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State of Michigan
Domestic Action Plan for Lake Erie

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Purpose

Michigan's Domestic Action Plan (DAP) is a guiding document towards achieving a healthier Lake Erie ecosystem. Michigan's DAP affirms actions towards: 1) commitments under the Western Basin of Lake Erie Collaborative Agreement (Collaborative Agreement); 2) meeting the nutrient-related ecosystem goals for Lake Erie under Annex 4 (Nutrients) of the Great Lakes Water Quality Agreement (GLWQA); and, 3) process and tactics for Michigan to implement as a jurisdiction and in collaboration with local municipalities, nongovernmental organizations (NGO), other stakeholders, as well as the states of Ohio, Indiana, Pennsylvania, New York, and the Province of Ontario.

Ecosystem goals for Lake Erie include reducing harmful algal blooms (HABs) in the western basin, eliminating the hypoxic zone in the central basin, and reducing *Cladophora* growth in the eastern basin. The DAP lays out specific objectives for the State of Michigan; actions to be taken or supported by the Michigan Departments of Agriculture and Rural Development (MDARD), Environmental Quality (MDEQ) and Natural Resources (MDNR) (i.e., Quality of Life [QOL] agencies); program, policy and research gaps; and, an adaptive implementation strategy. Together, these provide a focus for allocating existing resources and helping to identify resource gaps. Finally, this DAP describes how Michigan will measure, track, and report progress toward meeting its objectives.

Background

Lake Erie has experienced many water quality problems over the past 50 years, including nutrient enrichment. In the 1960s, the lake was declared "dead" due to high nutrient loadings from point and nonpoint sources (NPS). Excessive algae fouled beaches and consumed life-supporting oxygen from the lake. Major pollution control efforts targeting municipal and industrial point sources and pollution from land use activities in the 1970s greatly improved the water quality. Lake Erie recovered and was soon recognized as a tremendous walleye and perch fishery, and recreational resource for boating, swimming, birding, and waterfowl hunting. Lake Erie coastal marshes and wetland habitats also provide regionally significant habitat for sensitive, threatened and endangered fish, wildlife, and plant species.

Environmental conditions began to change again in the late 1980s as invasive zebra and quagga (*Dreissenid*) mussels established in Lake Erie. Zebra and quagga mussels have changed the lake ecosystem in many ways that are not well understood, including shifting how nutrients cycle in the water column and sediment, by feeding selectively on green algae and thereby increasing local concentrations of cyanobacteria (i.e., blue-green algae), and by increasing water clarity with high densities and high rates of filtration. During the same time period, other changes occurred on the landscape that affected nutrient delivery and loading rates, such as the evolution of farming practices and changes in storm frequency and intensity. All of these changes resulted in persistent and intense cyanobacteria blooms occurring on a regular basis in the Western Lake Erie Basin (WLEB) starting in the 1990s.

The resurgence of the blooms contributed to redevelopment of a hypoxic zone in the central basin. Nuisance *Cladophora* growth in the eastern basin began to occur during the same time period. In August 2014, the Toledo, Ohio, drinking water supply was overwhelmed with cyanotoxins and had to stop supplying drinking water for parts of three days. This resulted in a sense of urgency to address the water quality problems facing Lake Erie.

Two key agreements making commitments toward restoring Lake Erie water quality were initiated in 2015. One was led by the states and province, and the other was by the U.S. and Canadian federal governments. In June 2015, Governor Rick Snyder signed the Collaborative Agreement with Premier Kathleen Wynne of Ontario and Lieutenant Governor Mary Taylor of Ohio. This Collaborative Agreement establishes an initiative that has a defined goal, establishes specific implementation plans, and is measured against expected results.

The MDEQ published its Collaborative Agreement Implementation Plan in January 2016. Since that time, the QOL agencies have worked to advance and expand implementation approaches. This DAP builds on and incorporates those efforts into one collaborative DAP for Michigan.

Since the GLWQA amendments went into effect in 2013, the Parties to the GLWQA (i.e., the federal governments of Canada and the United States [U.S.]), have been working with state and local agencies, scientists, and NGOs to develop a framework for action under Annex 4 (Nutrients) of the GLWQA. Key to progress under Annex 4 is the establishment of specific ecosystem goals, a collaborative process for identifying needed actions and tracking their implementation, and a framework for measuring water quality improvement and progress toward meeting the ecosystem goals. The next step in that process is for each jurisdiction to develop a DAP (Canada and Ontario will have one plan) that when taken together will outline the binational actions, priorities, and gaps for meeting the overall ecosystem goals for Lake Erie.

In November 2016, MDEQ included the Michigan portion of the WLEB on the 2016 303(d), Impaired Waters list submitted to the United States Environmental Protection Agency (USEPA). This impairment listing is based on repeated, widespread and persistent cyanobacteria blooms described above. The conditions in Lake Erie are documented by monitoring data along Michigan's shoreline and satellite imagery. The blooms in Michigan's waters of the WLEB were determined to be excessive/nuisance conditions indicating ecological imbalance. Given the complexity of the problem and the multijurisdictional requirements for solving it, MDEQ is convinced that the path toward resolution is through the Collaborative Agreement and Annex 4 process and is fully committed to these collaborative efforts.

Annex 4 Binational Phosphorus Load Reduction Targets

The following ecosystem targets for Lake Erie have been established through the Annex 4 process. Michigan's DAP is focused on contributing to the achievement of these targets, which are inclusive of the goals of the Collaborative Agreement:

- **Minimize the extent of hypoxic zones in the waters of the central basin of Lake Erie.** Reduce total phosphorus (TP) entering the western and central basins of Lake Erie by 40 percent - from the U.S. and from Canada – to achieve an annual load of 6,000 metric tons (MT) to the central basin. This amounts to a reduction from the U.S. and Canada of 3,316 MT and 212 MT, respectively.

- **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 that are similar to or smaller than bloom conditions 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 that 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.

Objectives

The following are the specific DAP objectives to ensure Michigan fully contributes to meeting the larger ecosystem goals established under Annex 4, and the states commitment under the Collaborative Agreement. Based on 2008 load estimates established by Annex 4, reduce the nutrient loadings from the following tributaries and associated watersheds by 20 percent by 2020, and 40 percent by 2025:

- TP loads from the Detroit River.
- Spring TP loads from the River Raisin.
- Spring SRP loads from the River Raisin.
- Spring TP and SRP loading contributions from the Maumee River. This objective will be refined for Michigan's waters of the Maumee River following results of watershed monitoring conducted by Michigan, Ohio, and Indiana.

Appendix 1 outlines expected TP and SRP loading reductions (in MT) of 20 percent by 2020 and 40 percent by 2025 to meet the DAP objectives, demonstrating how Michigan is fully contributing to meeting the larger ecosystem targets established under Annex 4, and the states commitment under the Collaborative Agreement.

Actions Moving Forward

Michigan has been proactive and successful in reducing phosphorus (P) loads to Lake Erie, but the work is not complete. Michigan remains committed to addressing current problems by focusing on the following general actions in the future. The following are specific actions that Michigan will implement to achieve the above priority objectives. Additional details, including timelines and milestones, are included in Appendix 2.

1. Maintain the reductions achieved in the Great Lakes Water Authority (GLWA) Wastewater Resource Recovery Facility (WRRF) discharge as a result of the tightened permit limits.

2. Achieve reductions in P discharged from the Wayne County Downriver Wastewater Treatment Facility (DWTF) and continue reductions at Ypsilanti Community Utility Authority Wastewater Treatment Plant (YCUA WWTP).

3. Identify priority areas in Michigan's portion of the Maumee River Watershed for P reductions. Identify and implement priority actions to reduce P 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 (BMP) that work collectively to reduce both TP and SRP at the field-scale implementation level.

6. Implement P 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 farmers. Specifically, maintain an increased level of Conservation District (CD) Michigan Agriculture Environmental Assurance Program (MAEAP) technical assistance levels through 2018 and beyond.

8. Increase and maintain MAEAP practice implementation and verification for long-term water quality improvement.

9. Improve and increase outreach to the public and farmers 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 P loading.

In addition to actions identified in this plan, the QOL agencies recognize that there are other items that should be addressed that are currently beyond the scope of the DAP, in part, because they will require additional legislative or policy work at a statewide level. They are listed here as items that can help to comprehensively address nutrient loading and its negative impact. While these actions will not be tracked specifically as they relate to implementation of the DAP, the following recommendations, should they be approved by legislature, will contribute in a noteworthy way to the goals of this DAP.

- Develop and implement a uniform statewide sanitary code that is flexible and provides standards for site suitability based on risk, and pass legislation establishing a uniform statewide sanitary code.

- Evaluate and implement necessary changes to laws, including state and local land-use statutes as well as the Michigan Drain Code, to create a more integrated, watershed-based system for managing water at the landscape level and achieving water quantity and quality outcomes.

Because Michigan is using an adaptive management approach, the DAP may be revised in the future as new water quality and nutrient loading data become available and knowledge gaps related to SRP, the role of invasive mussels, and HABs are filled.

Measuring Progress

The Annex 4 process determined 2008 as the base year for P loads from which to measure progress. The Collaborative Agreement calls for an aspirational goal of a 20 percent reduction by 2020 and a goal of a 40 percent reduction by 2025. Michigan is working with the other states and the province to identify and agree upon Lake Erie basin wide metrics to measure and monitor success. The QOL agencies are currently participating in the development of the Great Lakes Commission's Blue Accounting, Erie Stat Platform.

In 2017, a new MDARD database was initiated to track MAEAP's effectiveness at minimizing potential pollution risks statewide. In 2018-19, the MAEAP database will be enhanced with spatial mapping to enable technicians and farmers to prioritize acres that are most vulnerable to sediment and nutrient loss.

Michigan will also continue to track nutrient reductions from the Detroit River and Raisin River. For the Detroit River, reductions will be calculated primarily using the GLWA and Wayne County discharge monitoring. For the Raisin River, reductions will be tracked using the monitoring data from the Heidelberg University, the United States Geological Survey (USGS), and the Monroe Wastewater Treatment Facility (WWTF). Michigan, in partnership with USEPA and USGS, is developing a monitoring strategy for the Maumee River tributaries (i.e., Bean Creek and St. Joseph River) to assess the contribution of overall P loads from Michigan's portions of the Maumee River Watershed. Specific consideration will be given to determining the best monitoring approach to identify "hot spots" of nutrient loadings to track progress in a meaningful way. The monitoring plan is not yet complete and therefore is not included in the DAP.

The most important measure of progress is Lake Erie's response to nutrient reductions; that is, whether and to what extent the reductions are driving changes in the frequency, duration, and intensity of HABs in the WLEB. Tracking of in-lake progress will be conducted by the state, federal and provincial participants in the Annex 4 process and will not be a Michigan-specific activity. Discussions are ongoing about how changes in the WLEB will be monitored, tracked, and reported.

The QOL agencies will report on progress annually through the Michigan Office of the Great Lakes' (OGL) Lake Erie Web site (https://www.Michigan.gov/OGL). In addition, the agencies are working with other Annex

4 partners to identify other means for tracking and reporting progress, such as through the Lake Erie Lakewide Management Plan and reports of the Parties to the International Joint Commission.

Metrics to Track Progress towards the Objectives

Michigan will use the following metrics to track progress toward meeting the Collaborative Agreement and Annex 4 objectives in addition to measuring changes to in-stream P concentrations and load reduction measurements compared to 2008:

Point Sources

- National Pollution Discharge Elimination System (NPDES) Permits for four key municipal WWTPs to include reduced TP concentration limits. These WWTPs include the GLWA Detroit WRRF, the DWTF, the YCUA WWTP, and the Monroe Metro WWTF. GLWA WRRF and YCUA WWTP are already meeting reduced permit limits, DWTF and Monroe Metro WWTF will achieve by 2020.
- Permit limits consistently achieved at the largest WWTPs; no significant noncompliance.
- Continue to remove untreated Combined Sewer Overflows (CSOs).
- Continue to implement:
    - Municipal Separate Storm Sewer Systems programs.
    - Concentrated Animal Feeding Operation (CAFO) NPDES permits.
    - Biosolids permits.

Nonpoint Sources

- The River Raisin Watershed and Michigan's portion of the Maumee River Watershed will have Michigan and USEPA 319-approved watershed management plans (WMPs).
- Annually document that at least an additional 3.5 percent or 35,000 more cropland acres in WLEB are managed under nutrient management plans (NMPs).
- Maintain a minimum of 85 percent MAEAP reverification rate for farms in the WLEB.
- Through MAEAP technical assistance:
    a. Reduce additional sediment entering the waters in the WLEB by 44,000 tons per year;
    b. Reduce additional P loading by 46,000 pounds (21 MT) per year; and
    c. Reduce additional nitrogen (N) loading by 176,000 pounds (80 MT) per year.
- Through MDEQ NPS program, add an additional 120 drain water management (DWM) controls to reduce tile line discharges from 3,300 acres of cropland per year for three years.

Key Program Tactics

Success at the Lake Erie basin level will require collaboration with Ohio, New York, Pennsylvania, Indiana, Ontario, and the federal agencies in the U.S. and Canada. To that end, each jurisdiction will need to develop tactics and implementation strategies to reach their respective reduction goals. The following section describes Michigan's implementation approach and strategy for implementation.

GENERAL APPROACH

Michigan's tactics involve an overarching approach that will incorporate adaptive management at the regional and state level, and individual programmatic actions identified through each Department. The QOL agencies are committed to working together to address Lake Erie nutrient loading holistically in the WLEB.

Adaptive Management

To capitalize on learning from approaches, investments and new scientific information, Michigan will use an adaptive management approach to guide management decisions, actions and policy development. Adaptive management requires both a structured framework and a process to implement (Figure 1). Active adaptive management begins with a set of goals that frame the desired management outcome and a list of knowns

related to the information surrounding the issue. With active adaptive management, a plausible list of solutions or actions is developed that are intended to achieve the stated goal and measurable management actions are implemented. A strong monitoring effort is required to track outcomes, frame uncertainty, and provide the basis for understanding progress. As such, adaptive management is an active learning process where objectives, strategies and actions may be adjusted as the knowns, uncertainties and understandings advance.

Figure 1. Adaptive management process for Michigan's Domestic Action Plan for Lake Erie

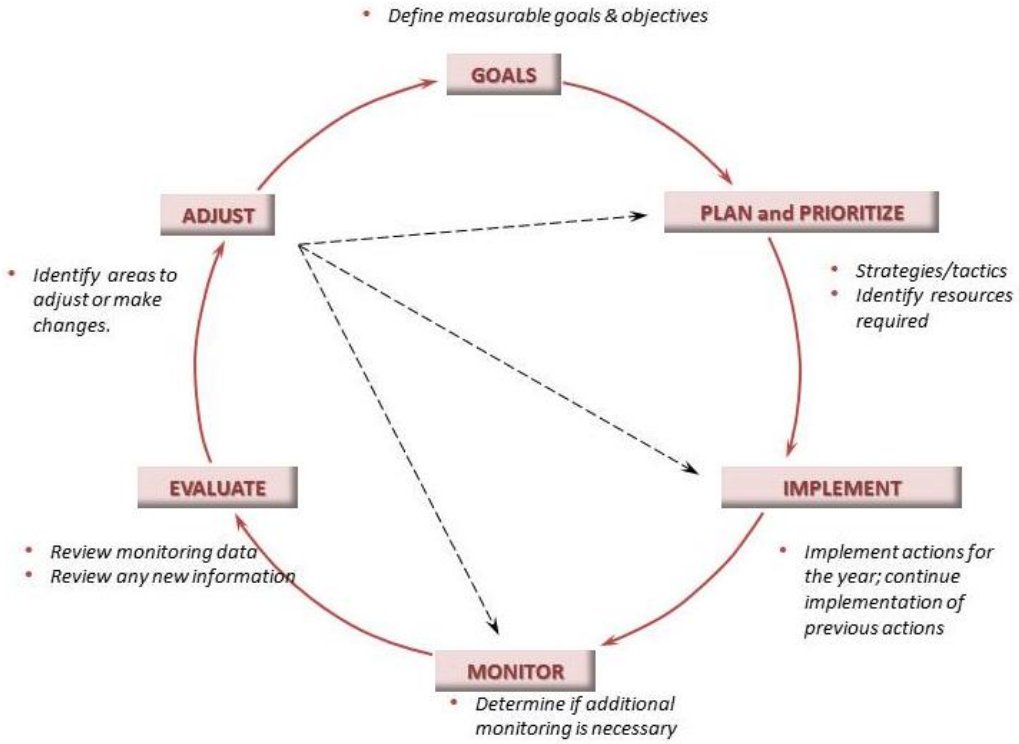


Figure 1. Adaptive management process for Michigan's Domestic Action Plan for Lake Erie.

Michigan plans to implement an active adaptive management process at two levels: the Lake Erie basin level and the Michigan-specific level. At the basin level, representatives of Michigan's QOL agencies will continue to participate on the Annex 4 subcommittee, its related task teams and work groups. These are interdisciplinary groups that integrate the policy perspectives and technical expertise of state and federal agencies' staff, academia, NGOs, and industry leaders. The combined purpose of these groups is to:

- Assess scientific information, models, and data related to addressing nutrient related problems in Lake Erie.
    a. Addressing areas of uncertainty in the information, and
    b. Providing input on how new information affects prior assumptions and management strategies.
- Assess progress toward meeting Lake Erie basin-wide and sub-basin specific goals; and,
- Identify recommended direction (or shifts in direction) for action and targeted areas for investment in research.

At the state level, the QOL agencies are also committed to annual review and evaluation of progress toward implementing key actions and meeting Michigan-specific P reduction. Each agency will track its implementation of specified actions as appropriate for the actions identified in this DAP. On a periodic basis, the QOL agencies, in collaboration with U.S. and Canadian federal, provincial and other state partners, academia, NGOs, and other stakeholders will evaluate the actions taken against trends in P concentrations and loads, and cyanobacteria blooms. Michigan is considering options for the evaluation timing to be

consistent with other states and federal partners. Based on the results of the annual evaluation (i.e., a feedback loop) the agencies will adjust implementation strategies as needed to ensure Michigan's objectives are achieved.

Lake Erie Biological Response

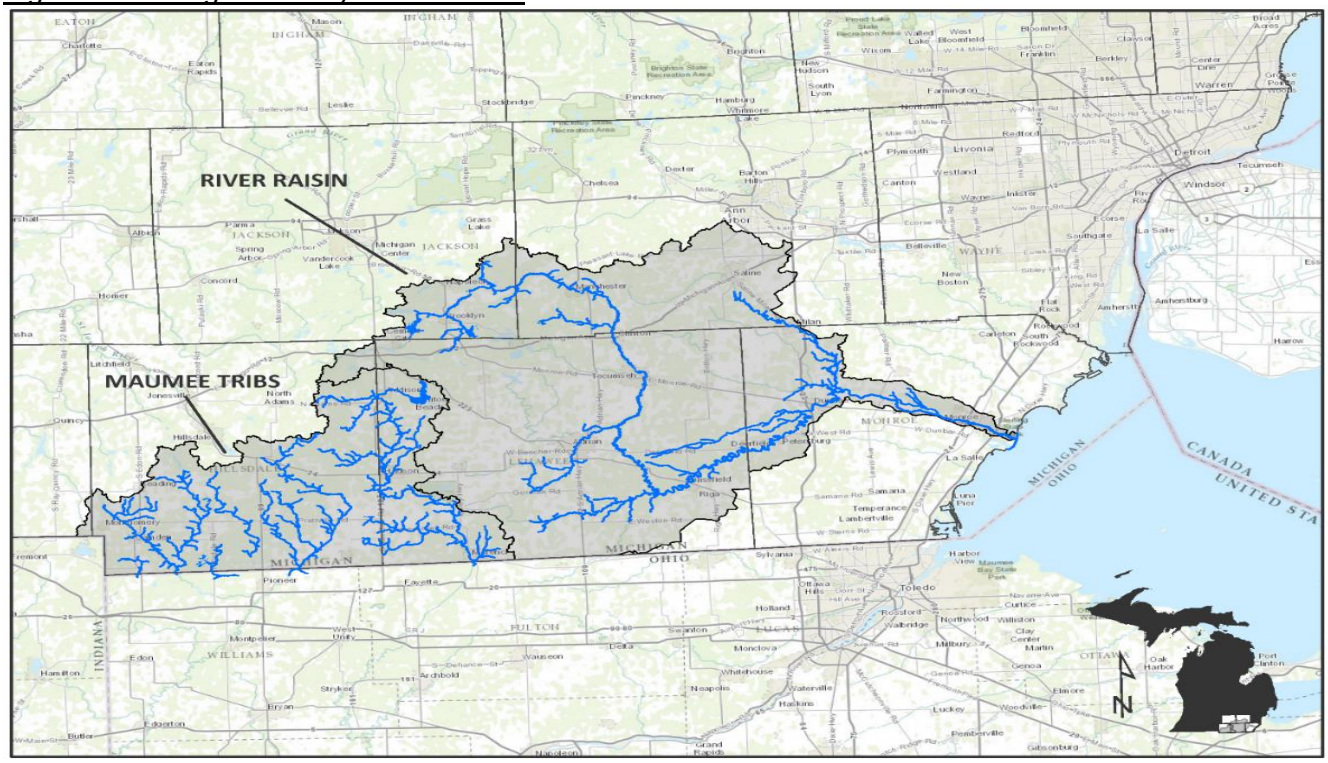
Time-lag is an important aspect to consider between the expected outcomes, management actions, and ecosystem results. Numerous examples document the existence of time-lag and the ability to measure an outcome of either a restoration activity or a detrimental introduction. The most well-known example in the Great Lakes is the long time-lag between the beginning of the invasion of zebra mussels and their dramatic altering of the biological (e.g., loss of native mussels) and physical integrity (e.g., water quality, substrate) of the system at a large basin-scale. Thus, it will be important as the adaptive management plan is implemented to consider the amount of time between implementation of management or landscape actions and the expectation of measurable outcomes.

While Michigan has committed to specific timelines for achieving load reductions of TP, watershed and lake ecosystem response times are not well understood. Nor are the sources of soluble reactive phosphorus (SRP) and actions that will effectively reduce SRP loadings well understood. Understanding the role nitrogen plays in HAB toxicity is also an ongoing research gap. Michigan plans to continue to track load reductions and Lake Erie's response, and to adjust management strategies as needed through the adaptive management process described below.

Strategically Targeted Watersheds

In May 2015, the Parties to the GLWQA through the Annex 4 process determined the Recommended Phosphorus Loading Targets for Lake Erie. The targets for priority watersheds were also established for Michigan under the Annex 4 process as detailed above. Consistent with the Annex 4 process, the QOL agencies have focused on the mouth of the Detroit River (for all sources of flow from the upstream St. Clair-Detroit River System [SCDRS]), the River Raisin Watershed, and Michigan's portion of the Maumee River Watershed (Figure 2). Focusing on these areas does not mean that the QOL agencies will not implement P controls in other areas of Michigan that drain to the WLEB. However, the total loads removed from other WLEB watersheds will be in addition to the loads removed in the priority watersheds.

Figure 2. Michigan Priority Watersheds.



Michigan Point Sources

Michigan has the unique situation where the GLWA WRRF (formerly the Detroit Water and Sewerage Department WWTP) dominates the nutrient loading discharged to the Detroit River then to Lake Erie. However, there are four WWTPs that will be addressed in this DAP, including: the GLWA Detroit WRRF, the Wayne County Downriver WWTF, the YCUA WWTP, and the Monroe Metro WWTF. These facilities discharge over 90 percent of the total P point source load downstream of the beginning of the Detroit River to Lake Erie. Other WWTPs and lagoon systems that are tributary to Lake Erie are not being addressed in this plan because addressing each WWTP and lagoon system will not significantly affect the overall P load reduction to Lake Erie.

Michigan Biosolids Program

Michigan establishes standards for the land application and beneficial recycling of biosolids in the state. Any treatment works treating domestic sewage proposing to land apply biosolids in the state are required to prepare a Residuals Management Program Guidance Document to obtain authorization. This authorization is under an individual NPDES permit, a Certificate of Coverage (COC) under an NPDES general permit, or a state issued Groundwater Discharge Permit. MDEQ ensures compliance with all issued permits.

Michigan Nonpoint Source Program

Michigan's NPS Program provides technical and financial support to stakeholders in developing and implementing WMPs to restore and protect water quality. The NPS Program uses an adaptive management approach to find and fix the highest priority NPS sources of pollution and causes of impairments identified in approved WMPs. The NPS Program supports implementation of BMPs to reduce or eliminate pollutant loads from livestock and cropping operations in watersheds dominated by agricultural land uses. These practices include traditional activities such as livestock fencing and NMPs as well as more innovative approaches such as DWM controls to reduce SRP loads and the use of geographic information systems (GIS) to target fertilizer application resulting in less fertilizer use without any loss in productivity. In urban watersheds, the priority

actions often include Low Impact Development and Green Infrastructure BMPs intended to address storm water impacts. Failing onsite septic systems are linked to water quality impairments in some watersheds. The NPS Program supports efforts to find and fix failing systems as well as provide information to homeowners regarding proper septic system maintenance. The NPS Program also supports efforts to protect high quality waters through the implementation of conservation easements or ordinance development.

The NPS Program is implementing several priority activities to address the P reduction goals including:

- Priority watersheds in the WLEB have been targeted for WMP development and all priority watersheds will soon be covered by approved plans.
- Pass-through grant funding and technical assistance is being targeted to the WLEB. Examples include:
    - The Bean Creek (Upper Maumee) Watershed management plan development is being developed with pass-through grant support. The Bean Creek plan will use the WLEB load reduction goal to help select critical areas and priority recommendations.
    - Pass-through grants are being used to target agricultural sources of phosphorus in the Raisin River Watershed and urban sources of phosphorus in the Huron River Watershed.
    - Grant funding is being provided to Michigan State University (MSU) to measure the effectiveness of drain water management control practices with respect to P removal.

Technical assistance is also being provided to implement agricultural inventories in priority watersheds to help stakeholder identify critical areas for agricultural BMPs.

Wetland Restoration

The QOL agencies in collaboration with other stakeholders will work together to implement wetland restoration and protection efforts in Michigan's portion of the WLEB. The MDEQ developed the Landscape Level Wetland Functional Assessment (LLWFA) to help identify priority areas for wetland restoration and protection based on watershed location and the target wetland function. The LLWFA is used as a planning tool primarily in the NPS program for development of WMPs and would be useful in other planning contexts.

Currently, there is a LLWFA for portions of Michigan's WLEB, with plans to expand available watershed coverage in the coming years. Another example of wetland restoration and protection efforts, starting in 2018, the OGL and the MDEQ are partnering with Southeast Michigan Council of Governments (SEMCOG), Ducks Unlimited (DU), and other partners to inventory and assess the status of inland and coastal wetlands in SEMCOG's seven-county jurisdiction. This information will be used to identify locations of current and potentially restorable wetlands that may serve as nutrient and sediment sinks and can be targeted for implementation actions.

The MDNR will continue to provide support and leadership for protection and restoration of wetlands and conservation easements as a matter of fisheries and wildlife habitat conservation. Specific emphasis will focus on wetlands that reduce the delivery of P into WLEB. Additionally, state facilities and land owned by MDNR will be reviewed to assess their status for potential contributions for P into WLEB and plans will be developed to address those sources.

Large-scale Land Management Initiatives

Michigan has a very long history of active enrollment of farms in voluntary conservation land management practices. From practices such as Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP), as well as participation in programs such as MAEAP, farmers have demonstrated a strong willingness to participate in such programs. For example, much of the progress already made in reducing TP in the River Raisin Watershed, as documented by MDEQ, has been due to voluntary efforts by Michigan farms in the WLEB.

Conservation implementation has an excellent history of being re-enlisted as contracts expire. Retention in the voluntary MAEAP program, for example, has stayed consistently in the 85 percent range over the life of the program. Although not all farms retain their verification, the 15 percent who choose not to reverify in the program are vastly exceeded by the number of new verification into the program each year. As such, the QOL agencies believe this progress demonstrates the most effective path moving forward to improve environmental performance on farms in the WLEB.

The Tristate Phosphorus Reduction Initiative, Regional Conservation Partnership Program (RCPP), led by MDARD is a five-year project that is providing $17.5 million ($2.5 million for Michigan) in federal funding from the U.S. Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS) to help protect water quality in the WLEB. The RCPP agreement was signed in 2015 and is providing funding to farmers to help install a variety of BMPs that will keep nutrients on fields and improve water quality. Specifically, project partners recommended USDA - NRCS conservation practices and innovative demonstration practices that farmers can apply for through the Environmental Quality Incentives Program and the Agricultural Conservation Easement Program. The financial and technical assistance available through the RCPP effort supports conservation practices that protect soil health, water quality and quantity, and prevent fish and wildlife habitat degradation. Specific BMPs promoted include: Nutrient management practices such as Cover Crops, Drainage Water Management Structures, blind tile inlets, placement of P below the soil surface using variable rate technology, and animal waste management.

Michigan CAFO Program

Agriculture is the predominant land use in the River Raisin and Michigan's portion of the Maumee River Basin. The predominant crops are corn, soybeans, and wheat. Michigan regulates CAFOs under an NPDES (individual or COC) or applicable Groundwater Discharge Permit. The latest general permit ensures protection of all water resources, including: storage, comprehensive NMPs, and other needed requirements. There are 14 CAFOs in Michigan's portion of the WLEB. Nine of these CAFOs are for dairy, three are for swine, and two are for heifers. The latest general permit ensures protection of all water resources, including: storage, comprehensive NMPs, and other needed requirements. These CAFOs have been and will continue to be inspected for compliance with permit conditions.

For permitted CAFOs in the state of Michigan, the NPDES permit requires six months of available liquid manure storage by December 1st in any given year. Although the ability to land apply in the winter or on frozen ground is not specifically denied, liquid manure application is generally not a common practice for these farms and requires DEQ notification. Variances to allow winter spreading of liquid manure by CAFO's have been a rare occurrence in Michigan. These have been granted four times in three years in the WLEB. This is not a systemic issue, but a rare occurrence.

Winter Manure Spreading

The QOL agencies promote and support the use of the USDA - NRCS Manure Application Risk Index (MARI) by farms who need to utilize winter spreading, and only allow the fields that rate as "low" or "very low" within the tool. All livestock farms verified in MAEAP are required to use MARI to evaluate winter applications. This tool looks at proximity to surface water, slope, cover, and tillage to assess the suitability for winter spreading. Technicians help identify fields for farmers that minimize the likelihood of offsite movement of nutrients and pathogens.

The MDARD and the MDEQ have also worked together to develop the Winter Manure Spreading Risk Based Decision Making Tool, which is an educational document to assist farmers in lowering the risk of offsite manure nutrient movement. This outreach tool can help farmers evaluate the risk of their application decisions and guides them toward practices that reduce the risk of offsite movement of manure nutrients.

The MDARD has also given a great deal of consideration to small and medium size farms in the decision not to ban winter application of manure. A ban on winter spreading would place an significant financial burden on small and medium size producers to construct storage systems. This is a strong consideration for the state to maintain locally healthy, and diverse, agricultural landscapes. Small and medium sized farms are still required to adhere to the Michigan Right to Farm Manure Management and Utilization Generally Accepted Agricultural and Management Practices (GAAMPs) on acceptable practices to reduce winter application risks.

Generally Accepted Agricultural and Management Practices

The Michigan Right to Farm Act, Public Act 93, was enacted in 1981 to provide farmers with nuisance protection. This state law authorizes the Michigan Commission of Agriculture and Rural Development to develop and adopt GAAMPs for farms and farm operations in Michigan. These farm management practices are scientifically based and updated annually to utilize current technology promoting sound environmental stewardship on Michigan farms. The current list of practices, which are reviewed and updated annually, includes: Manure Management and Utilization, Nutrient Utilization, Irrigation Water Use, Pesticide Utilization and Pest Control, Site Selection, Care of Animals, Cranberry Production, and Farm Markets.

Michigan Agriculture Environmental Assurance Program

The primary tool for working with agriculture in the WLEB and throughout the state is the MAEAP. The MAEAP is an innovative, proactive statewide program that helps farms of all sizes and all commodities voluntarily minimize agricultural pollution risks. MAEAP was developed by a coalition of farmers, commodity groups, state and federal agencies, and conservation and environmental groups.

Interested farmers enter the program through participation in a MAEAP Phase 1 training event. These local and statewide events provide farmers with information on participation in MAEAP, as well as associated environmental and risk mitigation topics. The next step is to work with a local MAEAP technician to conduct a confidential on-site farm assessment. Technicians focus on recommending the system of conservation practices and BMPs that will address the needs of a specific site. MDARD has increased the number of MAEAP technicians in the WLEB counties of Monroe, Lenawee, Hillsdale, Washtenaw, and Wayne to ensure increased technical assistance through “boots on the ground” is available.

There are a variety of factors that can impact the selection of conservation practices and effectiveness of a BMP. These include, but are not limited to: soil type, slope, and current farm management. If used by a farmer, precision agriculture technologies such as grid sampling, variable rate application, and yield mapping can also identify acres that are candidates for a management change. During the on-site review of a farm, technical staff specifically consider the suitability of filter strips, and the need for additional BMPs in the event of identifying subsurface drainage that may be bypassing existing filter strips. Soil test information and tools such as EnviroImpact, MARI, manure application heat map, and other decision-support tools are also available for MAEAP technicians and farmers to make informed management decisions to better protect water quality.

Cost-share funding to implement conservation actions and BMPs is available through a variety of federal, state, and local programs. Once a farmer has completed the management practices identified for environmental risk on their farm, they can request third party verification of environmental practices implemented by MDARD staff.
Farms can be verified in several “systems,” Farmstead, Cropping, Livestock or Forest, Wetlands, and Habitat corresponding to the risk assessment tools used by MAEAP technicians. The MAEAP systems’ committees establish verification standards for each system to keep up with the changes to laws and environmental standards, as well as address new issues that arise. If a farm is found to be in conformance with verification standards, the farm is verified in that MAEAP system and added to the MAEAP tracking database described above. Provided the farm continues to meet MAEAP standards, verification is good for five years before reverification with MDARD is required. At time of reverification, the farm must meet current program standards. Standards are reviewed and updated annually by each system workgroup. The standards are then

approved by the MAEAP Advisory Council and submitted to the Michigan Commission of Agriculture and Rural Development for approval.

Best Management Practices Research and Modelling Support

There is not one single agricultural BMP for reducing TP and SRP loss in the WLEB. However, research partners are providing valuable input regarding the suite of recommended BMPs and their effectiveness on the landscape. The QOL agencies continue to work collaboratively with research entities, state, and federal partners, and the agriculture industry to share and review BMP research results, and to identify and promote BMPs that are effective in addressing nutrient loading (i.e., N, TP, SRP).

MDARD is partnering with MDEQ, MSU, and the Lenawee Conservation District to study the effectiveness of DWM BMPs at reducing nutrient loads, including SRP, from tiled farmlands. The study will examine farm fields that are similar, but have some key differences, over a five-year period. The researchers will also alternate free-drainage and controlled-drainage systems on the different farms over several growing seasons to measure changes in nutrient loads from the tile lines.

Through the MSU Institute of Water Research's (MSU IWR) High Impact Targeting (HIT) Tool and the Michigan Sensitive Areas Identification System, users can identify and prioritize watersheds and farm fields by identifying lands that are at high risk for erosion and sediment loading, total erosion or sediment load, rates of erosion or sediment loading. This information can be used to identify a suite of potential BMPs and in the case of the HIT Tool, the cost benefit of implementing selected BMPs. The Michigan Great Lakes Watershed Management System (GLWMS) is another MSU IWR watershed-based decision support tool for evaluating, tracking, and reporting water quality and groundwater recharge improvements at both watershed- and field-scales. These tools can be used by a wide variety of partners to determine where to plan and implement conservation actions in the WLEB.

An economic analysis of conservation BMPs is also underway through the Western Lake Erie Basin Conservation Effects Assessment Project (CEAP). Every five years the CEAP is assessing how effective environmental conservation practices are at reducing the impacts of agriculture on the WLEB ecosystem and helping to identify opportunities for strategic planning and implementation.

ACTION AND CHANGE FROM 2008 THROUGH 2017

Michigan has been strategically aggressive in pursuing TP reductions since Lake Erie was first declared "dead" in the 1960s. In recent years, Michigan has continued to be proactive and successful in reducing loads to Lake Erie, but the work is not complete. The following specific examples highlight QOL agency actions and progress made since 2008 to achieve the 40 percent reduction targets.

Point Source Controls

Reductions in TP have been especially dramatic in the GLWA (formerly Detroit Water and Sewerage Department [DWSD]) P loadings. The GLWA is by far the largest point source discharger to the Detroit River and Lake Erie. The reductions in this discharge were the main reason the Lake Erie ecosystem rebounded the first time, and why Michigan continues to strategically focus on this discharge source. Michigan recently concentrated on the GLWA discharge in 2012 due to a confluence of events, including the large Lake Erie algae bloom, reissuance of the GLWA NPDES permit, and preparing for the end of federal court oversight after 33 years. These events pushed Michigan and the GLWA to focus and implement additional P controls early in the process – a proactive approach.

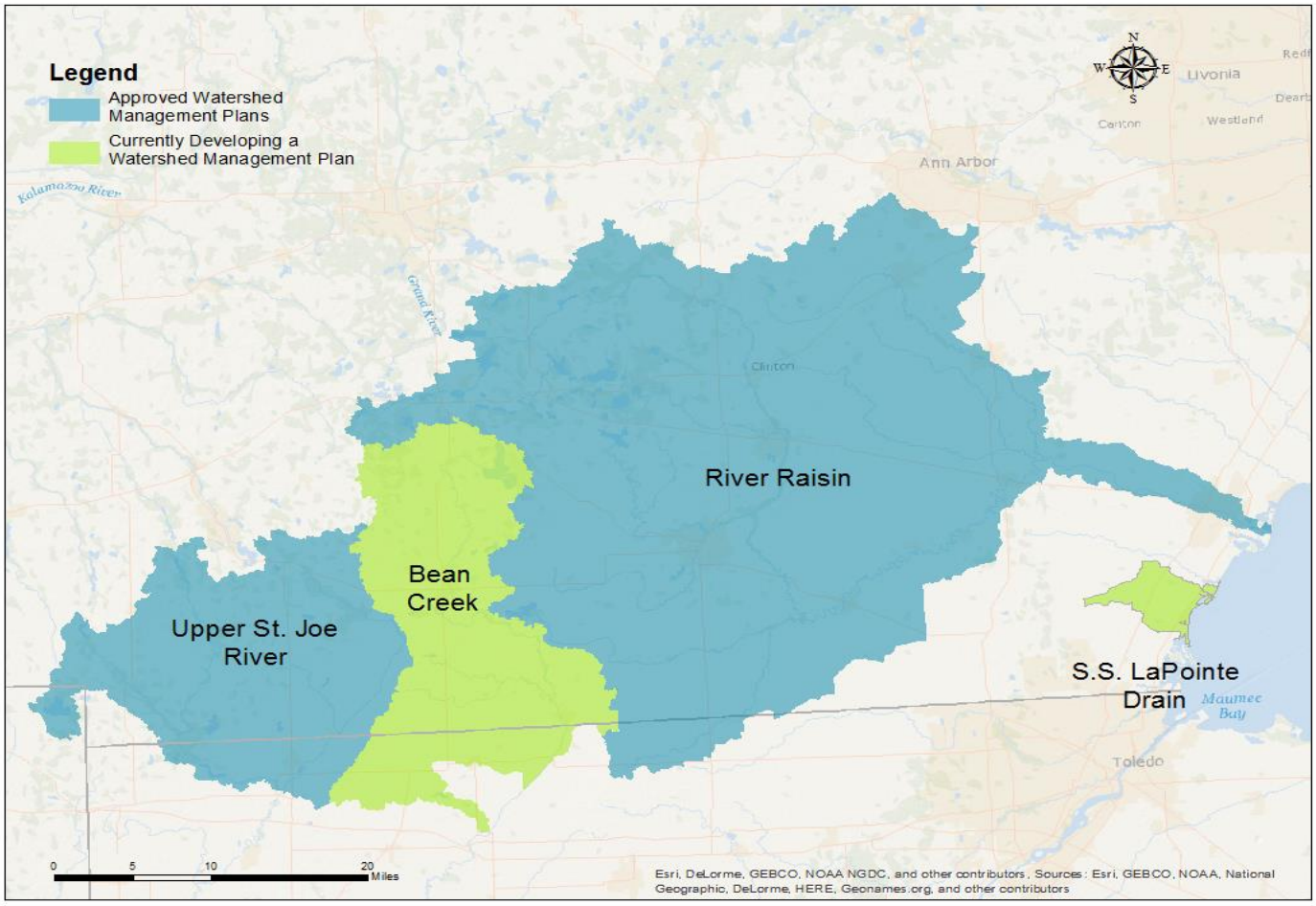
Nonpoint Source Program Planning and Implementation

MDEQ NPS Program continues to provide technical and financial support to stakeholders pursuing NPS nutrient and sediment reductions at the watershed level in the WLEB. Michigan offers financial support to implement approved WMPs for the River Raisin and Upper St. Joseph River (Michigan's portion of the Maumee River) watersheds through annual, statewide requests for grant proposals. Currently, Michigan's NPS Program is providing technical and financial support to develop WMPs for the LaPointe Drain and the Tiffin/Bean Watersheds (Figure 3). Michigan's portion of the Maumee River Watershed will be largely covered by approved WMPs after the Tiffin/Bean plan is approved.

Examples of technical and financial support to implement approved WMPs includes funding for the installation of 485 tile line control structures that resulted in DWM on 13,346 acres of cropland. Other examples include support provided to the city of Adrian to implement green infrastructure BMPs to control storm water inputs in the Raisin River Watershed. Permanent conservation easements were also purchased in the headwaters of the River Raisin Watershed to prevent sediment and nutrient inputs from high quality areas in the watershed. In addition, funding and technical support were provided to implement agricultural BMPs and matching funds for the CREP and RCPP in the WLEB.

Michigan also implemented a statewide residential fertilizer P ban in 2012. P fertilizer applications are restricted on residential and commercial lawns in Michigan, including athletic fields and golf courses statewide. This includes applications by both homeowners and commercial applicators. A more restrictive ban in 2006 in the city of Ann Arbor was shown to reduce P loadings in surface waters in residential areas by approximately 30 percent. This reduction may be used as a guide to estimate load reductions in residential areas in other watersheds. In addition, Michigan enacted a ban on P in dishwasher detergent that became effective in 2010. Phosphorus in laundry detergent as well as other soaps was banned decades earlier before automatic dishwashers were common. The 2010 action brought automatic dishwasher detergents in line with other soap products.

Figure 3. Approved and under development Watershed Management Plans in Michigan's portion of the WLEB.



Wetland Restoration

Wetland restoration and conservation easements along riparian areas can contribute significantly to restoring ecosystem function and providing for a reduction in P loading to the WLEB. Since 2010, Michigan has partnered with the state of Ohio and DU on more than five regionally supported projects to restore wetland function and habitat for waterfowl and fish in the WLEB. This amounts to an investment of approximately $5 million dollars for wetland restoration, fisheries, and wildlife habitat. The amount of reduction in loading that these efforts have contributed has not been calculated but demonstrates ongoing NGO partnerships and collaboration across state jurisdictions.

Large-scale Land Management Initiative Efforts

The CREP, which includes the River Raisin Watershed as a priority focus watershed, has made 14- to15-year agreements with farmers in the WLEB that cover nearly 23,000 acres with practices such as, field windbreaks; filter strips; riparian buffers; wetland restoration; sediment retention control structures; and permanent grasses, legumes, and native grasses. Approximately 65-75 percent reduction in P delivery and sedimentation has been realized on these acres, based on soil loss calculations before and after practice implementation, which is dependent on crop rotation and tillage practices.

MDARD is the lead agency for the RCPP Project ($17.5 million total award), which is providing $2.5 million in conservation practice funding for eligible Michigan farmers from fiscal year (FY) 2015 to FY 2019. In 2015-2016, over $584,000 was awarded to farmers in the Michigan area of the basin to install practices, including: 12,119 acres of nutrient management; 20,702 acres of cover crops; and, DWM structures that has impacted 1,677 acres.

In 2016, the QOL agencies began working with the University of Michigan's Water Center on a project titled: "Assessing the Sources and Management Options for Detroit River Nutrient Loads to Lake Erie," which is a binational, three-year project to model the nutrient dynamics within the watersheds that drain into the St. Clair and Detroit Rivers. The project will characterize nutrient loads to the Detroit River and then compare the efficacy of different management options and characterize agricultural and urban inputs, as well as nutrient retention within Lake St. Clair. This collaborative research project is designed to inform regional partners on the planning and the selection of nutrient reduction strategies.

Agriculture Practices Accomplishments

Although participation in MAEAP is voluntary, statewide, the program has grown tremendously in the last few years. After taking 10 years to reach 1,000 verifications, the last six years have shown the number of verifications has increased to over 4,400 verifications.

From 2013-2017 MDARD secured funding to provide additional technical assistance, soil testing, and outreach to farmers in the WLEB. In 2015, MDARD created an internal plan to outline program goals, action steps, and began tracking progress specific to the WLEB. Through MAEAP, MDARD can document the following environmental outcomes (Table 1). These agricultural practices provide nutrient and sediment reductions every year for the lifetime of the practice.

Table 1. MAEAP WLEB FY 2013-2017 Accomplishments.

Practice/Reduction	FY 2015 Verifications	FY 2016 Verifications	FY 2017 Verifications	WLEB Sums FY 2013-2017
Acres of Conservation Tillage	19,155	20,573	4,925	82,045
Acres of Cover Crops	5,542	6,480	1,671	18,407
Acres of Nutrient Management Planning	38,737	36,862	15,356	151,007
Linear Feet Filter Strips	267,023	112,712	128,328	1,074,323
Total, tons/year Sediment Reduction	57,497	54,248	22,985	360,176
Total, lbs./year Phosphorus Reduction	94,607	96,432	36,678	238,171
Total, lbs./year Nitrogen Reduction	201,119	236,986	73,181	738,384

The MDARD, MDEQ, MDNR, USDA - NRCS, USDA-Farm Service Agency, and CDs have been working together as part of the WLEB Partnership to address nutrient and sediment losses that may result from agricultural land uses. Through this partnership, technical assistance and Farm Bill financial assistance programs have been offered to farmers in the WLEB. The 4R Nutrient Stewardship Certification Program works with agricultural retailers, Certified Crop Advisors (CCAs), service providers, and other certified professionals to adopt proven best practices through the 4Rs (Right Source of Nutrients at the Right Rate and

Right Time in the Right Place). This approach provides a science-based framework for plant nutrition management and sustained crop production, while considering specific individual farms' needs. The 4R Program influences 1.9 million acres in the WLEB. MDARD supports the implementation and the continued growth and evolution of the 4R Program. Since 2015, four Michigan agriculture retailers have achieved 4R certification.

Priority Watershed Load Reductions

Detroit River - The Detroit River reductions to date have been calculated using available monitoring data from the GLWA. Thus far, the Detroit River has achieved a 32 percent TP reduction. This reduction is mainly due to additional controls at the discharge points at the GLWA Detroit WRRF and its associated treated CSOs.

River Raisin - There is a long-term dataset for nutrient concentrations and flow in the River Raisin, allowing for calculation of loadings and evaluation of statistical trends. Reductions in the Raisin River Watershed (predominantly agricultural land use) near the river mouth have been estimated using the available monitoring data by Heidelberg University, the USGS, and accounting for loads from the Monroe WWTF. Using the 2008 baseline from the Annex 4 process of 262 MT and normalizing for flows, the MDEQ estimates an approximate 20 percent TP reduction since 2008. The MDEQ also examined SRP data from the Heidelberg monitoring station using 2008 as the baseline year and normalizing for flows from the USGS gauging station (but not accounting for loads from the Monroe WWTF as they are not available). No statistical trend in SRP loading is discernible. In addition, spring TP and SRP loads have not yet been analyzed.

Maumee River Watershed - Michigan's portion of the Maumee River Watershed is relatively small, approximately 300,000 acres in size, representing approximately seven percent of the land area in the watershed. Michigan began monitoring water quality conditions in Michigan's portion of the Watershed in 2016 with a primary objective of identifying which parts of the watershed are contributing the highest P concentrations to the downstream portions of the watershed. Monitoring has been focused on Annex 4's definition of "spring" (March 1 through July 31) with grab sampling at 16 sites in 2016 and 20 sites (including the original 16 locations) in 2017. Additionally, five storm events have been sampled using automated samplers at five key locations between 2016 and 2017. Additional sampling will take place in 2018 to round out the project objectives.

Preliminary analysis of the data indicates that certain parts of the watershed tend to have higher concentrations of nutrients than others. For example, to date, the main stem of Bean Creek and Silver Creek (St. Joseph River Watershed) generally were observed to have lower TP and dissolved ortho phosphate concentrations relative to other parts of the study area, while certain parts of Lime Creek (Bean Creek Watershed), a different Silver Creek (Bean Creek Watershed), and St. Joseph River generally were observed to have the highest concentrations. Relationships between water quality results and nearby land use characteristics are being explored to determine why concentrations are greater in some locations than others. More analysis is needed and, once they are fully analyzed, the data will be used to help inform and prioritize where P BMPs should be focused and to help prioritize future monitoring needs.

Other Long-Term Planning and Implementation Initiatives

Released by the Michigan OGL in 2016, the Michigan Water Strategy is a 30-year plan for Michiganders to protect, manage, and enhance Michigan's water resources for current and future generations. The Michigan Water Strategy identifies key actions for people and organizations at many levels to promote healthy water resources. One of Governor Snyder's five priorities outlined in the Strategy is to achieve a 40 percent P reduction in the WLEB by 2025. In addition to the very specific priority to reduce P loadings to the WLEB by 40 percent, the Michigan Water Strategy includes other recommendations relevant to the DAP, including: developing harmful algal toxin water quality criteria; a real-time monitoring strategy for Great Lakes drinking water intakes and public recreation locations within the SCDRS; the development of a national drinking water advisory target; and, enhancing the ability of communities to facilitate and support community-based dialogue

and water-related vision development. Work by state agencies and interested partners in these additional areas will strengthen water quality-related policies, water-based stewardship, and improve water quality statewide.

The 21st Century Infrastructure Commission Report, published in November 2016, addresses Michigan's infrastructural needs for the next 30-50 years in a number of areas including water, sewer, stormwater, wastewater treatment, and drainage. Part of these targeted areas address water quality issues including: replacement of aging water, sewer, and stormwater infrastructure; regular assessments and maintenance of Michigan's drinking water, sewer, stormwater and dam infrastructure systems; development of integrated and sustainable approaches to manage the quantity and quality of stormwater; establish a statewide sanitary septic code and require septic inspections; and, provide safe, affordable drinking water through public and private water supplies.

Public Outreach and Engagement

The QOL agencies are committed to improve and increase outreach to the public and farmers to promote an understanding of the WLEB ecosystem conditions and the importance of good conservation practices by initiating new targeted outreach campaigns, workshops, field demonstrations and information sharing. For example, advancement of goals set in the DAP will be regularly reported as part of Michigan Water Strategy implementation through outlets including a public Great Lakes e-mail list with nearly 10,000 current subscribers, a Michigan Water Strategy Web page (www.michigan.gov/waterstrategy), QOL agency Twitter accounts, and other platforms. Implementation progress will also be distributed from the QOL agencies through e-mail lists, web features, and individual program messaging with the inclusion of webinars, community meetings, infographics, and digital media approaches.

In addition, Michigan will continue to engage the public in further development and implementation of the DAP through periodic public meetings and discussions with stakeholder groups such as the Michigan Cleaner Lake Erie through Action and Research (MI CLEAR) Partnership The MI CLEAR Partnership serves to improve the long-term water quality of the Western Lake Erie Basin through open discussion among regional leaders, a coordinated perspective to existing efforts, support for research that builds understanding of the science around water quality issues, and actions that bring meaningful change.

Success in the Lake Erie Basin

The approaches described above are thought to result in the greatest environmental and economic benefits while addressing the nutrient issues in Michigan's portion of the Lake Erie Basin. The QOL agencies and our partners are strategically targeting watershed- and field-scale planning and implementation actions using existing programmatic technical and financial assistance, supporting new innovative approaches and partnerships, and accelerating comprehensive conservation planning through MAEAP and other land management programs. The ability to specifically track implementation of these management actions (Appendix 1and 2) through an adaptive management framework will improve the DAP process and the state's ability to adjust our strategic actions moving forward. Ultimately, success will be achieved by actions taken by all stakeholders in the Lake Erie Basin.

APPENDIX 1. MICHIGAN'S Projected Measurements to Achieve Annex 4 Phosphorus Load Reduction Targets

Priority Objective (4)	2008 TP Target Baseline Load (1)	20 Percent Reduction Amount (by 2020)	40 Percent Reduction Amount (by 2025)	Target Load
Detroit River TP Load (at mouth)	1,261	252	504	756
River Raisin TP Load (at monitoring location) (5)	172 (0.157 mg/l)	34 (0.031)	69 (0.063)	103 (0.094)
River Raisin Spring TP load (at monitoring location) (5)	83 (0.148 mg/l)	17 (0.030)	33 (0.059)	50 (0.089)
River Raisin Spring SRP Load (3)	N/A	N/A	N/A	N/A
MI Maumee River TP Load (2)	267	53	107	160
MI Maumee River SRP Load (3)	N/A	N/A	N/A	N/A
Total Michigan Load Allocation	1,883	377	753	1,130

1. **Based on 2008 load estimated by Annex 4.**
2. **Based on percentage of land use in Michigan's portion of the Maumee River.**
3. **No SRP loading estimate for the River Raisin or the Maumee River; research is needed, and concentrations may currently be low for the River Raisin.**
4. **Concentration in parenthesis is a flow weighted mean concentration (FWMC).**
5. **Values at monitoring location on the River Raisin will be used to provide an entire watershed value.**

APPENDIX 2. MICHIGAN WORK PLAN

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

#	Task	Who	Timelines/Milestone	Reporting
1a	TP limits of 0.7 mg/l monthly average, and 0.6 mg/l growing season average (April – Sept.), are required at the main secondary treated outfall at the WWTP.	MDEQ	Completed through NPDES Program Discharge Monitoring Reports (DMRs).	MiEnviro
1b	TP limits of 1.5 mg/l monthly average are required at the two wet weather outfalls at the WWTP.	MDEQ	Completed through NPDES Program DMRs.	MiEnviro
1c	Monthly calls/meetings between MDEQ and GLWA to ensure compliance with effluent limits and to discuss any issues.	GLWA, MDEQ	Ongoing, monthly but reassessed annually for call frequency.	N/A

Task 2. Achieve reductions in P discharged from the Wayne County Downriver WWTF and continue reductions at YCUA WWTP.

#	Task	Who	Timelines/Milestone	Reporting
2a	Reissue NPDES permit with TP limits of 0.7 mg/l monthly average, and 0.6 mg/l growing season average (April – Sept.), at the secondary treated outfall at the WWTP.	MDEQ	Draft permit under negotiation, expect to reissue NPDES permit by 9/30/2017.	MiEnviro
2b	More stringent TP limits required by permit schedule by 2020.	Wayne County, MDEQ	More stringent TP limits required by 2020 through NPDES Program.	MiEnviro
2c	Continue to achieve the TP 0.6 mg/l growing season average permit effluent limit at the tertiary treated outfall at the YCUA WWTP, as required in its NPDES permit.	YCUA, MDEQ	Completed through NPDES Program.	MiEnviro

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

#	Task	Who	Timelines/Milestone	Reporting
3a	Develop and implement 2016 monitoring plans.	MDEQ	Completed.	N/A
3b	Develop and implement 2017 monitoring plan, including SRP, in coordination with Indiana and Ohio.	MDEQ	Monitoring began April 2017 and will conclude in spring 2018.	N/A
3c	Conduct additional monitoring as appropriate to evaluate P reduction success and identify additional target areas for reduction.	MDEQ	MDEQ is working with USEPA, USGS, OH and IN to develop a coordinated, appropriate monitoring plan for the	N/A

#	Task	Who	Timelines/Milestone	Reporting
			Maumee River watershed, including tributaries in Michigan.	
3d	Develop WMPs for the Tiffin and Bean Watersheds. The Tiffin/Bean are the last Maumee River subwatersheds in Michigan without a USEPA approved 319-approved WMP.	MDEQ	Ongoing. Grant awarded to Hillsdale County CD to develop 319-approved WMP. Target completion date is January 2019.	NPS Program Website

Task 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.

#	Task	Who	Timelines/Milestone	Reporting
4a	Assess annually to understand information gained, and opportunities for additional HAB research support through the Great Lakes HAB Collaboratory and other coordination networks. A better understanding is critical to refine the state's implementation programs under the adaptive management approach and Annex 4 process.	QOL, federal, academic partners	Ongoing.	N/A
4c	Implement two HAB-related research grants: Detection of toxin-producing cyanobacteria (Grand Valley State University); development of HAB hazard maps using land use and toxin data, and development of smartphone app to detect HABs (Oakland University with Wayne State University, Lake Superior State University and Northern Kentucky).	MDEQ, academic partners	MDEQ awarded grants in 2016.	N/A
4d	Conduct Zequanox pilots as needed.	MDEQ, Marone Labs, aquatic nuisance pesticide applicator	Pilot completed in 2014.	N/A
4e	Participate in the Invasive Mussel Collaborative and support research to better understand the role of invasive mussels in nutrient cycling and potential contribution to cyanobacteria blooms.	MDEQ, interested partners	Ongoing.	N/A

#	Task	Who	Timelines/Milestone	Reporting
4f	To further understand SRP, including agreement on appropriate sampling and analytical methods, participate in Annex 4, develop relationships, attend regional conferences, and partner with federal, state, and local monitoring efforts.	MDARD, MSU Extension (MSUE), OGL, MDEQ; Annex 4 Targets and Objectives Task Team, interested partners	Ongoing.	N/A
4g	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.	MDEQ, future partners	2017, ongoing.	N/A

Task 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	Who	Timelines/Milestone	Reporting
5a	Implement new MAEAP reporting and planning database to better track the cumulative impact of conservation practices across the watershed and county scale. Environmental and conservation practice information will also be used to estimate sediment and nutrient loading reductions.	MDARD	Started October 1, 2016, ongoing.	MDARD Annual Report and MAEAP Database
5b	Expand MAEAP database through the addition of a spatial mapping decision-based tool to enable MAEAP technicians to demonstrate to farmers sensitive areas that are conducive to BMP installation.	MDARD	FY 2018 creation of spatial mapping decision-based tool, ongoing.	MDARD Annual Report and MAEAP Legislative Report
5c	Implement spatial mapping decision-based tool upgrades to database with MAEAP technicians.	MDARD, MAEAP technicians	FY 2019 roll-out to MAEAP technicians.	MDARD Annual Report and MAEAP Legislative Report

#	Task	Who	Timelines/Milestone	Reporting
5d	Continue to seek new data and information about BMPs, and monitoring strategies through ongoing communications with research universities and federal agencies such as the USEPA, USDA - NRCS, USGS, U.S. Army Corps of Engineers, and USDA Agricultural Research Service.	MDARD, federal, academic partners	MDARD Environmental Stewardship Division staff annually identify and review research and conference opportunities. Discuss at MAEAP staff meetings.	N/A
5e	Work with partners to design and implement a study to evaluate the effectiveness of DWM control practices installed to reduce tile line discharges of SRP.	MDARD, MDEQ, USGS	Ongoing.	N/A
5f	Use pass-through grants to reduce sediment and nutrient loads from the WLEB by implementing priority BMPs from approved WMPs.	MDEQ NPS Program, interested partners	The NPS Program's pass-through grant request for proposals is issued annually.	N/A

Task 6. Implement P control actions in the River Raisin Watershed to achieve the target load reductions.

#	Task	Who	Timelines/Milestone	Reporting
6a	Conduct forensic analysis to determine likely sources resulting in reductions.	MDEQ	Completed February 2016.	MDEQ Water Resources Division website
6b	Reissue the Monroe Metro WWTF permit with more stringent TP limits of 0.7 mg/l monthly average, and 0.6 mg/l growing season average (April - Sep), at the main secondary treated outfall at the WWTF.	MDEQ	Completed April 2016; revised TP limits required by 2019.	MiEnviro
6c	Continue to use pass-through grants to place an emphasis on a targeted and comprehensive approach to farm conservation planning, livestock management strategies, and drainage water management strategies.	MDEQ NPS Program, interested partners	The MDEQ NPS Program will release a request for proposals annually.	N/A

Task 7. Maintain and expand partnerships to provide valuable technical and financial assistance to farmers. Continue expanded CD MAEAP technical assistance levels through 2017 and beyond.

#	Task	Who	Timelines/Milestone	Reporting
7a	Seek additional funding to assure the ongoing expanded levels of local MAEAP technicians in the WLEB.	MDARD, CDs	For 2017 and each subsequent year, maintain technicians in the WLEB. Annually review the technical assistance need to expand, reduce, or target efforts.	MDARD Annual Report
7b	Strengthen partnerships with the agricultural community, including farming input providers and CCAs through the 4R Nutrient Stewardship Program, to encourage more farmers to take action to protect water quality.	MDARD, interested partners	FY 2017-2019 Partner on the Farmer-Led Conservation effort to encourage grass roots farmer involvement in education, cost-share and decision-making. FY 2017 promote CCA incentive program to strengthen partnerships.	MDARD Annual Report
7c	Partner with USDA - NRCS, MSUE, and other partners to offer training to MAEAP technicians.	MDARD, MSUE, federal, partners	Annually train staff in risk assessment tools, nutrient management, manure management system plans, knowledge of BMPs, communications, and landowner outreach.	MDARD Annual Report
7d	Coordinate partnerships through quarterly WLEB Team meetings to review technical assistance and resources available to farmers.	MDARD, CDs, USDA - NRCS, MDEQ, OGL, interested partners	Host four per year. Debrief on local efforts to review who is doing what, success stories, and obstacles.	MDARD Annual Report
7e	Partner to identify and secure additional funding and cost share to provide opportunities to farmers.	MDARD, interested partners	Seek additional partnership opportunities to provide technical and financial conservation assistance.	MDARD Annual Report
7f	Continue to use pass-through grants that place an emphasis on a targeted and comprehensive approach to farm conservation planning; livestock management strategies; and DWM strategies.	MDEQ NPS Program, interested partners	The NPS Program will release a request for proposals annually.	N/A

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

#	Task	Who	Timelines/Milestone	Reporting
8a	Identify and implement more incentives to expand participation in MAEAP through the MAEAP Advisory Council (AC).	MAEAP AC, MDARD	Evaluate incentives and pilot projects annually. Incentive survey completed in 2016 with four recommendations submitted to MAEAP Advisory Committee and MDARD. FY 2018-19, MDARD will pursue incentives identified and approved by the MAEAP AC incentives workgroup to increase program participation.	N/A
8b	Increase MAEAP cropland acres managed under NMPs	MDARD, CDs	In FY 2018, increase total MAEAP NMP acreage on farms by 35,000 annually.	MDARD Annual Report
8c	Identify number of farms eligible for reverification and discuss during local MAEAP goal-setting meetings.	MDARD, CDs	Maintain a minimum of 85 percent reverification rate for farms in the WLEB.	MDARD Annual Report
8d	MAEAP technicians work one-on-one with farmers to provide technical assistance and identify environmental risks and recommend and prioritize BMP installation.	MDARD, CDs	Track number of risk assessments, BMPS installed, and acreage impacted.	MDARD Annual Report and MAEAP Database
8e	Increase farmers participating in MAEAP and track the environmental gains on both verified and non-verified farms.	MDARD, CD's	Increase number of program participants to 120 percent of FY 2017 level. Track pounds of sediment, N, and P reduced.	MDARD Annual Report and MAEAP Database

Task 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	Who	Timelines/Milestone	Reporting
9a	Work with the MAEAP Communications work group committee and partners to conduct targeted outreach to public and farmers to raise the awareness of the benefits of MAEAP.	MDARD, interested partners	MAEAP Communications work-group meets six times a year and will annually review short and long-term communication goals. FY 2017-2019 MDARD partner with Farmer-led conservation effort on targeted outreach analysis and campaign in WLEB.	MDARD Annual Report Communications committee reports to MAEAP AC
9b	Host six conservation sails in FY 2017 to help farmers experience the impact of land management decision on the waters of Lake Erie first hand through water sampling and educational presentations.	Lenawee CD, interested partners	Annually review attendance and impact of education to determine ongoing efforts.	MDARD Annual Report
9c	Coordinate with partners to host on-farm field days, MAEAP Phase 1 educational events.	MDARD, CD's, MSUE, interested partners	Annually review attendance and impact of education to determine ongoing efforts.	MDARD Annual Report and MAEAP Database

Task 10. Promote wetland restoration and land management initiatives to reduce P loading.

#	Task	Who	Timelines/Milestone	Reporting
10a	Develop innovative strategies to enhance wetland restoration, and green infrastructure, and other land management planning and implementation efforts in Southeast Michigan.	QOL, MDOT, SEMCOG, local units of government (LUG), NGOs, interested partners	Ongoing.	Water Strategy implementation reporting
10b	Work with agency staff to review BMPs implemented on state managed lands in the WLEB.	MDNR	Ongoing.	N/A
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 diverse aquatic and terrestrial biota.	MDNR, MDEQ, interested partners	Ongoing. External and internal funding opportunities will be shared with interested partners.	N/A

#	Task	Who	Timelines/Milestone	Reporting
10d	Issue requests for proposals that place a priority on purchasing conservation easements to limit land use activities that are detrimental to water quality.	MDEQ NPS Program, interested partners	The NPS Program's pass-through grant request for proposals is issued annually.	MDEQ NPS Program Website

Acronyms and Initialisms

AC – Advisory Council
BMP – Best Management Practice
CAFO – Concentrated Animal Feeding Operation
CCA – Certified Crop Advisor
CD – Conservation District
CEAP – Conservation Effects Assessment Program
COC – Certificate of Coverage
CREP – Conservation Reserve Enhancement Program
CSO – Combined Sewer Overflow
DAP – Domestic Action Plan
DMR – Discharge Monitoring Reports
DWM – Drain Water Management
DWSD – Detroit Water and Sewerage Department
DWTF – Downriver Wastewater Treatment Facility
DU – Ducks Unlimited
FY – Fiscal Year
GIS – Geographic Information Systems
HABs – Harmful Algal Blooms
HIT – High Impact Target
LLWFA – Landscape Level Functional Assessment
LUG – Local Unit of Government
GAAMPs – Generally Accepted Agricultural and Management Practices
GLWA – Great Lakes Water Authority
GLWMS - Great Lakes Watershed Management System
GLWQA – Canada-U.S. Great Lakes Water Quality Agreement, 2012
MAEAP – Michigan Agriculture Environmental Assurance Program
MARI – Manure Application Risk Index
MDARD – Michigan Department of Agriculture and Rural Development
MDEQ – Michigan Department of Environmental Quality
MDNR – Michigan Department of Natural Resources
MDOT – Michigan Department of Transportation
Mi CLEAR – Michigan Cleaner Lake Erie through Action and Research
MSU – Michigan State University
MSUE – Michigan State University Extension
MSU IWR – Michigan State University Institute of Water Research
MT – Metric Tons
N – Nitrogen
NGO – Non-Government Organizations
NMP – Nutrient Management Plan
NPDES – National Pollution Discharge Elimination System
NPS – Nonpoint Source
NRCS –Natural Resources Conservation Service
OGL – Office of the Great Lakes
P – Phosphorus
QOL – Quality of Life Agencies (includes MDARD, MDEQ, and MDNR)
RCPP – Regional Conservation Partnership Program
SCDRS – St. Clair-Detroit River System
SEMCOG – Southeast Michigan Council of Governments
SRP – Soluble Reactive Phosphorus, also known as Dissolved Reactive Phosphorus
TP – Total Phosphorus
USDA – United States Department of Agriculture
USEPA – United States Environmental Protection Agency
USGS – United States Geological Survey
WMP – Watershed Management Plan
WLEB – Western Lake Erie Basin
WWTP – Wastewater Treatment Plant
WWTF – Wastewater Treatment Facility
WRRF – Wastewater Resource Recovery Facility
YCUA – Ypsilanti Community Utility Authority