
NRTF	Natural Resources Trust Fund
P	Phosphorus
PEA	Programmatic Environmental Assessment
POTW	Publicly Owned Treatment Works
PPM	Parts Per Million
QOL	Quality of Life
RMP	Residuals Management Program
RTB	Retention Treatment Basin
SB	Senate Bill
SEAS	School of Environment and Sustainability
SEMCOG	Southeast Michigan Council of Governments
SIDMA	Social Indicators Data Management and Analysis Tool
SIPES	Social Indicator Planning and Evaluation System
SPARROW	Spatially Referenced Regressions on Watershed Attributes
SRP	Soluble Reactive Phosphorus
SWAT	Soil and Water Assessment Tool
TP	Total Phosphorus
UM	University of Michigan
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WCP	Wetland Conservation Program (DNR)
WLEB	Western Lake Erie Basin
WMP	Watershed Management Plan
WRD	Water Resources Division (EGLE)
WRRF	Water Resource Recovery Facility
WTF	Wastewater Treatment Facility
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant
YCUA	Ypsilanti Community Utilities Authority