State of Ohio's

Western Lake Erie Basin

Collaborative Implementation Framework

A Pathway for Transitioning Ohio to a Great Lakes Water Quality Agreement Domestic Action Plan

February 2017

Introduction

On June 13, 2015, the governors of Ohio and Michigan, and the premier of Ontario committed to a goal of reducing phosphorus loadings to Lake Erie by 40 percent as specified in the Western Basin of Lake Erie Collaborative Agreement (Collaborative). The Collaborative is intended to advance efforts toward the proposed nutrient reduction targets put forth in the Great Lakes Water Quality Agreement (GLWQA). This will be done through the development of this Implementation Framework (Framework), ahead of the formal timeline for completing a state Domestic Action Plan (DAP) as set forth in the GLWQA. The Collaborative will focus on the western basin watersheds of the Maumee, Portage and Toussaint rivers and the Sandusky River. The GLWQA through the Domestic Action Plan will include the Central Basin tributaries of the Huron and Cuyahoga rivers, but these will not be addressed in detail in this Framework.

Goals of the Collaborative

- Achieve a 40 percent total load reduction in the amount of total and dissolved reactive phosphorus entering Lake Erie's western basin by the year 2025 with an aspirational goal of a 20 percent reduction by 2020[1].
- To use 2008 as the base year from which progress will be measured.
- That each state and Province commits to developing, in collaboration with stakeholder groups, a framework outlining actions and timelines toward achieving the goals.

The Framework is based on the following guiding principles:

- **Implementation** of point and nonpoint nutrient reduction practices.
- **Verification** of targeted practice implementation and effectiveness.
- **Documentation** of water quality changes resulting through the implementation of nutrient reduction practices.
- **Adaptability** to allow for the modification of programs, practices and policy as new information is obtained and changes occur.
- **Accountability** to ensure clear areas of responsibilities and that the commitment is made and kept toward achieving the goals.

The Framework was developed with input through meetings and conversations with various stakeholder groups and state agencies. The initial draft was then made available for additional interest group and public comment.

Central to the implementation of the Framework is the adaptive management process. This means the Framework is intended to convey an understanding that there will be changes in data, programs and policy that will need to be reflected in the Framework going forward.

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[1] Achieving a spring (March – July) Flow-Weighted Mean Concentration (FWMC) of .23 mg/l TP and .05 mg/l DRP in the Maumee River and a target of 860 MT total phosphorus and 189 MT Dissolved Reactive Phosphorus for the western Lake Erie basin will achieve a 40 percent reduction from 2008. Similar targets will be established for the Portage and Toussaint rivers.

How does the Collaborative fit in the context of Ohio's over-all efforts to address Harmful Algal Blooms in Lake Erie?

Ohio's long history of problems and solutions for nutrient enrichment and nuisance and/or harmful algal blooms in Lake Erie is laid out extensively in the Ohio Lake Erie Phosphorus Task Force I and II reports. To summarize, after a lengthy but successful fight to reduce previously high nutrient levels in Lake Erie, algal blooms had abated in the 1980s. However, in the mid-1990s, toxin-producing blue-green algal blooms began to reappear in the western basin of Lake Erie. A particularly massive bloom occurred in 2003, and blooms of varying intensity have recurred most years since then.

The State of Ohio has been in the forefront of developing a response to the problems impacting Lake Erie. The Ohio Lake Erie Phosphorus Task Force I convened in January, 2007, in response to the increased harmful algal blooms in the early 2000s. Led by the Ohio Environmental Protection Agency (Ohio EPA), Ohio Department of Agriculture (ODA), Ohio Lake Erie Commission (OLEC) and Ohio Department of Natural Resources (ODNR), the Task Force included representatives from state and federal agencies, Lake Erie researchers, soil scientists, agricultural program representatives and wastewater treatment plant personnel and drew on the expertise of many other experts in a variety of disciplines.

The Task Force developed a variety of recommendations to address nutrient reductions, particularly to the western basin of Lake Erie. Recommendations were made for all the sources examined with a major focus on upland measures that influence agricultural practices. The report included a research agenda, which has served as a basis for directing millions of dollars of state and federal research funds.

In response to the findings of the Task Force, the State of Ohio directors of ODA, ODNR and Ohio EPA convened the Directors' Agricultural Nutrients and Water Quality Working Group on Aug. 25, 2011. The purpose of this group was to identify and implement, at the state level, those agricultural practice initiatives which would ultimately result in the reduction of harmful algal blooms developing in Ohio's inland lakes and Lake Erie, while at the same time continuing to assure that the region's agricultural base was not impaired by unintended consequences. As a guiding principle, the final report encouraged farmers to adopt nutrient application guidelines known as 4R Nutrient Stewardship (4R). The 4R concept promotes using the right fertilizer source, at the right rate, at the right time, with the right placement. It was believed that this approach would be in part effective in reducing phosphorus and nitrogen from impacting waterways across the state.

Starting in 2012, Ohio EPA, coordinating with ODA and ODNR, developed Ohio's Nutrient Reduction Strategy. This comprehensive framework to manage point and nonpoint sources of nutrients and reduce their impact on Ohio's surface waters was an outgrowth of Ohio's participation on the Mississippi River/Gulf of Mexico Watershed Nutrient (Hypoxia) Task Force. The strategy recommends regulatory initiatives and voluntary practices that can reduce point and nonpoint sources of nutrients throughout the state.

The Point Source and Urban Runoff work group of the Hypoxia Task Force recommended that Ohio develop a statewide nutrient mass balance that examines both point and nonpoint sources of nutrients to Ohio's watersheds. This is necessary to determine appropriate reductions for all sources and to enable cost-benefit assessments to determine the most environmentally effective and economically feasible mechanism for the state to reduce nutrient loading to watersheds. This effort is currently underway with watersheds in the Lake

Erie watershed receiving a high priority for analysis. Results from the mass balance study will be integrated into the DAP.

Simultaneously with those efforts, Ohio EPA, OLEC, ODA and ODNR reconvened the Ohio Lake Erie Phosphorus Task Force as a Phase II effort. The Task Force II final report (2013) includes a detailed review of state and federal efforts, including research results from some of the initial studies recommended by the Task Force I. After hearing from numerous experts at several meetings, the Task Force II worked to develop a phosphorus target for Lake Erie's Western Basin.

Based on a comparison of discharge, total phosphorus loads and dissolved reactive phosphorus loads for the Maumee River for water year and spring (March-June) totals for 2000 through 2012, the Task Force II recommended an annual loading reduction of approximately 40 percent to significantly reduce or eliminate HABs in the Western Basin. The Task Force II also recommended an adaptive management approach that would allow annual reviews of progress and evaluation/modification of loading targets.

As the Task Force II was completing its final report, the GLWQA Nutrients Annex Subcommittee was beginning the process of revising the prior GLWQA nutrient loading goal for Lake Erie. Modeling showed that spring loading of phosphorus from the Maumee River is the determining factor. The Subcommittee determined that there should be a reduction of 40 percent in spring loads of both total and dissolved phosphorus from the Maumee River. A 40 percent reduction to the Maumee equates to a target spring load of 860 metric tons per year of total phosphorus and 186 metric tons per year of soluble reactive phosphorus under high spring discharge conditions. This goal is intended to limit the formation of harmful algal blooms in nine years out of 10, which allows for an occasional very wet year in which the goal would not be achievable. The proposed goal, drafted in February 2015, has been finalized with the development of state and province Domestic Action Plans due by 2018.

This recommended loading goal tracked very closely to the recommended value from the Task Force II. Therefore, the state decided to move forward with accepting the proposed goal in the Collaborative Agreement and with developing the Collaborative Implementation Framework called for in the Collaborative.

Resources Allocated Since 2008

As a scientific consensus began to form around goals and changes in practices needed to achieve those goals, state and federal resources were allocated or reallocated to begin to implement on-the-ground practices. This includes agricultural practices, projects to reduce urban storm water runoff, upgrades to wastewater treatment facilities and home sewage treatment system improvements.

Through the Ohio Clean Lakes Initiative, the Ohio Legislature with Governor Kasich's support appropriated more than $3.55 million for the installation of best management practices (BMPs) to reduce nutrient runoff in the Western Lake Erie Basin. State and local partners worked with more than 350 farmers to implement BMPs on more than 40,000 acres. Additional stream monitoring stations have also been installed to measure the effectiveness of these practices.

Ohio EPA has used funds it has received through the Great Lakes Restoration Initiative to award grants to local and state organizations for projects to protect or improve Lake Erie water quality, including storm water projects, home sewage treatment system replacement/improvements and stream restoration projects. In total, for the five-year period ending in 2015, the Great Lakes Restoration Initiative has funded $182 million for 196 projects in the State of Ohio.

Ohio EPA works with local communities to develop, implement and fund long-term control plans to reduce overflows of sewage into streams and lakes following heavy storms and snow melt. Since 2010, Ohio EPA has awarded more than $292 million in low-interest and interest-free loans from the Water Pollution Control Loan Fund for 138 projects in the Western Lake Erie watershed.

Since 2008, the State of Ohio, working with various federal and private partners, have implemented numerous programs and practices directed at reducing nutrients from both point source and nonpoint sources and increased monitoring throughout the Maumee and Sandusky watersheds, two of Ohio's primary contributors of nutrients to Lake Erie. Following is a sample of the key initiatives, programs and funding directed at nutrient reduction in the western Lake Erie basin since 2008. It is not intended to be a complete listing. For more up-to-date information, please contact the appropriate agency or the Ohio Lake Erie Commission:

- 2009 – 2015 – NRCS Conservation Program WLEB Funding
- 2010 – 2015 – Great Lakes Restoration Initiative funding for Ohio projects
- 2010 – Phosphorus Taskforce I Report issued
- 2011 – NRCS Great Lakes Conservation Effects Assessment Project (CEAP)
- 2012 – Directors Ag Nutrient Working Group Report issued
- 2012 – NRCS Revised 590 standards
- 2012 – Ohio Clean Lake Initiative/Healthy Lake Erie Fund initiated
- 2012 – Ohio EPA Point and Urban Runoff Nutrient Workgroup Report issued
- 2013 – Phosphorus Taskforce II Report issued
- 2013 – Ohio Nutrient Reduction Strategy issued
- 2013 – Scotts/Miracle Grow eliminated phosphorus in their lawn fertilizer
- 2014 – Ohio 4R Stewardship program initiated
- 2014 – U.S. EPA provided funding for expanding targeted watershed monitoring
- 2014 – $17 million Multi-state Regional Conservation Partnership Program initiated
- 2015 – Ohio Nutrient Reduction Strategy Addendum finalized
- 2016- Ohio EPA provided 13 million dollars for home sewage treatment system repair/replacement
- 2016 – NRCS Western Lake Erie Basin CEAP issued
- 2016 – NRCS created the three-year, $77 million, Western Lake Erie Basin Initiative

It is estimated that since 2011 alone, more than $3.1 billion has been invested in Ohio's portion of the Lake Erie Basin for both point source and nonpoint source nutrient reduction and drinking water treatment. The Framework proposes that before any new funding is requested for programs, practices or administration that an evaluation be conducted of how funds and resources are currently being allocated to determine if a re-allocation of those resources toward the new priorities or programs could be made. Any new funding will need to be addressed by the appropriate state agency through the state budget process. It is recognized that a need exists for long-term funding commitments especially for water quality monitoring and certain on-going nutrient reduction practices. It is recommended that a comprehensive funding plan for both short-term (two years) and long-term (two to 10 years) for both the state and federal budget cycle be completed and serve as a fiscal plan and added as an addendum to this Framework.

Legislative Activity 2014 – 2015

As each task force and work group provided additional information and recommendations about potential solutions, state officials responded not only by adding resources and refocusing programs, but also through legislative channels.

In 2014, Governor John Kasich signed into law Senate Bill 150, an update of Ohio's regulatory structure specifically geared to improving water quality. The bill requires fertilizer applicators to undergo education and certification by ODA, encourages producers to adopt nutrient management plans, allows ODA to better track the sales and distribution of fertilizer throughout the state, and provides ODNR the authority to repurpose existing funding for additional BMP installation.

Governor Kasich signed Senate Bill 1 into law in April 2015. This bill prohibits spreading manure and other fertilizers with phosphorous and nitrogen when the ground is frozen, snow-covered or saturated. It also prohibits spreading manure if the forecast calls for a 50 percent chance of half an inch of precipitation over 24 hours or, for commercial fertilizers, an inch over 12 hours. The winter and spring of 2015-2016 was the first year of this legislated change in practices.

In addition, regulatory changes have been made to the point source regulated community. Senate Bill 1 requires that by Dec. 1, 2017, a technical capability and feasibility study is to be completed by those wastewater treatment plants over 1 MGD that have a phosphorus discharge limit above 1mg/l to determine the costs and feasibility of reducing the phosphorus discharge to 1mg/l. In addition, any wastewater treatment facility currently not performing phosphorus monitoring shall implement total phosphorus and dissolved reactive phosphorus monitoring program by Dec. 1, 2016. Going forward, voluntary, incentive-based and regulatory approaches will be considered to achieve desired nutrient reduction goals.

Partner Agencies and Related Areas of Responsibility

In general, the responsibility and accountability for ensuring implementation of programs and progress toward the agreed to goals will be with the various state agencies; ODA has responsibility for agricultural nonpoint; Ohio EPA has responsibility for point source and water quality monitoring; and the Ohio Department of Health (ODH) for household and small flow sewage treatment systems. Specific areas of responsibility and involvement are listed below for the primary state agencies and partners engaged in this initiative. This list may not be a total reflection of responsibilities and involvement and they may change over time.

In addition to those organizations listed, there is involvement and coordination from time-to-time on specific issues, such as monitoring and research by other universities, non-profit organizations, Indiana and Michigan state agencies and international agencies, such as Environment and Climate Change Canada and the Ontario Ministry of the Environment and Climate Change and Ontario Ministry of Agriculture - Agri-Food.

The Ohio Lake Erie Commission (OLEC) is comprised of the directors for six state agencies most directly involved in implementing this Framework and five public members. OLEC will serve as the overall Collaborative coordinating entity working in conjunction with the various state, federal agencies and other partners to achieve the Collaborative's goals. Through the Lake Erie Protection and Restoration Strategy, OLEC has identified Nutrient Reduction as a Priority Area for 2017. The Ohio Revised Code 1506.21 provides the

Commission authority to ensure the coordination of state and local policies and programs pertaining to Lake Erie with a priority on those identified in the Lake Erie Protection and Restoration Strategy.

Ohio Department of Agriculture (ODA)

- Agricultural nonpoint program implementation
- Agriculture Fertilizer Applicator Certification Program
- CAFO permitting and regulatory oversight
- Certified Livestock Manager training and inspections
- Manure and Fertilizer Application (SB 1) enforcement
- Fertilizer sales records
- Watershed coordinator program administration
- Agricultural nonpoint BMP technical assistance and oversight
- Agricultural Pollution Abatement Program
- Ohio Runoff Risk Forecast website
- Conservation Reserve Enhancement Program

Ohio Environmental Protection Agency (Ohio EPA)

- National Pollutant Discharge Elimination System (NPDES) permit approval and monitoring
- Wastewater treatment technical and feasibility studies
- Storm water management program administration
- Water quality monitoring (Watershed and Lake Erie)
- Combined Sewer Overflow monitoring
- Environmental Infrastructure funding (wastewater, drinking water)
- 319 Grant, Surface Water Improvement Fund (SWIF), GLRI Fund administration
- Areas of Concern program administration
- Harmful Algal Bloom program administration
- Total Maximum Daily Load (TMDL) studies (See Appendix A for further discussion of TMDLs)
- Administer and enforce a program for the regulation of sewage sludge management

Ohio Department of Health (ODH)

- Establish Sewage Treatment System standards and oversight (local health districts)
- Bathing beach advisories and sample results posted on BeachGuard website
- Bathing Beach monitoring for Lake Erie beaches

Ohio Department of Natural Resources (ODNR)

- Private lands wildlife habitat management
- Posting of bathing beach advisories on state park beaches and boat ramps
- Lake Erie fisheries

Ohio Lake Erie Commission (OLEC)

- Collaborative Implementation Framework coordination
- Lake Erie Protection and Restoration Strategy coordination
- Issues grants from the Lake Erie Protection Fund

Natural Resource Conservation Service (NRCS)

- Farm Bill program financial and technical assistance for conservation planning and practice implementation.
- GLRI grants
- Co-Chair the WLEB Partnership with the U.S. Army Corps of Engineers
- Maintain Ohio Field Office Technical Guide conservation practices and standards

Farm Service Agency (FSA)

- Conservation Reserve Program administration
- Conservation Reserve Enhancement Program administration
- Farmable wetlands program administration

U.S. Environmental Protection Agency (U.S. EPA)

- Great Lakes Water Quality Agreement administration
- Total Maximum Daily Load review
- NPDES permit review
- Nine Element Watershed Plan oversight
- 319 funding and GRLI funding administration

US Geological Survey (USGS)

- Stream gauge operation and monitoring

National Ocean and Atmospheric Agency (NOAA)

- Ohio Sea Grant
- Satellite imaging
- Coastal Resource Management

Heidelberg University National Center for Water Quality Research (NCWQR)

- Water quality monitoring and data analysis

Ohio Department of Higher Education

- Water Quality Research Projects

The Ohio State University (OSU – Stone Lab)

- Water quality monitoring
- Data analysis
- Research coordination and summaries

The Ohio State University College of Food, Agriculture and Environmental Sciences

- Research on agricultural and production processes, practices and nutrient best management practices
- Educational programs and producer certification training through OSU Extension

University of Toledo (UT)

- Lake Erie water quality monitoring

Stakeholder Groups providing input for draft Collaborative Implementation Framework

- Ohio Corn Growers
- Ohio Soybean Association
- Ohio Cattleman's Association
- Ohio Pork Producers
- Ohio Agri-business Association
- Ohio Federation of Soil and Water Conservation Districts
- Ohio Farm Bureau Federation
- The Nature Conservancy
- National Wildlife Federation
- Environmental Defense Fund
- Ohio Environmental Council
- Black Swamp Land Conservancy
- Alliance for the Great Lakes
- Pheasants Forever
- Great Lakes – St. Lawrence Cities Initiative
- Toledo Metropolitan Area Council of Governments
- Ohio Charter Boat Captains Association
- Ohio Association of Soil and Water Conservation District Employees
- County Commissioner Association of Ohio
- Lake Erie Improvement Association
- Stone Lab/Sea Grant
- The Ohio State University College of Agriculture, Food and Environment
- The Ohio State University – Stone Lab
- Ohio Sea Grant Program

Collaborative Implementation Framework Actions

Action items are broken down into two timeframes; within 12 months and within 24 -36 months. The first 12 months will be primarily focused on establishing processes and setting up the foundation from which program implementation will take place over the next 24-36 months.

Following are proposed actions to be taken by the state in cooperation with federal agencies and stakeholder groups within 12 months:

Ohio Environmental Protection Agency (Ohio EPA)

1) Ohio EPA will establish a comprehensive water quality monitoring network specific to tracking progress toward meeting the requirements of the Collaborative and Annex 4 (Appendix B). While some currently available water quality data will be initially used in this process, there is a need to establish processes and protocols specific to tracking the progress toward the Collaborative and Great Lakes Water Quality Agreement goals.

2) Ohio EPA will continue to develop a process to identify and recommend priority watersheds at the HUC 12 level (Appendix C). The establishment of priority watersheds does not mean that nutrient reduction practices for both point source and non-point should not nor will not continue to be implemented throughout the western Lake Erie basin. Establishing priority watersheds is intended to indicate those areas where it is believed that the most effective use of resources would potentially result in the quickest reduction in nutrient impacts to water quality and be verified as a result of targeted water quality monitoring. Priority watersheds are initially based on the results of a recent report examining six water quality models (Scavia, 2016), nutrient monitoring data collected as part of the Ohio EPA Watershed Assessment Program and specific knowledge of each watershed. Priority watersheds can be placed in groups based on characteristics that will affect specific nutrient sources and nutrient management practices. These proposed groups are:
    1) The proportion of hydrologic soil group D (intense tillage and drainage)
    2) Soil slope (erosion)
    3) Livestock presence (nutrient source and timing)
    4) Various landscape characteristics

    Further, within these priority watersheds other known nutrient sources exist. These would include NPDES permitted point sources (focus on those without total phosphorus limits) Biosolid Land Application Management Plans, and known unsewered communities with failing household sewage treatment systems. If these sources exist within a priority watershed they will be identified. Ground-truthing of various nutrient sources, implemented BMP's and resulting water quality improvements will be used to confirm and if necessary adjust priority watersheds as part of the adaptive management process.

3) Ohio EPA will take a leadership role with member entities on the Annex 4 Monitoring Task Team (Ohio, Indiana, Michigan and Ontario) to ensure a consistent sampling and lab testing protocol is in place and being followed. It is recommended that one, common platform such as the Great Lakes Commission's ErieStat program be used to collect, share and report on progress toward and verification of achieving the Great Lakes Water Quality Agreement and Collaborative goals.

4) Ohio EPA has identified those top 30 facilities in the Maumee basin with an NPDES permit (Table C7). Ohio EPA will evaluate those facilities that currently do not have a permit limit for total phosphorus and that are discharging less than 1 MGD to determine options on a facility by facility basis for reducing the phosphorus discharge level.

5) Ohio EPA will develop a recommended nutrient reduction target for priority watersheds (Table A1) based on empirical monitoring data, the Nutrient Mass Balance Study for Ohio's Major Rivers, multi-scenario modeling and other available information. This target will be used to help in meeting the ultimate nutrient reduction goal for Lake Erie. Monitoring locations will be established at key subwatersheds and at the most practical location near the mouth of all the direct, primary tributaries to the western Lake Erie basin. Ohio EPA, in coordination with local health districts, will track the installation of point source nutrient reduction BMPs installed since 2008. In addition, tracking will include all NPDES permits with discharge limits, those required to complete a technical and feasibility

study (SB1), CSO outfalls, identified failed home sewage system locations and state or federal funded storm water management practices.

6) Ohio EPA, in cooperation with OLEC and ODA, will institute a tracking program by county within the western Lake Erie basin with a focus on priority watersheds showing the total public dollars allocated for point source and when possible nonpoint source nutrient management/reduction practices.

7) Ohio EPA will implement the requirement of SB1 that all facilities discharging more than 1 MGD will include monitoring of both total phosphorus and ortho-phosphorus by Dec. 1, 2016 if this requirement does not currently exist.

8) Ohio EPA and ODA will cooperate in the development and anticipated implementation of a pilot Lake Erie Basin nutrient trading and stewardship credit program being developed by the Great Lakes Commission. Ohio EPA would recommend a stronger focus on a stewardship program and an evaluation of methods, and funding to ensure a net nutrient reduction results for the program

9) Ohio EPA will establish a contractual arrangement with Battelle to conduct an evaluation of processes, and products effectiveness for addressing nutrient and/or microcystin management, treatment and control with a focus on drinking and wastewater treatment systems, products and processes.

10) Ohio EPA in coordination with ODA will evaluate the various components of the nutrient and manure management plans with those of the Biosolid Land Application and Management Plans (LAMPS) to evaluate the need for more consistency.

Ohio Lake Erie Commission (OLEC)

1) OLEC will take the lead to ensure there is annual coordination between state and federal agencies for identifying priority programs, priority areas and timelines related to Lake Erie and the Lake Erie Basin. Each OLEC members' state agency will coordinate with the OLEC staff to maximize opportunities for the coordination of state and federal priorities.

2) OLEC will coordinate with the member agencies and federal partners on the establishment of a WLEB fiscal operations plan. This plan will serve as guide for identifying short-term and long-term funding needs and potential funding sources including the re-allocation as well as new local, state and federal funding opportunities for the WLEB. Priority should be given to a consistent and possibly a dedicated funding source for water quality monitoring.

3) Significant dollars and other resources are made available annually from various federal, state, local and private sources to address the issues of Lake Erie. These funds include the Great Lakes Restoration Initiative Funds (GLRI), 319 Grants and other federal funding programs through United States Department of Agriculture (USDA), U.S. EPA, NOAA, United States Army Corps of Engineers (USACE), United States Fish and Wildlife Service (USFWS) and USGS. Several state agencies, ODNR, Ohio EPA, and ODA also have provided significant funding over the years to help address Lake Erie issues. While the combination of funds is significant and it is often easy to point to the resulting projects, there continues to be the need to ensure dollars are being directed to projects and programs that truly address coordinated or stated priority issues. OLEC will seek cooperation, request coordination and may review

funding requests made too federal or state agencies from state agencies, government subdivisions and organizations for funding related to Lake Erie or Lake Erie Basin projects. OLEC does not have the authority to approve or disapprove an application but will evaluate the funding request to confirm if the project is helping to achieve state or federal priorities related to Lake Erie or the Lake Erie Basin.

4) OLEC will establish methods for tracking the amount of all public funds and when possible private sources such as from foundations expended in the WLEB for nutrient reduction. It is recommended that fiscal tracking programs be utilized by all levels of government and by those entities receiving public funds, including Soil and Water Conservation Districts, Sewer and Water Districts, and Watershed Programs that can track dollars received and expended on nutrient reduction and to help document the potential need for funding to achieve the desired program objectives. This would not include identifying the individuals or private business entities receiving cost-share dollars through Farm Bill programs, or other programs where confidentiality of the recipient is protected by law.

5) OLEC will work with the Ohio Public Works Commission and local Green Space Conservation Program's Natural Resource Assistance Councils (Clean Ohio) in the WLEB to evaluate the use of Clean Ohio funds toward projects that also result in nutrient reduction practices. Grant applications should reflect the preference toward this goal. Priority points should be awarded to those projects that include water quality improvements components.

6) OLEC and member agencies will provide an annual update to the Ohio House and Senate Agriculture, Agriculture and Rural Development, Energy & Natural Resources committee as well as the Lake Erie Caucus on the state of the water quality in the WLEB. These updates and status reports will be made available to the public on the OLEC website.

7) OLEC will establish the DAP Advisory Committee involving similar stakeholders as those involved in the Phosphorus Task Force initiatives. This Committee would provide input to the Commission of the progress of implementation toward achieving the stated nutrient reduction goals. Representatives from Michigan, Indiana and Ontario would be invited to participated periodically to evaluate the over-all progress toward DAP goals, targets, project implementation and monitoring data.

Ohio Department of Agriculture (ODA)

1) ODA will monitor the progress of the USDA Agricultural Research Service to finalize and present initial results from edge-of-field monitoring and research.

2) ODA will monitor the progress of OSU and other state and federal agencies to complete potential revisions to the Tri-State Fertility Guide and the Phosphorus Index.

3) ODA will continue the Ohio Clean Lake Initiative - Impaired Watershed Restoration Program through the Ohio Department of Agriculture Division of Soil and Water Conservation. This program aims to reduce phosphorus loading, including dissolved phosphorus loading, from agricultural landscapes to waters of western Lake Erie, the Maumee River and its tributaries. Specifically, this project will target four of the most impaired Watershed Assessment Units (WAU) in the Western Lake Erie Basin Watershed. A "systems approach" using a combination of management practices (soil testing, cover crops, drainage water management, fertilizer placement technology and manure storage structures

and/or roofed feedlots) known to reduce nutrient loading will be targeted within portions of 10 counties in Ohio, of select sub-basins of the Maumee and Sandusky Rivers.

4) ODA will work with NRCS to establish a Western Lake Erie Basin Technical Advisory committee as a sub-committee to the State Technical Committee to provide technical assistance specific to nutrient management issues and agricultural practices in the basin.

5) ODA will coordinate with the United States Department of Agriculture Commodity Credit Corporation to strengthen and stimulate the Ohio Lake Erie Conservation Reserve Enhancement Program (LE-CREP) to achieve its 2004 goal of voluntarily establishing 67,000 acres of filter strips, riparian buffers, hardwood tree plantings, wildlife habitat and field windbreaks. Incentives will be prioritized based on targeted watersheds and on optimal placement and effectiveness of the riparian practices.

6) ODA will collaborate with the USDA – NRCS, the Ohio Federation of Soil and Water Conservation Districts, and other partners to identify a suite of agriculture nonpoint BMPs (for example, drainage water management, nutrient placement, soil testing and livestock waste management) to be promoted basin-wide but with a priority for placement in targeted watersheds. Additional funds will be sought to provide cost incentives for implementing these BMPs, and BMP implementation will be tracked at the HUC 12 level.

7) ODA will educate producers on the importance of following the fertilizer and manure application restrictions and fertilizer certification requirements in the WLEB. Implementation and enforcement of these restrictions will be a top priority for ODA and Ohio's SWCDs.

Ohio Department of Health (ODH)

1) ODH will continue to work with local health districts to ensure implementation of their Operation and Maintenance Tracking programs for sewage treatment systems as required in the Ohio Administrative Code, by prioritizing identification of failing sewage treatment systems within targeted watersheds. Upon identification of a failing system, local health districts will establish specific action plans and timeframes for correction of the nuisance conditions which may include repair, alteration or replacement of the sewage treatment system, or connection to public sewers, including an analysis of those areas of concentrated failing HSTS and their proximity to public sewer as well as existing capacity of the most likely provider of public sewer.

Ohio Department of Natural Resources (ODNR)

1) ODNR, in cooperation with Ohio EPA, will continue to fund and complete engineering and design work for potential in-water coastal wetland restoration projects in the western basin that beneficially use dredged material and can help assimilate in-lake nutrients.

Following are proposed actions to be taken by the state in cooperation with federal agencies and stakeholder groups within 24-36 months:

Ohio Environmental Protection Agency (Ohio EPA)

1) Ohio EPA and ODA will coordinate with local entities in the development of Watershed Implementation Plans (WIPs) with a focus on priority watersheds that are not already covered by a WIP. The WIP ideally will meet the nine element watershed plan criteria established by U.S. EPA to meet expectations for providing reasonable assurance that nutrient reductions will be achieved and maintained and eliminate nutrient impairment for a particular stream. A WIP meeting the nine-element standard will also enable the county and others to apply for 319 grants and other state and federal funding even if an approved TMDL is in place. Cost share from the state for the WIP will be sought through a re-allocation of existing dollars or new funding.

2) Ohio EPA, in cooperation with Heidelberg National Water Quality Lab and USGS, will continue to develop and implement a program to track and verify water quality improvements resulting from nutrient reduction practices and BMPs at the HUC 12 level.

3) Ohio EPA will publish a Water Quality Milestone for each priority watershed and major western Lake Erie basin tributaries. The Milestones will be used in assessing nutrient reduction progress toward the Collaborative targets. (Appendix B)

4) Ohio EPA will coordinate with local authorities to conduct monitoring of nutrient discharge levels from priority combined sewer overflows to evaluate the total nutrient load resulting from these periodic discharges and to assist in determining priorities for separation projects.

5) Ohio EPA will continue to focus State Revolving Loan Fund dollars and coordinate with other infrastructure funding programs to direct funding at priority CSO separation projects, wastewater treatment plant upgrades, storm water management and home sewage treatment systems.

6) Ohio EPA, in conjunction with ODA and ODH, will coordinate in the development of a nutrient reduction BMP Implementation, Verification and Evaluation process in watersheds to be administered by the appropriate agency. This would involve developing a record of federal or state cost-shared nonpoint BMPs being implemented, their location, documenting the proper installation and life-cycle monitoring to ensure functionality at the county and HUC 12 level. While not identical, the program would complement the current NPDES point source Compliance and Compliance Assistance program administered by Ohio EPA.

Ohio Lake Erie Commission (OLEC)

1) OLEC, in conjunction with the Department of Taxation, will evaluate the establishment of a pilot State-wide Conservation Land Tax which would serve as an incentive to landowners to place land which would also provide water quality benefits into long-term conservation programs. As part of this initiative, OLEC could fund through the Lake Erie Protection Fund a study to evaluate tax revenue implications to local governments and school districts, possible models such as the State Homestead Exemption program and acceptance by landowners and other stakeholders.

2) OLEC with its member agencies will coordinate the development of an Adaptive Management Process "trigger mechanism" which would cause a change of program, practice or policy if the Milestones are not reached or do not indicate measurable progress toward achieving the goals. Any trigger will be based on the best available science, engagement of interested parties and state agencies.

3) OLEC, Ohio EPA, ODA and ODNR will meet with the Maumee Conservancy District to evaluate their role related to the design, construction, funding and management of storm water management including water retention/detention options. More effectively managing surface and subsurface water would help to minimize "flashiness" of streams often resulting in short-term but higher nutrient loads. The conservancy district model may be a structure worth evaluating as a way for implementation and funding large-scale water management issues in the WLEB.

Ohio Department of Agriculture (ODA)

1) ODA will develop a Farm Stewardship Certification for farmers who protect farmland and natural resources by voluntarily implementing best management practices (BMPs) on their farms. Farmers that fully implement the 4Rs, including nutrient placement or nutrient application onto a living crop, will be eligible to receive this newly created certification. A farm level nutrient management plan (NMP) will provide verification that appropriate BMPs have been implemented and all aspects of the 4Rs are being utilized. Ohio's SWCDs will assist with the review and verification components of the NMP and will recommend farms deserving of the stewardship certification. Acres included in the NMPs and enrolled in the certification program will be tracked at the HUC 12 level.

2) ODA will identify existing programs and consider development of new programs to install practices that reduce or eliminate water quality impacts from agricultural drainage. This will include programs for the installation of drainage control structures and developing incentives for water detention/retention structures in the agricultural landscape.

3) ODA will work with NRCS to encourage the establishment of stream-line processes, sign-up periods, and application requirements for various federal and state funding and technical assistance programs. This may include developing a "carve-out" of Farm Bill programs and processes specific to the multi-state Lake Erie basin for a specified period.

4) ODA will work with NRCS and encourage an assessment of the scoring criteria for Farm Bill program eligibility to ensure that those farmers in most need of technical and financial assistance are receiving higher consideration for assistance.

Ohio Department of Natural Resources (ODNR)

1) ODNR will continue to coordinate with and assist the USFWS/NOAA Upper Midwest and Great Lakes Landscape Conservation Cooperative (LCC) coastal conservation workgroup to develop a tool to identify potentially restorable wetlands for the western basin that incorporates landscape conservation design principles and goals, with a focus on restoring and conserving functional coastal wetlands that maximize coastal habitat, water retention, sediment trapping and nutrient processing/reduction benefits and in cooperation with Ohio Sea Grant shall jointly fund projects to investigate and quantify nutrient processing and reduction benefits of coastal wetlands.

2) ODNR through the Division of Wildlife will evaluate opportunities through their Private Lands program and joint state-federal programs to develop projects within subwatersheds with a focus on the identified priority watersheds in the basin that provide a combination of long-term wildlife habitat along with water quality benefits such as riparian buffers and wetlands.

Appendix A

The Role of Maumee River Subwatershed TMDLs in meeting the Goals of the Collaborative

The Total Maximum Daily Load (TMDL) program, established under Section 303(d) of the Clean Water Act, focuses on identifying and restoring polluted rivers, streams, lakes and other surface waterbodies. TMDLs are prepared for waters identified as impaired on the 303(d) list in the Integrated Report which is provided by Ohio EPA to the U.S. EPA as a requirement of the Clean Water Act.

A TMDL is a written, quantitative assessment of water quality problems in a waterbody and contributing sources of pollution. It specifies the amount a pollutant needs to be reduced to meet water quality standards, allocates pollutant load reductions, and provides the basis for taking actions needed to restore a waterbody. Each TMDL report includes an implementation plan that lists these actions.

Watersheds are assessed on a rotating basis. The current schedule for reassessing each subwatershed of the Maumee is given in the most recent Integrated Report (also see table). The oldest assessment and approved TMDL is the one for the Upper Auglaize River, which was completed in 2004. This subwatershed is scheduled for an updated assessment in 2018.

There are six completed TMDLs for subwatersheds of the Maumee River and three in preparation. All the TMDLs contain phosphorus load allocations for some or all parts of the respective subwatershed, based on local impairments due to nutrient loading. As of the current publication of the Collaborative Implementation Framework, these TMDLs have not factored in phosphorus load allocations based on proposed phosphorus targets for Lake Erie. However, the actions recommended to address local nutrient impairments will also aid in reducing the loading to the lake.

In addition to actions recommended in the Collaborative Implementation Framework, we incorporate the implementation plans from each TMDL for the Maumee, Portage, Toussaint, and Sandusky Rivers by reference (see list).

List of Maumee Basin TMDL documents

Total Maximum Daily Loads for the Upper Auglaize River Watershed Final Report. Ohio EPA Division of Surface Water. August 16, 2004.

Total Maximum Daily Loads for the Blanchard River Watershed Final Report. Ohio EPA Division of Surface Water. May 22, 2009.

Total Maximum Daily Loads for the Maumee River (lower) Tributaries and Lake Erie Tributaries Watershed Final Report. July 5, 2012. Tetra Tech Inc.

Total Maximum Daily Loads for the Ottawa River (Lima Area) Watershed Final Report. Ohio EPA Division of Surface Water. November 6, 2013.

Total Maximum Daily Loads for the Powell Creek Watershed Final Report. Ohio EPA Division of Surface Water. April 7, 2009.

Total Maximum Daily Loads for the Swan Creek Watershed Final Report. Ohio EPA Division of Surface Water. October 9, 2009.

Location	Due Date (TMDL)	Due Date (Implement. Plan)	Contaminants addressed	Comments
TMDL and Implementation work in the Sandusky River Watershed				
Sandusky Upper	TMDL Approved 9/29/2004		Phosphorus, bacteria, sediment	Next assessment scheduled for 2019.
Sandusky Lower	TMDL Approved 8/11/2014	Final draft in progress (2016)	Nutrients (TP and N+N), turbidity (TSS) bacteria (E. coli)	Next assessment scheduled for 2024.
TMDL and Implementation work underway in the Maumee River Watershed				
Maumee Upper TMDL	June 2017	N/A	Nitrates, nutrients, E. coli	Assessment completed in 2015.
Maumee Upper Implementation Plan	N/A	TBD	Nutrients (P/nitrate), sediments, unionized ammonia, total toxics	
Tiffin River TMDL	February 2018	October 2018	TBD	Tiffin to be linked with St. Joseph. Assessment completed in 2013.
St. Joseph River Watershed TMDL	September 2018	N/A	Bacteria, nutrients, sediment	No separate implementation plan. Assessment completed in 2013.
Auglaize River (lower)	N/A	N/A		Assessment completed in 2014.
St. Mary's River	N/A	N/A		Assessment completed in 2015.
Approved TMDLs in the Maumee River Watershed				
2004 – Upper Auglaize River TMDL	TMDL Approved 9/23/2004			Next assessment scheduled for 2018.
2009 – Blanchard River TMDL	TMDL Approved 7/2/2009		Bacteria, nutrients, sediment	Next assessment scheduled for 2020.
2009 – Powell Creek TMDL	TMDL Approved 6/18/2009		Nutrients, sediment	
2010 – Swan Creek TMDL	TMDL Approved 1/6/2010		Bacteria, nutrients, sediment	Next assessment scheduled for 2022.
2012 - Maumee Lower TMDL	TMDL Approved 9/25/2012		Nutrients (TP and N+N), ammonia, TSS, E. coli	Next assessment scheduled for 2023.
Approved TMDLs in Portage River Watershed (adjacent to Maumee River)				
2006 – Toussaint River TMDL	TMDL Approved 9/22/2006		Nutrients (sediment and habitat)	Next assessment scheduled for 2023.
2011 – Portage River TMDL	TMDL Approved 9/30/2011		Bacteria, nutrients, sediment	Next assessment scheduled for 2023.

Appendix B

Loading Milestones and Proposed Monitoring Strategy

Water Quality Milestones

The Collaborative has established a goal of 20 percent reduction in total and dissolved phosphorus loads by 2020 and a 40 percent reduction by 2025, using 2008 as a base year. These goals are for the springtime loading of phosphorus to limit harmful algal blooms (HABs).

These goals apply to tributary watersheds to the Western Lake Erie Basin in Ohio, which include the Maumee River, Portage River and Toussaint River. The same springtime loading goal also applies to the Sandusky River to control HABs occurring in the Sandusky Bay. Specific numeric milestones, which are the loading targets pinned to specific times, have so far only been developed for the Maumee River. While the Annex 4 of the GLWQA did not set a specific numeric loading target for the Sandusky River, sufficient data exists to develop milestones.

To track progress in the Maumee River, loading data from the Maumee River near Waterville United States Geologic Survey (USGS) gage station (04193490) will be used. Water quality monitoring is conducted at the Maumee River near Waterville USGS gage station on a regular basis by the National Center for Water Quality Research (NCWQR) at Heidelberg University. Springtime total and dissolved phosphorus loading at the monitoring stations are presented on Figure B1 and B2, respectively. The target loads for 2020 and 2025 are also noted on these figures.

The Sandusky River is monitored near Fremont, OH (USGS 04198000) with water quality monitoring conducted by NCWQR as well. Springtime loads for total and dissolved phosphorus, both with target loads, are presented for the Sandusky River in Figure B3 and B4, respectively. All figures include springtime stream discharge because there is a strong correlation between total load and streamflow.

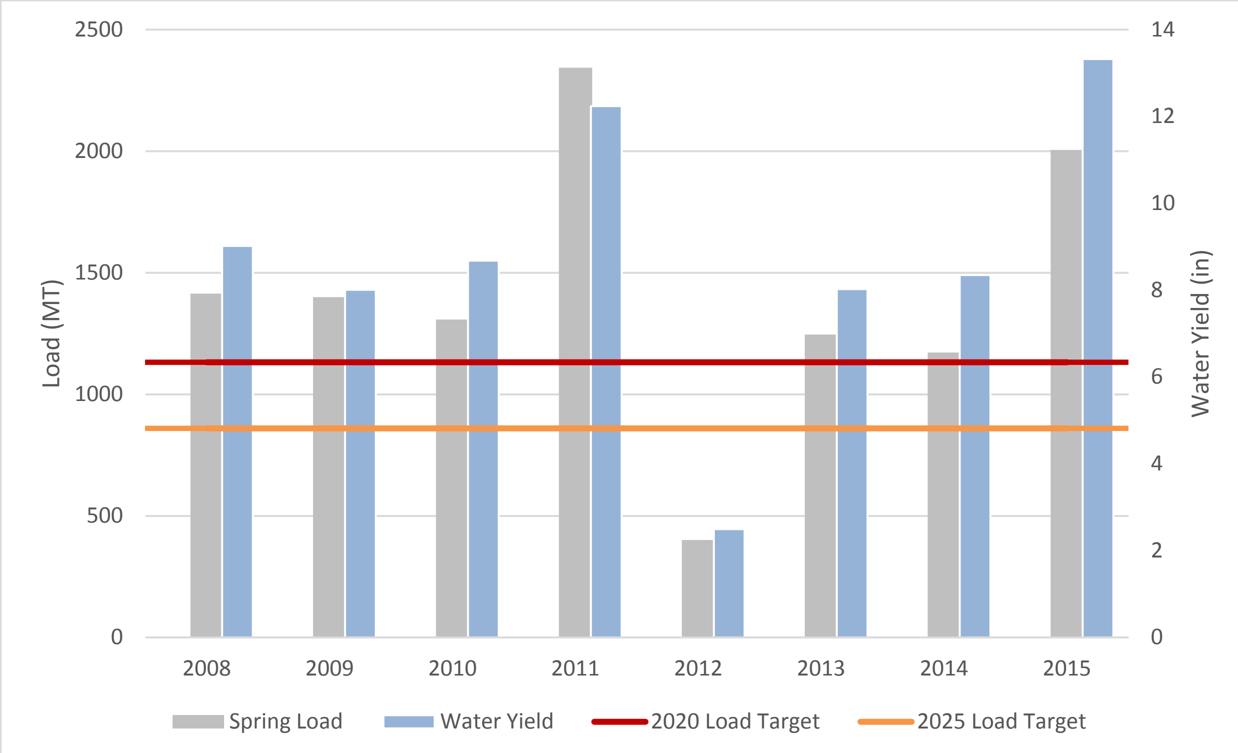

Figure B1: Springtime total phosphorus loading and water yield for the Maumee River from 2008 - 2015. Collaborative milestones of 20 percent reduction by 2020 and 40 percent by 2025 are included. Water yield is the total streamflow normalized by watershed area, this yield represents the amount of precipitation in inches that resulted in stream discharge.

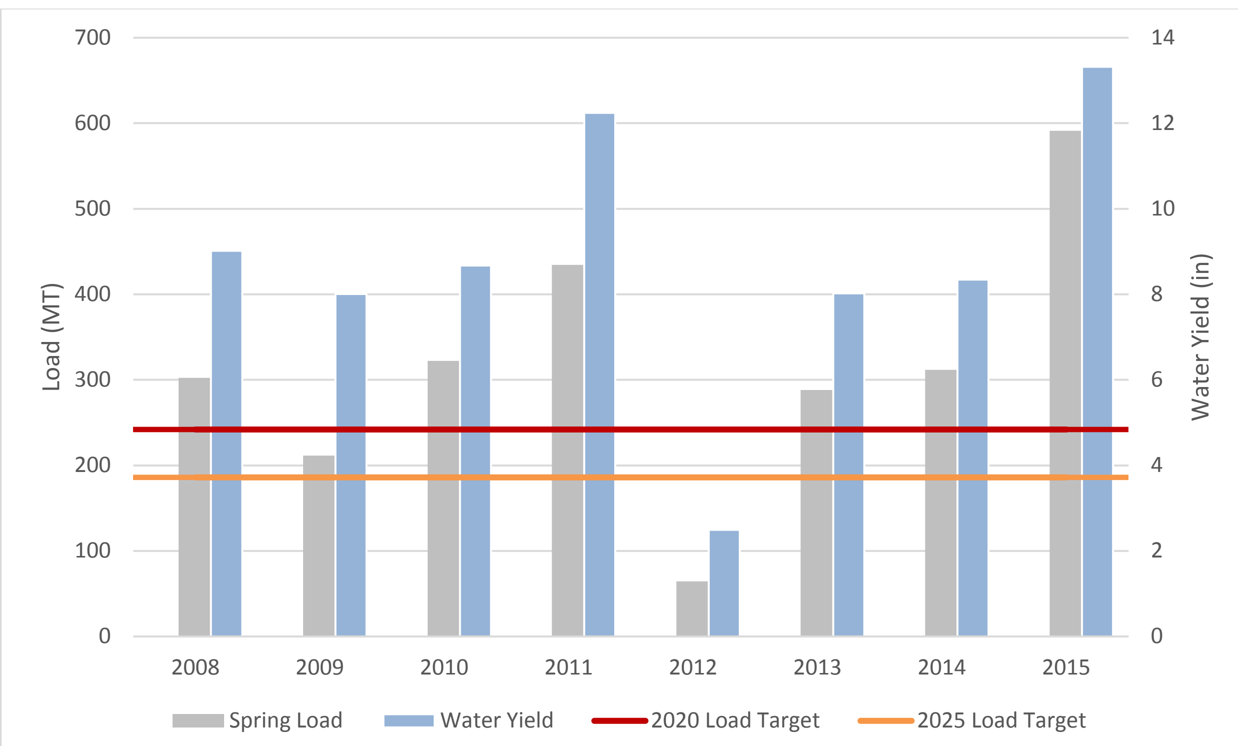

Figure B2: Springtime dissolved reactive phosphorus loading and water yield for the Maumee River from 2008 - 2015. Collaborative milestones of 20 percent reduction by 2020 and 40 percent by 2025 are included. Water yield is the total streamflow normalized by watershed area, this yield represents the amount of precipitation in inches that resulted in stream discharge.

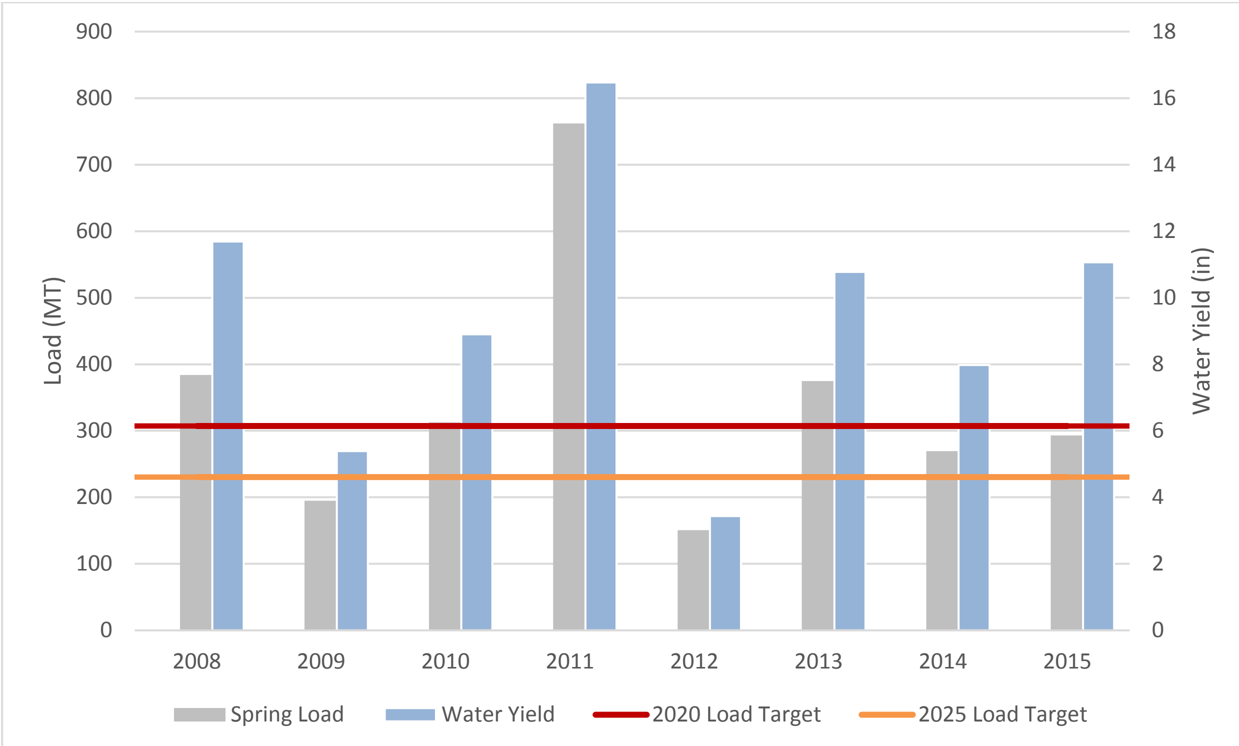

Figure B3: Springtime total phosphorus loading and water yield for the Sandusky River from 2008 - 2015. Collaborative milestones of 20 percent reduction by 2020 and 40 percent by 2025 are included. Water yield is the total streamflow normalized by watershed area, this yield represents the amount of precipitation in inches that resulted in stream discharge.

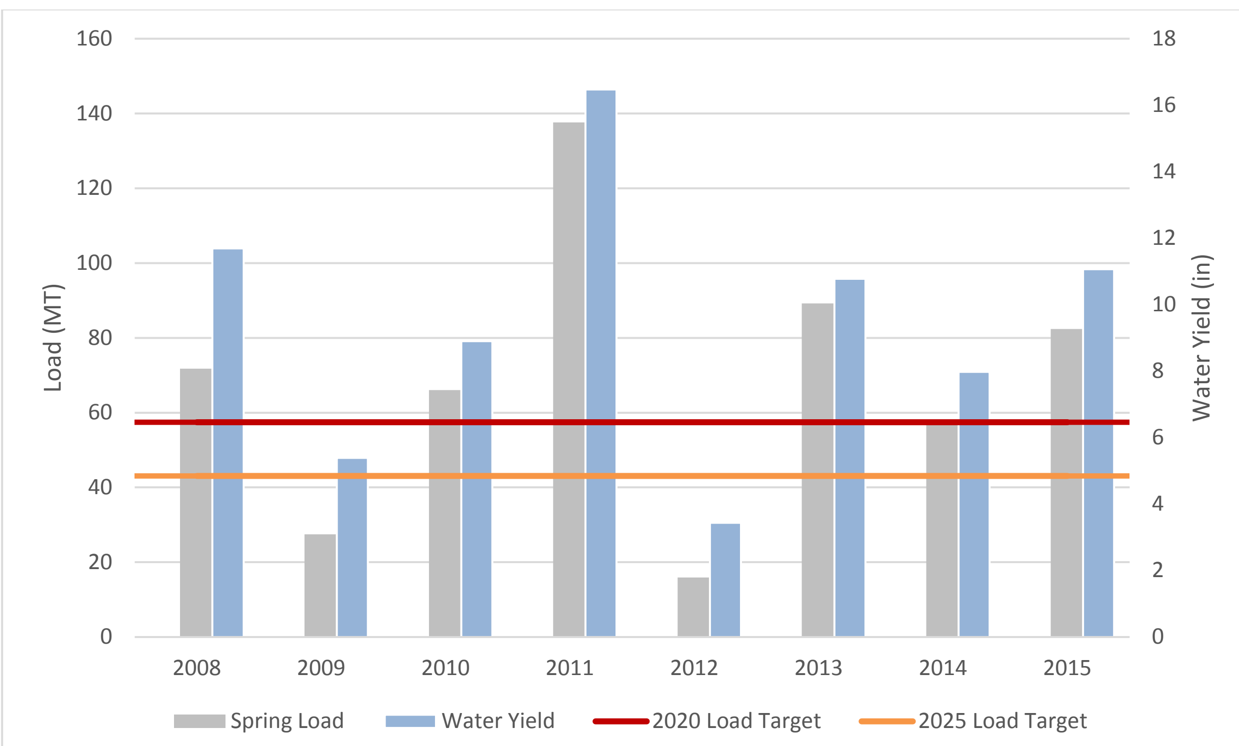

Figure B4: Springtime dissolved reactive phosphorus loading and water yield for the Sandusky River from 2008 - 2015. Collaborative milestones of 20 percent reduction by 2020 and 40 percent by 2025 are included. Water yield is the total streamflow normalized by watershed area, this yield represents the amount of precipitation in inches that resulted in stream discharge.

Total phosphorus load is strongly influenced by flow, which is the primarily driven by precipitation. There are implementation practices that can affect streamflow; for example, controlled tile drainage and other hydraulic retention practices. However, there is substantial noise in examining annual loads due to the influences from flow. As we approach the milestones on the timeline, improvements will be indicated (in part) by an uncoupling the phosphorus load from flow. The preferred method for doing this is to compute a flow weighted mean concentration. The FWMC is the total load for the time period divided by the total discharge for the time period. FWMC standardizes the measure of phosphorus delivery from a tributary so that year-to-year and trib-to-trib performance can be compared despite different flows.

Development of similar milestones for the other river basins, and for the sub-basins of the Maumee River, is underway where possible and will be added to future versions of this document. Data collection for the Portage River began in 2011. Data collection for the sub-basins of the Maumee River began with the 2014 water year. Options for developing milestones for the Portage River and Maumee sub-basins are being considered that include applying the percentage reduction targets to a year which had a similar flow to 2008, or using modeling methods to estimate the 2008 load.

At this time, there is insufficient monitoring information for the Toussaint River to develop milestones. Due to its small drainage area, the Toussaint River has a low load contribution when compared to the total WLEB load. However, this does not mean the yield, or intensity of the Toussaint load, is well understood and phosphorus reduction efforts should still be pursued in the watershed.

The Collaborative goals focus on phosphorus reduction efforts that impact HAB formation in the WLEB and Sandusky Bay. Looking toward the Domestic Action Plan required under the GLWQA, annual total phosphorus milestones will be developed to mitigate hypoxia (low dissolved oxygen) in the Central Basin of Lake Erie. Two central basin tributaries already have sufficient data to calculate milestones, the Sandusky and Cuyahoga Rivers. However, data is lacking for other priority watersheds in the Central Basin including the Huron, Vermillion and Grand rivers. These load and concentration milestones will be developed for each tributary as work progresses on the Domestic Action Plan.

To measure progress toward these milestones, it is important to continue and expand monitoring efforts. The State of Ohio is committed to working with the Annex 4 Subcommittee's Objectives and Targets Task Team as they develop further the Lake Erie Tributary Monitoring Strategy that will inform progress on the GLWQA Annex 4 targets, which are in line with the Collaborative goals. Along with that effort, Ohio EPA will continue its existing program of ambient monitoring and TMDL assessment in the Lake Erie watershed as outlined in the annual Study Plans for the Division of Surface Water and the biennial Integrated Report. The following section details the efforts to establish an improved monitoring strategy for the WLEB and Sandusky River tributaries.

Monitoring Strategy

This section defines the existing monitoring locations and proposes monitoring goals that help track the progress of the Collaborative directives. Also, a general outline of existing funding sources will be identified to assist long term planning and strategies to ensure long term success of the monitoring program. Table B1 and Figure B5 detail these efforts which are further discussed below.

There are 16 sites within the WLEB and Sandusky River watershed that have sufficient water quality and flow data for load calculations. These sites are maintained by both the NCWQR at Heidelberg University and the

USGS. Funds for the load monitoring stations are from federal, state and local governments as well as private enterprises. These stations were chosen to better understand the impact of loading from different regions within the WLEB and provide data for nutrient loading trends. However, many of these stations have been added since 2007. Ensuring funding for these stations for the long term is critical to measuring the success of nutrient reduction efforts.

Most of the existing stations in the WLEB and Sandusky River watershed are at sites representing large watershed areas. While these are useful in understanding nutrient loadings of these areas, at this scale it is difficult to understand the impact that management practices have on stream loading. Therefore, in 2014 Ohio EPA received a grant to conduct enhanced water quality monitoring at 13 smaller watersheds throughout the WLEB and Sandusky River watershed. Two of these stations are included in the group of 16 sites where loading calculations could be completed because the sampling was done at sufficient frequency by USGS. The remaining 11 stations were monitored by Ohio EPA.

After the first two years of Ohio EPA monitoring at the 11 stations, the sample frequency and method were determined to be insufficient to calculate loads. Currently Ohio EPA is proposing to eliminate six of these stations to consolidate resources that will result in better quality data at fewer sites. In addition to the elimination of six stations, two of the remaining stations are proposed to move to new locations based mostly on the watershed prioritization in the Collaborative Implementation Framework (Appendix C).

Two new large watershed water quality sites are also proposed, one on each the St. Joseph and St. Marys Rivers. Discharge monitoring already exists on the St. Joseph and St. Marys Rivers at these locations, therefore only water quality monitoring equipment would need to be installed. These two stations are critical for the State of Ohio to monitor progress toward the goals of the Collaborative in cooperation with Michigan and Indiana, who share jurisdiction in these watersheds.

It is the goal of the over-all water quality monitoring strategy to eventually include monitoring data from edge of field, subwatershed, primary watersheds and Lake Erie to provide a total picture of nutrient sources and the nutrient delivery system.

Table B1: List of existing and proposed load monitoring stations in the WLEB within Ohio.

Geographic location	Monitoring Program Name	Sampling Agency	Timeframe
Data Sufficient for calculating loads			
Maumee River near Waterville, OH	Heidelberg Tributary Loading Program	NCWQR	1/10/1975-9/30/1978; 10/13/1981-current
Maumee River near Waterville, OH	GLRI	USGS	continuous data 2011 to current -- misc WQ to 1967
Sandusky River near Fremont	Heidelberg Tributary Loading Program	NCWQR	10/2/1974-current
Portage River at Woodville	Heidelberg Tributary Loading Program	NCWQR	8/30/2010-current
Blanchard River near Findlay	Heidelberg Tributary Loading Program	NCWQR	7/9/2007-current
Tiffin River at Stryker	Heidelberg Tributary Loading Program	NCWQR	7/9/2007-current
Unnamed Tributary to Lost Creek near Farmer	Heidelberg Tributary Loading Program	NCWQR	10/1/1981-9/30/1993; 10/1/2007-current
Honey Creek at Melmore	Heidelberg Tributary Loading Program	NCWQR	1/28/1976-current
Maumee River at Antwerp OH	WLEB OH DNR	USGS	2013 to current -- misc WQ back to 1952
Tiffin River near Evansport OH	WLEB OH DNR	USGS	2013 to current
Blanchard River near Dupont OH	WLEB OH DNR	USGS	2013 to current -- Misc WQ back to 1966
Ottawa River near Kalida OH	WLEB OH DNR	USGS	2013 to current -- Misc WQ back to 1966
Auglaize River near Defiance OH	WLEB OH DNR	USGS	2013 to current -- Misc WQ back to 1952
Maumee River near Defiance OH	WLEB OH DNR	USGS	2013 to current -- Misc WQ back to 1952
Auglaize River near Fort Jennings OH	WLEB OH DNR	USGS	2013 to current -- Misc WQ back to 1965
Little Auglaize River at Melrose, OH	WLEB OH EPA	USGS	2015 to current
Swan Creek at Champion Street at Toledo, OH**	WLEB OH EPA	USGS	2015 to current
Enhanced monitoring but not enough data for loading calculations; <u>proposed to increase sampling frequency</u>			
Little Flatrock Creek near Junction @ Emerald TR 139	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA*	3/12/2015-current
Wolf Creek near Toledo @ Holland in Sylvania	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA*	3/26/2015-current
S. Turkeyfoot Creek near Shunk @ Henry CR N	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA*	3/12/2015-current
Rock Creek near Republic @Seneca CR 43	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA*	3/18/2015-current
West Creek near Hamler @ SR 109	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA*	3/20/2015- current

Table B1 cont.

Enhanced monitoring but not enough data for loading calculations; proposed to discontinue			
Ai Creek near Swanton @ State Route 2	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA	3/26/2015-current
Blue Creek near Whitehouse @ Finzel Road	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA	3/26/2015-current
Bad Creek near Delta @ County Rd 8-1	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA	6/11/2015-current
Flatrock Creek near Payne @ SR 613	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA	3/12/2015-current
The Outlet above Findlay @ Biglick TR 251	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA	3/19/2015-current
Wolf Creek near Kansas @Liberty TR 103	Ohio EPA Enhanced Tributary Monitoring in the WLEB	Ohio EPA	3/18/2015-current
New Stations Proposed			
St. Joseph River near Newville, IN	TBD	TBD	Proposed for 2017
St. Marys River near OH/IN State Line	TBD	TBD	Proposed for 2017
Prairie or Middle Creek (Trib of Little Auglaize)+	TBD	TBD	Proposed for 2017
Upper Auglaize River near Wapakoneta+	TBD	TBD	Proposed for 2017

*Sampling was completed from 2015 - present by Ohio EPA staff but partners are being considered for future monitoring.

**Problems with flow monitoring at this station reduced the confidence in loading calculations, based on an evaluation of resources this station may be discontinued.

+Station location is approximate and alternatives may be considered as the monitoring strategy develops in the coming months.

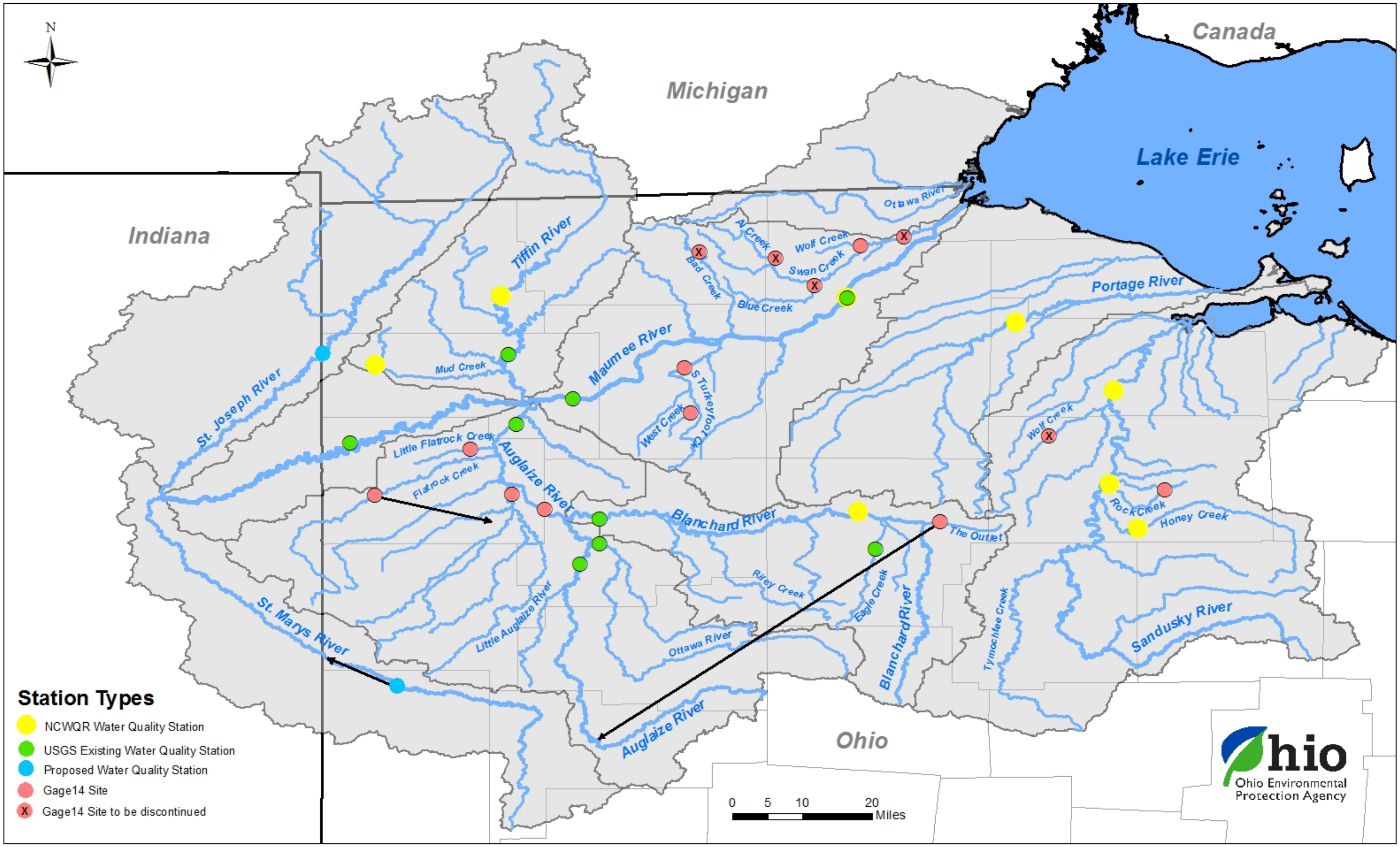

Figure B5: Existing and proposed load monitoring stations in the WLEB. Arrows direct existing stations that are being considered to be moved and a possible location for that move.

Appendix C

Methodology for Prioritization of HUC 12 Subwatersheds in the Maumee River Watershed

Introduction

The Maumee River watershed in Ohio is more than four million acres of diverse landscape superimposed by one dominant land use: row crop production. Producers use a variety of management practices to ensure the productivity of their crops while preventing the loss of soil and nutrients from their fields. Some areas of the Maumee River watershed are more prone to nutrient loss than others, and the need for particular best practices vary across the watershed.

To better understand this geographic variation and more specifically manage and verify the efforts to reduce nutrient loss, all subwatersheds in the basin have been prioritized utilizing a methodology based on various geo-physical characteristics, and the potential for nutrient contribution. The rational for prioritizing all areas in the Maumee watershed is so implementation resources and monitoring of water quality improvement can be focused on areas with the greatest potential for documented water quality improvements from nutrient reduction practices. This is intended as a starting point and a management tool as part of the adaptive management process. It is not meant to be exclusionary of the need for nutrient management practices and documentation throughout the entire watershed.

HUC 12 subwatersheds are divided into three levels of priority, with level 1 being the top priority and level 3 being the lowest (Figure C1). Twenty-four HUC 12s in the Maumee River watershed have been identified as highest priorities based on nutrient export potential. There are 120 HUC 12s determined to be at the middle priority level and 41 at the lowest priority.

Understanding that phosphorus losses are different based on watershed characteristics will aid in planning implementation efforts. Figure C3 shows priority level 1 subwatersheds subdivided by distinct implementation groups. These groups are based on the primary phosphorus loss mechanism/route that resulted in the models identifying each subwatershed as a priority. This should result in using different best management practices (BMPs) to achieve the desired phosphorus reductions. There are four implementation groups representing the largest exported load contribution:

1) high proportion of hydrologic soil group D (intensive drainage and tillage);
2) high soil slope (erosion);
3) livestock density (nutrient source and timing); and
4) various landscape characteristics.

Additional reasoning for the prioritized watershed approach is to improve “cause and effect” feedback by focusing implementation efforts *and* monitoring in the same areas. Appendix B details the existing and proposed load monitoring in the WLEB and the Sandusky River watershed, with emphasis on the Maumee River watershed. This will provide critical information about the success of the implementation efforts that address both point and non-point sources.

The same modeling effort used to identify priority watersheds shows that phosphorus management practices will have to be adopted widely across the landscape to achieve phosphorus reduction goals (Scavia et al. 2016). Also, a report from the Conservation Effects Assessment Project (CEAP) shows a simulated solution that requires adoption of improved nutrient management, erosion control and cover crops on 95 percent of cropped acres to achieve a total phosphorus reduction of 43 percent (USDA NRCS 2016). While the CEAP addresses the need for nutrient management throughout the WLEB, there is concern that it may be difficult to measure and verify significant water quality change resulting from specific and verifiable nutrient reduction practices if implementation of those resources are randomly spread across the entire basin. The prioritization of watersheds is not, however, intended to preclude other areas of on-going nutrient reduction actions. The proposed prioritization of watersheds is intended to compliment the NRCS preferred CEAP and other nutrient reduction efforts throughout the WLEB, so long as verifiable water quality improvements resulting from documented nutrient reduction practices, for both point and non-point sources, can be realized.

This appendix explains how the priority subwatersheds and subdivided groups of the priority level 1 subwatersheds were determined. Limitations of the prioritization method are also outlined in this appendix. Tables listing the priority level of each HUC 12 subwatershed are at the end of this appendix.

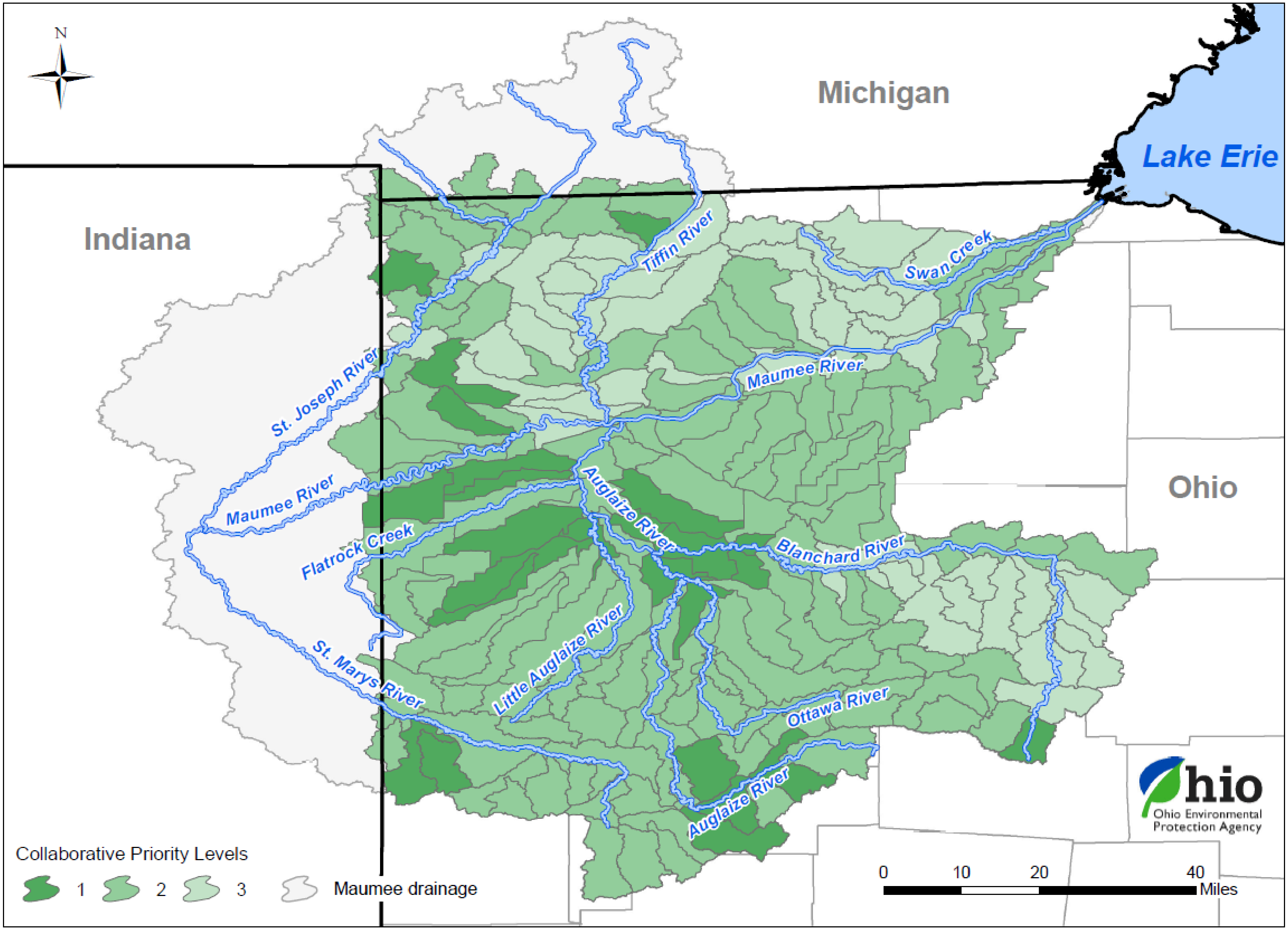

Figure C1: Priority levels for the HUC 12 subwatersheds in the Maumee River watershed.

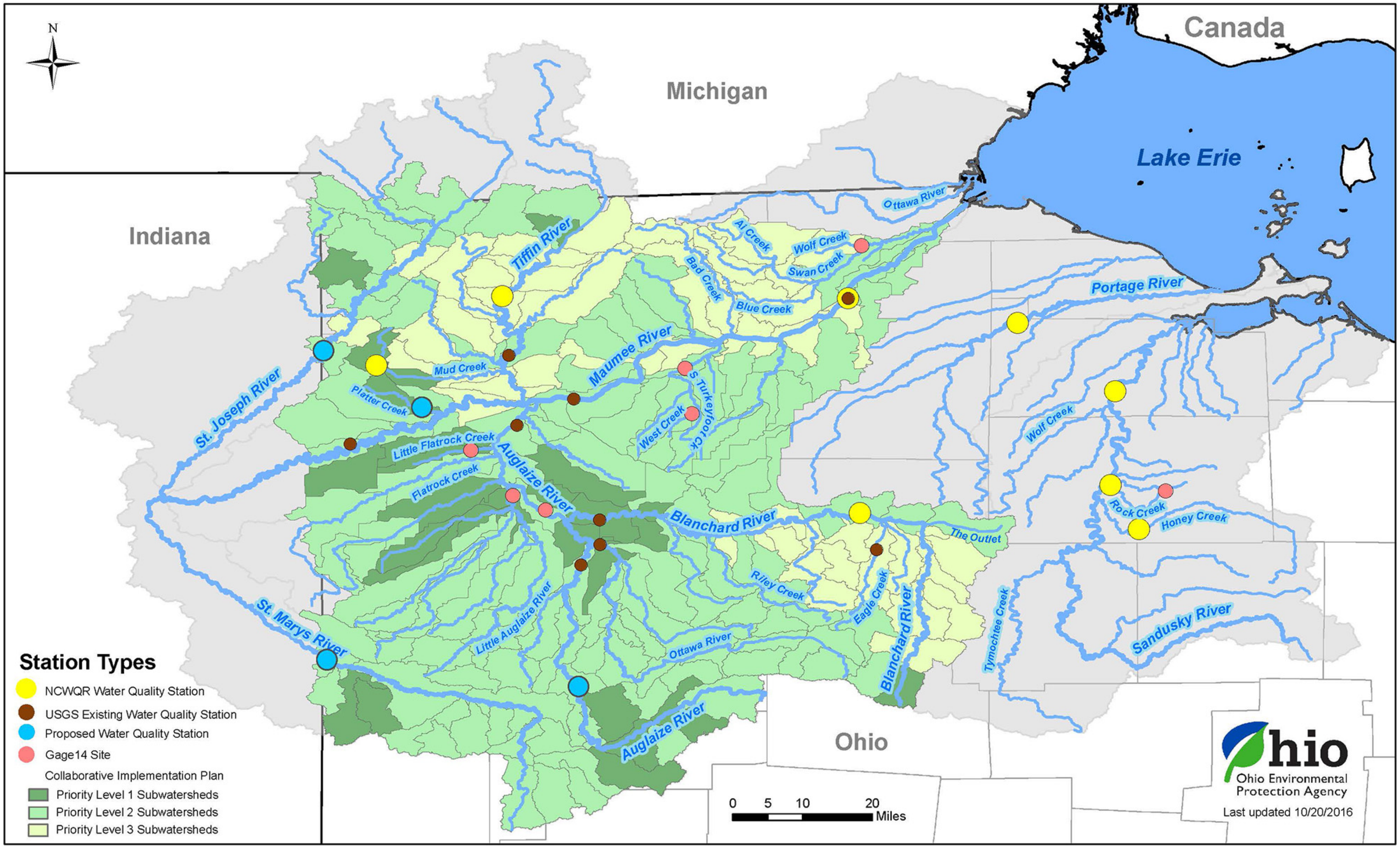

Figure C2: Lake Erie Western Basin Drainage in Ohio: Load Monitoring Existing and Proposed Stations.

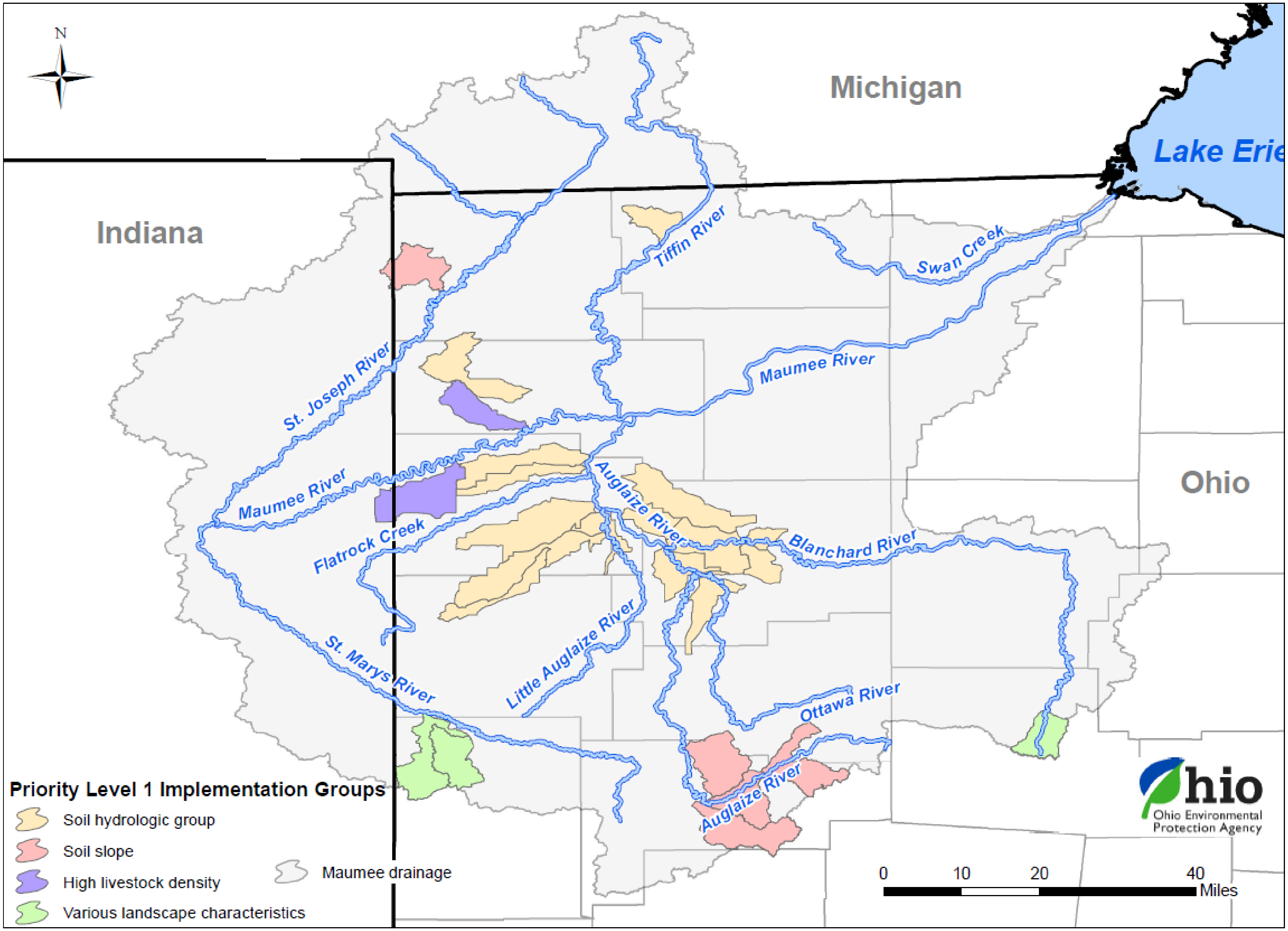

Figure C3: Level 1 priority HUC 12 subwatersheds in the Maumee River watershed subdivided into four implementation groups. Groups are noted by different colors.

Data Sources

Various sources of data are used to determine priority watersheds. This section outlines these data sources and how they are used.

Informing Lake Erie Agriculture Nutrient Management via Scenario Evaluation (Scavia et al. 2016)

A recent report has directly examined the issue of nutrient export in the Maumee River watershed (Scavia et al. 2016). This report considers the results from modeling analyses carried out by its coauthors, a wide range of resource experts from University of Michigan, Ohio State University, United States Agricultural Research Service, LimnoTech (a consultancy), Heidelberg University, United State Geological Survey, The Nature Conservancy and Texas A&M. Five Soil and Water Assessment Tool (SWAT) models and one SPAtially Referenced Regressions on Watershed attributes (SPARROW) model are examined and aggregated. One product of this report is the identification of "hotspot" subwatersheds. These hotspots are determined by agreement among the various models on the top 20 percent of nutrient export (Figure C4).

It is important to understand that all pollutant modeling has limitations of resolution. These start with the inputs and are carried through modeling computations into the outputs. One limitation with regards to the SWAT models examined in Scavia et al. 2016 is that existing row crop agricultural practices (for example, planting, tilling and fertilizing) and pollutant reduction BMPs are not input with geographic detail at the HUC 12 level. This Collaborative document recognizes those limitations when using hotspots to determine priority subwatersheds. Additionally, this document aims to make clear the unknowns of nutrient export inherent in the modeling when describing each priority level 1 implementation group.

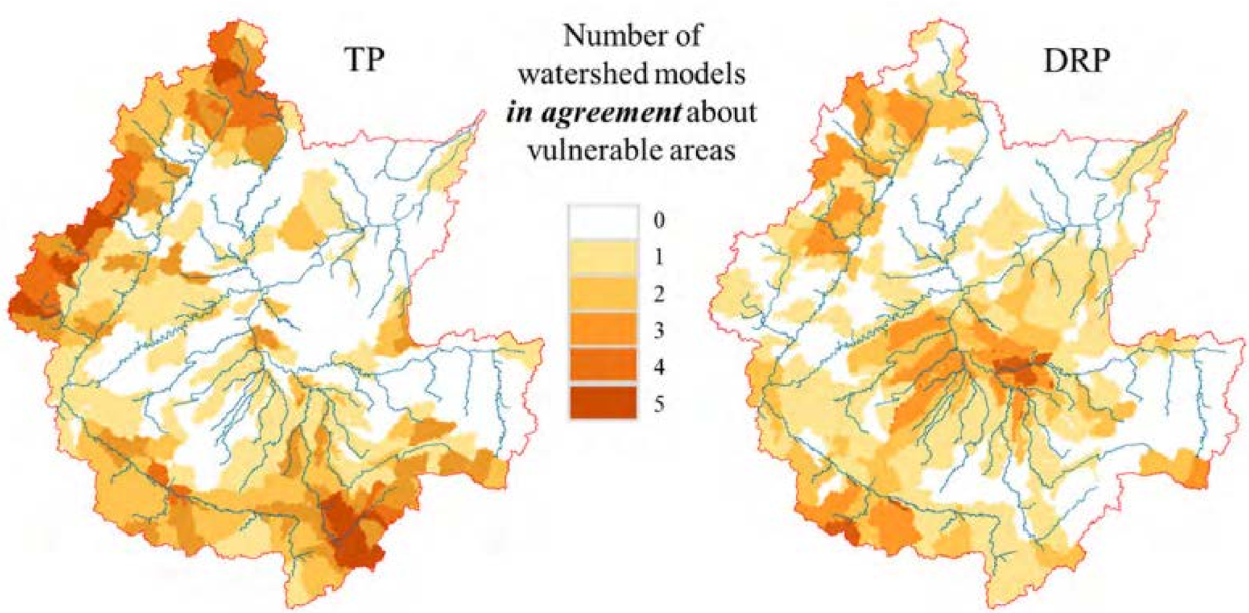

Figure C4: Potential "hotspots" of nutrient export to Western Lake Basin in the Maumee River watershed identified by comparing multiple models. Scale is 0 to 5 based on models in agreement. There were six models used in the total phosphorus (TP) map, however all six models did not agree on any area. Only five models are used in the dissolved reactive phosphorus (DRP) map. Figure source: Scavia et al. 2016.

Ohio EPA Monitoring Data

Ohio EPA stream survey TP data in the Maumee River watershed from 1999-2005 were examined as part of the evaluation to prioritize subwatersheds. Approximately 10,500 records were examined throughout this area. Samples of WWTP effluent were removed as not indicative of instream conditions. Records from samples collected as part of complaint response were also removed as not indicative of typical in-stream conditions. To focus on HUC 12 subwatersheds, sites draining more than 200 square miles were removed. This included samples taken on the main stems of the large rivers.

The bulk of Ohio EPA samples are collected in the summer field sampling season when biological indices are assessed (March through September). The result is a purposeful bias of low-flow sources representing a critical condition for stream biology. Using these data alone to prioritize nutrient export far-field, that is as it relates to Lake Erie loading targets, without hydrologic considerations (for example, weightings) is not appropriate. Rather these data are used to flag watersheds with relatively high TP concentrations and are currently most useful in understanding particular low-flow sources for nutrients, such as point source discharges.

Miscellaneous Data Sources

Additional data may be used in the future to further quantify factors influencing water quality in particular counties or watersheds. This may include NPDES permit limits, biosolid field application data, fertilizer sales, nutrient management training and certifications and BMP implementation.

Determining Priority Levels and Implementation Groups

The priority levels were determined based on the hotspot analysis from the Scavia et al. 2016 report. The SPARROW model results do not consider DRP and the model's treatment of livestock manure input is overly generalized. Because of this, only the SWAT model results from the Scavia et al. 2016 report were directly used for prioritization in this Collaborative report.

Areas with at least four SWAT models in agreement for TP or three models in agreement for DRP are considered viable hotspots to be assigned the priority level 1 (Tables C1-C4). If those hotspots do not align completely with a HUC 12 boundary, priority is given to the entire HUC 12 containing the hotspot. HUC 12s with headwaters in Indiana or Michigan, or that only include a mainstem river and small direct tributaries in Ohio, are excluded from becoming priority subwatersheds. Both these exclusions are due to practical geographic reasons that limit Ohio's ability to implement practices in the entire watershed area.

The remaining HUC 12s are assigned to the middle, priority level 2 if they have area that is identified by three, two or one SWAT model as a TP hotspot; or area with two or one models identifying a DRP hotspot (Table C5). The HUC 12s remaining (ones where the Scavia et al 2016 report SWAT models did not identify any TP or DRP SWAT model hotspots) are assigned to priority level 3 (Table C6).

In examining the priority level 1 HUC 12s, it is evident that the nature of the modeling input, processes and output makes for some common features that explain nutrient export. Since the Collaborative focuses on implementation, it is appropriate to identify the common features of the top priority watersheds that affect nutrient export. To do this, primary source groups are delineated.

It is important to note that while top priority watersheds are placed into these groups, other sources of nutrient export are certainly present in each watershed. Additionally, some sources of TP, such as areas with a high density of failing home sewage treatment systems and sanitary NPDES dischargers without nutrient limits, are noted within tables below in this appendix.

Priority level 1 implementation group 1: Prioritized HUC 12s with a high density of hydrologic soil group type D

Fourteen priority level 1 HUC 12s have been identified in this group (Table C1). This group has high percentages of soil group D, which is characterized by very low infiltration rates even when drained. In the Maumee River watershed, these soils are most common within the extent of the Great Black Swamp which was drained for agricultural production. The low infiltration rates may result in reduced effectiveness of subsurface drainage systems, so drainage practices could include surface enhancements that may promote surface runoff.

The SWAT models generally identify these regions as being a high source of dissolved reactive phosphorus (DRP) loading. The models predict the potential for elevated DRP loading when subsurface drainage intensity is high. Based on the way subsurface drainage is incorporated into the model, these areas are likely treated as heavily tiled (Kalcic and Logsdon Muenich 2016). While tile are most certainly present in these areas, the models may be over predicting the DRP contributions from them. This is because surface drainage may be promoted through various practices. Despite this modeling limitation, prioritizing these areas is warranted to promote a better understanding of the phosphorus loading.

The differences noted in agricultural management practices in these areas lead to unique phosphorus management challenges. The soils have high clay content and these clays are easily suspended by precipitation and melt-water and carried with the runoff as colloids. These surface clays are likely associated with elevated phosphorus concentrations. Management practices might focus on improved infiltration and water holding capacity of the soil (if possible), increased residue cover, cover crops and nutrient incorporation since nutrients surface applied are especially prone to runoff.

Priority level 1 implementation group 2: Prioritized HUC 12s of high slopes (erosion)

Five priority level 1 subwatersheds have been identified in this group (Table C2). A primary source of phosphorus from the agricultural landscape is that which is bound to sediment eroded from fields. Soil loss due to erosion is strongly affected by slope, as more energy is generated by the water as it moves across the landscape. While much of the Maumee River watershed is characterized by exceptionally low slopes, the watershed is bounded by glacial end moraines. This leads to slightly undulating topography, where potential for erosion is increased. Consequently, agricultural practices that help to mitigate erosion are more common in these areas.

One of the limitations of SWAT is its inability to capture conservation practices as they exist on the landscape. SWAT modeling results often identify areas with higher soil slopes as having elevated total phosphorus loads. While this represents the potential of the landscape to have increased phosphorus yields, it is likely the potential is reduced by existing agricultural practices not included in the SWAT model. The models used in the Scavia et al. hotspot analysis are no exception to this (Confesor 2016; Kalcic and Logsdon Muenich 2016).

Subwatersheds identified in this group are expected to have high potential for phosphorus loading linked to erosion. Consequently, the types of BMPs that should be targeted in these priority areas can be customized to this condition. These practices would include: grassed waterways designed to reduce nutrients where concentrated flow exists, conservation tillage, no-till, streamside retention practices and other practices that improved infiltration and slow down runoff. It is likely that the aforementioned practices are already common in these watersheds. If the adoption of appropriate conservation practices is documented in these watersheds, the information can then be used to adapt the models to more realistic conditions and update the hot spot areas.

Priority level 1 implementation group 3: Prioritized HUC 12s of high livestock density (nutrient source and timing)

Phosphorus sourced from manure makes up a portion of the total nutrients used in the WLEB. Manure application is generally difficult to represent using watershed modeling methods. Limitations include the complexity of exactly when, where and how manure is applied and the inability to accurately document and represent those processes. Consequently, the work by Scavia et al. 2016 does not identify areas that may have increased loading from manure application. Ohio EPA water quality monitoring data has identified areas where manure application potentially is the most likely nutrient source.

Only two priority level 1 HUC 12s are currently included in this category (Table C3). Again, these two HUC 12s were not identified by the Scavia et al. 2016 modeling report. These are watersheds where large animal feeding operations exist, although specific numbers of animals at these operations have not been documented for this analysis. While the amount of manure applied within these watersheds has not been documented, Ohio EPA has observed elevated ambient nutrient concentrations without being able to identify or observe other obvious nutrient sources.

Evaluating subwatersheds where manure may be or is documented as the primary nutrient source, not necessarily where the actual livestock operations are located, can provide vital information as to manure’s role in nutrient export and how specific management practices can affect that contribution.

Priority level 1 implementation group 4: Prioritized HUC 12s with various landscape stressors

It is uncommon for the models to agree on hotspot areas in the Maumee watershed where there are not high slopes or high percentages of D soils. However, three level 1 HUC 12s fall into this category (Table C4). Each of these watersheds were identified by the Scavia et al. 2016 report as hot spots for both TP and DRP. These were the only locations where this phenomenon occurred.

Subsurface drainage is nearly ubiquitous in this region, and depending on soil health and composition, and tile spacing, improved infiltration rates may result in more water leaving fields through drainage tile. Understanding the influence of subsurface drainage on water quality in these regions is especially important. Emphasis should be placed on management practices that are linked to improving water quality through tile discharge.

Additional nutrient sources

The focus of this prioritization effort is to evaluate potential nonpoint sources at the HUC 12 scale. However, there are other sources that should be considered for nutrient reductions. In this section, we are providing some additional analysis of point sources of nutrients across the Maumee River watershed. Some of these sources, including point sources, combined sewers, failing home sewage treatment systems are noted where present within the priority level 1 subwatersheds on Tables C1-C4. Potential nutrient point sources are not noted for priority level 2 and 3 HUC 12s on Tables C5 and C6.

Throughout the Maumee River watershed, several wastewater treatment plants that are significant minors discharging less than 1 MGD are present, but do not a have phosphorus limits. These facilities report self-monitoring data to Ohio EPA's discharge monitoring report database.

For water year 2014 (October 1, 2013 – September 30, 2014), we calculated loads for the top 30 load contributors of Ohio's NPDES permitted facilities in the Maumee River watershed (Table C7). Most of the largest facilities, those discharging over 1 MGD, already have limits of 1 mg/L in the discharge (denoted in green in the table). However, the list includes many smaller facilities that do not have limits but are still significant contributors. For this reason, they rank high on the list for annual total phosphorus load. Plants shown in red on Table C7 do not have phosphorus discharge limits. Those in yellow have limits in their current permit, but these limits were not yet in place during water year 2014.

Table C1: Priority level 1 HUC 12 subwatersheds within the Maumee River watershed due to high density of hydrologic soil group type D (intensive drainage and tillage) implementation group

HUC 12	HUC name	Soil feature	Other sources
041000060205	Stag Run-Bean Creek	D – 29% C – 44%	
041000060601	Lost Creek	D – 20% C – 57%	
041000070503	Village of Kalida-Ottawa River	D – 23% C/D – 77%	
041000070701	Hagerman Creek	D – 45% C/D – 38%	Convoy WWTP
041000070703	Prairie Creek	D – 56% C/D – 44%	
041000070806	Burt Lake-Little Auglaize River	D – 97%	
041000070905	Lapp Ditch-Auglaize River	D – 97%	
041000070906	Prairie Creek	D – 100%	Anaerobic digester with land application
041000071004	Lower Blue Creek	D – 95%	Several small WWTPs Paulding biosolids fields
041000071102	Upper Powell Creek	D – 100%	Continental WWTP
041000071207	Little Flatrock Creek	D – 100%	Paulding biosolids fields
041000071208	Sixmile Creek	D – 100%	Paulding biosolids fields
041000080604	Bear Creek	D – 100%	
041000080605	Deer Creek-Blanchard River	D – 100%	Ottawa biosolids fields

Table C2: Priority level 1 HUC 12 subwatersheds within the Maumee River watershed due to high slopes (erosion) implementation group

HUC 12	HUC name	Soil feature	Other sources
041000030305	Bear Creek	Not determined	Edon WWTP
041000070103	Wrestle Creek-Auglaize River	72%	Lima biosolid fields
041000070104	Pusheta Creek	65%	
041000070105	Dry Run-Auglaize River	45%	Several small WWTPs
041000070201	Twomile Creek	18%	Several small WWTPs

Table C3: Priority level 1 HUC 12 subwatersheds within the Maumee River watershed due to high livestock density (nutrient quantity and timing) implementation group

HUC 12	HUC name	Other sources
041000050206	Platter Creek	
041000050201	Zuber Cutoff	Antwerp WWTP

Table C4: Priority level 1 HUC 12 subwatersheds within the Maumee River watershed due to row cropped with various landscape characteristics implementation group

HUC 12	HUC name	Other sources
041000080102	Headwaters Blanchard River	Kenton biosolids fields
041000040301	Little Black Creek	
041000040302	Black Creek	

Table C5: Priority level 2 HUC 12 subwaterheds within the Maumee River watershed

HUC 12	Name	HUC 12	Name
041000040304	Duck Creek	041000040203	Blierdofer Ditch
041000071002	Upper Blue Creek	041000040303	Yankee Run-Saint Marys River
041000070803	Maddox Creek	041000030501	Bluff Run-Saint Joseph River
041000070804	Lower Town Creek	041000060404	Lower Lick Creek
041000070702	West Branch Prairie Creek	041000030204	Lake Da Su An-West Branch St J. R
041000071206	Big Run-Flatrock Creek	041000030302	Cogsworth Cemetery-St Joseph R
041000030306	West Buffalo Cemetery-St J. R	041000070904	Big Run-Auglaize River
041000070903	Lower Jennings Creek	041000070403	Honey Run
041000070405	Leatherwood Ditch	041000070502	Plum Creek
041000070907	Town of Oakwood-Auglaize R	041000090203	Wade Creek-Maumee River
041000090201	Preston Run-Maumee River	041000090204	Garret Creek
041000060504	Coon Creek-Tiffin River	041000090401	Konzen Ditch
041000090202	Benien Creek	041000060202	Deer Creek-Bean Creek
041000070304	Lower Hog Creek	041000090508	Middle Beaver Creek
041000090501	Big Creek	041000090507	Cutoff Ditch
041000090504	Upper Yellow Creek	041000090106	Lower South Turkeyfoot Creek
041000090506	Lower Yellow Creek	041000070301	Upper Hog Creek
041000090902	Grassy Creek	041000080304	Howard Run-Blanchard River
041000040401	Twentyseven Mile Creek	041000090804	Heilman Ditch-Swan Creek
041000030301	Nettle Creek	041000050204	Gordon Creek
041000070603	Wolf Ditch-Little Auglaize River	041000030303	Eagle Creek
041000050207	Sulphur Creek-Maumee River	041000040205	Prairie Creek-Saint Marys River
041000060204	Mill Creek	041000071001	Upper Prairie Creek

HUC 12	Name	HUC 12	Name
041000070203	Sims Run-Auglaize River	041000070801	Dog Creek
041000070604	Dry Fork-Little Auglaize River	041000070402	Dug Run-Ottawa River
041000090103	School Creek	041000070501	Sugar Creek
041000070306	Lima Reservoir-Ottawa River	041000071103	Lower Powell Creek
041000070303	Little Hog Creek	041000090104	Middle South Turkeyfoot Creek
041000080401	Binkley Ditch-Little Riley Creek	041000090402	North Turkeyfoot Creek
041000090105	Little Turkeyfoot Creek	041000070102	Blackhoof Creek
041000090509	Lower Beaver Creek	041000070305	Lost Creek
041000080101	Cessna Creek	041000080505	Dutch Run
041000090601	Tontogany Creek	041000080504	Dukes Run
041000090903	Crooked Creek-Maumee River	041000090502	Hammer Creek
041000050205	Sixmile Cutoff-Maumee River	041000040204	Twelvemile Creek
041000040201	Hussey Creek	041000070601	Kyle Prairie Creek
041000040105	Sixmile Creek	041000071005	Town of Charloe-Auglaize River
041000040103	East Branch	041000030106	Clear Fork-East Branch St Joseph R
041000070805	Middle Creek	041000040101	Muddy Creek
041000070204	Sixmile Creek-Auglaize River	041000070901	Upper Jennings Creek
041000070406	Beaver Run-Ottawa River	041000080601	Cranberry Creek
041000070404	Pike Run	041000080403	Marsh Run-Little Riley Creek
041000071101	North Powell Creek	041000080404	Middle Riley Creek
041000070101	Headwaters Auglaize River	041000080402	Upper Riley Creek
041000040305	Town of Willshire-St Marys River	041000070302	Middle Hog Creek
041000071205	Wildcat Creek-Flatrock Creek	041000090101	West Creek
041000050202	North Chaney Ditch-Maumee R	041000090102	Upper South Turkeyfoot Creek
041000030505	Willow Run-Saint Joseph River	041000080602	Pike Run-Blanchard River
041000030402	Headwaters Fish Creek	041000090505	Brush Creek
041000040202	Eightmile Creek	041000080202	The Outlet
041000070802	Upper Town Creek	041000090904	Delaware Creek-Maumee River
041000070602	Long Prairie Creek-Little Aug. R	041000050203	Marie DeLarme Creek
041000060401	Upper Lick Creek	041000071003	Middle Blue Creek
041000040102	Center Branch	041000071209	Eagle Creek-Auglaize River
041000070202	Village of Buckland-Auglaize R	041000040106	Fourmile Creek-Saint Marys River
041000070401	Little Ottawa River	041000040104	Kopp Creek
041000080603	Miller City Cutoff	041000070902	West Jennings Creek
041000090205	Oberhaus Creek	041000080405	Lower Riley Creek
041000080205	City of Findlay-Blanchard River	041000090503	Upper Beaver Creek
041000090901	Grassy Creek Diversion	041000080301	Upper Eagle Creek

Table C6: Priority level 3 HUC 12 subwatersheds within the Maumee River watershed

HUC 12	Name	HUC 12	Name
041000060604	Buckskin Creek-Tiffin River	041000080203	Findlay Upground Reservoir Number One-Blanchard River
041000060402	Middle Lick Creek	041000060603	Webb Run
041000080302	Lower Eagle Creek	041000060301	Bates Creek-Tiffin River
041000090803	Wolf Creek	041000080303	Aurand Run
041000050208	Snooks Run-Maumee River	041000060403	Prairie Creek
041000090206	Village of Napoleon-Maumee R	041000060203	Old Bean Creek
041000090302	Lower Bad Creek	041000090801	Upper Blue Creek
041000080503	Moffitt Ditch	041000090802	Lower Blue Creek
041000090403	Dry Creek-Maumee River	041000080204	Lye Creek
041000080105	Ripley Run-Blanchard River	041000030503	Russell Run-Saint Joseph River
041000080201	Brights Ditch	041000060303	Flat Run-Tiffin River
041000090603	Haskins Road Ditch-Maumee R	041000090702	Fewless Creek-Swan Creek
041000060501	Beaver Creek	041000090701	Ai Creek
041000060302	Leatherwood Creek	041000090602	Sugar Creek-Maumee River
041000060503	Village of Stryker-Tiffin River	041000080104	Potato Run
041000090301	Upper Bad Creek	041000060602	Mud Creek
041000090703	Gale Run-Swan Creek	041000060502	Brush Creek
041000030304	Village of Montpelier-St J. R	041000080506	Village of Gilboa-Blanchard River
041000080502	Ottawa Creek	041000090207	Creager Cemetery-Maumee River
041000080501	Tiderishi Creek	041000090510	Lick Creek-Maumee River
041000080103	The Outlet-Blanchard River		

Table C7: The top 30 total phosphorus NPDES permitted discharges in Maumee River watershed for water year 2014 (October 1, 2013 – September 30, 2014) [a]

Maumee River (Water Year 2014, NPDES Loads only)							
Rank	Permit #	Permit Name	Design Flow (gal/day)	Actual Flow Volume (millon gal)	[TP] (mg/L-P)	TP Load (kg/yr)	% of total NPDES (OH) Maumee River load
1	2PF00000	Toledo Bay View Park WWTP	130,000,000	25,162	0.44	41,909	33.72%
2	2PK00000	Lucas Co WRRF	22,500,000	5,745	0.71	15,439	12.42%
3	2PD00008	Findlay WPCF	15,000,000	4,213	0.77	12,281	9.88%
4	2PE00000	Lima WWTP	18,500,000	5,413	0.38	7,786	6.27%
5	2PD00013	Defiance WWTP	6,000,000	1,190	0.96	4,324	3.48%
6	2IF00004	PCS Nitrogen Ohio LP	3,740,000	1,034	1.10	4,304	3.46%
7	2IH00021	Campbell Soup Supply Co LLC	10,000,000	1,389	0.71	3,707	2.98%
8	2PD00002	Perrysburg WWTP	5,400,000	2,168	0.36	2,914	2.34%
9	2PB00034	New Bremen WWTP	900,000	254	2.87	2,755	2.22%
10	2IH00110	Cooper Farms Cooked Meats Van Wert	N/A	63	10.90	2,583	2.08%
11	2PD00001	Rockford STP	250,000	240	2.33	2,120	1.71%
12	2PB00050	Ada WWTP [a]	2,000,000	258	2.02	1,970	1.59%
13	2PD00006	Van Wert WWTP	4,000,000	1,070	0.49	1,964	1.58%
14	2PD00003	Montpelier WWTP	1,000,000	306	1.51	1,750	1.41%
15	2PD00000	Napoleon WWTP	2,500,000	684	0.63	1,630	1.31%
16	2PB00025	Swanton WWTP [b]	920,000	216	1.90	1,553	1.25%
17	2PK00002	Shawnee No 2 WWTP	2,000,000	682	0.60	1,548	1.25%
18	2PB00046	Elida WWTP	500,000	217	1.77	1,448	1.17%
19	2PB00042	Hicksville WWTP [c]	400,000	314	1.15	1,359	1.09%
20	2PD00027	Paulding WWTP	710,000	241	1.47	1,334	1.07%
21	2PH00007	American-Bath WWTP	1,500,000	462	0.70	1,225	0.99%
22	2PD00026	Saint Marys STP	3,000,000	693	0.44	1,153	0.93%
23	2PA00047	Kalida STP	200,000	69	4.08	1,060	0.85%
24	2PC00004	Columbus Grove WWTP	820,000	251	1.10	1,043	0.84%
25	2PA00002	Ottoville WWTP	339,000	83	3.02	953	0.77%
26	2PB00040	Leipsic WWTP	1,500,000	238	0.98	879	0.71%
27	2PB00005	Convoy WWTP	200,000	84	2.73	869	0.70%
28	2PD00019	Wapakoneta WWTP	4,000,000	1,088	0.21	844	0.68%
29	2PB00006	Pioneer WWTP [d]	500,000	88	2.37	792	0.64%
30	2PA00037	Antwerp WWTP	33,000	78	2.62	769	0.62%

Legend
TP limit
No TP limit
Limit in new/ existing permit

[a] New permit includes a TP limit that will take effect in 2017.
[b] Current permit includes a TP limit, took effect in 2015.
[c] New permit includes a TP limit that will take effect in 2019.
[d] New permit includes a TP limit that will take effect in 2017.

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